

# 1 Overview



## Introduction

The **DVD-lab PRO** is the next step in DVD authoring for advanced users who need an accessible and easy to learn tool with the full range of DVD features.

Most of the existing tools are either very expensive and hard to master or are limited in their implementation of the DVD-Video specifications. Many tools that are marketed as "advanced" or for "professional" use are often actually only more expensive consumer applications with pre-cooked DVD structure and questionable user interface.

**DVD-lab PRO** is based on the idea of original DVD-lab. Instead of insulting the users with an overdone flashy interface, DVD-lab and DVD-lab PRO put strong emphasis on the usability of it. The Modern Windows GUI can be tweaked and reorganized to everybody's taste even across multiple monitors.

DVD-lab is also one of the very few applications on the market that grows with your requirements and knowledge. Users of other applications usually either outgrow them very soon or they need to study a long time before they are able to create even simple project. We put a lot of effort to the DVD-lab PRO so it offers benefits of both worlds. It is easy to start making simple DVDs but it doesn't stop there. As you continue to master the craft you will realize that DVD-lab PRO offers an unlimited range of design flexibility and delivers the goods even for most demanding designers.

### Flexible DVD structure

DVD-lab PRO is a full Multiple-VTS application, that means you can put different aspect ratios or movies with different audio channels on one DVD. But unlike other Multi-VTS applications in this category, DVD-lab PRO does not force you to use any predefined DVD structure. Each Video Title Set can be as complex or as simple as **you** want. The full flexibility of creating the DVD structure is one of the strongest point of DVD-lab PRO.

### Multiple Audio and Subtitle Channels

Each title in DVD-lab PRO can have up to 8 audio channels: AC3, MPA, LPCM or DTS and also number of subtitle streams. You have the ability to add 8 subtitle channels, these can be created within DVD-lab or imported using popular formats. You can use customized graphic subtitles (imported from bitmaps).

### Multiple Angles

For the advanced DVD author, multiple angles are the special feature to spice up the video.

**Single and multiple PGC Titles**

For the advanced DVD author who needs a special case of Multi-PGC titles.

**More Menu Effects**

DVD-lab PRO builds on DVD-lab's available menu effects. You can use various Texture Fills and new Effects such as Metal Shine for new cool effects such as metal, gold, chrome, marble - and more!

**New Dynamic effects**

DVD-lab and DVD-lab PRO have strong integrated menu designers with multiple Undo/Redo. DVD-lab PRO adds also new DynamicFX textures that can be animated for Motion menus.

**Delayed menu buttons and menu Cells**

We added delayed menu button for motion menus so you can create motion menu with a loop points for seamless transition from intro. This also works together with Render Motion where you can now specify an intro effect.

**Play Lists, Counter Lists, Random Lists etc.**

DVD-lab Pro has also ability to add a number of different play lists. If you like to play your movies in an alternative order you don't have to add the files to DVD multiple times. All you need to do is to make one or more play lists.

**Special Navigation Objects**

There are other special navigation object such as Condition Splitter, Case List or Return to last menu that you can incorporate into your layout.

**Audio-Only Track**

A 'Movie' can now have also audio track(s) only. This is a good option for distributing large amount of music on a DVD. As addition you can also edit the still screen that will be displayed during the audio playback. (For example, a song title).

**Movie Branching**

Branching object allows you to add a new chapter sequence into a Movie. Chapters can then be played in any order, can be skipped or repeated in any fashion - and they don't take additional DVD space.

**Multi-Aspect Widescreen menus**

DVD-lab PRO can create widescreen menus that will play correctly on both widescreen and normal 4:3 aspect ratio televisions.

**Smart-Compile**

Recompile only the menu changes and keep the time intensive movie multiplexing from the last compile. This way you can change or fix project within a few minutes.

**Connection**

The Connections window is the heart of your DVD structure even more now with the PRO version. You have additional ways to organize your objects where the Connections window

allows for easier work with table view, split-view or snap-to-grid features. As well as the Title Button, you can now program the action to be taken when the player's remote control "Menu" button is pressed.

### **Smart Components and Scripts**

DVD-lab PRO's integrated scripting language, "Lab-Talk", will enable you to make your own wizards, smart components and effects that can help you with repetitive tasks.

### **Things for PROs**

If you still feel you don't have enough features, DVD-lab PRO gives you full access to the PRE and POST commands of any object where you can add your own virtual machine code using a self-checking VM Command Scripting language.

### **Ability to Compile without Abstraction Layer**

For special needs DVD-lab PRO can compile DVD without its Abstraction layer. This will work like the professional high-end systems where you can define all the links and structure by yourself.

### **High Educational Value**

DVD-lab Pro is an excellent tool with which to learn and understand all the fine aspects of DVD authoring while still being fun to use. It will put you in the driving seat with the whole structure clearly in front of you.

### **Grows with your requirements**

As you get more experienced with DVD authoring, you will be happy to learn that DVD-lab PRO is always ahead with its features. It is not easy to outgrow our software because we designed it for creative users like us.

### **.. and More**

We haven't even mentioned other new things like Film Strip menus or 360-degree Panoramic menus. But there are still more things to discover...

### **System Requirements**

DVD-lab is available for Microsoft Windows 98/NT/2000/XP (recommended 2000 and XP)

 **Note:** You will need at least a FAT32 disk file system on Windows '98 (which supports up to 4GB file size). However, a NTFS volume in Windows 2000 or XP is strongly recommended (no size restriction). The compile process takes about 200MB of RAM, but the designer can require much more - depending on the projects. It is recommended not to go under 500 MB of RAM.

## **2 About Us**

Mediachance is a privately-owned software company in Ottawa, Canada. We have years of experience in producing imaging and multimedia software.

Please visit our page [www.mediachance.com](http://www.mediachance.com) for more great software.

We all hope DVD-lab software will become popular for its power and low price. Many hours were spent on each detail (which is sort of our "trademark"). We are planning to reinvest all the money from sales into enhancing it much further. This is where you can help us.

The DVD-lab PRO has about 250 thousands lines of code.

## 3 Basics

### 3.1 Basic layout



- 1- Assets Window
- 2 - Project Window
- 3 - Movie Window
- 4 - Menu Window
- 5 - Connection Window

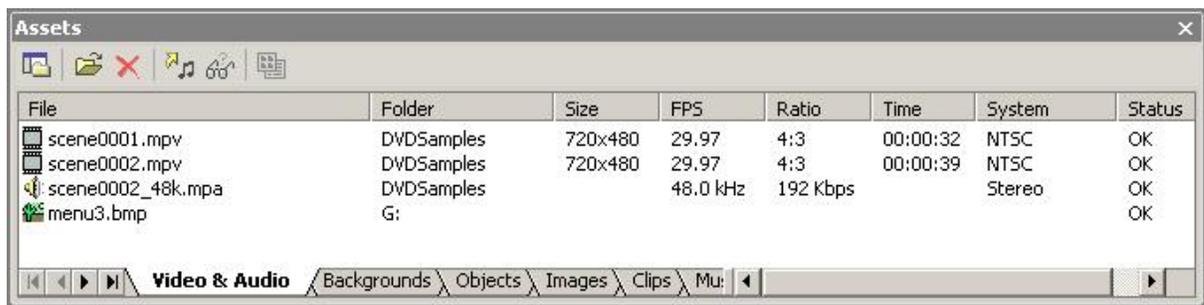
## 6 - Preview Window

See the Quick Tutorial which will briefly explain how to work with each of these windows.

## 3.2 Assets

As described in the Quick Tutorial, the Assets window the place to starting creating your DVD project.

DVD-lab prefers the professional approach to DVD creation. This means that there is an expectation that the DVD author has taken care to insure that their source assets are of excellent quality and already DVD-compliant when brought into the DVD-lab Authoring environment. This has numerous advantages, principally that the compile process is quite fast, with much shorter compile times than for other products that need to constantly re-encode non-compliant files each time a change is made. The DVD-lab Author has the advantage of quickly testing the DVD files to confirm any changes they made.



The Assets window shown here has a selection of tabs displayed at the bottom of the window. Each tab selection represents a different Asset function enabling you to see or manage the Bins that contain the Project components.

The **Video & Audio** Bin tab is the one you will use the most within the Assets window. Files dropped here are checked for validity and are project specific. You can also import an image to this Bin if you need to have the image listed just for this project.

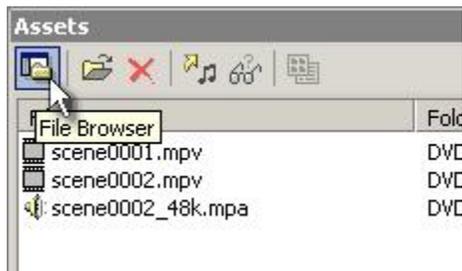
You import files here by simply dragging the file into the Video & Audio Bin from within Windows Explorer or by using DVD-lab's built-in File Browser. The DVD-lab built-in File Browser has the advantage of listing only related files (video - mpg, mpeg, mp2, m2v, audio - mpa, m2a, ac3, dts, wav, aiff, pcm) and most of the image formats. With DVD-lab open on your desktop and the Assets / Video & Audio tab visible, open your Windows Explorer, find the file to import, then Drag & Drop that file into the Assets / Video & Audio window to include that file in your Project.

 **Note:** The role of Video & Audio Bin is not only to collect project-related files but also check their validity. This is the time when the file may be accepted or rejected. The validity check is done by reading the file headers. If the headers are not exactly true (for example GOP timecode is off) some parameters such as Total Time or Average Bitrate will not show the correct value. This doesn't affect the compiled project in any way, it is only a quick display

of information. If you want to know more precise values you can run Bitrate Viewer which will examine the file frame-by-frame and then calculate accurate values for the file's bitrate and total time. Also read more in Frame Indexing.

### ► File Browser, Import files

To open DVD-lab's File Browser, press the File Browser button - the very first button on the Assets Bin toolbar. For the Open File dialog (which is faster) click the second button. With either function, the File Browser or the File Open dialog, you can select one or multiple files. Use Windows' standard multiple file selection methods like <Ctrl>Click for multiple individual files or <Shift>Click for a range of files.



A File Browser behaves just like your standard Windows File Explorer from where you can drag-and-drop files directly into an Assets Bin.

 **Tip:** A valuable shortcut within the DVD-lab File Browser is that you can double click on a file which will then be immediately added to the asset Bin for you.

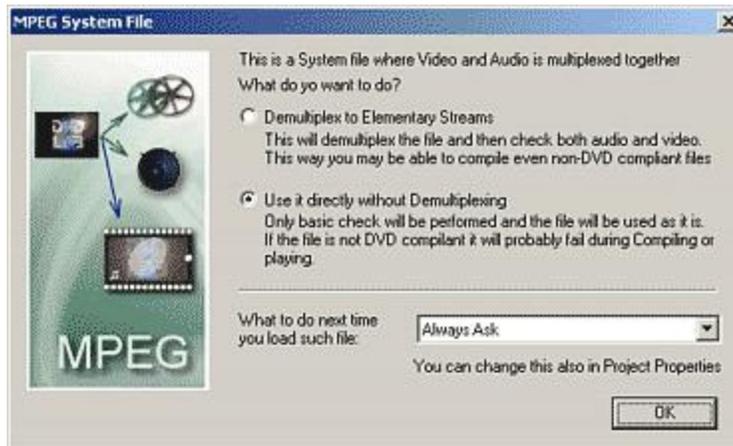
### Checking Files, Errors and Warnings

As soon as you drop a file into the Video & Audio Assets Bin, it will be checked for validity. If the file is not DVD-compliant, DVD-lab will display a Error Message and a Warnings window will appear descriBing the cause of the error.



### ► Demultiplexing files

Normally, DVD-lab expects to import elementary stream files (mpv, mpa, ac3, dts, ...). However, you may also import non-elementary streams such as MPEG or VOB files. When importing an MPEG or VOB file, you will be given a chance to decide what to do with them: Demultiplex them or use them as they are as the below dialog box shows.



### Demultiplexing

This option results in the safest, most compatible asset files at the expense of a little time for DVD-lab to perform the automatic demultiplexing for you. Since the files are first demultiplexed and then re-multiplexed during the Compile process to DVD format, many potential packet related errors will be avoided by taking this option. The demultiplexing processing takes place independently as a background process, you can terminate the process by simply deleting the asset.

File	Folder	Size
! motionoverlay.mpg	DVDSamples	75%

After the files are demultiplexed, DVD-lab will automatically check them and add the new video and audio elementary stream files to your Assets / Video & Audio Bin.

 **Note:** The resulting demultiplexed file(s) will be placed in the same directory where the source file currently is. Make sure you have enough disk space (you need at least the same free disk space as the file size). You can set the destination directory for Demuxed files to other directory by changing the Options in Properties.



 **Tip:** For those using an external software encoder for encoding DVD compliant MPEG-2 video from an AVI file or other source, it will save you time if you select not to multiplex video and audio and to simply output elementary stream files resulting in separate a video and audio file. It saves time in your encoder and also in DVD-lab.

### Use without Demultiplexing

This is a faster method of importing an Asset, but it requires the files are already DVD-compliant. The DVD Compiler is less forgiving when using non-elementary streams. If this option fails, then try Demultiplexing to elementary stream files.

### What to do next time

You can set automatic response next time an MPEG file or VOB file is imported by changing

the Options in Properties.



### ▶ Joining VOB files

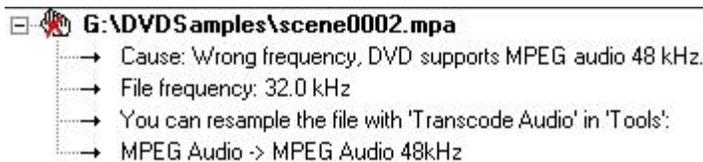
When importing source VOB files, DVD-lab offers a third option. That is, for DVD-lab to join together source program VOB files into one rather large but continuous file. VOB files are divided into 1GB blocks for compatibility with older systems. For joining purposes, DVD-lab requires that your first selected file is the first of the VTS\_ named files such as VTS\_XX\_1.VOB. If you were to then select file names: VTS\_XX\_1.VOB , VTS\_XX\_2.VOB, VTS\_XX3.VOB (etc.) and Drag & Drop these files into your Assets / Video & Audio Bin, DVD-lab will offer a third option to join all sequential VOBs. When this option is selected, a prompt appears for the disk location of the resulting **joined.VOB** file which will be a very large file. Consider going out to lunch when this process starts.

When joining is completed, you will notice a **joined .VOB** file in your Assets / Video & Audio Bin. To make this **joined .VOB** file into compliant elementary stream files, first remove it from your Assets / Video & Audio Bin with the red **X (Remove Asset)**. Recall that this removal just takes the file out of your Bin but does not delete the file from your disk. Next, open the DVD-lab File Manager, find the **joined .VOB** file and double-click it to start the demultiplexing dialog as above.

### ▶ Audio Transcode

The DVD specs are quite picky and specific about the nature of audio files. While many formats are "legal", we may encounter WAV or MPA files that work on our local computer, but are not DVD-compliant. Typically, the culprit is the sampling rate. An audio CD is 16bit/44.1 kHz whereas DVD requires 48 kHz for most formats.

If you import an audio file which is not 48 kHz, then you will be prompted to transcode the file.



You can also Audio Transcode a file at any time by clicking the Audio Transcode button in Assets bar.



In special cases you may end up with audio content in the format of a PCM file (Pulse Code Modulation). While a WAV file is technically a PCM type file, this PCM format is not DVD-compliant or usable in most audio editors. This PCM file then needs to be converted to WAV format (use add WAV header). To accomplish this, DVD-lab provides a built-in PCM->WAV tool for your conversion convenience.

See more in Tools.

#### ► **Previewing files in the Asset Bin.**

You may want to preview a file that is in your Assets / Video & Audio Bin to see what it contains. To do that quickly for a video file, you can simply drag-and-drop it into the Preview window or simply double-click the file.



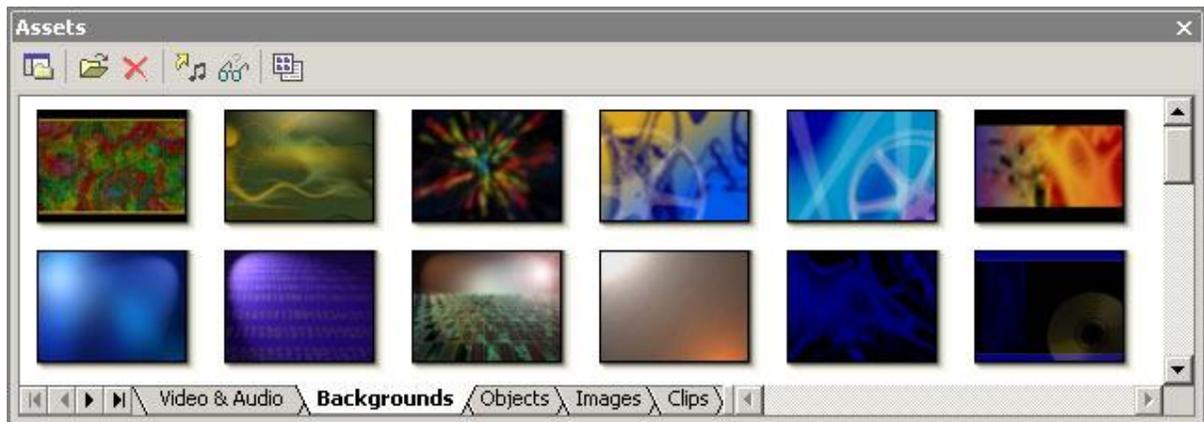
The Preview window shows video content. For audio content, DVD-lab passes the audio file to whatever application the Operating System thinks is associated with that file type (WAV, AC3, MPA). Whatever plays that file on your system outside of DVD-lab gets called when a preview of that audio file type is requested.

#### ► **The Library Bins**

There are other Bins available to you in the Assets windows besides just Video & Audio. These are Permanent Bins. That means the files in these Bins are available for all projects. You may think of them as your library. See the tabs at the bottom of the Assets window. When DVD-lab was installed, it created a series of folders within whatever folder the DVD-lab program was installed into. These obviously named folders contain the files that represent the Library Bins. You can add you own files into the folders as needed.

#### **Backgrounds Bin**

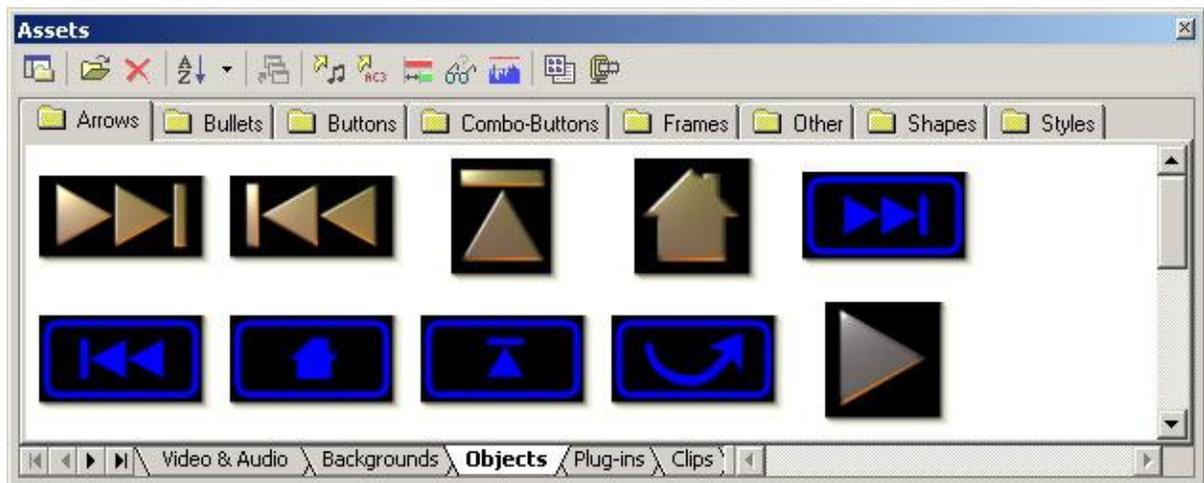
Here DVD-lab displays files that are in the Backgrounds folder. Any file dragged from Backgrounds Bin onto a menu window will fill the menu background. You already have a quite large set of professional backgrounds supplied with the DVD-lab installation. These (.BKG) background image files reside on your disk in a folder named Backgrounds within whatever folder the DVD-lab program was installed into.



To add more background images to this library from your own image files, simply drag-and-drop that image file from the Windows Explorer into the Assets / Backgrounds Bin. That image file will then be physically copied into the Backgrounds folder. When creating your own images, note that menu backgrounds are 720 x 480 pixels, 24 bit color in PNG format.

### Objects Bin

Next Bin is for buttons, frames and other elements for use in building menus. These Objects are transparent PNG format files so they perfectly blend into the background.



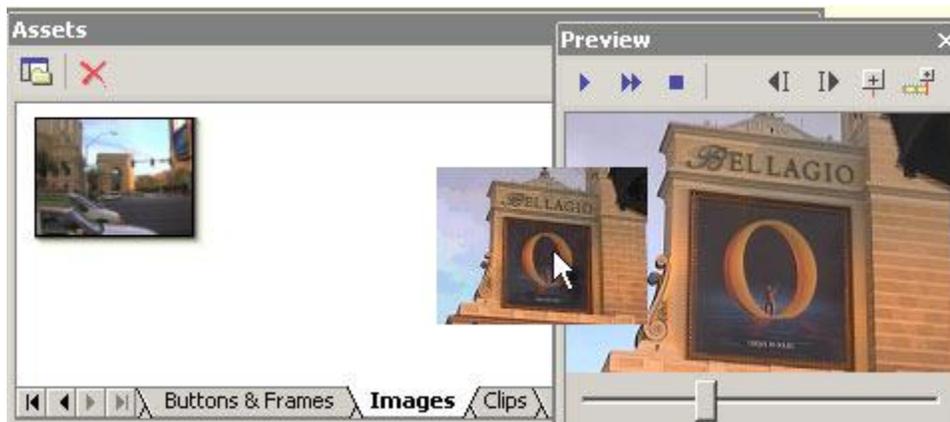
You can create more buttons and frames with software such as Mediachance Real-Draw Pro (In fact all the files you see there were originally created in Real-Draw Pro). The Objects are organized into a few sub-Bins. These sub-Bins are representations of sub-directories within the Objects directory. You can create your own sub-Bins by simply creating a new folder in Explorer. The next time you open DVD-lab you will notice that new sub-Bin.

A special case is a "Styles" sub-bin. Here are stored often used object styles such as color, textures etc. You can apply the style by dragging it over any menu object.



**Images Bin**

This is a tab library for other types of images such as video-stills. It is initially empty. You can easily add video-stills by dragging them from Preview window.



These files dragged here will be again physically copied to the Images folder.

**Clips Bin**

A Bin for permanent video clips such as various short splash screens used before main feature, etc.

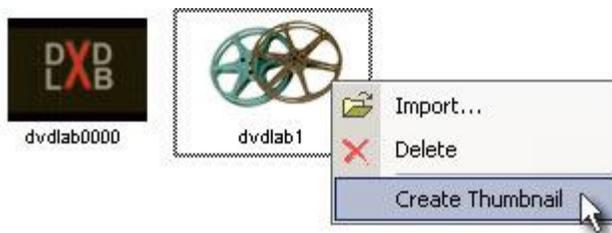


**Note:** The clips dragged here will be permanently copied to the Clips library, as it's a folder available to all Projects. That means you shouldn't copy anything into here that is too

big, The main feature video should be dragged to the Assets / Video & Audio Bin which represents a reference only to the actual asset file on disk.

 **Note2:** The files copied here will not be checked for DVD-compliance. It is your responsibility to add only compliant files. You can always check it first by dropping a file into the Assets / Video & Audio Bin.

Initially, when you add a new clip to the Clips Bin it will have a default thumbnail. You can easily associate a new thumbnail with the clip if you first drag the clip to the preview, scroll to the frame you like and then right-click on the clip in the Bin and select Create Thumbnail. Whatever is currently visible in Preview will become a new thumbnail for that clip.



### Music Bin

A permanent asset Bin library for short audio clips in mpa, pcm or ac3 format. These music clips may be then used for menu audio backgrounds. A normal length of these clips is about 1 min.



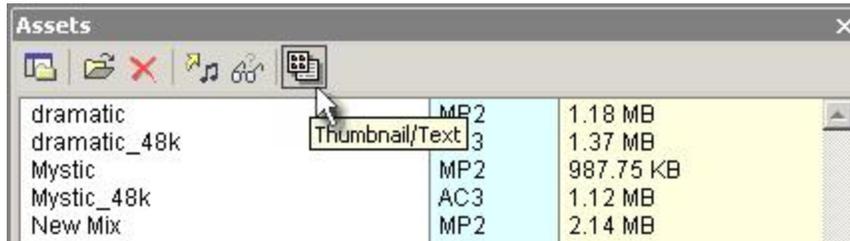
 **Note:** The files copied here will be not checked for DVD compliance. It is your responsibility to add only compliant files. You can always check it first by dropping a file into the Assets / Video & Audio Bin.

You should store files in Music bin (and other permanent bins) only if you plan to use them often. It makes no sense to copy audio file to the Music bin if it will be used only once in one project - in that case add it to the Video & Audio asset bin (which only stores a shortcut to the

file, not the file itself)

► **Display Files**

You can switch the permanent assets to display files instead of thumbnails with the Thumbnail/Text button.



► **Sub-Folders in bins**

The permanent bins: Backgrounds, Music, Clips and Images can also have sub-folders. This will help you to organize a large amount of item in the bin.



This can be done by simply creating a New Folder in the Explorer under the Backgrounds/Clips/Images/Music folders in DVD-lab PRO installation.



Next time you start DVD-lab PRO the sub-folders will appear in bins.

You can organize the items in the bins by moving the files from folder to sub-folder in the Explorer. You need to move the main file (for example \*.jpg) and its associated \*.tmb file (if exist)

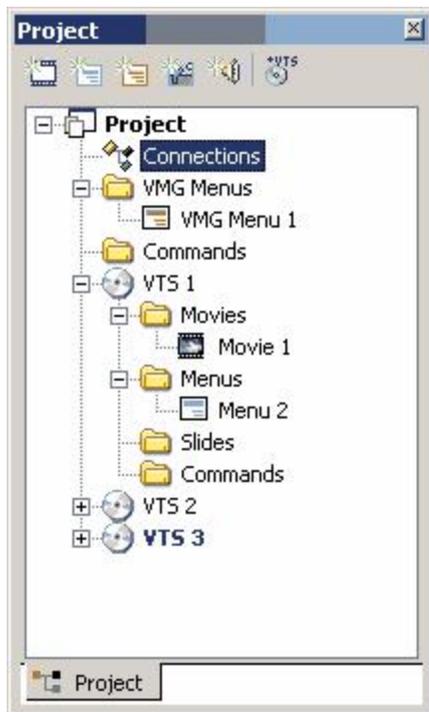
You can also add new items (like background images) into the bins, by simply copying the image files to the /Backgrounds folder or its sub-folders (if any). You need to close and start DVD-lab PRO in order to see the files in the bins.

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This concludes the explanation of the Assets. As with many other things in DVD-lab, you use the Assets by dragging them out onto a Movie or a Menu window.

### 3.3 Project

A Project window displays the items that make up your Project, in a well-organized manner. The items in a Project represent what the contents and elements are that will comprise your DVD when Compiled. They also represents a window which can be opened on the workspace. These items are Movies, Menus, Slideshows and the Connections between them. While you can add many Movies and Menus and Slideshows, there is only one Connections item for each Project.



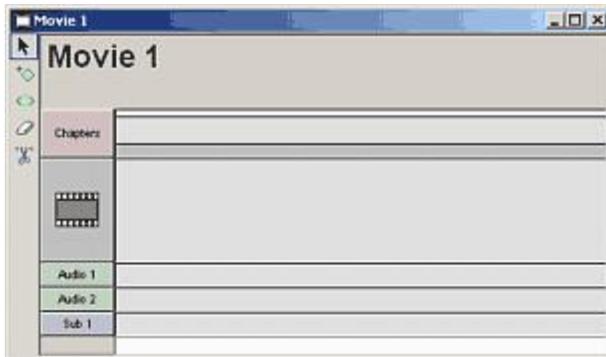
The Project window logically group the object into separate types.

#### Open an Item window.

For example: To open a **Movie 1** window to add Video and Audio, double-click on the **Movie 1** item in the Project window. The opened Items will be also indicated on the workspace tab:



You can open or close these Items as you like. If you close a particular item, for example a Movie 1, it will still remain in the Project, though the window will be hidden



### Deleting an Item

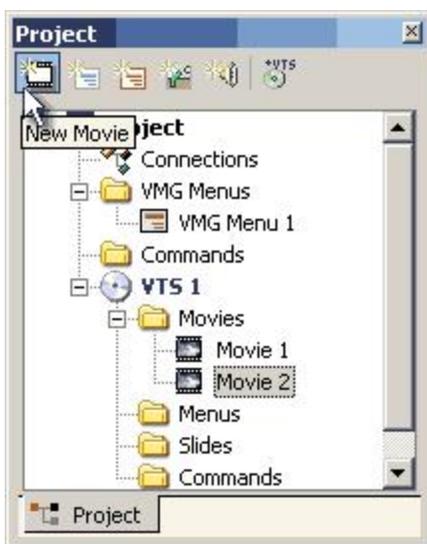
You can delete an Item from the Project by selecting it in the Project window and pressing the Delete key on the keyboard. You can also delete Movie or Menu or Slideshow items, you can't delete the Project Connections.

### Rename an Item

You can rename selected item in the Project window by pressing F2 key. Some objects cannot be renamed such as First Play or any of the folders. Items can be renamed also in Connection View.

### Adding Item

You can add another Movie or Menu item by clicking at the buttons right above the Project tree.



Every Video on the DVD needs to have its own Movie object, even a short clip. At least one Movie object with a Video clip must be present in order to compile the DVD.

A DVD doesn't need to have a Menu. It could just start playing movie as you insert the DVD into the player. See Connections.

### Adding new VTS (PRO).

DVD-lab PRO is a multi-VTS authoring system. A VTS (Video Title Set) is a group of movies and menus that share similar properties. If, for example, you need to include a 16:9 movie and a 4:3 movie to your DVD project, then each of these movies must be contained within its own VTS.

To add VTS simply press Add new VTS button.



A new VTS will be created and also an empty movie object will be placed there. (Each VTS has to have at least one movie object)

To delete VTS simply select it in the Project and press Del key.



### VMG and VTS Menus (PRO)

In multi-VTS application there are two types of menus VMG (a kind of top level menu) and VTS menu (menu that is attached to VTS). Each has its own purpose. You may start using normal Menu if you are not sure about the technical details but once you add another VTS you will soon see the need for a top level menu (VMG). For a more detailed description and further information, please see here.

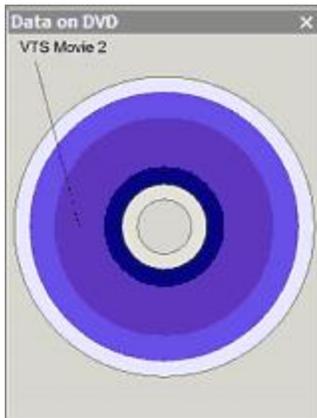
To add normal VTS menu, press the Add menu button (cyan)

To add VMG menu, press the Add VMG menu button (red)

### ► DVD Topology.



You can view a simple overview of the data as they would be physically written on the DVD.



As you select an object in Project, it will be also be highlighted in the DVD Topology window as a ring which represents the physical position of this data on the DVD disc.

 **Note:** The place near the DVD edge are the best candidates for scratches. It is then wise to add there less important data. That means, when you are adding movies start with most important ones.

The physical view will also help you determine how far the DVD laser needs to jump if you connect two movies together.

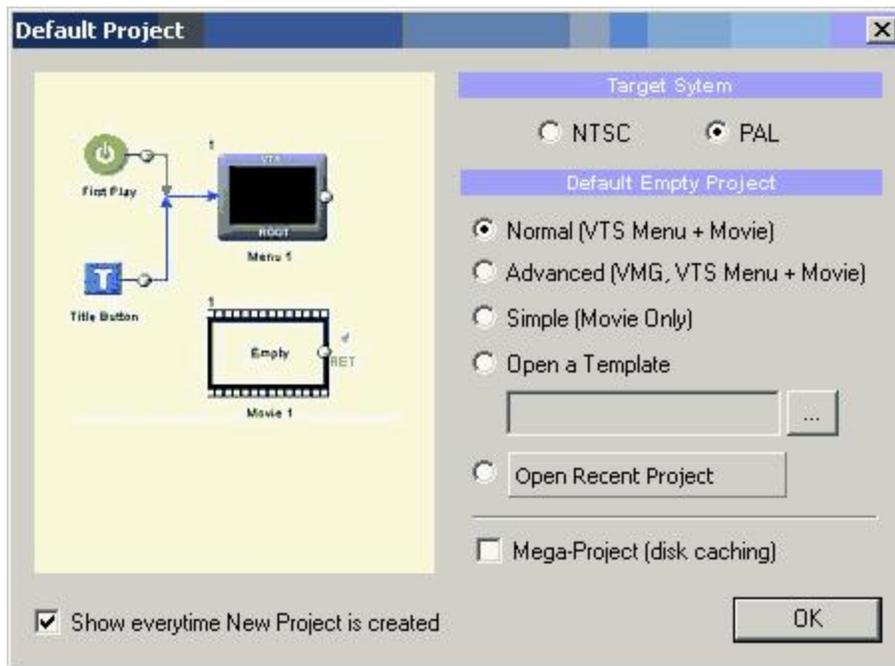
### 3.4 First Steps

Here is a very basic quick tutorial on how to use DVD-lab. We will barely scratch the surface of the complete feature set of DVD-lab and DVD-lab PRO, but it will give you a basic overall idea how things are done.

DVD-lab supports elementary Video and Audio stream file types (mpv, m2v, mpa, m2a, ac3, dts, wav, aiff) or system files (an mpg file with both Video and Audio inside) also called a "Program Stream" for MPEG-2 files.

#### New Project

After starting DVD-lab or when you press New button a Default Project window will appear.



► If this window doesn't show click on menu Project and select Set Default Properties item. Enable the checkbox "Show every time New Project is created".

Select a Normal (VTS Menu + Movie) project and your system, NTSC or PAL.

DVD-lab/DVD-lab PRO will create a simple, empty project for you.

### Import content into the Asset window

First, we need content. Import the Video and Audio files that you intend to use for the DVD into the Assets Bin. To do so, you can Drag & Drop files from Windows Explorer into the Assets Bin or Drag-and-Drop files from the built-in File viewer into the Project specific Asset - Video & Audio Bin.



In the Asset window, click the File Browser button

This will open the internal File Browser which displays only files that can be imported. Browse to the directory where your Video files are and either Drag-and-Drop them into the Asset Bin or double-click on them.



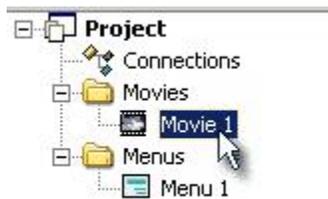
DVD-lab will quickly check the files and display any warnings. If you are importing a system

or program stream, the file will be demultiplexed in the background. Demultiplexing means separating a combined file into its component Video and Audio element files as shown here.

File	Folder	Size	FPS	Ratio	Time	System	Status
scene0001.mpa	DVDSamples		48.0 kHz	224 Kbps		Stereo	OK
scene0001.mpv	DVDSamples	720x480	29.97	4:3	00:00:32	NTSC	OK

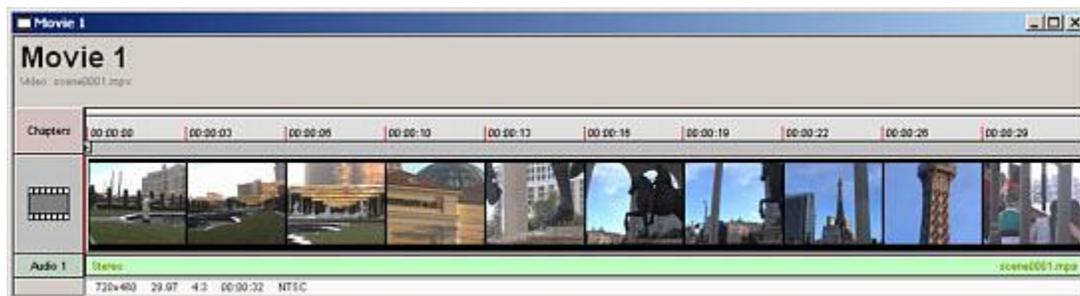
When everything is OK, you can continue building the DVD.

### Making a Movie object



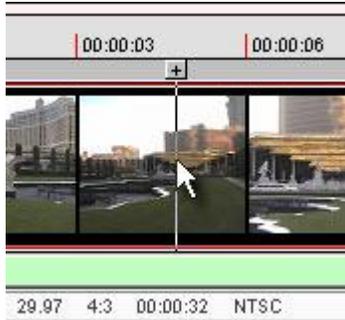
Open the Movie 1 if it is not already open by double-clicking on it in the Project window:

Now, drag a video file from the Asset Bin to the Movie 1 window and drop it into the video track. Next, drag the correct Audio file for that Video there as well, and drop it into the Audio 1 track immediately beneath the Movie.

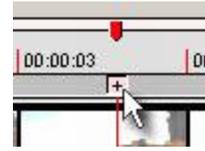


Now you have created your first Movie title. You can now click on the thumbnails in the Movie window and drag the Movie cursor along the length of the Movie. Watch the preview window to see where you are.

### Adding Chapter Points



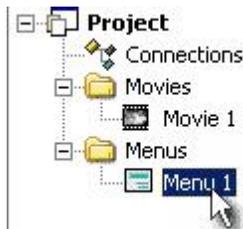
When you see a frame of the Video that you would like to use for a Chapter Point, you can stop and press the [+] button on top of the Movie Cursor. This will add a Chapter Point, shown by the red marker.



 **Note:** you don't need to add a Chapter Point at the beginning of the movie, that's done automatically.

Now enter a few more Chapter Points this time by clicking the "Add Chapter Point" button found in the Preview window's toolsets.

### Building a Menu



Open the Menu 1 by double-clicking on it in the Project window.

An empty Menu will appear.

You can zoom the screen in or out with the zoom buttons on the main toolbar:



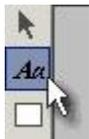
### Choose a Menu Background

In the Asset window, click the Backgrounds tab:



You will see a number of backgrounds available for use in your Menu. Pick one and drag it into the Menu window and drop it onto the Menu. This becomes that Menu's background graphic image.

Menu toolsets are found along the top and left side of the Menu editing window. From the left side toolset, select the text tool (Aa) and then click on the Menu screen in the position that a text item should be placed.



A text window will appear where you can type a title like "My Movie", for example. Now, click OK and place and resize the text to the desired position. Add another smaller text object like "Play Movie" and yet another "Scene Selection".



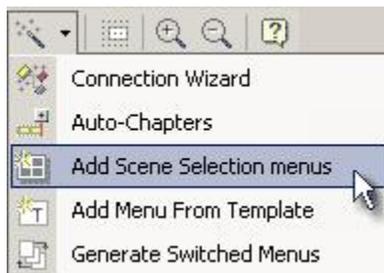
### Making a Linked Button

To add a link from the text to a Movie, simply drag the Movie 1 item from the Project window over the "Play Movie" text and release the mouse button. The link will be created automatically for you. Pretty easy, wasn't it?

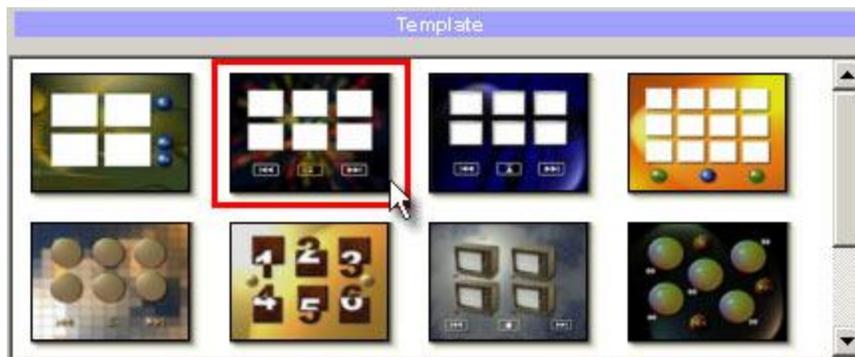


## Using Scene Selection

Now click on the Wizard button found on the Main toolbar and from the context menu select Add Scene Selection Menus, as shown here.



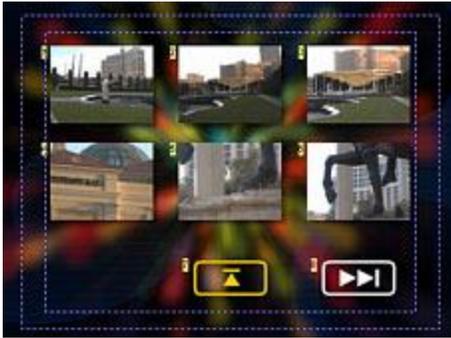
A Template window will open and from there pick a template you like for your scene selections.



DVD-lab will proceed to populate your template with buttons linked to the defined Chapter Points, creating a new, very complete Menu or Menus. Depending on how many Chapter Points you added, one or more new Menus will be created.



You can now open the new Menu by double-clicking on its name in the Project window. DVD-lab did a lot of the work for you already in building this Menu.



### Making a Menu link

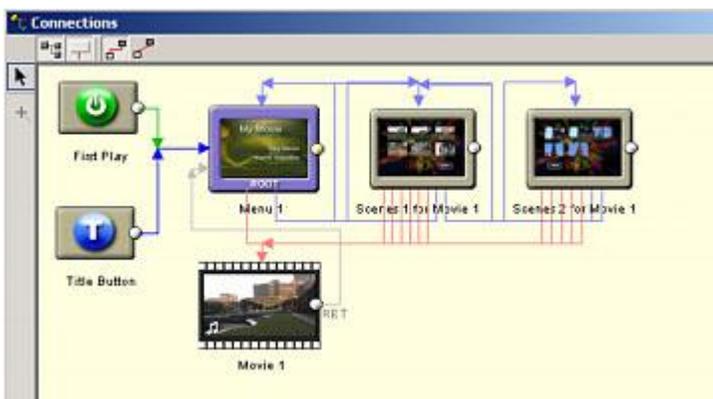
We are almost done, but remember; we don't yet have a link from the first Menu 1 to the selection Menus.

Open the Menu 1 item and from the Project window drag the **Scenes 1 for Movie 1** marker and drop it on top of the "Scene Selection" text.



### The design phase is now done!

You can open the Connection view by double-clicking on the Connection item in the Project window. This is your visual navigation layout of the DVD. The Connection view shows the relationships between items. We will get into more detail on this later. For now you don't have to change anything. DVD-lab has made all of these Connections for you.



### Building the DVD

With the layout and design completed, you are now ready to build a DVD. Click the Compile DVD button found in the top DVD-lab toolbar.

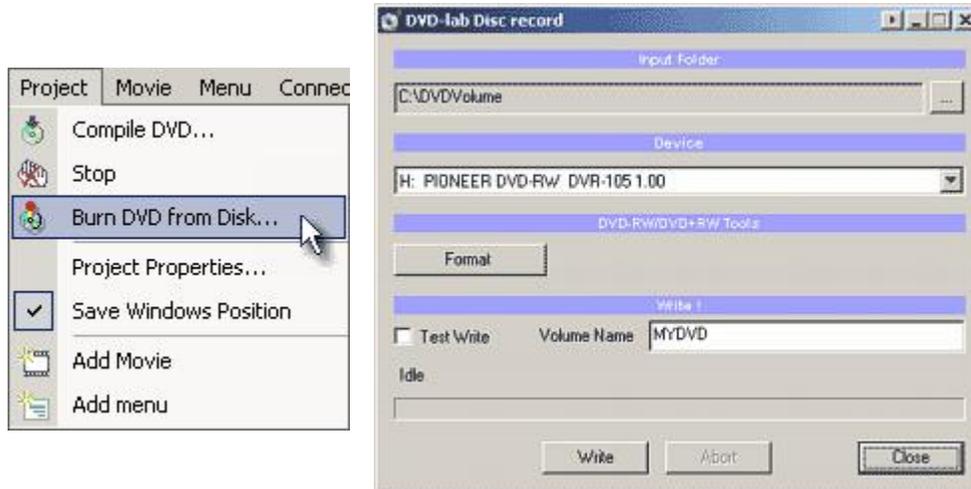


In the Compile window, select a destination folder and a temporary folder on your hard disk. You will benefit in speed of compile if you select two different disks. These folders should be on a drive - or drives - with plenty of free disk space.



Click the Start button and the DVD files will be created in the specified folder (ex: C:\DVDVolume).

You can now test the performance of your DVD Project with a software player such as PowerDVD, CinePlayer, WinDVD and others. Next, burn the Project to DVD media using the Burn DVD from disk command:



You can also use your favorite DVD recording application such as Nero, Gear or Roxio to burn the DVD as well.

### What did you learn:

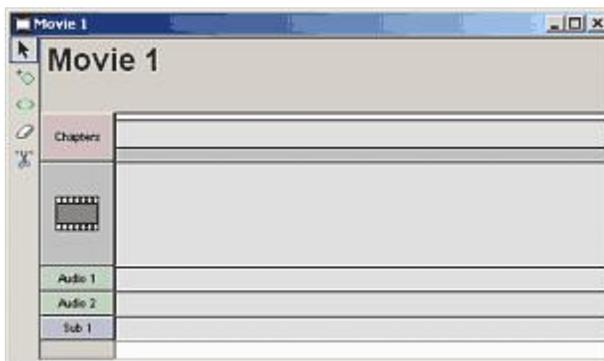
- First, you need to drag your content files to the Video & Audio Asset window for checking of the formats
- You learned how to add chapters
- You learned how to add links to the buttons on Menus
- You learned how to use the wizard to add Scene Selection Menus

- You learned that you need to first compile the DVD to hard disk and then record (burn) to DVD media

## 4 Movie

### 4.1 Movie Window

A Movie window is the place where you add a single video clip and its audio stream(s). You can have many video clips on DVD, but you need a separate Movie window container for each of them.



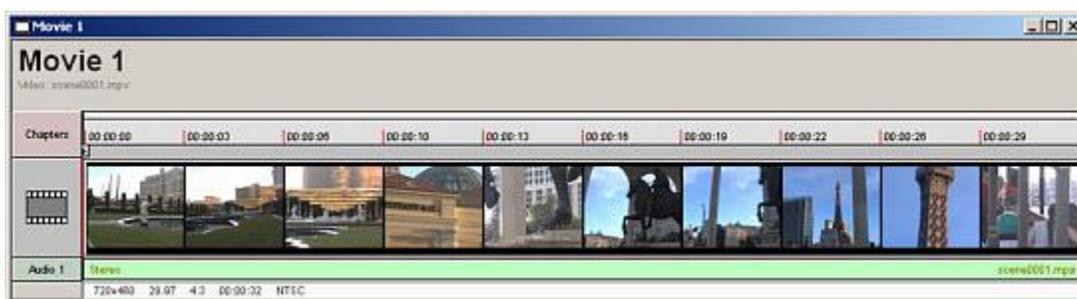
A Movie window has a place (a track) to put a video clip, audio file and a way to enter Chapter Points.

#### Add Video

To add video, drag the video elementary stream file from the Assets Bin and drop it onto the Movie video track. Thumbnails of the video will be quickly generated over the entire length of the video.

#### Add Audio

To add audio, drag the audio stream file from the Asset Bin and drop it onto the Movie audio track.



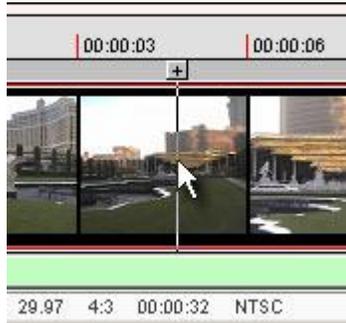
As you add one audio track a new empty track will appear. In DVD-lab PRO you can include up to 8 audio tracks for each Movie.

#### To delete Audio or Video

Select the item on the Movie window which you want to delete and press the Delete key on your keyboard.

### Scrolling through the video

Click on the Video represented by a series of thumbnails and drag the video cursor. Watch the preview window as you drag the cursor.



You can slow scroll by I-frames with keyboard arrow keys: left and right. Alternatively, you can use an external jog/shuttle controller such as Power mate (above, right) or any other controller device which can be assigned to the arrow keys.

You can also use I-Frame buttons on the Preview Window.



### Zoom

You can zoom in or out of the screen with the zoom buttons found on the main toolbar:



Click either the zoom in (+) or zoom out (-) tool, then click in the Movie area to zoom in or out of depending on the tool you selected. Zooming in will enable you to more precisely set the Chapter Points in a long movie.

 **Note:** Video is the main stream in a Movie container. Normally, the video and audio of ordinary video clips are of the same length. However, if the audio is longer than the video (for example: you add a background music clip to your splash clip) the audio will be cut to the length of the video stream. If the audio is shorter than the video, then the movie will be silent after the end of the audio.

A Movie doesn't have to have audio.

See next Chapter Points

## 4.2 Chapters

Chapter Points are used for quick navigation through the movie using the Next/Prev chapter buttons on the viewer's DVD player remote control. Adding a Chapter Point to a movie

creates an internal marker available to DVD-lab that a number of features can then reference. You can have a Menu button jump to this place in the movie for example.

### ► Add Chapter Point

To add chapter point press the [+] button on top of the movie cursor



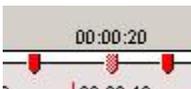
or press *Spacebar* or use action from the jog/shuttle controller assigned to the space bar.

Alternative way:



Select the add chapter point button, Click on a movie and while holding mouse cursor drag to the required position. (Watch the preview window). When position is correct, release mouse button and the Chapter Point will be added.

A Chapter Point is indicated by a red arrow. If you click on the red arrow, it becomes selected and its timecode will be displayed above its marker.



A Chapter Point may also be indicated by a green diamond.



This is in case if a movie has frame index.

 **Note:** You don't have to add a Chapter Point at the beginning of the movie because this is done automatically.

The chapter time is always displayed in non-Drop format (NDF) for NTSC.

### ► Delete Chapter Point

Select the Chapter Point you want to delete by clicking on it and press Delete on your keyboard or press the minus sign on the movie cursor below the chapter.



Alternative way:



Use the Erase Chapter tool and erase over the Chapter Point or Points you want to remove.

### ► Move Chapter Point

You can move existing Chapter Point with the Move Chapter tool



Select the Move Chapter tool and then click on a Chapter Point and hold the mouse button down. Then move the chapter left or right. Release the mouse at new position. A thumbnail associated with the chapter (later used in scene selection for example) will be also changed.

### ► Move Chapter to Previous/Next I-frame (Only for Frame Indexed chapters)

You can move selected Chapter Point left or right in I-frame steps. (The smallest possible step where chapter can exist on DVD)



This will move the chapter itself, but the original thumbnail associated with the chapter (later used in scene selection for example) is **not** changed.

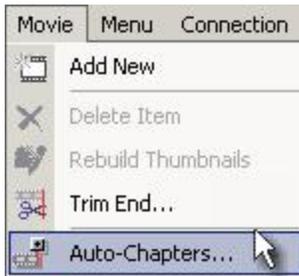
 **Tip:** You can first select a visually good frame, add chapter, then move it to previous or next I-frame for exact chapter placement. You need to have Frame index for this function.

**Technical note:** As you are adding chapters or moving them you will discover you can't always add chapter to an exact spot you would like. DVD specifications require that each chapter point be on an I-frame which occurs approximately every 15 frames. 15 frames is about 0.5 sec of playback. Therefore Chapter Points can only be placed on these spots which occur approximately every half-second.

This limitation is often solved in professional practice by encoding the MPEG-2 stream such that - if necessary - extra I-frames will be generated at specific times to allow for accurate placement of Chapter Points (such as a scene change or transition).

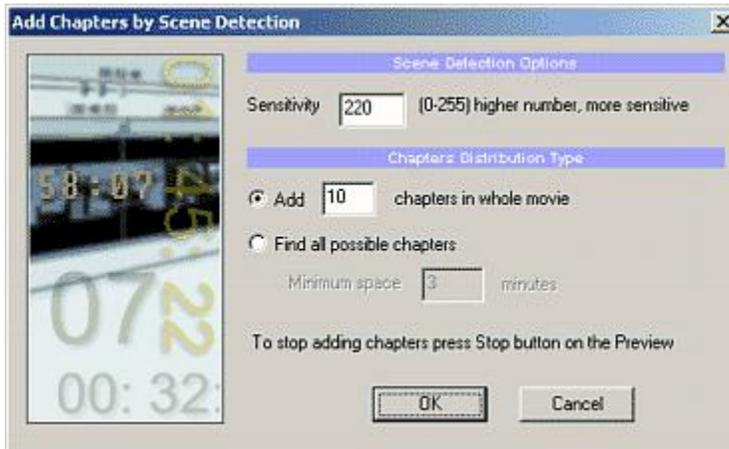
### ► Add Chapter points by Scene Detection

DVD-lab provides professional level tool to analyze and find Chapter Points for you automatically by using scene detection. *See Movie - Auto-Chapters*



You can also click on the Auto-Chapters button on the Preview window.

The Scene Detection tool will look through the video trying to find cut scenes or scene changes, setting Chapter Points there as it finds them. Rather than manually marking Chapter Point ourselves, we can ask DVD-lab automation to help us by marking Chapter Points where it thinks the scene changes.



**Sensitivity:** This sets how much the Scene Detection tool is sensitive to scene changes. A higher number means higher sensitivity, which also means more Chapter Points will be found. If you set this value too high, say at 250, then every new frame will be considered as a scene change. If you set the number too low, the scene detection tool may not find any scene changes. A value about 220 seems to work best.

### Chapter Distribution

This sets how many Chapter Points the software locates optionally the minimum length of a chapter.

#### Add X chapters in whole movie.

The movie will be divided to X blocks, then from each block the Scene Detection will try to find next closest scene cut. This is the fastest way of adding chapters because the movie doesn't have to be scanned frame by frame. The resulting chapters will be not equally spaced and there may be less than X chapters added if there were not enough cut scenes.

 **Tip:** If you want to equally space the chapters enter a high number for sensitivity : 250

### Find all possible chapters + Minimum space X min

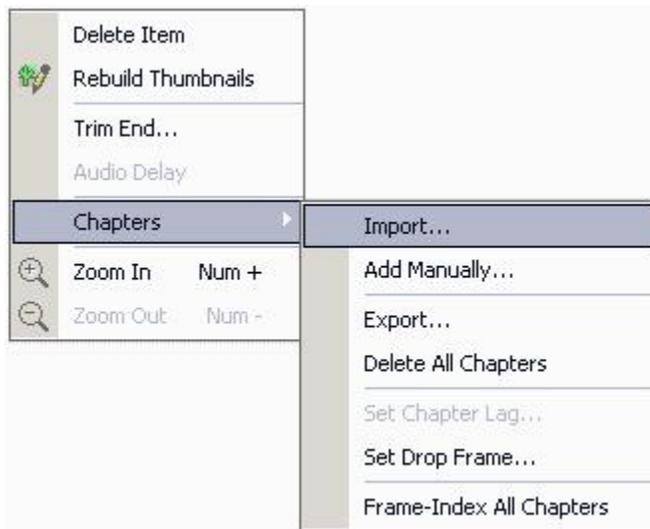
This will scan the whole movie and add the chapters when it finds a cut scene. It will also not add another chapter until the minimum space of X minutes is allowed between them.

 **Note:** The scene detection works by analyzing the image. This however depends on the source - if your camera is shaky then the cut scenes will be placed quite randomly. You may try to tweak the sensitivity for best result or simply add chapters manually.

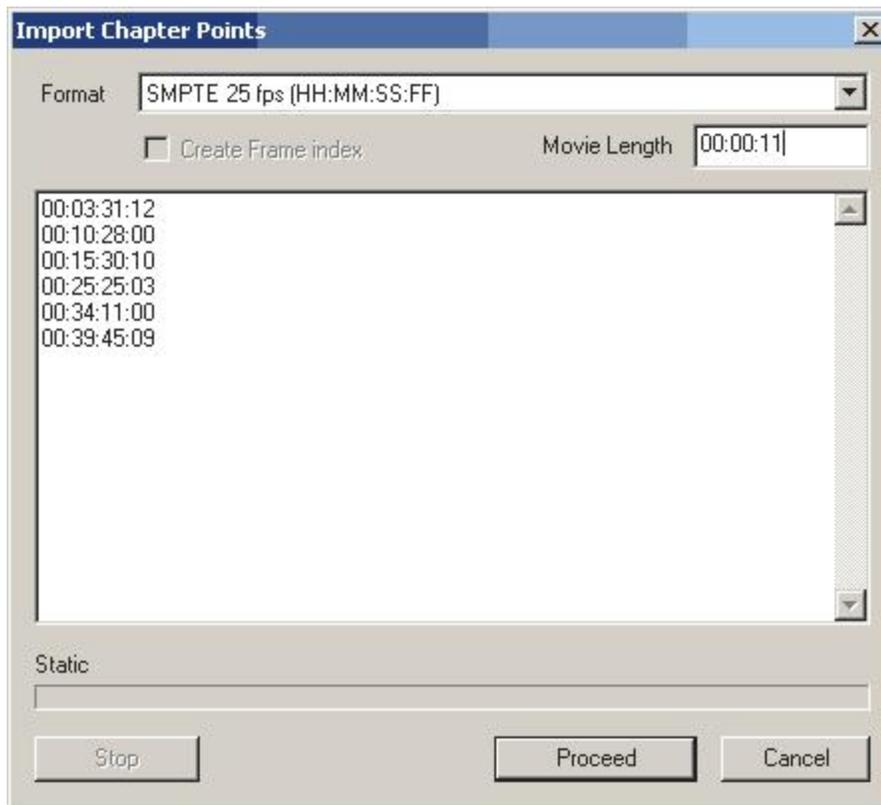
The Chapter Points may be then used for adding a Scene Selection menu.

### ▶ Import Chapters

To import chapters from external file, right-click on the movie and select *Chapters - Import Chapters* from the context menu.



You will be prompted to select the chapters file from the disk. You may either select the chapter text file or press Cancel to add chapters manually. Almost any time-based chapter file format is supported. Smart parsing will extract the timecode from any common text file formats and list them in the edit box:



When you click Proceed a searching algorithm will start looking for the frames in the video file to match the entered timecode. This may take couple of minutes for very large files.

### Timecode or Frame

A standard way is to enter timecode which is often in form of SMPTE

HH:MM:SS:FF

H - hour, M - minute, S - sec, F - frames

 **Note:** For NTSC timecode can be in Non-Drop Frame or Drop Frame Format.

However you may wish to directly use frame number, for example 33134 (which corresponds to the 00:18:24:46). In this case select Frame Number in the Format combo box. Entering the Frame is the most exact way of adding chapters. You should consider to have the movie Frame Indexed prior using Import or the chapter thumbnails may be shown incorrect. (However the chapter position in compilation would be ok, the chapters will be placed at the closest I frame number in any case)

For NTSC/PAL you have to choose the format in which the chapters are written. It could be either HH:MM:SS:FF, HH:MM:SS:CCC or frames. For NTSC you need to also select if the chapters are written in NDF or DF time format.



The chapter time will be in DVD-lab interface displayed in Non-Drop Frame (NDF). If you enter chapters using Drop Frame, they will be converted to Non-Drop Frame so you will see different number in chapter.

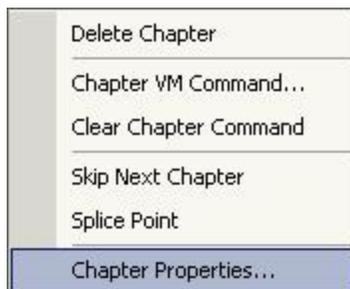
To avoid confusion, you may consider entering the chapter time in NDF format (so the number displayed in chapter will correspond to the number you imported)

### ▶ Chapter Properties

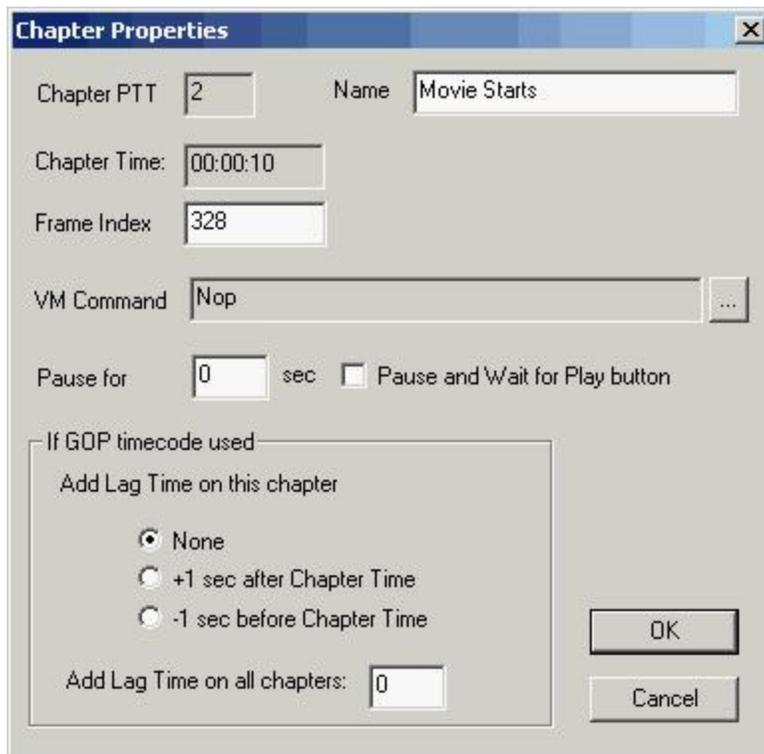
Each Chapter has few adjustable properties. To open Chapter Properties, select a chapter, right-click to open the chapter menu:



From the menu select Chapter Properties...



The Chapter properties window will open.



**Chapter PTT:** Show the chapter-number, which can be used as PTT number in JumpVTS\_PTT command. The first chapter you can add will have Nr. 2, since there is always at least one hidden chapter on the beginning with PTT 1.

**Name:** Here you can set a name of the chapter. Such name will then appear in the Menu Links . Some chapters will have internal name that cannot be changed (for example when you use buttons over video).

**Frame Index:** The frame number of the chapter. If your chapter cannot be placed correctly, you may try to change this number. However remember that chapters will be placed only on I-frame, and if your frame number is not I-frame, closest I-frame will be used. The difference may be up to 0.5 sec. This is done by the DVD specs.

**VM Command:** Another way to add VM command to chapter.

**Pause for:** The video will pause for certain number of seconds. You can also set it to pause for infinite time. In both cases pressing Play button or Next button on your remote will continue the playback. This could be used for presentation or tutorial/guide DVDs.

#### **Chapter Lag (only for non-indexed movies)**

 **Note:** We assume that in normal project the chapters will be always placed with Frame Index accuracy. You either create frame index manually prior compiling or let DVD-lab create frame index during compiling.

Therefore the text below will not apply. It apply **ONLY** if you disallow creating/using frame

index for whatever reason.

Since the chapters from the Movie will be on MPEG I-frame markers rather than time based, it may have happened that the Chapter Point starts a just a bit too early (displays a bit from previous scene) when played on a DVD player. Instead of moving the chapter one second later you can use the Chapter Lag option to make corrections to these time points.

If we set it to play 1 second after the Chapter Time. A Chapter Point that has had a Chapter Lag parameter set will be displayed as having a (+1) or (-1) sign after it's time value, as shown here.



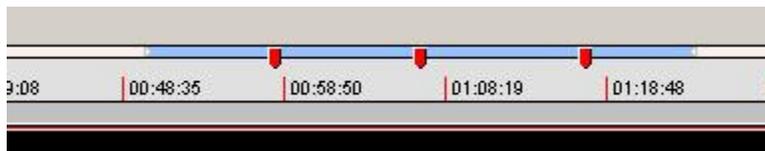
In this case, the chapter will start playing 1 sec after the Chapter Point.

### Movie Branching

Chapters allow you to use a branch object that can play the chapters in any sequence or play only some of the chapters. For more see Advanced objects.

### Layer Break Range

If you have project that is larger than DVD-5 you may see a Layer Break Range area as a blue or cyan bar behind the chapters.



This indicates the area of possible layer break on the DVD.

### Shortkeys:

Action	Shortkey	Description
Insert Chapter	SPACE	Insert chapter at the cursor point
Remove Chapter	Del or Shift+Del	Chapter point must be selected. Del is used also for removing the video, audio or subtitle tracks. Shift+Del can be used only for deleting Chapters.
Next Chapter	Page Up	Select next chapter (right of cursor)

Previous Chapter

Page Down

Select previous chapter (left of cursor)

## 4.3 Indexing

(Optional step)

To speed-up the pre-authoring process, DVD-lab displays the MPEG GOP (Group of Pictures) timecode in the Chapter Points area and in the preview. However DVD-lab will always remember the **exact** chapter placement and then during compiling it can automatically create *Frame Index* and match the desired position of chapters to the correct frame number.

### Chapters accuracy

The usual error for chapter placement is about +/- 0.25 second. This is the best DVD can offer since Chapter Points must be on an MPEG I-frame marker which comes every 15 frames or so. When you are adding chapters to movie manually (using the cursor and plus sign) DVD-lab will stick to closest I-frame.

The Frame-Indexing will make sure the chapters will be placed within this accuracy.

#### ▶ All you need to know

If you don't want to read any further, then all you need to know is this:

In order to use Frame-Index you have to check "Create/Use Frame-Index ..." in the Compile window.



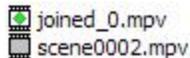
This option will **make sure** that the Chapters will be added with frame accuracy and therefore they are not dependent on the GOP timecode. If the Frame-Index has not yet been created for the Movie, it will be generated just before the compile process starts and all your chapters will be translated to frames.

You can stop just here or read further if you need more information.

### [More reading about Frame-Index](#)

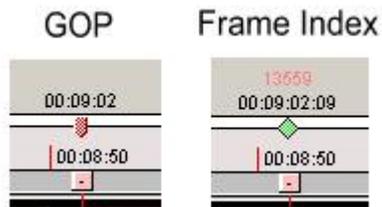
#### ▶ Movie with existing index

A movie which has been indexed will show a Green diamond in the small icon in Assets when loaded. A new movie will not yet have an index, so it will not show this Green diamond flag.



### ► Adding chapters

It doesn't matter if you add chapters with index available or not. DVD-lab is built so that you can Frame-Index a movie anytime without re-creating chapters. So you can add chapters the same way as before and then let DVD-lab create an index afterwards, for example during DVD compilation. Once Chapter Points have frame information, they will show a green diamond instead of red chapter point as shown here.

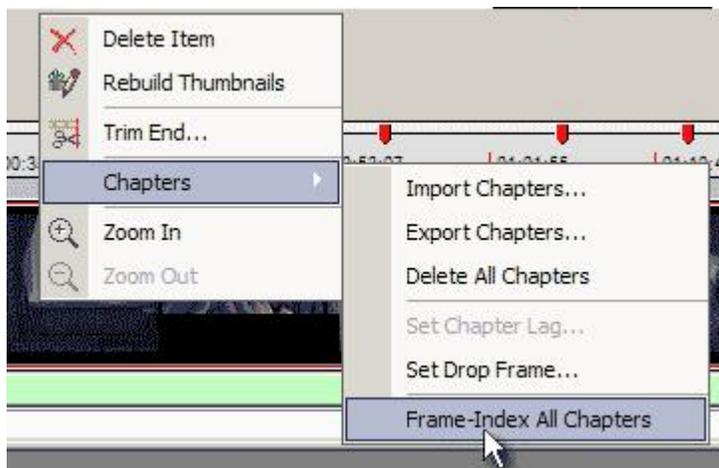


While the GOP timecode is in format **HH:MM:SS** the Frame based timecode is **HH:MM:SS:FF** where the FF are frames. Also, the frame number of the Chapter Point will be shown above in red. For NTSC users the time is shown in Non-Drop Frame format.

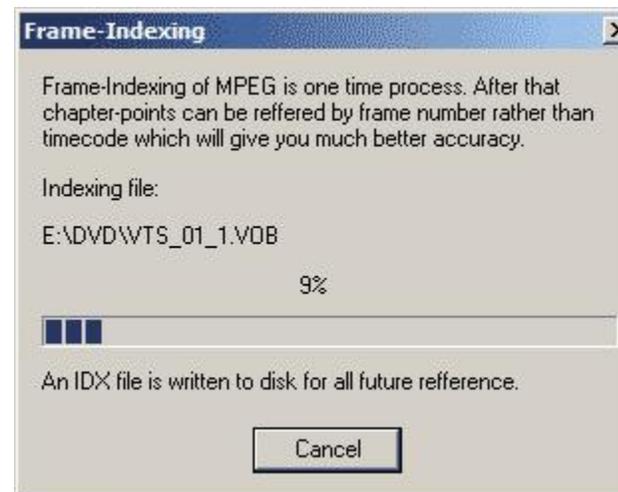
### ► Indexing the movie

**Automatic** - DVD-lab does this for you. That's easy. When you go to Compile, enable Frame-Index Chapters.

**Manual** - Right-click on the movie and select Chapters-Frame-Index All Chapters



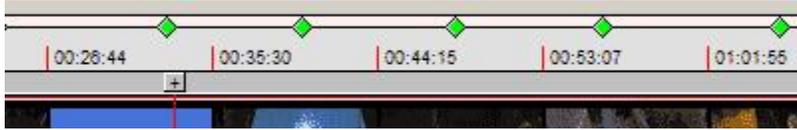
Manually create Frame-Index



If the index file for this mpeg is not found it will be created

When a Frame Index is created all previous chapters will be switched to Frame mode (green)

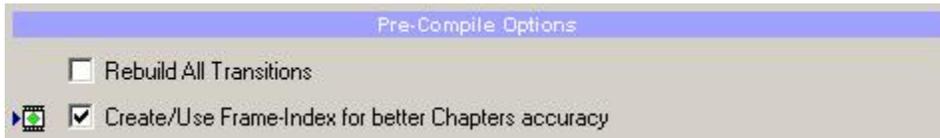
diamond):



 **Note:** If you change the movie file in any way (transcode, re-encode, cut etc...) you have to also delete or manually generate the Frame index again. Using a frame index that was created for different file will place all chapters to wrong location.

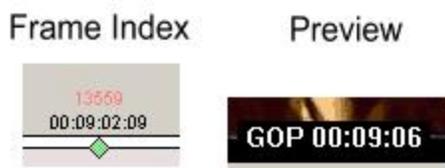
### ► **Compilation**

If you like to use Frame-Index for Chapter Points you will have to enable "**Create/Use Frame-Index ...**" in the compile window. If you don't enable it, a GOP timecode will be used even if you have index created.



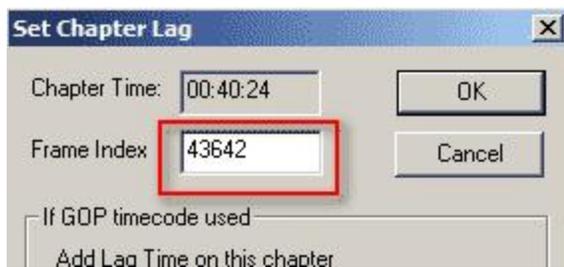
### ► **Time calculation**

Normally the GOP timecode and the displayed Frame timecode should be close, but sometimes there may be a slight discrepancy of a few seconds or so if the MPEG is in drop-frame format - this is nothing to worry about. The Frame displayed timecode is calculated from the frame number, frame-rate and pulldown. In rare cases, the GOP timecode and the Frame-Index based timecode may differ by more than a few seconds. The Frame-Index based timecode is the accurate one.



### ► **Manually adjusting the frame number.**

In most cases the Chapter Points using Frame Code will occur exactly where you want them. Sometimes, especially if you use automatic Chapter Points, some Chapter Points may be placed one I-frame early or later than desired. In GOP timecode you may adjust time lag by +/- 1second, but this doesn't work for Frame Code. You can either delete the Chapter Point and try to create a new one 1 I-frame back (or forward as needed) or you can also directly adjust the frame index in the Set Chapter Lag dialog. An I-frame is usually 15 or 18 frames apart.



## 4.4 Skip Section, Splice Point, Commercial skip

The most common editing requirement on an already existing MPEG-2 is the removal of unwanted sections of the video - such as commercials or bad scenes. Unfortunately in MPEG-2, it is not that simple to remove parts of video without re-encoding (using a nonlinear editing application) and losing quality or rewriting of the whole movie (MPEG GOP editing applications). Things are even more complicated when different audio is involved or if we use elementary streams and it often result in further audio sync or playability problems.

### Skip Section (Shorten Playback)

A non-destructive **Skip Section** tool solves many technical issues with re-editing/cutting MPEG-2 streams.



Select the Skip Section tool and then click on beginning (doesn't have to be exact) of unwanted material and while holding mouse button down, move to the end of the unwanted material (while looking at the preview window), then release the mouse button.

A skip section range will be created with the unwanted part of the movie "disabled". A chapter points will be also placed at the beginning and end of the section.



Now you can use the Move Chapter tool  to fine-tune the exact position of the section boundaries. Continue same way to add another Skip section if you need.

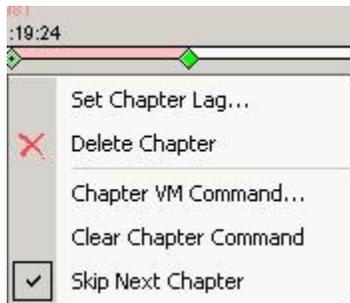
This section will be skipped when the movie is played-back on a DVD player.

 **Note:** Unlike destructive editing, this will not alter the original MPEG-2, nor it will it create a new MPEG file. It will also **not make** the resulting DVD any smaller. Doing it this way, DVD-lab prevents the risk of potential problems with playback or audio sync, commonly existing in GOP MPEG editors.

An obvious usage of this function is to skip commercial breaks on materials recorded on standalone DVR or computer.

### Skip Next Chapter

This option in right click menu is related to the Skip Section tool. The chapter at the beginning of skip section has Skip Next Chapter flag set which will perform the actual skip section to next chapter that is at the end of section.



To open this menu right-click on any Chapter Point.

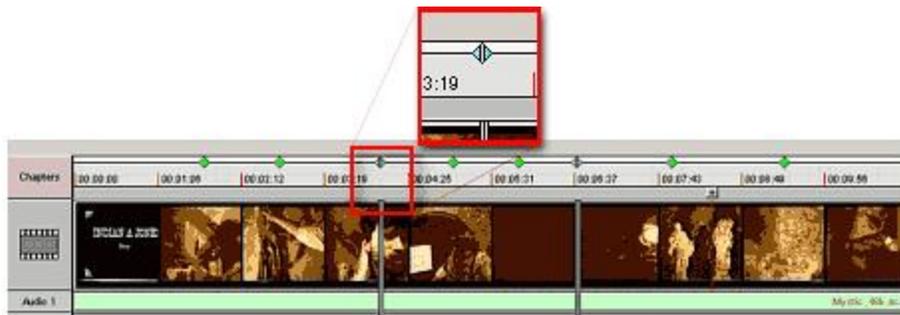
You can remove "Skip Next Chapter" flag and the Skip section will be turned into two normal chapters or you can set it to any normal chapter which will then create skip section.

 **Note:** Skip Section is a tool to instantly remove relatively short parts of a video, such as commercials or bad scenes without any re-encoding or writing of new file. It is not designed to replace a video editing application, but rather like last-minute help. As with Chapter Points, the skip section boundaries can be only placed on I-Frames (which comes every 15 frames or so, about 0.5 sec). If you require more precise editing or you need to remove large parts of the video, the best option is to create new clip with your video editor.

Chapters marked as Skip Next will be also ignored in the Scene selection and Film Strip wizards.

### Splice Point

Any chapter can be set as a Splice Point. During playback, the Splice Point will behave as the end of the movie. This way you can virtually divide movies to various blocks where each block will return where the movie ends returns. Of course each block can have own chapter points.



Since the Split Points are chapters you will link to each block same way as you link to a chapters. On the example above we put Splice points to chapters 4 and 7. You will call playback of first block by linking to Chapter 1, the second block by linking to Chapter 4 and third block by linking to Chapter 7.

The player will play block 1 from Chapter 1 until it will get to the Splice point and at that moment it will end playback and return to the Movie end link. Similarly the block 2 will be played from Chapter 4 till the next Splice point.

#### To Set Splice Point

Select chapter in the timeline and right click to open chapter menu:



The chapter will become Splice Point.

#### Conditional Splice Point (advanced)

The Splice Point set previous way is unconditional. The movie will always return on the Splice Point. However with VM command you can create a conditional Splice Point or with Branching object you can set any sequence of chapters (a Chapter Play-list).

Set the Splice Point, then right-click on the Splice Point chapter and select Chapter VM Command.

You will see command:

```
LinkTailPGC (button 0)
```

Insert a condition before the command such as:

```
if (GPRM0==1) LinkTailPGC (button 0)
```

This way the Splice Point will be valid only if GPRM0 register is 1. If it is any other number the movie will continue.

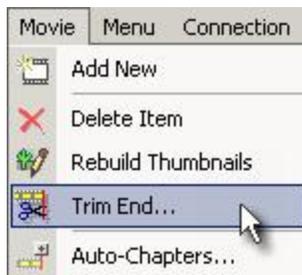
**With Branching Object see:** Movie Branching Object in Connections - Advanced Objects

### Trim End (destructive editing)

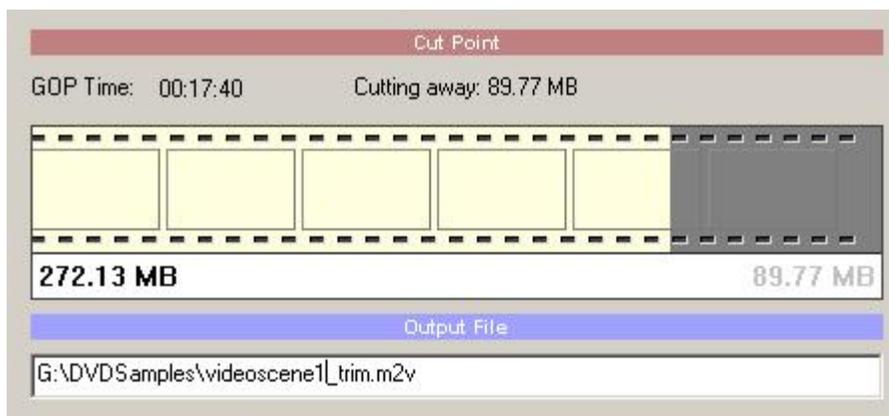
In some cases you may like to trim away the end of the video. For example a TV capture where you didn't turn recording off on time or you have video just a bit longer than it fits on DVD-R.

This end trimming is easily done without re-encoding and without sync problems since we don't touch the beginning of the movie. However a new, shorter copy of MPEG file will have to be created. You have to trim MPEG first, before you add chapters or set Skip Section.

To do so, select a Movie item, then scroll with the video cursor to the position where you want to have cut, right-click for the Context menu and select the Trim End command.



Another way to accomplish this is to click on the "Trim End of the Movie" control in the Preview window. A new window will appear where you can see the size of the file you are cutting away as well as the new file size.



Then just click the Trim button.

In this trim window are two check box options.

**Add the results to Assets** - The trimmed video will be added to the Assets / Video bin as a

new item.

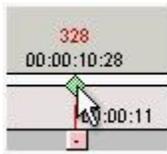
**Replace Current Movie with trimmed** - A trimmed video will be created which replaces the current video in a Movie.

## 4.5 Chapter Pause

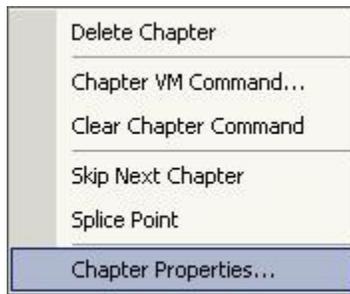
A movie can pause on chapter for certain number of seconds or infinite. In both cases pressing Play or Next button on the DVD player remote will resume the playback.

This can be used for creating presentations, tutorials or guide DVD which will pause and wait for user.

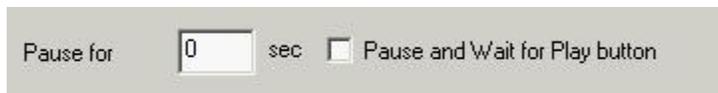
First you need to select the chapter, then open its Properties. To do so, right-click on chapter



From the menu select Chapter Properties...



The Chapter properties window will open. We are interested in the *Pause for* section:



You can set Pause for certain number of seconds from 1-254 sec. Or you can click *Pause and Wait for Play button*, which will pause for infinite time (same as entering 255 sec).

### Pausing at the very end of movie

You don't have to add chapter at the end of a movie if you want to pause there. There is a flag in UOPs & Initial Settings that will allow you to pause and wait for play button. To open UOPs you can just click on the large Movie button left of the movie timeline.

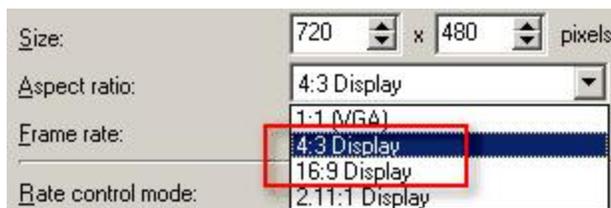
## 4.6 Movie Aspect Ratio

There are two aspect ratios supported by DVD: 4:3 (also called "Normal" or "Full Size") and 16:9 ("Wide Screen"). Both aspect ratios use the same picture size, however the 16:9 (widescreen anamorphic) image is horizontally compressed on DVD and then stretched by the DVD player when viewing.



4:3 is the aspect ratio of a normal TV (Image 1). 16:9 is the aspect ratio of a widescreen TV (Image 2). A 16:9 feature will be letterboxed on 4:3 TV (Image 3) or Pan & Scan (Image 1).

An MPEG file carries within it a parameter for the aspect ratio information and is a flag set by the encoder. Most encoders provide an option to set this flag: for an example, see the following screenshot from the TMPGEnc encoder:



Of course, in order to have widescreen image, your source video **must be widescreen**. If your source is a miniDV camera then it is probably always 4:3. Some consumer miniDV cameras feature a "widescreen" option, but this is a feature with no benefit. It has no value since what it does is to simply mask out the bottom and top of the image, while the image itself is still 4:3. So instead of the image being made wider, this method is in fact a crop from 4:3 so you are actually losing angle of view!

You can however make a widescreen movie with almost any miniDV camera by using a special 16:9 Widescreen Converter (for example by OPTEX or Century Optics) which optically compress the image in the horizontal direction. These lenses cost about half of a normal miniDV camera. When using one of these converters, you will use 16:9 settings in your encoder, since the picture is really 16:9 squeezed into the 4:3 format.

Some high-level consumer cameras now offer a more "real" 16:9. This is thanks to a large imaging chip which doesn't use all of its pixels for the 4:3 mode. When you switch such a camera to widescreen mode, the full set of horizontal pixels will then be used. In this manner, the camera indeed captures more pixels in 16:9 mode than it would in 4:3 mode. Some of these high-level cameras even allow you to record the movie as anamorphic to tape, thereby creating a real 16:9 movie.

► **If you want author a 16:9 movie**

First, be sure to enable the 16:9 flag during encoding of your MPEG video file, before bringing that video file into DVD-lab as an Asset. Within your DVD-lab Project, you can setup in Project Properties how the player should play the 16:9 on a 4:3 TV. In the Project Properties window, under the heading "16:9 Display Mode" are pull-down selections for: **Automatic - Player Decide** (*the default*), **Pan & Scan** and **LetterBox**. For most situations, the default **Automatic - Player Decide** is probably best. **Pan & Scan** mode will show the movie on a 4:3 TV in Pan-Scan mode (crop the left and right side to fit to the 4:3) whilst the **LetterBox** mode will add black bars above and below the movie frame.

*What follows applies to DVD-lab (Studio) only. (DVD-lab PRO is able to produce multi-VTS DVDs so you can include both 4:3 and 16:9 aspect ratio movies on a single Volume.)*

Also in the Project Properties window, under the heading "Menu Aspect", we have a choice of either **16:9 Widescreen** or **4:3 Regular (All Compatible)**. This Menu Aspect setting will be consistent throughout the Project.

► **Mixing 4:3 and 16:9 modes on one disc**

DVD-lab Studio is a single VTS authoring tool. VTS is DVD-speak for Video Title Set. Each complete movie project is a Video Title Set. The DVD spec allows for multiple VTSs on a single DVD disc. A DVD-lab VTS can have multiple movies, however each of the movies will play in the same format as the first movie. That means you can't mix 16:9 and 4:3 modes on one DVD, unless you use a trick (*see below*) or upgrade to DVD-lab PRO.

► **If you really, really must: The trick to mix 16:9 and 4:3 on one DVD**

If you are in the business of making multi-aspect DVDs, you likely need a multi-VTS DVD tool such as DVD-lab PRO or Scenarist (*at \$25,000US*). To some extent, you can do multi-aspect DVDs in DVD-lab which is a single VTS tool.

The trick is to use your 16:9 mode video content as Movies (probably your main feature) and then use all your 4:3 mode video clips as Motion Menus. You simply drag the 4:3 video to an empty Menu window, without adding any button to that Menu. If there is audio content to go with the video, then drop that audio into the Menu audio track as well. In this sense, it's not truly a Menu, we are just taking advantage of the fact a Menu can have it's own video/audio background as a Motion Menu. It now becomes foreground really, as the intended content.

One disadvantage of this trick is that for the 4:3 video clip dropped into a Menu, you can't add Chapter Points for that video content. Fortunately, in a mixed aspect DVD the 4:3 video contents are often supplemental or bonus material where chapter points may not be needed. Also be aware that when the viewer presses a menu button on their remote while playing this Motion Menu, that menu's video contents will start playing again from the beginning.

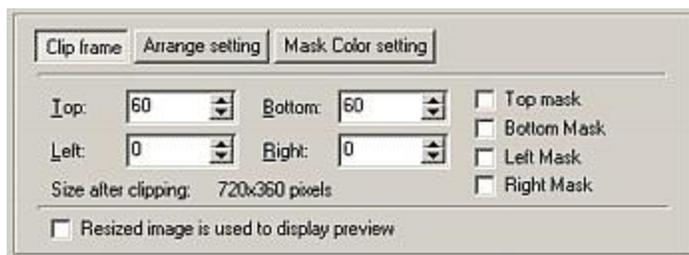
► **Cheating Trick: Create 16:9 movie from a 4:3 source.**

Taking a 4:3 source and cropping it to a 16:9 aspect ratio means that you will be losing field of view. That would not make much sense unless it's just for artistic purpose. A neat trick may be to add a wide conversion lens (0.7 or so) to the camera to enlarge the field of view of the original source video. In this case if you crop the image you will still get a larger horizontal field of view than without the conversion lens.

In many cases this is actually the best way to produce a 16:9 movie with your ordinary 4:3 miniDV camera. Use a wide conversion lens on the camera in the recording phase and then crop the image during DV to mpeg-2 encoding. You may use the letterboxing (widescreen option) on your miniDV just to make sure you shoot within the black bars on frame. You are going to crop out these bars anyway.

### Here is how to set the encoding in TMPGenc Plus software encoder:

Start with an NTSC DVD template which creates 720x480 MPEG-2 video. On the Video setting screen, select Aspect ratio **16:9 Display**. This will set the flag to be 16:9 so that the DVD player knows that it has to stretch the image. In the Advanced tab in settings, set the Video arrange method to **Full Screen** (no matter what it will stretch the image to full screen) and then in the filters below select Clip frame. Double-click on it and in the Clip frame tab set Top **60** and Bottom **60**. The "Size after clipping" value should now should read 720x360 pixels.



That's it, click OK, close settings and you are ready to convert. The result will be "faked" anamorphic 16:9 movie for DVD.

### 16:9 Menus

You can also create 16:9 menus, please refer to the 16:9 section in Menus.

### ▶ Progressive or Interlaced

Unless the MPEG video file is a transfer from a normal film, most of the videos will be interlaced. Video cameras, TV and any other consumer devices works primary with interlaced video signal. You may be tempted to encode the interlaced video as progressive but it is a generally bad idea. This is a too drastic step, it is always best to keep the DVD video as close to the source as possible. There is a lot of discussion about making video a more film-like, but the key is not the progressive format. The film has a film look mostly because of the lighting and scene framing. You can't make a good looking film or DVD from a bad looking video.

## 4.7 Subtitles

**Studio:** A movie can have one subtitle track

**PRO:** A movie can have up to 8 subtitle tracks. Initially there is only one Subtitle track visible to save space. As you add the subtitles to this track a new, empty track will become available.

**Note:** For Closed Captioning see UOPs and Initial Settings

DVD-lab allows you to import various types of subtitles and also adjust timing, text and visual effects.



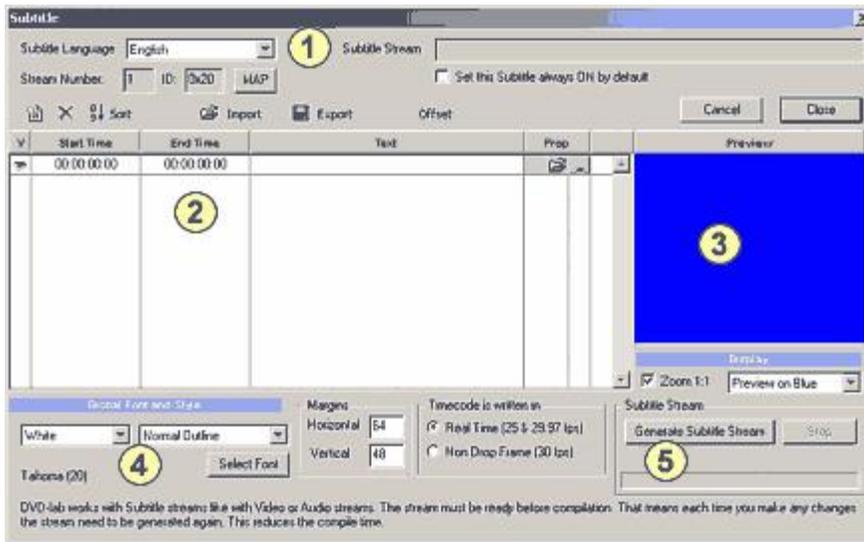
### Add Subtitles

DVD-lab Studio/PRO works with subtitle stream as any other streams such as audio or video. The subtitle stream has extension \*.sp1..\*.sp8

To create new subtitles, double click on the empty subtitle spot:



A new subtitle window will appear. From this window you can import subtitles, adjust them, set properties and finally compile them to \*.sp stream.



- 1 - Stream Info
- 2 - Subtitle Editor
- 3 - Subtitle Preview
- 4 - Font and Style
- 5 - Generate SP file

You may wish to create some subtitles right away. Enter start time, end time and type some text.

V	Start Time	End Time	Text	Prop
	00:00:01:00	00:00:05:00	This is subtitle text. Great!	

The time is in format:

**HH:MM:SS:FF**

For example the time above 00:00:01:00 means one second. A time 00:19:23:12 means 19 minutes 23 seconds and 12 **frames**.

The edit boxes are set for fast typing. You can use Tab to jump to next box .

The text can be maximum 3 lines per subtitle. You can either type text, import text from few common subtitle formats or import a 4 color bitmap that will be used instead of text.

**Note:** The subtitle editor in DVD-lab PRO is for simple creating, adjusting and importing existing text or bitmap subtitles. It is not replacement for a more sophisticated subtitle editor. We expect that you already have figured out the exact timing of each subtitle. Adding subtitles on audio cues is a lengthy and delicate process that is best carried in a NLE or dedicated subtitle editor and require perfect audio/video sync that is not possible when using elementary streams. DVD authoring application is never the best place to start creating

subtitles from scratch.

You may look at "Subtitle Workshop", a freeware application from [www.urusoft.net](http://www.urusoft.net), which can be used to add subtitles on audio/video cues.

## Import Subtitles

The most common way to enter subtitles is to import them from common text or bitmap formats. Press the Import button on top



These formats are directly supported:

\*.sub;\*.srt;\*.ssa;\*.son;\*.sst

Most subtitle editors (such as "Subtitle Workshop") will export subtitles in one of these formats.

00:10:10:23	00:10:15:04	schloß! Ich war in der Küche mit dem Rosenkohl be	
00:10:15:12	00:10:20:02	in. Ciao, Schmeckalchen! Das hat vorher noch nie ein	
00:10:20:17	00:10:24:09	Jetzt braucht es nur zu pfeifen und ich springe.	
00:10:24:10	00:10:28:17	wahz langweilt dich sicher. Man hat dich am Rastplatz	
00:10:28:10	00:10:33:05	Und du willst denen eins auswaschen.	
00:10:33:06	00:10:36:09	Ich will nur nach Pescara zurück.	
00:10:36:10	00:10:40:09	Ich wie nämlich noch nie einen Tag allein zuhause	
00:10:40:10	00:10:44:10	Ich hab viele Dinge zu erledigen.	
00:10:44:11	00:10:48:20	Schäme! Ich nicht. Mittlerweile beneide ich euch.	
00:10:49:09	00:10:53:13	Oh Gott, hab ich dich beleidigt?	
00:10:53:14	00:10:57:13	Ja? Was hast du gemacht?	
00:10:57:14	00:11:01:13	Eisenwengerercht! Daran meinem Mann bei der Guc	

 **Note:** Most of the subtitle formats (except \*.son) use timecode in HH:MM:SS:DD or HH:MM:MM:SS:CCC where D are 1/10 sec and C are 1/100 of sec. It is important to note the difference. A timecode such as 00:15:49:200 or 00:15:49:20 will be imported to DVD-lab as 00:15:49:06 for NTSC or 00:15:49:05 for PAL which is the same time, but in format that depends on FPS. It is important to note this fact or you will be surprised why DVD-lab "changes" the timecode.

Generic Text Subtitle Formats		DVD-lab	
HH:MM:SS:DD	HH:MM:SS:ccc	HH:MM:SS:FF (NTSC)	HH:MM:SS:FF (PAL)
00:15:49:20	00:15:49:200	00:15:49:06	00:15:49:05
00:00:05:85	00:00:05:852	00:00:05:26	00:00:05:21

You can export back the subtitles to \*.srt or \*.sub formats and the frames will be transformed back to 1/10 sec or 1/100 sec. Some rounding will apply.

 **Note:** The format DVD-lab uses is 'DVD-ready' and it depends on FPS.

## Adjusting Subtitles

You can simply adjust timing by typing a new time to Start Time and End time.

Eye icon. By clicking on the eye icon you can disable displaying of the subtitle at that time.

	00:10:24:10	00:10:28:17	wätz la
	00:10:28:18	00:10:33:05	
	00:10:33:06	00:10:36:09	

**Loading Bitmap.**

You can load a bitmap instead of text subtitle. The bitmap has to be full screen (720x480) with only 4 colors used - black, white, red and green - 4-bit RLE-encoded.



**Bitmap Format**

For subtitles apply the same as for subpicture on menu. It is a mask that use 4 colors (black, white, red, blue) These colors will be then replaced by the Style color and transparency.

The 4-color BMP file will be used this way:

BMP Color	Used for	Color on screen
white*	Background	Transparent
black*	Main Color	White or Yellow
red	Outline	Black
blue	Antialiasing	Semitransparent gray

\*If the bmp image has black background then the black and white colors in BMP will be swapped (Black will be used for background and White will be used for main color). The background is determined from the top left pixel of bitmap.



**Note:** You can apply the Outline and other styles to bitmap as well as it is apparent on the image above (Thin black outline)

**Font and Style.**

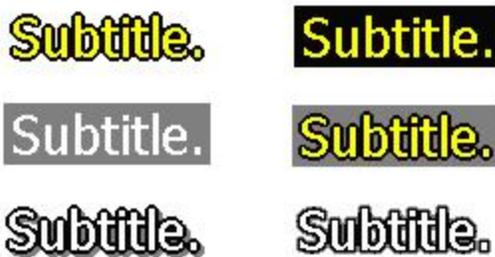
Applied to all subtitle rows. This is found on the bottom of subtitle window. Here you can choose the font and a style.



**Tip:** Best fonts for subtitles are light Sans-Serif fonts such as Helvetica, Verdana, Tahoma or Microsoft Sans-Serif. You should start with size 24.

DVD-lab PRO allows creating White and Yellow subtitles with various outlines or background bars. Yellow subtitles are often used for their great visibility on any background.

Here some of the combinations that you can create:



There are two ways how the font outline is created and this affects the overall look of the text on screen:

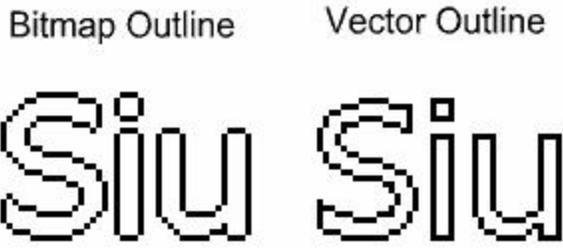
- **Bitmap based**, using various bitmap post-processing functions to create round outline.
- **Vector based**, Outline is created using pure vector processing

Bitmap based Styles are all first styles from *Outline* to *Smooth Max*, Vector based are last from *Vector Outline* to *Vector Thick Back*

A Bitmap based create a rounder, less jagged text. However displaying it on some players may suffer from player poor scalling algorithym.

A Vector based create more crispier text. A Smooth Vector type is set as default.

Here is example of the same font processed through Bitmap and Vector outlining. Both have outline exactly 1 pixel. The Bitmap looks smoother but the letters may look less defined on TV, the Vector will show more jagged letters but it will be optically crispier because of more "air" between outlines.

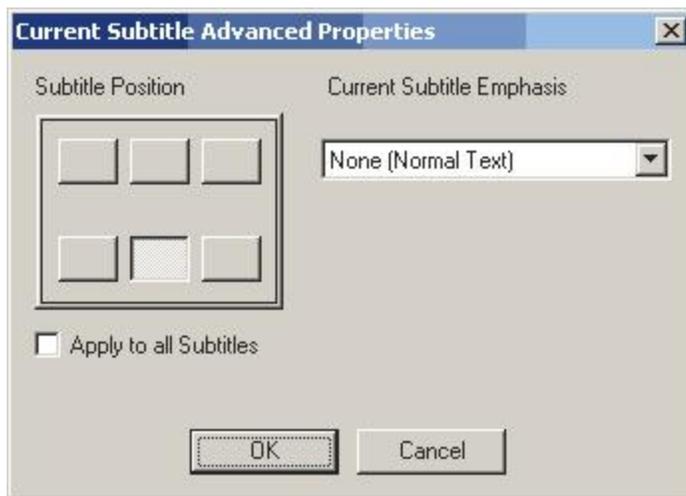


### Subtitle position and Emphasis.

While the font and style apply to all rows, each row in the subtitle window can have few unique properties. To change subtitle properties click on the small button, near the bitmap open.



This opens the Advanced properties for that particular row.



Here you can set position of the subtitle. Subtitles are by default displayed on bottom center. Clicking on Apply to all Subtitles will apply this setting to all subtitles in the grid table.

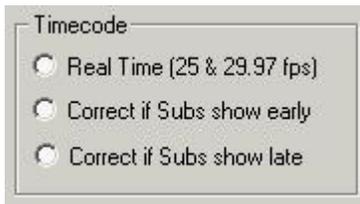
A **Subtitle Emphasis** is other way how to further adjust each subtitle. For example, it is often used in dialogue with somebody off-screen, the first line, in italics, would be spoken by someone out of shot, whilst the second, in normal style, by someone in the shot:

*-First Line*  
-Second Line

## Timecode Format

When importing or writing subtitles in NTSC you have to know if they are written in **Drop frame** or **Non-drop frame** timecode.

### NTSC



Timecode convention - the difference between NDF and DF is about 3.5 sec. in one hour and that is significant for subtitles. You should always assume the subtitles are in Real Time. However if your subtitles are getting progressively late or early after compilation, it is most likely due the different timecode used on subtitles. In such case you need to select one of the other settings to correct it, then generate the subtitle again, and then compile. Most of subtitles created in external subtitle editors will be probably be created in Real Time format (29.97 FPS)

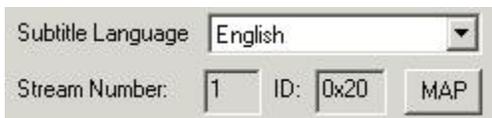
### PAL

PAL doesn't suffer from the DF and NDF issue, but if you import a NTSC subtitle for PAL project, there is a big chance that the subtitle will not match. In this case the subtitles will go progressively out of sync when playing back on PAL. You should use then Generate the subtitles with the second or third option depending on what is the error.

 **Note:** DVD-lab compiles the subtitles to the subtitle stream *before* you close Subtitle window. Having subtitles compiled before main compilation is a big timesaver. When you do any other changes to the project, the subtitles will not have to be recompiled, but directly the \*.sp? stream will be used. Similarly if you do any changes to the subtitles they have to be recompiled.

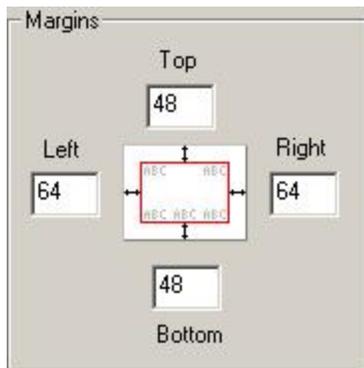
## Stream Info

Here you can set the subtitle language and subtitle Map.



## Margins

By changing margins you can define the position of the subtitles on the screen. The margins define the rectangle inside screen in which the subtitles will appear.



### Format for 16:9 (optional)

A normal subtitle is formatted for 4:3 TV. A widescreen 16:9 movie is side-compressed on the DVD and so a Widescreen TV need to stretch the image to widescreen format. A subtitle will be stretched with it as well and depending on the font it may look "fat" on 16:9 screen.



This subtitle will look correctly on 4:3 TV, but on widescreen TV it will look bit side-stretched as the image above.

That means for 16:9 movies we **may** consider to squeeze the subtitles to something like this:



so after the widescreen TV stretch the image they will appear somehow normal



To squeeze the subtitles we have a *Format for 16:9* option (In Studio version this is called Squeeze to 16:9):



 **Note:** This option is enabled only if the movie is 16:9.

However, once we squeeze the subtitles they will now appear squeezed on 4:3 TV!

## 4.8 Subtitle Map

Once we squeeze the subtitles to 16:9 they will now appear squeezed on 4:3 TV!

Therefore once you set *Format for 16:9* option you have to fully understand what is the main

target in terms of playback.



1. You may decide that the DVD will be mainly played on widescreen TV so we would squeeze the subtitles.
2. .. or you may say that mostly people will play the movie on 4:3 TV as letterboxed or PS. We will do nothing and so if somebody plays it on widescreen TV the subtitles will look a bit stretched
3. The third option will create two subtitle streams, one squeezed for 16:9 TV and the other normal for 4:3 TV. Then it will set Subtitle Map (see below) so both streams appear as one single Subtitle 1 on the DVD that is different for 16:9 and 4:3.

 **Note:** It is important to fully understand the Subtitle Mapping feature. After we create first pair of 16:9/4:3 subtitles, we still have created only one Subtitle 1, even if it occupy two subtitle streams inside movie (Sub1 and Sub 2). If we add third subtitle stream we have to remap it to Subtitle 2 because by default each stream is mapped to the same number (In our case the third stream is by default mapped as Subtitle 3, but since we combined stream Sub 1 and Sub 2 to Subtitle 1, we still have Subtitle 2 free - we need to map the Subtitle 3 there). It is obviously vital that you understand the below Mapping feature.

 **Tip:** Squeezing and then stretching text during playback may not always look good and it requires some experiments to determine the right font type and size. To simplify things we may decide to use just one subtitle for both 16:9 and 4:3 TV. That's nothing bad, some Hollywood movies have just one subtitle for all formats. We may start with a font that is originally a "narrow" or "condensed" font which may look satisfactory both as stretched or normal. (Many of these fonts are installed with Microsoft Office)

### Subtitle Map (advanced)

*Widescreen* movies can be displayed differently on a 4:3 TV (as letterboxed or Pan & Scan)

than on one with a widescreen display. You also have the ability to differentiate which subtitle stream will be displayed on each system. For example you may choose larger font for widescreen displays or move the subtitles below the black bar on letterbox. In such a case Subtitle 1 may use stream 1 for widescreen and stream 2 for letterbox. You will prepare two subtitle streams but on DVD they will appear as only one Subtitle ( that plays differently on widescreen than on 4:3 displays). This "assigning" of streams to Subtitle track on DVD is done through Subtitle Map. By default the map is set so **each subtitle stream appears as one new Subtitle track** on DVD.

On the image below we see the default map where each stream is a new Subtitle on DVD and also a special situation where we assigned the Stream# 1 (0x20) to be played as Subtitle 1 on DVD for 4:3, LB and PS and Stream# 2 (0x21) to be played also as Subtitle 1 on the DVD but only on widescreen displays. We needed to create two subtitle tracks in DVD-lab, but the result DVD will show only one Subtitle.

The screenshot shows the Subtitle Map configuration in DVD-lab. At the top, there are three subtitle streams: Sub 1 (English), Sub 2 (English), and Sub 3. Below this, two stream configurations are shown: Stream Number: 1 ID: 0x20 and Stream Number: 2 ID: 0x21. The interface is divided into two main sections: 'Default' and 'Special Case', each containing two mapping grids for Subtitle 1 and Subtitle 2 across different display modes (4:3, WIDE, LB, PS).

**Default**

	4:3	WIDE	LB	PS
Subtitle 1	x	x	x	x
Subtitle 2				

	4:3	WIDE	LB	PS
Subtitle 1				
Subtitle 2	x	x	x	x

**Special Case**

	4:3	WIDE	LB	PS
Subtitle 1	x		x	x
Subtitle 2				

	4:3	WIDE	LB	PS
Subtitle 1		x		
Subtitle 2				

You set the mapping by simply clicking on the grid which will place x to the desired configuration. Clicking on existing x will remove it. When you assign the particular configuration in one stream, it will be automatically removed in all other streams so they don't overlap.

 **Note:** Don't be too concerned about the subtitle mapping if you fully don't understand the function. It is really used only in special cases as the one above. In fact many professionally-prepared Hollywood DVD's use often the same subtitle stream for all display types (as it is set by default in DVD-lab).

The Subtitle Map has meaning only if the movie is 16:9. If the movie is 4:3, player will never use the Wide, LB or PS settings.

### Subtitle quality

The DVD forum defined the subtitles as subpicture mask that can have only 4 colors. That means a subtitle can practically use only 3 shades (one color must be transparent so the movie can be seen through the subtitle background). This is one serious limitation. Because movie under subtitle changes rapidly the best looking subtitle we can make is using one color as the color of text (white, yellow), another color as the outline (black) and we are left with just one more color that can be used to somehow smooth the text.

It is important to know this limitation of DVD specs and understand that the subtitles on TV will never look as good and smooth as a text generated on a computer screen or printer. It is very often work of trial and error to choose the correct font and the size to make the DVD subtitle as pleasing as it gets with these limitations.

### Default behavior of subtitles

User can choose subtitles by selecting them from his remote or they can be selected programmable: from menu button (Link - Subtitle) or using a VM command SetSTN (subp=0:on )

The selection of subtitles will be remember during playback of DVD in the current VTS.

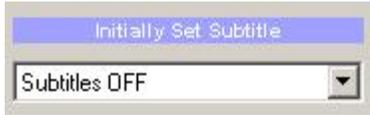
In a perfect world the subtitles are set to OFF automatically by player when you insert new disc. But here are exceptions:

- Some players set logically subtitle ON if the movie has no audio (Pioneer...). Unfortunately you can't rely on this because many other players don't do this.
- Some Chinese firmware based players set the Subtitle register to ON after power-up. That means if you don't explicitly set the subtitles to OFF somewhere in VTS domain, the DVD will start playing with subtitles
- Some software players like PowerDVD will remember the last used subtitle selection so next DVD may start playing with subtitles ON if you played subtitles on previous DVD.

Unfortunately the DVD specifications do not allow for changing the subtitle register globally. You can change subtitle only while in VTS domain.

### Tips (advanced)

1. You cannot set SetSTN or use Link-Subtitle in the VMG menu
2. The DVD-lab will set subtitles Off only once in the first (hidden) VTS menu. If you want this to happen you must obviously let user to go to VTS ROOT menu before he can start playing movie or call playlist. This reset will happen exactly only once, next time you get to ROOT menu the subtitles will stay as selected.
3. Set Subtitles OFF in the UOPs & Settings on a VTS menu if you want to make sure the subtitles will be switched off **everytime** user gets to this menu
4. If you want to be sure the movie **always** starts with subtitles off no matter previous settings, you can set subtitles to OFF in the UOPs & Settings of the Movie



5. With VM command you can create your own Subtitle management based on storing values in some GPRM and then setting them before movie plays with SetSTN (subp=GPRMx:off) Please note GPRMx with value [0...8] will set that subtitle OFF but GPRMx with value 64 + subtitle[0...8] will set it ON:

### Examples

This will set first subtitle (0) to OFF - that means on most players no subtitle will be shown.

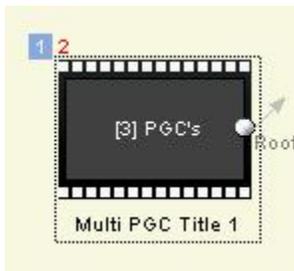
```
GPRM1 = 0
SetSTN (subp=GPRM1:off)
```

This will set first subtitle (0) to ON

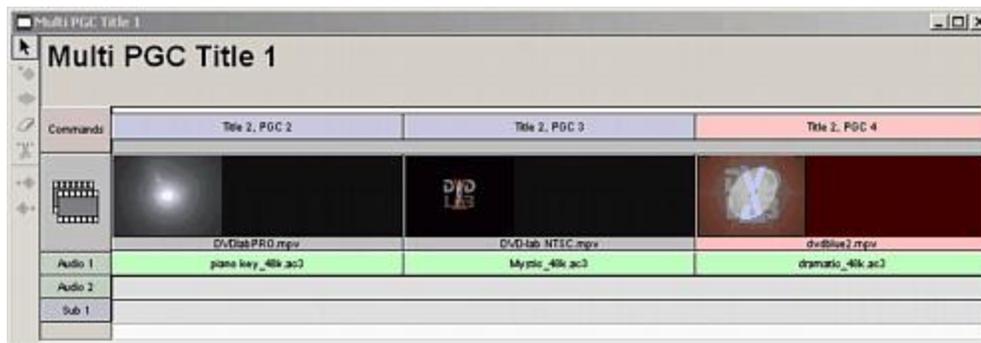
```
GPRM1 = 0
SetSTN (subp=GPRM1:on)
```

## 4.9 Multi-PGC title

Menu: *Connections - Add - Movie Multi-PGC Title*



Multi-PGC title is a special movie title that is built with various video segments (short movies) that will form a PGC (a program chain). These segments will be joined on the DVD and a Chapter Point will be added to beginning of each segment. Each video segment can have its own audio tracks, subtitles and its very own PRE and POST commands. The result will behave as one joined single movie where you can jump to different parts by using PGC commands..



Here is a Movie Segment with 3 short movie segments (PGCs).

The Movie Segment offers some benefits, but it has a few limitations:

- You can have up to 99 segments in a Multi-PGC Title
- The video segments must have same properties (frame size, aspect ratio, FPS)
- The audio must be the same type for all segments (AC3, MPA, WAV)
- You can't manually add chapters. The chapters will be automatically inserted at beginning of each segment.
- There is no direct way in the menu interface for buttons to link to each segment, only to the beginning of the Title. Each segment of the Multi-PGC title belongs to the same Title (so it is addressed by the same JumpVTS\_TT)  
However you can use JumpVTS\_PTT to jump from menu to particular part of the Multi-PGC title (see below)

### **The difference between Multi-PGC and a single PGC (normal movie) title.**

The main difference visible to the author is that Multi-PGC title can have its own list of 128 lines of PRE and POST commands for each PGC segment. In comparison a normal Single-PGC movie has only one PRE and one POST command and the chapters in the PGC can each have only one command line. The Multi-PGC Title is therefore used for cases where a certain segments will play in maybe a special order, according to a various complex conditions outlined in the PGC's PRE/POST commands.

### **Add PGC**

First you need to add the Multi-PGC Title object. Open Connection window and then use menu *Connections - Add - Multi-PGC Title*. An empty object will be added. Now double-click on it to open it. Then you can drag movie and audio clips one by one from your Assets Bin to this window.

### **Add PGC audio**

Drag and drop the audio from asset to each segment (PGC).

### **Delete PGC**

To delete PGC simply select it so the video PGC becomes red, and then press Del key. Both video and audio will be deleted.

### Delete only audio of PGC

Select only the audio in PGC. The video segment will stay light red, the audio will become darker green. Press Del key.

### Zoom in/out

If you have too many PGC's, to see their names then click on Zoom In.

### Jump to any PGC from VTS menu (advanced)

The menu interface doesn't allow you to link directly to PGC in same way it allows you to link with chapters, you can only link to beginning of the Multi-PGC Title (Play sequence). That doesn't mean you can't link to particular segment. If you really need to do this, you can use JumpVTS\_PTT VM command in the menu button. (You can use it only from a VTS menu)

The syntax is:

JumpVTS\_PTT (tt 1, ptt 2)

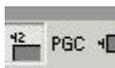
Where the **tt** is title number and it is also the right-hand number you see on top left corner of the Movie Segment in Connections (in our case 1):



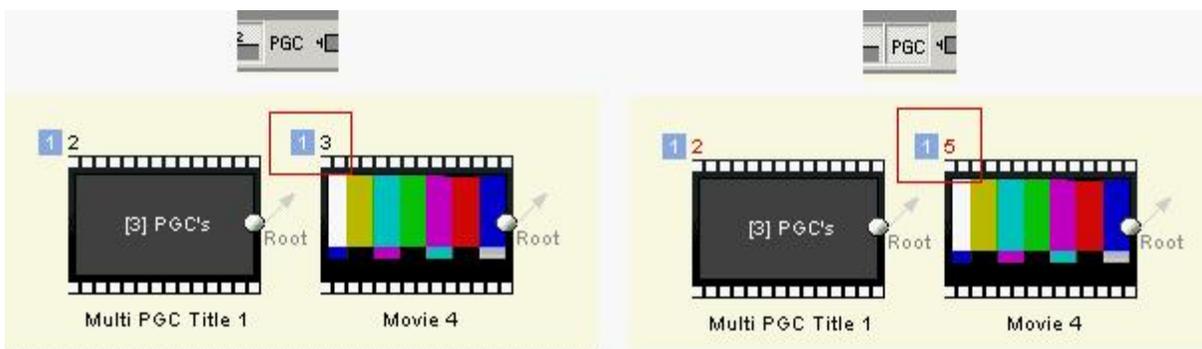
The **ptt** means Part of The Title and it points to the segment. The ptt are counted from 1, that means first segment is ptt 1, second is ptt 2 etc...

Note:

To see the title number, make sure the Show PGC is **OFF** when looking at the right-top numbers in connections.



This is indicated by the second number on the right top corner being black. If it is red, then it displays PGC number. See the difference below:



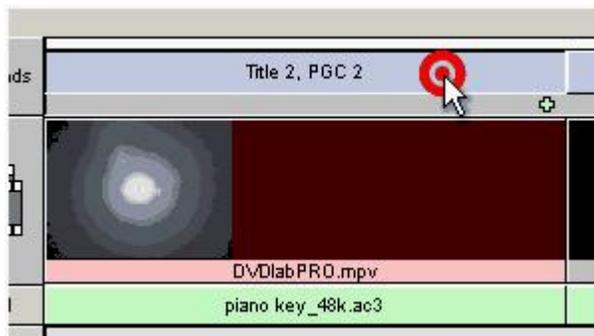
On the image you can see that because the Multi-PGC title has 3 PGC's the next title PGC number will be offset by this.

Make sure you take all this into consideration when working with Multi-PGC titles and VM commands, because mixing these number will make your commands unplayable.

### Change PRE/POST VM Commands

Each PGC in Multi-PGC Title can have its own PRE/POST commands. The first PGC **PRE** command is also the **PRE** command of the Title and the last PGC **POST** command is also the same as **POST** command of the Title.

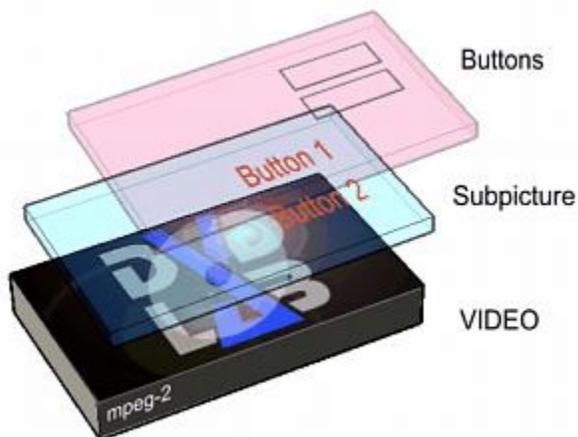
To edit the VM command of the PGC, click on the *PGC header bar*. The familiar VM Edit box will appear.



If you add any custom VM commands then a + sign will appear below the PGC title bar. By default the POST command of every PGC is set to link to the next PGC (to play segment one by one).

## 4.10 Buttons over Video

As it is explained in Motion menu we can imagine the DVD screen as a composition of few layers. Similarly to the Menu, the Movie can also have superimposed buttons.



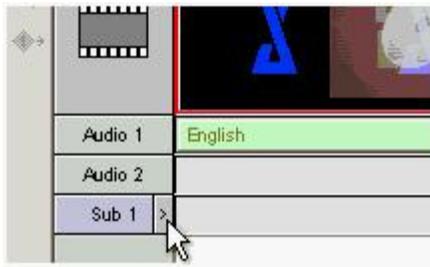
The buttons on Movie could be used for various special effects that require some sort of interaction.

For example having just one button to pop at a certain place we may give the viewer the ability to press "Enter" button on the remote to see a special feature or path of the film. This is now often referred between authors as a "*Follow the White rabbit*" because of the well known feature in the first Matrix movie DVD (that has one of the most complex DVD structure done in recent years - well worth studying). When a white rabbit appears in a corner, you can press "Enter" button to see a special behind the scenes documentary about that particular scene. The White rabbit is a **single** button over the video.

Of course you can have more than just one button over the video. For example we can put few buttons that each switch to different chapters, movies or menus, or you can produce a fully interactive story where the buttons point to the new directions of the story.

### Switching Subtitle to Buttons

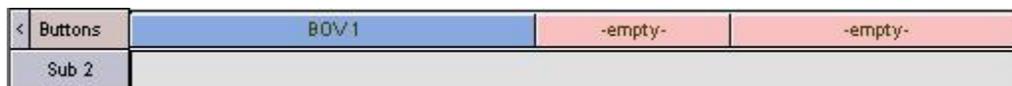
The Buttons over video use the first subtitle for their placement. To switch to a Button mode, press the small arrow on the Sub 1:



This will switch the Subtitle to the Buttons mode:

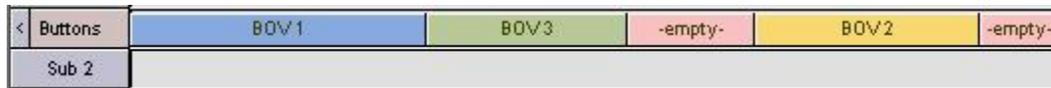


The buttons can be placed within a chapter. That means as we add more chapters, the Buttons space will be divided by them:



Each of the box (chapter) can have different (or none) buttons. These buttons will be visible for the whole length of chapter. We call these boxes BOV, (buttons over video). By default at least one BOV will be always created (the BOV 1). However it can remain empty if you don't want any buttons for the length of first chapter.

**Note:** The BOVs are added in the order we create them. These BOVs are *linked* then to the chapter cells before compile. Some chapter cells may have no BOV's (shown as "-empty-")



The BOVs shown in the Movie window **could be in different order** if we didn't add them sequentially one after another from left to right (see image above).

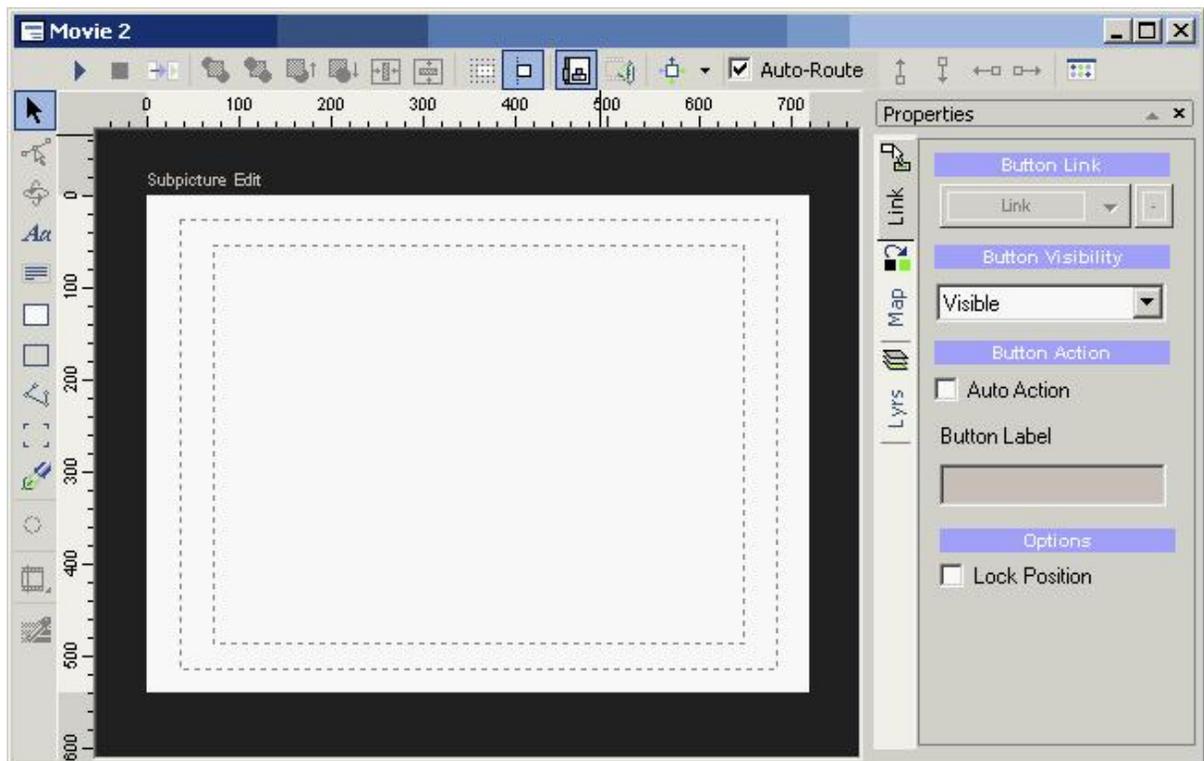
This ordering has **no effect** on the final playback. It only displays the order in which we created the BOVs.

### Editing the Subpicture

By clicking on any of the rectangle you will open the Subpicture editing mode.



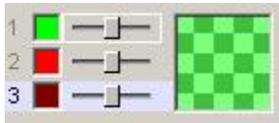
The Subpicture editing mode is some way similar to the Menu editing with few important differences.



Subpicture can be essentially only one of 3 colors as defined in Map. Therefore there are no object colors or textures available for subpicture. A subpicture object can belong to one of 3 groups



where each group can have different color from palette. On the subpicture canvas these groups will appear as **red** for group 1, **blue** for group 2 and **black** for group 3.



For more info you may look at the Color Map explanation in menu.

When we add an object to the subpicture canvas it is set in *non-ready* state:



It is shown in light colors and such non-ready object will not be visible over the video. In order to use the object we have to define it as a button or group of buttons (using Group Hotspot). To do so, simply add a link to the object by either dragging the DVD item (movie, menu) from Project tree list over the object, or right clicking the object and selecting one of the offered Link or VM Command.

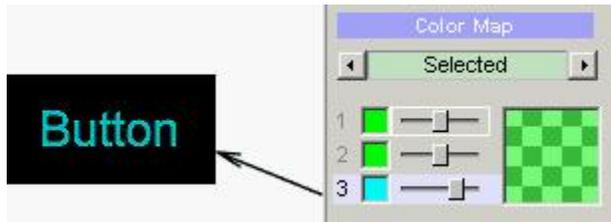


This will make the object ready. Such object will be visible over the video as a button and it is indicated on canvas by appearing in dark color (red, blue or black, depending on the Group)

To see how the button will look like in the real situation, press the Simulate button:



By adjusting the Color Map for each state (Normal, Selected, Activated) we can observe the real substituted colors and transparency. Since here we have only one button so far, we cannot observe the Normal state. (That's the state when button is not selected)

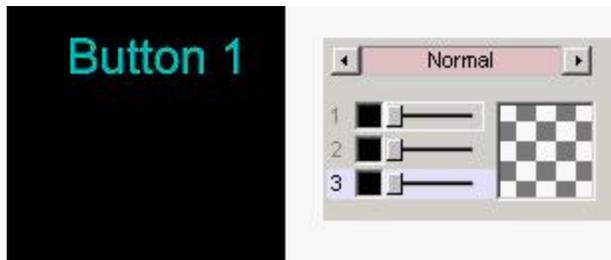


See Color Map for more detailed info.

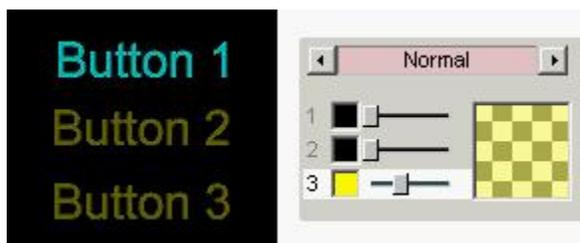
Let's add more buttons:



Now we can Simulate the Subpicture and observe the normal state.



Right now the Normal state is set as a fully transparent and black which means the non-selected button will be invisible. We can change the Normal state to yellow and semi transparent as on the image below:

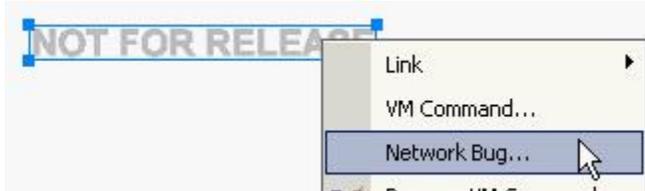


This makes all the buttons visible with the selected button highlighted by the color set in Selected state.

This is the very basic principle for buttons over video.

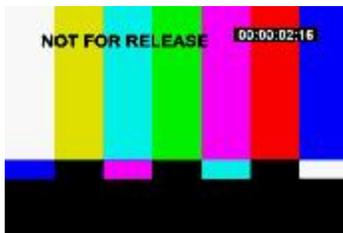
## Network Bug

This can be used to quickly turn selected object into a "Network Bug" that will cover part of the screen, but it will have no other functionality.



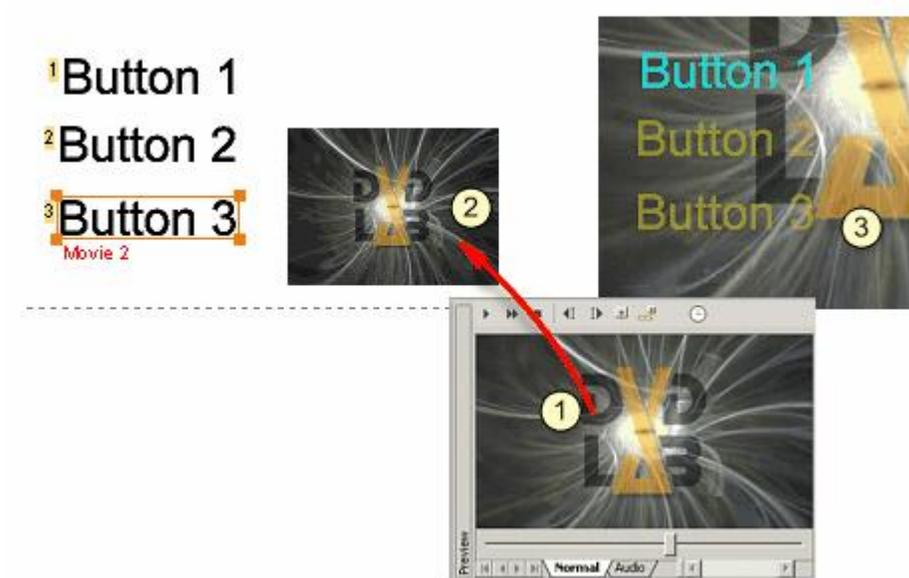
This is often used to quickly customize dailies for different customers where you can add provisional text or simple logo without re-encoding the whole movie.

This function will set the object to NOP, then select it as Group 1, change mapping of the Group 1 to Opaque black for all 3 states (Normal, Activated, Selected). It will also ask you if you want to copy this object to all cells.



Additionally when you want to delete a Network bug object, the software will ask you if it should delete all Network Bugs at this position form all cells. You can change the color or transparency of the Network Bug in the Color Map area. (You have to change all 3 states of Group 1 to the same color and opacity)

**Tip 1:** You can drag a video frame from the Preview (1) to the Subpicture canvas (2) to substitute the empty background with a real frame from video for more real life Simulation (3).



**Tip 2:** While editing subpicture, you can quickly jump to other **already added** subpicture using the Cell window on the bottom of Subpicture view.



This will enable you to for example copy object from one cell and paste it to another. Do not be concerned if the order of BOVs shown in the Movie window is not the same (sequential) as the order shown here in Subpicture Editor. It has no effect on the final playback, the BOVs will play exactly in sequence as shown in Movie window.

### Expired Buttons Note

Maybe you are thinking about using the buttons over the video not to do a linking but just to change GPRM register or maybe the audio, subtitle, angle using the SetSTN command. It is however not so easy:

Most of the DVD players after a button is pressed expect some sort of link and therefore they *expire* the button. What that means is after the button command is executed (for example SetSTN or set GPRM) the player no longer displays the button. This will last till the end of the currently played cell (chapter).

So for example if my button command is just SetSTN (audio=1 )

The player will set the audio stream 1. However on most of the DVD players the buttons will be no longer visible or you will be no longer able to navigate these buttons until the next cell. Do not use RSM command on Video buttons neither. A RSM command can be combined with GPRM or SetSTN, however on most players while playing video RSM command will actually STOP the player (show player welcome screen) - not a good thing.

The correct simple command should be for example:

SetSTN (audio=0 ), LinkCN 1 (button 0)

This will set the audio and then restart a for example cell 1 (beginning of chapter 1). This will work, but restarting a cell means it will start playing again from beginning of the chapter. This is probably not the effect you wanted. Unfortunately there is no easy way around this. So the best advice is to use the buttons over video to always jump or link somewhere. (*Follow the White rabbit* type).

**Note:** We tried also different approaches that would not require restarting a cell - for example calling a menu that will set angle or audio and then immediately use RSM so the movie (should) resume. Unfortunately this all works on 50 % of players and doesn't work correctly or at all on the rest. If you decide to do something like this - don't get too excited if it plays on first player you try! Especially if you use RSM command as this seems to work correctly only on half of the players while on others it will restart the title from beginning.

## 4.11 Multi-Angle Title

A DVD features multiple camera angles. You may remember this feature being portrayed as the one that "will completely change the way we watch movies". That was ten years ago. Today you will hardly find any mainstream title that uses this feature. This is due many reasons:

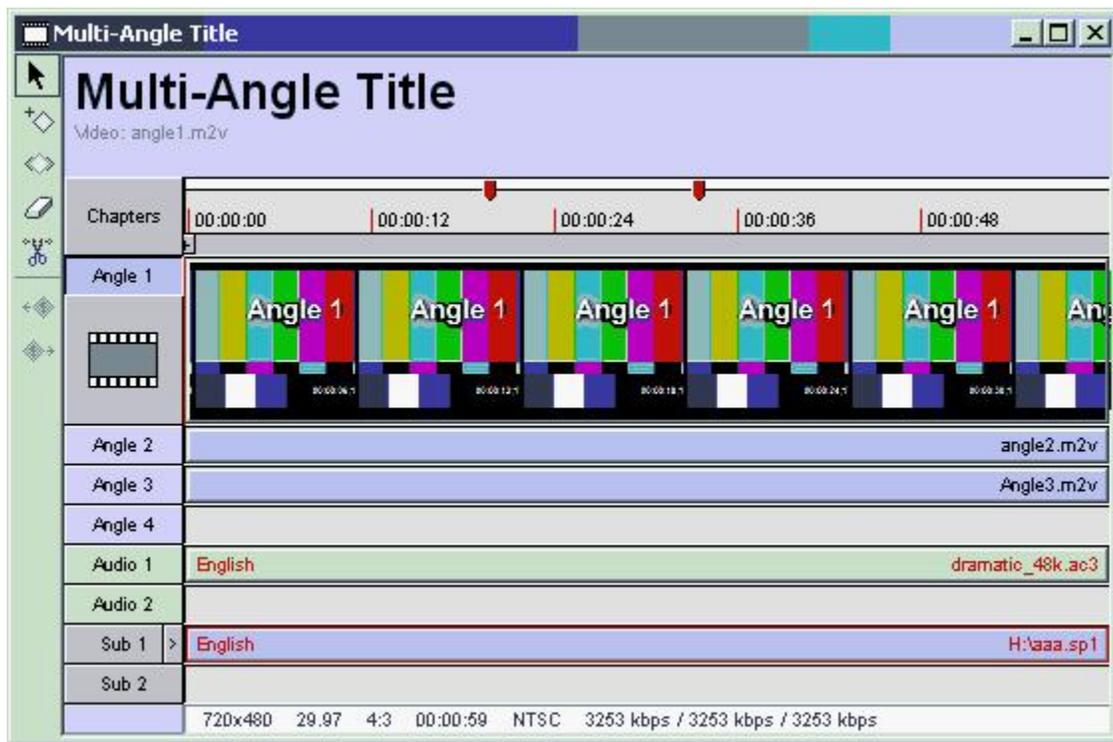
- Vast number of people want passive viewing of stories. The interactive story already exist and it is called "game" or "internet". Therefore there is no need to do the same for movies as the former fit the shoe perfectly.
- It is distracting to mess with remote during viewing
- It is more difficult to produce
- Angles do not change immediately but there is a slight delay (one second or more)

However multiple angles found its way in educational industry. For example a DVD that teach one to dance will benefit from multiple-angles. The viewer can switch the angle for example from the posture to the steps to learn the details. Similarly learning to play on instrument or operate machinery etc. There are also other usages including the adult industry.

Multi-angle title can be added by the Multi-Angle button on the bottom of connection view:



**Note:** There is however limitation that the multi-angle tile has to be the only one title in the VTS.

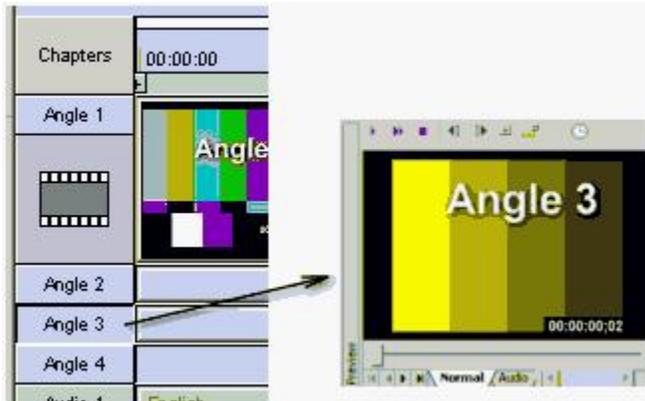


Similarly to a normal Movie the Multi-angle VTS can have multiple audio, subtitle and also buttons over video.

The obvious difference between a Movie and a Multi-angle Title is that the later has a place for multiple video. Only first video will show as a thumbnails, the rest will be shown as a track.

### Angle Selector

This is a switch button on the left side that shows the video from that particular angle in the preview.



That is the only function of the Angle button.

### Switching angles

User will switch the angles during playback with the Angle button on his remote.

The angle switching is not immediate. There may be a slight delay (even up to one or two seconds) before the player can change the angle. It also depends on the differences between the bitrate of

videos. Larger differences will produce much longer angle switch delay. The multi-angle videos on a DVD are stored in interleaved format. When you ask player to change the angle it need to find the next angle chunk with the correct time. If the videos have different bitrates, such chunk may come much later.

**VM: Changing the angles programmatically.**

If you want, you can change the angle programmatically during playback on the chapter VM command:

To switch to angle 2, use the SetSTN (angle = 2)

You can also use it together with changing audio track. SetSTN (audio=1 angle=2 )

**Note:** first track of audio is audio = 0, however first angle is angle = 1

**Cells:** if You use LinkCN on chapter VM command you have to multiply the cell number by the number of angles. (Each angle has a cell)

**Bitrate for multi-angles**

We mentioned that the bitrate of all videos should be the same or very close. But what should be its value? The total sum of the video angles bitrate **can exceed** the maximum DVD bitrate. That means generally the maximum bitrate of **each** angle is limited by the maximum allowed bitrate of any single video + audio. However because the player needs to skip over the interleaved chunks with different angles, using too high bitrate may indeed cause the player to stutter. We think an average bitrate of 6500kbps **per angle** should be a good compromise.

**Encoding Video for multi-angle Title**

Very important part of creating multi-angle title is the encoding. The angles **must be** encoded all with the **same parameters**, most importantly bitrate and GOP structure. That means you should encode each angle using the same MPEG encoder and same settings. The video must be encoded using Closed GOP (check settings of your encoder) otherwise there will be a very visible picture disintegration during angle change.

Parameter	
GOP	Closed GOP
Bitrate	max 8000kbps per angle
GOP structure	fixed, same in all angles (not variable GOP structure)

**GOP structure** - it is important that all angles have the same GOP structure (same sequence of IPB frames, same number of frames per GOP). Few encoders will create a "flexible" GOP structure - that is they will sometimes add or remove frames within GOP as they see it fit and therefore no two angles will have the same GOP structure. (TMPGENC and standalone encoders are known for creating flexible GOP)

This may result in a player lockup or even a crash. Mainconcept Encoder and Video editing Tools based on Mainconcept Encoder usually work well for this purpose.

## 4.12 Shortcuts

### Keyboard Shortkeys for Movie Window

All items listed in menu can have assigned a customized keyboard shortcut. To assign a shortcut, go to menu: *Tools - Customize*. Then select Keyboard Tab. You can see the assigned shortcuts also listed on right side of menu items.

However there are also other special keyboard shortcuts that can be used while on Movie window. Such shortcuts can be used directly or they can be used in customizable Jog-Shuttle controllers such as ShuttlePRO2.

Action	Shortkey	Description
Jog Right	Mouse wheel Up or Right Arrow	Moves the position cursor right
Jog Left	Mouse wheel Down or Left Arrow	Moves the position cursor left
Shuttle Right 1	]	Moves the position cursor faster right
Shuttle Right 2	'	Moves the position cursor even faster right
Shuttle Right 3	0	Moves the position cursor fastest right
Shuttle Left 1	[	Moves the position cursor faster left
Shuttle Left 2	;	Moves the position cursor even faster left
Shuttle Left 3	9	Moves the position cursor fastest left
Zoom In	+ on numeric keyboard	Zoom Timecode In, can be used for more precise setting of chapter point.
Zoom Out	- on numeric keyboard	Zoom Timecode Out.
Insert Chapter	SPACE	Insert chapter at the cursor point

Remove Chapter	Del or Shift+Del	Chapter point must be selected. Del is used also for removing the video, audio or subtitle tracks. Shift+Del can be used only for deleting Chapters.
Next Chapter	Page Up	Select next chapter (right of cursor)
Previous Chapter	Page Down	Select previous chapter (left of cursor)
Show Connections	Ctrl+Home	Bring connection window on top (customizable)

Also see Shortkey Summary for setting up a Shuttle device.

## 5 Menu

### 5.1 Menu Window

The Menu window is where you create your Menu design, add buttons and to link them with other Menus or movies. In the real world, creating Menus and links is the main creative task of the DVD authoring process and it determines how polished and professional the final DVD product will look.

Therefore DVD-lab puts a strong emphasis on this area of DVD creation. We can say with confidence that the Menu creation module of DVD-lab surpasses that of almost every other DVD authoring tool.

#### **DVD can have two kinds of Menus.**

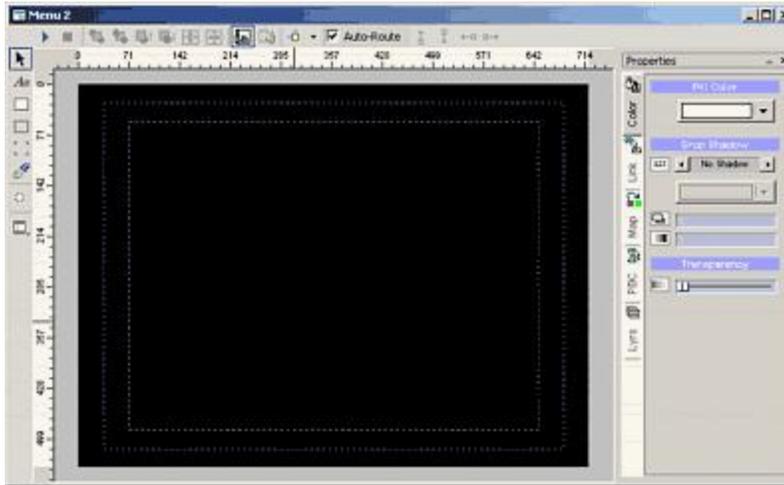
In the **PRO** version you will see that you can create two kinds of menus. One is called VTS Menu or simply Menu. The other is called VMG Menu. The differences are mostly in limitations of linking to other menus or movies. You can read more [here](#).

In brief: If you are creating a normal project that doesn't require multiple VTS, you can go away just with using normal Menu. If your project has movies that have each different parameters (for example one is 16:9 and other is 4:3) you may need to use also one or more VMG Menus.

Both VTS and VMG menus are being edited exactly the same way so the text below simply refers to a "Menu".

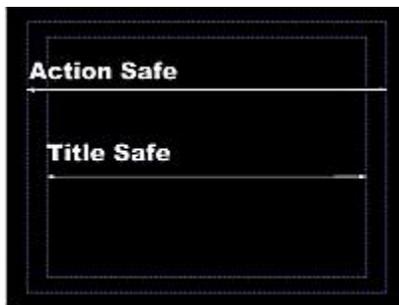
**Studio** version uses only VTS menu to make things simpler.

#### **The Menu window basics**



### Safe Area

We will refer to the working area of a Menu as a 'canvas', it's shown in Black here. You will notice the two rectangles shown over the Menu canvas. This is called the "Safe Area".



Standard tube TVs are usually set to overscan, that means you can't see the edges and you lose up to 20% of the image that you would see on computer screen.

Make sure that all important information such as text and buttons are places within the Title Safe Area.

### Safe Area for Widescreen menus



Widescreen menus that are set to display Pan & Scan on 4:3 TV (Properties) will have Pan & Scan Safe area displayed. You have to limit all text inside this area otherwise people watching

it on 4:3 TV will not see it all. You can also set the menu to be displayed as Letterbox (in Properties) and then use whole wide are for your text. For more information, see the end of this topic.

### Zoom

You can zoom in or out of the Menu canvas by selecting the zoom in or zoom out tool and clicking on the Menu canvas where needed. Notice the zoom tools on the main toolbar:



### Snap to Grid

The main toolbar has another Menu related button: **Snap to Grid**:



This will make designing layouts easier. **Snap to Grid** is a toggle, click the button to turn the feature on, click again to turn it off. The layout grid is set up in such a way that it follows a 4:3 ratio. With the **Snap to Grid** toggled on, it is very easy to move objects to line up in a precise manner.

### Undo/Redo

The Menu window features multiple Undo/Redo (the number of undos can be set in the Project Properties).



The Undo/Redo feature keeps track of these object parameters: position, size, color, drop shadow, link.

### ► Basic design

The Menu window features many controls and settings. On the right side of the window you have a Properties window with 4 Tabs: Color, Link, Map, PCG and Layers

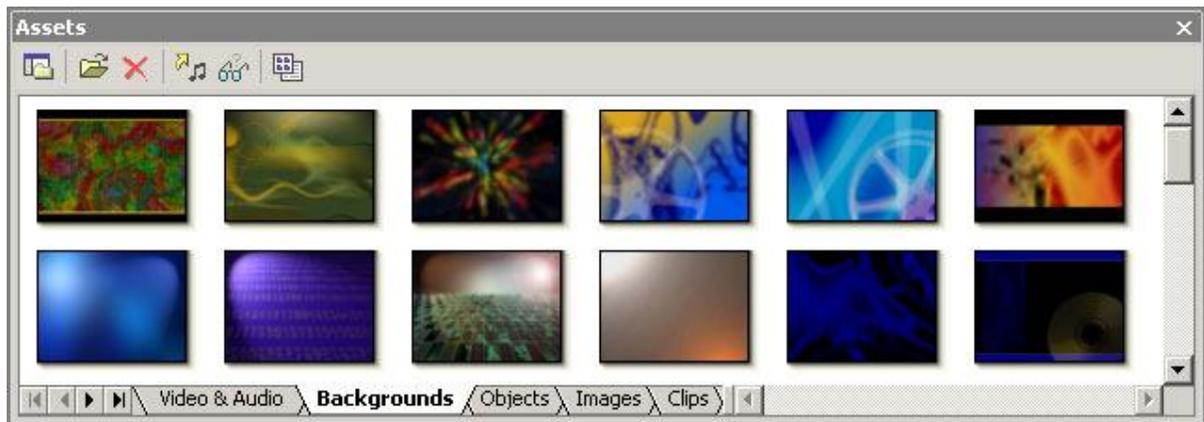
On the left side is a toolbar with tools for creating text, rectangles, frames, Group Hotspot and chapter still image.

The top toolbar has settings for Navigational routing, simulation and buttons for moving in layers.

### ► Set the Background

You can supply your own image or use one of the DVD-lab supplied backgrounds.

In the Assets window, click the **Backgrounds** tab:



You will see a number of backgrounds available for your Menu. Pick one and drag-and-drop it onto the Menu to set the Background. You can replace the background with a different one at any time.

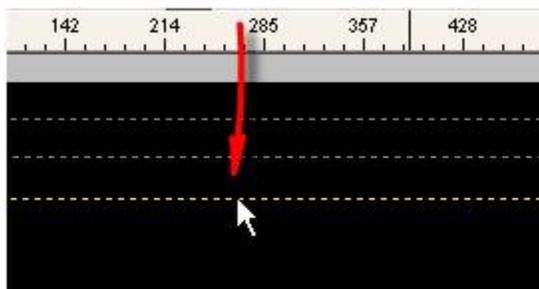
**Tip:** You can use a video still frame as a background when you drag the video frame from the Preview window onto the Menu while holding the SHIFT key. It's SHIFT-Drag & Drop. Similarly, you can use any image as a background if you drag it from Assets to Menu while holding the SHIFT key.

### Merge to background

This command in the Menu will merge all objects in the menu onto the background. All links will be lost and all objects will be then deleted.

### Guidelines

You can use guidelines to help you place your objects, as you might in many other graphic tools. To create a guideline, simply drag it from the horizontal or vertical ruler onto the canvas..



To remove guideline, drag it outside the canvas.

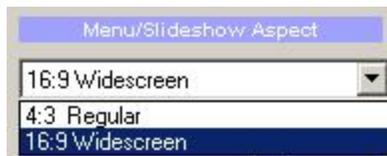
Objects will snap to the guidelines, if they are moved close to it. Guidelines are saved with the project.

By right-clicking on Ruler, you will open a Guidelines edit box where you can add or delete guidelines by their relative pixel numbers. This offers much precision by defining the exact screen pixel to align to.



### 16:9 Menus

DVD-lab allows you to create 16:9 aspect ratio Menus for viewing on a Widescreen TV. DVD-lab PRO create **multi-aspect widescreen menus**, that means they are safe to use for both widescreen and 4:3 viewing.



### Displaying menus on TV.

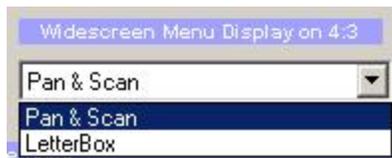
The images below explains how are 4:3 and Widescreen menus displayed on different aspect TV's.



The 4:3 Menu can be displayed on widescreen TV as stretched (16:9 TV Full) or with the correct aspect with black bars on sides. There is nothing to set on DVD, all settings will be done while viewing on the widescreen TV.



The 16:9 Menu will be displayed as designed on widescreen TV. On 4:3 TV the menu can be displayed either as Pan & Scan or Letterbox. You have to set this settings in properties before you compile DVD.

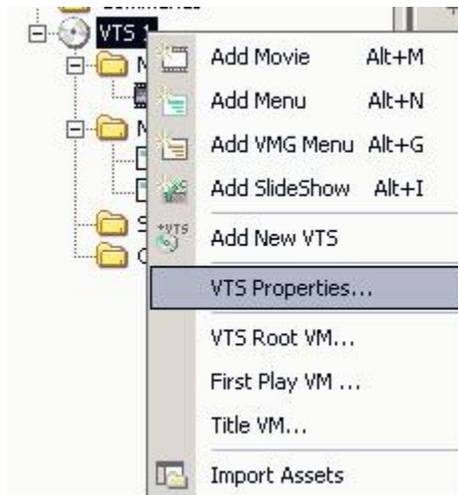


If you select Pan & Scan you have to remember to have all objects inside the Pan & Scan Safe area. The 16:9 Menu on the example above is a good example of correctly designed menu for PS - in all possible situations the menu will display all objects inside the screen.

A good rule of thumb is that if the main movie is in 4:3 (Full Screen) then you should also design your menus in 4:3. For 16:9 movies you can go with 16:9 menus.

### PRO Version

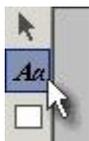
In DVD-lab PRO **each** VTS can have its **own** aspect settings. You can have for example one VTS with widescreen menus and other with fullscreen menus. To set settings that are different from global settings set in Properties, right click on the VTS in the Project window and select VTS Properties.



## 5.2 Objects

### ▶ Add Text, Rectangle or Simple Frame

To add text, click the Text tool button on the left toolbar:



Click in the Menu canvas area and a Text Entry windows appears. Here, not only can you edit the text, you can apply attributes such as Font, Size, Bold, Italic and set justification as Left, Center or Right.

Once you add text, you can resize it or position anywhere on the screen. To edit the text, double-click on it.

To add a rectangle or a frame, click on the rectangle or frame buttons and draw the rectangle on screen. Rectangles and frames are mostly used for the highlighting of text. For example, you may use a rectangle to draw an underline which you will learn later how to set-up visible only if the link is selected. Similarly you may use frame to highlight a thumbnail image.



### ► Selecting an Object

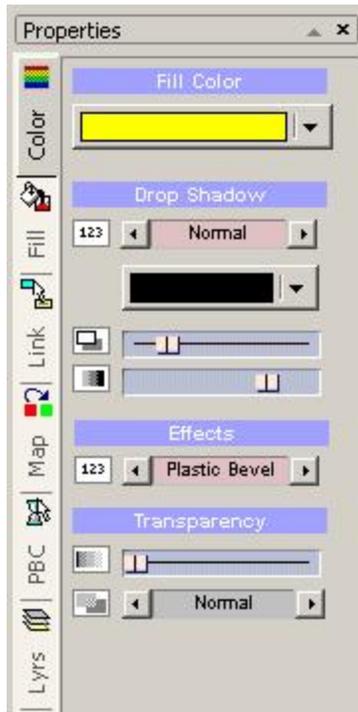
To select an object, simply click on it. This will select an object which is on top. If you have a pile of objects and you would like to select the bottom one, then first click away from the object so nothing is selected. Then, hold **CTRL** and click on the objects. The bottom-most object will then be selected.

To select an object **below** the currently selected object, hold **ALT** and click on the pile of objects. By repeating this you will loop through each of the object on pile.

 **Note:** When moving the objects, they are made a bit "sticky" to their initial position. This is to prevent from accidental moving the object when you just want to select it (shaky hands from too much coffee). To start moving object you will have to click on object and move the cursor about 4-5 points to the desired direction.

### ► Color and Drop Shadow

You can change color of these basic elements with the Fill Color on the Color tab of Properties. Below is a Drop Shadow setting. You will notice that everything you add or draw will have the drop shadow on by default, but you can switch Drop Shadow off at anytime. The Drop Shadow makes the text stand out. If you look at the image above you will see that it makes the image looks more readable by adding a sense of dimension to it.



The Drop Shadow itself can have also its own color. By default, this color is black. The sliders below are for setting the shadow offset (how far away) and the shadow intensity.

The top selector is for selecting the type of shadow, It has values: **No Shadow**, **Normal**, **Strong**, **Sun**, **Hard** and **Fat**

You can use these settings also for a few additional effects:

To create **Glow**: move the offset slider to left and set some other than black color as a drop shadow. Set type to **Strong**.

To create **Outline**: move the offset to left, the intensity to right and select **Hard**.

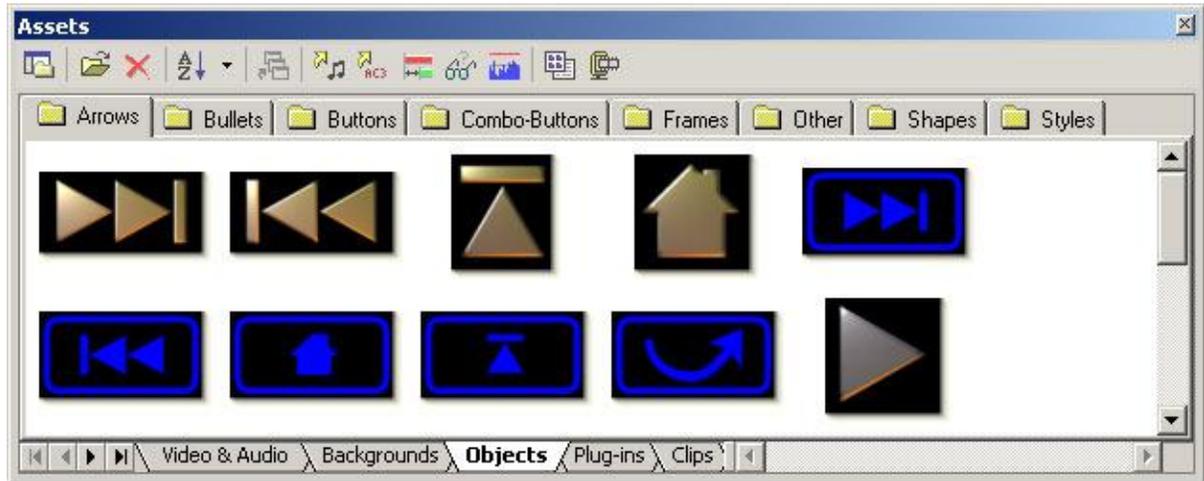


 **Note:** The Strong type is particularly good for dark backgrounds.

You can apply these effects on any object in menu including video stills. The effect will be not part of the subpicture (highlighted mask)

### ► Buttons, Frames and Bullets

Being limited to only text and rectangles on a Menu wouldn't be much joy. To extend the artistic qualities of a Menu, DVD-lab provides you an Objects bin in the Assets window where many buttons, frames and bullets are available for your use. Each of these Objects were produced so that they blend perfectly into any background.



You can design your own buttons in software such as Real-DRAW pro - where these default buttons were originally designed.

### ► Buttons and Bullets

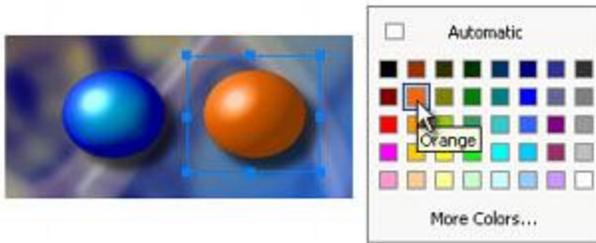
To add a button to a Menu canvas is easy - just drag the button from Assets Bin and drop it onto position on the menu.



### ► Colors and Drop Shadow

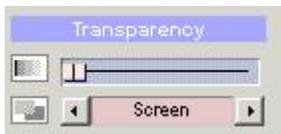
As with the text and rectangle you are allowed to change color and drop shadow.

As you drag the button to the canvas, its color will be set to Automatic (shown as white), this will show the button colors as the button was originally designed. You can re-color the button by selecting the button object and then choosing a color in Fill Color. You also have a choice to reset the color to its original color by checking the Automatic checkbox.

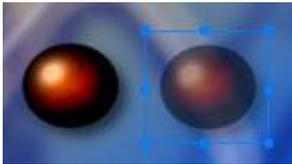


If you choose Black, the button will be de-saturated (Black & White). This method also works also on Video Stills.

### ► Transparency and Layer Effects



Each object on a Menu can have it's transparency value set to blend with other objects. You can set the transparency value of an object by selecting that object and moving the Transparency slider in Color Properties.



### ► Layer Blend Effects

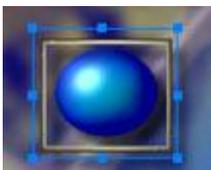
This option changes the way a current object (layer) blends with the objects (layers) below. There are 14 typical effects available: (Normal, Multiply, Difference, Screen, Overlay, Darken, Lighten, etc.)

For more information, see Blend Modes in the Appendix.

 **Note:** When you switch from Normal to any other Blend mode, the Drop Shadow will be set to None. This is the most probable use for the blend modes. If you decide that you do want the drop shadow, you can turn it back on via Properties / Drop Shadow.

### ► Frames

Frames are essentially same as button objects, except that when you drop a frame on existing object, the frame will be resized to surround it.



You can always resize a frame or move it, but this method will save you some time. Another feature of a frame is that it will also pick-up a link from the object behind it.

### ► Object Order

As you are adding objects they are placed on top of each other in what we call "Layers". On the top toolbar you have the left-most four buttons which can move the object within the layers:



You can move an object to be top-most, bottom-most, up one layer, down one layer by first selecting that object and then clicking on the buttons shown here that represents what you want it to do. The two right-most buttons are for centering the object on page horizontally and vertically.

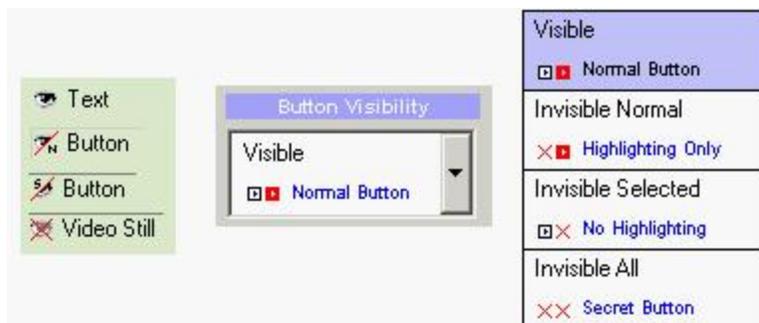
### ► Layers

You can also select object by simply opening the Layers Properties. (Lyrs)



By right-clicking on the Object in Layers, you can also set few things such as Links or Copy.

There are few icons showing status of the object. For example the Eye icon corresponds to the Button Visibility:

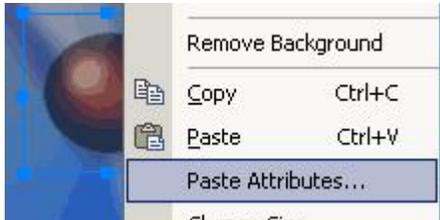


Other icons: = Auto Action, = Object has link, = Object is locked

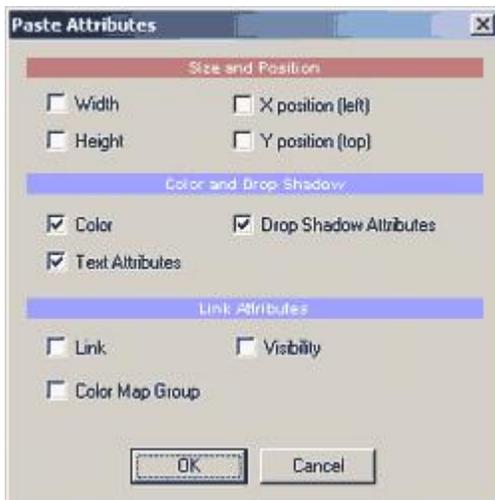
### ► Paste Attributes

This is a way to format two or more objects the same way, to have their formatting attributes

be consistent. First, select the object to copy attributes from, then Copy (CTRL+C) that object as the source to clipboard. Then use paste Attributes on other selected objects from right click menu.

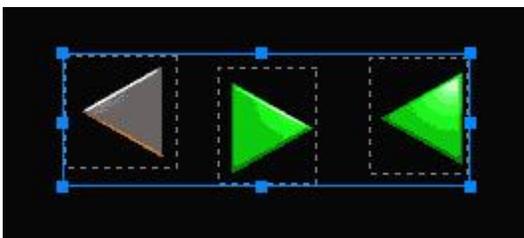


You have options for various settings as to which attributes you would like to be pasted over the new object from the source (in clipboard) including size, color or link information.



### ► Multiple Selection

You can select multiple objects by holding CTRL and clicking on the objects or by drawing a selection rectangle around all the objects to be selected.



This allows you to move or resize the objects together. It also allows you to change the color properties to all selected objects together.

### ► Align options

When you make multiple object selections, then right-clicking on the Menu canvas will present the Align sub-menu.



This allows you to align the objects in various ways.

### Shortkeys

Action	Shortcut	Description
Next Object	Page Up	Select next object (towards layers top)
Previous Object	Page Down	Select previous object (towards layers bottom)

## 5.3 Effects and Styles

DVD-lab PRO menu capabilities are far beyond simple 2D graphic editing. In fact you can easily create hundreds of 3D-like effects, that are normally difficult to create in any graphic editor. These include realistic light-reflected bevels, various glass or magnifying effects, shiny metals, chrome or gold and much more. This is another very unique feature of DVD-lab PRO.

### ▶ Basic Effects

On the Color Tab there is a switch for effects.



These are some quick, but powerful effects you can apply to an object. These are various types of bevel or glass effect.

### Basic Bevel types:



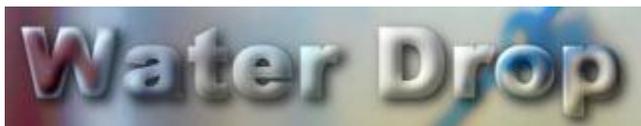
### Realistic Bevels

These bevels offer very realistic look of shiny metal or a smooth plastic:



### Water Drop

Water Drop object takes color from the background and fill it to the shape simulating watery or glass effect.



 **Tip:** A water-drop effect can be nicely combined with texture **Fill Type:** *Transparent*. Adjusting *Color-Fill Mix* will create hundreds of glass-like effects.



### Lenses (Magnifier, Mirror Lens)

These effects works best with large objects. One magnifies what is below and the other displays it upside down.



 **Tip:** A mirror Lens effect with drop shadow can be used on a text on colorful smooth background. The reversed mirror effect of the background will create a subtle color difference that is similar to background yet still distinguishable.



### ► Texture Fill

The TAB Fill offers additional texture fills and effects that can be combined with the effects on Color Tab.

The Fill effects will allow you to create many amazing results that can be normally obtained only in special graphic software.



Any object can be filled with a Texture. The textures are fully seamless.

# TEXTURE

## Fill Type

The fill type determines how the texture will be applied to the object.



Normal Fill - The texture is filled in the object

Overlay - The texture uses the object color

Negative - The texture is applied as negative

Transparent - The texture affects alpha channel of an object

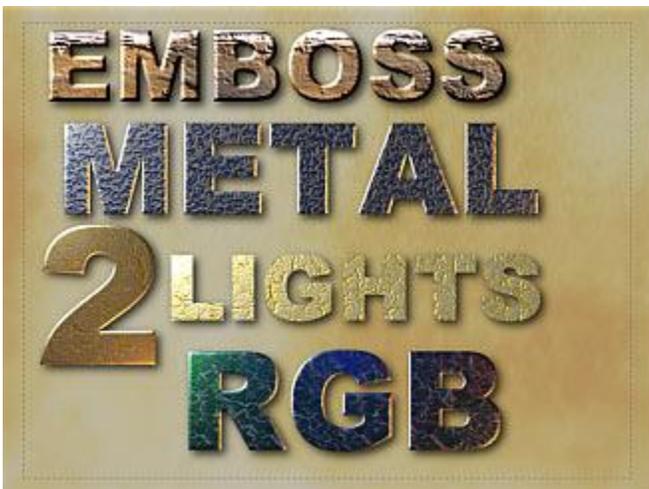
## Color-Fill Mix

This slider will affect how the original color and texture are mixed. On the left side is full color, on the right side is full texture.

## Fill Effect

Another set of effects can be applied to the filled texture. The slider below will adjust the effect.

Fill effects combined with texture will allow you to create many interesting effects like metallic shine or gold.



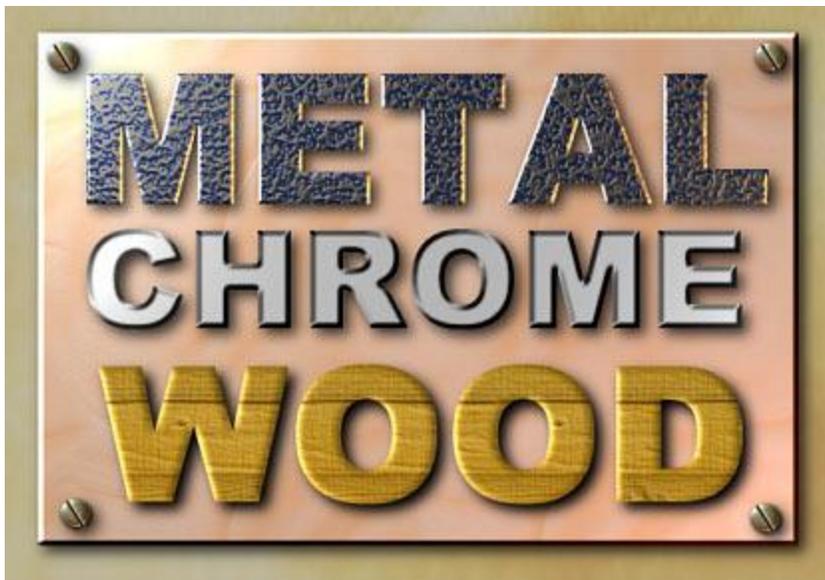
**Emboss** - a simple embossing of texture. Gives dimension to wood or other non-shiny materials.

**Metal Shine** - a contrast strong light from left top corner will create shiny sparkles on a fine texture

**2-Lights Shine** - Two lights from corners will work best on smooth textures to create gold or chrome effect

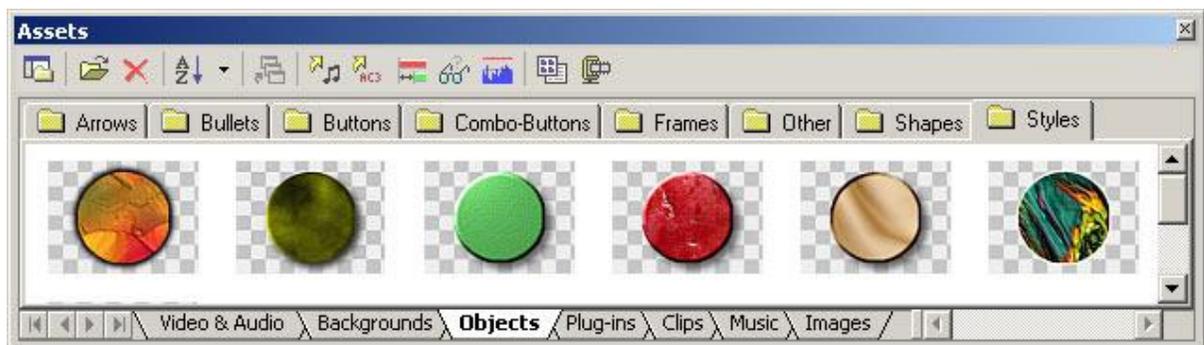
**RGB Shine** - Three lights from top will cast Green, Blue and Red light. Good with smooth textures.

Shiny materials are usually very hard to create in normal graphic applications, but DVD-lab PRO can do this very easy. By combining the texture fills, Bevels and effects you can easily create various materials from marble through metal to wood.



### Object Styles

To be able to quickly remember and recall particular object effect, we have a special sub-bin in the Object bin, called Styles.



Style holds only the color and effects attributes of the object, but not the object shape. (Unlike objects found in all other bins)

To quickly reveal the Styles bin, press *Show Styles* on the Menu tool bar:



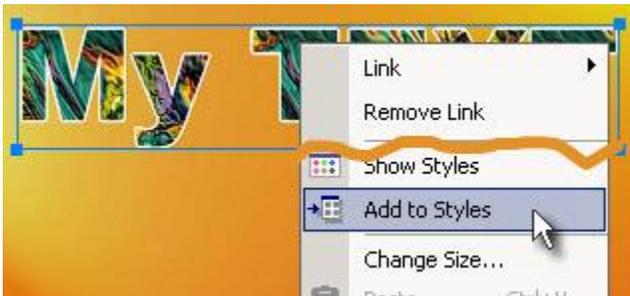
### Apply Style

To Apply Style, simply drag and drop a Style from Style bin over the object in menu



### Create Style

To Create a new Style from any object, select the object, right-click to reveal pop-up menu and select Add to Styles.



### ▶ 3D Rotation Tool



Any Menu object can be rotated. DVD-lab allows you to not only normally rotate the object, but move it in a virtual 3D space. This is a great way to add some interesting looks to your Menus by tilting, rotating and panning the text, buttons or video stills.



You can rotate around one axis at a time by holding the keys:

CTRL - rotate around X only

SHIFT - rotate around Y only

ALT - rotate around Z only (same as normal 2D rotation)

 **Note:** remember that active buttons on DVD can be only rectangles. If you rotate a button, the active button space will be the maximum rectangle around the button. This will change the distance how close together you can put two buttons. It doesn't affect non-linked objects. See the picture below which shows the new active area:

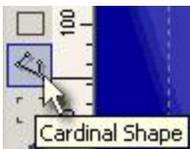


 **Note 2:** When you select the object, the bounding rectangle with the resizing handles will remain in the original object position for simplicity.

## 5.4 Cardinal Shape

### ► Create Cardinal Shape

A Cardinal Shape is a special type of polynome with the ability to dynamically adjust its roundness.

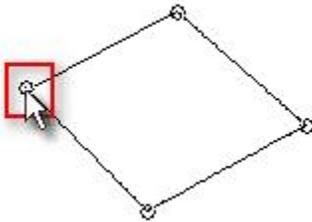


To create a Cardinal Shape, click the Cardinal Shape tool, as shown here. Then click on the Menu canvas to create a first point and release the mouse button. Drag the mouse to the second point and click, then release the mouse button. Repeat this for the desired number of

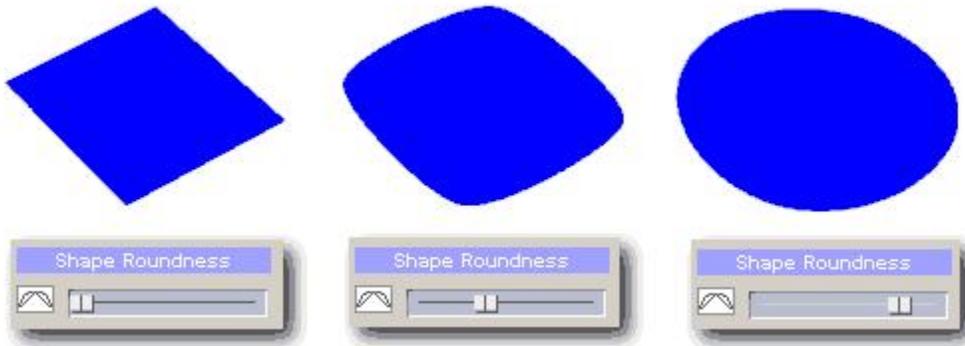
points.



To finish the shape, create the last point over the first point where you started drawing.



A Cardinal Object will be created. If you look at the **Color tab** in the menu properties a new slider will appear there just below the Transparency Section: **Shape Roundness**. By moving the slider towards right (changing Tension) the Cardinal shape become more rounded.



This is the basic idea of Cardinal Objects.

### ► Open Shape (line)

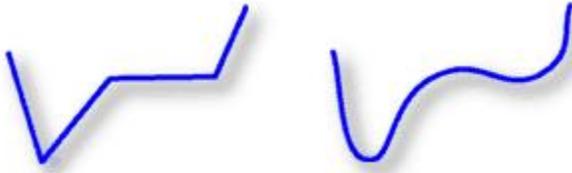
If you don't wish to close the object then instead of clicking and releasing the last point, double-click. This will create an open shape.



(Doubleclick)

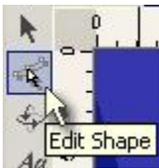
You can adjust the roundness of the open shape the same way using the Shape Roundness

slider:

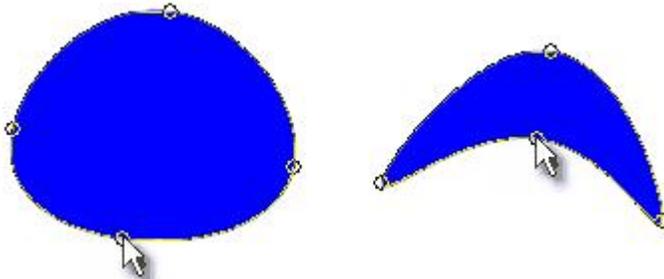


### ► Editing the Shapes

Once you create the shape you can still move its points to adjust the shape. First select the Shape Object tool, then when an object is selected, click the Edit Shape. Alternatively, you can double-click on the object.

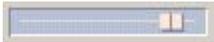


The points will become visible and you can drag the points with the mouse to a new position.



When the Roundness slider is set towards right the shape will always keep its smoothness allowing you to create interesting and natural looking shapes.

💡 **Tip:** With Cardinal Shape it is easy to create a circle: Draw Square with Cardinal Shape Tool and then set the Roundness slider almost to the right (but not completely)



### ► Break Shape

You can break a closed Shape with the *Menu-Break Path* command.

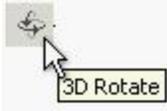
## 5.5 Transformations

There are two types of transformation:

- 3D rotation
- Perspective transformation

### 3D Rotate

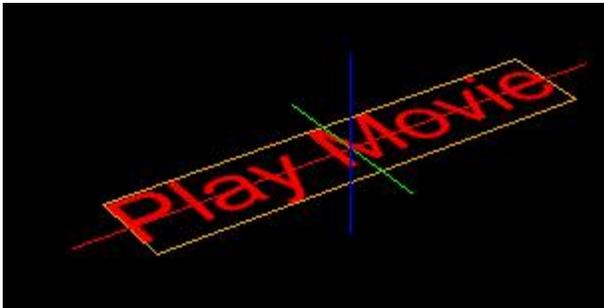
This will rotate the object around the 3 axis.



Select object, then click on 3D Rotate button.



Click on the object and move the mouse while holding down the mouse button.



### Options

Holding ALT, SHIFT or CONTROL will rotate only around one axis

#### ALT



Rotate object around Z axis.  
This can be used as a simple  
2D rotation around center

#### CONTROL



Rotate object around X axis.  
This can be also used to flip the  
object upside down.

#### SHIFT



Rotate object around Y axis.  
This can be also used to flip  
the object left-right.

## Perspective Transformation

Another Transformation effect is the Perspective Transformation of objects.



In some cases a 3D rotation is not enough to simulate the desired effect. Look at the image below:



In the case above the "Play Movie" doesn't look like it belongs to the image, because it doesn't fit to the perspective. For such cases we can use Perspective Transformation.

With Perspective transformation we can "fit" the object to the perspective of background.



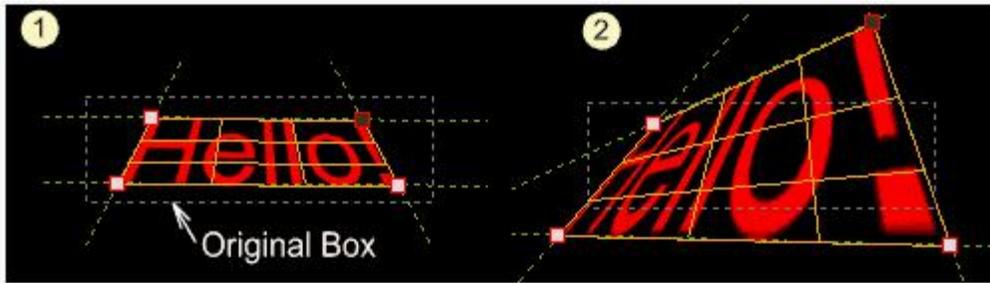
Click on the Perspective Transformation Tool, then adjust the four corners of the Perspective box until the perspective of the object correspond to the perspective of the background.

Perspective Transformation allows us to create many interesting menus:



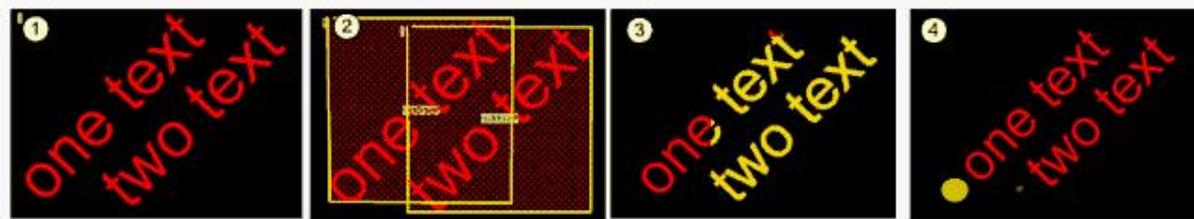
### Original box

When you are editing Perspective Transformation, there is a dashed rectangle displayed over the object. This is the Original Box, showing the original size of the object. When a quality of the image is important you should move the four handles within inside of the box (1). When you resize the object outside the Original box (2) some edges may be more blurred.

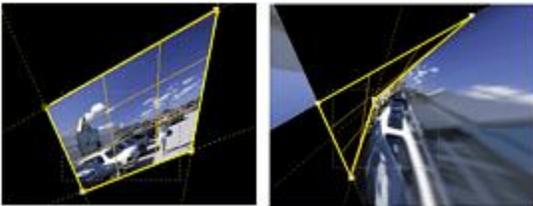


**Note 1:** The 3D rotation and Perspective Transformation use the same data properties. You can apply Perspective Transformation after 3D rotation, however if you then use 3D rotation **after** Perspective Transformation, the transformation will be first reset to its original size.

**Note 2:** When you use rotated or transformed objects as buttons, you have to remember that the active part of the button is the largest bounding rectangle around the object. For example you can't place for two text objects rotated 45 degrees (1) too close because they will overlap (2). Overlapped buttons will show strange highlighting effects (3). If you want rotated text, it is always best to use bullets as highlighting (4).



**Note 3:** You can move the transformation handles to such position in which they no longer define a rectangular surface. In such case you may see effect as shown on the second image:



### Reset Transformation

Right click on the object, from the menu select Reset Transformation.

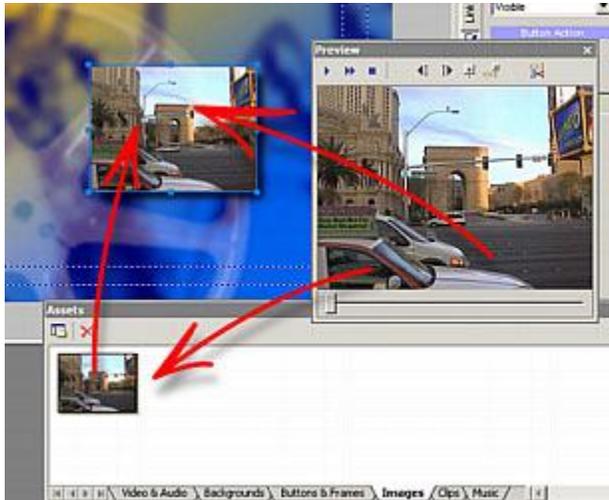


This will reset both rotation and perspective transformation.

## 5.6 Video Stills and Images

In addition to all of the objects you can place on a Menu, you can also drag video-stills onto a Menu. You can either collect your video-stills and images in the Image Bin (by dragging them

there from Preview) or you can **directly drag** a still-frame from the Preview directly onto a Menu.



Navigate in the Preview to the exact spot from which you would like to make a video-still. What you see in the Preview, is what you get. Click within the Preview and drag directly onto the Menu, close to where the image should land, then release the mouse button. Alternatively, you can choose to drag a video-still from Preview directly into the Assets / Images Bin and then to a Menu from that Bin. The latter method allows you to have this image a separate file in a bin, to do what you like with.

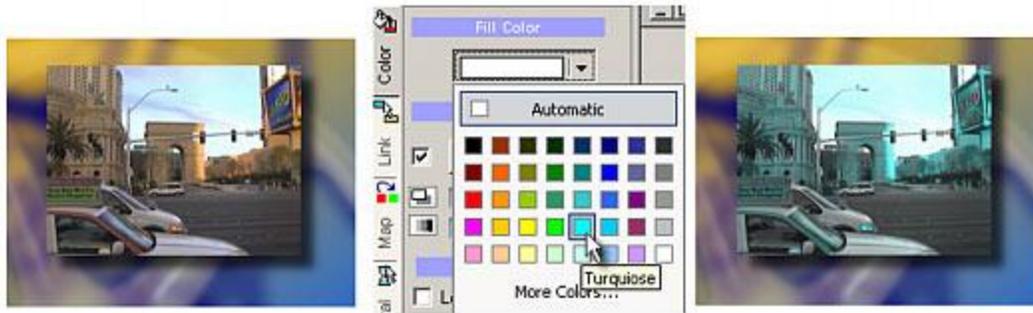
As described in Assets, you can drag any of your own images to the Images Bin from the File Browser or Windows Explorer.

#### ► Video Still as Background

You can also directly set the Menu background with the video-still image. When dragging from Preview onto a Menu, hold down the SHIFT key. The Video still will then be placed as a background. Holding SHIFT will indicate that this graphic is to be inserted as a background, not as an object.

#### ► Change color

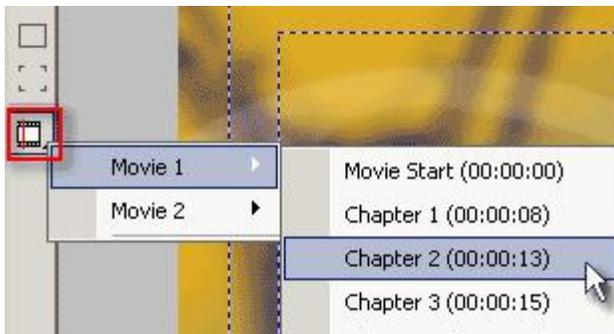
As with any other object, you can also re-color stills with Fill Color properties. This is a non-destructive feature, the image itself is never changed. You can return to the original colors (Automatic - white) or choose any other color at any time.



If you choose a black color the image will be de-saturated.  
Re-coloring is an interesting way how to make your menus look "cool".

### ► Insert Chapter Still Images (VTS Menu)

Instead of spending a lot of time tracking down where Movies / Chapter Points are and collecting the stills for all Chapter Points, DVD-lab provides a neat tool called "Insert Chapter Still Images" to greatly automate the assembly process.



Considering that a Movie in the Project has had Chapter Points defined, DVD-lab knows exactly where they all are. Along the left side of the Menu border, we see the above button for the list of Project Chapter Points, that button is the "Insert Chapter Still" button. Click this button and a flyout menu will appear (as above) from which you will be able to select the appropriate Chapter Point. A video-still from this chapter point will be automatically inserted to the Menu, when selected. The video-still will also have a link set already to the chapter point.

A very smart feature that can save you a lot of time.

 **Note:** You can link to chapters only from VTS menus. On VMG menus this button will be disabled!

## 5.7 Links

Menu objects can be either active (meaning it has links to another Movie or Menu) or inactive.

An active object is commonly referred to as a "Button", though it can be any shape. An active object could equally be text or a frame.

### ► Create a simple link

To create a simple link, just drag an Item from project window and drop it on a object.



You can drag the "link" to an empty space on menu and DVD-lab will automatically create a new object. In the case of a Movie, it will create a simple rectangle button with still frame from the movie.

💡 **Tip:** Hold Shift while creating the new object this way and you will be offered the option to create a Text object instead of a still frame.

### ► Create links to Chapter Points (VTS menus)

A very convenient and intuitive way to create a link is to right-click on the Menu object and select "Link". From there you will be shown a list of places to link to that DVD-lab knows about and keeps track of for you. As shown in the screen shot here, if we select a Movie that has Chapter Points defined, we can directly link to a specific Chapter Point.



This method will give you access to link to any object in the project.

📄 **Note:** You can link to chapters only from VTS menus. From the VMG menu you will be able to link only to Movie Start and no other chapter points will be listed! This is in compliance with the DVD-Video specifications.

💡 **Tip:** Press Spacebar when you have selected object and a link menu will directly appear at the place of cursor.

### ► Remove Link

To remove a Link, right-click on the object and select Remove Link.

### ► Button order

When you create a link, a number will appear near the top left of the object showing that button's order.



The button order is not so much the order in which you created the links, but the order in which the objects will be navigated on the player's remote control. That means, if you start adding text from the top, the top button will always be button number 1 no matter in which order you created the links. As you add or remove links, DVD-lab will keep track of the button number order.

It most important for us to know which button is first.

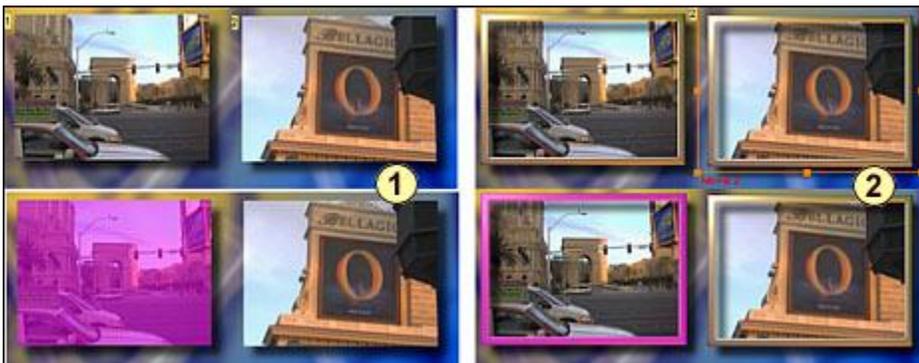
### ► First Button

Each Menu will display Button 1 as selected, by default. That's why it is important to set a first button. You can make any Button a first Button by right-clicking on it and choosing "**Set as First Button**". Another way is to select the object and move it to the back with the layer buttons. You can also Force Select any other button to be selected.

### ► Frames as links

We know that if you drop a frame on an object, it will position the frame to surround the object. And that if the object happens to have a link, the frame will pick-up that link. Defining a frame as an object to link to gives us good creative options, especially for thumbnails and images.

Notice the following images:



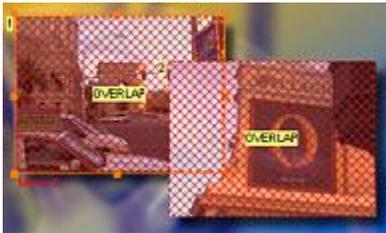
1 - Here are two video stills each with a link (top). When the Menu plays (bottom) the whole

image is highlighted.

2 - Here we have a frame around the thumbnails (the frame was dragged to the Menu from the Assets / Buttons & Frames bin) and the frame has a link (top). When the menu plays (bottom) only the frame is highlighted rather than the image creating an outline effect.

### ► Overlapping

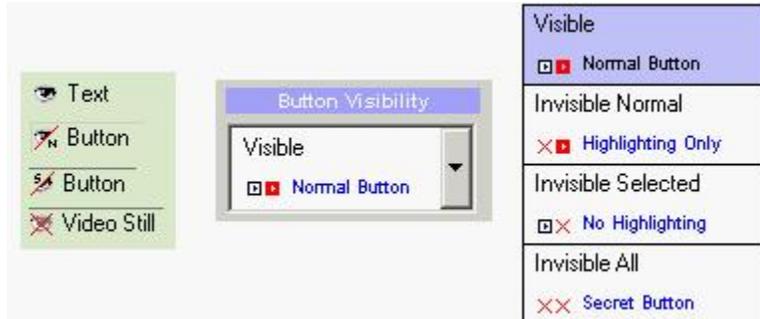
Buttons on DVD can not overlap. This is DVD illegal as the player could not determine which button to activate. If you create a new object or move two active objects so that they overlap, you will see the overlap warning as show by the rather obvious red grid.



Just move the buttons some where else until the Overlap warning disappears.

### ► Visibility

Now the fun part starts. A button may have visibility properties.



This is a setting in the Link tab of Menu Properties. An active object may be:

#### - **Visible** (default)

The object is always visible against the background. If it is selected then the object is highlighted using the highlight color.

#### - **Invisible Normal**

The object is not normally visible. If it is selected then just the highlighted image is shown.

#### - **Invisible Selected**

The object is visible against the background but when it is selected it doesn't show the highlighted image

#### - **Invisible All**

The object is both invisible against the background and as highlighted. The user cannot see that such a button exists but can navigate there and press Enter. This is sometimes used for "Easter Eggs" or secret buttons.

The most useful are the first two settings.

Here are some examples. We have two text objects that link to movies.



1 - The first text is set as default **Visible**. The second text we set as **Invisible Normal**.

2 - When the menu is played and the first text is selected, it is highlighted. Since the second text is **Invisible Normal** we don't see anything else there

3 - When the second text is selected (press Enter), the player then shows only its highlighted picture.

#### Application of visibility

Besides creating Easter Eggs, the visibility settings has a quite important role in customizing the menu.

Please consider the image below:



1 - We **removed** the Links from the text 1 and text 2 objects and added a rectangle below each text. Next we **add** links to each of the rectangles. (See the button numbers to their left).

2 - Next we set both rectangles to **Invisible Normal**.

3 - When we play the menu - it looks like the selected text is underlined.

Similarly, we can modify the example with frames where we set the frames to **Invisible Normal**:



Though the thumbnail images have no visible frame, when the menu plays, only the "

**Invisible Normal**" frame which has a link defined will be highlighted.

These settings let you customize a menu in many ways. Instead of highlighting what the user sees as a button you can highlight a frame around an object, highlight a bullet such as an arrow placed over an object or beside it, an underline etc...

### ▶ **Special Commands**

DVD-lab PRO has a special set of commands that can be called from the button. See more in Special Links

These features give the DVD Author a lot of freedom and creative options. When used along with the Group Hotspot feature, this gives you some very impressive design tools.

### **Shortkeys**

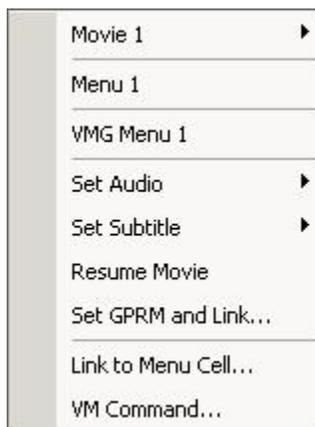
Action	Shortcut	Description
Add Link	SPACE	Shows a Link menu below cursor
Remove Link	Shift+Del	Shows a Remove Link menu item below cursor

## 5.8 Special Links

There are few special functions that can be used as Menu Button Links

### ▶ **Special Links Commands**

DVD-lab Studio/PRO has a special set of commands that can be called from the button



**Set Audio** - Directly Select which audio track will be played when you play the movie.

**Set Subtitle** - Directly Select which (if any) subtitle will be visible when you play the movie.

Set Audio/Subtitle will be combined with one of the following command:

- + **Restart Menu** - (Default) When user click on the Subtitle or Audio button on menu the Subtitle/Audio stream will be set and Menu (if motion or sound) will start playing from beginning. This is to prevent compatibility problems with some players.
- + **Go To Next Menu** (PRO) - When user click on the Subtitle or Audio button on menu the Subtitle/Audio stream will be set and Next menu will play.
- + **Go To Prev Menu** (PRO)- When user click on the Subtitle or Audio button on menu the Subtitle/Audio stream will be set and Previous menu will play..
- + **Go To First Menu** (PRO)- When user click on the Subtitle or Audio button on menu the Subtitle/Audio stream will be set and First menu (a ROOT menu) will play.

The "+" commands can be used various way. When user click the button to select Audio or Subtitle, it can immediately return to parent (previous, ROOT) menu, next menu to set other settings or even play movie.

 **Note:** Setting Audio or Subtitle Directly from button **may not always work correctly** on all DVD players. For greater compatibility across many different players and for greater flexibility you should consider creating your own Audio/Subtitle Manager that uses Set GPRM and Link command. See more about this later.

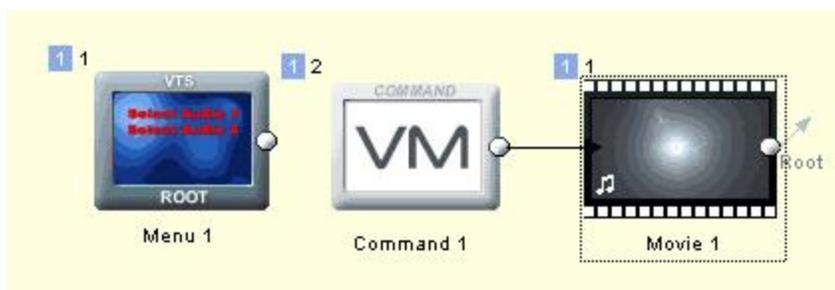
**Important:** You can use this only from a VTS Menu.

### Audio/Subtitle (Direct Setting) Examples

The following apply only to PRO version.

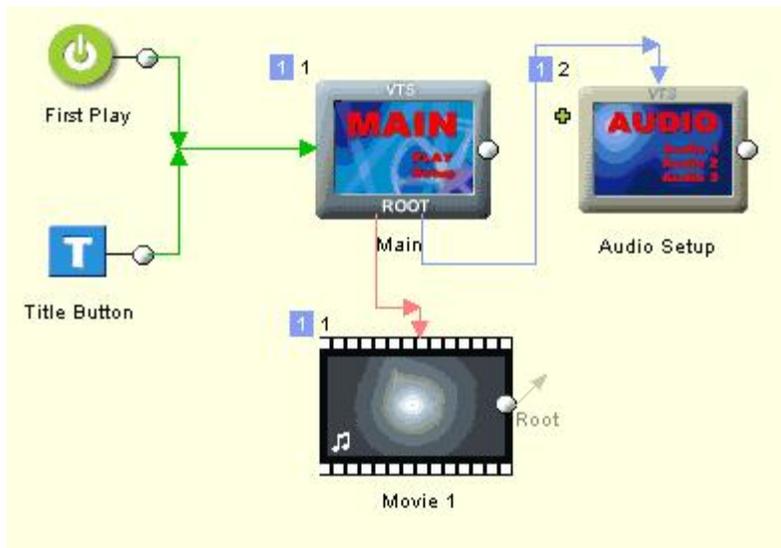
 **Note:** We used big red text on menus to be visible in this manual. Normally using red text is a very bad choice. (Red can be good for highlighting)

**Example 1:** After User select Audio 1 or Audio 2, the movie will start playing right away.



This is done by setting each of the two buttons to select Audio Stream 1 and Audio Stream 2 and set the "+" command to "+ **Go To Next Menu**". Then we have to create the *next* menu - in our case we added VM Command object (*Connections - Add - Add Command Object - In VTS Domain*) that is placed in VTS Menu domain (so our Next menu will be the VM Command object). Then we link the VM Command to the Movie.

**Example 2:** We have Main Menu with buttons to Play movie and Setup Audio. Clicking Setup will get us to next movie where the current audio is highlighted. Changing the audio will get us back to main menu.



The basic is done simple way. The Audio Setup menu has 3 buttons for Audio 1, 2 and 3. Each links to Audio Stream 1,2 or 3, The "+" command is set as "+ Go To Prev Menu". So far so good.

Now how does the Audio Setup menu knows which button to highlight according to the current audio selection? For this trick we have to use VM Commands. This will be explained much later but as a preview here is the Custom VM Command in menu PRE Sequence:

```
GPRM0 = SPRM1
GPRM1 = 1024
if (GPRM0 == 1) GPRM1 = 2048
if (GPRM0 == 2) GPRM1 = 3072
SetHL_BTN GPRM1
Break
```

GPRM0 is set to the status of current Audio (SPRM1) 0,1,2...7  
 GPRM1 is set to 1024 for first audio. 1024 is first button (buttons are set as multiple of 1024)  
 if the current audio is 1 (second audio) then set the second button to be selected  
 if the current audio is 2 (third audio) then the third button is set  
 Now highlight the button according to the value in GPRM1  
 Do not execute any other commands below (they will change the highlighting)

Modify the code to highlight the buttons according to the Subtitle.

Instead of SPRM1 use SPRM2, but we have to change values as well. The SPRM2 if Subtitle1 is ON is 64, Subtitle 2 On is 65 etc...

```
GPRM0 = SPRM2
GPRM1 = 1024
if (GPRM0 == 64) GPRM1 = 2048
if (GPRM0 == 65) GPRM1 = 3072
if (GPRM0 == 66) GPRM1 = 4096
SetHL_BTN GPRM1
Break
```



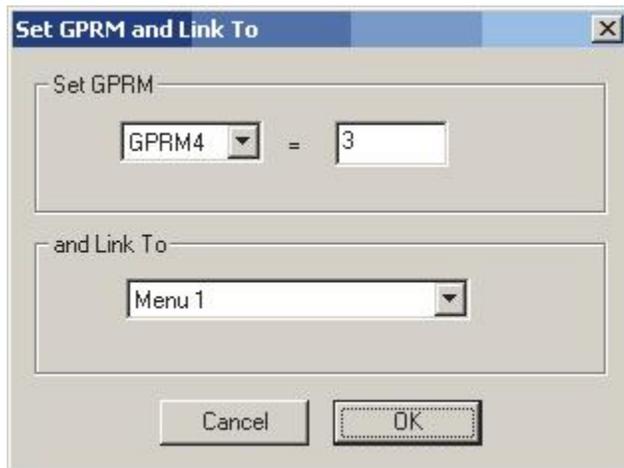
## Other Commands

**Resume Movie** - resume the movie from the last position. Works, for example, if you

interrupt movie with menu button.

### Set GPRM and Link

Allows setting one of GPRM parameter to a custom value and then link to another menu or return to the same menu.



The DVD specs allows linking only within the domain - that means:

- from VTS menu you can link only to other or same VTS menu or VM Command Object in VTS Domain
- from VMG menu you can Link only to other or same VMG menu or VM Command Object in VMG Domain.

By default The *Link To* will be set to the same menu where we are editing the button. This will restart the menu (play music/motion from beginning). It is necessary to avoid some players lockup.

This function enables you to create a special button functionality that normally is not possible. For example you can create the full Audio/Subtitle or Language Manager. It really depends on the author what he can do and what functionality he needs.

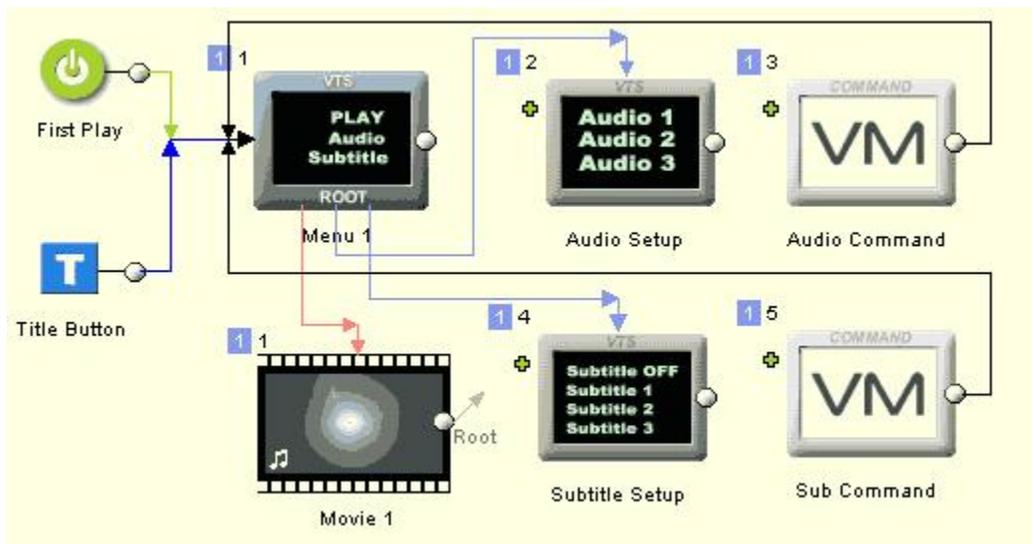
### Audio/Subtitle Manager Example

We mentioned previously that for greater player compatibility and flexibility we should create our own Audio/Subtitle manager. The task is not that difficult and we will reuse code mentioned previously.

A goal of this simple manager is to have two menus called from main menu, one for setting audio and other for setting subtitles. Each menu should by default select button that represent the current audio/subtitles regardless if it is selected with remote or on screen. Then when user select Audio or subtitle it should return back to the main menu from where user can press Play. The selection should be remembered even when a movie ends.

**Important:** You can use SetSTN commands only from within VTS domain. Therefore we

can do our special menus as VTS, not VMG!



This is our simple Audio/Subtitle Manager project. We have Movie that has 3 Audio Tracks and 3 Subtitle Tracks. VTS ROOT Menu has link to Play movie or to set Audio or Subtitle. We need two additional menus for Audio and Subtitle selection and two VM Command objects in the VTS Domain (Menu: *Connections - Add - Add Command Object - In VTS Domain*)

Audio Setup menu has 3 buttons for selecting the audio. The Menu has a PRE command that is similar to one we had previously to highlight the currently selected audio stream.

Audio Setup PRE Command - highlight button according to the current selected Audio

```
GPRM0 = SPRM1
GPRM1 = 1024
if (GPRM0 == 1) GPRM1 = 2048
if (GPRM0 == 2) GPRM1 = 3072
SetHL_BTN GPRM1
Break
```

Instead of directly setting Audio stream on buttons we will use Set GPRM and Link command.

Let's say GPRM2 will be used to hold the new desired audio. So each button will set GPRM2 to different value (0,1,2) and then link to a VTS VM Command object "Audio Command"



Each button after setting GPRM2 links to Audio Command VM Object. This object has just one command that finally select the audio according to the GPRM2 parameter.

### Audio Command VM Object

```
SetSTN (audio=GPRM2 )
```

The Audio Command VM Object links back to our main menu Menu 1.

Second menu is Subtitle Setup menu to choose a subtitle. Same as above, but with modified PRE commands for highlighting the current subtitle.

### Subtitle Setup PRE Command - highlight button according to the current selected Subtitle

```
GPRM0 = SPRM2
GPRM1 = 1024
if (GPRM0 == 64) GPRM1 = 2048
if (GPRM0 == 65) GPRM1 = 3072
if (GPRM0 == 66) GPRM1 = 4096
SetHL_BTN GPRM1
Break
```

We will use GPRM3 to hold the new desired subtitle stream - we will use the same coding that DVD expects.

0 for selecting first subtitle stream and setting it OFF,  
 64 for selecting the same first subtitle stream but setting it ON,  
 65 for second subtitle ON  
 66 for third subtitle ON.

All buttons will link to "Sub Command" VM Object.



The "Sub Command" VM Object object has just one command that finally select the subtitle according to the GPRM3 parameter.

### Sub Command VM Object

```
SetSTN ( subp=GPRM3:off )
```

Again the Sub Command object links back to main Menu.

We are done with our simple Audio/Subtitle manager. This is of course just one way which may be modified to fit the project. We can, for example, modify it for Language Manager, that will select both Audio and subtitle according the Language preferences or we can create much more complex manager that involves "switched" menus where we can put Audio and Subtitle on the same page with a "selector" pointing at both current Audio and current Subtitle.

One other example of more complex Audio/ Subtitle Manager that uses different approach is here:



This would involve a multiple menu trick, that means we would need one menu for each combination (total 6 menus).

 **Tip:** You start by making one menu complete and then use *Menu - Add - Add Duplicate*, then change the differences.



You need to fit this with commands. Here you don't necessarily need to use a VM Command object as above because each menu can be used to set the Audio and Subtitle in its PRE command (because simply each menu defines exactly the correct combination). That means we don't need to use buttons with Set GPRM either, or any other trick but simply link each button on each menu to the menu that corresponds to the new combination. A lot of criss-cross linking!

From the Main menu we need to call this group of menus through one VTS VM Object that would be used to choose the correct menu according to the currently selected Audio and Subtitle combination... a case of employing some simple maths! Ok, a bit more help, we solved this Selection task using this code snippet:

```
GPRM0 = SPRM1
GPRM1 = SPRM2
GPRM0 *= 100
GPRM0 += GPRM1
if (GPRM0 == 64) LinkPGCN 4
if (GPRM0 == 65) LinkPGCN 5
if (GPRM0 == 100) LinkPGCN 6
if (GPRM0 == 164) LinkPGCN 7
if (GPRM0 == 165) LinkPGCN 8
LinkPGCN 3
```

but let's stop there. The rest is a good exercise for you to complete.

### Other Special Link Commands

**Link to Menu Cell** - A special VM Command helper that sets the VM Command so the Menu (motion menu with delayed buttons) will jump to next cell.

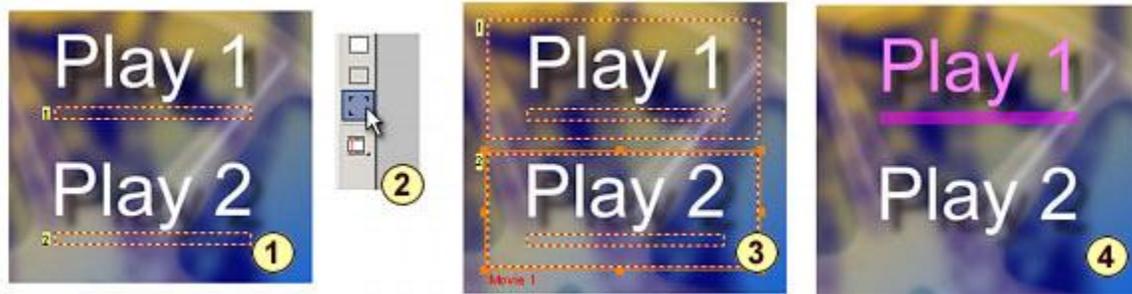
**VM Command** - Type a single line of VM command directly to a button. See more info about VM here. (Buttons can have only single line VM command as per the DVD specs)

## 5.9 Group HotSpot

Previously, we saw how to use visibility to customize what Menu object will be highlighted. That related to a single object only. Now we are going to look at making a group of multiple objects.

For example: What if we would like to have not only the text underlined, but highlighted as well?

For all this and more there is the Group Hot-Spot feature.



The image above is a modification of our previous example.

- 1 - We have a Text object and an underline rectangle object with its link set to Invisible Normal.
- 2 - Select the Group Hotspot tool.
- 3 - Draw a rectangle (bounding box) to include both the Text object and the underline rectangle. The objects within the bounding rectangle become a Group. The Group Hotspot will pick-up the link from the underline rectangle. Repeat this action to make a group from the second text object and underline object.
- 4 - When played, both the Text and underline will be highlighted together a Group, each retaining it's original visibility.

The Group acts like a single item on the player, yet we designed this from multiple objects grouped together.

### Group Hot Spot vs. Packages

Later we will show another way of grouping, called Packages. While Group Hot Spot can "group" active objects with different visibility and Highlighting Group, Package will group items to create one single editable object.

#### ► What does the Group Hotspot do?

First of all, it is an invisible (logical) object for which we can define a link. The Group Hotspot uses all the objects which are behind it (or inside it's boundary) and the properties of these objects to draw the highlighted image. With the Visibility settings applied to the objects behind it, you can determine exactly which objects will be highlighted. In the example above the Text is set to Visible, the underline rectangle is set to Invisible Normal. After drawing a Group Hotspot over them they become one logical button, still retaining these characteristics.

You can move the Group Hotspot away if you need access to an object behind it in order to change that object's properties. You can also add a link to the Hotspot the same way as you would to any other object.

### Group Hot-Spot and Button Visibility

Group Hot-Spot pickups all objects inside its rectangle. There is a special relationship

between group Hot-Spot and Button Visibility. For example as we discovered in the previous example, any objects set as Invisible Normal will under Group Hot-Spot appear as highlighting.

If we have a different situation where there is an object under the Hot Spot that we don't want to be a part of the Highlighting, we can set that object to *Invisible Selected*. This object will be visible on menu, but Group Hot Spot will not use it for Highlighting.

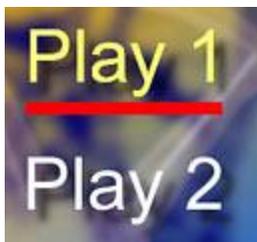


All the object are set in the (1) as Visible. The Group Hot-Spot will then pickup all the objects under its rectangle as Highlighting (2). However we can set the Triangle to Invisible Selected, which will remove it from Highlighting (3).

Please see more in Links.

*Group HotSpot is a powerful and amazing tool that belies its simplicity.*

There are also other object parameters which the Group Hotspot preserves, such as the Color Map Group. You will learn about Color Map in the next chapter, but here is a small example. You can set the Text object to a different Color Map Group than the underline rectangle object, which will allow you to have different highlight color settings for each. Now you group them under Group HotSpot so they become one button, but they will retain their color mapping parameters as well.



 **Note:** The Group Hotspot doesn't necessarily have to be on top of all objects in order to function. In fact, if you need access to the objects it contains, you can move it back behind all those objects. So it would be fair to say that the Group apply to all objects bounded by its rectangle.

This barely scratches the surface of all the possible uses of the Group Hotspot. Together with the Visibility settings and Color Mapping, it will let you to create any button highlighting possible. You can set the highlighting to exactly what you need.

Group Hot-Spot can be also used over Packages (or any other objects in fact) to create more than one buttons from a single object.

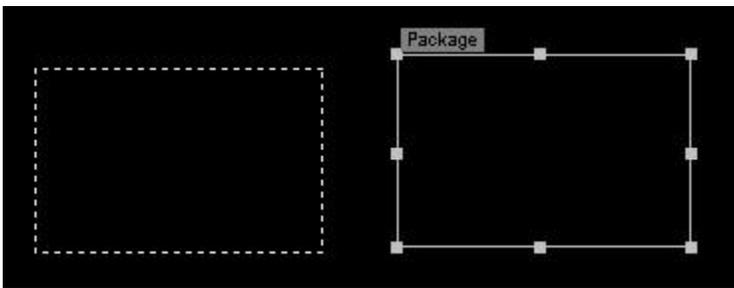
## 5.10 Package

Package is a special "Image Group" Object. It allows to group few objects together so they will appear as a single Image Object. However the Package will also offer a separate View where we can further edit the content of the Package separated from other objects. The Package can be used same way as any other object - for buttons, placing Group HotSpot over it etc.

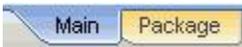
To create Package, select the Package Icon



and draw a rectangle over canvas.



This will create an empty Package Object. A tab bar will also appear at the bottom of canvas giving us a quick access to the Main canvas or each Package.

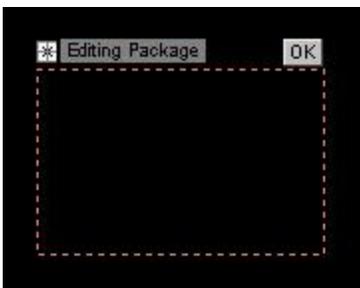


**Note:** The size of rectangle during drawing Package will determine the original size of the Package.

### Editing

To edit Package, **double-click** on it or click on the corresponding Tab bar (each package has a different color).

This will open the Package inside a new empty canvas (all other objects will disappear)



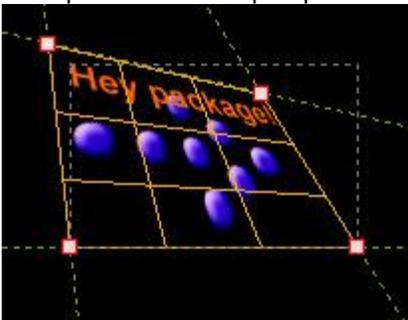
Now we can add any number of other objects inside the Package area, the same way we add the objects in main canvas.



### Close Package

When we are all finished, click OK button or click "Main" tab bar. The Package will close. We will be back in the Main canvas and the Package will display both objects, while behaving as a single object.

We can now apply any other effects or transformation to the Package as to any other single object. For example we can add perspective transformation,



or for example apply a texture:



This will be applied to the whole Package.

However any time we need to edit the original Package, we can always just double click on it and we can make any changes!

### Rename Package

Right click on a Tab bar and select Rename View. You can then edit new name for the Package. This name will be also stored in "Button Label" properties.

### Package Background

Normally the package background is fully transparent. However while editing the package we can add a background to it as to a normal canvas.

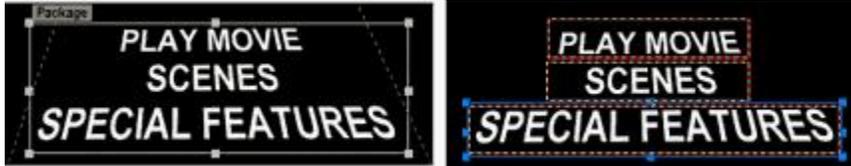
### Links

We cannot apply links to objects inside the package during editing, but we can apply link to the closed package as to any other object. We can also use the universal Group Hot Spot to pinpoint one or more active parts.

The button Highlighting will be created from the Package transparency.

### Use one Package for more buttons

If you want to have more than one link over various parts of the Package, the Group Hot-Spot objects placed **over** the Package (not during Package editing) is all what you need.



Place Group Hot Spots over the desired parts of the closed Package you wish to have as a separate button, then add different links to these Group Hot Spots (not to the Package itself!)

As described in previous chapter, the Group Hot-Spot will pick-up the underlying parts from the Package as the Highlighting.



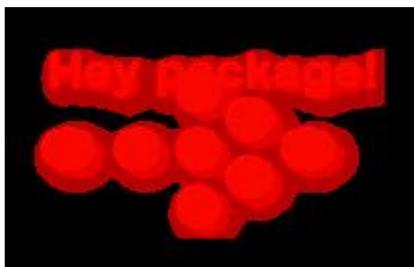
**Note:** If you have any other objects below the Package that you don't want to show as part of Group Hot-Spot highlighting, set these objects to *Invisible Selected*.

### Shadows inside vs. Shadows Outside.

When we apply shadow to the objects inside package, they will become a part of the image.



If we apply link to the Package, then the Highlighting will be created also from the part of shadows (because it is now part of the top image) . This may not always be what we want:



If we are planning to use the Package also for buttons and want drop shadows, it is better to remove all the shadows from objects **inside** the package and add the shadow to the package as whole.



**Note:** By default objects created inside the Package will be applied without shadow.

### Cells and Package.

A Package belong to only one cell. Each menu cells can have different own set of Packages.

### Usage Tips:

For parallax images you can create a package and then apply perspective transformation to the whole Package which is far easier than trying to fit each object into scene separately.



And the best thing is that when you need to change the text, just double click on the Package or select its Tab, change the objects inside and go back - the perspective transformation will be intact.



## 5.11 Color Map

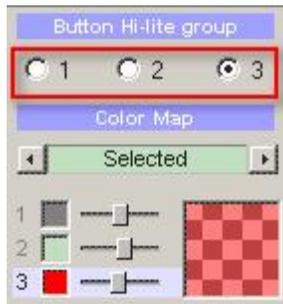
We have already learned how to create links and how to modify what part of a button that will be highlighted.

When you **Simulate** the Menu, you will see that all the links are highlighted with the same color and with some transparency. The Map tab on the "Menu Properties" is where you set these parameters.

 **Note:** The changes to Color Map can be seen directly in Simulation. That means you can stay in Simulation mode and change the parameters with immediate results.

### ▶ Hi-lite Groups/Antialiasing

Any active object can be in one of the three groups 1,2 or 3 (also called E1, E2 and P). By default all buttons are set to group 3.



Each of the Button Hi-lite groups can have different color properties.

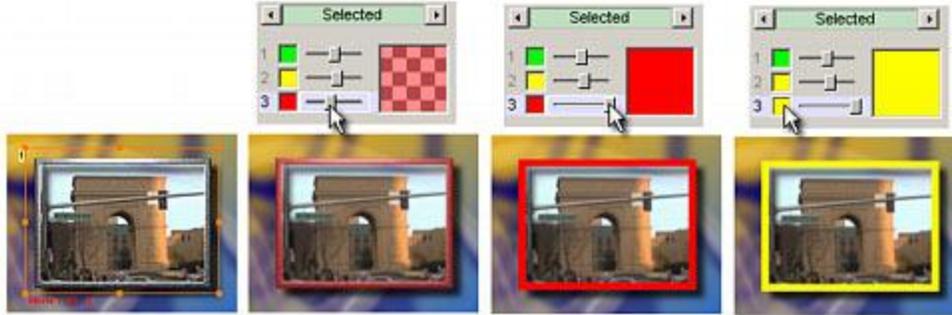
### ▶ Antialiased Subpicture



Three color groups can be used together to create an anti-aliased subpicture. DVD-lab will use the three groups of color to create a color fade on the edges. The edges will then appear smoother, but this will allow you to use only one color and transparency value for highlighting the buttons on the menu.

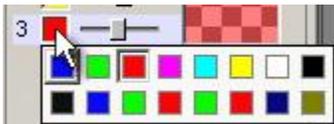
### ▶ Transparency and Color

In the example below the Frame with link is also set to group 3 so the third slider will affect it.



Notice the different settings for the highlighted image. The slider is the **transparency** of the highlighted picture (left - fully transparent, right - opaque).

To change the color, click on the color "well" to the left of the slider.



You will be given a palette of 16 colors to choose from.

### A Button State

An active object can have 3 Highlight states: Normal, Selected and Activated.

**Normal** state is when the button is not selected. A most common setting is that in a Normal state the highlight picture is fully transparent.

**Selected** state is when the button is selected. This is where you do most of the changes, because this is the highlight state that user will see the most.

**Activated** state is when the user clicks on the button (press Enter on their remote). This state will briefly appear before the player navigates the link.

To change the color settings for each state, click on the left or right arrows near the State indicator:



Here are the default settings for each state and highlight group



Again note, that in the Normal State all groups are fully transparent. That means you don't see any highlighted picture if the button is not selected. However, in some cases such as for motion menus, you may use also the Normal state.

All this may seem to be a bit overwhelming but it is really quite easy to master.

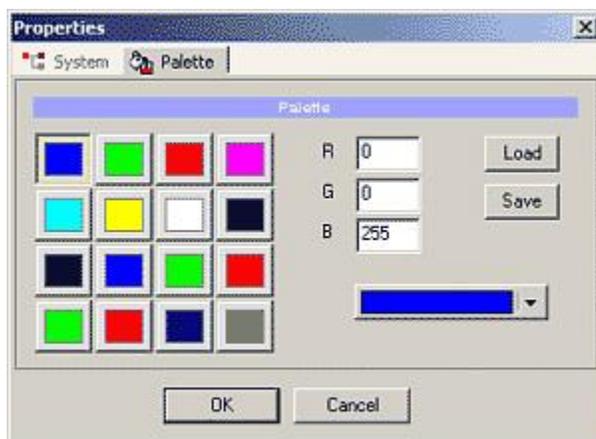
### A small challenge

Here is an example of what you can do with the features we have just described. By combining all the accumulated knowledge of Frames, Visibility, Groups and Color Maps, you should be able to produce the buttons below (displayed as not-selected, selected and activated).



### Palette

The palette is a common color set for the whole project. You can change the Palette in the menu Project - Project Properties.



## 5.12 Navigation

When a viewer plays a DVD on their DVD player, they have the option to interactively navigate menus and other features by using the buttons on their DVD remote control.

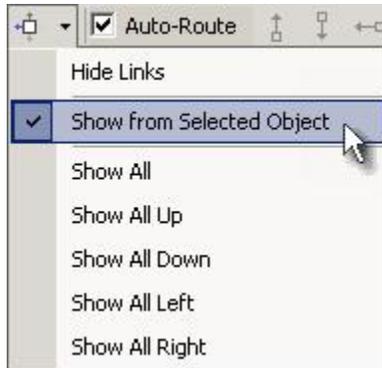
The navigation logic that the DVD player will respond to is setup during DVDaAuthoring with a tool like DVD-lab. Each menu button has four parameters to direct the player as to where to go when the user presses either the Up, Down, Left or Right keys.

 **Note:** Navigation is a property of a button, that is any object which has a link to movie,

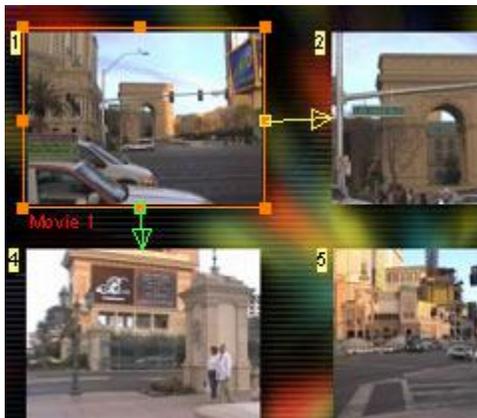
menu or chapter point. Objects without links are not navigable.

### ► Show Links.

At the top of the Menu window is a small yellow square that represents "Show Navigation Links". Clicking the down arrow at the right of this button will offer the below pull-down menu to control which links to display (or hide). Display of the navigation links is disabled by default. Links can be displayed or hidden as needed during the Menu design stage.



Here we selected "**Show from Selected Object**". Whenever you select an object, its links to other buttons will be shown by arrowheaded lines.



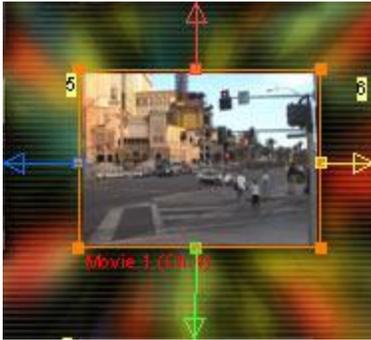
Here we see that when the user has button 1 selected and then presses the down key, the selection will go to button 4. If they press the right key, the selection will go to button 2.

You may try other settings to show all links or only links in a certain direction.

### ► Link Color

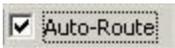
The down button may not always point down, so each direction has its own color and you can visually recognize visually the link by it's associated color:

Up is Red, Down is Green, Left is Blue, Right is Yellow



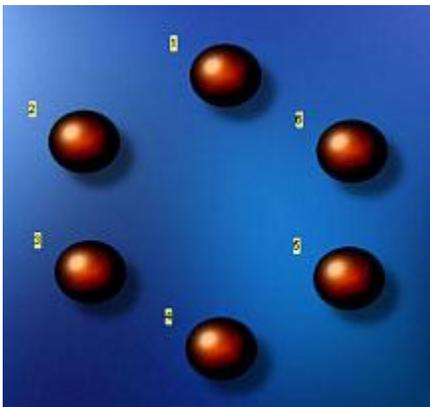
▶ **Auto-Route**

DVD-lab offers an option of automatic button routing. That means DVD-lab will automatically determine a best routing pattern and populate the button navigation parameters for you. In many cases, this will be quite acceptable, as it follows simple matrix logic.

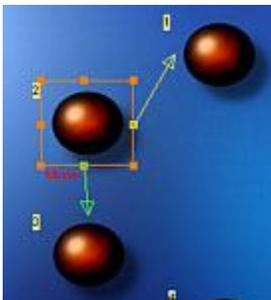


▶ **Manual-Route**

For less traditional design, Auto-Route may not be what you want. Consider the following image:



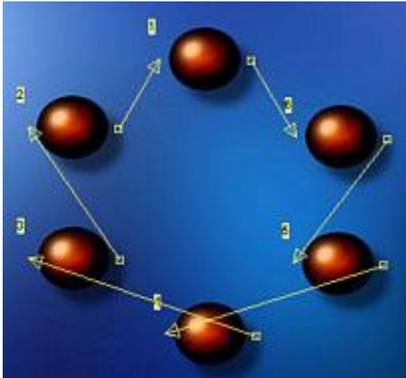
We have buttons position in a circle. Here normal matrix logic will not work. On the following picture it shows that using auto-routing you will have to press right key to go from button 2 to button 1 and a down key to go from the button 2 to button 3.



It may not look like a big deal, but try to navigate such menu in a real life. You will be guessing what buttons you have to press in order to get somewhere.

### Clock Navigation

Even if it may look alien at first, the best way to navigate such menu would be in a circle.



That means we would set up the keys Up and Right going clockwise and the keys Down and Left going counter-clockwise. In the image above, we see only right navigation links for better clarity. Watch where the arrow points and you will see all of the arrows go clockwise.

That's why, in DVD-lab you have the option to switch the Auto-Routing off and draw the links manually.



Drawing links manually is very easy. First, un-check the Auto-Route checkbox. Then, select one of the four link directions to draw with buttons, these are shown as color coded next to the Auto-Route checkbox. Let's say for example, you choose Up.

Now, click on the Menu button that will be the FROM button and drag to the button that will be the TO button.



 **Note:** When drawing links, only the links of the same kind will be shown. That is, if you are drawing an up link, you will only see up links. It is logical this way.

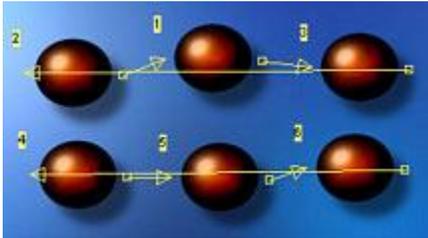
### ► Blind Link

You can by design, make a link that does nothing. If you don't want a direction arrow to point

to any object, drag it to a space where there is no object. Such link will be blind, meaning the user can press a button for that direction, but nothing will happen.

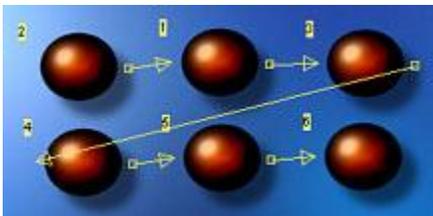
### ▶ Looping

Another type of navigation is looping. The right arrow of the end button (3) links back to the first button (1) and the left arrow of first button (1) links back to the end button (3).



### ▶ Zig-zag Navigation

Another type of navigation is Zig-zag . The end of one row navigates to beginning of next row and vice versa.



 **Note:** Remember to draw all four direction navigation links. When finished drawing the Up arrows, then continue with the Down arrows, etc...

 **Note:** If you were to switch back to Auto-Route ON, all of your manual navigation layouts will be lost! It's one way or the other only.

Finally, you can test your Menu navigation layout in a **Simulation** view within DVD-lab.

## 5.13 Duration, Timeout and Force buttons

There are a number of very sophisticated Menu navigation techniques that the DVD Author has available to them within DVD-lab. These feature controls are found on the PBC (Playback Control) tab of the Menu window.



### ► Duration (Timeout)

A Menu's duration is set to infinity by default, in other words, it never finishes or "times out". That means if the user doesn't press any remote key, a Menu will stay on screen forever or until the DVD player breaks down (which may not be as long as you think).

DVD-lab has an option to set a value for Timeout in seconds. If you set the Timeout value to 10, then after a Menu has been on screen for 10 seconds, the Menu will then be considered finished or "timed out"; play of the program will then continue in a flow defined in Connections. The choices of program flow are: go to itself as loop, go to another Menu or it can run the **Force Activate Button** Command.

 **Note:** To set the Timeout value back to infinity, enter **255** in the Timeout "sec" box.

When you add Audio or Video to the menu the Duration will change to "a/v" which is the same value as entering 0.



That means the duration of the menu is the same as the duration of audio and/or video after which the menu either loops (if no end link is specified) or continue to another end link.

### ► Force-Select Btn:

When a DVD player comes to a new Menu, it considers the first Button (1) on a Menu as its starting place. After that Menu has been visited, the DVD player then remembers its last Button position.

DVD-lab allows the Author to override this default by entering a number greater than zero in the **Force-Select Btn** value. Refer to the numbers at the top left of Buttons that display their order. These numbers are valid values for **Force-Select Btn**. Enter 4 into the **Force-Select Btn** value and the Menu will have Button number 4 highlighted when the DVD player encounters this Menu.

**Force-Select Btn** is used for Switched Menus, for example.

### ► Force Activate Btn.

If you set a value for Timeout in seconds, then you can also force the activation of a defined button when the Menu "times out". For example, you have a Button on a Menu to play a Movie. You set the Menu Timeout value to 60 sec. and set the **Force Activate Btn** value to 1. After the Menu has been on screen for 60 seconds and "times out", Button 1 will be automatically activated and the movie will start.

 **Note:** This is not the same as Auto-Action (found on Link tab). Auto-Action needs user input (pressing a key to get to the button), **Force Activate Btn** doesn't need user input. However, you can use both features, if you need to.

## 5.14 Simulation

As you are developing your DVD Project, one of the important steps in Menu creation is the Simulation of how a Menu will perform if it were in a DVD player, mostly regarding the links and navigation.



The current Menu will be shown in a similar manner as it would be on a DVD player.



While a simple Menu probably doesn't need much testing, if you use advanced features such as Visibility, Manual Routing or Groups you will want to test the creation thoroughly. The Simulation mode will allow you to view the Color Map and Color group changes in real time.

Navigating a DVD Menu on a computer using a mouse and navigating a DVD player using remote control may be different. Simulation provides a DVD player-like remote control on screen, which you can use to test the Navigation sequence (which button gets selected). You can also use the keyboard arrows to navigate the menu.



 **Note:** The Simulation is for testing the Menu's look and functionality. It doesn't actually play the DVD disc. You can however see the link on clicked buttons when you change the Properties to Link tab. In fact, you can even change links while in the Simulation mode by clicking on the Link box and selecting new link from Menu or dragging a new link from the Project window.



### ▶ Follow Link option



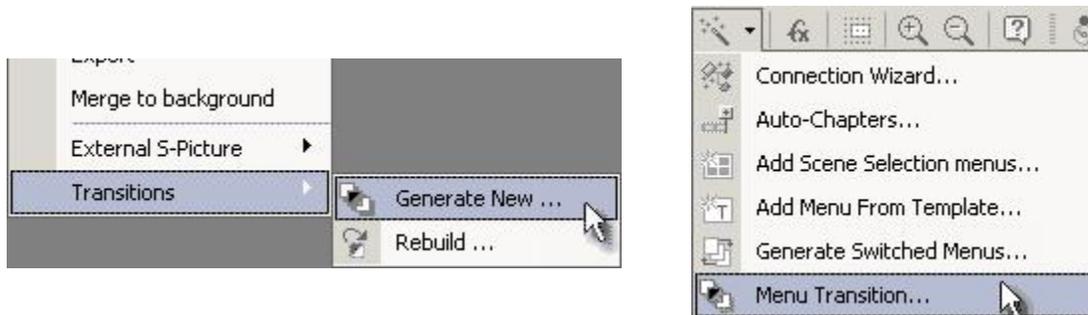
Normally the Simulation is for testing the Menu subpicture display, so that when using Simulation, it doesn't jump to the links when you click on them. By enabling the Follow Link Option, you can enable this feature so that when you click on a active link, the particular object (Menu/Movie/Slideshow) will open. This will help you to Simulate the DVD play and check the program flow on the disc.

## 5.15 Transitions

DVD-lab uniquely provides an interesting visual effect: a transition between two Menus. This is done by inserting a motion Menu in between Menu A and Menu B.

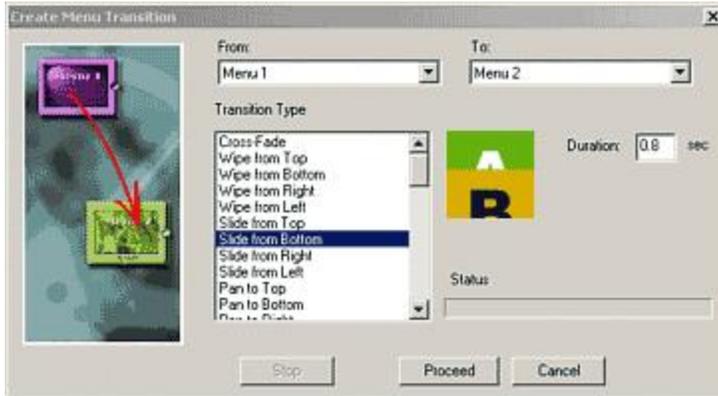
The effect is such that, when you click on a Button on Menu A which is linked to Menu B, you will see a short transition when the Menu changes, such as blending, zooming, panning, etc. Used with artistic care, this feature can enrich the visual experience of the viewer.

We need at least two Menus (A and B) to add a **Menu Transition**. It also helps if there is a link between the two Menus already established, but it is not required. Then, select either " *Menu - Transitions - Generate New...*" or from the Wizard button select *Menu Transitions*.



A transition dialog will then appear where you choose the direction - from what Menu (Menu A) to what other Menu (Menu B).

 **Note:** You can make a transition both ways. For example, from Menu 1 to Menu 2 and/or from Menu 2 to Menu 1. There is no limit to the number of transitions in a Project.



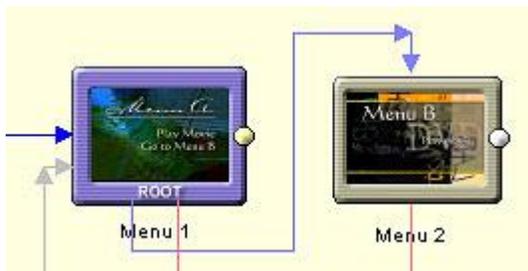
Choose the **From** Menu and the **To** Menu using the pulldown list of Menus that DVD-lab knows are in your Project. Alternatively, you can use a blank **To** Menu, this will have the effect of going to black (nothing) instead a real Project Menu.

Then, pick your Transition effect. There are many different transition styles to choose from. The last thing is to select the duration of the transition. It usually works best around 1 second.

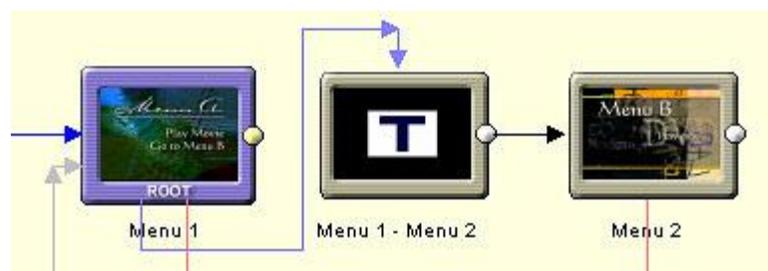


DVD-lab will then prompt for the file name of the new MPV file it is going to create for you.

If a link from Menu A to Menu B was already created, then the new transition will insert itself in the flow:



Menu 1 link to Menu 2



Menu 1 link to Menu 2 through the transition (Menu 1-Menu 2)

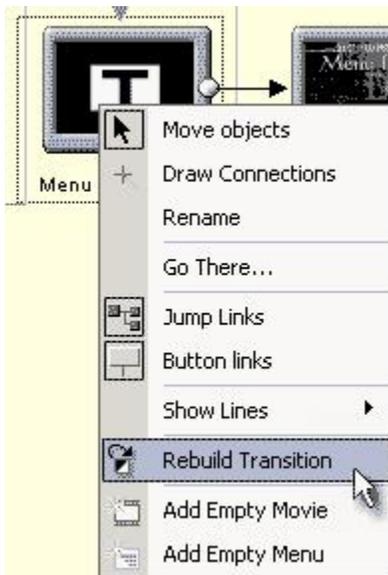
If you don't have a link created, then the transition will create a link to Menu B and you will need to manually choose a Button on Menu A and link it to the newly created transition.

 **Note:** The transition video will be created according to the Project's TV standard (NTSC or PAL) and Size (D1, Half, SIF...). If you change these settings at any time whilst working on this Project, you will need to rebuild the transitions.

### ► Update or change Transition

Since a Transition is essentially a video clip, anytime you change the look of your Menus, you need to re-create the transition. This is simple to do since the transition "Menu" remembers it's settings. This way you can easily change the transition type without deleting the object and creating it again.

Transitions are rebuilt by either by opening the transition "Menu" and then using "*Menu - Transitions - Rebuild...*" or even better from Connections view, right-click on the transition and from the context Menu select "*Rebuild Transition*" as shown here.

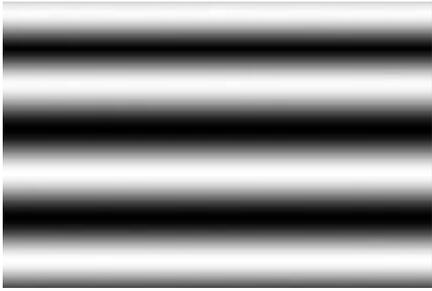


You will return to the Create Transition dialog where you can change the duration or transition type and build the transition video once again.

### ► Custom Transitions

Transitions are generally 2 kinds - the pre-defined (algorithmic) ones which are in the first half of the Transition type list (such as Pan, Move, Page Curl) and the Bitmap or Custom type. This gives you a lot of freedom to create your own transitions.

Custom Transitions are grayscale jpeg files 720x480 in the **Transitions** folder.  
Examine the Bars.jpg



The Custom transition will simply progress from black to white during the Time duration and use the intensity to mix the A and B Menus. The pixels which are below current intensity will be Menu A and pixels above the intensity will be Menu B. As the current intensity progresses towards white, Menu B increases in visibility whilst Menu A decreases in visibility.

It helps if the transition jpeg file is the size of the system (NTSC or PAL) but you can use any size and it will be resized to cover the whole frame.

#### ► Transitions from outside DVD-lab

Since a Transition is really a short MPV video file, you have the option to create transitions outside DVD-lab as well. You can export Menus as a AVI file (See *Menu - Export*) then bring them to your video editing application and apply transitions to the AVI files. Then, export the AVI file to a MPEG-2 DVD file. Now, you can create a motion Menu with this file which is called from a Button on Menu A and a timeout to Menu B.

## 5.16 NTSC Overheat - Safe Colors

A graphic (such as a Menu) played on a NTSC television may have special requirements. If you use saturated reds or yellows, they may "bleed" on the TV screen, other colors may appear washed-out or some parts may flicker even though the same content looks perfectly fine on your computer monitor.

Most DVD and video professionals are aware of this problem, but they often don't exactly know what is the cause of it. You often get half-cooked advice like "don't use saturated reds", etc.

 **Note:** Some engineers even refer to NTSC as "Never Twice the Same Color" (PAL is sometimes de-abbreviated to "Perfection At Last").

DVD-lab's NTSC Overheat window shows possible Menu problems and lets you to check how the Menu will appear after automatic NTSC Safe Color filtration. It will also visually pinpoint which colors are causing the problem, so that you may change your design to remove or alter these colors. NTSC Overheat demystifies the NTSC color situation and has educational value as well.

#### ► NTSC Safe Color filter

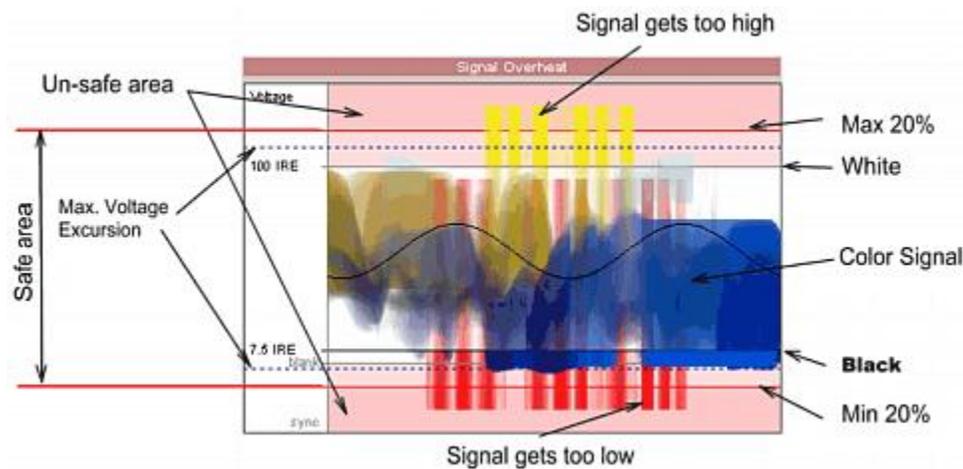
DVD-lab has implemented one of the **most accurate** NTSC Safe Color filters available which

goes hand in hand with the Overheat calculation. This exactly filters out the colors that may cause problems. The result will be a very smooth looking image without any big color changes and ready to display on NTSC. The filter is automatic, that means once you enable it in Properties you are done. This is an advanced tool. Some video professionals pay more than the entire cost of DVD-lab, for less accurate plug-ins.

### ► NTSC Overheat

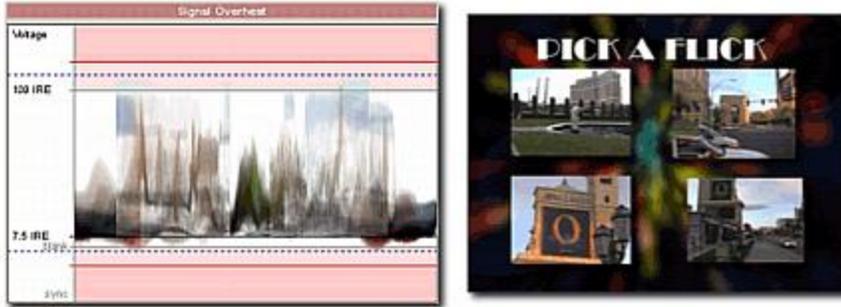


The signal Overheat window shows how signal travels through the video composite wire.



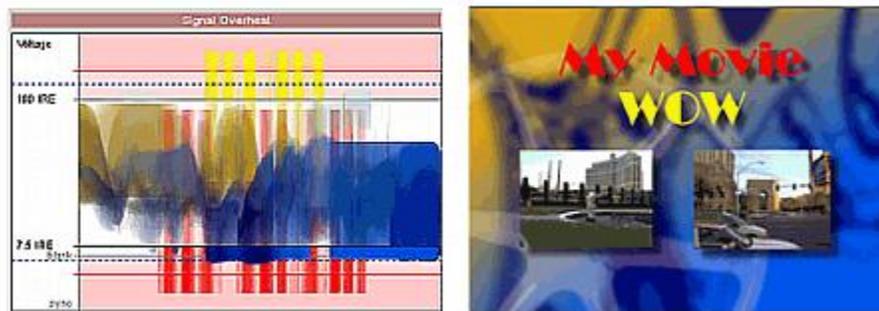
In the center between "Blank" 0 IRE and 100 IRE you will see the video signal (color-coded as to the actual color which produced it). The top and bottom red lines determine the 20% maximum and minimum limit under 0 IRE and over 100 IRE as defined by NTSC specifications. Signals which go higher or lower than these range boundaries are considered an "unsafe" signal and may produce bleeding, shaking and loss of sync.

Notice the picture below:

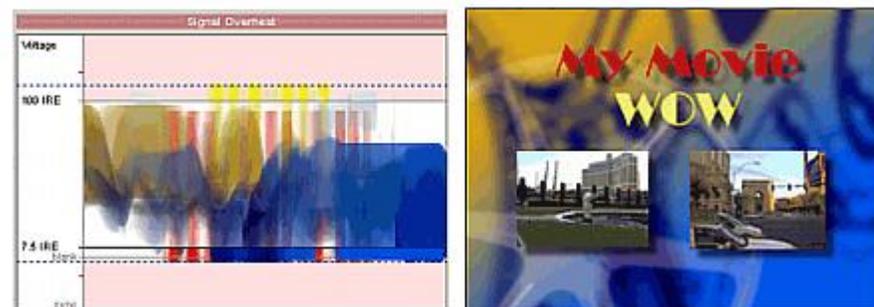


The signal is entirely within the allowed area between the red lines. That means, this Menu is already a NTSC Color Safe Menu, it will not be visually changed by the NTSC Safe Color filter.

Here is another Menu. In this Menu we boldly set a text object to be red and yellow (two colors well known as bad Colors on a NTSC TV).



You immediately notice that the yellow and red signals go way out of the safe area boundary into the unsafe area. Here the NTSC Safe Color feature will be automatically applied and the colors will change accordingly.



This is the Menu and signal after the NTSC Safe Colors feature was applied.

#### ► **Maximum Voltage Excursion.**

The dashed line shows our "Maximum Voltage Excursion" setting - this is a value beyond what we don't want any signal. This is the value NTSC Safe Color Filter uses to calculate new safe colors boundaries.

The values are from 0-20% but around **10%-15%** produces best result. If you set 0% then the signal will be strictly set to go from blank 0 IRE to 100 IRE. This will however change the Menu colors quite a bit since many colors goes beyond this.

If you set value bigger than 20%, then the signal is allowed to go beyond the red lines into the unsafe area. Logically then, you should not set this to be higher than 20%. Since NTSC allows for 20% excursion, the best values are about 15%, the color doesn't change as much as with 0%, but it is still within in the safe 20% area with 5% reserve.

 **Note:** The voltage value is in IRE measurements. The actual voltage in Volts may differ between systems and countries, so IRE is a relative measurement, the 100 IRE may be 1 V, or sometimes 0.75V etc... In the US version of NTSC the black is set as 7.5 IRE (shown on graph), while in Japanese NTSC the black is set to 0 IRE (shown as "blank").

### **Do I need to worry about the NTSC settings?**

You actually don't. Once you have set NTSC Safe Colors in the Properties then you are safe. You can just go to the Overheat window to check how the Menu will change or set the maximum Voltage Excursion to better suit your taste.

### **A little technical explanation.**

While all computer graphics are mostly RGB, this is not the color space which our brain understands. Our mind perceives color as a combination of brightness and two additional color components. YUV color space tries to reflect this. NTSC uses a similar YIQ color space to create composite signal. The I (in-phase) and Q (quadrature) are modulated together and then Y (brightness) component is added. As you can see, these three components are mixed together to create a composite signal which travels through a single wire.

Because of the YIQ color space conversion, the highly saturated colors also generates higher voltage changes than for example: black and white. If a white color has a voltage of 1V and black 0V then yellow will have 1.33 V and red -0.33V.

Because of the backward compatibility with older B/W NTSC TV sets, the NTSC specs specify that video signal is not allowed to go more than 20% above white and 20% below black voltage levels. But some colors such as yellow or red actually go higher or lower than that (yellow +33%) !

This limitation in NTSC is the main cause of the problem. Also, the video sync signal is mixed to the YIQ signal. Colors such as red can go so low with voltage that they can even affect the sync signal and you can lose synchronization on some TV sets because of that.

PAL doesn't have this backward compatibility limitation.

## **5.17 Effects, Gen-EFX**

DVD-lab allows you to apply various effects to objects and backgrounds.

Menu: *Menu - Effects*



### Simple Object Effects

You can apply one of the simple effects to objects: Sharpen, Blur and Deinterlace.

### Special Haze Effects

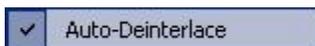
These two special effects will allow you to apply Bold Color Haze and Light Haze to images or video still, that will soften details and make the image look more "dreamy". To make the effect stronger, use it repeatedly.



If you don't select any object, the effect will be applied to background. This is great way to apply some smoothing to various images used as backgrounds or backgrounds generated by GenFX.

### Auto-Deinterlace

By default, DVD-lab always deinterlaces a graphic which is dropped from the Preview Window to a Menu or added as Chapter Point image.



It is recommended to leave this set unless you notice it creates an unwanted side-effect on some video still images.



DVD-lab has much more effects at your fingertips. These are special algorithmic effects commonly named Gen-EFX.



The Gen-EFX can be applied to Selected Objects (such as images, buttons or video stills), a Background or Background + Object



When you apply Gen-EFX to Background or Background+Object the result will be inserted as a new background.



The menu



GenEFX applied to object



GenEFX applied to Background



GenEFX applied to Background + Object

### Working with Gen-EFX

The Gen-EFX window will present a preview of 12 thumbnails in outer ring and one larger thumbnail in the Center. The Center (working) image is the effect that will be applied when you click OK. The 12 smaller thumbnails are preview of random effects or variation of the effect.

## Random

First you can simply press Random Button. This will change 12 thumbnails randomly. If you like a particular effect simply click on the thumbnail. The effect will be applied to the Center (working) image.

## More of this kind

This button will randomly varyate the effect applied to Center image in the 12 thumbnails.

## Smaller Variation steps

If you click on the Center image, the 12 thumbnails will variate based from on the effect applied to the Center image.

## Library

Since Gen-EFX works randomly and there are many thousands of possible effects and variations you can save current variation set to a library and then be able to recall it at a later time.

## New Library

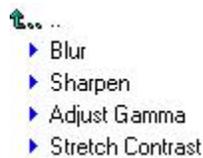


Clicking **New** will present a prompt to create a new \*.eff Library. You have to "save" it in the DVD-lab folder in order for it to be visible in the Library list.

Libraries work like a folders in Explorer.

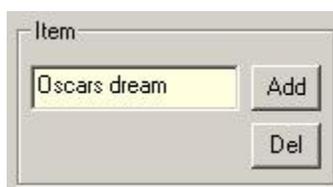


To open an existing library simply click on it in the Library view. The view will move "inside" the library where you can select or add a variation.



## ▶ Add new item variation to library

You can save the current variation as item to any currently opened library



First enter the new name and then click Add. The item will be appended to currently opened library.

- ▶ Despeckle Strong
- ▶ De-Noise
- ▶ Oscars dream

### Delete Item

To delete an item, first select it and then click Del.

### Tips and Tricks

There are basic image adjusting functions already pre-defined in the Basic library. Many of the other effects are perfectly suitable for creating interesting backgrounds. Some are grouped in the "The Background Maker" library.

Some of the effects may seem to be a little unusual and chaotic at first. But they are specially generated for creating backgrounds and interesting textures from almost any image possible. The role of background is to make the image **interesting**, yet it **shouldn't draw** too much **attention** to itself. Putting a simple video still as background doesn't meet these requirements and looks amateurish.

By combining the Background+Objects you can easily add a text in various fonts into the background itself which often enriches the texture.



On the image above the text buttons were also mixed into the background itself under various angles by simply using Gen-EFX applied to Background+Objects.

#### ▶ Repeating Gen-EFX is the key.

In order to create suitable backgrounds, you can repeat the Gen-EFX function as needed. For example, the green image above was created from a normal video still and by repeating various Gen-EFX on the background we got the result which has very little in common with the original image, yet we achieved an interesting texture with it.

It is up to you as to what kind of effects you want to apply and how many times you repeat the Gen-EFX. There are hundreds of thousands of combinations you can achieve, so no two backgrounds will look the same unless you want them to. Just bear in mind the background should not draw too much attention to itself. You can later apply Light Haze to soften it.

 **Note:** To add a video still as a menu background, drag the frame from Preview onto a Menu while holding the SHIFT key.

### Convert to Bitmap.

In order to apply effects to text or vector objects you need to convert it to bitmap. *Menu-Effect-Convert to Bitmap.*

### Merge with shadow

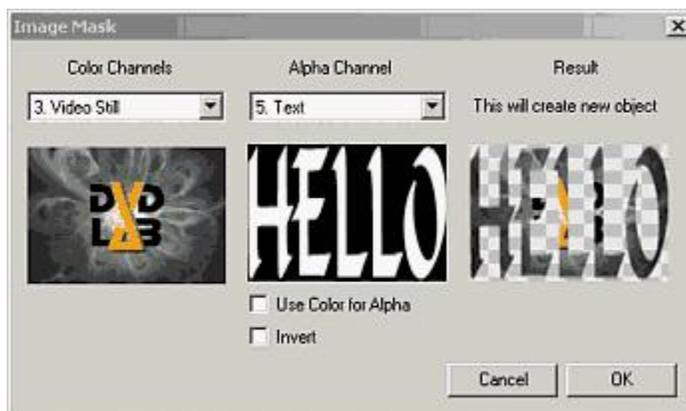
This will convert the object to bitmap and merge it with its shadow. Then you can apply another shadow to it and repeat the process. The shadows may be creative - using different colors and creating outlines and glows.



### ► Image Mask Combination.

DVD-lab PRO allows you to combine any objects colors with any other object alpha channel. The result is a new object.

*Menu - Create - Image Mask Combination*



Object selected in Color Channels will use the RGB channel for the new object. This will be mixed with the Alpha Channel object. The alpha Channel Object will contribute its alpha to the new object.

If object has no alpha channel (for example a video still has filled alpha channel with white) you can use the colors of that object as the alpha channel for some special effects.

Also additionally you can invert the alpha channel.



## 5.18 Tex-Mix

A fun way to turn one image into ... well ... let's call it a "different image".

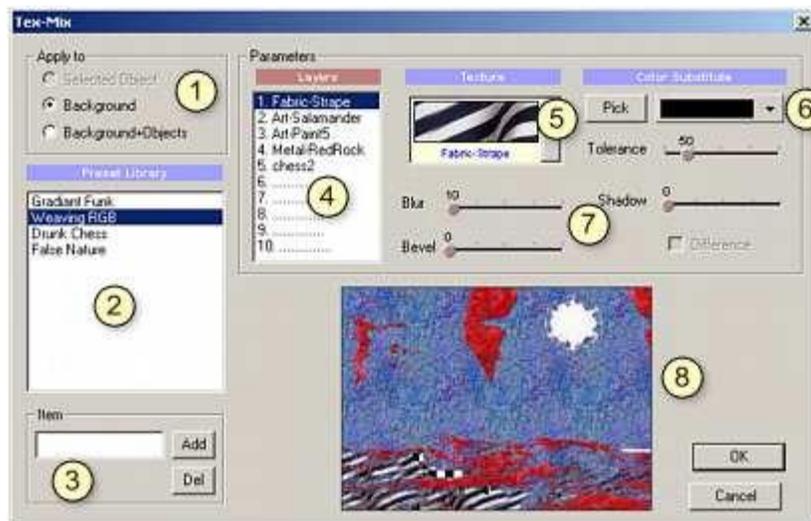
The basic idea behind this effect is that a certain range of color is replaced by a texture with few other effect settings. Please see the image below:



We started with a black and white image (for easier explanation) on the left side. We enabled 4 layers of texture corresponding to various color intensity. The right side is the result of that. Of course we don't have to start from black and white image - we can start from any image!

### The Tex-Mix interface

The Tex-Mix works on a menu that has either a background image and/or objects. It cannot "generate" an image from black canvas.



#### 1 - Apply To

Similarly to Gen-EFX, the Tex-Mix can be applied to Selected Objects (such as images, buttons or video stills), a Background or Background + Object



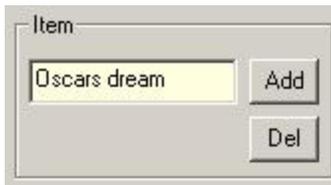
**Note:** In order to apply effects to a text or any vector objects you need to convert them to bitmap first. *.Menu-Effect-Convert to Bitmap.*

## 2 - Preset Library

Here is a list of Presets. A preset is the combination of various texture layers and settings that can be applied to image.

### 3. Add new item variation to library

You can save the current texture layers as item to the preset library



You can also delete item from library by selecting the item and pressing Del button.

## 4. Layers

The Tex-Mix can be created using up to 10 texture layers. Each layer correspond to a texture, the color (6) that is replaced by this texture (5), the tolerance and few other parameters (7). If you want to disable a layer, set it's texture (5) to "No Texture". By default the Tex-Mix starts with only a single layer turned on.

## 5. Texture

This is the list of available textures. (You can add your own seamless textures by copying the jpg files to /Textures folder and restarting DVD-lab PRO)

## 6. Color, Color Pick, Tolerance

The basic of this effect is that a certain color range on original image is replaced by the texture (5). We can set up to 10 different "pairs" here called layers (4). With Color Pick we can sample a color from the original image or in fact from any other image visible on the screen.

A Tolerance will set the range of the colors that will be replaced.

## 7. Effects

There are few other properties that we can set for each layer(4).

Blur - setting a blur to the edges of the replaced texture

Bevel - creating a bevel on the edges of replaced texture (this slider affect the intensity of the Bevel, while the Blur affects the width of the bevel)

Shadow - intensity of a shadow behind the texture layer

Difference - when checked it will fill the texture on that layer according to the color and tolerance but **only** in places where there is not yet any previous texture applied

## 8. Effect Preview

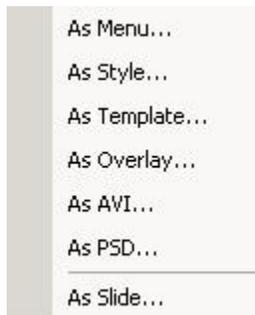
Preview of the Tex-Mix.

Have fun!

## 5.19 Import/Export

There are many ways to Export and Import Menu items. These features allow the DVD Author great flexibility in sharing, replicating and re-using a preferred Menu design. Useful for maintaining a consistent look and feel throughout one or many Projects.

Menu: *Menu - Export*



### ▶ As Menu

The Menu will be exported as \*.mnu file which you can later Load into any Menu window using *Menu - Load menu* command

### ▶ As Style, As Template

The current Menu will be exported as \*.stm file which can be used as a style or a template. Styles are used for scene selection wizard and the Templates are used for the **Add from Template** command. Please refer to the Template chapter on how these files differ from a Menu (\*.mnu) file.

### ▶ As Overlay

This will create a transparent PNG file from all of the objects on the Menu, minus the background. This is a great feature if you want to use it in Adobe "Premiere®" or Sony "Vegas Video®" to overlay it on a video clip and then bring back to DVD-lab as a Motion Menu, for example.

### ▶ As AVI

The entire Menu (with background) will be exported as an AVI file. There are video parameters you can specify such as the Compression, number of frames, FPS and the size.



This is an excellent option if you want to bring the Menu into your video editing application to create some effects such as special transitions, etc.

#### ▶ As PSD

The entire Menu (with background) will be exported as layered Adobe "Photoshop®" file.

#### ▶ As Slide

It will save the menu as JPG and also insert it into the first Slideshow if any exist. An easy way to create titles or credits in your slideshow.

#### ▶ Load Menu

There is one function to Import an entire Menu in one step - *Load Menu*. This command will load the previously saved \*.mnu file into the currently opened Menu.

For more ways see Add from Template.

#### ▶ Import from PSD

This will load the menu into empty menu window from layered PSD Adobe Photoshop file. All layers will be separated as objects.

Same as if you drag and drop PSD file from explorer or assets to Menu.

Please note the PSD file must be designed in the true respective aspect (WYSIWYG) not in the DVD native system size as some other authoring tools require. DVD-lab will do the proper non-rectangular pixel stretching before compile. That means a perfect **circle** designed in Photoshop will appear as perfect circle in DVD-lab menu and it will appear as the same perfect circle on TV.

Here are the sizes you should use for designing a file in Adobe Photoshop.

Aspect	PSD image size for both PAL and NTSC
4:3	720x540

16:9

960x540

You don't have to do anything else to the PSD file - no resizing or stretching... just use the image size from above, design the menu as you would like it to appear on TV, save and import to DVD-lab.

 **Note:** After you import PSD file, you can apply effects, fills or bevels to the PSD objects as to any other DVD-lab objects.

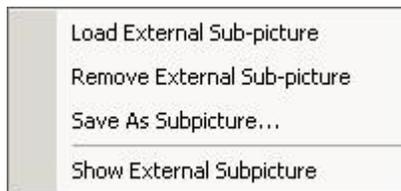
### **Export Button as PNG**

You can also export any object as a Transparent PNG directly from menu. This function is in : *Menu - Create - Export as PNG*

In addition you can also export a group of objects as one PNG if they are inside Package

## 5.20 External Sub-picture

Menu: *Menu - External S-Picture*



DVD-lab allows you to directly load a sub-picture for a Menu that was created in another authoring / image program. In most of the other authoring programs you can import a Menu by adding a background and a sub-picture. Then you define the hotspots.

DVD-lab will allow you to accomplish the same function, should you choose to not want to use its broad Menu capabilities or in the case of having existing art that you would like to use within the DVD-lab environment.

 **Note:** You can mix the external sub-picture with the DVD-lab objects and their created sub-picture.

To import a Menu background, Drag & Drop any image file from Assets onto the Menu while holding the SHIFT key.

### **Load External Sub-picture**

This will load an external sub-picture as a .bmp file. The file must be 720x480 pixels for NTSC or 720x576 for PAL. You will not see any change unless you enable Show External Subpicture.

The next step is to define button rectangles, the Group Hotspot is exactly the tool for that. Simply draw the Group Hotspot rectangle around the area where you want to make a button

and then add a link to it.

▶ **Remove External Sub-picture**

This will remove the external sub-picture layer from the Menu.

▶ **Save As Sub-picture**

You can also save the current existing sub-picture (loaded or generated by DVD-lab) as a file and then use in other authoring tools.

*Here is an example.*

We can design Menus using other software programs, for example Adobe "PhotoShop" or "DVD Menu Studio". In this example we will assume the Menu was created in DVD Menu Studio.



We export it as a DVD Menu using Generic Export, then select Normal Subpicture Menu and BMP files. Save it under some name for example myMenu, the result being 2 .bmp files will be created - a Menu called **myMenu.bmp** and a sub-picture **myMenu\_sub.bmp**

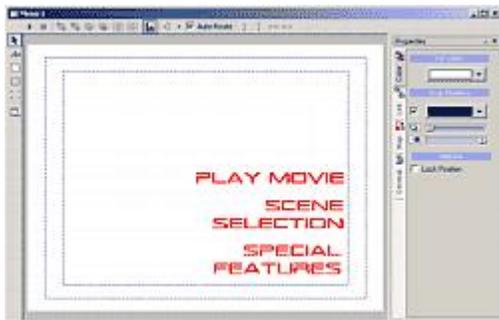
If you use other software, then you will have to create background and sub-picture files manually. Anybody familiar with creating Menus for "DVD Maestro" should feel at home.

Drag the **myMenu.bmp** file to the DVD-lab Assets / Video & Audio Bin and then drag-and-drop it from that Bin onto a Menu while holding the SHIFT key. Holding SHIFT will indicate that this graphic is to be inserted as a background, not as an object.

This will create the background in our DVD-lab Menu.



Now go to Menu-External S-Picture and select Load External Sub-picture. Choose the second file **myMenu\_sub.bmp**. The sub-picture will then be loaded. You can verify that and view the sub-picture if you go to Menu External S-Picture and choose "Show External Sub-picture"



The last step is to add button rectangles with the Group HotSpot feature and add links to them.



That's it, now you can Simulate the Menu to check your design.

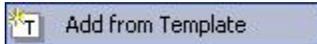
Of course, this is just an example of working with graphics from outside DVD-lab. It's likely to be much easier to create the Menus entirely within the DVD-lab environment. You may consider creating the background in "Real-DRAW", "PhotoShop" or any other suitable software, import it into DVD-lab and then add text and buttons in the full featured DVD-lab menu editor.

## 5.21 Template

Templates are a simple and easy way to store Menus for future usage.

Menu: *Menu - Add from Template*

Menu: *Menu - Export - As Template*



When a template is saved, DVD-lab creates a thumbnail to go along with the template file, you can see these thumbnail images in a list in the "Add from Template" dialog.



Templates are designed to be a basic format with a number of features that may change between different Projects, such as text titles and links. Another features of Templates is that they can allow you to replace text and add links directly from the "Add from Template" dialog as shown here.



For each text item in the Template, the "Add from Template" dialog will give you a text editing entry and as applicable a selection for places for that text to link to.

Considering that a Movie in the Project has had Chapter Points defined, DVD-lab knows exactly where they all are. Click the "Link To" button as shown above, and a flyout menu will appear (as above) from which you will be able to select the appropriate Chapter Point to link to.

Click the Next button to continue or the Finish button when completed with the Menu.



### ► How to create a Template

Menu: *Menu - Export - As Template*

This is quite easy - create a Menu you like, then use *Menu - Export - As Template*. Recall that

Template files are .stm extension files and saved into the Templates folder.

### ► How to create a template which prompts for text edit and links

In order to create a Template which will prompt to replace text and links, the Template needs to be instructed that a particular Button has things to prompt for. We do that with the entry of a set of specific command words, entered into the Button Label for that object (found on the Link tab in Menu Properties).

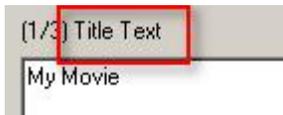


 **Note:** This is not required - you can store a Menu as a Template without this feature.

There are three parts of the Button Label command words

#### **askTitle Text-nolink**

The **ask** in front of any text will present the user a prompt creating the Replace text dialog in the Add from Template wizard for that object. The text immediately following **ask** will be displayed above the edit box in the wizard as a Prompt Title, it's "Title Text" in our example.



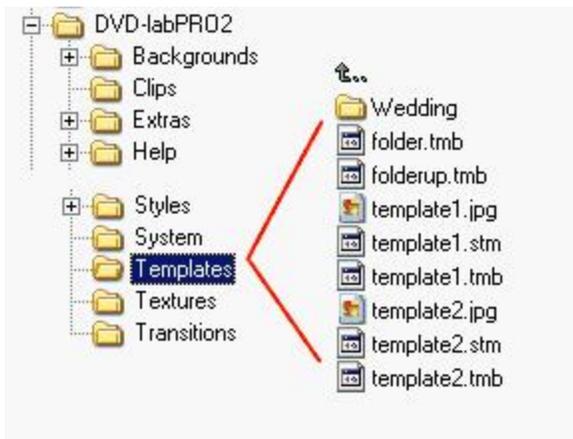
The suffix **-nolink** will disable the Link To button, so that you can't add a link to this object from the wizard. This is used for titles or any text only object.



If you don't include the **-nolink** command word, then the Link To button will be enabled. Note the dash that starts the command **-nolink**.

### ► Template storage

The templates (\*.stm) files (see how to create template above) are stored in the *Templates* folder in the DVD-lab installation.



You can also create sub-folders in the *Templates* folder which will then appear in the Template window.

## 5.22 Background Audio

### ► Menu Background Music and Audio

A DVD Menu can play background audio whilst that Menu is on the viewer's screen. The DVD author will have already prepared audio clips for this purpose and imported these audio clips into the Assets / Music Library Bin to be shared by all projects or into the Assets / Video & Audio Bin if the audio is specific to this project only. Refer to the DVD audio specs for the specific file formats of DVD supported audio, typically 16b/48kHz AC3, MPA or WAV files. Drop a file into the Assets / Video & Audio Bin to check if it is in a compliant format. DVD-lab will let you know.

The precise time length that an audio clip will play for is quite important in the design and planning of a Menu. That is, because we know that in a DVD-lab designed Menu, at the completion of the playing of the audio clip, the player will either be either looped to itself (play again) or will continue to another Menu according to the values of the Connection links or Force Activate Btn. The DVD author has control of these features, all based on the time length that an audio clip will play.



To add background music or audio to the menu, simply Drag & Drop the supported audio

format file from the Assets window, either from the Assets / Video & Audio Bin or from the Assets / Music Library Bin.

The fact that the menu has audio is indicated in the PBC Tab in the Menu Properties or in the audio track below the menu.

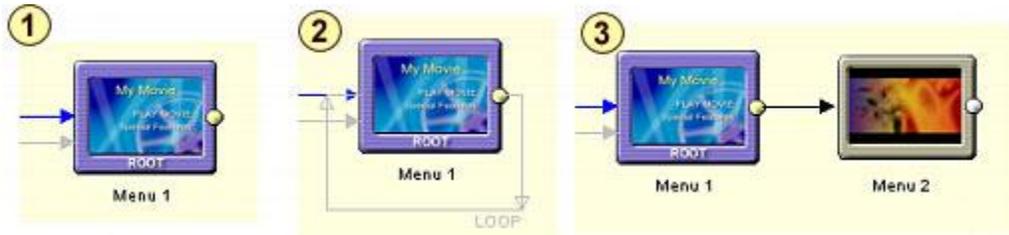


To remove the audio, simply click the Del button near the audio box in the PBC Tab or the x button on an Audio Track.



### ▶ Looping the menu / Continue to another menu

A discussion of Menu Connections belongs to the Connections description, but here is a quick overview:



(Image 1) A Menu which has no link defined is considered as automatically looping to itself

(Image 2) A Menu can have explicitly set looping defined, even to itself

(Image 3) A Menu can be defined to continue to another menu after the completion of audio being played

### ▶ Continue to Play Movie

After the completion of audio being played, the DVD-lab Author can instruct the DVD to continue to play a movie or whatever a particular Menu button is setup to do. This is done by setting the **Force Activate Btn** (Button) value in the PBC tab of Menu Properties. Here we are simply saying "When you are done playing the menu audio, go do whatever button (X) does".



First, set the **Timeout** to 0 "(a/v) otherwise you can't set the **Force Activate Btn**, then in the **Force Activate Btn** input enter the number of the button in this menu where the playback should continue (in our case we put button #1). This number is the same button number which appears near the button on the Menu canvas as shown here as 1:



 **Note:** The Duration is initially set to the time length of the audio which is indicated as "a/v" (it has the same value as entering 0)

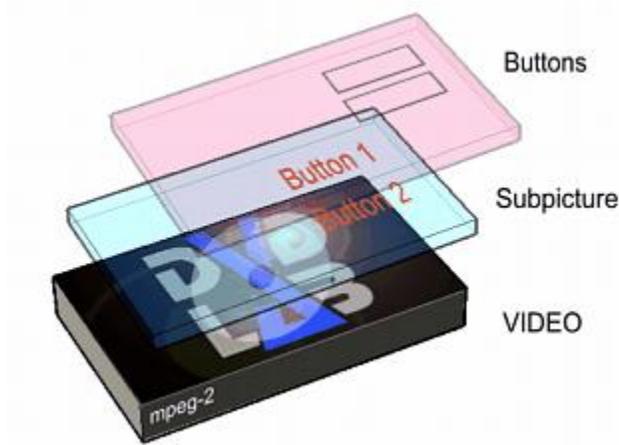
You can also enter other value (1-254 sec) which will then overwrite the true length of audio/video. For example setting 10 will make the music play only 10 sec then return. Setting "inf" with audio or video present in the menu will have the same effect as setting a/v.

## 5.23 Motion Menu

A Motion Menu is a Menu where the background is a Video stream (hence Motion) instead of a still background image. You can also add sound to a Menu as background audio, which may or may not match the video.

### How DVD works

It is important to understand the way DVD works. When you look at the screen you can imagine you see a composition of a few layers where the bottom layer is the mpeg-2 video. On top of it is superimposed a layer we call the *subpicture*. Unlike the video, the *subpicture* can have in fact only four different colors and transparency. Since one of the color in subpicture is used for the fully transparent background (so the bottom layer can be visible), technically we have only 3 colors. The top layer determine the rectangles (or hotspots) where the buttons are active.



That means, normally the buttons on video will be visible by using the 3 colors subpicture. If you want to have a nice looking multicolored buttons then obviously these must be already integrated in the video itself.

The Motion menu feature allows you to create very sophisticated Motion Menus (with the right video editor). You can also use DVD-lab's built-in Render Motion tool to merge the buttons with the video.

### **Motion background**

DVD-lab doesn't by default, mix the Motion background with the buttons you put on top of it. These buttons will be used for the Highlighted image (*subpicture*) and they will be not visible in a normal Menu. You can, however, let DVD-lab render the Menu which will mix any Motion objects (backgrounds, video thumbnails) with all other objects.

Basically, you are responsible for how and in what way you create the video background. This gives you a lot of freedom: it depends on you and the application you use to create the video background. DVD-lab doesn't restrict you to do only one type of Motion Menu, nor does it force you to use the built-in Render Motion tool.

Once you have built your video background, import it into your Assets Bin, then in DVD-lab you can easily create the highlighted text, frame or rectangle part objects and create links on top of them.

### **▶ A Very Simple Motion Menu**

You can create a very simple "Motion Menu" directly in DVD-lab, without another video application, by replacing the Menu background still image with a short video clip. You will use the "Normal" subpicture properties to show an subpicture in normal state, which will then be shown in a different color for the highlighted state.

1. Create a new, blank Menu. Then add two text objects and create links from each (Just drop

a Movie or Menu from the Project tree onto the text object). Something like this.:



2. Import a short video which you would like to use as background video into the Assets Bin.
3. Drag the video background from the Assets bin and drop it onto this Menu. DVD-lab presents this message:
  - You are setting a Motion Menu.
  - The background image and all the objects in Normal stage will be replaced by the video.

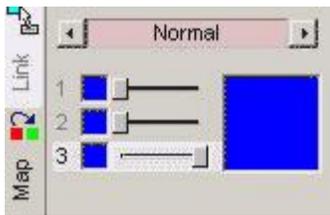
As the message indicates, it is a good idea to make the video background one of the first things added to a new menu to avoid losing any Normal State design objects the Motion Menu would replace. The Menu now looks something like this:



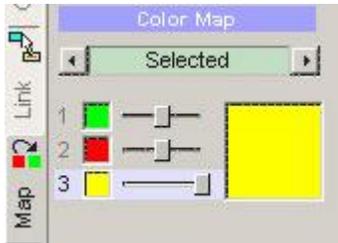
#### 4. Click Simulation



5. The white text will disappear and you will see just the first text object highlighted. Go to the Properties pane (on the right) and select Map. Switch the State slider from Selected to Normal. Since you are using Group 3 for both text objects, move the third slider all the way to right and optionally pick some other color via the color box.



Switch to Selected and pick some color for selected:



6. That's it. Setting the Normal state will make sure the text is always visible even if not selected and the selected state has a different color.



This is very simplistic Motion Menu, but it is done without much effort. You can use your knowledge from previous chapters to build an underline (which will look better in this case) or use Group Hotspot to create more complex "buttons".

### Cells and Motion Menu

Motion Menu has a special relation to cells. Please refer to the Menu Cells chapter.

#### ► Complex Menu

For everything else, you need either some video editor or to use the build-in Render Motion and/or any third party MPEG Encoder to end up with a MPEG-2 file.

## 5.24 Render Motion menu

### *Menu-Render Motion*

Previously, we learned how to create a simple motion menu where we replaced the

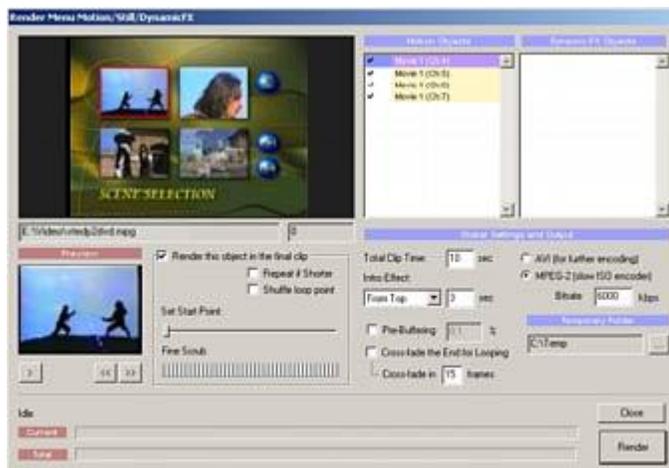
background still image with a motion video clip. What we got was more or less a motion background with a subpicture over it.

You can certainly choose to prepare your motion menu in a separate video editing program such as "Adobe Premiere", "Video Vegas" or "Puremotion EditStudio". There is also a simple and effective way to build a motion menu directly in DVD-lab with the optional utilization of an external encoder application.

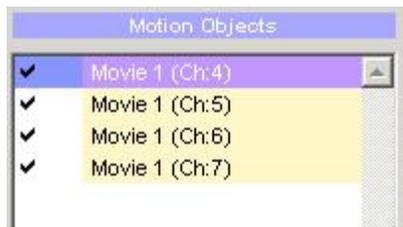
The Render Motion feature will allow you to merge the static graphics (images, background, buttons) with a motion video (thumbnails, motion backgrounds). One application would be to simply combine the background video with static object on top. Another application can be to create motion menu thumbnails, for example.



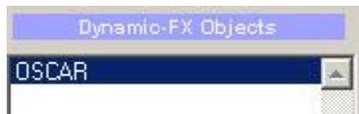
Imagine a scene selection menu as above. The Render Motion feature allows you to merge the video clips from different parts of one or more movies with the other static elements.



The Render Motion feature will recognize all objects which can be possibly motion thumbnails (images linked to movie or chapters, video stills) and lists these in the Motion Objects list.

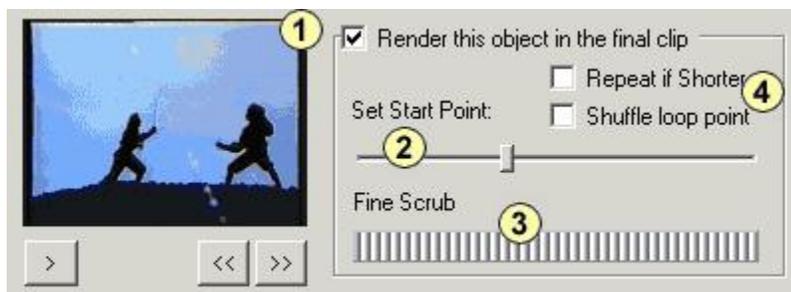


If you have Dynamic-FX objects in the menu, this will be listed in the Dynamic-FX list:



**Note:** The Dynamic-FX objects are not affected by the settings described below. They are simply always rendered to the final clip and you can change the settings in the Dynamic-FX properties.

Now by selecting each motion object you can set other parameters to the partial clip:



1 - Render this object. This determines whether you want to use the motion object in the final menu or not.

2 - Set Start Point of the motion clip. By default this will be at the chapter point the clip links to.

3 - Fine Scrub, set the Start Point more precisely.

4 - Set other options, see below.

You can set these parameters for each of the motion objects.

### Total Time

This sets the length of the produced motion menu. A typical motion menu is about 10 - 30 sec long and then loop.

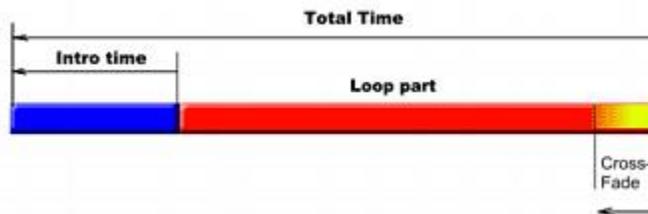


### Intro Effect (PRO Version)

This allows to add an intro (sort of transition effect) that can be later used in Delayed button menu. There are few pre-defined effects, they all virtually move the objects on menu, for example all objects come to screen from top, each with its own speed.



The relation between Intro time and Total time is demonstrated on the image below. The end of the loop part may optionally cross-fade to the beginning of the loop part with Cross-Fade option.



The Intro Effects determine how the objects appear during the Intro sequence. For example "From Top" will, during intro sequence, animate all objects from top part of screen to their current position.

There are also two special cases Buttons Cut and All Objects Cut that don't have any animation.

**Buttons Cut** will make all buttons invisible during intro (every other object will be visible). The buttons will then appear at once right after intro time.

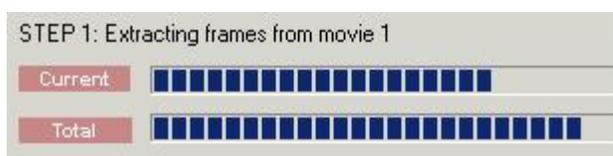
**All Objects Cut** will make all objects invisible duuring intro, except background. The objects will then appear at once right after intro time.

## Render

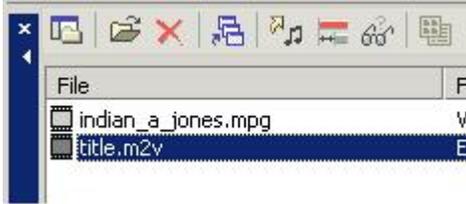
After you click the Render button, you will be asked to create the final rendering. DVD-lab will allow you to create an uncompressed AVI format video file only, which you then need to encode to MPEG-2 format with the MPEG encoder of your choice. Optionally you may directly export as MPEG-2 using DVD-lab's slow ISO internal encoder.



There are two steps in rendering. First, all of the frames will be extracted from the video clips. Then, these frames will be assembled together with static objects into a final menu video.



After that, you need to encode the AVI into a DVD compliant MPEG-2 file as an Elementary Stream by using an Encoder of your choice. Then, load the resulting MPEG file into the Assets Bin:



and then drag-and-drop this new file from the Assets Bin into the menu, which sets this video to be the Menu Motion background.

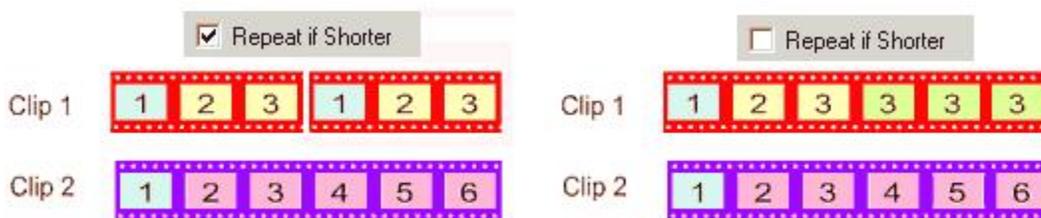


You don't have to delete any objects from the menu, just keep them there. If a motion background is defined with no objects (except the motion background and Subpicture) it will be visible.

Compile the DVD, and you have your first real Motion Menu done.

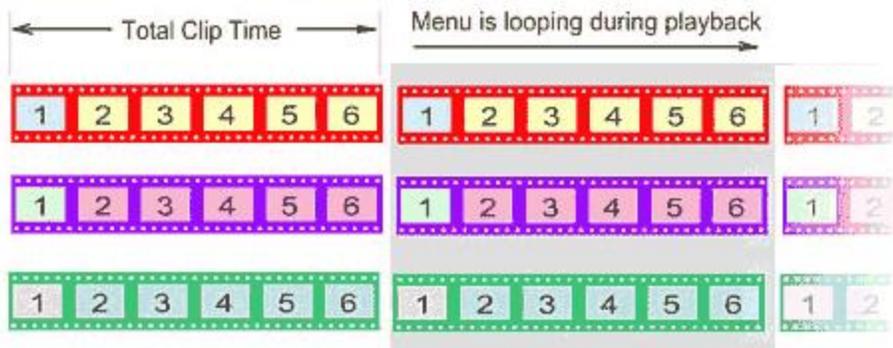
### **Repeat if Shorter.**

If a motion object is shorter than desired total time you can let it loop during the total time. If you don't set the **Repeat if Shorter**, then after the motion object play is completed, the rest of the clip would remain still showing the last frame. If you set **Repeat if Shorter** ON, then the object will repeat (loop) within the total time. Of course, if the motion object is longer than the Total time, then this has no effect.



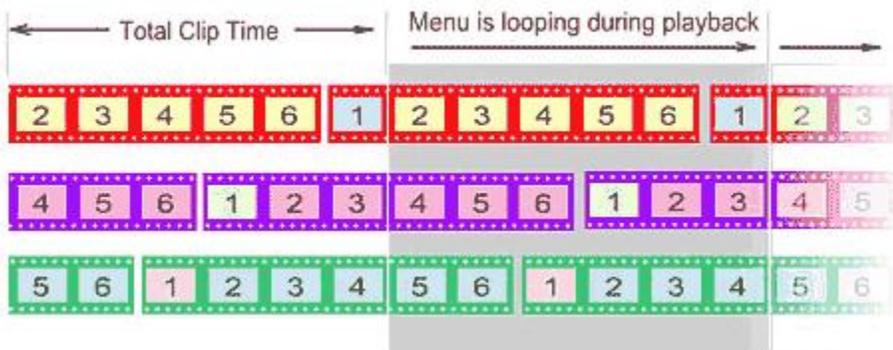
### **Shuffle Loop Point**, seamless looping

When you play the motion menu, it will loop. So every Total Clip Time (for example 10 sec) you will see a jump in all the thumbnails since the last frame of any thumbnail will change back to the first frame:



You can see on the picture above, that all the thumbnails will have the loop point at exactly the same time when the menu loops. The effect is a bit annoying and quite visible. Most Hollywood productions do their motion menus (if any) this way. With DVD-lab, we can do better than that. DVD-lab has a totally unique "Shuffle loop point" option to fix this "problem".

What Shuffle loop point does is that for each thumbnail with Shuffle loop point checked, DVD-lab will offset its playback to have the loop point in different time spots than others.



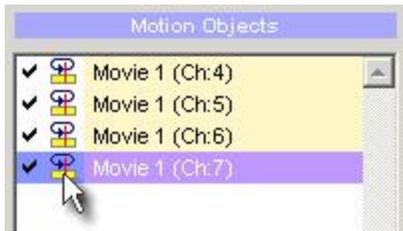
You can see from the image above that when menu loops none of the thumbnails will be in a loop point by itself. Since each thumbnail will loop in a different time the effect is that you can't visually tell during playback when the menu loop occurs. It appears as if the menu is looping seamlessly.

In real life, this is a priceless feature for anybody who creates thumbnail motion menus.

### How to set Shuffle.

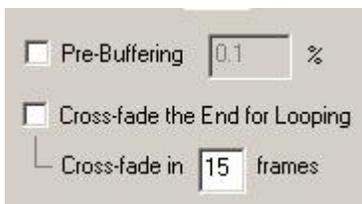
We need to set the Shuffle loop point for **each thumbnail**.

You can either do this by selecting the motion object and checking the Shuffle loop point box or you can do it by clicking on the space between the check mark and text in the Motion Objects list. You will need to click twice, since the first click will just set the **Repeat if Shorter** option.



Then Render the motion menu again. Now, when you play the menu in a loop you will not really be able to tell when the looping occurs since each thumbnail loops in different time duration.

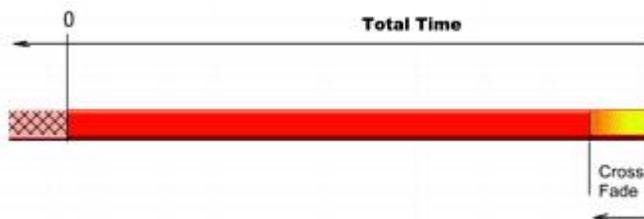
### Pre-Buffering and Cross-Fade



Pre-Buffering will start playing the video clip earlier as specified here by the %. MPEG-2 files may have an "Open GOP" structure so it is not always possible to simply start playing the clip from any place we wish. Pre-Buffering will start playing earlier and by the time it gets to the correct point the image should be fully usable.

### Cross-Fade

The end and beginning of the rendered clip can be cross-faded by specific number of frames. The specified number of frames will be cut from beginning and then they will be merged with the frames at the end. This way if the clip is played in a loop, it will crossfade on the seam, make the seam far less visible. It is good option for Dynamic-FX objects, for example. The total length of the movie will be less of the cross-fade frames.



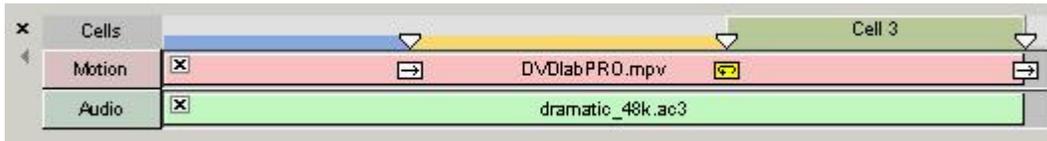
**Note:** This is just one example of how to use the Render Motion tool. Because of its simple, but effective principle, you can create many other types of motion menus. Also note that you can select different effects for video thumbnails and other objects such as Display mode, transparency Lens flare or 3D rotation so the result can be unlike any plain old motion thumbnails menu.

The Render Motion feature together with the menu editing capability of DVD-lab make it one

of the most powerful motion menu solutions in any DVD authoring software.

### Render Motion and Cells

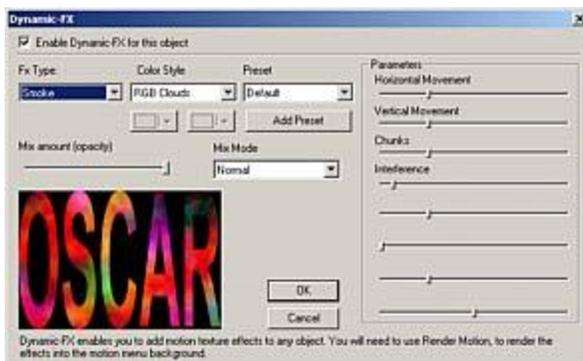
A motion menu spans across all menu cells. However you can create Render Motion from any of the cell.



## 5.25 Dynamic-FX

### *Menu-Effects-Dynamic-FX*

Dynamic-FX are special dynamic fills that can be used for motion menu with Render Motion.

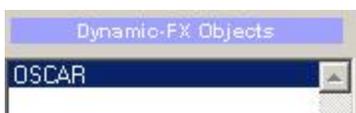


First you need to select any object on menu, for example Text and then apply Dynamic-FX. There are number of pre-sets and few parameter settings that change the look of the dynamic fill.

On a normal menu the fill will become a simple static fill:

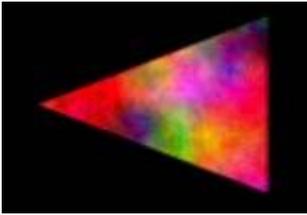


However the Dynamic-FX are best used with motion menu. As in the preview in the Dynamic-FX window, the effect changes with time that can be rendered using Render Motion to a MPEG-2 file.

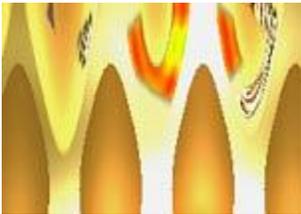


FX Type

**Plasma, Smoke, Fire** - this type draws the texture inside the object, like a dynamic texture fill.



**Picture plasma** takes the existing texture of the object (for example video still ) and use that for the plasma effect



**3D Dots/Fire** rotates the object within its rectangle and shows a trail. This is the only type of Dynamic-FX that doesn't work as fill because it changes the shape of the object. For best result the object has to have enough empty borders around the active area.



**Bumpy Light** will put a light that moves around the object in various directions.



**Picture RotoZoom** will use the existing object texture or fill to tile it and zoom it within the object.

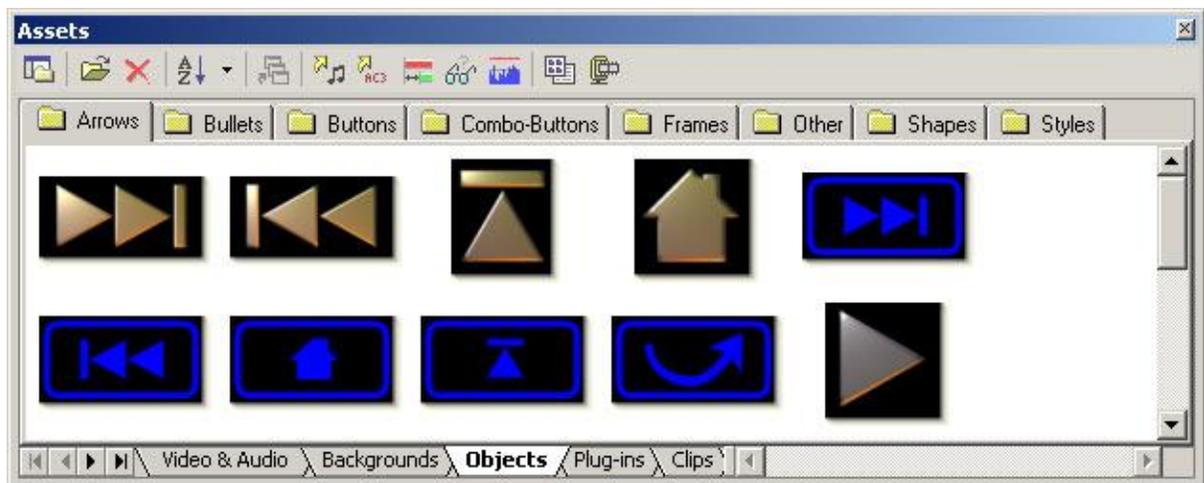


For more tricks you can use **Mix amount** slider or **Mix Mode**. Both will change the way how the original object is mixed with the dynamic texture. For details on Mix Mode see blending modes.

 **Note:** The Dynamic-FX effects should be used to "spice-up" the motion menu, not as the main tool. A good menu must be easy to read and navigate.

## 5.26 Custom Buttons

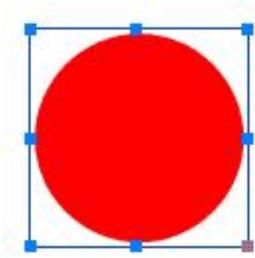
How to create customized buttons and frames for DVD-lab.



The buttons and frames that are provided by DVD-lab in the Assets / Buttons & Frames Bin are transparent PNG format files. They were all created in Real-DRAW PRO, but you can use any other software you are familiar with such as Adobe PhotoShop. Real-DRAW PRO is however the most suitable for the task.

Here is an example of the process in Real-DRAW PRO. We are going to create a simple bullet button.

1. We draw a simple circle

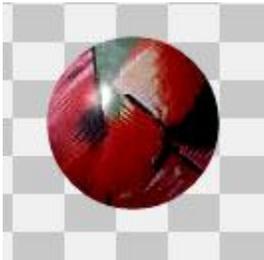


2. Then we apply a Texture and from the 3D Bevel choose 3D Ball.

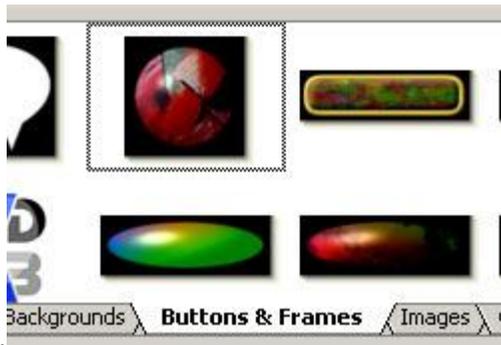


3. Do not apply any shadow - the DVD-lab will add shadow by itself and since the subpicture is created from the alpha mask, the shadow embedded in the button will make the subpicture different to what we want.

4. Use Trim Canvas or Export Crop to crop area around the button and use Export to export it as Transparent PNG format file.



5. Export it to disk. Using Windows Explorer, Drag & Drop the newly created PNG file into the Assets / Buttons & Frames Bin within DVD-lab. You will be asked if you want permanently copy the file there, say Yes. The image will be then be displayed in the alphabetically sorted images list



Now, you can drag-and-drop your new button from the Asset Bin onto a menu.

#### ► Frames

The frames have a special role. If you drop a frame on an object in a menu, the frame will be resized to accommodate the object inside. Also, if the object has a link then the frame will pick-up the link.

The frames are exactly the same transparent files as any other button. In order for DVD-lab to recognize it as frame you have to name it **starting** with the word "frame" for example frame21.png.

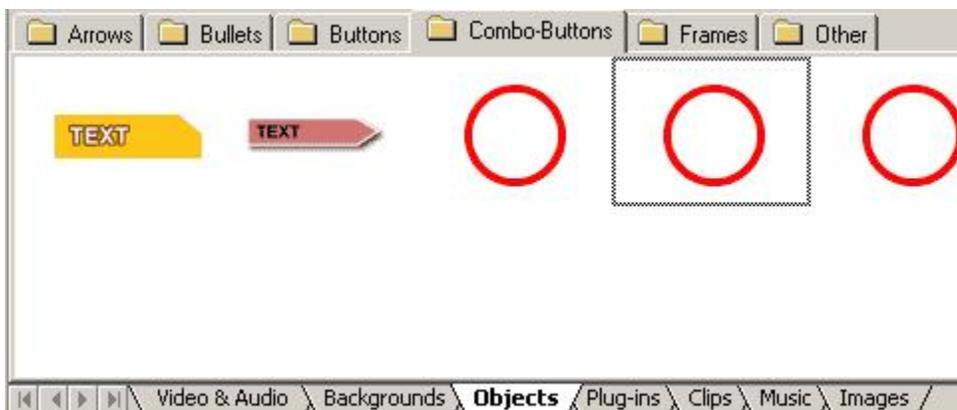
#### ► Export Button as PNG

You can also export any object as a Transparent PNG directly from menu. This function is in : *Menu - Create - Export as PNG*

In addition you can also export a group of objects as one PNG if they are inside Package

## 5.27 Combination Buttons

Combination button is a special case of button that carry also a customized highlighting.. You will find them in the Object tab under Combo-Buttons sub-tab.

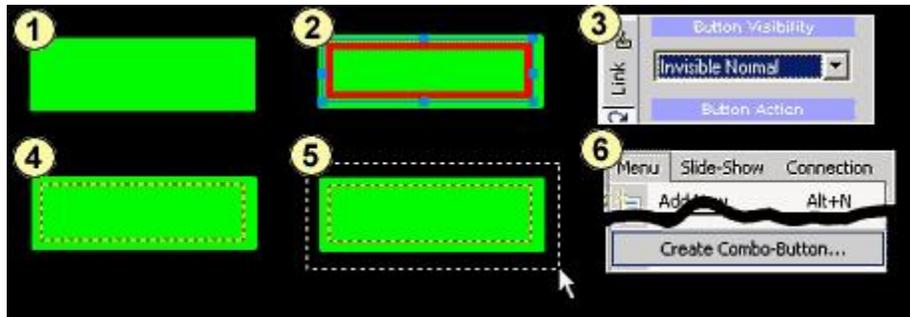


When you are there, just click on one of the buttons, you will see what it means that the button carry its own customized highlighting:



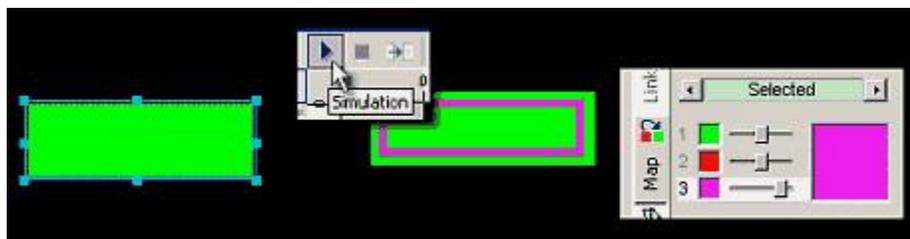
To use these buttons is easy - Just drag it to the menu, then add a link to it and you are done.

To create new combo-button button is quite easy. Bear with me:



- 1 - I draw a simple rectangle. This will be the visible part of button.
- 2 - I draw a frame on top of it - this will be my highlighting.
- 3 - Since I want the frame to be highlighting I have to set it as Invisible Normal.
- 4 - Here it is a rectangle with an invisible frame on top of it...
- 5 - ...so I select both by drawing rubber band around both objects
- 6 - Now the fun part, click menu Menu and select Create Combo-Button

Now I have my combo button. I can test it by adding a link to it and then click simulation button.

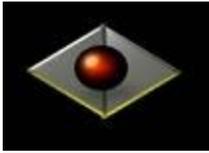


As with any other highlighting, the color of it is determined by the Color Map properties.

You can now save it to the Combo-Buttons Bin by going to Menu, then Export Button item.

This example was very simple, one rectangle and one frame on top of it. But in fact you can create much more complex button and you can combine highlighting with different groups.

In this next example I build the background of the button from 3 different objects:



Then I build highlighting from circle frame and another ball. Here it is shown without the background for clarity, but I need to put it over the background objects.



Each of the highlighting object was set as different group so it can have different highlighting color, then set Invisible Normal. All objects together with background objects were selected and Combo button was created:



Not the best button ever, but it shows the potential.

## 5.28 Shortcuts

### Keyboard Shortcuts for Menu

All items listed in menu can have assigned a customized keyboard shortcut. To assign a shortcut, go to menu: *Tools - Customize*. Then select Keyboard Tab. You can see the assigned shortcuts also listed on right side of menu items.

However there are also other special keyboard shortcuts that can be used while on Menu window. Such shortcuts can be used directly or they can be used in customizable Jog-Shuttle controllers such as ShuttlePRO2.

Action	Shortcut	Description
Arrow Tool	1	Select Arrow Tool
Text Tool	2	Select Text Tool

Rectangle Tool	3	Select rectangle Tool
Group Hot Spot	4	Select Group Hot Spot Tool
3D Rotate	5	Select 3D rotate tool
Cardinal Polynome	6	Select Cardinal Polynome Tool
Frame Tool	7	Select Frame Tool
Simulation	8	Select/unselect Simulation mode
Zoom In	+ on numeric keyboard or Mouse Wheel up	Zoom In
Zoom Out	- on numeric keyboard or Mouse Wheel Down	Zoom Out.
Add Link	SPACE	Shows a Link menu below cursor
Remove Link	Shift+Del	Shows a Remove Link menu item below cursor
Next Object	Page Up	Select next object (towards layers top)
Previous Object	Page Down	Select previous object (towards layers bottom)
Show Connections	Ctrl+Home	Bring connection window on top (customizable)

Also see Shortkey Summary for setting up a Shuttle device.

## 6 Menu Cells

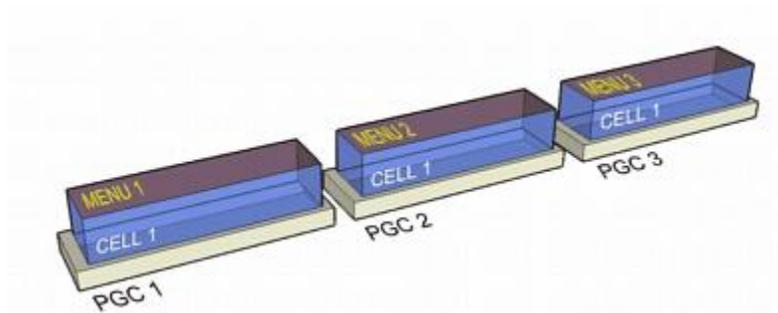
### 6.1 Basics

This is an advanced topic, that require a bit more knowledge of DVD structure. You may skip this topic if you want, you usually don't need Menu Cells for any normal projects.

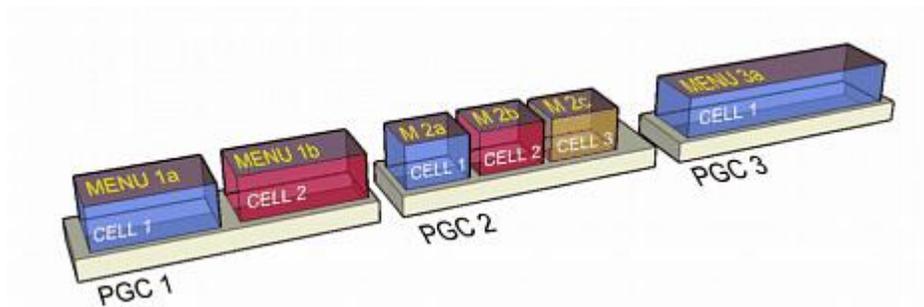
You may already realized that DVD specifications are quite complex and there are more than one way how to achieve some task. Menus in Cells are such example. With a normal menu we internally (during compiling) put each menu to its own so called "program chain" (or PGC). You can have many of such menus (PGCs) in a VTS and you can have also many VTS's on your DVD. However each program chain has in fact also smaller units called Cells.

On our normal menu there is only one cell in each PGC and the menu is added to that cell. The DVD specifications allows us to have more cells in a program chain. This is what we call Menu Cells.

On the image below is the situation where each menu is in separate PGC (in each PGC first cell). This is a normal menu as it is described previously.



This second image shows situation where each PGC has more than one cell. Each of the cell has (is) a menu.



So we see, each cell can be used as a place for separate menu.

The obvious question would be why would we want (or need) to have more cells in a PGC. We don't necessary need it, but in some special cases using cell menus can simplify the design.

Here are some cases:

- We need a large amount of related menus (for example for CBT, Quiz, Training etc...)  
We can have up to 30 Cells per each PGC menu and we can have 640 of such menus per VTS
- We need to switch between menus for some special effects, like jumping buttons or background/button change  
This is the situation described in Switched Menus topic, but here we can use cells instead of separate menus.

- Disabling or enabling buttons depending on different conditions  
Using VM commands we can switch to a cell that has some buttons disabled depending on the previous choice
- Show buttons on menu with some delay (for example intro without buttons, then loop with buttons)

As you may see all the above can be done also without cells, by simply adding more new menus, but using cell menus will simplify the whole design.

### **What is the upside of using cells**

- If cell has no VM command then it become **seamless** and the next cell will play without any delay. When using seamless cells with audio or motion, there is no jump or stutter in audio or video between the cells. So you can for example create a motion intro that will seamlessly continue into a motion loop without pause. (This is the single most significant reason why to use cells)
- Faster switching even between non-seamless cells within one PGC (cells with VM command)  
This is not much of an issue in the modern players, since modern players have much faster VM command interpreters and that means even normal menus should switch rather quickly. But in theory the cell-to-cell should be faster than menu-to-menu because there is only one line of VM Command on cell, but there can be many lines of commands on menus.

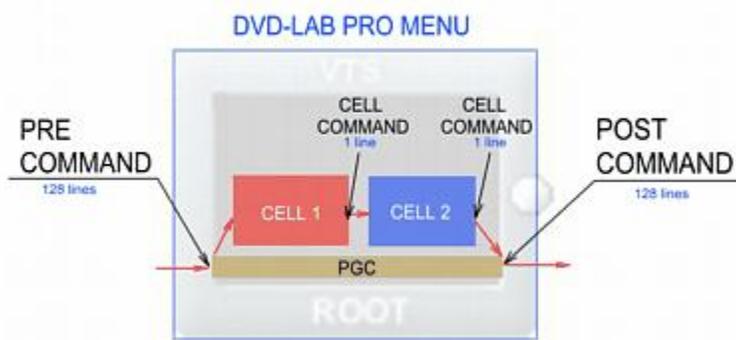
### **What is the downside of using cells.**

- Each cell can have only one line VM Command
- Unknown player bugs  
The players developers may not always test their firmware for more than one cell in a menu and there can be some related bugs on few players.

### **Cells and VM commands**

Each PGC (also what we call a "menu") has its PRE and POST commands. Such commands can have up to 128 lines. In case we have multiple CELLS inside the menu, each cell also have its cell command that is executed at the end of the cell playing time. A Cell command can have only 1 line.

The image below shows the relationship between PRE/POST and cell commands inside one DVD-lab PRO menu.



In a simple situation the flow of commands (marked by red arrows) when entering menu will be: PRE commands - play CELL1 - Cell1 cell command - play CELL 2 - Cell 2 cell command - POST Command. This of course assumes that none of the cell will be still (that means infinite timeout). If a button is called from any Cell then neither that cell command, nor POST command will be invoked.

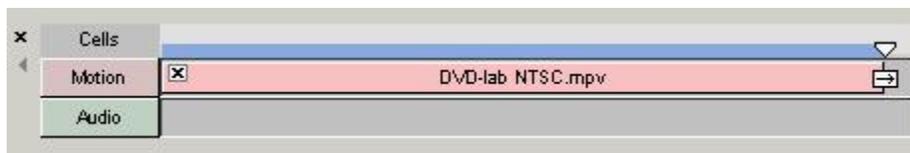
## 6.2 Working with Cells

When you add audio or motion to the menu a **Cell menu** window will appear at the bottom of the menu area.

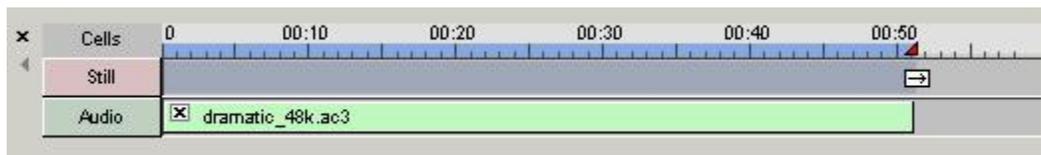
This window can be enabled or disabled also with the Motion & Audio Tracks button.



A normal motion menu tracks will look like this:



A still menu with audio looks like this:



There are three typical cases of a menu

- still menu (no audio)
- still menu with audio
- motion menu (video) with or without audio

From the above only the Still menu can have the timeout infinity. An infinity timeout (or duration) means the menu will stop there and wait until user press any button. On contrary both the audio only or motion menu will play for certain time and then either loop or go somewhere else.

On the Cell window there is a row of buttons to add, delete or set different commands to cells:



Each cell is color coded for better overview. A currently selected cell is marked by the raised color handle.

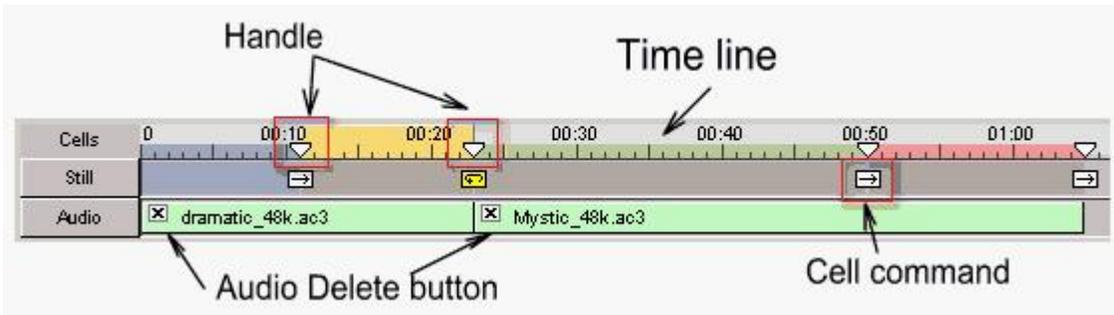


You can select cell by clicking anywhere on the space between the start and end of the cell. The same color and cell number is displayed on the left top corner of the menu canvas to remind us we are working with cells:



Obviously that mark will be not present on the final menu on DVD.

The following picture shows various elements of the cell window timeline:



It also show a feature we will explain later where the audio spans across few cells.

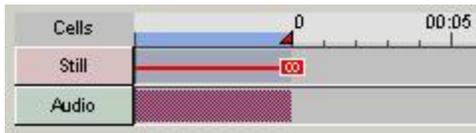
### 6.3 Still Menu Cells

Still menu can have up to 30 cells. There is always at least one cell in a menu present. A normal still menu is set with the timeout of infinity, but it can have any other length (timeout) that is set in integer seconds. You can reveal the Cell menu timeline display by pressing the

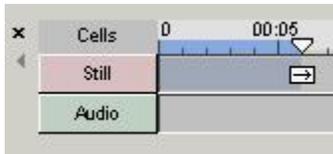


Motion & Audio Tracks button on the top of Menu view.

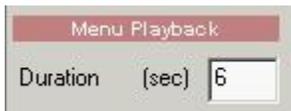
A still menu with **infinity** timeout will *skip* part of the cell timeline, with the infinity sign at the end. (Infinity cell has no actual duration)



We can grab the red triangle handle and drag it to any other value. This will create a still menu that lasts for certain time, then continue with the further flow (next cells, next menu, movie...).



Dragging the handle is the same as setting the Duration in the PBC tab:



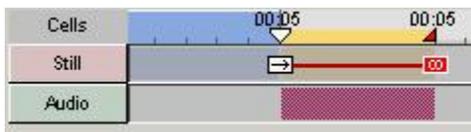
To set the still menu back to infinity click the Infinity button  or enter a number on the PBC tab larger than 254 seconds.

**Add new still cell.**

To add new Cell to our menu click the Add New Cell button:



a next still (infinity) cell will be created:



To select the cell for editing, click anywhere within the cell boundary on the timeline:



**Note:** Any infinity cell will *skip* a part of the timeline. As on the image above, beginning of the second cell is at the same time 00:05 as its end. This is because infinity cell has no duration.

Each cell can have its very own background, objects and buttons. All menu Properties are local to the cell, except the Color Map. The Color Map is shared by all the cells in the menu.

However the *Button Hi-lite group* on the Map tab is also local for each cell.

### Cell commands

Each cell can have one VM command at its end. It can be for example setting a GPRM parameter or a LinkCN to loop the cell or go to any non sequential cell.

There are 3 buttons for the Cell command setting:



**Link to Next Cell** - this create the seamless cell transition where the next cell will play. In fact this command is a "no command" since the seamless cell always automatically follow to the next cell. This is the default "command".

**Loop Cell** - this will loop that current cell

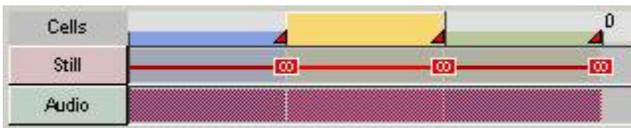
**VM command** - you can write your own one line VM command

In the example below I created 2 cells, one will show for 5 seconds then the next cell will show for another 5 seconds and then loop. This is done intentionally as a bad example:



If you are already familiar with DVD authoring you should quickly recognize that looping a still cell makes no sense. Nothing moves, no audio plays so in fact the second cell should be rather set to Infinity. Such situation will be logical only if we add audio to the cell.

In the example below I have 3 still cells. All of them are set to infinity. That means the menu will stay on that cell until we press any button on that particular cell.



What would be a real-life example for such situation?

Here is a very simplistic Audio and Subtitle selection done on 3 cell in one menu together with the VM commands on each button:



Btn1: LinkCN 2 (button 1)  
 Btn2: LinkCN 3 (button 1)  
 Btn3: link to main VTS menu etc.

Btn1: SetSTN (audio=1 ), LinkCN 1 (button 1)  
 Btn2: SetSTN (audio=2 ), LinkCN 1 (button 1)

Btn1: SetSTN (subp=1:off ), LinkCN 1 (button 2)  
 Btn2: SetSTN (subp=1:on ), LinkCN 1 (button 2)  
 Btn3: SetSTN (subp=2:on ), LinkCN 1 (button 2)

From the first cell, pressing Set Audio will send us to the Cell 2 (LinkCN2) and selecting first button, pressing Set Subtitle will send us to the Cell 3. On each of these next cells (2 and 3) the required audio or subtitle settings will be set using SetSTN, then return to the first cell.

#### There are few things to notice:

- While the button command can have only one line, we can in most cases write a combined command together with the LinkCN
- After executing SetSTN command, it shows it is in fact NECESSARY to combine it with the LinkCN command, even if it points just to the very same cell (to simply restart it). This is because *some* players may end up stuck. Pressing a button will flag the cell as expired, but without LinkCN *some* players will not know what to do next, they will remain stuck in "nowhere". The cure is to add the LinkCN command to go to or restart the same cell. This is yet another example of the different interpretation of DVD specs by different firmware engineers.

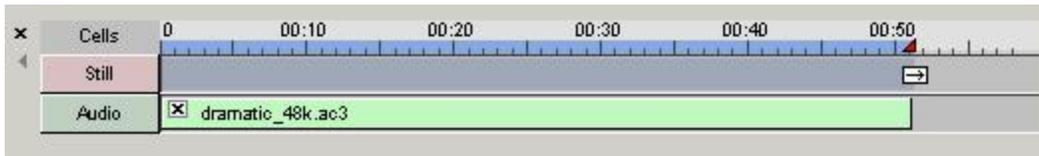
#### Other info

- Some players (very few Sony models) may have trouble displaying highlighting on cells 2,3, etc. if these are set to infinity. Use either non-infinity still cells or audio cells.

## 6.4 Audio Menu Cells

The Audio menu cell is created when we add an audio track to the still menu. To do this, drag and drop audio file from Video & Audio assets or from Music Assets to the menu canvas or to this cell window under the cell region.

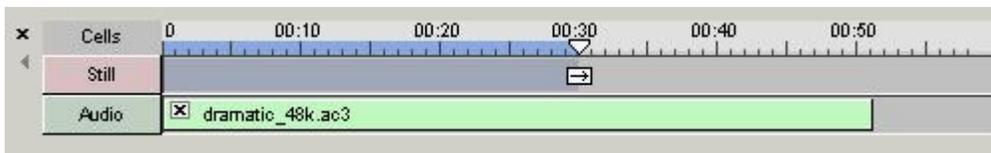
A basic Audio menu cell will look like this:



As with the still menu the red triangle handle reminds us that this is a "special" case. For the Audio menu it means the duration of the menu is the *same* as the duration of audio. That is also indicated on the PBC tab:



As soon as we move the handle it will change to a white triangle.

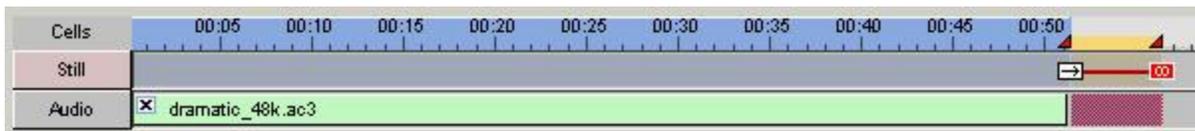


To make it back the same length as audio you can press the *Set to End of Audio* button:



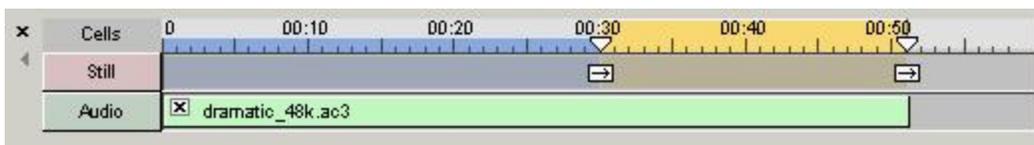
or write **0** in the PBC tab Duration.

When we add new cell an infinity still cell will be added:



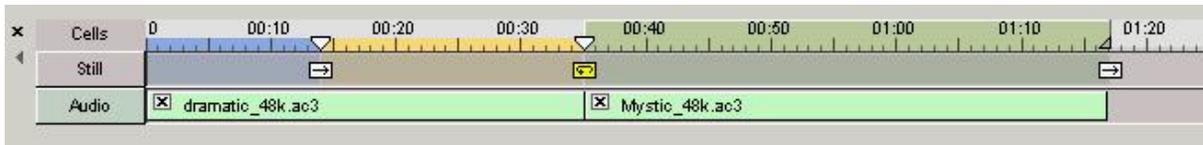
The Infinity still cell does not play audio. This is indicated by the hatched audio area under the cell.

We can either add another audio to this new cell, by dragging the audio from Video & Audio assets or from Music Assets or we can in fact move the handles of the cells so the audio from first cell will continue in the next cell:



What this will do is to play the first cell for 30 seconds then seamlessly continue in the cell 2 without interrupting music.

We can combine this in different ways, for example first two cells will share the same audio, the next cell will have its own audio etc. Also the same VM commands apply as described before in Still menu Cell.



Again as mentioned before to add audio for particular cell, drag and drop audio file from Video & Audio assets or from Music Assets to the Audio track under that cell.

We can also combine infinity still and normal audio cells, however the still cell will be always silent - indicated by the hatched pattern over the audio track area. It is not recommended to combine them.

## 6.5 Motion Menu Cells

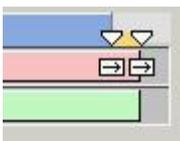
Motion Menu Cell is a *different* than the Still and Audio cell. The Motion Cell can have only **one** Motion and one audio across all the cells. There is no timeline as the cells are always a percentage of the single video. The cells will cut the motion video into smaller parts that can be used for various effects such as delayed buttons.

A basic motion menu will have only one cell

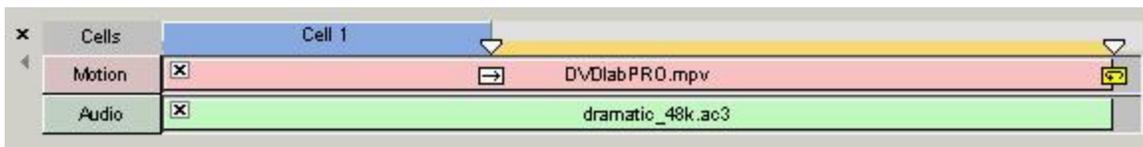


This will play the motion and either loop or continue, depending on the POST command of the menu. (and of course also the cell command of this cell).

When we add another cell it will be added at the end:



We can now resize the first cell and watch the video preview to set the desired cell point:

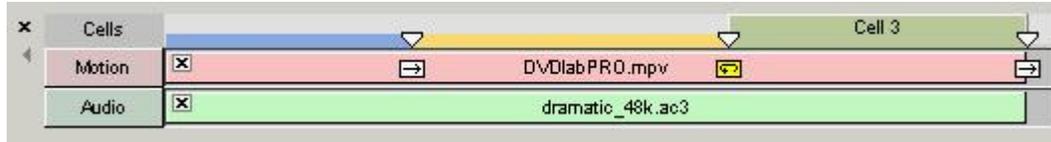


This arrangement can be used for example for delayed button menu. The menu will start with motion in Cell 1 without any buttons, then it will continue with the Cell 2 where we assign some buttons. The cell 2 is set to loop.

This is quite common on some DVD's. The transition from Cell 1 to Cell 2 cell is seamless, which is the reason such menus are done this way and not by using two menus or movie and

menu.

You may also add more cells, up to 10.

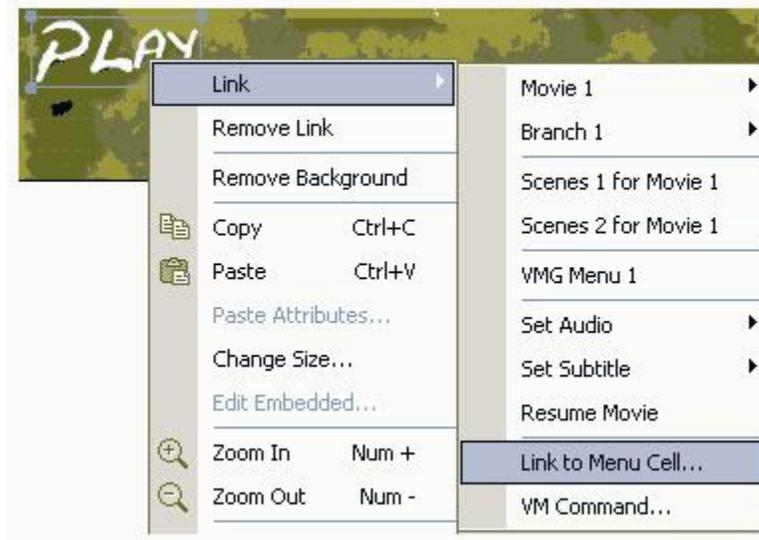


In the example above the Cell 1 will play first, then the Cell 2 will loop. You may ask, "when will the End cell 3 play?" The answer is, "never" - that is unless we do some special commands on the menu button(s).

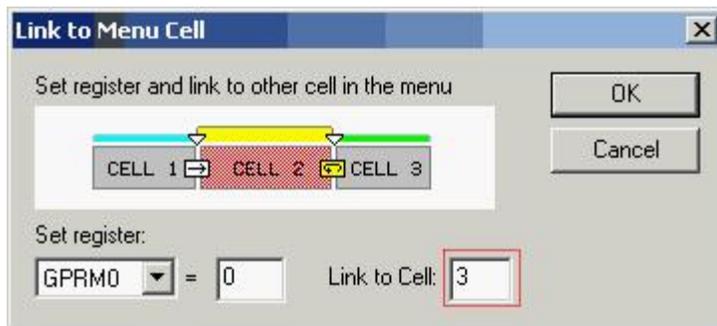
### Link to Menu Cell - 3 cell example

This is the situation as we described last - the 3 cells where the middle one cell 2 has the buttons and also loops. The cell 1 is an intro - without buttons and the cell 3 is exit, also no buttons.

To be able to play the End Cell from the Cell 2, we will use LinkCN command on all menu buttons as in the still menu example.



This will open a Link to Cell window

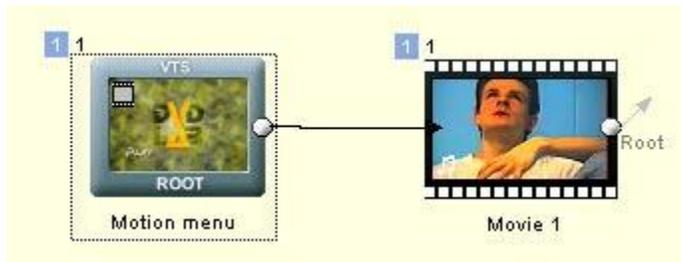


In our case we want to link to a Cell 3 of our menu. This helper window allows us to also choose an register to set before the link is executed. This register than can be used to identify which button was pressed!

After we press OK a simple VM Command will be written to the button.

GPRM0 = 1, LinkCN 3 (button 0)

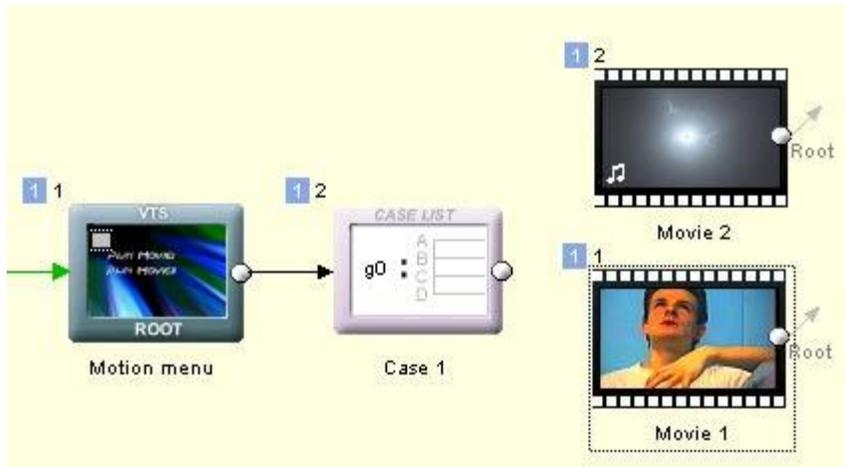
Now if we connect the end of the menu with a movie and user press the button during loop on cell 2, the exit animation (Cell 3) will play and the movie will start.



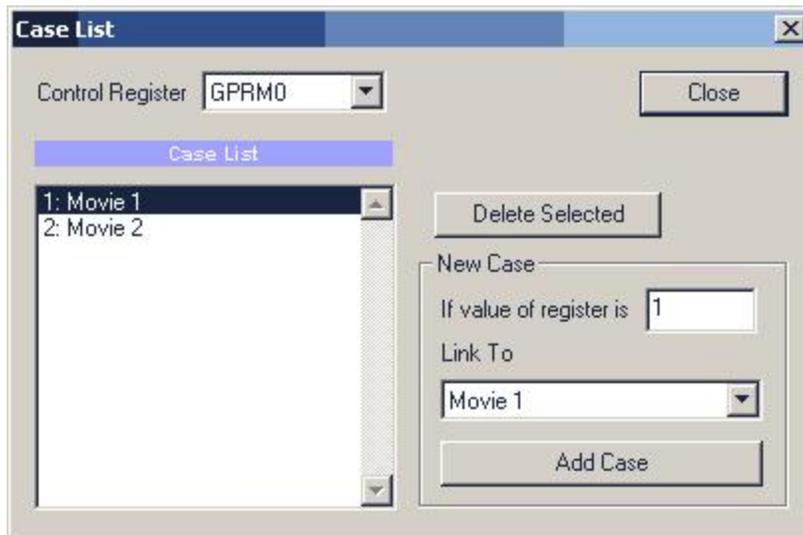
Good for one button. But what we want is for all buttons to end the animation and then each do something different.

For that we have the **Set register** part. In our case we will for each button set different number to the GPRM0 register. Lets say we have two buttons, First will play **movie 1** and second **movie 2**. Both buttons will link to cell 3 to play the exit animation, but first will have GPRM0 = 1 and second will have GPRM0 = 2

After the Menu end we have to process the GPRM0 and redirect the flow to Movie 1 or Movie 2. For that, the Case list object is just perfect.



The case list will process exactly this kind of scenario:



Here we can setup the case if  $GPRM0 = 1$  play Movie 1 and if  $GPRM0 = 2$  play Movie 2.

## 7 Menu Scenes

### 7.1 Scene Selection Menus

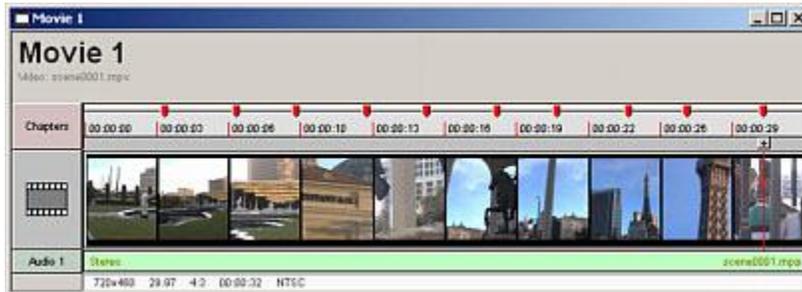
#### *Menu - Scene Selection Menu - Thumbnail Scene Selection*

DVD-lab has a useful automation feature called "Add Scene Selection menus from chapter points". Its function is to create linked Menu buttons for you from a Movie using the Chapter Points you have already defined. As DVD-lab offers a number of ways to do things, you can also create such menus directly by using Chapter Still Images.

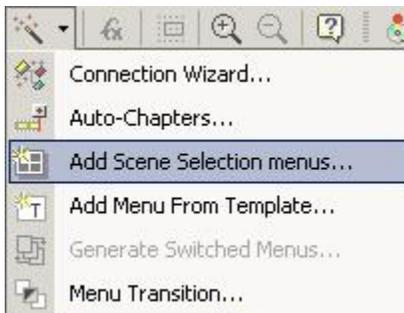
To start with, open a Movie and add Chapter Points to the movie if none are defined. Recall

that DVD-lab can find Chapter Points for you with it's "Add Chapters by Scene Detection" feature, see *Movies - Auto-Chapters*.

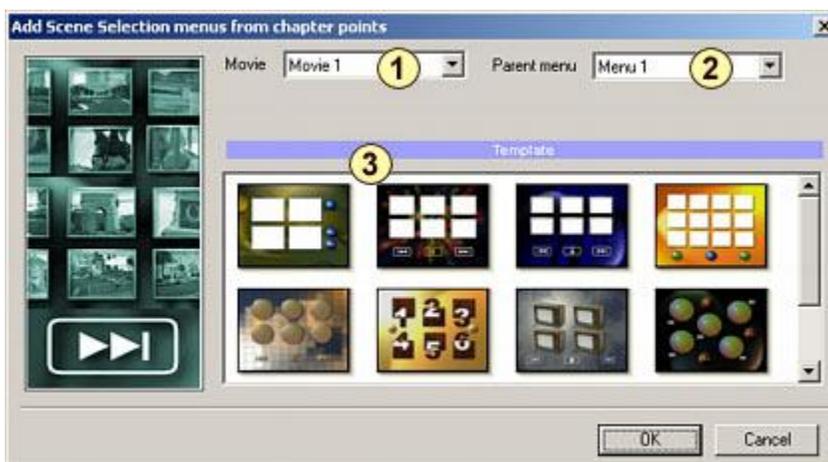
Here is a Movie with many Chapter Points defined.



Now we are ready for the next step. Locate the Add Scene Selection wizard from *Menu - Scene Selection Menu - Thumbnail Scene Selection* or from the Wizards button just under the top menu, select "Add Scene Selection Menus...".



You will be prompted with the dialog box:



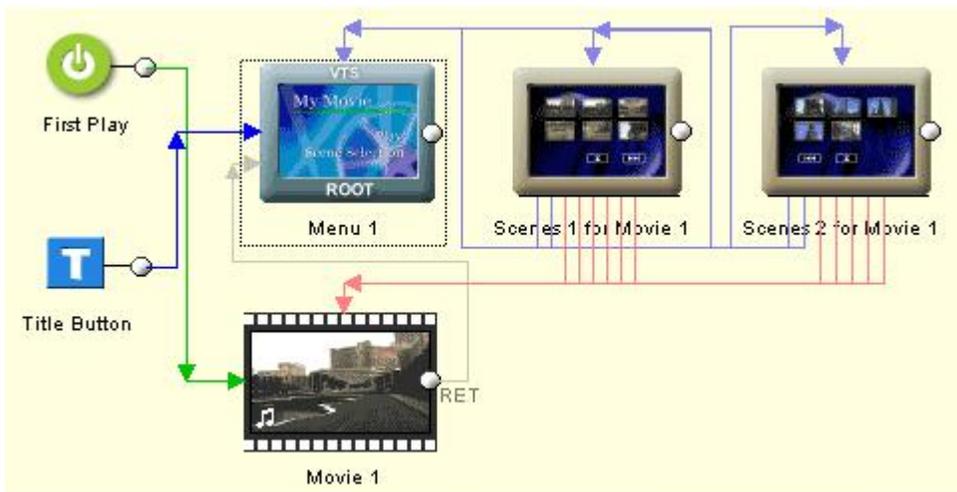
First you have to choose from which **movie** you want to create scene selections (1).

Then choose which menu is the parent menu to the newly created scene selection menu (2). The up buttons on the new scene selection menu will be linked to this menu as successive

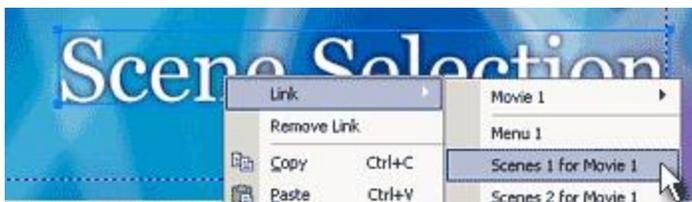
menus are added.

Lastly, choose which template (3) you would like to be the base Menu to be populated. Style items are used for these templates, you can create your own Styles as needed.

When you click OK, one or more menus will be created. The number of menus will depend on the number of chapters to allocate and the number of receiving placeholders per menu. A Movie with 10 Chapter Points using a Style with 4 placeholders will yield 3 Menus; 1) with 4 buttons 2) with 4 buttons and 3) with 2 buttons.



The Add Scene Selection wizard will have built all the necessary links automatically. The only thing you need to do now is to link the "Scene Selection" button from your main menu to the first created menu (Scenes 1 for Movie 1). This tied these new menus into the rest of the Project.



Here are few examples of how a Scene Selection created menu may look, depending on the chosen template:

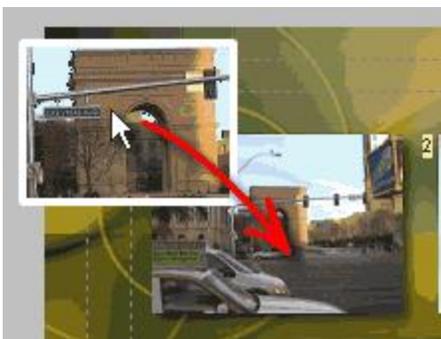


Because you can easily create your own Style template, there is a wide range in the look and layout options that you can choose from. The Scene selection template doesn't have to follow the typical column-row principle. You decide where the buttons are and in what order.

 **Note:** The start of the movie is also understood to be a chapter even if you don't create a chapter point there. Each movie then has at least one chapter (the beginning). If you create 4 chapters, for example, then the total number of chapters will be 5.

### ► Replace Scene Thumbnail.

You can replace any scene thumbnail on selection menus by simply dragging a new still frame from **Preview** over the old thumbnail. This will not change the link, simply replace the bitmap also referred to as a Video Still.



## 7.2 Scene Selection Menus-Create Style

*Menu - Export - As Style*

You can create your own Scene Selection Template which DVD-lab calls a "Style". Styles are used during "Add Scene Selection menus from chapter points". See *Menu - Add Scene Selections*.

Similar to Templates, the Style objects are distinguished by the Button label in the Link tab in Menu properties.



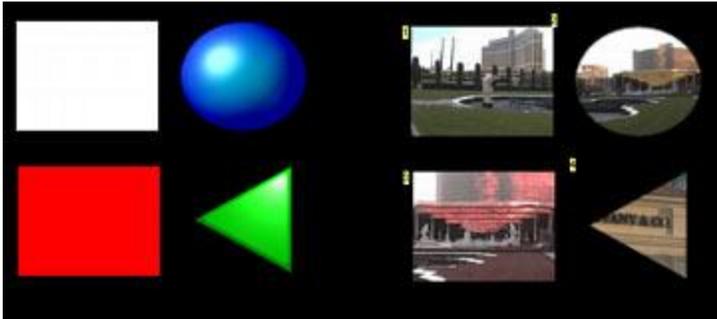
There are these functional commands DVD-lab expects to be placed inside the button label:

- place
- placeholder
- up
- prev
- previous
- next
- number
- hide first
- show first
- hide last
- show last
- hide noparent
- show noparent

All other labels are non functional and simply ignored during building the Menu. Here are explanations of what each of these functional command do for us.

**placeholder (or place)**

This is the object that the chapter thumbnail will be inserted into. The object will retain its shape when loaded with a thumbnail, so if for example, you use a circular button the result will be a circular thumbnail.



On the image above we created 4 placeholders. Each object has the command: **placeholder** entered in the Button Label box. If we export this Menu as a Style (\*.sty file) and then use that style to create Scene Selections, each of the thumbnails will automatically be placed inside the placeholders. Note that for the bottom rectangle we changed the color to Red. When a thumbnail is inserted, if the color is different than White (Automatic) DVD-lab will colorize the thumbnail as explained in the Video Still and Images section.

 **Note:** The placeholders must be created in the order in which the chapters are to be inserted. This is typically starting from the Left Top corner. The order is determined by the position in layers - the first created object is on bottom layer, next object is on top of it, etc. That means you can reorder the objects by using the Object order buttons shown here:

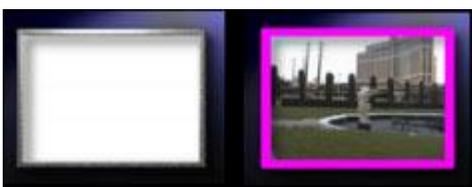


If you create objects one after another in a straight sequence, then this is not an issue. However, as soon as you change the order or delete an item or add an item, the object order may be mixed up. To help you to visualize the button order, you can drop a link on each object (for example on Movie 1). The number which appears on the top left of each object is the number of the order in which the thumbnails will be placed.

Using Styles, you don't have to worry about dealing with multiple pages. If there are more scenes identified than buttons on your Style page, DVD-lab makes more pages for you. You then only need to create one page as a Style, then when Scene Selection processing occurs, the wizard will automatically create new pages if necessary and smartly uses the rules found on the first page. It will also delete unused objects from pages.

### **Pick-up links.**

There is one important rule on the placeholders. If the placeholder is on top then it will get the link to the chapter point. If there is any other object or objects directly on top of the placeholder, then the top most object will pick-up the link.



That means while the thumbnail will be always inserted into the placeholder object, the actual link may be added to a frame or other object on top of the placeholder. The image above is an example. The white rectangle has the placeholder set in Button Label, but a frame is on top of it. When Styles are used, the frame will become the actual link. You may set the Frame to Invisible Normal, or use a different Color Map and Group Hotspot over the objects. This enables you to customize Styles much further.

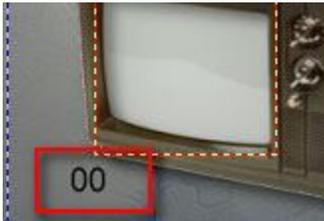
### **up, previous (or prev) and next**

These are objects which will be linked to the next, previous or parent (up) Menus. Typically you would use arrows or some buttons such as below:



### **number**

This is a label on a text object saying that the number of the chapter point will be inserted here.



Typically you put 00 in a text object to hold the size and then type: **number** in the Button Label.

 **Note:** you must create the number objects in the same order as the placeholders. See the note in the placeholder section.

### **show/hide first/last noparent**

For a larger number of chapters, more than one menu will be created. These menus will be linked with next and prev buttons. Normally object on top of **prev** or **next** buttons will be deleted from the first and last pages together with the **prev** and **next** buttons themselves.

However we can also use the show/hide commands to show or hide any object(s) from first or last menus. We can use show command to cover up a buttons and hide command to hide the buttons themselves.



**show first** - this will show the object on a first menu (1) (cover up PREV button)

**hide first** - this will hide the object on a first menu (1) (hide PREV button)

**show last** - this will show the object on a last menu (3) (cover up NEXT button)

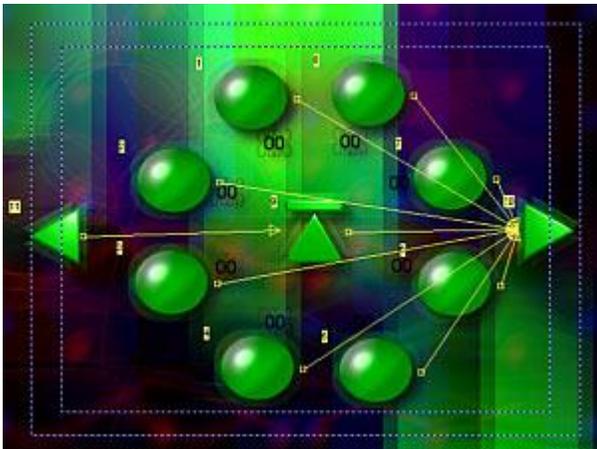
**hide last** - this will hide the object on a last menu (3) (hide NEXT button)

**show noparent** - this will show the object if there is no parent menu defined (cover UP button)

**hide noparent** - this will hide the object if there is no parent menu defined (hide UP button)

### ► Routing

The Style can have automatic or customized routing which will be carried forward to the new created Menus. This will help you to create styles which are not typical for example the style below.

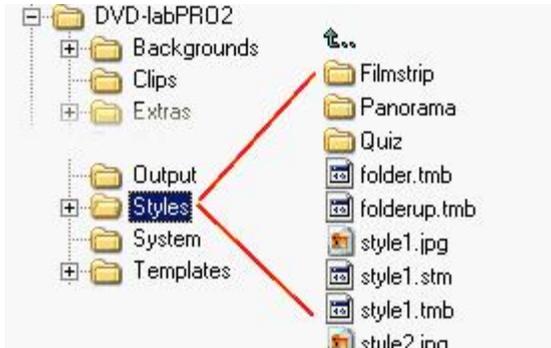


The thumbnails (placeholder) are in the circle. Such design can't rely on Auto-Routing because the user will be confused. Instead, we created manual routing where - key up on the remote will go clockwise, key down will go counter-clockwise, key right will go to the Next button, key left to the Previous button. The Up button will be placed in between prev and next. (On the image above you can see routing to the right)

The blurry effect was created on background using Gen-EFX.

### ► Scene (Style) template storage

The Style templates (\*.stm) files (see how to create Styles above) are stored in the Styles folder in the DVD-lab installation.



You can also create sub-folders in the *Styles* folder and fill it with your styles, which will then appear in the *Scene Selection* window. Note, there are already by default three sub-folders (Filmstrip/Panorama/Quiz) to hold other templates. These three folders will not appear in the Scene selection template selector, only folders you add later. If you want to copy a Style from folder to sub-folders, you need to copy the \*.stm, \*.jpg, \*.tmb files with the same name.

## 7.3 Cloning

### *Menu - Cloning*

Until now every menu you have created was a separate and independent of all others. That's probably the most common case. However on DVD you can be really creative and use menus a bit different way.

We can for example create a series of similar menus where user can switch between them, which (if done right) will create an effect of much richer menu, like created on a multimedia PC application. Consider the image below. We have six similar menus linked together in a special way to create illusion of a menu with special functionality.

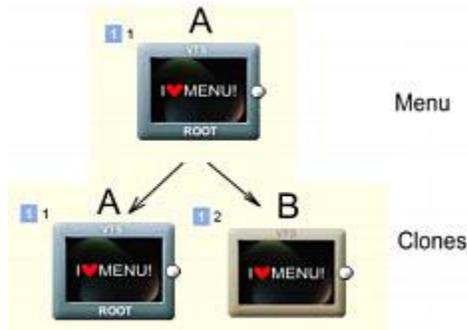


All works fine until you need to change one thing, for example replace text "French" with text "Spanish". You would obviously need to do it on all six menus. What about if you need to redesign the whole menu - put that text there, move this somewhere else? To do it on all six menus exactly the same way would be a tough job. It would be actually easier to start from scratch.

For this sort of projects we have something that is called Menu Cloning. If we would design the above menus using Cloning Technique, moving or changing one object will automatically do it for all other menus.

## Cloning

Cloning is at first may look like a Duplicating menu, except that the objects in both menus continue in a special relationship.



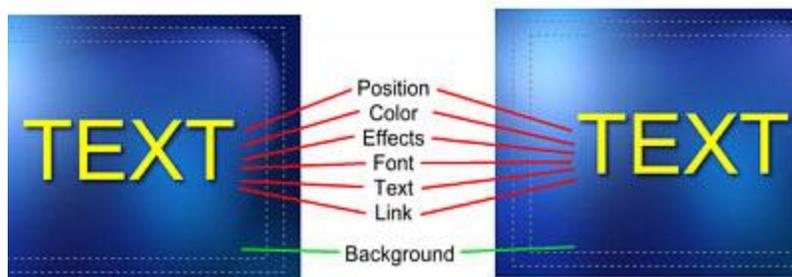
Here we cloned menu **A** to new menu **B**. It is important to mention that with Clones we don't have a true Master-Slave relationship, both menus, the new menu **B** and the original menu **A** becomes equally same what we call "Clones". Changing objects in menu **A** will change the same objects in menu **B** and vice-versa.

We can now decide to clone again menu **A** to menu **C** or we can clone menu **B** to menu **C**. Since menu **A** and **B** are both Clones, cloning from any of them will produce the same menu **C** and we will have 3 menu clones **A,B,C**. Changing any of them will change all the rest.

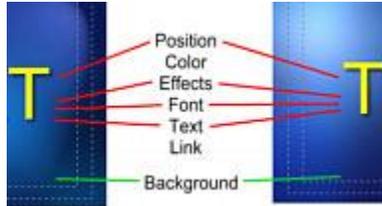


## Cloning Relations

Cloning is not just blindly copying whatever we do on one menu to all other clones. That wouldn't be much fun. Instead each object can have specified the cloning relationship with others. This is very powerful feature that allows us to clone only the parameters we want.



For example we may want one particular text on each menu have its own color which is not affected by cloning and also we need the text to have different links. We can set up the relations for each object separately, in our case we would need something like this:



### Symmetric Relation

The clones relations are always symmetric. If we for example change a relation of our object to ignore Color and Link that will be true for the same object on every cloned menu. That means the same object on every clone menu can now have separate color and link.

### Adding Object to Clone Menu

Once we create Clone menus, all objects on these menus prior cloning will be cloned by default relation. After that we can add separate objects to any of the Clone Menus and the object will be "local". That means adding new object to Clone Menu will be by default NOT added to all other Clone menus. However we may later decide to do so.

Similarly we may delete an object from Clone Menu, and choose if we want to delete all cloned objects or only this object in particular. In the latter case the objects on other clone menus will continue to have the clone relation.

 **Note:** By deleting an object only in one Clone menu and then immediately adding a new object and cloning it to all other menus may in some situations simply substitute the new object for the deleted one and replace (instead of just add) the objects in other Clone menus.

### Clone Group

In our example all the cloned menus A,B,C are part of the same Clone Group because they were all cloned from each other. If we create brand new menu and then clone it, it will be member of another Clone Group.

A selected object that is a "clone" will display a small icon and a number on left side. The number is the Clone Group.



Not all objects in a menu must be set as clones, but if they are, they can be members only of the same Clone Group.

 **Note:** Every time we say that something will apply to "all Cloned menus" we actually

understand that it will apply to all Cloned menus in the same Clone Group. Two clone groups are totally independent of each other.

### Clone Bitmap

Not all data is automatically cloned. For example the bitmap of the object (like Video Still) is not Cloned. We are therefore able to freely change it or apply some effects which will be not picked up by the other Clone menus. If needed, the Bitmap of the object can be copied to the clones.

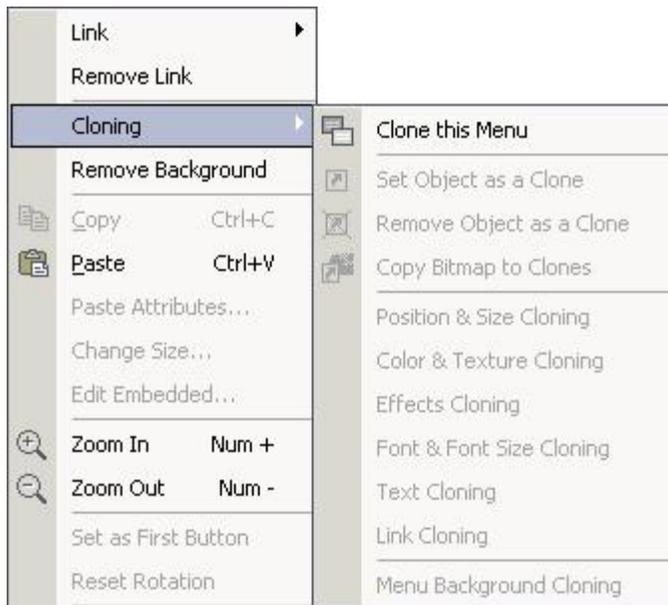
### That's enough, let's see some real life examples

This all may sounds complicated, but the real application of it is quite simple. Let's first design some menu. Three text objects and one video frame were dragged from the video preview into the menu.



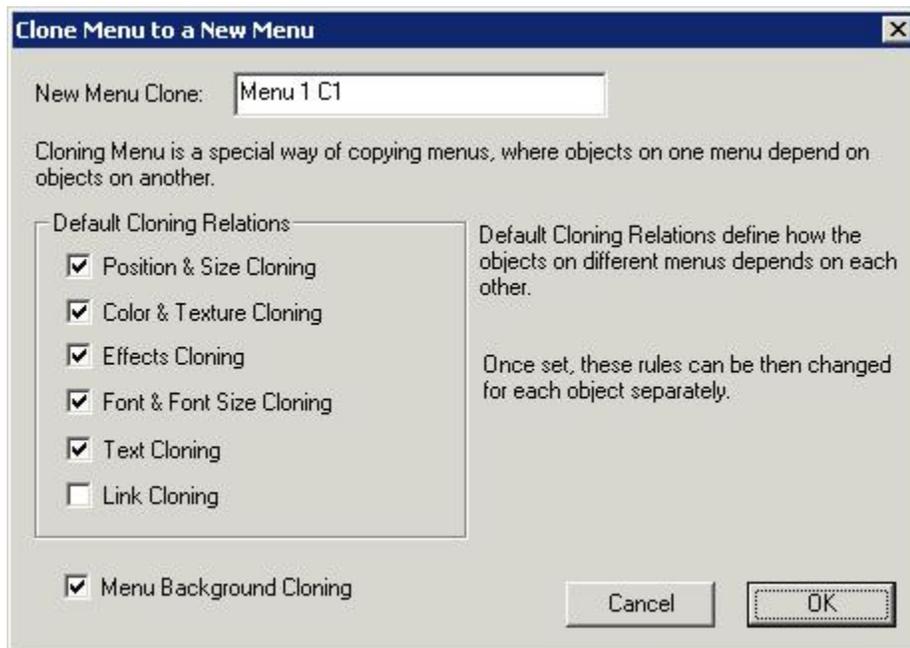
With cloning it is always best to first create the menu as completely as possible. This is as far as we get today.

Now while the menu is still open either choose Cloning submenu from the main menu bar under Menu, or right click and choose Cloning from the pop-up menu.



As we can see, there is not much to do here yet, just Clone this Menu.

A Clone Menu dialog will appear with the default values for object relation.

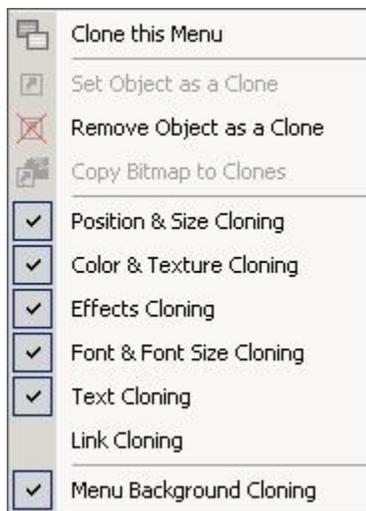


Since Relation of each object can be later changed, these default values are just right. Clicking on OK will create our new Clone Menu



Now you can check it out. Open either of the menus and try to move or resize any object. Then try to change color or text of the objects. Whatever you do the other menu will follow.

Select any of the object and right click, then open the Cloning menu. Now there is much more to do here.



### Remove Object as a Clone

This will remove the Clone properties from this object (and from all the same clones in all other clone menus) The object will become independent You can try it on one of the text in the menu.

The object still remembers the previous relations so we can later set the object as clone back and it will connect to the correct objects in other menus.

### Set Object as a Clone

An object that is not a clone (or the clone properties has been removed as above) can be cloned to all the Clone menus. If we add a new object, then after "Set Object as a Clone", this object will be copied to all other Clone Menus.

In our example let's add a frame to the picture:



As explained above, the frame will be **not** automatically added to other Clone but it will remain as a local object in this menu. However we want to have it on all Clone menus, so we select the frame and apply "Set Object as a Clone". The frame will appear also on the second menu.

### Bitmap Data

Now we have frame around Video Still on both menus. We decide that on one of the clone menu we want a different video still (yet we want its position to be linked with the other still in other clone menu). This is simple. Since bitmap data are not being cloned all we need to do is to drag another video still from preview over the old one. (This dragging-over works only with Video Stills).



The current bitmap has been replaced with a new one, but in the other Clone Menu it still remains the same.



### Copy Bitmap to Clones

In previous example we ended up having on each clone menu different video still. Yet the stills are linked, we can move or resize one and the other will move as well.

This time we may want to copy the bitmap data of the still to all Clones. This can be done with the *Copy Bitmap to Clones* command.

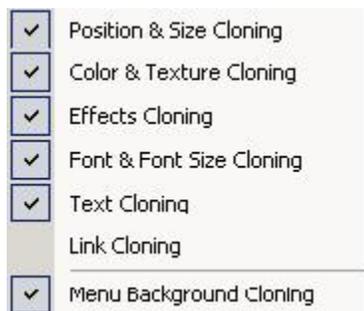
We need to first select the video still. It is behind the frame, but a simple trick - holding ALT will allow us to cycle between objects behind when clicking on them. Now we need to go to menu: *Menu-Clone-Copy Bitmap to Clones* (because we have selected bottom object, right clicking on it will select back the frame so we have to do it from main menu)

That's it all Clone menus have now the same bitmap data in Video Still.



## Object Relations Settings

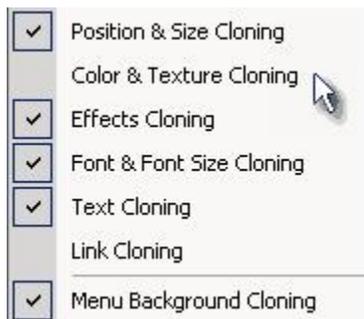
The bottom part of the Cloning menu is devoted to the Relations setting for selected object.



We mentioned this before that the default object relations between clones can be changed later for each object. This is the place.

In our Example let's see the text "Text One" and "Text Two". We would like to have it different color on each menu. But right now if you change the color of the text it will be changed in all Clones.

All we have to do is to remove "Color & Texture Cloning" checkbox from both, the "Text One" and "Text Two".



It is enough to do it on one menu. Because of the symmetry, if you open the second menu you will see that the checkbox "Color & Texture Cloning" is removed here as well.

This means we can set both text to any color on any menu without the color data being "cloned". All other things like position cloning etc. still works!



That sums up the cloning. But this is just the beginning. Cloning is a very special feature that can be used to easily create many advanced menu projects.

## 7.4 Switched menu

*Menu - Scene Selection menu - Switched menus*

In previous chapter about cloning we mentioned some more advanced techniques of creating interaction that involve multiple menus.

### Switch effect

We started to call this type of menu "Switched" because this is essentially what is happening. Instead of modifying, adding or removing some objects on a menu - which is common in multimedia applications but unfortunately not possible on DVD, we simply quickly switch to the menu that has the object already modified, added or removed. The switching from one menu to other is fairly quick so user will believe that the menu actually changed. (Although players may vary). With this trick plus mixing it cleverly with some normal highlighting type of action we can create many different types of menus:

- A menu that highlights buttons with visual effects (shadow, glow etc....)
- A menu that shows different image each time we highlight other button
- A menu where user can place checkboxes to one or more items
- A menu that shows pop-up menu
- ...anything else

Here are the same visual ideas.



Switched menu trick allows us to do almost anything possible, if we have enough time for it.

### Mixed Technique

It was not exactly intended to make menus this way when the specs of DVD were created. So it has a downside. There wasn't any requirement for players to be able to switch from one menu to another as fast as possible. While it isn't long by any means, the time lag may be an issue. For example when user press an arrow button he expect that the selection jumps immediately to next button. With switched menus (and Auto Action) this doesn't happen right away. There may be some 0.5 sec. before the menu changes. Impatient user doesn't see any action for this brief period after he press the button. That may foul him in belief that the remote didn't send signal so he may quickly press the button again and ultimately end up two buttons down.

It is therefore good to mix both techniques - the old highlighting which gives the immediate feedback and the switched menu that allows us to do visual tricks.

### Switched Menu Wizard

In all switched menus the number of menus depends on the number of buttons (behind each button is a menu usually called by Auto Action).

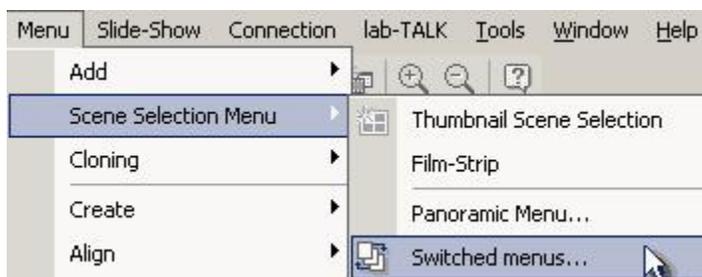
The Switched menu Wizard will create this kind of Auto-Action menus when pressing arrow button on remote will immediately call the auto action of the button that switch to the other menu.

The wizard will create each new menu by cloning it and place all the links to correct places so the moving arrow button will switch menus and pressing Enter will follow the destination link.

Before you start the wizard you have to create your menu with all the links to destination places (like Movies, other menus etc..). The wizard will build switched menus based on the linked buttons.



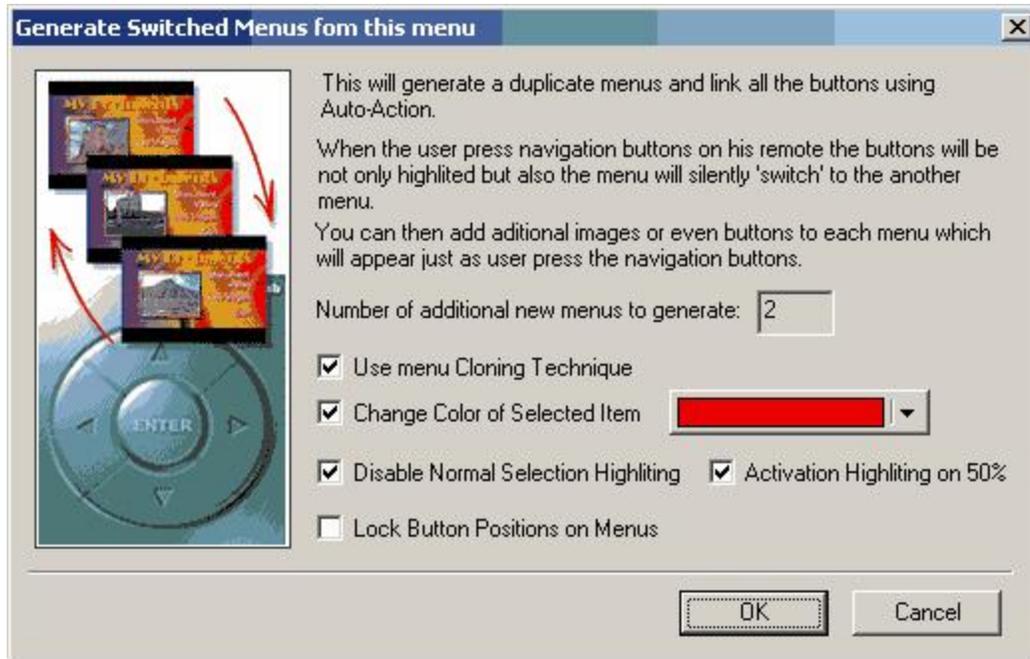
When this is done, call the wizard.



A Wizard will show the short explanation for people who don't read this and allow few

options.

Here are the default settings:



**Use menu Cloning Technique (PRO)** - this doesn't just duplicate the main menu, but sets a cloning relationship. That means if you change one thing on one menu, all other menus will be updated. That's a great helper.

**Change Color of Selected Item** - On each created menu one item is selected - this is the item where pressing Enter will go to the button destination. You can instruct to change color of this item if you don't want to use the old fashioned highlighting overlay as in normal menu.

**Disable Normal Selection highlighting** - Disable the overlay highlighting (Selected). When you want the selected item to change color, it assumes that you don't want to use the old fashioned overlay highlighting.

**Activation Highlighting on 50%** - It is usually good to have activation highlighting set because it visually shortens the time between menus being switched.. You may set the Activate color in the Color map to the same color as you use in Change Color of Selected Item. (This has to be done prior to entering the wizard). This option will set the Activation highlighting to 50% of transparency, hiding bit the fact that this is an overlay.

**Lock Button Position** - not needed if you use menu Cloning since all buttons will be synchronized.

When we click OK, a Clone Menu (PRO version) option will appear (if *Use menu Cloning Technique* was used)

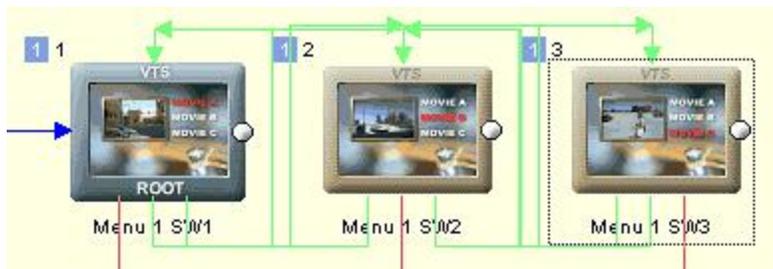


You can see that some Cloning options that would interfere with what the wizard intends to do are disabled - the Color cloning is switched off because we enabled Change Color of Selected Item and the Link Cloning is obviously off because each button needs a different link.

We will leave it as it is. Two new menus will be created and all links will be placed accordingly.

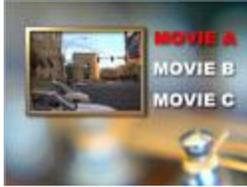
Now, our goal is to display different image for each selected button. Sort of like a Still preview of movie.

So we will replace the still image for menu SW2 and SW3. (You can replace a video still by dragging a new video still from preview window over the old one - replacing bitmap data has no effect on cloning, see more in Cloning chapter)



That's all.

A typical playback sequence of this type Auto-Action Switched menu is as following:



User see the first menu.  
"How nice, how nice..." he says....



He press the Down arrow button on remote to get to MOVIE B because according to him "the MOVIE A is a chick flick."



Because there is auto-action set on the next button, an Action Color will *immediately* appear over the next button and the menu will go to switch. It may take on some player up to 0.5 sec. until the switch appear, therefore we used the Action color red and 50% transparent (Color Map), because it shows immediate action.

Because we have the selected item painted in red - we could disable the Selection color .



The menu switched and user see selected next item. Also the image on left changed.

"Now let's see some action!" He says with one hand on remote and other in popcorn bag...



He then press Enter on the remote



A menu will immediately react by displaying Selection color over the button. We can be creative, the selected button on each menu may be in different Button Hi-lite Group than the rest, allowing us to have different color for the Action highlighting when user actually press Enter.(as we have here)



A movie plays.

Next time you will over-hear the user saying to his friends that DVD obviously must allow the same creative freedom as any multimedia application.

"I have seen it doing things! .." he says

Once you understand the simple logic behind switched menus you will discover many other usages.

Here above we used Auto-Action to switch the menus which gave us the possibility to change image while user move from button to button. We also replace the normal Selected overlay

with nice smooth red text but cleverly used Activated overlay to gave user the quick feedback. That's just one simple sample, it can go much more complex from here.

 **Note:** While this allows us to create many great visual tricks, we shouldn't forget that the main goal of our work is the usability, not a showcase. What good is a special effect menu if it only confuses user (who watch the DVD mostly because of the main feature and doesn't really care to what great length we had to go to make the menu switching, buzzing and popping). A standard way of making menus - especially when combining with motion is still the most rewarding.

**Tip:** Another way of creating self contained switched menus is to use CELLS in menus. The principle is the same except that all the different stages are inside one menu.

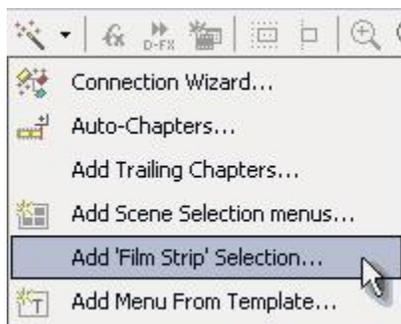
## 7.5 Film Strip

### *Menu - Scene Selection Menu - Film Strip*

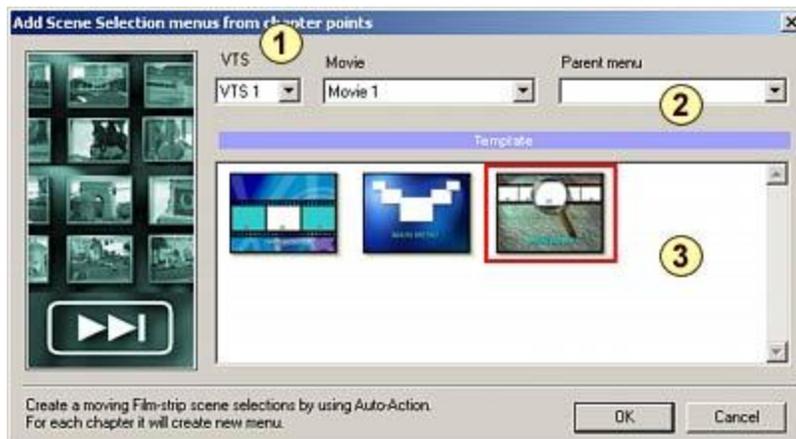
Another type of scene selection menu is one that we call "Film-Strip". This is a more advanced and complex set of menus that are linked together to create a special motion interaction.



After we add chapter points to a movie we open the wizard from *Menu - Scene selection menu - Film Strip* or from the Wizards button just under the top menu, select "Add 'Film-Strip' Selection ...".



You will be prompted with the dialog box:

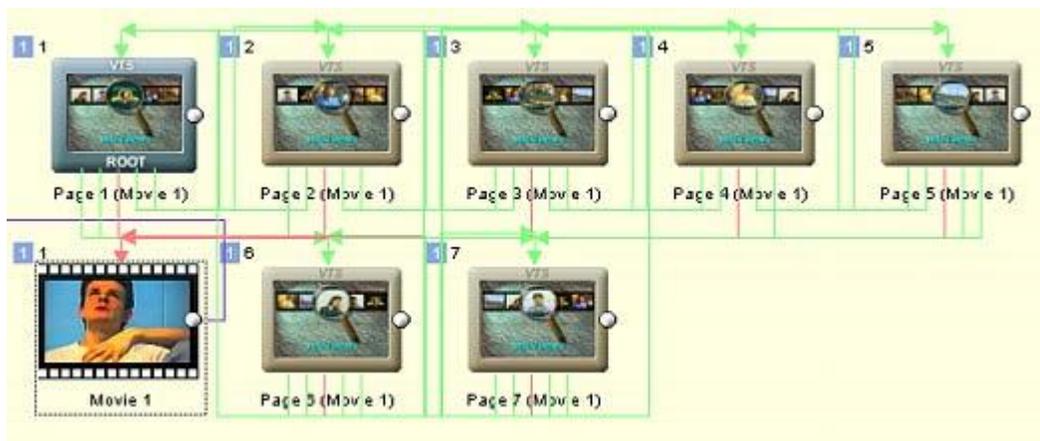


First you have to choose from which **movie** in what VTS you want to create scene selections (1).

Then choose which menu is the parent menu to the newly created scene selection menus (2). The "Main Menu" buttons on the new scene selection menus will be linked to this menu as successive menus are added.

Lastly, choose which template (3) you would like to be the base Menu to be populated.

When you click OK, a number of linked menus will be created



► Film-Strip will create each new menu for every Chapter Point!

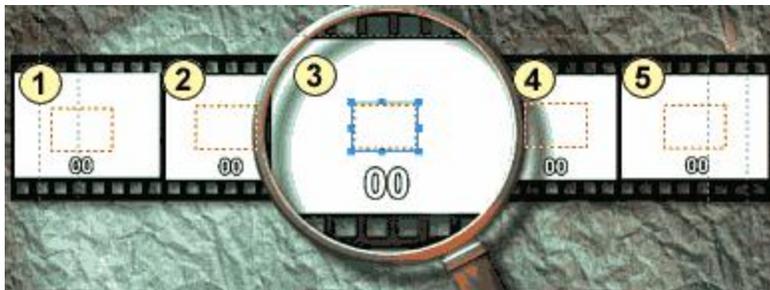
Film-Strip uses a "switched menu" trick for the interaction. When user press left or right arrow on his remote the button will use auto action (without the need to use Enter button) to "switch" to other menu that has different thumbnail selected. The result is as if we move a film where the center is the current thumbnail.



### ► Create the Film-Strip Template

Most of the actions described in Style for Scene selection apply here as well. The Template is a \*.stm style file in Styles - Filmstrip folder. It may help if you load one example and move things around.

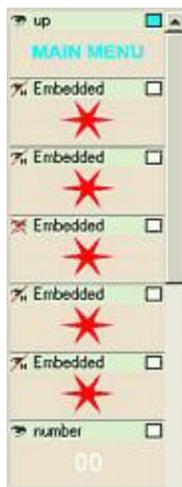
As in the Style, the places for thumbnails have a Button Label "placeholder". It can be a simple rectangle. You have to design the placeholders from left to right so the left most is bottom-most in layers. You need to use 3 or 5 placeholders. Then you need to put a frame or other object (star, circle etc.) on top of it them that will be used for highlighting. They have to be also in the order left-to-right and they need to be set Invisible Normal. The Auto Action will be set automatically so we don't have to set it. You may also place a text object called "number" on top of placeholder that will be replaced by the chapter number. The object (text for example) that links to Main menu has to have a Button Label of "up".



In the style above we want 4 small thumbnails and one large thumbnail in the middle. They are simple white rectangles, but they must be in the order from left to right, see the layers:



On top of them we have 5 numbers with button label "number" and then 5 Invisible objects (stars in our case) that will be used for highlighting. The middle star is set to Invisible All - we don't want to see it at all. The other 4 stars around are set to Invisible Normal - we want to see it only when highlighted.



## 7.6 Panorma Menu

### Menu window - Special menus - Panorama Menu

*Menu - Scene Selection Menu - Panorama menu*

This is a special tool for creating a Panorama menu. Such a menu is not dependent on chapters as previous selection menus and it doesn't even link to chapters. It is a series of still menus and transitions between them. The still menu has left and right buttons. Pressing either one will rotate the view to that direction revealing a new point of interest. The key word is to "rotate". Not just plain slide from one picture to another which you can do with a simple menu transitions or in any NLE, but a real feeling of the camera being rotated.

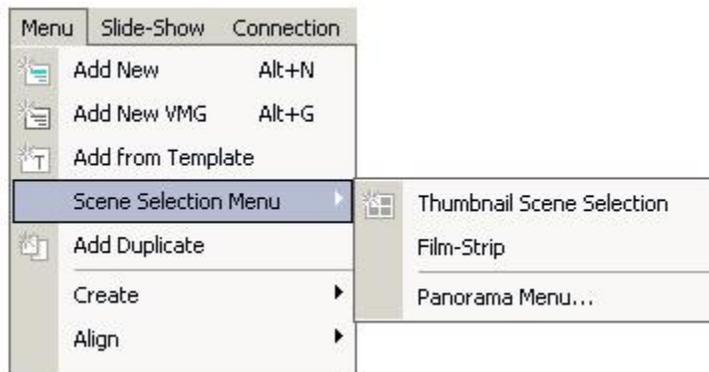
First you have to have a stitched panoramic image, DVD-lab doesn't "stitch" the panorama for you.



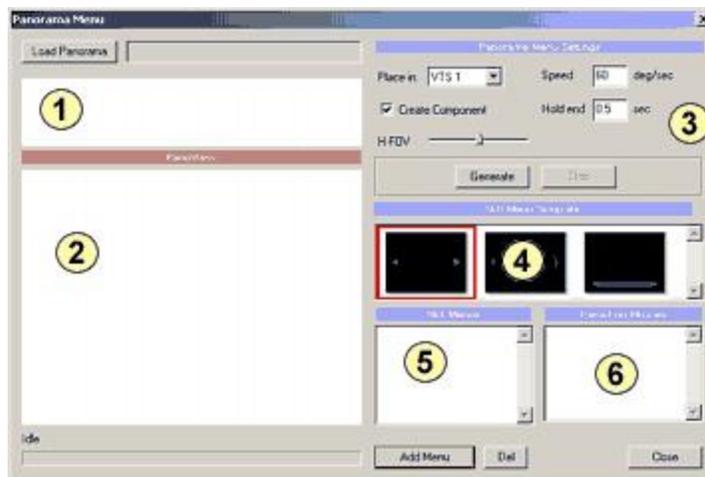
A 'stitching' application is used to create one single wrap-around image from series of single images. This application often comes with the camera equipped with panoramic mode (eg: from Canon, Olympus, Pentax ...)

**Note:** Panoramas are spherical and cylindrical. We will work on cylindrical panoramas - these are the ones you can create with your digital camera and allows moving in the horizontal direction

Once we have our stitched panoramic file we can continue in DVD-lab PRO:



This will open panoramic menu maker:



- 1 - Preview of loaded panoramic image
- 2 - Panoramic View
- 3 - Settings
- 4 - Menu template
- 5 - Menu list
- 6 - Transition List

First we will load the stitched panoramic image using Load panorama button. The image will appear in preview and also below in the Panoramic View. This view is very similar to the web page panorama views, you can click inside and then drag mouse to rotate the panorama.

### H-FOV

If the image was stitched correctly, what you see in the Panoramic view should look fine. Sometimes, however, it may look bit squashed or stretched to sides. This can happen if your stitching software didn't wrap the images correctly - for example if you set that the lens was 20mm when in fact it was a 35 mm lens etc.... but this can be adjusted with the H-FOV slider. The default way is in the middle.

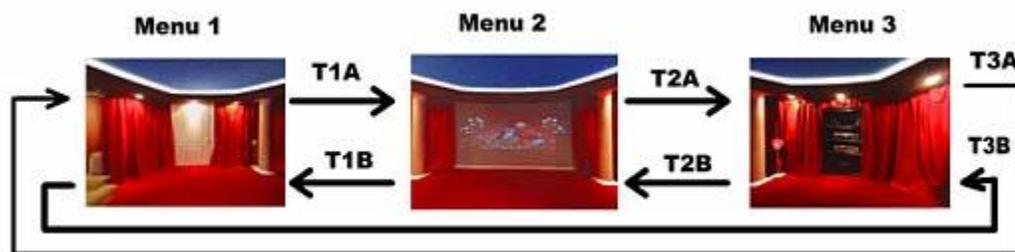
### Setting points of interest

We need to choose few places of interests in the panorama that will be generated as still menus. Then the generator will create a transition movies between these still menus in both direction. At the end all will be combined and linked, ready to use.



First we rotate the view to a point of interest and then click Add Still button. Few things will happened: the Still Menu entry will be added and two new transition movies will be added to the right list.

 **Note:** For each still menu we need two transition files to cover both possible directions.



### Settings

**Speed** is measured in degrees per second. Full panorama is 360 degrees. A value between 60 (slower) or 120 (faster) works best.

**Hold end** of 0.5 second will create the transition that will hold last frame for 0.5 sec. This will assure that when player go from transition to still menu it will not create "jump" but make it smooth. A value of 0.5 sec. is a very good one.

**Create Component.** All created menus and transitions will be enclosed within new component.

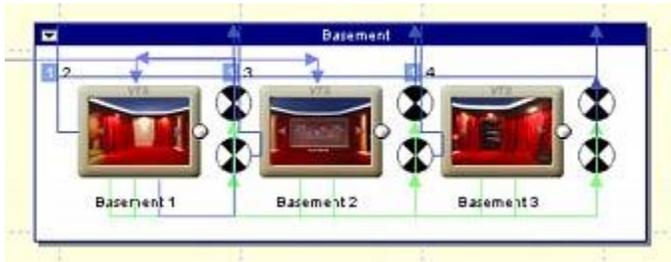
### Still menu template

This is a template that will be added on top of the still image in each point of interest. It simply add buttons to right and left so user knows what action is expected.

### Generate

It will ask us for a name (as \*.m2v file). After that it will take few minutes because the transition movies will need to be generated into MPEG-2 mini-movies.

Here we have panorama with 3 points of interest and total 6 transitions between them.



A central dummy button is also added to each menu. This is the default "first" but invisible button. As soon as user press left or right button on remote the left or right button will be activated (they have auto-activate property set) and the transition movement (rotation of camera) is played.



 **Note:** The invisible central dummy button can be also later used to link various panoramas together. For example here if user press enter it may "go" to the room behind the door or go to any normal menu.

 **Tip:** You don't have to limit yourself to a virtual tours. Take a panorama image of your desk or room and use various items as buttons.

The Panorama menu is a generator helper. If you need to change something you have to generate whole panorama again. It doesn't keep the values so once the dialog is closed all settings are lost.

### Template

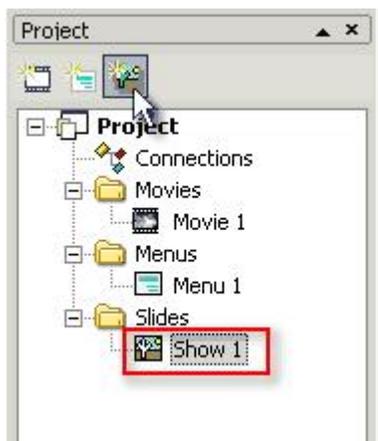
Template is simple \*.stm style placed in Styles - Panorma folder. It has one central invisible button or Group Hotspot that needs to be named CENTRAL (in the Button Label) and has to be the first button - it must be on the bottom layer. Then we have one left button named PREV and one right button named NEXT. The background of the template will be replaced by the panorama snapshot. You can load one into menu (Menu - Load menu) and see in detail how it is done.

## 8 Slideshow

### 8.1 Slideshow

#### *Slide-Show - Add New*

Slideshow is a special movie object where each frame is a slide (a video still). You can set the duration of the slide and also add audio as background music to the Slideshow. To add a new Slideshow object, click either *Slide-Show - Add New* from the DVD-lab top menu or from the Project view, right-click on Slides, then click Add SlideShow. To work on an existing Slideshow object (like Show 1) , double- click on it's icon within Project.



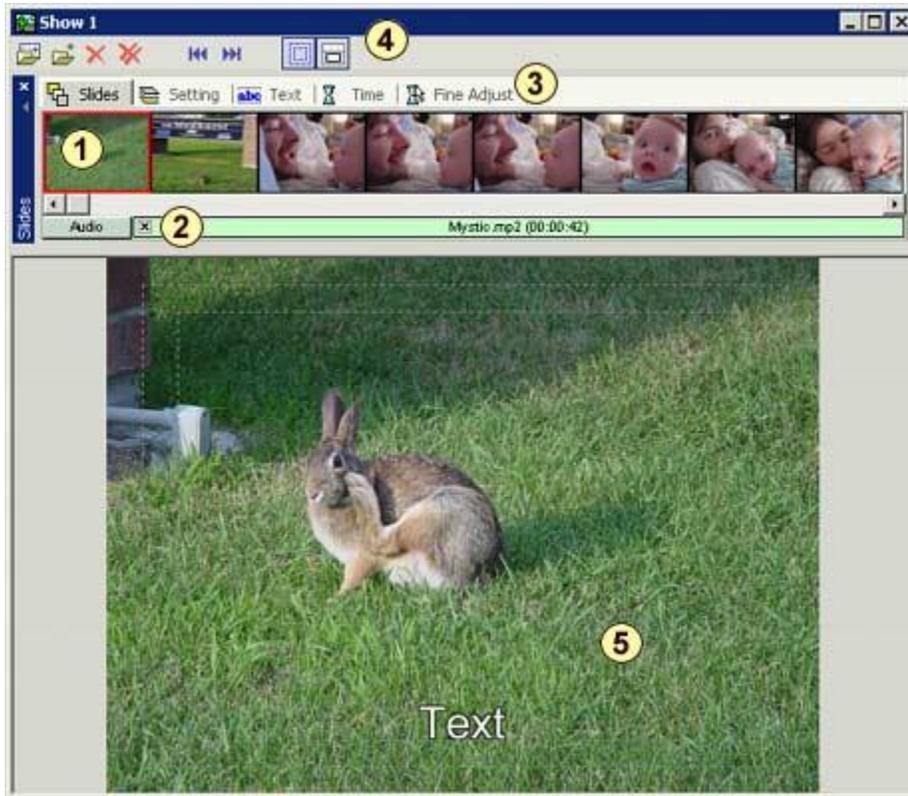
Like other DVD-lab windows, Slideshow is a dockable window which can be moved or reconfigured as needed.

### Slideshow Basics

The Slideshow window has its own unique layout and functions. Here are the main components:

1. Slide list
2. Audio Track

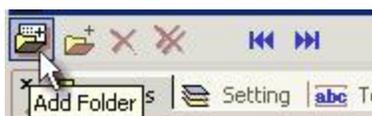
3. Settings
4. Tools
5. Slide Preview



### Add Slides

The basis of this window is to arrange a list of still images (slides) in a list. To start, we will bring some slide elements into slide containers on the Slideshow timeline. As is true in other DVD-lab windows, you can drag-and-drop files from Assets / Images Bin into a slide container.

Another way to bring in slides is to add slides into the slide list using Add Folder or Add Slides, see the top left of the Slideshow window for these buttons.



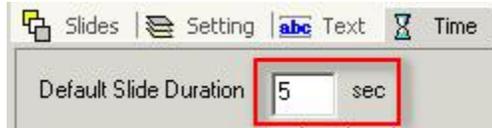
The Maximum number of slides in one Slideshow is 99 slides. You can however create more than one Slideshow object optionally linking them together in the same way as Movies are linked.

### Add Audio Track

To add audio to the Slideshow, Drag & Drop an audio file from Assets to the Audio Track or Slide Preview.

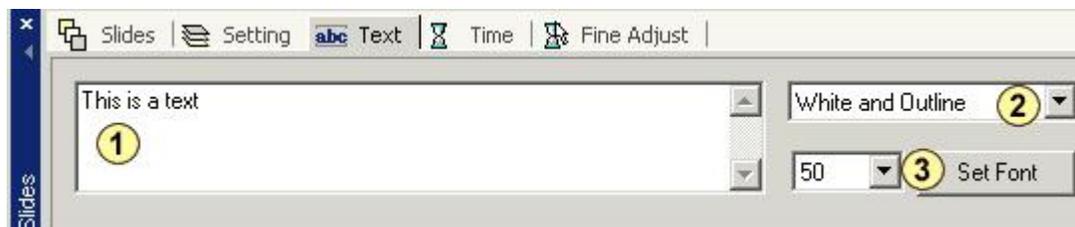
### Set Default Slide duration

Click on the Time tab in Settings and set the default duration of each slide. This is the time in seconds that each slide will appear on screen before going on to the next slide.



### Add text to a slide (optional)

You can add a text line to a slide. Select the desired slide in the Slide list (notice the Red box around the slide frame when selected), click the Text tab in the Settings and type any text to be displayed with this slide.



1-Type the text that is to be displayed here

2-Text style

3-Text size and font

### Text Style

There are various types of styles of text defined: White/Black/Yellow text on solid/transparent background, outline, etc.. Text often looks best on a TV screen with a slight drop shadow or outline as is the default.

 **Tip:** While the text editor is open, should you want to edit text on another slide, you can move to the next slide by clicking either of the Next/Previous slide buttons shown here.

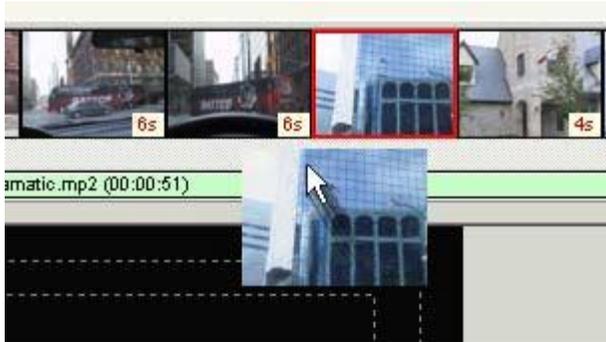


### Remove Slide(s)

You can remove the current slide or all slides with the Remove buttons on the Slideshow tool bar shown here.



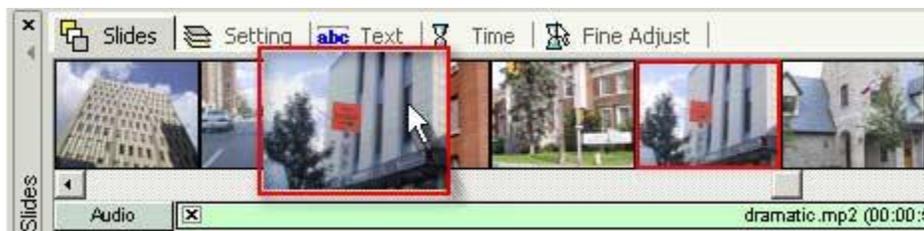
You can also remove the slide by dragging it from the slide list anywhere outside of the slide list (for example to the preview)



 **Note:** You can drag the slide from the slide list to a Menu. The slide will be removed from the list, but it will be inserted in the menu as object. You can also copy the slide to menu by doing the same while holding the CTRL key.

### Re-arrange slides

You can easily change the order of the slides by dragging a slide within the slide list to a new position.

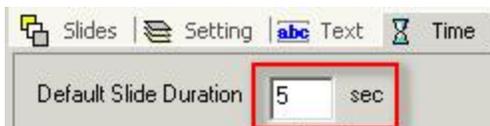


## 8.2 Slideshow Timing

DVD-lab's Slideshow feature has options for fine tuning the durations of slides and matching up audio content with the Slideshow as video content. Each Slideshow object can have up to 99 slides contained within it. A Project can have multiple Slideshows, linked together or linked to separate buttons as you might with a Movie.

### ► Default Slide duration

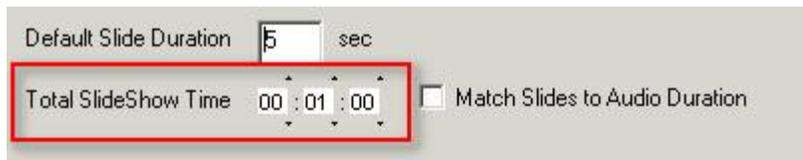
Click on the Time tab in Settings and set the default duration of each slide. This will be the default playback time for all slides in this Slideshow.



Each slide in the Slideshow will be displayed for the number of seconds set here.

### ► Total Slideshow Time

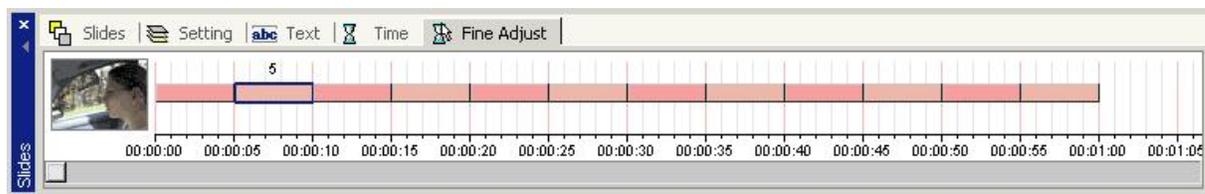
This is a helper setting in the Time Tab



The number of slides and the Default Slide Duration are multiplied and displayed as SlideShow Total Time. If you change the Default Slide Duration, you will notice the Total Slideshow time changes as well.

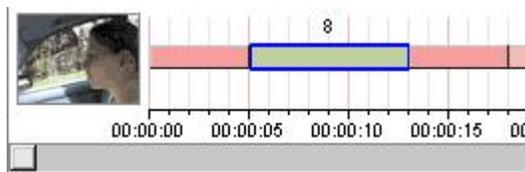
You can also change the Total Slideshow time by clicking the up / down arrows on each of the numbers, in the Hours, Minutes, Seconds columns from left to right. The Total time will be divided by the number of slides and the result, the calculated default time for each slide will be posted into the Default Slide Duration box. Since the time for each slide is set in seconds, not all changes in Total time will affect the Default time duration.

### ► Fine Adjust tab



The playback time of any slide can be directly adjusted individually in the Fine Adjust tab, as show above. Each slide is represented by a colored bar segment on the screen, If you click on the bar, the duration time for that segment will be displayed on top and a tiny slide image thumbnail will be displayed on the left.

Click on the screen in the segmented area that represents a slide, hold down the mouse button and move the mouse left or right. This will increase or reduce playback time for that particular slide.

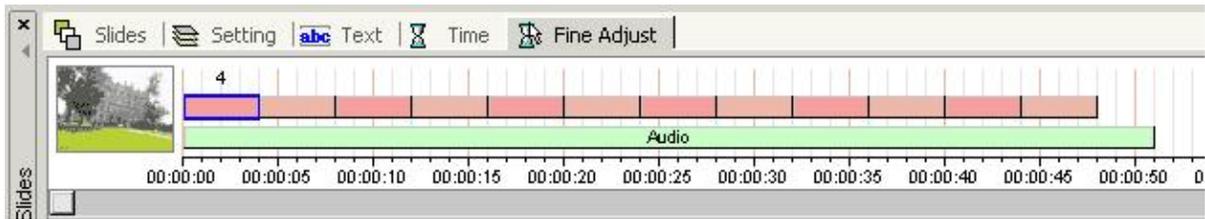


### Red and Green bars.

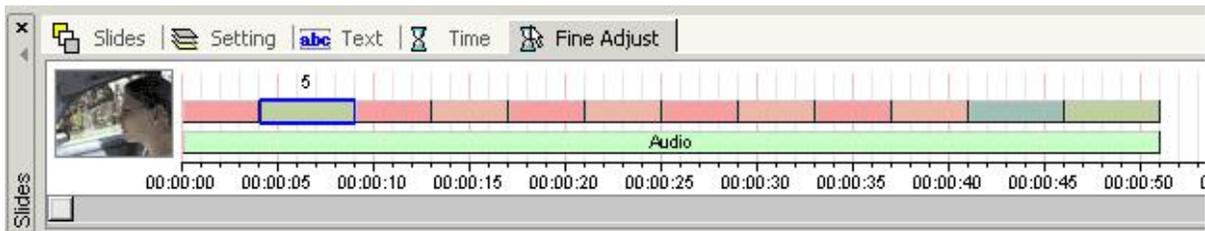
The red bars indicates that the duration time is set by the default duration. If you change the default duration, all red bars will change and segments are redistributed. The green bar indicates that the duration time was adjusted manually. A duration time can be set to more or less than the default duration. The changing of the default duration time has no effect on the duration time of the manually set green bars.

### Match Slides to audio duration

When you add audio track, its length will be displayed below the slide bars.

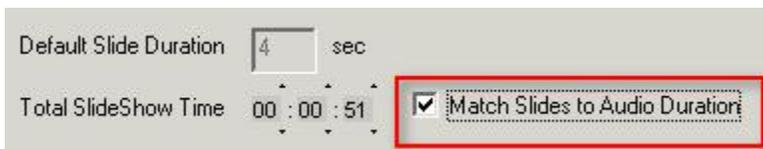


To make your video content match up in total time with the total time of the audio (which is set), you can move the duration slider for one or more segments to fit to the length of audio track.

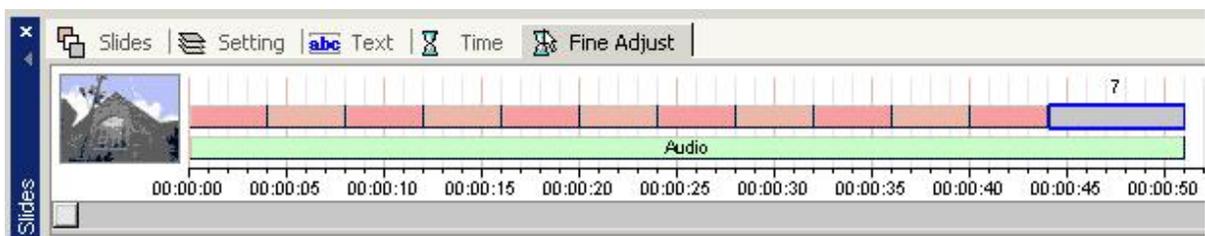


This is fine, but when you add one more slide or change the duration time of a slide, the timing will be off regarding the video total time matching up with the audio duration.

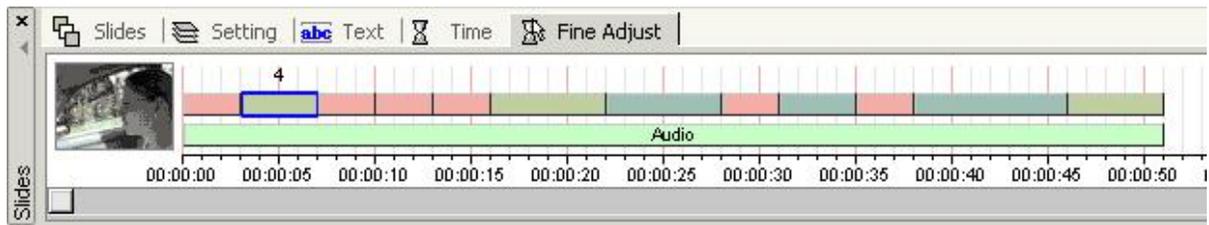
There is a better way to do this. Make sure that all the slides are in Default Time (resize them until they are reddish). Set the **Match Slides to Audio Duration** checkbox to checked.



The default slide duration will be adjusted to fit to the audio length and last slide duration will be adjusted to fit completely to the length of the audio.

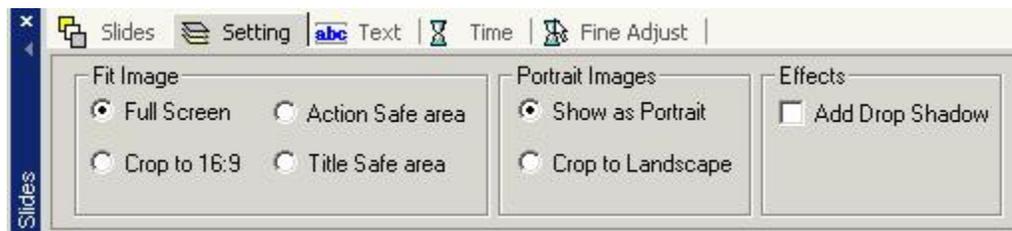


Now, even if you should add or remove slides or change the duration time of some, the total length of the video content is tied to the audio content.



## 8.3 Slideshow Advanced

### Slide Settings (global for all slides in the current slide object)



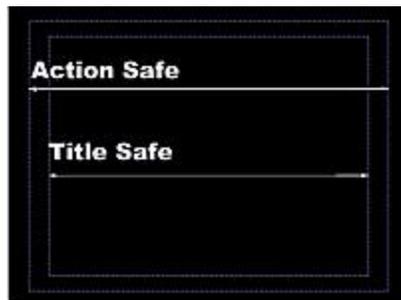
Settings made here will be in effect for all of the slides in this Slideshow.

#### Fit Image

This sets how the slides will fit to the screen.



- 1 - Full Screen
- 2 - Action Safe Area
- 3 - Title Safe Area

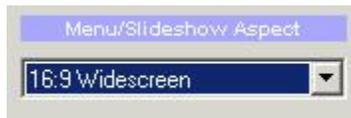


 **Note:** The normal tube TV's are usually set to overscan, that means you can't see the edges

and you lose up to 20% of the image you would see on the computer screen.

### Crop to 16:9

This setting is for 16:9 Slideshow/menus. You can set 16:9 aspect ratio for the Project in the menu *Project -Project Properties* (Menu/Slideshow Aspect)



A normal picture is in 4:3 aspect ratio, so displaying it in a normal way (Full Screen, Action or Title Safe) on 16:9 aspect will display the picture in the middle with black bars on left and right.

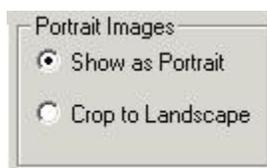


Crop 16:9 will enlarge and crop the picture to fully-fit the 16:9 display.

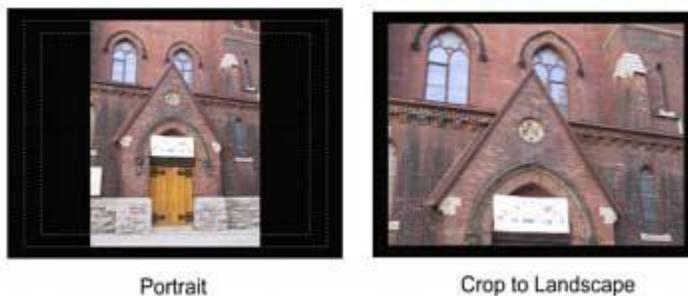
 **Note:** This works only for 16:9 aspect ratio projects.

### Portrait Images

Some images are shot as portrait. You can choose how these images will be displayed.



The Crop to Landscape setting will enlarge and crop the image so the main focus fits on a 4:3 display.



### Add Background

You can add a background under the slide if the slide fits in Action Safe, Title Safe or Crop 16:9. To add a background simply drag the background image from Assets-Backgrounds to the Slide Preview.



Slide Backgrounds are global to the Slideshow Object. All the slides in the current Slideshow will have the same new background instead of a black frame.

### Remove Background

To remove a background from a slide, select the slide, right-click on the slide preview and select "Remove Background".

### Add a Drop Shadow

To spice up the image you can also add a drop shadow for all slides in the Slideshow with the Setting / Effects / Drop Shadow checkbox.



## 8.4 Audio Cuts

Any slide can start playing different audio than the one set in Audio track. To do this, drag and drop an audio file from assets onto the particular slide in the row of slides at the top.



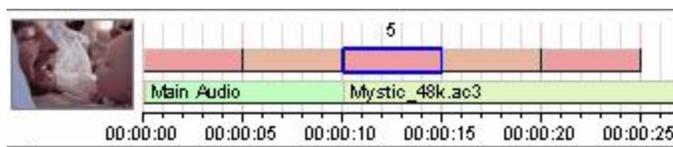
Such slide will be then marked with Audio sign and from that time new audio will play.

When you select that slide or any slide after it the new audio will appear in the Audio bar.



To delete the Audio Cut, select the slide with the audio change and click the x button on the Audio track.

To better see the different Audio changes in relation to the slides, switch to the *Fine Adjust* tab



When you re-arrange slides, the audio cut will be kept with the particular slide.

## 9 Audio Title

### 9.1 Audio Title

*Project - Add Audio Title*



Audio-only Title is a "Movie" that has no video, just audio track(s). This can be used for demo songs that can be recorded in high quality or surround sound. Also you can add more music to DVD than to CD.

Audio Title is very similar to a Movie in many ways. In fact from DVD's point of view (if it

has one) Audio Title is a movie where the video part is just a still image.



When you first create Audio Title it is empty. You need to drag any DVD audio to the window (AC3, MPA, PCM, DTS) from Assets.

Once the Audio Title has audio track a timecode will appear.

You can add up to 2 audio tracks.

### Title Screen

The Black part (where the video would normally be) says "Double-click to create/edit title screen".

When you double-click on it a edit window similar to menu editor will appear. Here you can type text of the song, insert a picture etc. Then close the editor.

### Marks

You can add "Chapter Points" to audio title that are called "Marks". Adding Marks is more for creating a fast way to skip through the song(s) than anything else. You can apply same tools as in chapters for a movie.

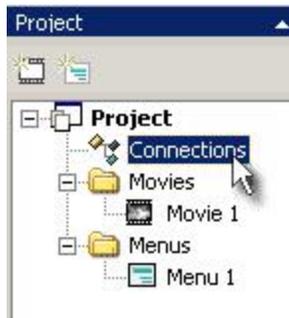
**Each** mark can have its very own Title Screen. If you don't change the title screen it will simply keep the previous one.

In connections, the Audio title behaves the same way as movie and also the same things apply in regard to VM commands.

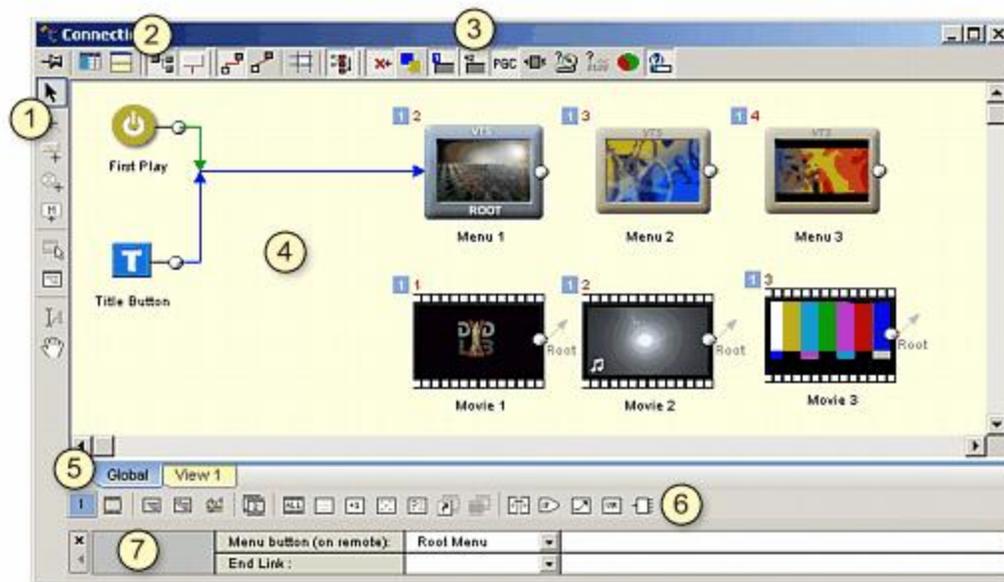
## 10 Connections

### 10.1 Basics

*To open the Connections view, double-click on Connections in the Project window.*

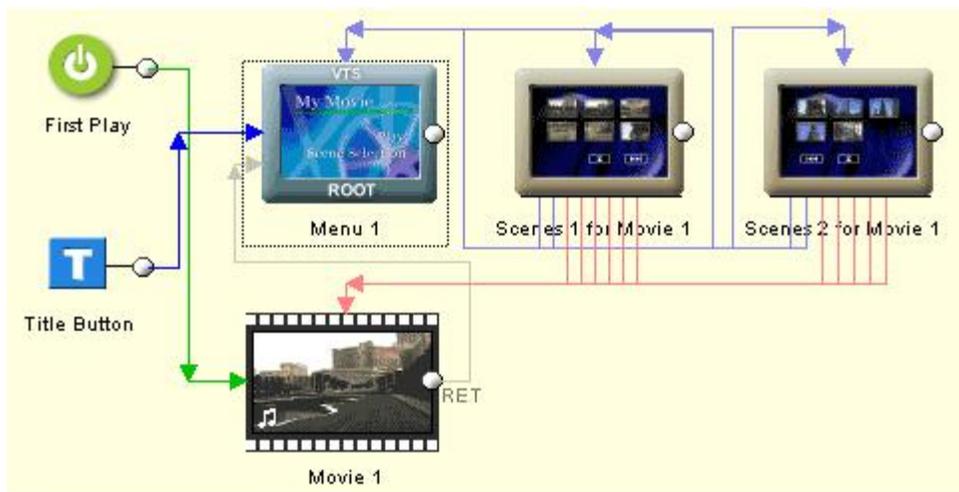


There are various elements of the connection window:



- 1 - Connection Tools
- 2 - Options
- 3 - Info tools
- 4 - Connection Canvas
- 5 - Sub-Views
- 6 - Basic DVD Objects and Advanced DVD Objects
- 7 - Quick Link Details

The concept of Connections is the essence of the DVD layout. Connections define how the various elements (Movies, Menus) are connected together.



### ► Why do we need a link?

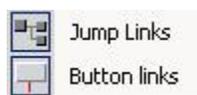
The links tell the DVD player what to play next when the current item has finished. A typical example is a Movie, when it finishes playing, we can have the DVD player return to a Menu or play another Movie. You can have many Movie segments linked together.

For Menus, dealing with what happens when it finishes is less important. Most Menus have a Timeout value set to infinity meaning they never "stop" playing. However, for those Menus that have an audio background, or Motion Menus or for Menus with a defined number of Timeout seconds, these Menus will in fact "finish" at some point. For these cases, we do need to define a link as to where to go next within our DVD-lab Project.

If a Menu has no link defined, then it is assumed to be looping (to itself).

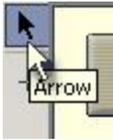
There are two types of links shown in the Connections view. First, there are the Item or **Jump links** (from the right side of an object to the left side of another object). These are links that you can draw connections for. Second, there are **Button links** within Menus. These links show a relationship from where the buttons are on a particular Menu link. Button links are display only, you can't draw or delete these links from the Connections view. You create or delete Button links from inside the Menu window by adding or removing links. Button Links are displayed in a light red color (for Movies) or light blue color (for Menus) and go from the bottom of a Menu to the top of a Menu or Movie.

You can show or hide displaying of these types of links via these Connections view controls.



### ► Moving Objects

You can move a Movie or a Menu object anywhere on the Connection workspace. To do so, select the Arrow tool.



You can move these items anywhere you like to better reveal the Connections or group the related parts together, etc.

### ▶ Multiple-Selection

You can select more than one object by drawing a rectangle around the objects or holding SHIFT while selecting the objects. You can move or delete multiple selected objects. First Play, Title or closed Components will not be selected into the multi-selection.

### ▶ Drawing Connection Links

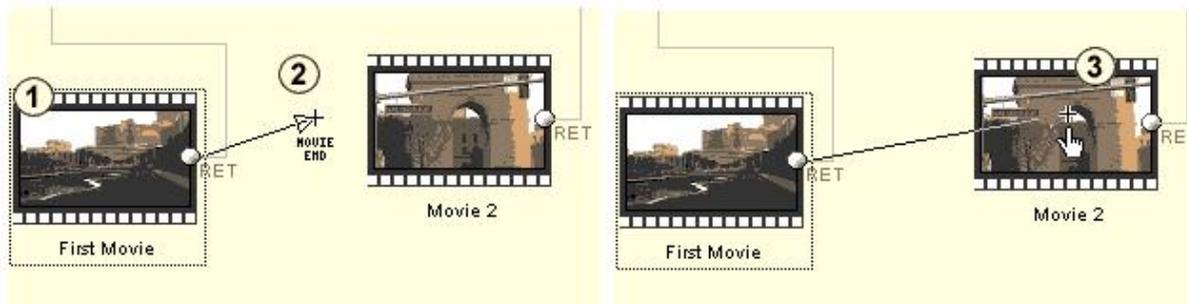
To draw Connections select the Draw Links tool.



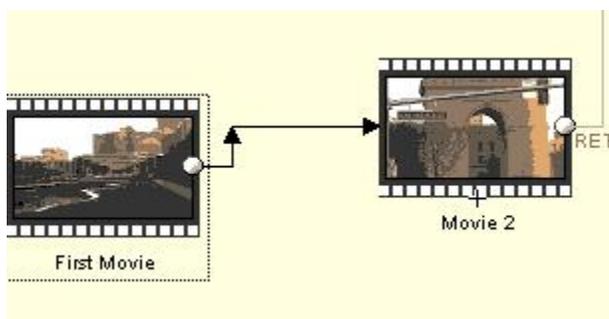
As you add new items you will notice that they are already connected by default. For example, all new movies will return to the Menu using RET command (image 1), the First Play will be connected to the Menu etc. You can leave these as they are or rewire the Connection as you need. For example, to connect movies sequentially (Image 2)



To draw a Connection, click on the Draw Links tool button, then click on the object **From** (Image 1) and drag the line (Image 2) to the object **To** (Image 3).



When you release the mouse button the new Connection will be made and a flow relationship is displayed.



#### ► Connection restrictions.

Due to various technical reasons, there are few restrictions as to how to make direct Connections.

1. The First Play, Title Button and VMG Menu can be linked either to **Any Movie**, **Any VMG Menu** or it can link to **First Menu (ROOT)** of any VTS.
2. The movies in one VTS can be linked together in any order. They can be also linked to any menu in the same VTS.
3. VTS Menus (using a Duration value or button link) can directly connect only to another Menu or Movie in the same VTS or any other VMG Menu. Don't mistake this with the button links on Menus! The button link on a Menu can link to **any Movie** or **any Menu**.

Here is a table for a better overview

	Connect to Movie	Connect to VMG Menu	Connect to VTS Menu
First Play	✓	✓	ROOT Menu
Title Button	✓	✓	ROOT Menu
VMG Menu	✓	✓	ROOT Menu
VTS Menu	✓	✓	✓ (in same VTS)

✓ means it can connect to Any of that item

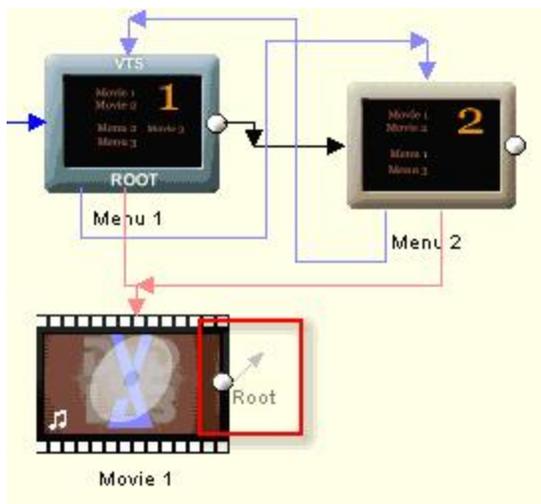
If you look at the table above you will see that these are in fact not that restrictive to your creative ability.

**Trick:** You can connect First Play, Title Button or VMG menu to any VTS menu by simply going through a short movie placed in the same VTS (such as 1 sec transition).

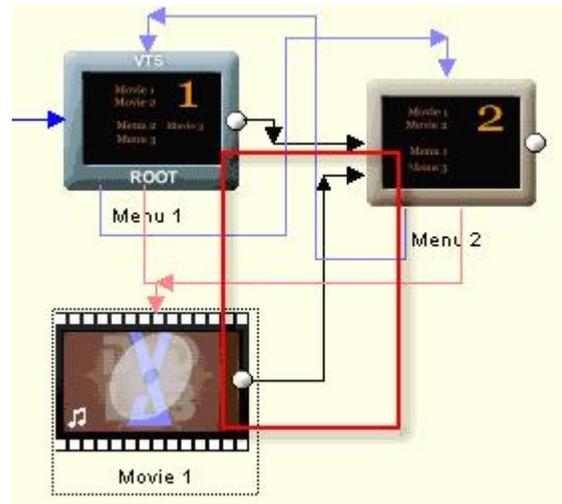
### ► Root command

Movie can return to the ROOT menu with Root command. That means if you start the movie playing from Menu 2 the Root command will return to first menu (Root) when the movie is finished.

To create Root link simply draw the connection from end of the movie to any free area.



Root - return to ROOT menu.



Direct link.

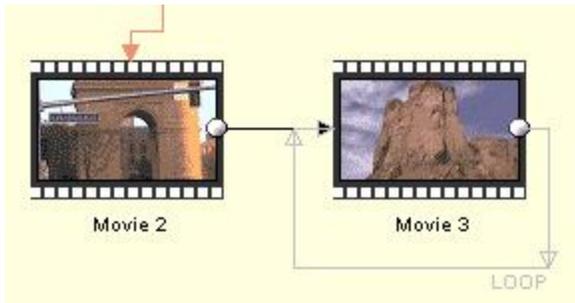
This time the movie always return to Menu 2, even if it has started from Menu 1

### ► Looping

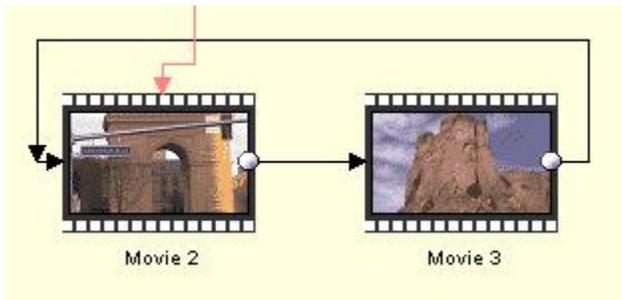
You can add looping to any item Movie or Menu. As stated before if a Menu has no exit link defined then it is assumed looping. Looping is especially useful for Motion Menu or Menus with audio.

To Draw a loop - click on the end of an Item (right side) and drag the arrow to front (left side) of the same item.

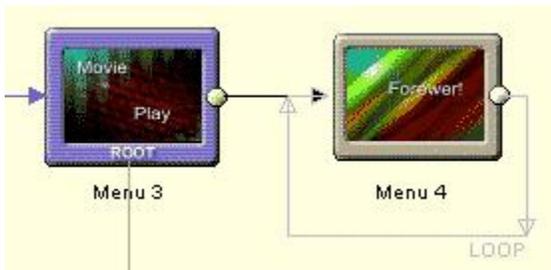
► **Movie looping** - a movie segment can loop to itself, that means it will play forever until you press Menu or Title on the remote.



You can also "loop" multiple segments together, but that's considered a "link".



► **Menu Looping** - The looping for Menus has meaning only if the Menu is one of the types that will "finish". These Menu types are: Menus with a timeout value set, Menus with an audio background and Motion Menus. For each of these types, we can define a Connection action to take when the Menu "finishes".

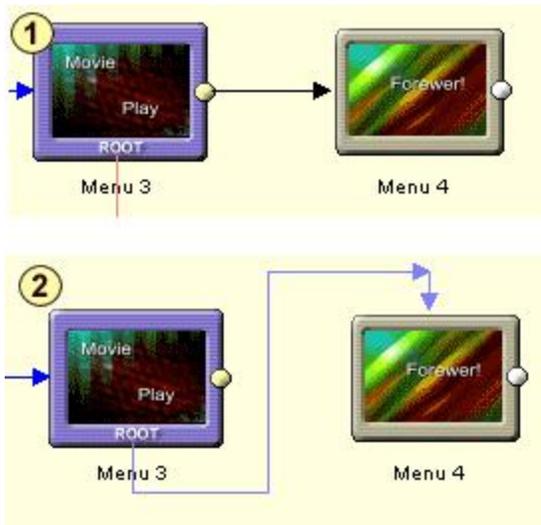


Make sure you create a button on a looped Menu by which the user may escape!

📄 **Note:** If you don't have audio, nor Motion Menu then setting some timeout value and also looping makes very little sense.

► **Menu Timeout vs Menu Button Link**

It is important to see the difference between Menu Timeout (Image 1) and the Menu Button Link (Image 2)



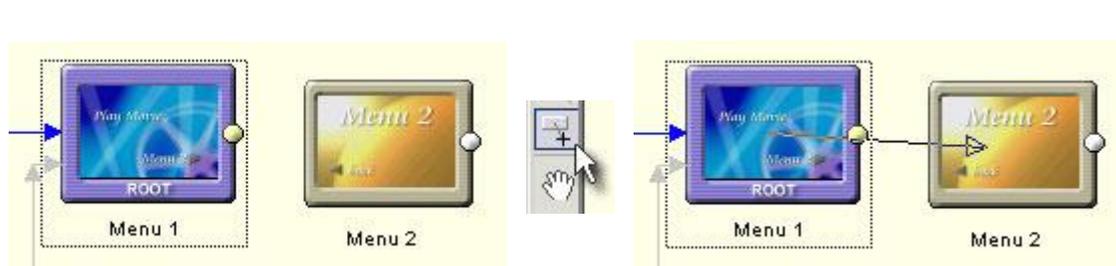
Both features connect Menu 3 to Menu 4, but the **Image 1** feature relies on fact that we set a timeout (ex. 10 sec) or there is an audio background or motion video on the Menu. The player will go to the Menu 4 after it has been played or the time-out occurs. If we don't set the timeout or there is no audio, or not a motion Menu, the link will be never executed.

**Image 2** connects Menu 3 to Menu 4 through a Button link. This means user either needs to click on the button or if we set a timeout value (or have an audio background or a motion Menu) and use Force Activate Btn. then the player will jump to menu 4 automatically.

► **Button Connections**

So far we covered connecting objects when the object comes to an end (end of the movie, end of the Menu). The Connection view also allows you to connect Menu items (buttons) to objects. This is normally done in the Menu designer and it is described in detail there.

For better flexibility, you can connect Menu objects to a Movie or a Menu from Connections as well.



We want to link the button on first Menu with the second Menu.

Select the "Draw button Links" tool

Drag the Connection FROM the first Menu to the second object (Menu or movie)

A small window first Menu will appear you select the link

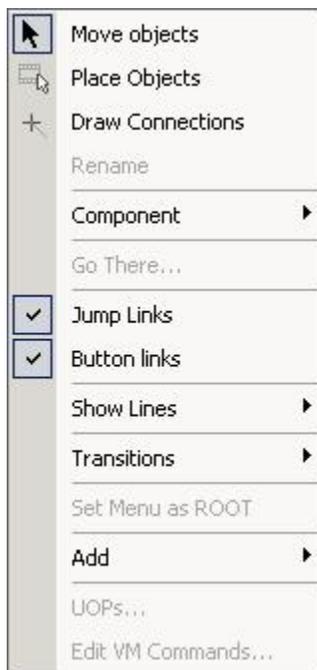
 **Note:** Buttons with NOP text are not yet assigned. NOP means No Operation.

### ► Use Connections as your Workspace

You can use the Connections view as your main Workspace. Within the Connections view you can easily add or delete Movie and Menu Items, add clips and audio files to Movies, add backgrounds, still images or buttons to Menus, edit transitions, rename objects. This can all be done directly from the Connections view.

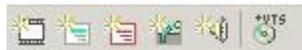
### ► Connection Menu

When you right-click on the Connection view you will see a Connection context menu as shown above. From here, you can access features such as Rebuild Transition or Rename as well as other navigational features.



### ► Add Empty Movie/Menu

There are couple of ways how to add new Movie or Menu



Clicking on a button in Project Window. This action will also open the newly created Movie/Menu as soon as it is created. The object will be added to the first empty place in Connection window following the internal rules.



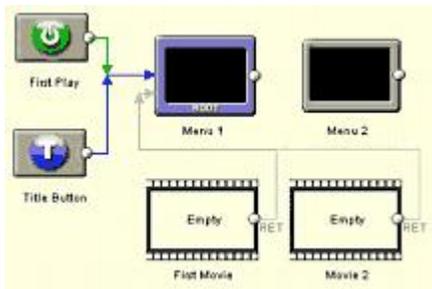
Clicking on buttons in Connections bottom bar or using Connections/Context Menu: *Add-> Empty Movie,...* The object will be placed to first empty spot in Connection but the new items will be not opened in their respective windows. In this manner, you can add additional empty items to the Project as needed and then edit them later in their respective view.



Using Place Objects button in Connection view. This will allow to add new Movie/Menu on the place of cursor. You can continue adding items until you select other tool.



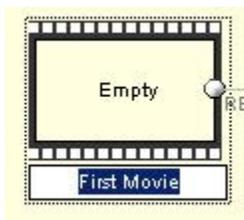
It may seem that adding new objects is redundant in DVD-lab (it is used in many places) but it is done on purpose. Adding Movies and Menus is the most used function and user can choose the most suitable way to do it.



Here we have added a Menu and two Movie Items, ready for development.

### ► Rename

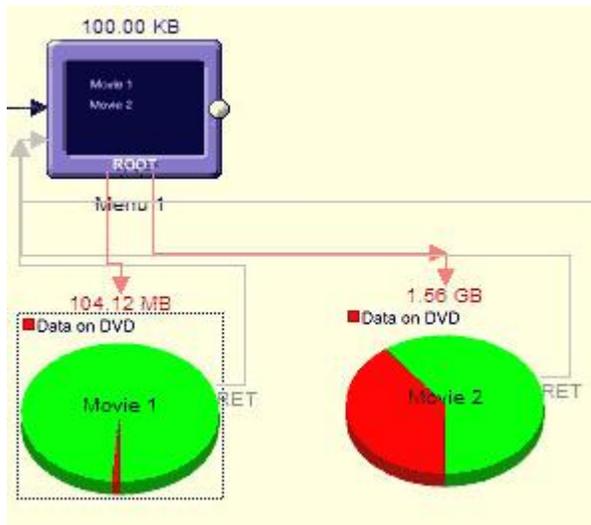
You can rename Items by selecting the Item and pressing the F2 key or the right-click Connection context menu and select Rename. Type the new name, then press Enter to confirm it or Esc to cancel.



### ► Size Size / Show Pie



At the top of the Connections view are two buttons for Project statistics. Use the Size and Pie buttons to see an overview of each object's size and percentage of use on a 4.7 GB DVD disc.

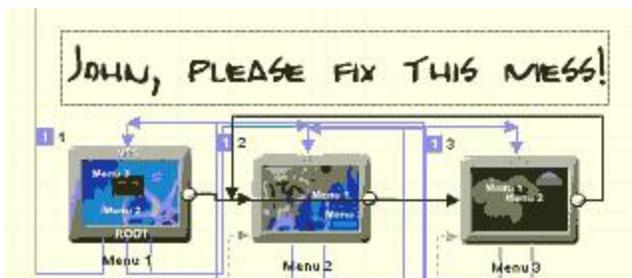


See more in options.

### ► Text Notes



You can add many free text notes on the connection canvas. They can be in any font and any size. They will be saved with the project \*.dal file.



## 10.2 First Play

*To open the Connections view, double-click on Connections in the Project window.*

The DVD Project has a few special entry points, from a viewer's point of view:

**First Play** - This is the very first item to play when the DVD starts. A DVD starts when a disc

is inserted into a DVD player or when the Play button is pressed on Remote. The DVD Author can decide to have the player start the Program by showing a Menu or a short clip and then go to a Menu or to immediately start playing the main feature or combination of these features.

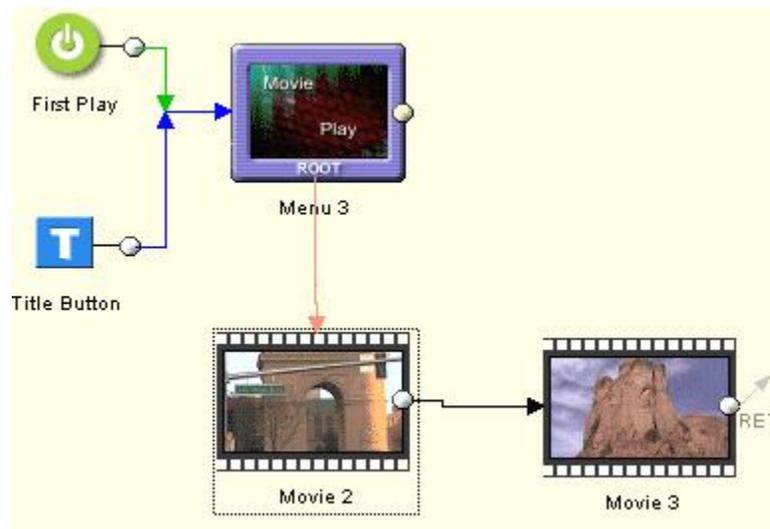
**Title Button** - This is the action to take when the user presses the Title button (AKA Top menu) on their remote control.

**Menu Button**- This is the action to take when the user presses the Menu button on their remote control.

Here are the most common examples:

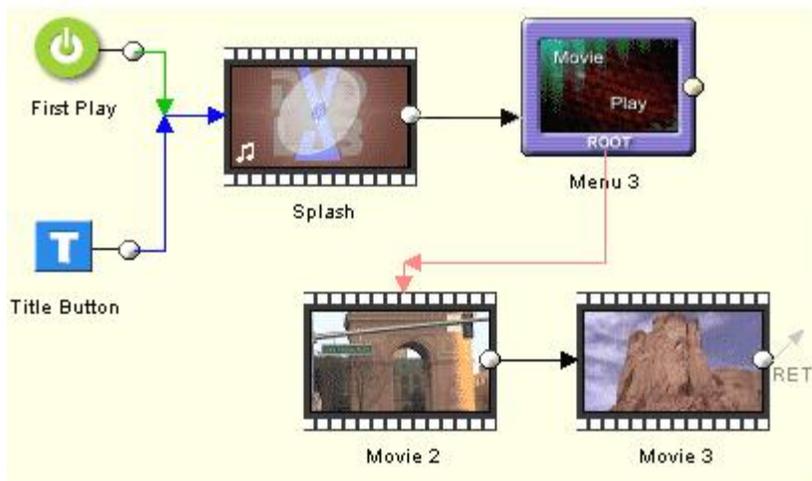
#### First Play - **Play Menu**

This is the default Connection, the First Play (and Title button) will start with the first Menu (which is called ROOT).



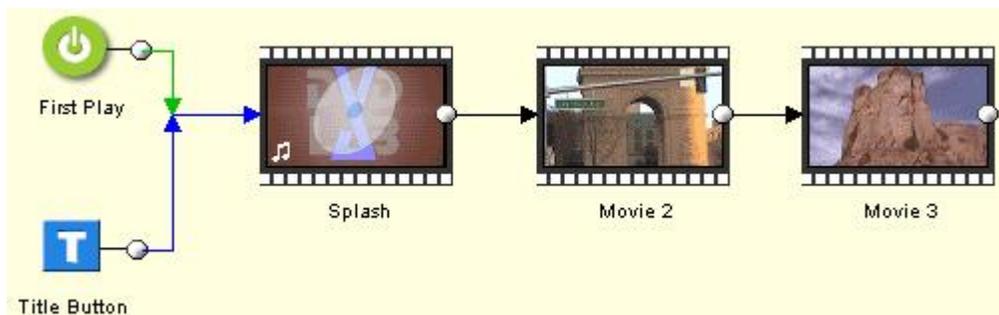
#### First Play - **Play short Clip, then Menu**

This is a modification of the above. When the DVD starts, a short clip such as warning or company logo is played first and then the player goes on to the main (ROOT) Menu.



### First Play - **Play Movie**

You don't have to have a First Play at all. The DVD Author can decide to have the player just start playing the main feature movie immediately, without the need of an initial Menu. You can also have the player first play a short clip and then the main movie, similar to the following Connections.



The DVD Author can also decide to combine these features to create a custom flow. Immediate movie play with return to a menu is such a combination that might be useful. We can do all of this within the Connections view.

First Play can be connected to any VMG Menu, Any Movie and First (ROOT) VTS Menu in each VTS

	Movie	VMG Menu	VTS Menu
First Play	✓	✓	ROOT Menu only

## 10.3 Title Button

*To open the Connections view, double-click on Connections in the Project window.*

A DVD remote has two kinds of "Menu" buttons. One is called simply Menu and the other is called Title Menu, Title, Top Menu, Digest and few other creative names just to confuse people.

Here is a simple remote from DVD. The Title menu is here called Top Menu.



DVD-lab Also known names on remote controls  
PRO calls it

Title Button Title Menu, Title, Top Menu, Digest, Menu

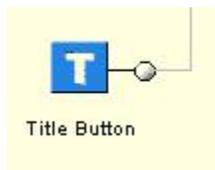
**Title (Top Menu)** - This is the action to take when the user presses the Title button on their remote control.

**Menu** - This is the action to take when the user presses the Menu button on their remote control.

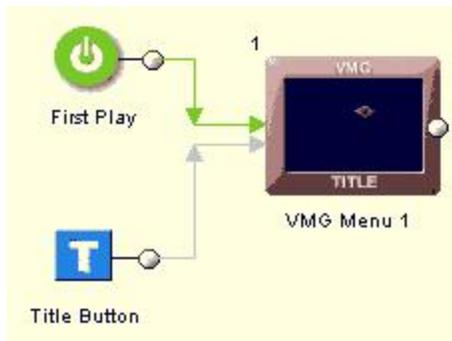
#### ► The Title Button Connection

The Title Button is similar to the First Play function with the difference being that it's interactive where First Play is always automatic and out of the users control. We define connections for the Title Button as the action to take when the user presses the Title button on their remote control.

A Title Button is on connections represented by blue "T" icon.



You simply connect it same way as you do other objects or first play icon.



Title button can be connected to any VMG Menu, Any Movie and First (ROOT) VTS Menu in each VTS

	Movie	VMG Menu	VTS Menu
Title Button	✓	✓	ROOT Menu only

## 10.4 Menu Button

*(Do not confuse this with a button on menu)*

To open the Connections view, double-click on Connections in the Project window.



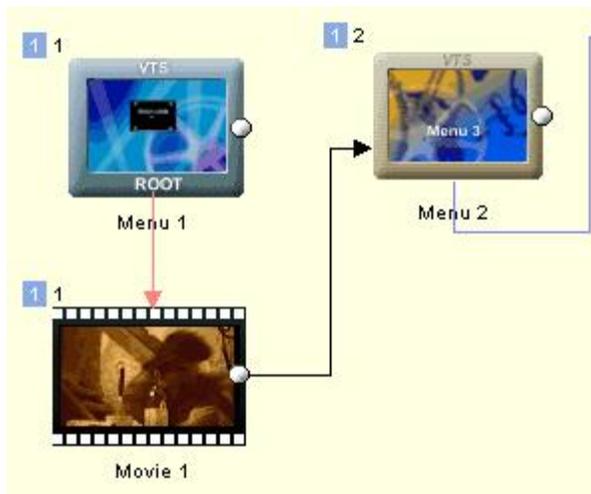
The second "Menu" button on DVD remote is almost always called "Menu" (Unlike the "Title Menu" button). But some players may use other creative names.



DVD-lab PRO calls it Menu Button Menu, Root

Also known names on remote controls

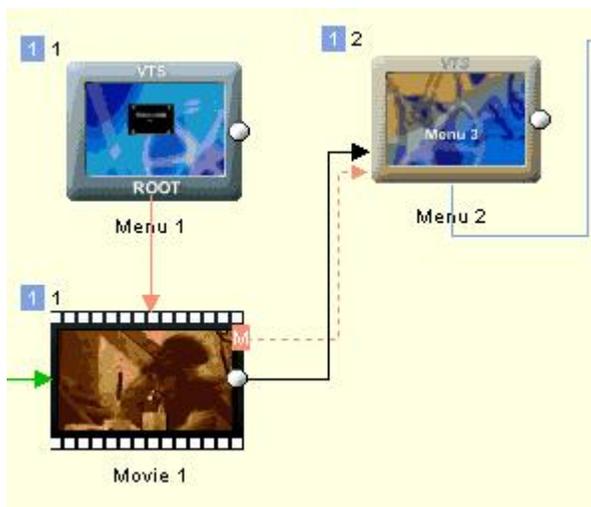
Its default function is to go to ROOT menu of the currently played VTS:



In this simple situation above, when the Movie 1 finish playing it will end up in Menu 2. But if during movie playing user press "Menu" button on his remote, it will go to ROOT menu (Menu 1). That's by default - there is no need for any link.

In most cases this is what we want, but let's say in this situation we would like to go to Menu 2 if user press "Menu" button .

Simply click on the 'Menu Button' Link button and draw connection from movie to Menu 2:

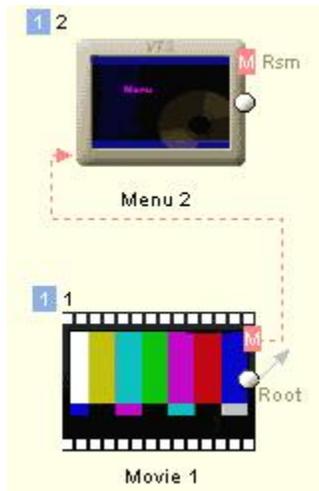


Now during playback of Movie 1 if user press "Menu" button on his remote, it will go to Menu 2.

### Self (RSM)

On some players the Menu button has also a secondary function - Resume. (Some players have separate Resume button, some don't). While playing movie, the **Menu** button on remote will bring us to menu (this we already covered above), but when we are on a menu the **Menu** button will work as Resume and it will resume the played movie from last position. We have

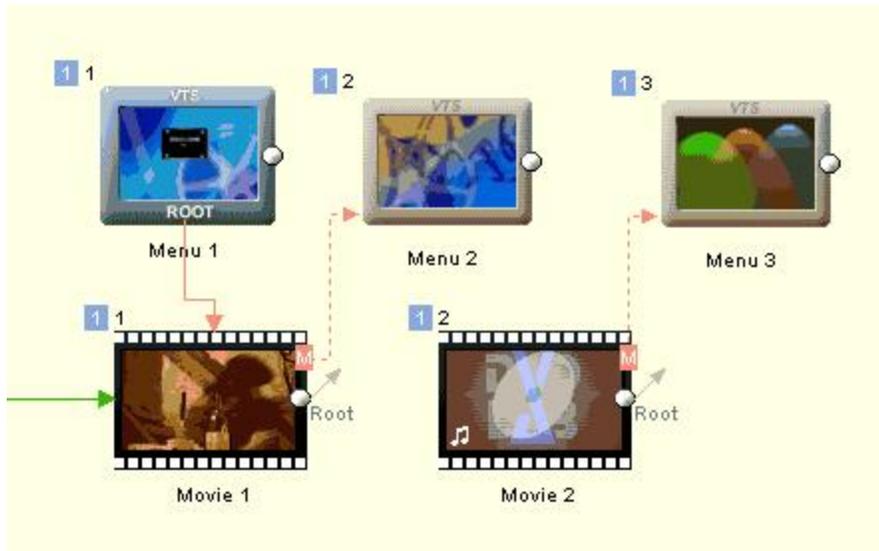
to take this behavior to account. The safest bet is to assume that all players Menu button works also as Resume. Therefore if you link Menu button from a Movie to a Menu, the menu will be also set itself automatically as Menu Button link.



The effect of this is that **Menu** button pressed on the remote will resume the movie and remember where to return in case of repeated calling Menu button. In case that player doesn't have Menu button working as a Resume we will simply stay on the same menu.

You already should know that because of the differences between players, the task of DVD author is not only blindly drag and click but he has to always think about maximum compatibility and find the best working scenario. The Menu button is a good example. Not only names are confusing, but often also functionality. Some players while playing menu will use Menu button as Resume, some others will call Root Menu. Having set Self (RSM) on a menu that is a recipient of Movie Menu button, will create the ideal common logic that will satisfy most scenarios.

 **Note:** Unlike the Title Button, where we have only one possible connection, each object can have its own "Menu" button. Depending on which object is playing, pressing Menu button may have different effect.



For most projects you can simply leave Menu Button as it is. It will then serves its primary function to jump to ROOT menu of the currently played VTS.

Menu button can be connected to any VTS menu but only in the same VTS. If it is not specified, it will always go to ROOT menu of currently playing VTS.

 **Note:** Having different Menu button functionality for each object is a specific feature of DVD-lab Abstraction Layer.

	Movie	VMG Menu	VTS Menu same VTS	VTS Menu different VTS
Menu Button	No	No	✓	No

## 10.5 Playlists

DVD-lab has several objects that are called "Lists". They simply list a number of movies or menus that can be accessed through the object. These movies or menus are not added as duplicates to DVD. The list holds only a "shortcut" to them.



### VMG and VTS Play List

Menu: *Connection - Add - Play List*

Menu: *Connection - Add - Single VTS Play List*

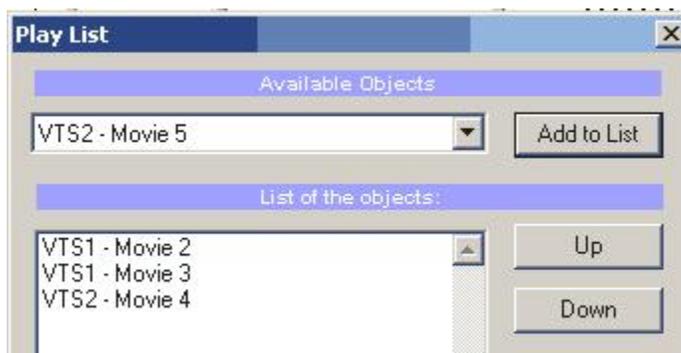


Play List will play all movies one by one in the order they are listed inside the Play List object. The last movie will return to the end-link of playlist.



**Advanced info:** The Playlist object is in VMG domain and therefore it can access movies in any VTS. There is also a special Single VTS version of play list that can be added with menu: *Connection - Add - Single VTS Play List*

To define the play list you have to double click on it in connections window.



Here you can add items from "Available Objects" to the list.

The list uses GPRM13 register. It is safe to have many Play lists in a project.

*Example of usage:*

Create DVD with numerous movies that has a Play All function. The Play All button simply link to a Play List. Play List has listed all the movies we would like to include in Play All. The end of Play List goes back to Menu.

**See also:** Chapter Play-List

### Play All

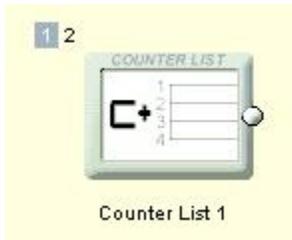
A special type of VMG Play List is a Play All object.

You don't have to add any Movies inside. When the Play All is called, all existing movies will play one after another in the same order as added in DVD-lab project.

## Counter List

Menu: *Connection - Add - Counter List*

Each time you navigate to Counter list, the next item in list will play or show. After all items were called, the counter resets and return to the object end-link.



Counter list is in the VTS domain. It will list the Movies and Menus from that VTS.

*Example of usage:*

Create a DVD that each time you go to menu shows a slightly different menu. You need to create number of similar menus, then add their "links" to Counter List. Create Loop - link the end of Counter List with its start. Anytime you want call a next Menu, call the Counter List.

Depending on the application, it may not be safe to use more than one Counter List at the same time, because they will affect each other.

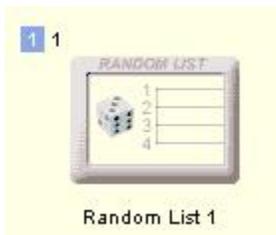
*Technical Note:* All Counter Lists in project shares GPRM14 for the counter. That means if you call 3 times Counter List 1 and then call counter list 2 it will run its 4th item unless you set the GPRM14 to zero first.

## Random List

Menu: *Connection - Add - Random List*

Very similar to Counter List, but the items in list will be called in pseudo-random order. This will continue as long as you keep calling the Random List

 **Note:** This object, unlike Counter list, may call the same item more than once.



Because of the nature of random list, it is safe to use more than one Random Lists in a project on the same time. However Random lists will affect the counter value in Counter Lists.

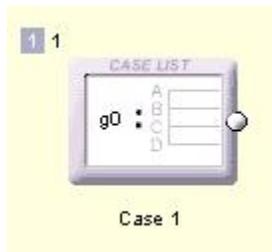
*Technical Note:* Random List and Counter list share the same register GPRM14. If you first

run Random List that will randomly go to item 3 and then call any Counter List, the counter list will continue with item 4 unless you set the GPRM14 to zero first.

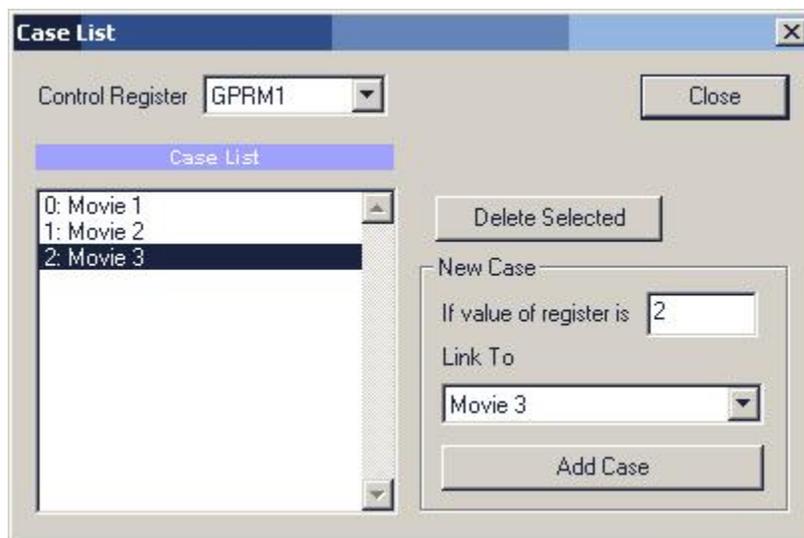
### Case List

Menu: *Connection - Add - Case List*

Case list is advanced type of list that requires to work with registers. Depending on the value of control register the case list will go to the defined "case".



If you double-click on a case list it will open its definition



The image above shows a case list that depends on a register GPRM1. If the GPRM1 is 0 then the listlink to Movie 1, if it is 1 then it links to Movie 2 etc. You can freely define the values and the link objects as long as the objects are in the same VTS. Case List can also address VMG menus.

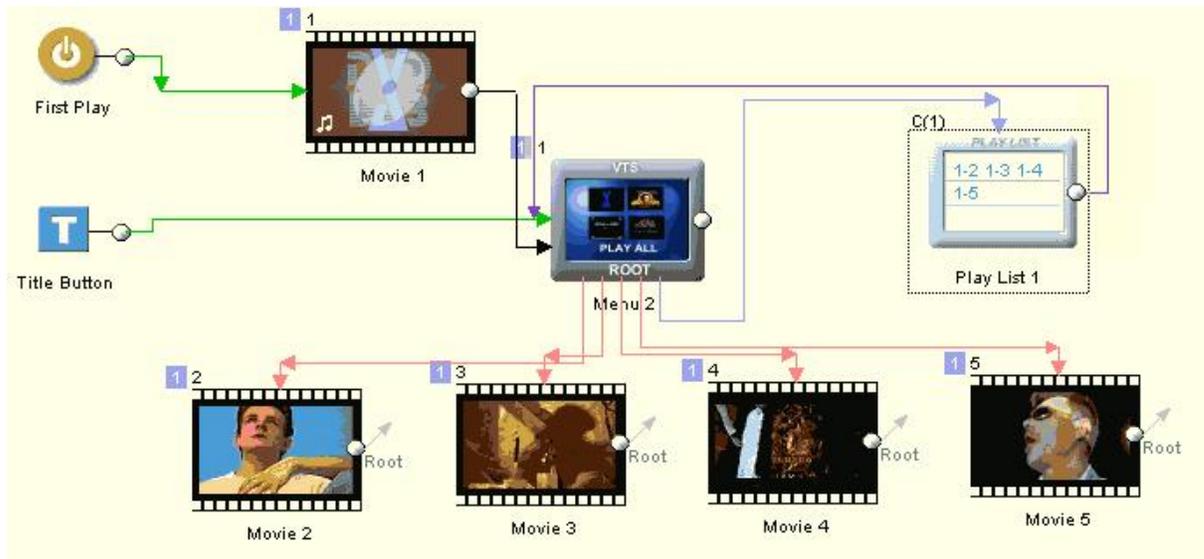
It is safe to use as many case lists in the project as you require.

A good advanced example of Case list usage would be to have Movie link to different Menus when you press Menu button on remote depending on the current chapter you have been watching. You will need to link the Movie to the Case List using the special Menu button Link (red dashed line) and set the condition register on each chapter VM command to different number (or test PTT register on the Case List PRE command, then fill the condition

register accordingly)

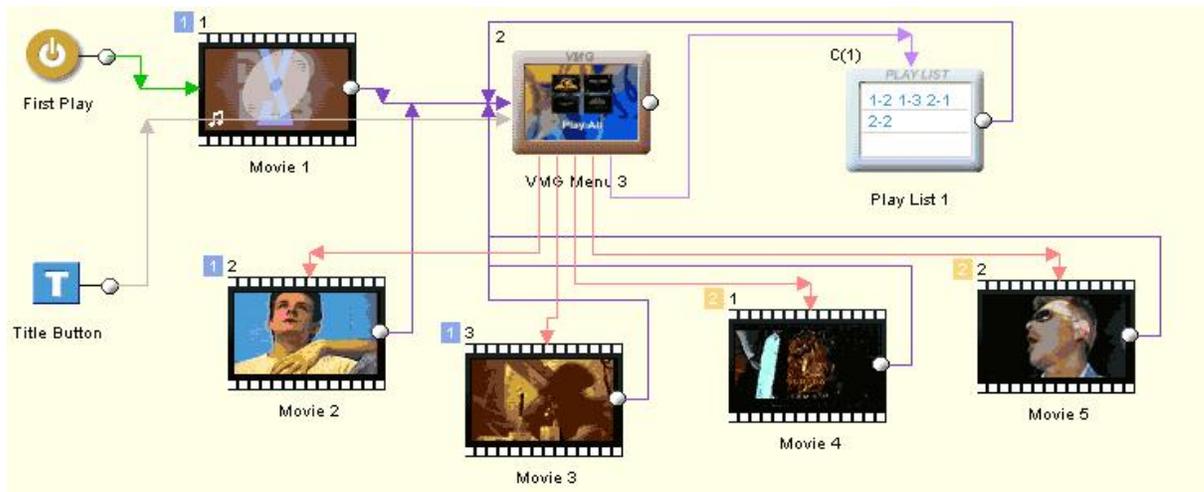
## Few examples with these objects:

### PLAY ALL example 1



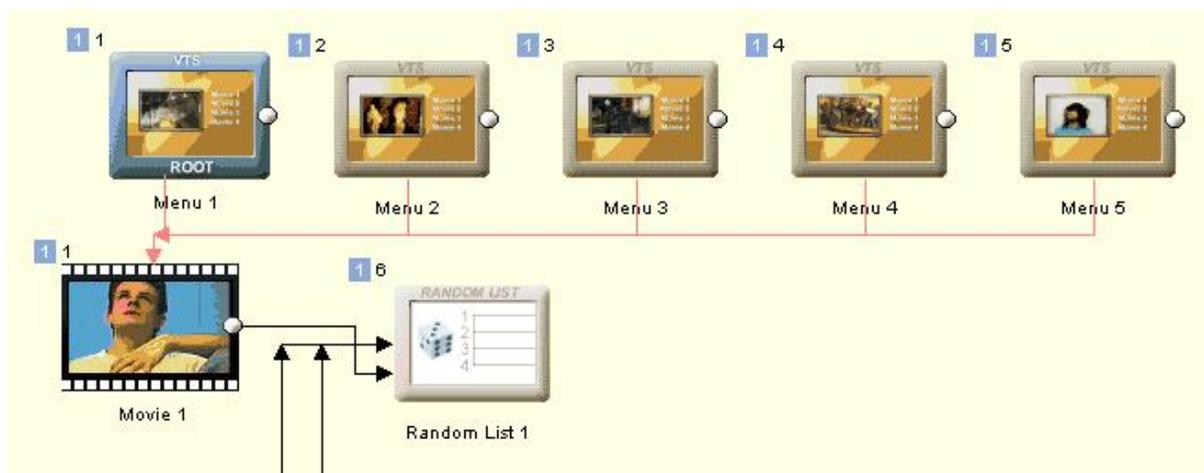
The project has 5 movies from which the first one is used as a "splash" or overture and it is called first thing as you start playing DVD, then it goes to **the VTS menu**.. Each Movie has its button in that VTS menu so it can be directly called. The end of movie calls back that menu - it is Root menu, but it can be of course linked to any other menu you need. The VTS menu has also **Play All** button that links to Play List. The Play list lists Movie 2, Movie 3, Movie 4 and Movie 5 (we don't want to play our overture Movie 1 in the sequence of movies). The the end of Play-list goes back to the VTS Menu. In this case we can use both Play List or VTS Playlist (all the movies are in the same VTS)

### PLAY ALL example 2



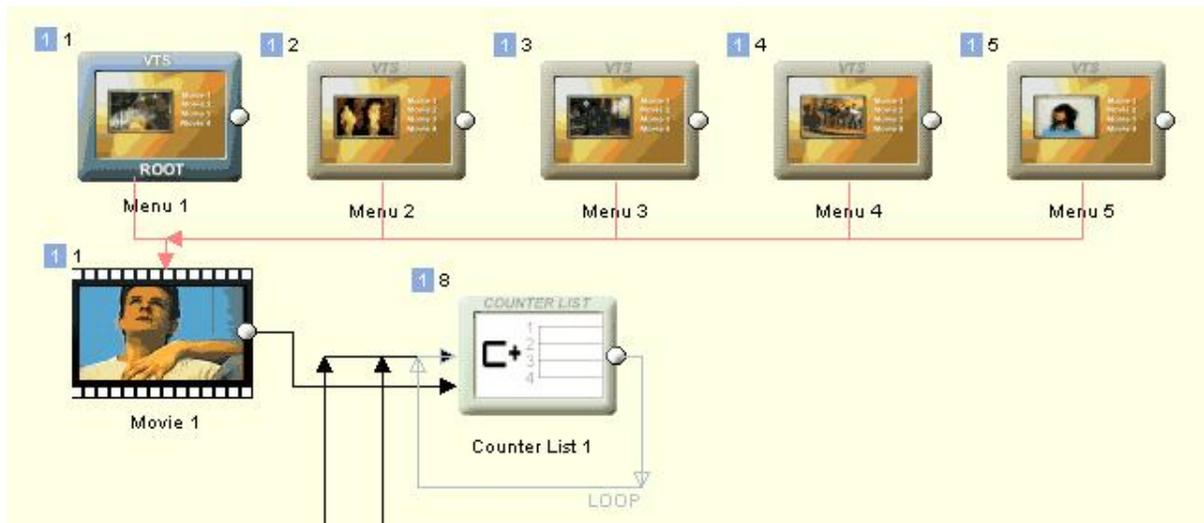
This example is as above, but here we had to put two movies to VTS1 and two other to VTS2 (because they are different frame size, let's say). This is demonstrated by the blue number 1 and yellow number 2 near the left top of each object. Again we call our overture from First play then we go to the VMG menu. We need the VMG menu in this case, because the VMG menu can simply access any movie in any VTS. The VMG Menu has links to each of the movie. Each movie links back to the VMG menu. Then we have Play All button that calls the Play List and Play List lists Movie 2, Movie 3, Movie 4 and Movie 5.

### SHOW RANDOM IMAGE example



This may be a cut-out from a larger project. It looks like each time we go to a menu a random image from the movie is shown. We have in fact many same menus with the same text and links (Add Duplicate) but each has different picture. When we need to call the menu, we call Random List that will always randomly choose one of the Menus (1 - 5). The Movie end links to the Random list as well. Obviously the more we have these menus the better is the effect.

### CYCLE IMAGE example



This is modification of the Random Image example. Since the random feature is in fact often semi-random (on many players the random generator generates the very same sequence each time you switch ON the player) we can simply use Counter list for the same purpose. This will cycle the images and each time we get to menu we will see different image. (With the random list they may repeat).

Note that the Counter list is looped - the end is linked with its beginning. This way when the counter list gets to the end it starts from beginning!

### Case List

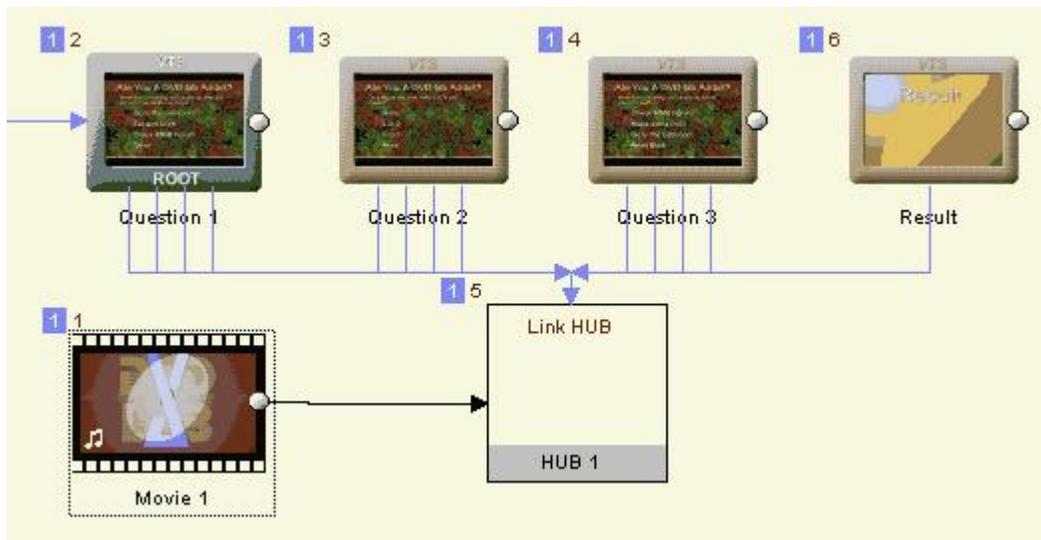
For example of Case List see the Delayed buttons on motion menu.

## 10.6 Link HUB

Link HUB is a special type of item that works like a "link distributor".



The idea is that instead of the many items (Movies, Menus) each linking directly to their destination items (For example "end of Movie 2 to a Menu 1" or a "Button on Menu 1 to Movie 1"), the items instead all link to the Link HUB.



The Link HUB then distribute the links according to the settings in the HUB Properties.

**Note:** The hub will change values of GPRM10 parameter. You can use more than just one HUB in a VTS.

#### What is the benefit?

The Link HUB was created to manage a very complex projects (*unlike* the one pictured above) with many interlinked items. Instead of having an unmanageable spider-web of hundreds items and their links, all items will simply link to one (or few) HUB(s). Then you can set the destination links for each item/objects (like buttons) inside the HUB properties. This makes a complex project more manageable and it reduces the chance of error.

As an added bonus, each link can also set or increase/decrease up to two GPRM parameters. This can be used for training, quiz, interactive story or "games".

Our project here is a simple quiz project called "*Are you a DVD-lab Addict?*".

The answers for each question may increase the GPRM0 register. Some answers "cost" more points than others and more quickly increase the "addiction" to DVD-lab.



### (1) Items in VTS.

The list of all items in this VTS. This include Movies, Menus or other VM objects. The items that have objects affected by this Hub are marked as "used".

### (2) Objects

The list of all objects that can have link (like buttons or end-link) on a selected Item in (1). This list all potential objects on Menu, even objects that don't yet have any link assigned (and so they are not regarded as buttons yet)

### (3) Object action - GPRM

Each Object (button, end-link) can change up to 2 GPRM parameters. This can be simply to set a value or increase/decrease value.

### (4) Object Action - Link To

Each Object will then link to other objects in this VTS or VMG.

### (5) Item Preview

To better locate the selected object (button) on the item (Menu), this object will be highlighted.

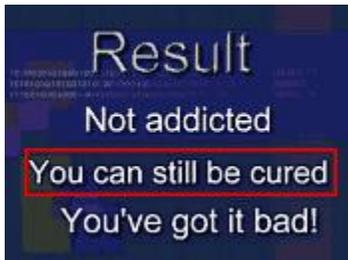
On the image above we see selected Question 3 (menu) in (1), that lists all its available objects (potential buttons) in (2). We use only four of these objects (four answers) for any links, the other objects are simple texts on the menus. Since Question 3 is the last question all four answers link to the same Result (Menu). However as we can see only two of the answers will increase the GPRM0 parameter (one more than other). The GPRM0 is the indicator of the "Addiction to DVD-lab" and a higher number at the end will report higher addiction. (This is the premise of this quiz, not an actual fact).

## The Result Menu

The Result will then have to process the GPRM0 and then report the findings. This could be done by more than just one way of course. We can for example create a couple of menus, each for different result (Not addicted, Addicted little ...) and a Case list that will link to the particular result depending on the value of the GPRM0.

Another a *simpler way* is to have all the Result texts on just one single menu and then highlight one of the texts (for example by putting a frame around it)

**Example:** Simple Result Menu for "Are you a DVD-lab Addict?" quiz:



Here is a quick overview how we created the above "Result" menu:

First we designed menu with the text for 3 degrees of "results". We then draw a frames around the texts:



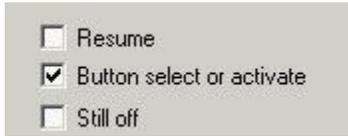
The next step is to set all the frames a "Invisible Normal", because we don't want to see them if they are not selected. We also set the color mapping to fully opaque red.



Now in order to be able to select each frame, we have to make them "buttons". Since we don't really want them to do anything, we create these buttons by adding a VM Command: Nop (In fact anything will do, even a link to "itself")

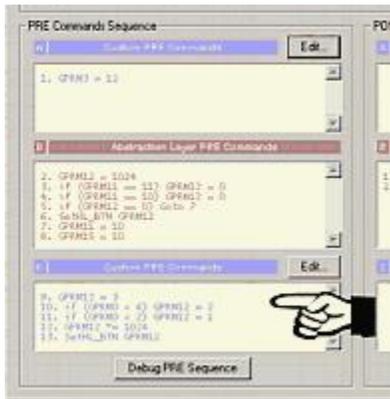


Next we will set UOPs to disable selecting any buttons:



(That's why we didn't care what command or link the buttons will have, because user will be not able to click on these buttons)

Last step will be to change the Menu PRE commands. We will use the [C] Custom PRE commands



That is the PRE commands at the **very bottom** of the sequence in box [C] (because the Abstraction Layer (box [B] ) itself change the SetHL BTN and we want to override that). This is the sample of our custom PRE commands:

```
GPRM12 = 3
if (GPRM0 < 4) GPRM12 = 2
if (GPRM0 < 2) GPRM12 = 1
GPRM12 *= 1024
SetHL_BTN GPRM12
```

We simply set the text that will be highlighted depending on the GPRM0. That's it.

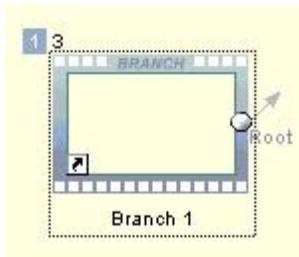
You may also want to set the Menu Playback duration to 10 seconds and then do something else, for example restart the quiz (remember to reset GPRM0 = 0) or go to play a movie etc....

## 10.7 Advanced Objects

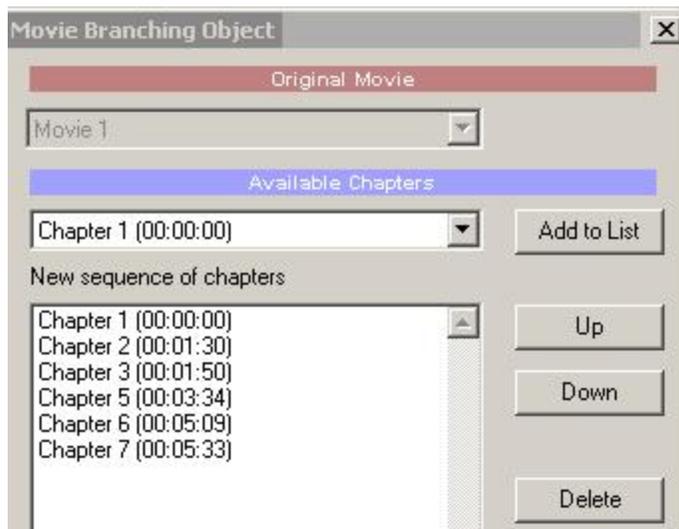
There are few other advanced objects that you can add to your DVD structure. These can be used for special or complex DVDs.



### Chapter Play-List (Movie Branching Object)

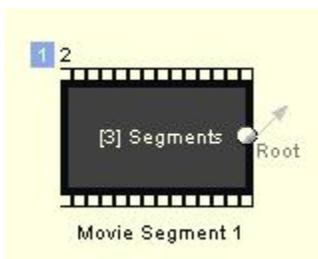


This special object uses chapters of an existing movie object to play them in any sequence or play only few of the chapters. Double-clicking on the Branch object will open its properties.



On the image above, we link the Branch object to the Movie 1. Then we added chapters from the Available Chapters combo box with Add to List button. You can see that in our example we skipped Chapter 4. That means the region between Chapter 4 and Chapter 5 will not be played. (The Chapter marks the beginning of the chapter region).

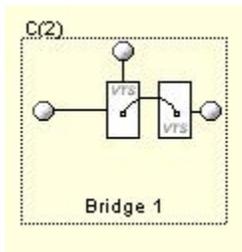
**Multi-PGC Title** (previously called Movie segment)



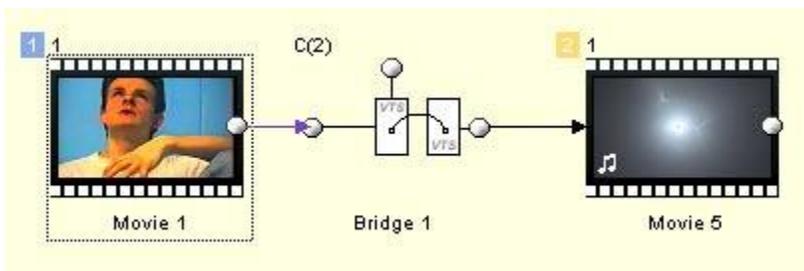
Multi-PGC Title is a special title that is build of various video segments (short movies). These segments will be joined on the DVD and a chapter point will be added to beginning of each segment.

Please see more information in Movie: Multi-PGC Title.

## Bridge Object

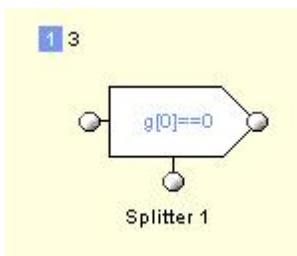


Bridge object is a special type of "bridge" that can link together any two objects even from different VTS.

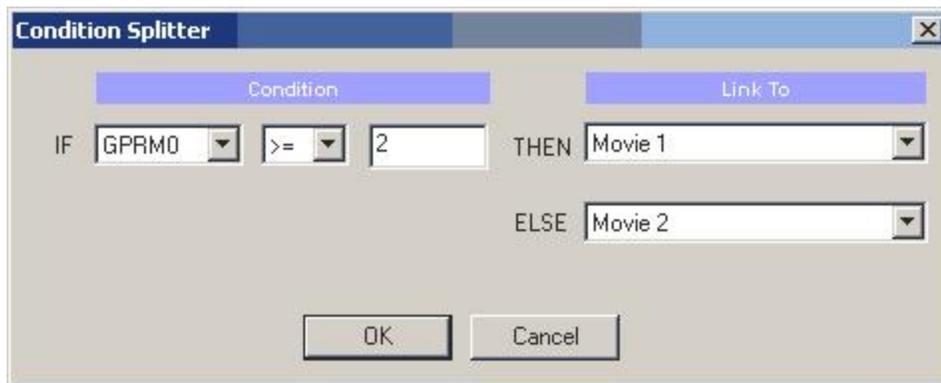


In our example above we linked Movie 1 in VTS 1 to the Movie 5 in VTS 2. Without a bridge there is no simple way to link these two objects. A bridge is often listed as a possible link in other objects that normally link only to objects in the same VTS such as Play Lists, Case List or Splitter.

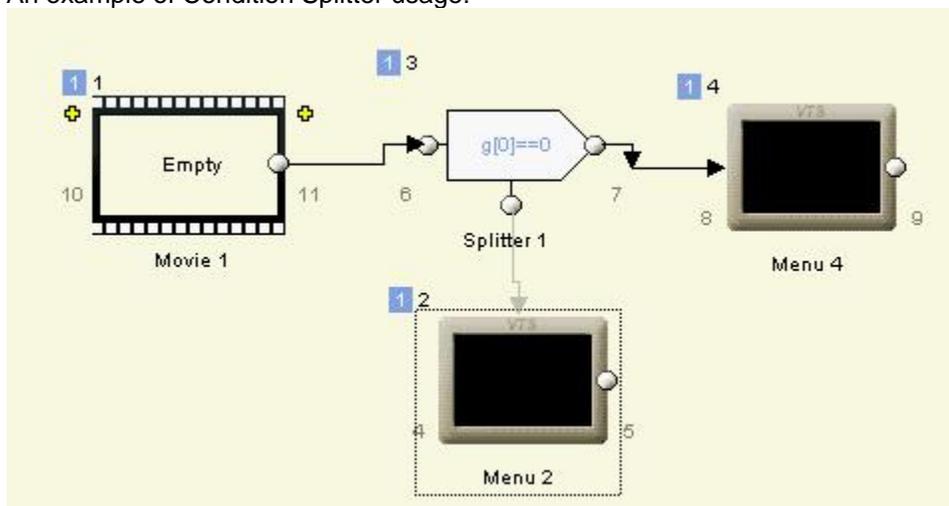
## Splitter



Splitter object uses a GPRM parameter to connect to two different objects in the same VTS.

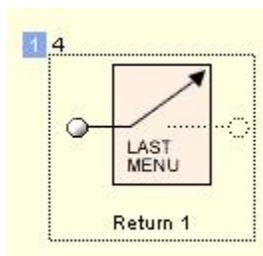


An example of Condition Splitter usage:



The splitter object uses VM Command GPRM register for the Condition. See more in VM Commands.

### Return to last Menu



This special object can be used to link end of a movie to the last viewed menu in the same VTS or VMG. For example we have 3 VTS menus from which we can play the same movie. After the movie ends we would like to return to the same menu from which we started. So we connect the end of the movie to the Return to last menu object.

The return to last object has also end link. This can be used for special purpose if there is no

known return link. (For example the movie play from first play or it is invoked from different VTS using Bridge object)

### VM Object



This is special object that is a simple pass-through link where it can run VM commands before it continues to its own end link.

We can use the VM Command object in VMG domain or VTS domain.

## 10.8 Hi-lite Button

Normally each menu has always some default button highlighted. If you don't do anything special in menu it will be the first button - the button that is bottom-most in menu layers.

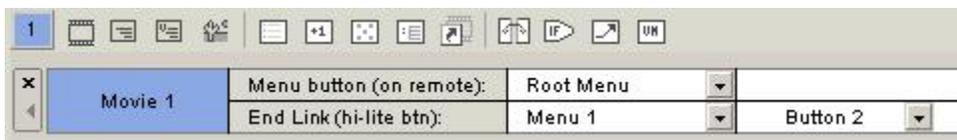
However in the PBC tab on menu properties you can choose which button in fact will be highlighted by default. (Initially it is set to 1)



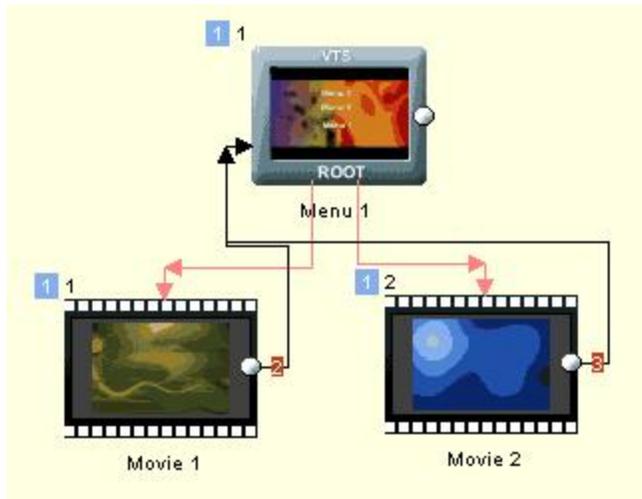
There are cases where we would like to have always different button highlighted on the upcoming menu. For example first button links to a short Movie 1 and when we return from that movie we would like to have highlighted button 2 that points to Movie 2 and so on.

### Link from Movie or Menu end to Menu

For this we can specify any object to "force" highlighting on a menu to which it links. To set this we have to select the object (Movie 1) and then use the Quick Link at the bottom of the Connection window



Here in the End Link (hi-lite btn) is listed the end link of the Movie (which points to the Menu 1) but also a special setting for Button. Normally it says Default Button, but we can change it. We would like to have Movie 1 go to menu 1 and highlight button 2, then Movie 2 go to same Menu 1 and highlight button 3 etc... The situation will be as shown:



If you use a non-default button to be highlighted, there will be a red number on the end link.

### "Don't change" Button

There is a special case called Don't Change. This will not change the current highlighting nor will use the default highlighted button. The button that will be highlighted will be the last button highlighted on any previous menu. It has more meaning with links from menu button to menu. See below:

### Link from Menu to Menu

As you may notice the highlight button setting works only on end connections. But you can override also highlighting for links that come from a button on menu.

This is not done in the Connections window, but on menu window. Select the button on the menu and go to tab Link in the Menu Properties. The Button Link item has also a small rectangle on the right that specify which button to highlight on the linked menu. By default it is the Default button, marked as '-1'.



### "Don't change" Button for menu links

The Don't Change button (0) has some use here. As we mentioned above, this will not force any specific button, nor it will use default button on the upcoming menu. So which button will be selected? The same number as on this menu. If we link from a button that is number 2,

then a button number 2 will be highlighted.

An example of usage may be a number of menus where each Next button links to the next menu and Previous button links back to the previous menu. If we click Next button we would like to have on the next menu also Next button selected. If we click Previous button we would like to also have Previous button on the previous menu selected. In this case we just make sure all menus have the Next and Prev buttons with the same number. (To refresh memories, button number is the number that appears on the left top corner of a button with link). Then each Next and Prev button link to the next and previous menu with Don't change button set.

 **Note:** While it is not likely to happen, it is worth mentioning that if two buttons from one menu links to the same menu, only one of them can have set highlighted button. It is limitation that most likely will never happen - there is no big need to link with two buttons from one menu to the same other menu. There are very few cases where this may be desired, but it is always other way to do it.

 **Tip:** you can set the Hi-Lite Default Button in the PBC to 0 and then the menu will always keep the selection from previous menu.

## 10.9 Components

Component is a group of objects (Movies, menus) in Connections.

It has several practical applications:

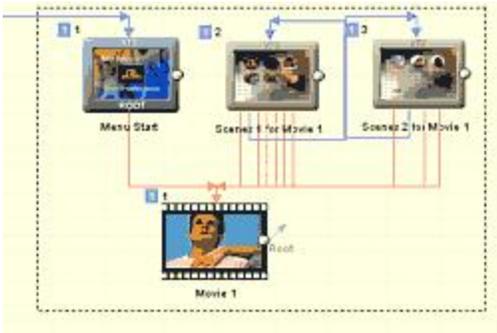
- Group and enclose objects in connections into logical blocks for easier designing (See also Sub-Views)
- Export the component and reuse it many times
- Create a Smart-Components that runs like a wizards

### To create simple component

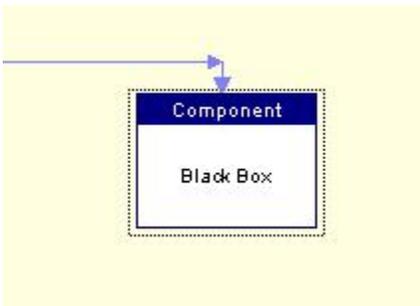
Component can be created with the Component button on the left Connection tool bar.



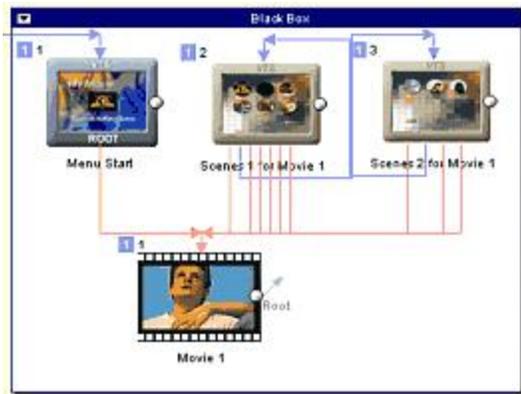
Select the Component button and draw a rectangle around objects that you want to enclose into Component.



A component will be created. It will be named by default "Black Box"



To **Open** the component, double click on it.



To **Close** the component, double-click anywhere inside the component (on the white area) or right click on component and from menu select *Component - Open/Close*.

To **Move** open component, click anywhere inside the component - on its white area and drag it.

To **Move** objects inside component, simply click on the object and drag. The component will be resized to accommodate the changes.

### Component Control menu

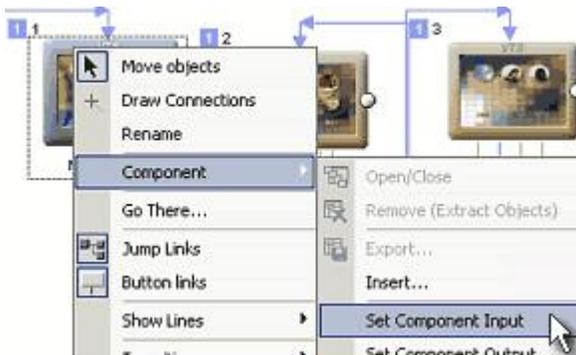
Open component has a small arrow on the right top corner. This open a control menu for special commands.



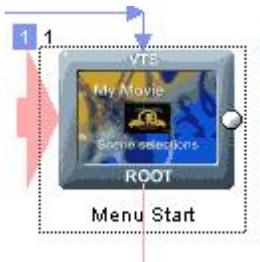
## Input and Output

When you open the component you can freely link from/to the objects inside, as if the component doesn't exist. If the component is closed you can specify Input and Output points of the component. Then you can link to closed component and work with it as if it is really "black box".

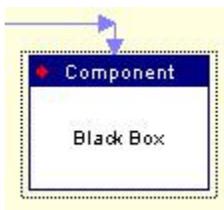
To specify Input, right click on object **inside open** component and from pop-up menu select *Component-Set Component Input*.



Similarly you can set Output. Once the Object is set as input/output a red arrow will appear near it.



This will also show on a closed component as small red arrow



Now even if the component is closed we can draw a link to it. If we specify output we can also draw link out of closed component.

 **Note:** Since the components can be exported and reused later, the Input and Output marks what is intended input or output for the group of objects inside. This allows us to work with the component as with a box without need to look inside.

### **Rename Component**

To rename component, select it and press F2. This is same as with any other object.

### **Add Object to component**

Right click on any object outside component to open Pop-up menu. Select *Component - Add Object to Component*. A menu with list of all components will appear. Select the desired component and the object will be moved there.

### **Remove Object from Component**

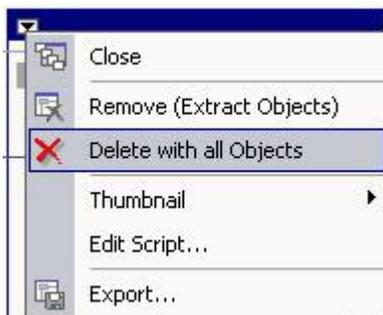
Right click on any object inside open component to open Pop-up menu. Select *Component - Remove Object from Component*. The object will be removed and placed outside the component.

### **Remove Component - Extract the objects**

Right click on component to open Pop-up menu. Select *Component - Remove (Extract Objects)*. All objects will be removed and placed outside the component and the component will be removed.

### **Delete Component and all objects inside**

Either delete all the objects from inside by pressing Del button or Click on the Component control arrow and from menu select Delete with all Objects.



### **Change Component Thumbnail.**

A closed component can be represented by a thumbnail. You can load your own thumbnail that will be saved with the component. Click on the Component Control arrow in top left corner and select *Thumbnail - Change Thumbnail*. Any image can be used - it will be resized to correct size. To remove existing thumbnail select *Thumbnail - Remove Thumbnail*.

### **Export Component.**

Once you do all necessary changes to the component you can export it. Either from Component Control arrow or right click on component and from menu select *Component - Export*

Component has the extension \*.box and by default it will be saved in *Extras\Components\* folder.

### Import Component

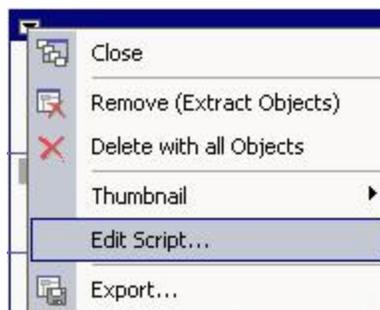
All exported component to *Extras\Components\* folder will appear in the Assets - Plug-ins tab under Components Sub-tab.



You can simply drag and drop component from there to Connection window. Alternatively you can also import components that are not saved to *Extras\Components\* folder and don't appear in the asset window. To do so, right click on a canvas in connection and from pop-up menu select *Component - Insert*.

### Smart Components (PRO version)

A component can use labTALK script to create reusable wizards. To edit script associated with Component, click on the Component Control arrow in left top corner and select Edit Script.



The script will be run every time you drag the component from Asset Plug-ins window to Connection and can initialize the component various ways. For example it can create menus depending on the user input.

All default components that can be found in the Plug-ins tab are scripted in labTALK.

 **Note:** If you don't want to run the script when adding the component to Connections, hold down SHIFT.

### Writing script.

For more information about labTALK see the appropriate topics. Here are just some important notes about labTALK usage for Components.

1. To access component objects from within the component script you have to use special access.

In order to know which objects belongs to the component three array variables are filled up:

#### **menusInBlackBox, vmgsInBlackBox, moviesInBlackBox**

*Example:* menusInBlackBox returns the number of menus in box and menusInBlackBox[1] returns what is the order number relative to project of the first menu in box, see the code below:

```
print "Number of Menus in this Component: ",menusInBlackBox
```

```
for menu=1 to menusInBlackBox
```

```
print "Menu #",menu," in Component is a Menu #",menusInBlackBox[menu]," in the whole project"
```

```
next menu
```

Simply if we want to use menu number one we can't use Firstmenu = 1 because that is not true, but we have to use

```
Firstmenu = menusInBlackBox[1]
```

2. After you edit the Component script you don't have to press save button in the lab-TALK window, simply just close the lab-TALK window and then export the component.

3. Because the component script often changes the component itself, it is important to keep an original, unchanged copy of the component while you debugging the script. For example the Keypad component has initially just one menu. If we run its script it will create couple of new menus inside the component. Obviously we want to keep the component before the script is run.

There are few scripts in the appendix that can help with understanding lab-TALK's use inside Components.

Script 1 - Region test

Script 2 - Keypad

Script 3 - Set Audio

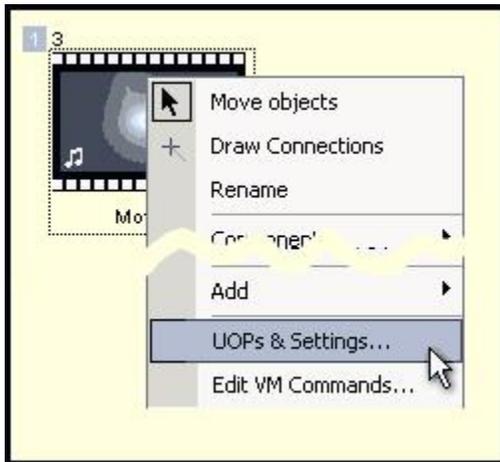
## 10.10 User Operation Prohibitions

User Operation Prohibition is set of flags that apply to any object and prohibits user from certain actions. The UOPs are in effect for example in FBI warning that you can't skip or fast

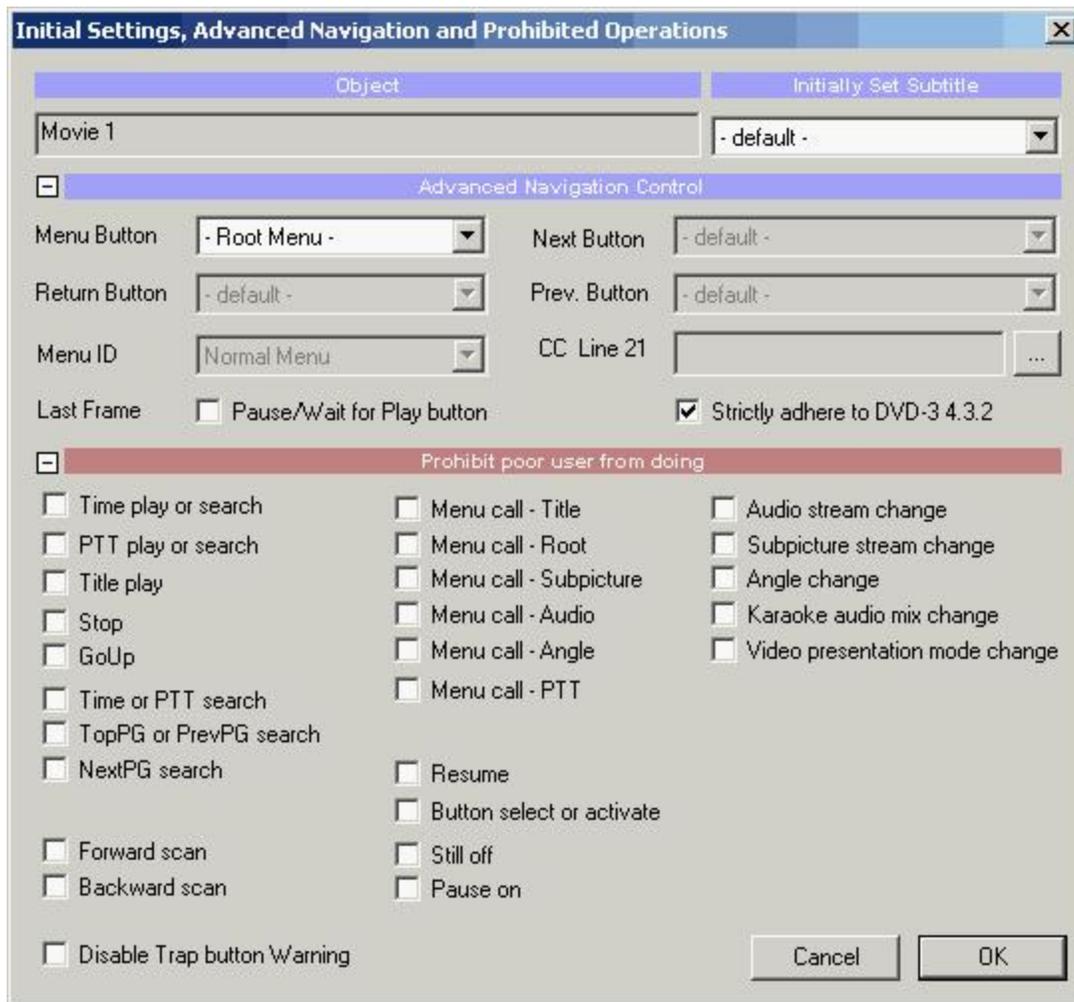
forward, subtitles that can't be disabled etc. The set has 25 flags.

 **Note:** First of all it is important to note that you have to have very good reason to use UOPs. Do not simply blindly add UOPs just because everybody else does it. People generally hate any kind of restrictions especially if there is no reason for them.

UOPs can be added to any object from Connection window.

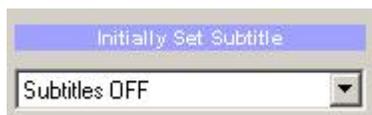


Simply right-click on object and from menu select UOPs & Settings from menu.



### Initially Set Subtitles

This is enabled for movies and VTS menus only. It allows you to initially set displaying subtitles ON/OFF. If combined with "Subtitle stream change in Movie" UOP user will be not able to switch them off or change them to something else.



A "- default -" means it will not change the subtitles status.

**Default** - No particular stream will be selected. This allows the user to select the subtitle from menu.

**Subtitles OFF** - Set Subtitles to OFF.

**Set Subtitle 1,2...** - Set the particular subtitle set to ON.

### Advanced Navigation Control

These 4 controls will set or override special functionality for four specific buttons on remote control.

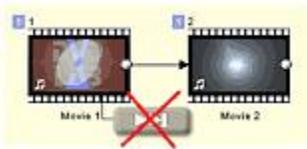
**Menu Button** - same as setting 'Menu Button' Link in Connections. This can specify a non-default behavior of Menu button on remote.

**Return Button** - this can specify a non-default behavior of Return Button on remote. Please note, not all DVD players have Return button on their remote controls. A return button can link only within the same domain - from movie only to movies in same VTS, from menu only to menu etc... If you want to specify Return button from movie to link to a Menu, you have to use Dummy Movie as the target.

**Next Button** - A normal function of Next button is to move between chapters. After last chapter is played, we may want the Next button to advance automatically to next movie.

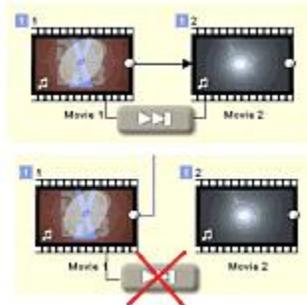
- **Default**

The default player behavior, After last chapter is played pressing Next will do nothing even if there is another movie linked to it.



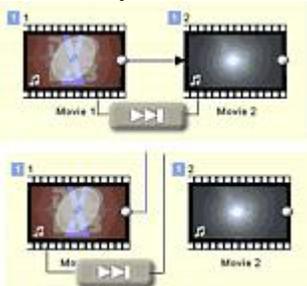
- **Follow End Link to Next Movie**

After last chapter is played if user press Next button, it will jump directly to the next movie, **if such movie is defined by End Link**. If the movie has no direct link to another movie, pressing Next will do nothing.



- **Follow End Link to Movie or Menu**

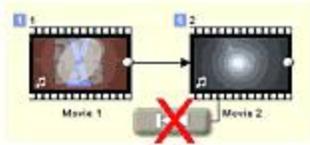
After last chapter is played if user press Next button, it will try to jump to the link defined by End Link, that means to next movie or to menu.



**Previous Button** - A normal function of Next button is to move backward between chapters. When you are at the beginning of the movie you may want the Previous Button to link to previous movie.

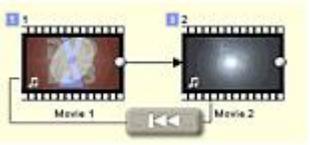
- **Default**

The default player Behavior. When you are at the beginning of the movie (before first chapter), pressing Prev button will do nothing.



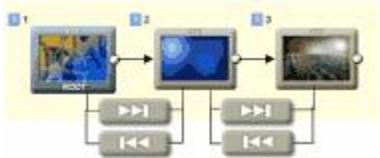
- **Go to Previous Movie**

When you are at the beginning of a movie, pressing Prev button will move to the **beginning** of previous Movie. The previous movie is the one that has PGC number one less than current movie. (Simply said - the previous movie is the one that appears in Project before the current movie)



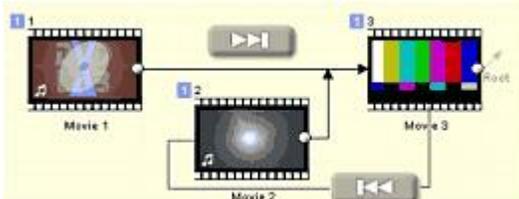
**Note:** You can't move to the last chapter of the previous movie, at least not a simple way (only by using VM commands)

Using NEXT and PREV button works similar way on a Menu. If you set *Prev* or *Next* button on menu, user will be able to jump from one menu to another by pressing the Prev or Next buttons. Please note, for Next button (*Follow the End link to Next Menu*) you have to have End Link defined otherwise it will not work. See image below.



### Some notes about these buttons:

You may see the Next and Prev buttons works a bit differently. The *Next* button will Follow the End Link, which may not always go to the exactly next Movie, while the Prev button will always link to the previous Movie (PGC-1). This is to simplify the logic - We can link both Movie 1 and Movie 2 to Movie 3 as in the image bellow. That means Movie 3 may have two potential "previous" movies. The Prev button will always point to the Movie that is created just before the current movie. (Above current in Project tree)



Next and Prev Button behavior quite depends on the firmware of the DVD player. In most cases the players will behave as described above, but it may not be 100% true. Some players may not behave as desired. Here are some problems that may sometimes appear on few players: 1. Pressing Prev button on menu will go to Next menu. 2. Pressing Next button after last chapter will go to next Movie even if "Default" is set. 3. Pressing Next button will go to next movie even if the Movie has end link to menu.

### **Last Frame: Pause/Wait for Play button**

The movie will pause at the end and wait for user to press Play or Next button on the remote. Only available in movies.

### **Menu ID (a.k.a Menu Category)**

VTs Menu can have a special property that identifies its purpose to the player. (At least that's the theory)

This is called Menu Category or Menu ID. A menu can be identified as Subtitle, Audio, Angle or Chapters Selection menu.



The idea behind Menu ID is that player **may** go to this menu when user press Subtitle/Audio/Angle/PTT buttons on the remote instead of displaying the players on-screen interface to select the Subtitle/Audio/Angle.

 **Note:** While this may sound nice in theory, you will have very hard time to find a player that actually does support this feature. Almost all players will always display its own interface after pressing Subtitle/Audio/Angle buttons on remote no matter what you have set.

It is therefore recommended to simply leave all menus set as "Normal Menu".

### **CC Line 21 (Closed Captioning)**

Closed Captioning is a special information inserted into the video stream that can be used to read transcript or dialogue of the audio portion of video. As the video plays, text captions are displayed that transcribe, although not always verbatim, what is said and by whom and indicate other relevant sounds.

In the US and Canada, "captions" are distinguished from "subtitles". In these countries, "subtitles" assume the viewer can hear but cannot understand the language, so they only translate dialogue and some onscreen text. "Captions" aim to describe all significant audio content, as well as "non-speech information," such as the identity of speakers and their manner of speaking; sometimes music or sound effects are also described using words or symbols within the closed caption. The distinction between subtitles and closed captions is

not always made in the United Kingdom and Ireland, where the term "subtitles" is a general term. (Source Wikipedia).

Another difference between subtitles is that for Close Captioning, the TV set has to decode the information text, not the DVD-player - it means not everybody has the technical ability to see CC.

NTSC DVDs may carry closed captions in the Line 21 format which are automatically sent to the TV and turned on and off by the TV remote or the set-top decoder. Both Line 21 and DVD Subtitle formats can co-exist on the same DVD, providing two very different methods of displaying captions from the same DVD. On some DVDs, the captions may contain the same text, while on other DVDs, the Line 21 version contains more captions to cover non-speech information than the DVD Subtitles.

CC files can be used in the Line 21 \*.scc format. This works only for Movies, it has no effect in Menus.

Line 21 format is encoded with special captioning Character set. For more info see <http://robson.org/capfaq/caption-charset.html>

### **UOPS (prohibit operations)**

Each flag can disable particular operation. By default, none is selected that means there are no UOP placed on this object.

- Time play or search
- PTT play or search
- Title play
- Stop
- GoUp
- Time or PTT search
- TopPG or PrevPG search
- NextPG search
- Forward scan
- Backward scan
- Menu call - Title
- Menu call - Root
- Menu call - Subpicture
- Menu call - Audio
- Menu call - Angle
- Menu call - PTT
- Resume
- Button select or activate
- Still off
- Pause on
- Audio stream change
- Subpicture stream change
- Angle change
- Karaoke audio mix change

Video presentation mode change

## 10.11 Sub-Views

On the bottom of connection window there are tabs called Sub-Views.



So far all objects you added to the canvas appeared on the Main view. This first "Main" view always show ALL objects in the project. Working with a very large project can create quite a chaos with many objects and links between them. One way to clean this, is to create Components in the Main view. Another way, described here, is to put some logical group of objects into the separate Sub-Views. Mastering Sub-Views will make working with a large project quite enjoyable experience as each logical group can be virtually separated.

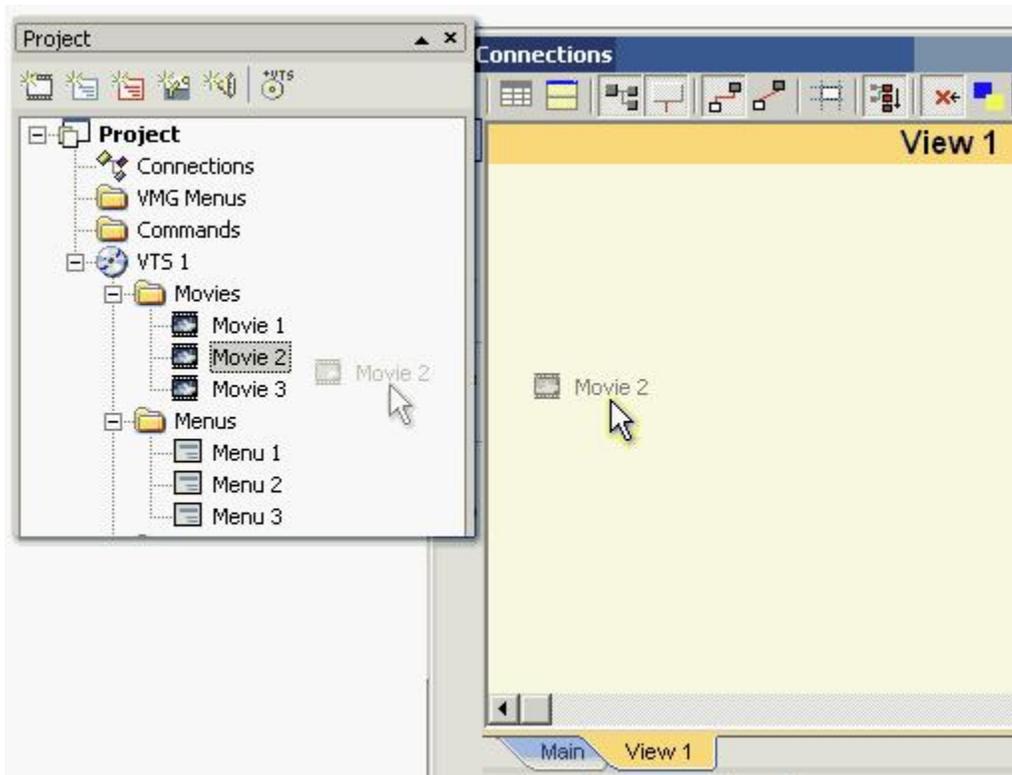
The Sub-View is just a different *partial* view on the same project as defined in the Main Connection view.

- Objects placed in Sub-View will show links only between themselves.
- You can place the very same object into many separate sub-views
- You can re-arrange the objects in each Sub-view as you want
- Sub-View will not display Components. Objects placed in Component in Main view will show as a separate objects in sub-view
- Each sub-view can have its own annotations
- You can have sub-view that will have only annotation (sort of Read Me)
- You can have up to 9 sub-views
- Sub-Views are automatically added or removed as they are needed (there is always at least one empty sub-view available)

Initially when you click at the View 1, its canvas will be empty.

### **Add existing object to a Sub-view**

To add any existing object to a Sub-View, simply Drag and Drop it to the view from the Project tree box:



Again, remember this will create just a different Sub-view of the project, it will not change the project at all, (it will not add another Movie/Menu etc.. to the project..)

Alternative: Use **Copy** and **Paste**.

A Copy (CTRL+C) and Paste (CTRL+V) can be used to copy objects to Sub-Views from Main view (or other Sub-View).

- Open the Main view, select one or more objects and press Copy (CTRL+C)
- Open any other view and press Paste (CTRL+V)

The Copy/paste does not create a physical copy of the object, it can only be used to copy these objects to Sub-Views.

### New Object

When you add a **new** object to the Sub-View (new menu, movie...) with the object toolbar, it will automatically appear also on the Main view as the Main view always displays **ALL** objects.

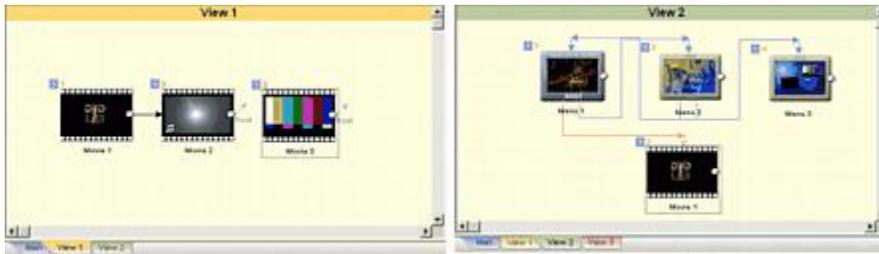


**Note:** You can also drag and drop a component on any Sub-View, in which case the objects will display in Sub-View without the component grouping, but in the main view they will display as a Component.

In the example below we have two Sub-Views. The View 1 shows only movies, the View 2 shows only VTS menus.

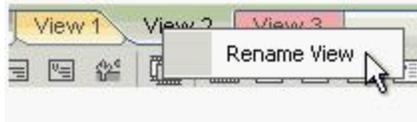


The same object can be shared between various views, for example in the project above we can add Movie 1 also to the View 2:

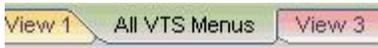


### Rename View

You can rename each view by Right-clicking on the view tab:



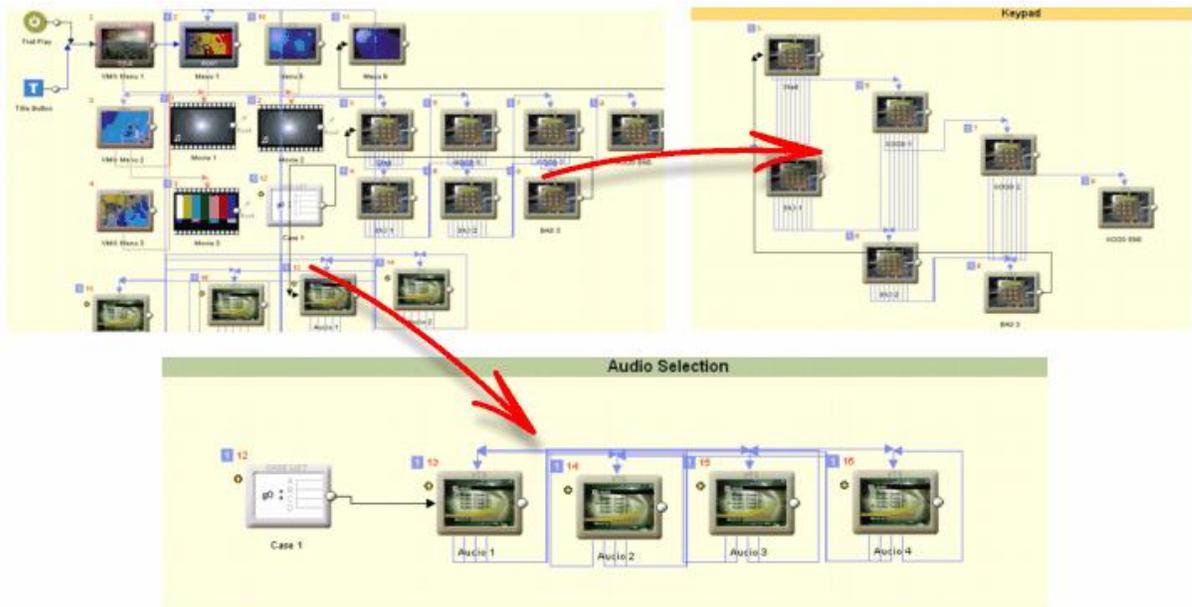
Then entering new name:



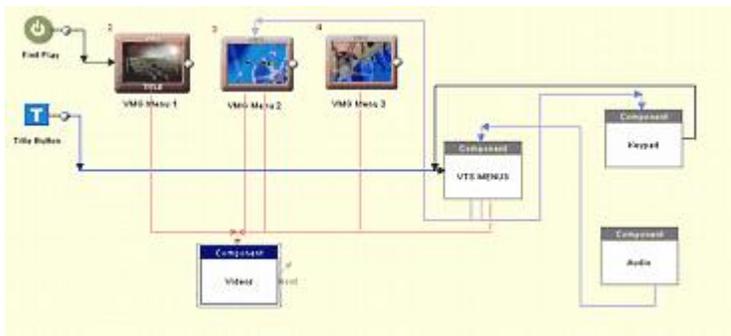
This will be saved with the project.

### Suggested Usage

The idea behind sub-views is to "group" the project into few logical blocks and most importantly to reduce clutter. The image below shows how we group few blocks together in a separate views. This will enable us to focus only on a particular group and use the main view to link all objects/blocks together:

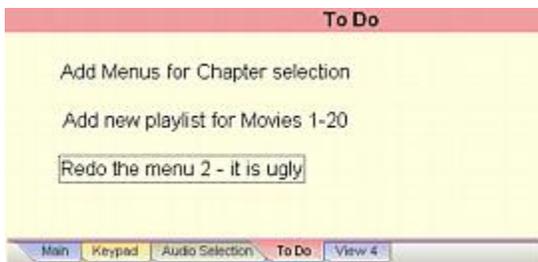


Then we can group the object on the Main View into the components to clean the clutter there:



This is indeed the very same project, but now the Main view is much more cleaner, yet we can easily access each individual part through components or switching to the particular Sub-View (see also Linking Component below).

**Tip:** You can also use entire view just for a text annotations, for example a To Do list:

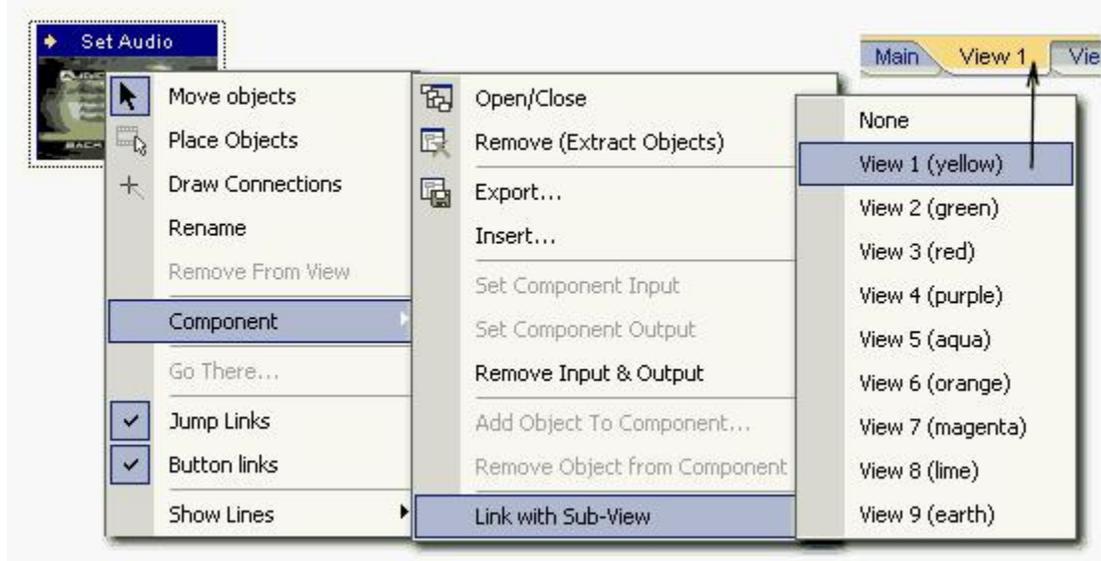


### Linking Component with any view

You can *virtually* link a component placed in a Main view with any other view. That means when you double-click on a Component in the Main View, instead of opening/closing the Component you will actually switch to the *linked* view.

To link the Component, right click on it in Main view and from the menu select *Component - Link with*

Sub-View-View x..



The Sub-views are listed like they appear on the tab, that means the View 1 is the yellow tab (default name View 1), View 2 is the green tab etc...

**Note:** This linking is just for your convenience. In fact you can link any component with any view even if they are totally unrelated - but of course that wouldn't make much sense.

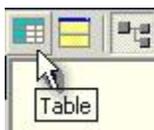
The linking works by double-clicking on both Open or Closed component. To open or close *Linked* component without performing the linking hold *Shift* while double-clicking.

## 10.12 Options and Settings



In DVD-lab PRO, the connection window is the most important. Therefore it is highly customizable and offers many settings and helpers.

### Table View



*Connections - Show Table*

Connections can be switched to Table view with the Table button.

Title	End link	Button HL
VMG Menu 1	(SELF)	
Menu 4	(SELF)	
Movie 1	Menu 4	Default Button
Menu 1	VMG Menu 1	Button 1
Menu 25	(SELF)	
Page 1 (Movie 3)	(SELF)	
Page 2 (Movie 3)	(SELF)	
Page 3 (Movie 3)	(SELF)	
Page 4 (Movie 3)	(SELF)	
Page 5 (Movie 3)	(SELF)	
Page 6 (Movie 3)	(SELF)	
Movie 3	(Root)	

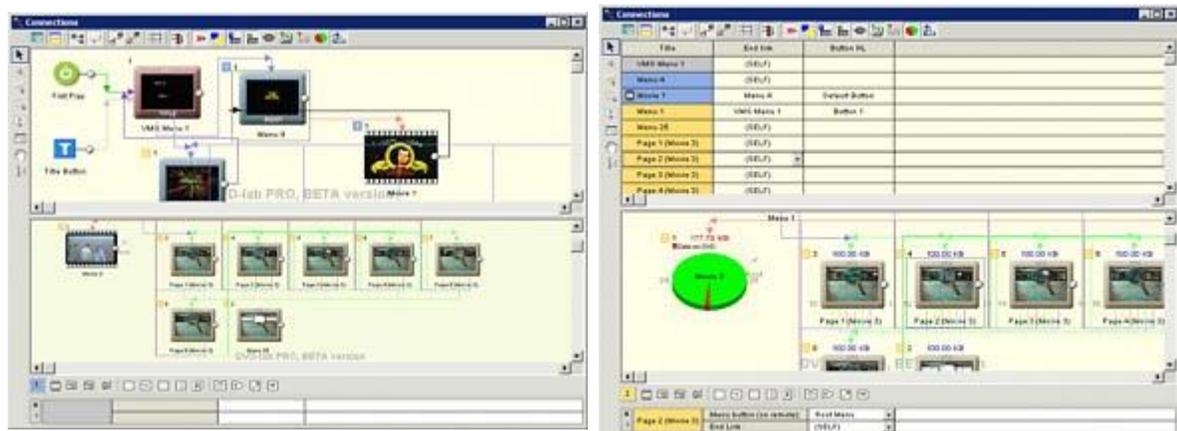
The table view shows and allows you to change the end links of all objects.

### Split View



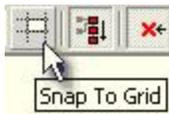
#### *Connections - Split View*

A Connections window can be split to two windows where each can show different part of the structure and each can have its own settings such as zoom for example, table view, size view etc...



This can help you to better navigate and edit objects in connection view.

### Snap to Grid



### Connections - Snap to Grid

Snap to grid will place a grid on the connection window which will help you to organize the objects by snapping them only in between the grid space. It also adds a column header on top (letters) and row header (numbers) that helps navigate in large projects.

### Jump Links, Button Links and lines



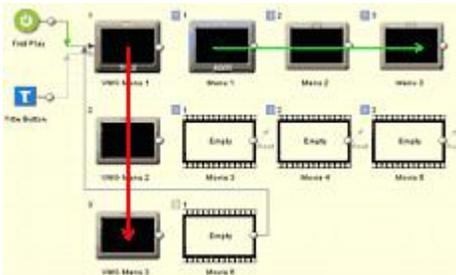
These buttons are for showing or hiding a few types of lines that link objects. Jump links show/hide the end connection links and Button links show/hide the links that come from menu buttons.

The lines may be straight or right angles.

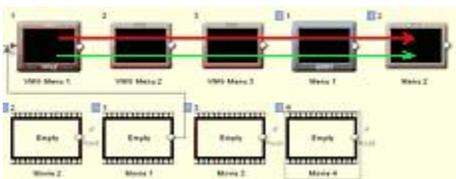
### Place VMG vertically



Using this button will place new VMG vertically instead of horizontally as the VTS menus. It will also start adding movies into second column rather than first.



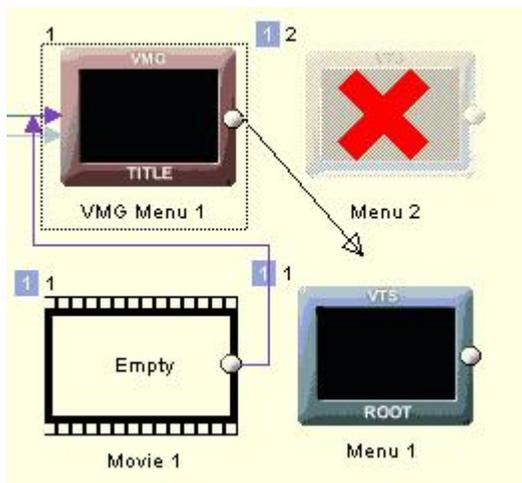
The image above places VMG menus vertically. The image below places both VMG and VTS menus in same row.



### Link Assist

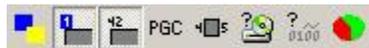


Link Assist is a great helper for adding links. When selected, using link tool will visually disable objects to which you can't link from the object.



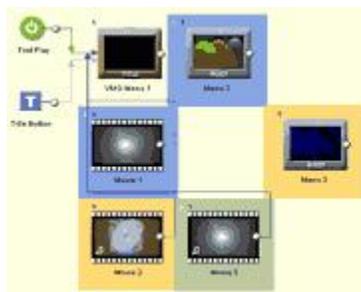
In this example we see that we can't link the VMG menu with anything other than the ROOT VTS menu.

### Info Tools



Various info tools are provided to give better information.

**Color Code Background for VTS** - This will put a color coded background to all objects so you can quickly see to which VTS they belong.



**Show VTS** - This will show a VTS number on colored rectangle in the right top corner of each object.

**Show Item Order** - This shows a virtual item order in that VTS.



**Show PGC Number** - This shows the true PGC number instead of item order. This number can be later directly used in VM commands for PGCN links. The PGC Number is always shown as red. The PGC number on Menus and VMG menus is  $1+item$  order because of the special invisible first menu.



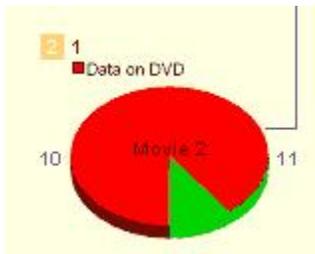
**Show Node** - This will show the in/out node number that can be later used in VM commands. The image below shows that the Movie object has In node 12 and Out node 13.



**Show Size** - This will show a size in MB that the object takes from DVD.

**Show Average Bitrate** - This will show average bitrate of movie objects.

**Pie graph** - Shows the relative part that the movie takes from the DVD.

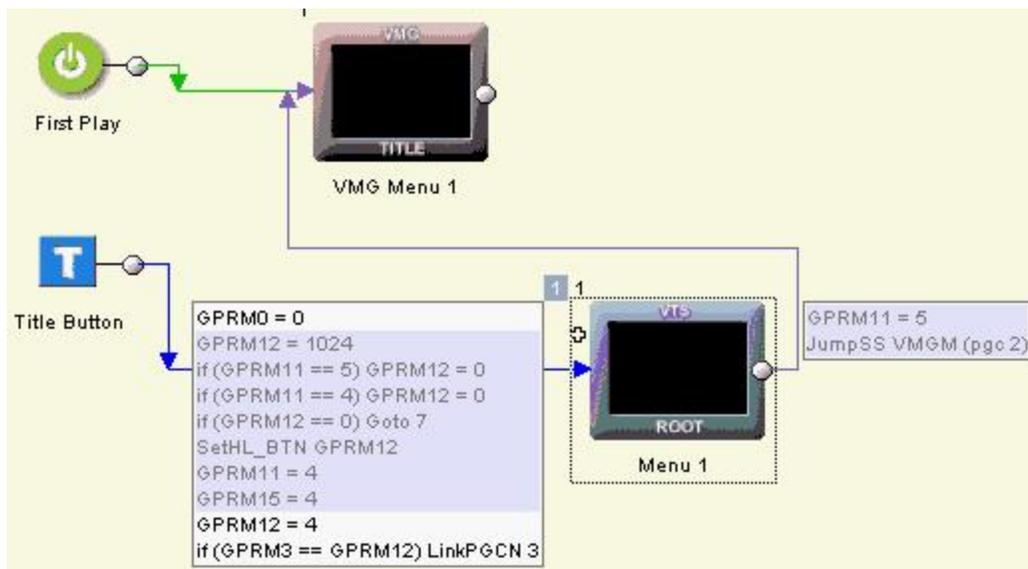


### Show VM Commands

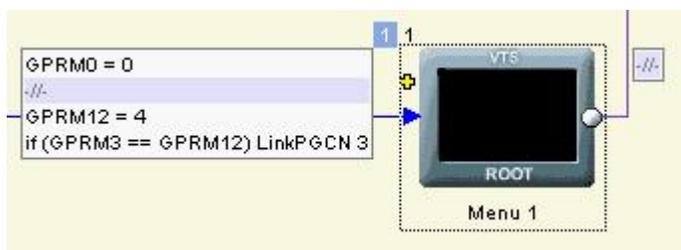
Each object can show PRE/POST VM commands in the connection window.



The Show VM Commands have 3 states. Pressing it once will show all VM commands for the selected object. Pressing the button second time will collapse the Abstraction Layer and show only custom commands. Third state is all commands off.



Collapsed Abstraction Layer.

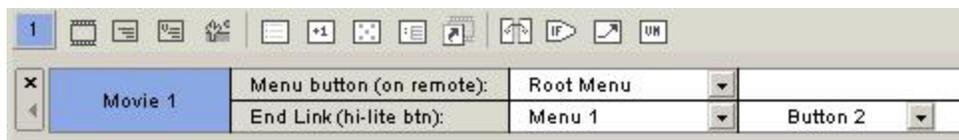


This button is only for displaying the VM commands. The commands (at least the Abstraction layer) are inside the object, even if they are hidden in the connections.

**Quick Link details window**



This opens a Quick Link Info bar at the bottom of connection window.



**VTS selector**



A VTS selector is a special button that shows which VTS is currently selected. The selected VTS is also highlighted in blue in Project.



Clicking on the VTS selector will cycle through existing VTS so you can quickly add object to desired VTS with the add buttons on right of the VTS selector.

## Floating Connections Window

### *Connection - Floating (Multimonitor)*

Normally the Connections Window is inside the DVD-lab interface between all other windows in what Microsoft designers call a Multiple-View Interface. That is fine as long as you have only one monitor. For multiple-monitor workstations we added the possibility to remove the Connections window from the DVD-lab PRO interface and place the Floating Connections beside, preferably in a separate monitor.

To create Floating Connection window, click the Floating (Pin) button



A Connection window will be "removed" from DVD-lab PRO interface and could be now positioned anywhere on the desktop or secondary monitors.



To put the Connection back to interface, click again the Floating (Pin) button.



## 10.13 Connections Shortcuts

### Keyboard Shortkeys for Connections

All items listed in menu can have assigned a customized keyboard shortcut. To assign a shortcut, go to menu: *Tools - Customize*. Then select Keyboard Tab. You can see the assigned shortcuts also listed on right side of menu items.

However there are also other special keyboard shortcuts that can be used while on Connection window. Such shortcuts can be used directly or they can be used in customizable Jog-Shuttle controllers such as ShuttlePRO2.

Action	Short key	Description
Arrow	1	Select Arrow Tool
Draw Links	2	Select Draw End links Tool
Draw Button Links	3	Select Draw Button Links Tool Tool
Draw Transition	4	Select Draw Transition Tool
Menu Button link	5	Select Remote Menu Button Link Tool
Create Component	6	Select Create Component Tool
Hand Tool	7	Select Hand tool to move canvas
Switch to table	8	Switch/Unswitch table view
Zoom In	+ on numeric keyboard or Mouse Wheel up	Zoom In
Zoom Out	- on numeric keyboard or Mouse Wheel Down	Zoom Out.
Next Object	Page Up	Select next object (towards Project top) and scroll view if it is not visible
Previous Object	Page Down	Select previous object (towards Project bottom) and scroll view if it is not visible

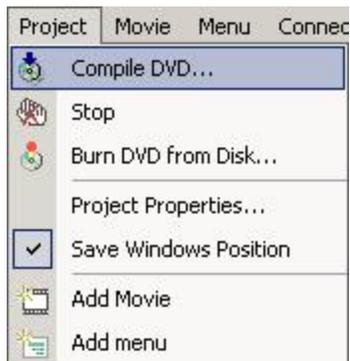
Also see Shortkey Summary for setting up a Shuttle device.

## 11 Compile

### 11.1 Compile

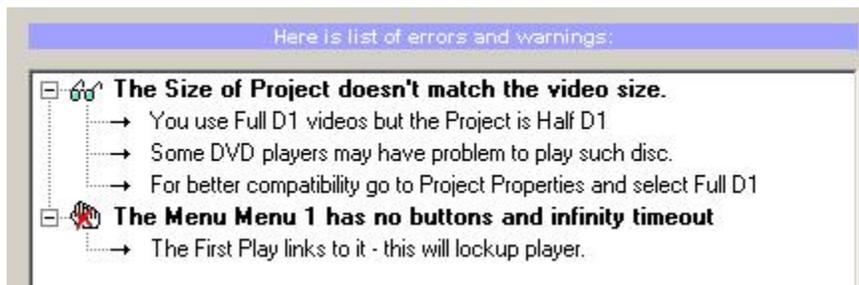
Menu: *Project - Compile DVD*

After you design the DVD it is time to compile it. Compiling means that DVD-lab processes all the assets and features of your Project, converting them into DVD files ready to be tested and then burned onto DVD media.



#### ► Errors and Warnings

Before you start the compile process, DVD-lab will check all data and display possible Errors and Warnings



The **warnings** can be ignored - these are the best suggestions or things which you may have forgotten, but they don't essentially make problems for the DVD.

The **errors** are serious problems which will make the DVD unplayable. You can't continue with Compile unless you fix all errors.

-  Error - you can't ignore this
-  Warning - you can accept or ignore this. The DVD may be still playable

#### ► Compile

DVD-lab favors the two-step method of DVD creation. First, you Compile the DVD to hard

disk, which enables you to test it from hard disk with a software DVD player such as PowerDVD or CinePlayer. Then, if everything is fine, you can burn it to DVD media with either the DVD-lab internal record module or any third party software you have good results with such as Nero, Gear, Easy CD/DVD, Prassi, etc...

There are few groups of parameter settings in the compile window.

### ► Output folders



Here you set the output directory. **Output Folder** is the place where the final compilation files will be created. The folder you specify will be the root to the VIDEO\_TS and AUDIO\_TS folders. In the example above a folders G:\VIDEO\_TS and G:\AUDIO\_TS will be created and the DVD files will be compiled into the VIDEO\_TS folder.

 **Note:** It is normal for the AUDIO\_TS folder to be empty on a DVD-Video Project. Do not delete this folder as the DVD player expects to see it.

The Pie graph on the right shows the free space (green) on the drive where you specify the Output folder. The red part of the pie is the space that will be used to compile the DVD.



► **Temporary Folder.** You can speed up the process when you set a temporary folder which is on different drive than the Output folder. This temporary folder will be used during multiplexing.

If there is not enough free disk space required for all the files, a icon exclamation will be displayed near the troubled data.

Free Space:  1.937 GB

The Pie graph on the right shows the free space (green) on the selected temporary drive. The red part of the pie is the space that will be needed.



### ► Required Space

DVD-lab will check and calculate the free disk space needed on the Output and Temporary drive



**Estimated DVD Size** - this is the DVD data which will be put in the Output Folder. These are the data you are going to record to DVD. It displays the data in computer format (Here 2.12 GB) and in DVD data format (here 2.44 GB). The DVD data format is a format where 1KByte has 1000 bytes as opposed to computer format where 1KByte has 1024 bytes. If you know your DVD-R has 4.7 GB then look at the second number to see if it fits to DVD or not.

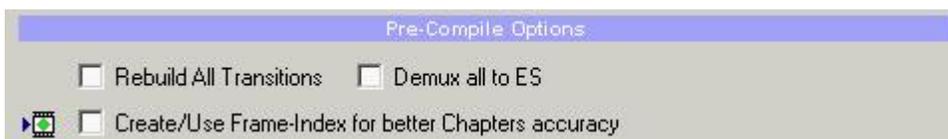
The Pie graph on the right shows how much data will be used (red) on the 4.7 GB DVD disc. The top Pie graph also shows the type of the DVD (D1) in its header.



**Temporary Space** - the space needed on temporary disk.

**Total Required Space** - this is the sum of both the temporary and output folder required space. The exclamation point will be shown if there is not enough space to create the DVD on your hard drive.

### ► Pre-Compile Options



#### **Rebuild All Transitions**

Just before the compile starts, all transition will be re-created. This will make sure the

transitions reflect the menu changes.

### Demux all to ES

Just before the compile starts, all program streams will be demultiplexed to Elementary Streams.

### Create/Use Frame-Index Chapters

This feature will first perform frame-indexing on all movies if the index doesn't exist and then use the Chapter Points in a frame format instead of time-code format. You can optionally create a frame-index before compilation from menu Movie-Frame Index - Rebuild Frame-Index. See more about this in the Frame-Indexing section.

### ▶ Menu Compile Options



### NTSC Safe Color

You should leave this set, For more info read [here](#).

### Enhanced menu Rendering

During menu design, the menu is displayed in the correct aspect ratio using square pixels of your computer monitor. However before compiling the menu has to be rendered using rectangular pixels for NTSC or PAL. The normal, fast method will adjust the whole menu at once.

The new Enhanced method will adjust each objects separately for the destination system (NTSC/PAL). In addition it will also 2x up-sample text. This will mostly benefit the Highlighting of the buttons, especially text where the new Enhanced method will now completely cover the underlying text background with more natural edges (see bottom image).



Since the Enhanced method is rather new addition, just to be safe we let user to have the option to turn it off. (In case the result looks differently than designed). However, for best result it should be always set to ON - regardless of the system. The setting has no effect on external subpicture or external background.

### Adv. Proc.

Advanced processing on menus:

- Normal - standard processing
- Sharper - the menus will be perceived as sharper
- De-Jitter - This will reduce the Jitter on Menus by applying a special de-jitter filter.

▶ **Advanced Compile Options**



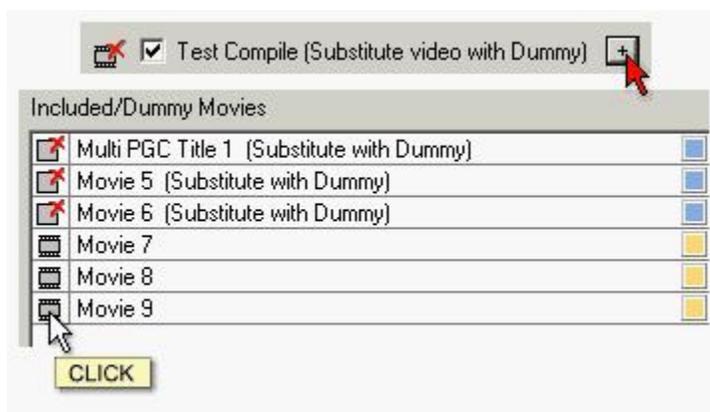
**Test Compile**

Because multiplexing long movies is a most time consuming operation, you can let DVD-lab replace the movies with a dummy MPEG file as a place holder. This will make the Compilation very brisk and you will be able to quickly test the overall layout and flow of links on your menus with a software DVD Player such as PowerDVD or CinePlayer.



This is a very fast way how to test your DVD Project performs without a long wait for the multiplexing phase to finish.

To open additional options click on the + sign:



You will see a list of all Titles in all VTSS. By clicking on the left icon you can set which movies will be substituted and which will be used full.

### Compile without Abstraction layer

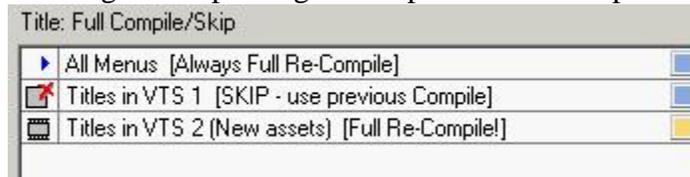
A special option that create DVD without DVD-lab's abstraction layer. Read more in Abstraction Layer.

### Smart Compile

This option can be used for quick compile of changes where part of previously compiled files will be used from previous compile.

- The menus on all VTSs will be always recompiled (this is relatively fast)
- For final release, always use full compile

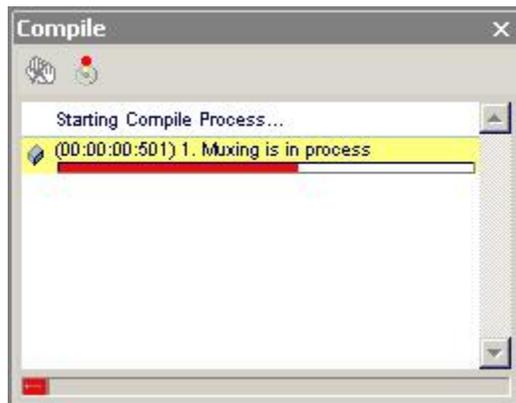
Clicking on the plus sign will open additional options:



Here you can set which VTS titles will be fully recompiled and which will be kept from previous compilation.

### Run on Background

DVD-lab allows you to run the Compile as a background process. This enables you to work on the project or any other project during Compiling. If you use this feature, a Compile window will be opened in DVD-lab where you see the Compile progress and you will get full control over the application. You can even start doing a whole new project while Compile is processing.



You can also exit from DVD-lab during Compiling. In this case, you will be prompted with a question whether to stop the Compile as well or leave it running and detach it from the closing application. In the second case the Compile window will be detached from DVD-lab and the application will close leaving the compile running in its own new window.

### ▶ Post-Compile Options



### Create Verification Report

Using this option a Verification report will be created. You can access the log by clicking the Show Verification Log button on the Compile bar (on the main interface)



### Automatically Start Recording

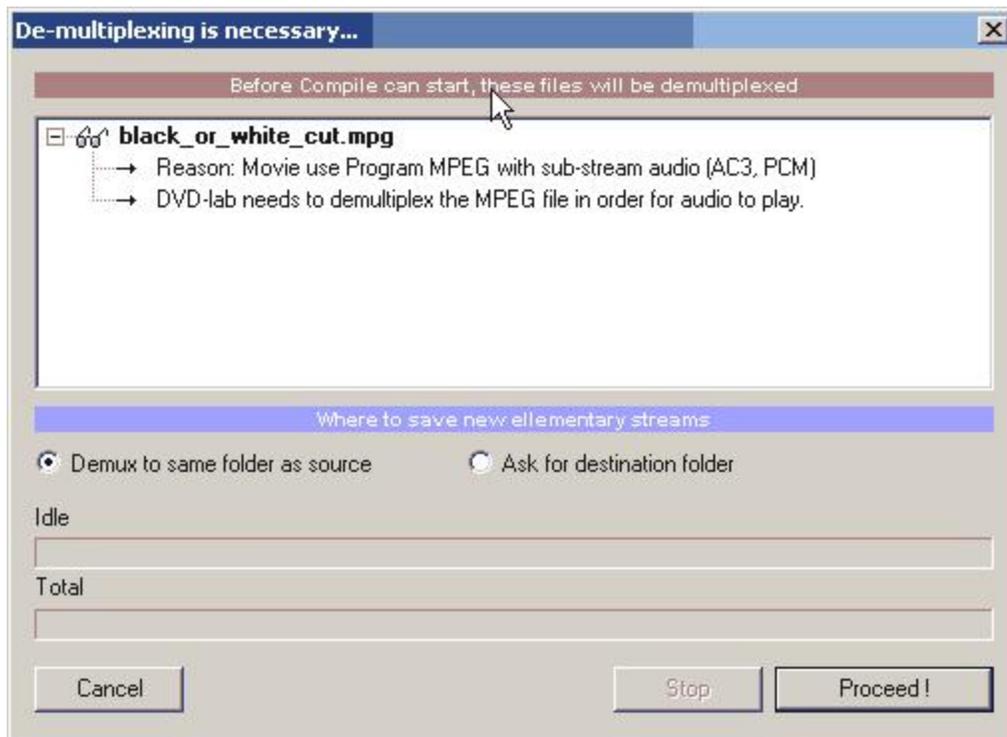
Optionally, you can set a parameter to have DVD-lab run it's Recording module after the Compilation is finished. However, this is not recommended. It is better to first test the compilation with a software DVD Player, playing the DVD files from your hard drive and then record it. This will save a lot of wasted DVD-R media.

### ► Necessary Demultiplexing

Even if you choose Program MPG or VOB files to be imported without demultiplexing, there is still chance in special situations that the demultiplexing is actually necessary prior compile.

These situations are:

- 1. You have MPEG file that has no MPA audio, but has multiplexed AC3 or PCM substream instead. Unless you are sure that the file is just wrongly named VOB file, you will need to demultiplex otherwise the audio will not be heard.
- 2. You use Program MPG file or VOB/VRO file in the movie, but add additional audio or subtitle streams to the same movie. You can't mix multiplexed and elementary streams in one movie, so the MPG or VOB files will need to be demultiplexed.



 **Note:** As mentioned above in (1), some MPG files that have AC3 streams as audio may be in fact full VOB files but wrongly named with an MPG extension. In this case it is easier to rename the \*.mpg file to \*.vob, import it again and use it directly. Unless the (2) apply to the VOB, compiling vob files will be much faster.

### ► Testing the Compiled DVD

To test the DVD from your hard drive use any software DVD player which can run DVD's from hard drive files. For example, PowerDVD, CinePlayer, WinDVD and others can do that.

On a software player, try opening the VIDEO\_TS.IFO file in the VIDEO\_TS folder as a kind of header or index file to start the DVD. Some players need you to open this file from within the player.

 **Note:** The software DVD players can have their own issues. Each software has it's own little quirks and features.

## 11.2 Abstraction Layer

*Compile - Compile w/out Abstraction Layer*

### ► What is Abstraction Layer

*abstraction* - Generalisation; ignoring or hiding details to capture some kind of commonality between different instances.

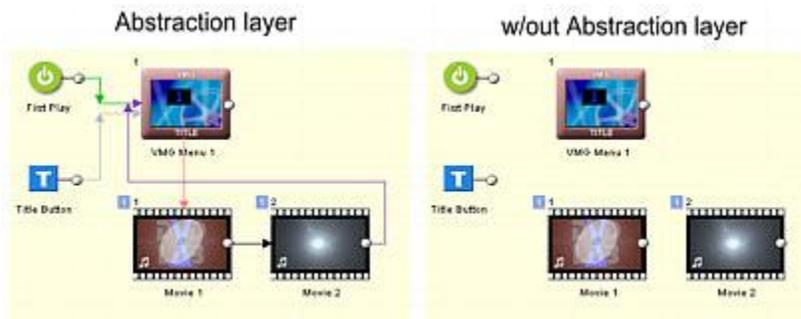
Abstraction Layer is simply the "interface" between you and the specifications. Abstraction Layer is everywhere and it is the reason computing exist - Windows OS is one large Abstraction Layer - even if you are doing some simple operation like dragging a file from one folder to another there are a lot of complex operations going on underneath. But thanks to the Abstraction Layer you don't really have to know anything about sectors or file tables. In fact OS like Windows is an Abstraction Layer build on another Abstraction Layer which is probably build on another layer etc...

A DVD authoring application is the interface between you and the DVD specifications. It also has layers built upon other layers so we have to limit the definition to some usable area.

By using the Abstraction Layer in DVD-lab we will understand the relationship between objects on the DVD (movies, menus) that is generated by DVD-lab. For example if you draw a link from one Movie to another, that is our abstraction layer. You see a connection line and expect that the movies are linked together, but DVD-lab's Abstraction layer will write into Movie Post the command: JumpVTS\_PTT (tt 2, ptt 1). This is very simple example and it gets much more complicated from here.

It is very safe to say that because of the freedom in DVD structure, no two authoring application will create the relation between the objects the same way. Each application leaves its own signature on the compiled DVD by the form of created structure and relations.

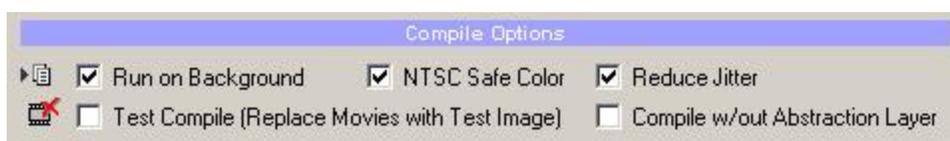
A simple visualisation of our definition is below:



If we build the DVD as displayed in the second image it will obviously not work. The data will be there but DVD player will not know what to do with them. This is the Abstraction layer we are interested in.

► **Compiling without Abstraction layer**

There is an option on the Compile Dialog box that, when used, will instruct DVD-lab not to add any of its commands that are part of the Abstraction layer we just defined.



**Important:** Compiling without Abstraction Layer will guarantee that the DVD will be non-playable, **unless** you had written your own VM commands that substitute for the DVD-lab Abstraction Layer.

### ▶ What DVD lab does when you Compile without Abstraction Layer

#### It will **not** do:

- It will **not** use any graphically defined end links, such as First Play, Menu or Title end links
- It will **not** create shadow (invisible) PGC1 menus in VTS and VMG that are used by the DVD-lab Abstraction Layer for various linking and remote operations
- It will **not** use the special objects such as Play Lists, Splitter, Case List, Return to last menu) because they are part of its AL.

#### It will do

- It will compile and place the DVD objects on DVD (menus, movies, slideshows...) as with AL
- It will use the VM Commands you defined in First Play
- It will use the VM Commands defined in PRE and POST commands of your objects
- It will use the VM Commands you defined in Title Menu on the first VMG menu
- It will use menu Button links and button VM commands (note we put menu button link outside AL)
- It will use Chapter VM Commands (title cells)

 **Note:** Because of the Shadow menu in VMG and VTS, **normally** the VM LinkPGCN command has to use PGCn+1 (the first visible menu in connection is PGC 2). But that doesn't apply on Compiling without Abstraction Layer. Here DVD-lab will not add shadow menu to VTS and VMG, therefore the first visible menu in Connection will be really PGC 1. You have to remember this.

Obviously Compiling without AL is not for everybody. It can be for example used to test a special custom DVD structure or create DVD titles that will become later a part of something else. A very good knowledge of DVD structure and VM commands is obviously required.

## 11.3 DVD Recording

Menu: *Project - Burn DVD from disk*

This is the last step in the DVD creation process.

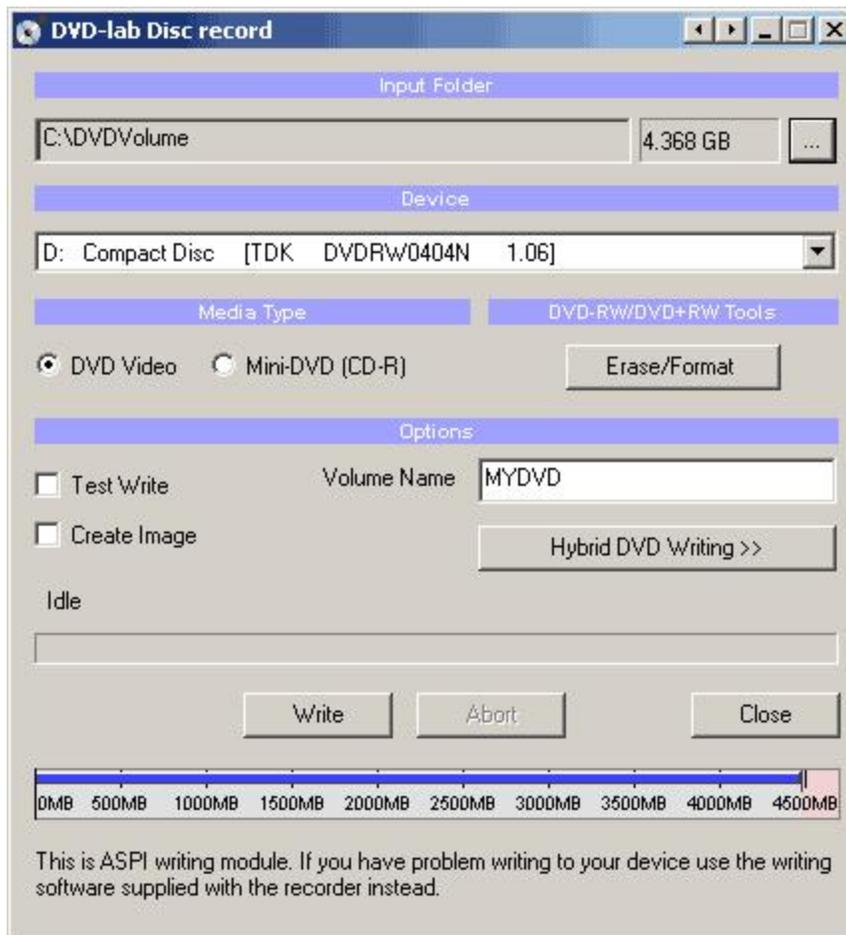
With our DVD Project having been Compiled, there are a set of files that DVD-lab has prepared for you in the Output folder as set in the Compile process. At this point, the DVD Author has choices as to how to convert this set of files into a DVD master disc. You can either use the DVD-lab built-in recording module or you can choose to use a third party DVD recording software such as Nero, Prassi, Gear, etc...



It is common that you are supplied with a DVD recording software that was bundled with your DVD-R/DVD+R burner. This software may be better optimized for your particular drive. The DVD-lab built-in DVD recording module is a general ASPI writing application and should work fine. In an ideal world, either one would work equally well.

#### ▶ DVD-lab Disc record window

The DVD-lab Disc record window is automatically detached. That means it runs as a separate process independent from DVD-lab, you could even close DVD-lab and the recording will continue.



Here are some of the parameter choices for the DVD-lab Disc record window.

## Input Folder

The Input Folder is the same as the Output folder in Compile. That means this is the folder where the VIDEO\_TS and AUDIO\_TS folders are expected to be.

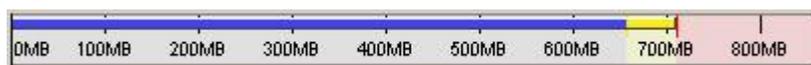
## Device

The DVD recording drive you want to write to, presented as the O/S recognizes it.

## Media Type

Set if you want to burn DVD Video or a Mini-DVD.

**Mini-DVD** is a DVD format burned on the CD-R. Obviously you can put far less data on a CD-R (about 700 MB) than on DVD (4.3 GB)



The size indicator on the bottom can help you to determine how much data you can record to the disc. You have to keep your data below the red area.



**Note:** While you will be able to play the CD-R on a computer not all standalone players will be able to play the Mini-DVD. In fact such format is not officially supported. The reason is that CDs have far less density of data so in order to play the large DVD video bitrate they have to spin much faster than DVD. Not all DVD drives in players are ready for this so the functionality to DVD files from CD-R is often simply disabled. However a number of Asian or re-branded Asian US models of players use a standard PC type of DVD drive which allows for the faster spin speed of CDs.

## DVD-RW/DVD+RW Tools

For those using a re-writable media, the DVD-RW needs to be formatted if they were already used - click the **Erase/Format** button to do this. The more common DVD-R media do not need any formatting.

The DVD-RW and +RW needs to be finalized after writing. This takes quite a large amount of time on RW media. Please be patient until this important process is completed.

## Options

### ▶ Test Write checkbox

Use this option by checking the Test Write checkbox to have DVD-lab do a trial run at writing a DVD. This option does not write anything to disk or your hard drive, it merely goes through the motions to insure that all of the content and menus within the DVD project are correctly prepared and defined.

### ▶ Volume Name input

Enter here a name for the DVD volume that will appear when placed in a computer drive. A standalone DVD player just ignores this.

### ▶ Create Image checkbox

You can choose to have DVD-lab create a large file on your hard drive which is an the image of a DVD disc instead of burning. The result will be one big IMG file. That IMG file can be used with a number of third party DVD recording software to replicate a DVD disc from this image file, as many times as you like, whenever you like. Some software will look for a ISO file name extension, if so, just rename the file to a .ISO extension. This method has the advantage of speed as the DVD image is all prepared on your hard drive, it is then a just matter of how fast your DVD burner drive will burn that image.

### ▶ Hybrid DVD Writing button

You can add additional files and folders to the DVD master disc with the Hybrid DVD Writing option. What this option will do is setup an alternate filesystem on the DVD master disc which is called an ISO filesystem. The ISO format is what a standard CD uses while the DVD video is in UDF/ISO. This is perfectly DVD "legal" as the DVD player doesn't know or care about this ISO filesystem's contents, it just looks for a UDF filesystem.

It doesn't matter at all what the content or nature of these files are. They are just files, not Windows or Mac or Linux files, just files. As they are recorded into the ISO file system domain, they are available on any computer with a DVD drive. This offers the DVD-lab Author some creative options for bonus content that would be available to a computer user on any O/S that supports a DVD drive.



For example, you can create an autorun project in Multimedia Builder and record it to DVD as an extra feature when used on PC. HTML based content may be placed here as well, be sure to indicate to your computer users where to find your HTML starting page (ex: index.html).

 **Note:** The space used by the Hybrid DVD Writing option counts in the entire Project space value. You only get so much space on a DVD (4.7G), this option uses part of that. Do the math to be sure you have room for this extra area.

#### Write button

As expected, click this button to start the DVD writing (burn) process.

 **Note:** It is not recommended to do any work on the computer during DVD writing. Things like reading/writing to hard-drive may easily ruin your DVD-R. Try to let the burning process be the only thing your computer is running until it is completed.

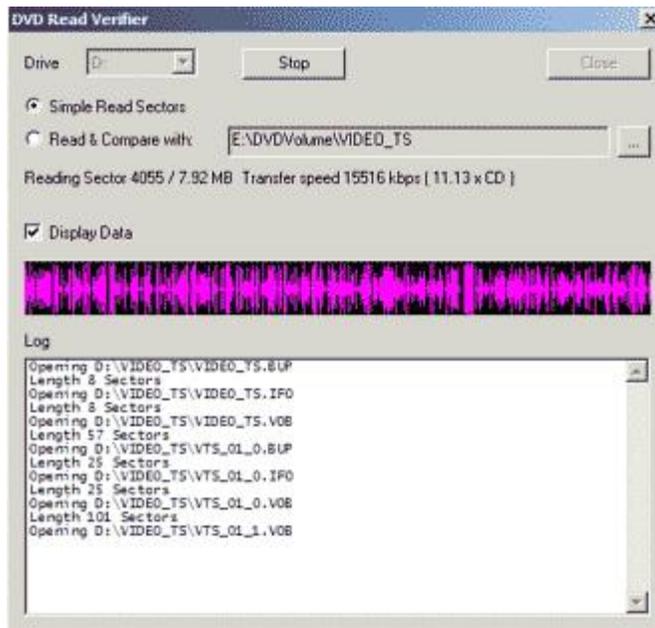
---

**Congratulations** - now it is up to you to enjoy the DVD.

## 11.4 DVD Verification

Menu: *Project - Verify Burn DVD*

When you are done recording the DVD, you can use this tool to verify the burned data.



**Simple Read Sectors** - this is a simple way to test any DVD. Each sector will be tested and you will see a visual representation of the data being transmitted from the DVD. This will assure you that all data can be read.

**Read & Compare** - a more advanced verification where the written sectors will be compared with the original Project on your hard-drive. This will assure you that all data can be read and they are same as the original data.

## 11.5 Generate Report

Menu: *Project - Generate Report*

Often it is useful to share some of the project information with other people. An example could be a "*How to*" document or tutorial, a bug report or a quick project explanation over internet (for example forums or E-mail)

There are three different Reports that can be generated from a project. First two are pure text reports while the third one uses images.

### File Overview

A simple overview of the used audio and video files in project. This Report will report data on used audio/video files in Movies. It will only report a number of menus but nothing more.

*Example:*

```
VMG Menus: VMG Menu 1

VTS 1
Menus: Menu 1, Menu 2, Menu 3
Movie 1: MPV 720x576,25.00,4:3,00:04:02,PAL,6162 kbps
Audio 1: MPA 48.0 kHz,224 Kbps,00:04:02,Stereo,224 kbps
```

This report can be useful when you having some problem compiling files and need to share the file information with people on web boards or in E-mail.

### Links & Commands

This Report creates a description of the project layout and logic. All links and VM Commands will be included.

*Example:*

```
First Play: Link to Menu "Menu 1" (VTS1)
Title Button: Link to Menu "Menu 1" (VTS1)

VMG Menus
-none-

VTS 1 Menus
Menu: "Menu 1"
Timeout: 255 Default Btn: 1
PRE Command:
GPRM2 = 0
Button 1: Link to Movie "Movie 1", Chapter 1
End Link: -none-

VTS 1 Movies
Movie: "Movie 1" Chapters: 1
End Link: Root Menu
```

This report can be useful when examining the flow of the project or debugging complex layout. It can be sent by E-mail or post on web boards. By looking at the report someone may build a project that works similarly to the original

### HTML with images

A full Report that not only combines the two previous reports but also adds images to illustrate the visual part of the project. This is a great way to make a tutorial or explain how some project looks and works. Everything that is needed to understand such project is included in the Report and by looking at it you can build a project that looks and works just like the original.

*Example:*

	Link To	VM Command
First Play	Menu "Menu 1" (VTS1)	
Title Button	Menu "Menu 1" (VTS1)	

**VMG Menus**

-none-

**VTS 1 Menus**

	Menu	Menu 1
	Timeout: 255	Default Btn: 1
PRE	GPRM2 = 0	
POST		
	Button 1	Link to Movie Movie 1, Chapter 1
End Link	-none-	

**VTS 1 Movies**

Movie 1	720x576,25.00,4:3,00:06:06,PAL,3185 kbps	
	V1: black_or_white_cut_DCT.mpv V1: black_or_white_cut_DCT.ac3	
Chapters	1	
Audio 1	AC3	CH:2,48.0 kHz,256 Kbps,00:00:09,Dolby 2/0,262 kbps
PRE		
POST		
End Link	Root Menu	

Such Report can be placed on a web page as a tutorial. It stores the images in "images" subfolder.

 **Note:** This above is obviously very simple project that has only one menu, one button and one movie. It is here for an illustration.

## 11.6 Pre-Mastering - Layer Break

Menu: *Project - Pre-Mastering - Set Layer break*

A dual layer disc was created to double the capacity of normal single-layer DVD. It has two layers of data where one layer is semi-transparent so the laser can focus on it through first layer. Generally the second layer can be PTP (parallel track path) or OTP (opposite track path also called RSDL). The Layers (called L0 and L1) may have different amount of data. For OTP the L0 must be bigger or equal to L1.

The OTP layer is designed for DVD-Video to provide continuous playback across the layers. There is no guarantee that the layer change will be seamless. A dual layer has about 8.5GB space.

### Layer Break

In order to record a long video on dual layer disc a Layer Break need to be specified. A layer break can be automatically a beginning of a video, but in case of a long video crossing the layers, the Layer Break must be specified within the video itself.

### DVD+R DL

There are new recordable Dual Layer formats such as the DVD+R DL (Hewlett-Packard, Dell and Philips) with other formats such as DVD-R DL coming soon.

It is important to realize that DVD-Video and recordable DVD+R DL are two different formats. The DVD+R DL is a commercialized dual layer and it doesn't replace DVD-Video. Most notably the +R DL is already pre-formatted as OTP where each layer must have the same amount of data. A DVD+R DL was not created for any extensive using of custom Layer Break and it is expected that the data will be equally divided (the layer break will be in the middle of disc).

For DVD+R DL it is recommended to let the recording application to place the Layer Break.

It is possible to also set a custom LB for DVD+R DL, but this require that a writing application must:

- Honor the set Layer Break (not all recording application do)
- Reallocate sectors so the LB meet the DVD specification criteria
- Make the both DL layers equal by writing padding data.

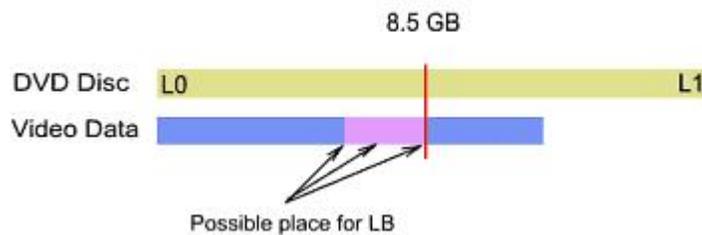
Not many (or in fact very few) current recording application are able to do all the above. The +R DL format is a commercial format so most recording applications will simply split the files in the middle.

A custom layer break is more important for mastering DVD-Video.

### Position of Layer Break (LB)

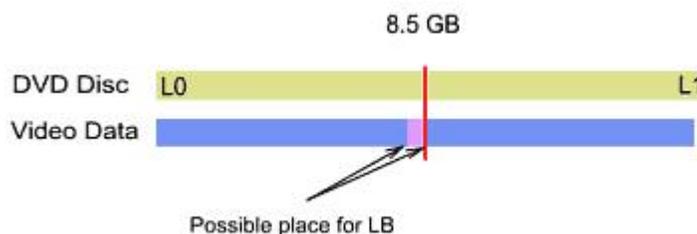
A common mistake is that LB can be placed anywhere. But it is not true. There is only small

area where the LB can be and it depends on the total amount of data we are writing to DVD.



The image above shows the relationship between the LB position and the amount of data we are writing to disc. The top bar shows the total DL disc capacity. The Blue bar shows the amount of data we need to write. The purple bar shows an area where it is possible to have Layer Break.

If we will try to write more data to DVD, the area of possible LB will shrink until the only possible layer break will be in the middle.



Layer Break cannot be anywhere on the video. The more data you write to DVD, the less freedom of placing LB you have.

There are also other rules for placing LB within DVD Specs. It has to be on cell boundary and the cell must be on the edge of ECC block.

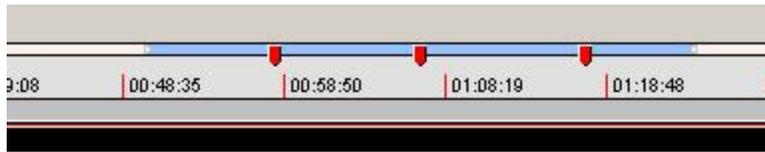
After a DVD compilation there is, however little chance that an usable cell will be already aligned with the edge of ECC block. Therefore a recording or pre-mastering application has to reallocate sectors to meet this requirement.

Custom placing Layer Break is not trivial job.

### Layer Break Range

To help you approximate the placement of Layer break a LB Range is shown in the chapter area as a blue or cyan line. (Only for projects that have data larger than single DVD 5)

Beginning of this area marks the half size of data on the disc, the end of this area marks the half size of total DVD9 capacity. A chapters inside this area will be able to serve for Layer Break. The Layer Break Range may also cross movie boundaries or even cross few movies, depending on the size of each movie and their position on DVD. Besides this, "Change Order of Items" will also reposition this area.

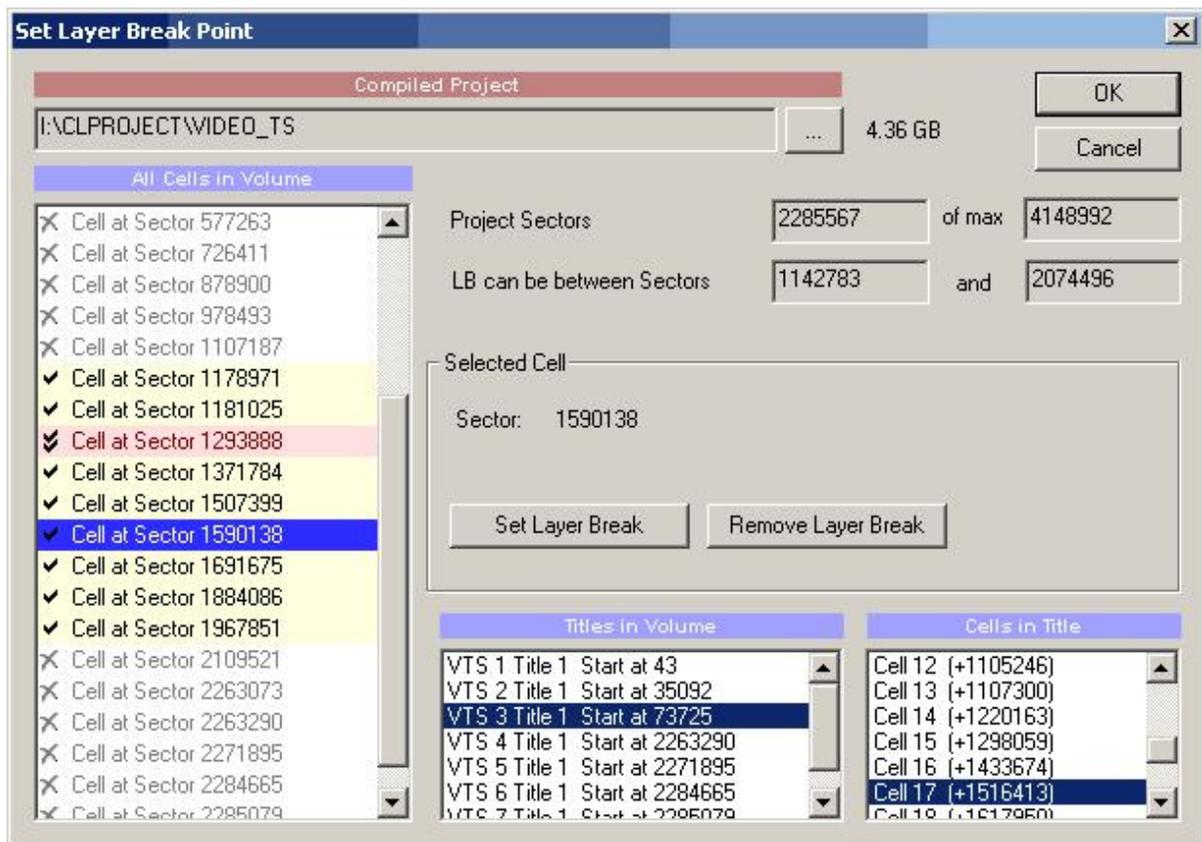


The Layer Break Range is only approximated.

### Set Layer Break Point

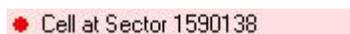
Menu: *Project - Pre-Mastering - Set Layer break*

This pre-mastering tool will show all the cells on compiled application (All cells in volume) that are all in the area where Layer Break is possible. A video Preview will show the place of each cell. The cells corresponds to a beginning of video and each chapter in your DVD-lab project.

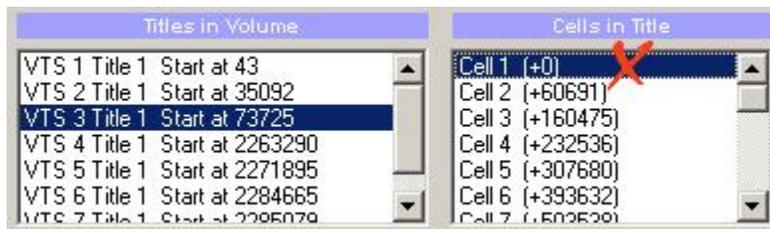


You simply select a cell in "All Cells in Volume" listbox and then press "Set Layer Break" button.

The Cell will be flagged with a non-seamless flag and shown with red circle icon.



 **Tip:** You don't need to flag a LB to a Cell 1 in a title. The Cell 1 is automatically a good candidate for LB and recording application should choose that cell for Layer Break Automatically if possible. However in most cases Cell 1 will be not in acceptable area.



Setting a cell to be LB is just the first step in pre-mastering.

The next step is to

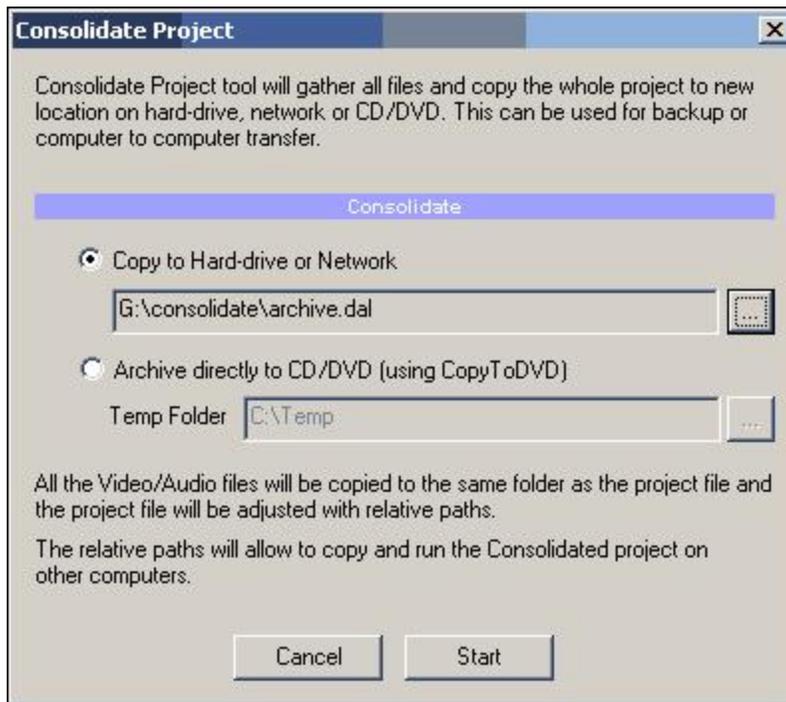
- Burn the DVD with application that honor the LB placement
- Create ISO file
- Write to DLT

## 11.7 Consolidate

Menu: *Project - Consolidate Project...*

Consolidate Project is a tool for project backup, archiving or to transfer it from one computer to another. It will gather all necessary files and write it together with modified project file to a hard-drive, network or CD/DVD.

 **Note:** Before the Consolidate Project tool can start, the current project has to be saved.



### Files that are being copied:

- The Project (\*.dal) file
- Video, audio and subtitle files of Movies
- Index files for Video
- Transition videos
- Video/Audio for Menu
- Images for slideshow

There are two modes:

### Copy to Hard-drive or Network

This will get all external files and copy them to the desired place. The Project file will be modified to use Relative Paths and can be run from any location provided the files stay within the same path.

### Relative Paths

Normal project stores the paths to external audio/video file as a full path for example:

E:\videos\wd\_02.mpg

A Consolidated project uses relative paths and it will store just the name of the file:

wd\_02.mpg

This way you can transfer the whole project and files from computer to computer.

 **Note:** First the project with relative paths will be saved to the destination, then all other files will be copied.

### **Archive directly to CD/DVD (using CopyToDVD add-on module)**

This will write all audio/video files and project file to the CD or DVD. The Project file will be modified with relative paths so it can be later run directly from the CD/DVD.

 **Note:** It is recommended to create index files for all movies prior archiving because you will be not able to do it once the movies are written on CD/DVD.

### **Running Consolidated Project**

If you open previously Consolidated project from hard-drive or Network, the project will behave as the original but it will load local copy of the audio/video files that were copied to its own location. The project will keep relative paths until you save it. Once you save the project back it will convert relative paths to full paths according to the current situation.

You can also open Archived project directly from CD/DVD and make changes, then you can only save it to some other place than the CD/DVD. The project will however still need the audio/video files from the archive media. Opening project directly from CD/DVD is not recommended for speed reasons and possible file access problems.

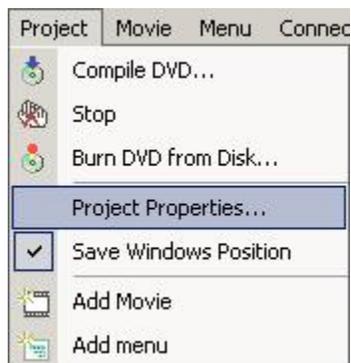
A better way is to copy the project and files from the CD/DVD to hard-drive and run it from there.

## **12 Project**

### **12.1 Properties**

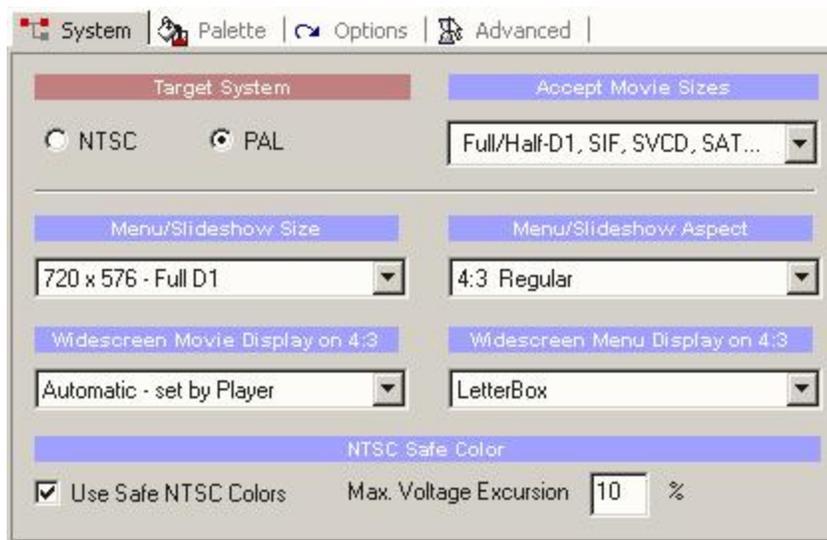
Menu: *Project - Project Properties*

Here you can set Project, Palette and General Properties



#### **▶ System properties**

These are project properties setting for the DVD System:

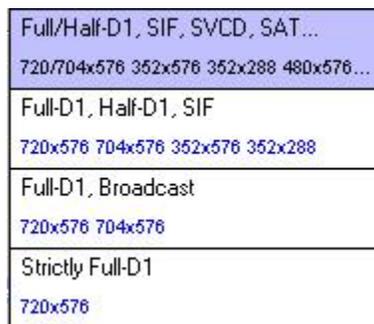


### Target system

NTSC or PAL. Select the system you want to create the DVD for. This setting will be remembered for all future sessions.

### Accept Movie Sizes

DVD-lab allows you to add any DVD acceptable NTSC/PAL MPEG-2 and MPEG-1 files. It also allows you to add MPEG files with non-DVD frame sizes for special purposes. The Accept Movie Sizes option is here to more define the area of DVD specifications and compatibility that you can use.



The items in the 'Accept Movie sizes' towards bottom will put more restrictions to the files you can import. For example if you choose *Strictly Full-D1*, only 720x480 or 720x576 will be accepted and all other frame sizes will throw error message during importing.

Here is a list of normally accepted MPEG1/MPEG2 files by DVD-lab:

	NTSC	PAL	Comment
MPEG-2			
Full-D1	720x480	720x576	Best frame size

Full-D1 (broadcast)	704x480	704x576	
Half-D1	352x480	352x576	(1)
SIF	352x240	352x288	(1)
SVCD	480x480	480x576	(2)
SAT	544x480	544x576	(2)
<b>MPEG-1</b>			
VCD	352x240	352x288	(3)

- (1) Some player may have trouble to display subtitles  
 (2) Out of DVD-specs. It may play on some DVD players but it will not play others  
 (3) Very low quality

### Menu/Slideshow Size

This is setting for the target Menu/Slideshow size.

The Menu/Slideshow size will affect only the **creation of menus and slideshows** and has nothing to do with movies you can add to DVD.



The far most common setting is to have menus always **Full D1** (even if you have Half D1 videos).

However a few DVD players may be confused playing such discs so in this case, you can set the Menu/Slideshow Size to the same size as the movies. Most of the DVD players will be able to play this fine, but a **small misalignment** of background and subpicture in menus may be produced in some players.



**Image 1** - the correct alignment on **Full-D1** menu. **Image 2** - Few players may show a misalignment if the Menu is **not Full D1**. The misalignment is most likely due to the poor scaling algorithm in the DVD player. Some cheaper brands may have such a flaw.



**Always the best is to use Full D1 menus size** regardless of the movie frame size - such discs should perform the best

If you are very concerned about playability on all possible systems you can always put non-

standard or non-Full D1 movies into separate VTS and access them only through standard Full-D1 VMG menu.

### **Non-Standard Sizes.**

There are sizes which are not in DVD specs, but many DVD players will play them. (Sadly, sometimes they will be played better than some supported modes)

DVD-lab will allow you to add these files. In a questionable case it will produce a warning and let you to continue. That means you can for example add a SVCD movie (480x480) to a DVD. You can have about 3 SVCD movie on one DVD-R. (Normally SVCD should be recorded on CD - hence its name Super-Video-CD). Many players supporting SVCD will play such DVD just fine and they will not care that it has been recorded on DVD. Also some players which explicitly say they don't support SVCD may play it.



**For best compatibility across many players use only Full-D1 MPEG-2 movies.** Never even consider non-standard size for a release that goes to many people

### **Menu Aspect**

Menus can be 4:3 or 16:9, please read more in the menu section.

### **Widescreen Movie Display on 4:3**

This is a flag telling your DVD player how to play 16:9 movies on 4:3 TV. It doesn't affect widescreen TV's nor it affect the 4:3 movies on either TV.

See Aspect Ratio chapter about the 16:9 movies.

You can leave it on Automatic - the player will use its internal setting to display the movie as Letterboxed or Pan&Scan.

Other common setting is to use Letterbox (this will add the black bars on top and bottom on 4:3 TV)

### **Widescreen Menu Display on 4:3**

This will tell your DVD player how to display widescreen menus on 4:3 TV. You can choose either Letterbox or Pan & Scan.

### **Default DVD Volume Name**

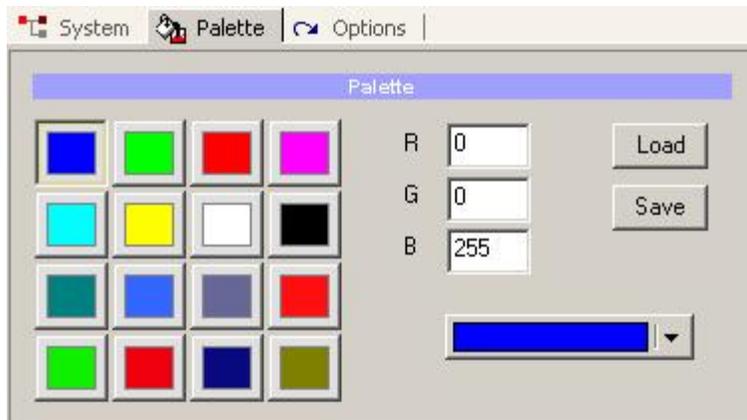
This is a default DVD name which will be recorder to DVD during burning session. You can also change it from the Record Dialog prior the writing.

### **NTSC Safe Color**

Process the menus through the NTSC Safe color filter prior compiling. It doesn't affect PAL target systems. Read more about the NTSC safe colors in the NTSC Overheat. You should leave it selected.

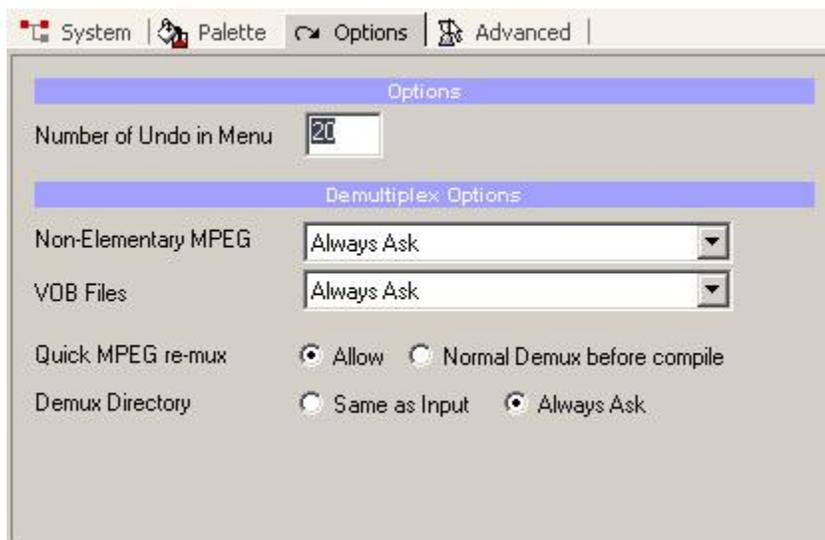
### **Palette**

The DVD allows you to have palette of 16 colors from which you can choose colors for menu subpicture highlighting.



This is the place where you define the palette. Read more in the Color Map section of Menu. The new Color Palette will be available for future sessions.

### ► Options



Here you can set other DVD-lab options such as Number of Undo for menus, Demultiplex options and Errors & Warnings.

**Non-Elementary MPEG/ VOB Files** - what to do if you import System MPEG or VOB files - Ask, Demultiplex or use without demuxing.

**Quick MPEG re-mux** - This sets how the multiplexed MPEG will be used during compilation. If you use input MPEG files without demultiplexing then:

- a). if set to **Allow**, the files will be re-multiplexed in parallel mode (on-the-fly) during compile to DVD (faster, uses less space)

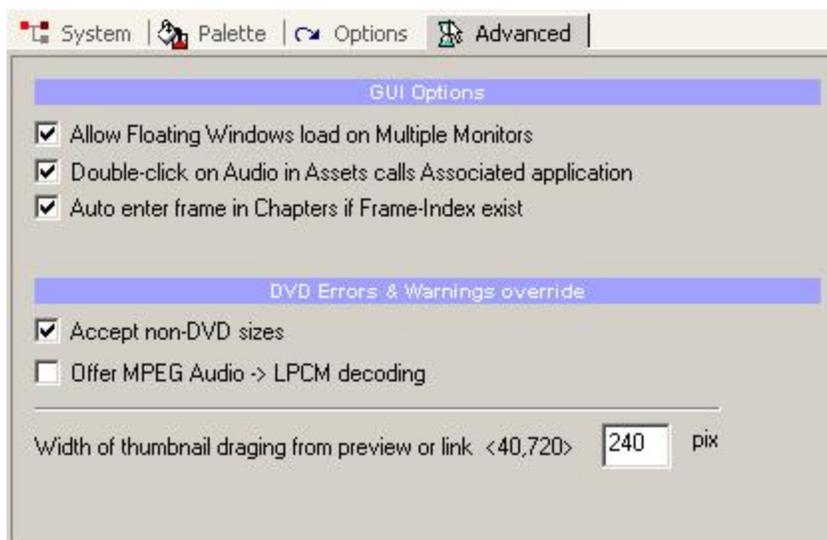
b). if set here **Normal Demux before compile**, the files will be normally demultiplexed during the pre-compile operation. (slower, more space, more safe)

The default is set to **Allow** (re-muxing on-the-fly) which in a case when an MPEG has a different mux ratio, may cause audio loss (the compile is not getting audio data fast enough). As an option, you can then switch this to perform in a "Normal" mode, that means demux the files quietly first, then use them as elementary streams in further compiles.

If you use MPEG encoders which are DVD compatible (MainConcept, TMPGEnc etc.) then the **Allow** option should work fine. If the MPEG is questionable, then either demux it first or use the Normal mode.

**Demux Directory** - What directory to use for demuxed files - the same or ask for new.

### ▶ Advanced



### GUI Options:

**Allow Floating Windows load on Multiple Monitors:** - If you have multiple monitors then this option will let you to remember window position also on the secondary monitors. If unchecked, all floating windows will be moved to the first monitor next time you load the software.

**Double-Click on audio assets calls Associated application:** When you double-click on an audio file in Assets, it will be played by running the associated application for that file type such as WinAmp (default). If unchecked, the audio will be played through an MCI call to Windows Media Player. While this is faster option, the WM MCI are known to cause problems which may even lead to crash.

### DVD Errors and Warnings

**Accept non-DVD sizes** - If the frame size of the video is not in DVD standard the software

will issue only a warning but will let you to continue.

**Offer MPEG ->LPCM encoding** - If imported MPEG Audio files are encountered, DVD-lab will offer you to transcode it to LPCM.

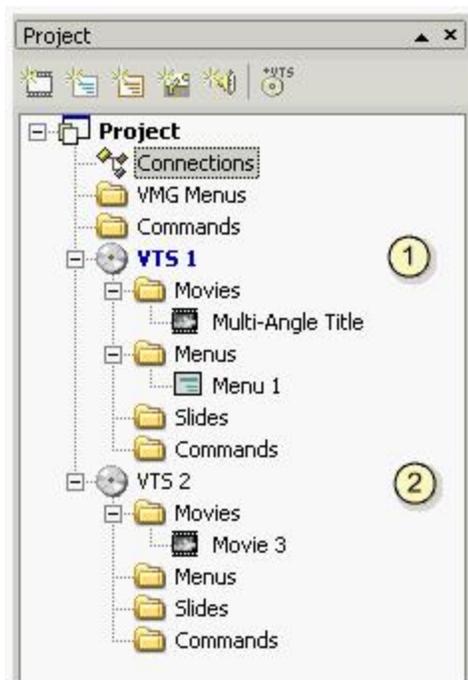
### **Width of thumbnail dragging from preview or link <40,720>**

Width of the still image created in menu that you drag from preview or from Properties.

## **12.2 Multi-VTS**

DVD can be divided into sub-projects with similar parameters called VTS or Video title Set. To get some idea about DVD structure you can read the DVD basics.

A project Window displays the current DVD structure where you can see that each VTS can have its own movies, menus and other items.



By default you will start with one VTS and for many project that is all what is needed. However if you want to for example combine different type of video (widescreen, 4:3) or movies with each different audio type (one with ac3, other with mpa) then you will need to use multiple VTSs.

In one VTS you can combine movies only with:

- same frame size (for example D1)
- same type of audio channels (for example ac3)
- same aspect (for example 4:3)
- multi-angle

If any movie differ from the above, you can't use it in the same VTS with the other movies, you have to create a new VTS for it.

To add VTS simply press Add new VTS button on the top of Project Window.



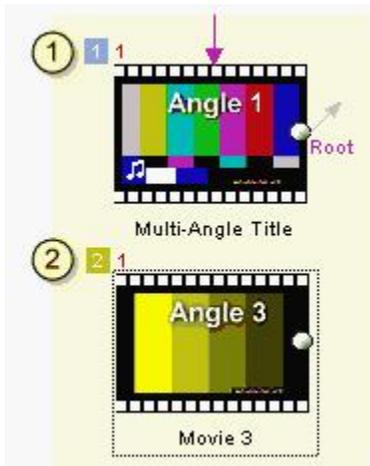
A new VTS will be created and also an empty movie object will be placed there. (Each VTS has to have at least one movie object)

To delete VTS simply select it in the Project and press Del key.



The active VTS will be highlighted in blue. Any new objects will be added to the active VTS.

In Connection window each VTS will be coded by different color under the item number.



You can also switch between active VTS's by clicking on the VTS selector in the connection window (bottom)

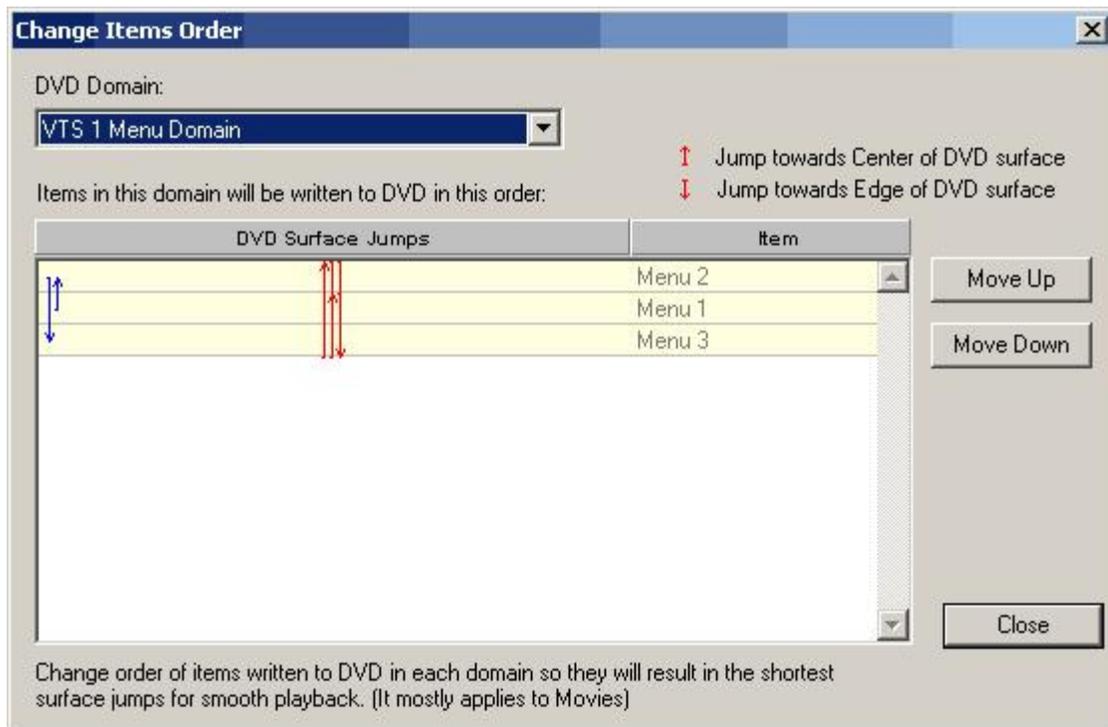


## 12.3 Change Order of items

Menu: *Project - Change order of items*

On DVD the order in which the files are written matters. For example a first menu in a VTS called ROOT has a special meaning. Or if you often call one movie after another it is better if they are written sequentially on the DVD than in random order.

This option lets you re-order the items in project at any time..



### ► DVD Domain

Here you will select in which domain you would like to do reordering. The domains are VMG, VTS Menu domains (for each VTS) and VTS Title domains (for each VTS)

### ► Table

Pressing Move Up or Move Down you can re-order the selected item in this table. Arrows on the left side shows the jumps that DVD player will have to perform (based on your links).

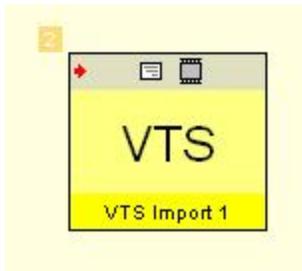
 **Note:** Normally you should not be concerned too much about creating the "perfect" order of items on DVD, only in special cases. Especially menus don't take much surface space so player can jump quite randomly without much delay.

## 12.4 Attach External VTS

*File - Attach External VTS*

**Note:** If you don't fully understand this feature, you may easily create unplayable disc or player lockups.

*Attach External VTS* will allow a user to load a whole VTS that has been previously compiled with DVD-lab.



One example of using this feature would be a very complicated DVD with many hundreds of menus. It would be much easier to handle and test it, if you divide it into few VTS blocks that are created, compiled and tested separately. Then at the end you can join these VTS blocks into a final disc using the Attach External VTS feature.

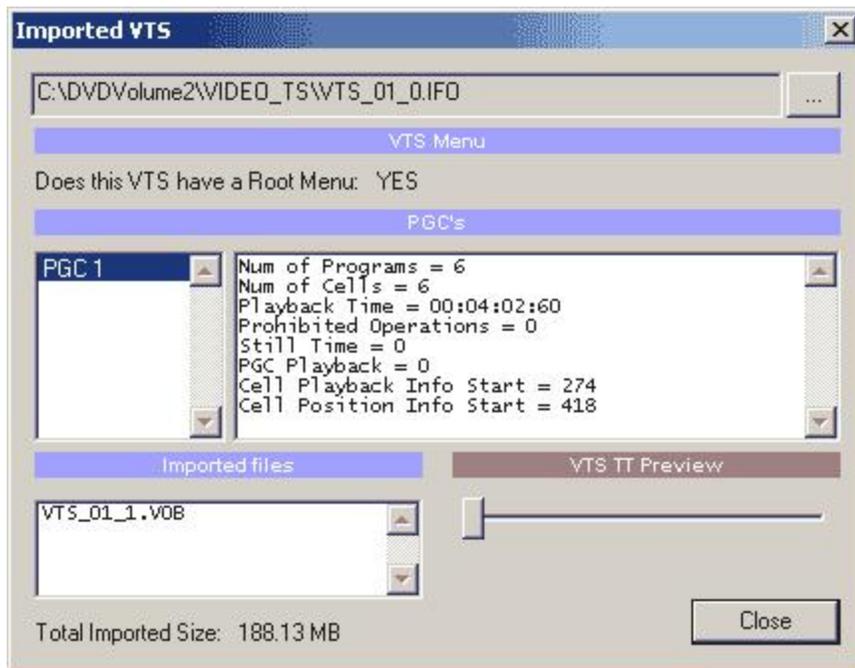
Another example would be creating a special VTS project in another DVD application and then using it in DVD-lab. For example create a fancy slideshow in some advanced DVD slideshow software. However, especially here apply the above warning: if you don't understand how the external VTS is built and what objects it calls from within, you may create an unplayable DVD.

This option will does what it says - it will attach the whole VTS as is, without any changes. It is your responsibility to know what your VTS exactly does. A VTS that calls other VTS or VMG menus that will be not present in this new disc will lock up or crash the player.

VTS import has two inputs that can be used in connections:

- Root menu
- First Movie

By doubleclicking on the imported VTS you will see some details:



Here you have some detailed info about the imported VTS. From the details above we see that the VTS has Root menu. We also see that there is only one PGC (one movie) which has 6 chapters (Num of Programs/Cells).

Note that in some cases the Root menu may be just a dummy containing just VM commands.

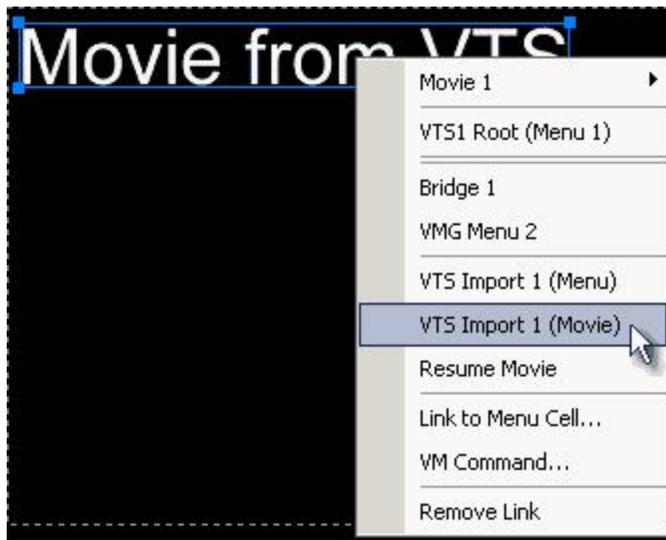
**Note:** You can attach only 3 VTS's in one project.

### Connection

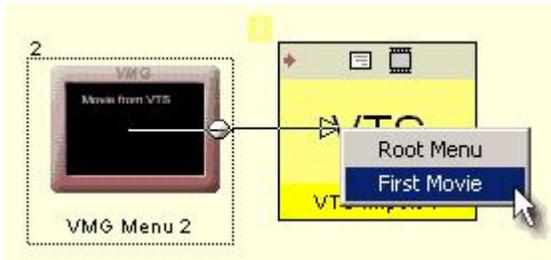
The only thing you can connect is the input. The VTS must handle the end link (if any) by itself.

Since it is a VTS, you have to connect it from VMG menu.

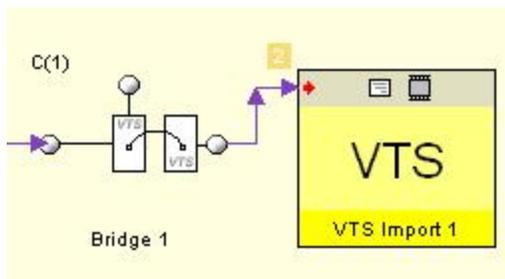
Select any button in VMG menu and right click (or press SPACEBAR) to open the link menu.



The VTS import will have two entries Menu and Movie. Similarly if we create a button connection from the Connection window we get to choose the input of VTS import as either Root menu or First movie.



You can't connect to VTS import from VTS menu because of the cross-VTS limitations on DVD. Eventually you can connect any VTS menu to VTS import using Bridge.



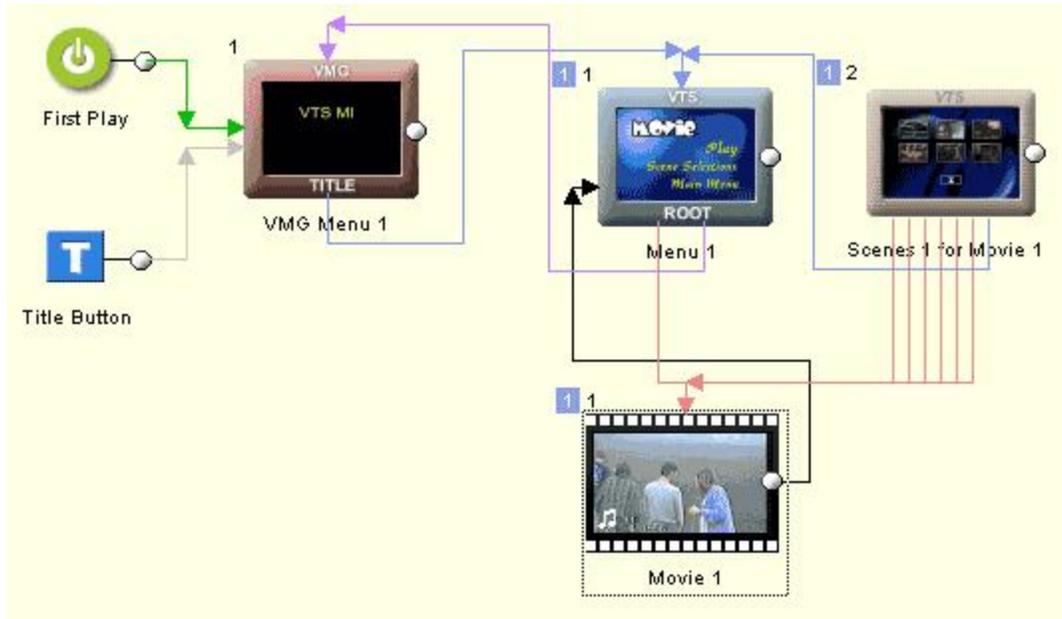
If you link from the end of a VMG menu (menu timeout) or a Bridge the connection is unspecified (the link comes to the left side). The pre-compile will first test if VTS import has a Root Menu and if not it will connect to First Movie.

### A simple example

This is just a very simple example that shows the idea of working on one project per VTS. Obviously, there is no reason for this particular example to do it this way, but it is just for

illustration. Imagine the project is far more complex.

First we create the VTS project as below.

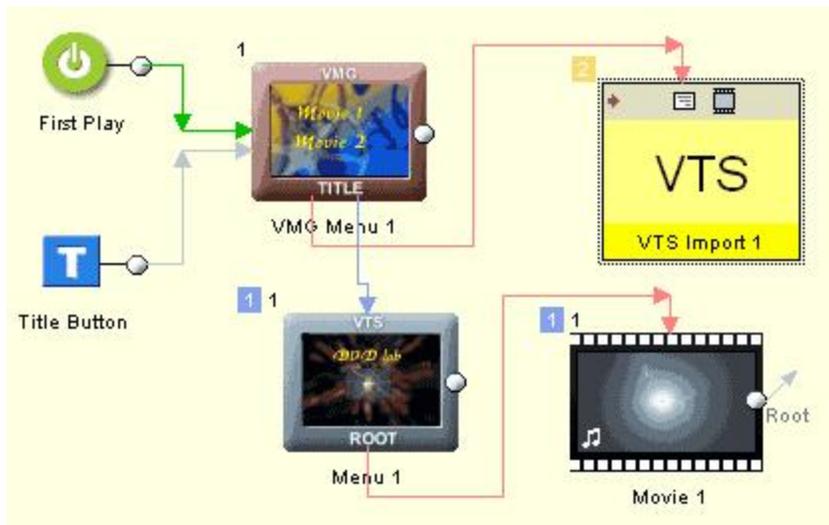


We have one VMG menu that is used just temporary. It calls Root VTS menu. The Root VTS menu has Play button and Scene Selection button, but it has also button called "Main Menu" that links back to the VMG menu.

We save the project, then compile it to C:\DVDVolume1 and then test it with a software DVD Player.

On the image above, all objects that have blue number 1 in top left corner belongs to the VTS and can be later attached to new project. The VMG menu is just a temporary here. It will be not attached to the final project, but the link in the VTS menu to the first VMG Menu will still exist in the VTS.

Now create fresh new project: that will import the previously created VTS



In this project we Attach external VTS the VTS\_01\_0.IFO we created just previously in C:\DVDvolume1\VIDEO\_TS

Then add a VMG menu and another movie with its own VTS root menu. The VMG menu buttons links to VTS Import Root Menu and another to the new VTS Menu 1 with link to some other movie. Because in the previously compiled VTS, in menu we put a "Main Menu" button that links to the temporary first VMG menu, this will work in the new project as well. The imported VTS menu will link to first VMG menu, but this time we have VMG Menu that we want on final DVD.

Now compile this to a new place C:\DVDVolumeResult

The result should be fully working.

The Attach External VTS is designed for projects compiled with DVD-lab PRO. While there is a theoretical probability that Attach External VTS will allow you to add VTS built by other DVD applications, please note that in many other authoring applications (even in advanced ones) it is not exactly clear to the author which menus are put to VMG and which to VTS. The authoring application does this often behind the author's back and mix it in a messy DVD structure. Yes, even some professional expensive applications will create structure where a simple link from one menu to another may go through few dummy VMG menus. In such VTS, linking to Root menu may easily crash or lockup player and only linking to First Movie may work to some extent.

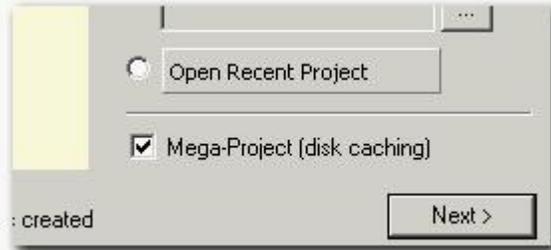
DVD-lab PRO favors a clean structure where you exactly know where is what, therefore Attaching External VTS should work without problems if you understand what you are doing.

## 12.5 Mega-Project (caching)

When you are creating large amount of menus (hundred and more), the memory may get soon full and the Windows system may start showing memory messages. One way to save memory at this point would be to use menu *Project - Free-up memory* to dump not currently used data from memory.

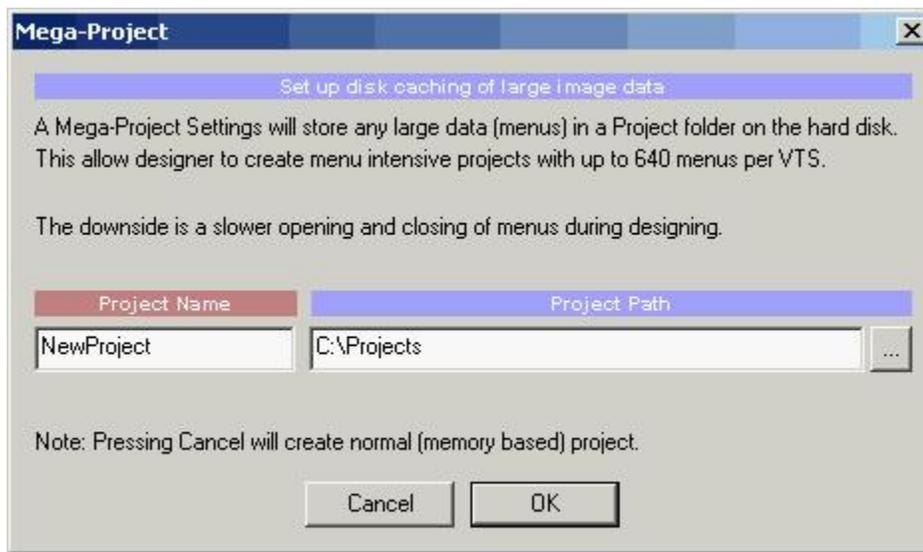
The other, better way is to plan ahead and create Mega-Project, that will cache all menu data constantly to disc and not to memory.

From the *Default Project* window that appears when you press New, choose *Mega-Project* option.



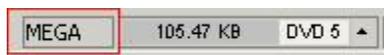
Note: If the *Default Project* window doesn't appear on New, then you may have disabled it - go to menu *Project - Set Default Project* and then set ON the *Show every time New Project is created* option.

The next step in the Mega-Project is to select the Project folder where all data will be constantly saved.



The data are saved to the disc when you close a Menu and then loaded when you open the menu back. The folder will have a file for each menu and/or cell on your project. Each of the files can have one or more megabytes depending on the data, so make sure your disc has enough space to store all your menus (could be few hundreds of MB in total)

The status bar will remind you that you are in mega-Project mode and also will indicate when there is saving or loading of the data:



There is no way to turn Regular project into Mega-project and vice-versa, so a careful planning is necessary before you start project.

## 13 VM Commands

### 13.1 Basic Overview

All actions on DVD are driven by a special DVD command language also called virtual machine commands (VM). If you decided to create a DVD all by yourself (without an authoring application) it is simply not enough to place all the video files there, but you have to write a "program" or set of instructions to tell the DVD player how to start, what to do with the files, what to do when the files finish playing etc. And we didn't even started with menus yet....

#### **Don't panic!**

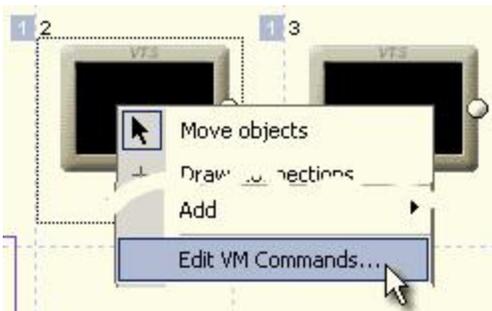
Knowledge of VM Commands is absolutely **not** required in order to work with DVD-lab PRO. You may simply skip all this *nonsense* and pretend VM Commands exist only in a parallel universe. In your nice and cozy universe, a DVD is built using only tiny boxes that you can link together in the Connections window using your mouse. Hey, if you believe in this long enough it even becomes the truth!

#### **VM Introduction**

The major task of any mainstream DVD authoring application is to hide as much as possible of this from the users. It is obvious why. Users would require a much deeper knowledge of the DVD structure to be able to do even simple task like playing a movie. A DVD authoring application has to create a flexible environment for the user yet it has to be smart enough to be able to translate all this flexibility into a playable VM command language. Because VM commands are a language, two similar DVD's that seems to behave the same way are very often created totally different way internally.

All the pages in this tutorial before this one talk about various way of linking "objects", "buttons" and various smart components. But what is hidden beneath this is in fact the difficult task of creating DVD structure and a "program" in DVD machine code that would perform what users visually designed.

A simple way of checking this is to open connection window, right click on a Menu to open the menu and select Edit VM Commands.



In the window that will open you will see in the *DVD-lab dynamically added commands* something like this:

```
1. GPRM12 = 1024
2. if (GPRM11 == 7) GPRM12 = 0
3. if (GPRM12 == 0) Goto 5
4. SetHL_BTN GPRM12
5. GPRM11 = 6
6. GPRM15 = 6
```

There are already some commands and we didn't make anything yet!

▶ As you may see DVD-lab goes one step beyond standard DVD authoring. It allows you to not only see these commands but also add a new ones. For serious authors this is very important feature. No matter how smart you can make your authoring application, there is always something that it will not allow you to do easily or not at all. Having ability to edit VM commands opens a whole new range of possibilities. An example may be a DVD created for the testing of knowledge where you need to discover good and bad answers.

### Places for VM commands

VM commands can be inserted in these places:

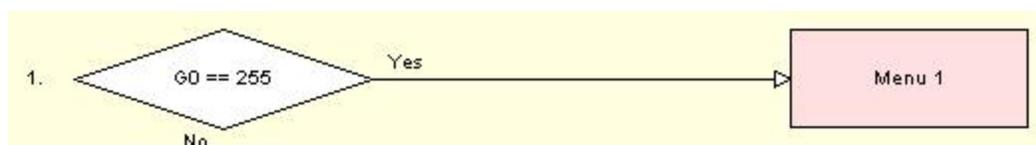
- Any item in connection, (menu, movie, slideshow etc.), PRE and POST command
- First Play
- Title button
- Button on menu (only one line)
- VTS Root (PGCN 1 , invisible root menu)
- Chapter of a movie (cell command)

### VM language

The DVD VM language has less than 40 instructions that can also be combined. A need to combine instructions comes from the fact that at some places DVD allows only one line of VM commands. A typical example are the VM commands on menu buttons.

### VM Blocks

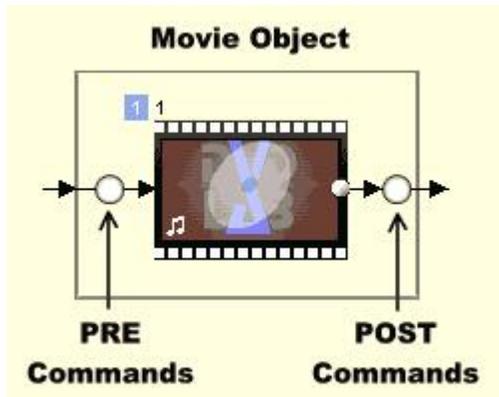
A special aid to your vm scripting in DVD-lab PRO comes in a form of visual "block" language. This overcomes the problem with DVD VM code being static. For example a line *if (G0==255) LinkPGC 2* in your vm code will link to a PGC 2 which may be Menu 1 at the time of writing, but later after you delete and add few menus or change their order, it may become a completely different menu which requires you to change the code. In VM Blocks you visually specify what you want to do using few pre-defined blocks for Operator, Link, If-Goto, If-link and insert between these normal VM Script.



This creates a dynamic VM code that is always actualized. You can switch between the VM Script and VM Blocks on the fly.

### PRE and POST commands

Commands on DVD can be in many places, but in most cases you will look for PRE and POST commands. The PRE command is the place before the object (Movie, Menu) plays and POST is just after the object is played.



### Abstraction Layer commands

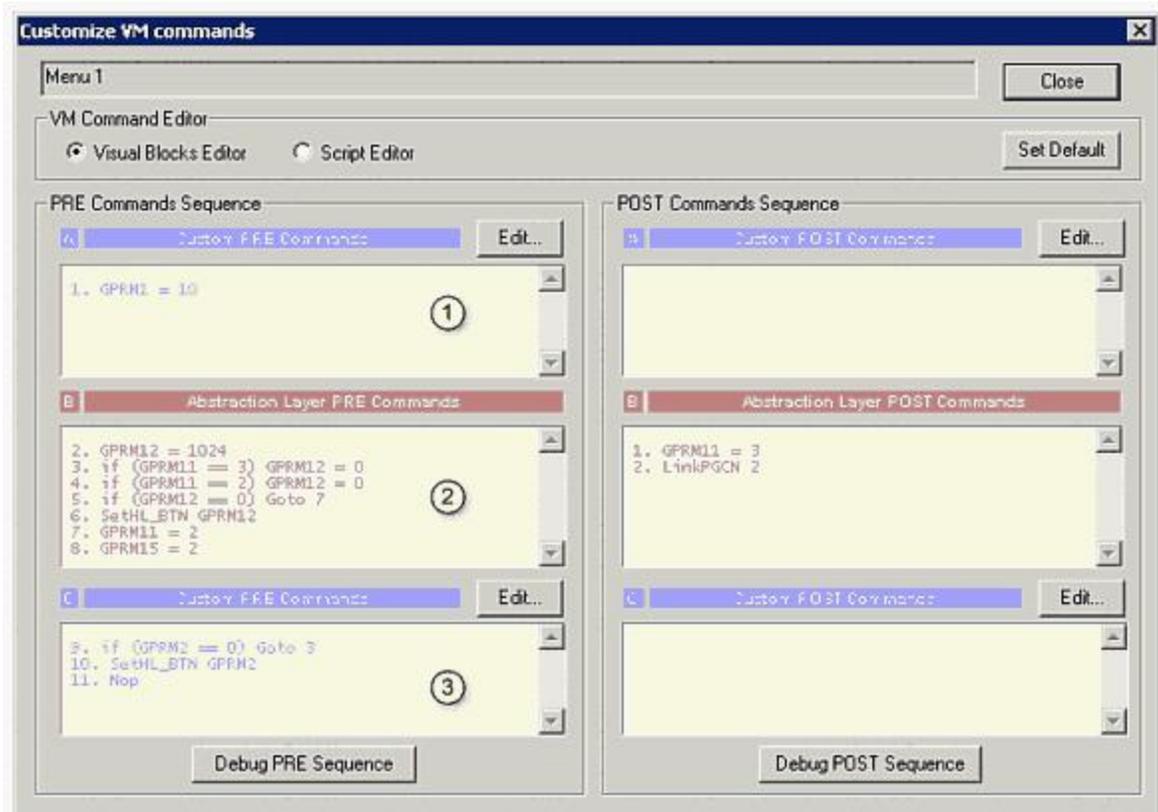
DVD lab will enter its default PRE/POST commands (that we call Abstraction Layer commands) to make all the links and features work and you can insert your own commands in front of (A) and/or at the end of (B) them. If you don't want the DVD-lab commands to be executed, simply put a last line **Break** command in the Custom commands "A".

The structure of any object would be like this:

	PRE command	Object	POST command
A	Your Custom Commands	MOVIE MENU SLIDESHOW etc.	Your Custom Commands
B	Abstraction Layer commands		Abstraction layer commands
C	Your Custom Commands		Your Custom Commands

When commands [PRE or POST] are executed they go in the order A, B, C where the B are "dynamically added" commands that cannot be edited. This arrangement allows you to put your commands before and/or after the dynamically added.

A VM Command window that appears when you select "*Edit VM Commands*" reflects this situation

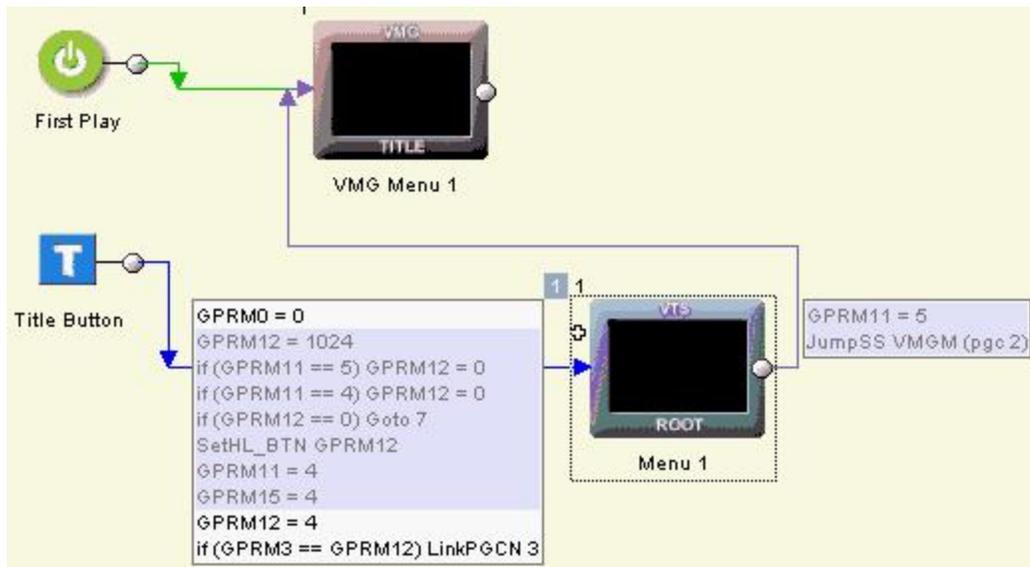


The numbers 1,2,3 on the image above shows the position of the commands. The 1 and 3 are custom commands editable by user the B are Abstraction commands that DVD-lab creates.

► **Note about menus.** Menus always execute PRE command when you go to the menu, but if you get out of the menu with a button, the POST command of menu is not executed, instead a Button VM Command (one line) assigned with the button is used. The POST command of menu is executed **only** if menu times out (or for non-looping motion or audio menu).

### Show Commands in Connections

You can also display VM commands of a particular object in Connections view. Abstraction Layer commands are grayed out, custom commands are on a white background.

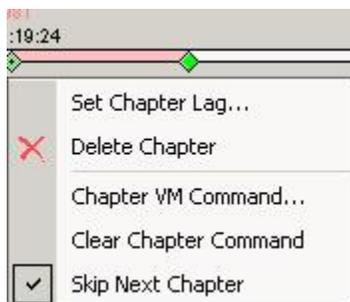


You can also show First Play, Title Button or Root command by clicking on the appropriate button:



## Chapter Commands

A movie can have a VM command on each chapter. These are also called cell commands. When you are in movie window, right click on a chapter point and from menu select *Chapter VM Command...*



Chapter command can be only one line.

**Technical Note:** If chapter has a VM command a short pause may occur on that spot during playback.

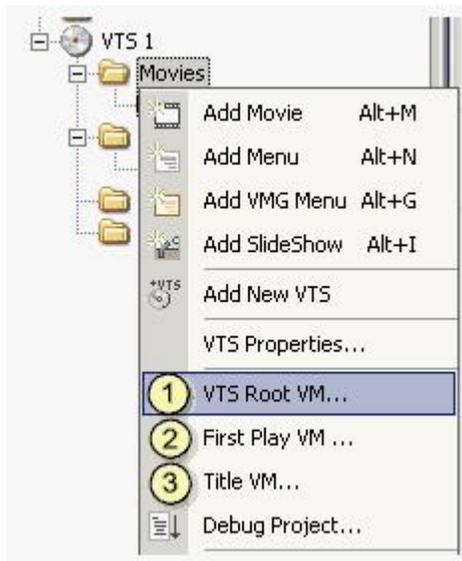
## Menu Cell Commands

Commands associated with cells on menu. Each cell can have one line of command.

## Domain Commands

Various domains (such as first play) can have its own VM commands. These can be accessed

by the right-click menu on Project window:

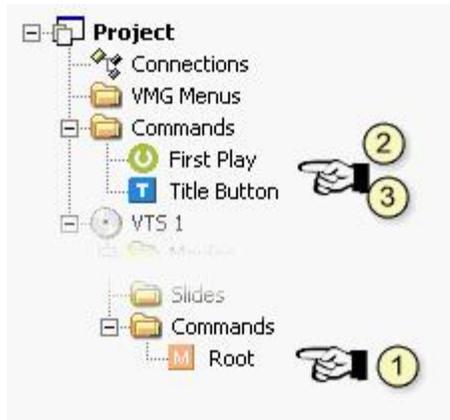


(1) - VTS Root VM - commands that are in the ROOT menu of each VTS. This is associated with menus and with the "Menu" button on remote.

(2) - First Play VM - commands associated with First Play

(3) - Title VM - commands associated with VMG menus and the "Title" button on remote.

The domain Commands can be edited also from Project Window by doubleclicking on these items under Commands sections.



### DVD Domains:

Objects and commands on DVD can be in a few different places called domains. We have:

- First-play (FP)
- Video Manager (VMG)
- Video Title Set (VTS)
- Video Title Set Menu (VTSM)

If you want to know more about the structure, see appendix.

### Variables (registers, GPRM, SPRM)

As with any language, VM commands have a few registers (or variables if you will) that can be used to read or store temporary values.

There are 16 GPRM registers (General Parameter) that can be freely used by DVD programmer and 24 SPRM registers (System Parameters) that are used to access information specific to DVD player (for example region of the player). You can't write to SPRM registers.

There are 16 registers GPRM0 - GPRM15, but as described before, DVD-lab creates its own VM code so the actions you design visually will work on DVD. In DVD-lab we tried to use the minimum number of registers for our internal purposes. These are registers GPRM11 to GPRM15 inclusive. Writing to these registers will make other parts of DVD-lab code (abstraction layer) not work correctly. In other words: DON'T touch!

We were very careful to use as few registers as possible so you can use the rest for your own programming needs.

### DVD-lab reserved GPRM registers

GPRM 10	Used as a temporary in HUB object. If you use Link HUB then the GPRM10 value will be changed by the HUB
GPRM 11	Node, used to link Movie to particular VTS menu and for Menu button highlighting
GPRM 12	Used for temporary in-command sequence data storage
GPRM 13	Used to identify currently playing play lists*
GPRM 14	Used as a counter in a Counter and Random list
GPRM 15	Used for Return to last menu object

\* GPRM13 is also used as a one-time flag to make sure DVD player starts with subtitles OFF.

You can freely use the registers GPRM0 ... GPRM10 for your own VM programming creations.

### ▶ PGC Numbers

We will mention this on the following pages as well but it is vital to remember:

## For VM Commands add 1 to the PGC number for all menus (VTS and VMG)

**The first VTS menu that will shows in connections as ROOT is in DVD-lab PGCN 2.**

There is always a shadow (hidden) menu for each VTS (PGCN 1) that has a special purpose\*. To see its VM commands, right click in the Project window and from menu select *VTS Root VM...*

**The first VMG menu that will shows in connections as TITLE is in DVD-lab PGCN 2.**

There is always a shadow (hidden) menu (PGCN 1) before other visible VMG menus that has a special purpose\*. To see its commands, in Connections right click on the Title Button and select *Edit VM Commands*.



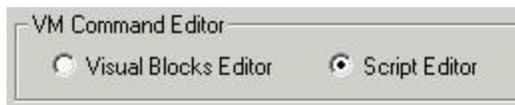
You can instruct the Connection window to display the *true* PGC number above all objects instead of the item order by checking the **Show PGC** Number button. The PGC number appears in red in top left corner of object.

You can then use this number directly in VM Commands as PGC number

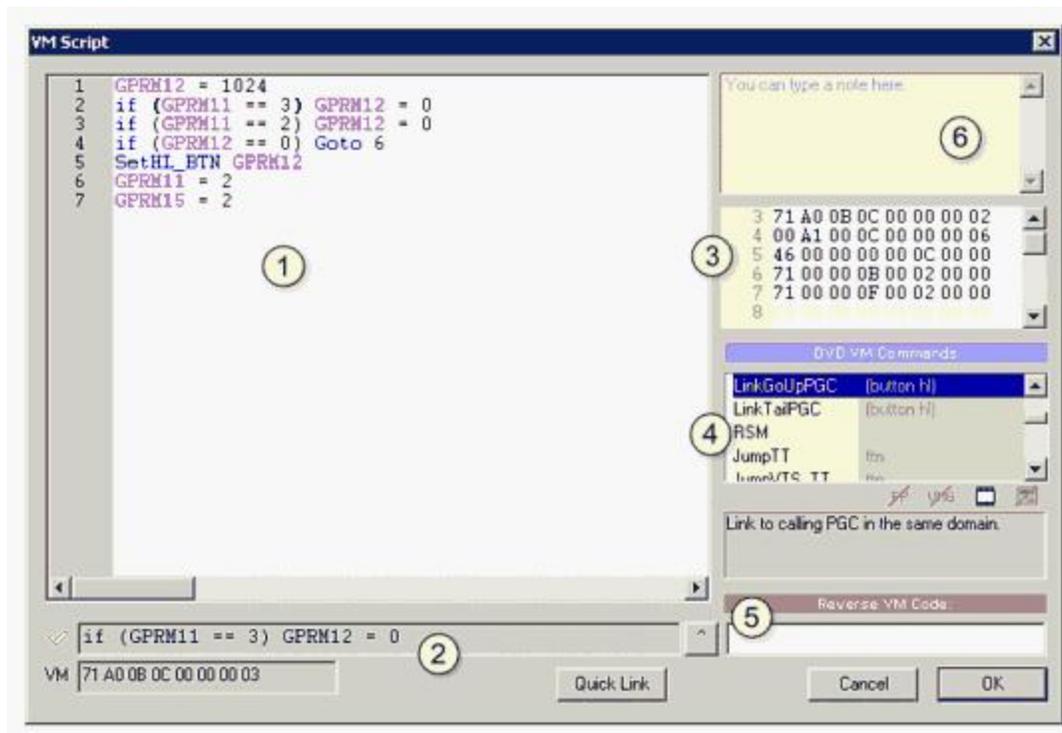
\*This doesn't apply if you plan to Compile without Abstraction Layer. Without AL there will be no shadow menu created and therefore the first visible menu in DVD-lab will also become PGC 1 as expected

## 13.2 VM Editor

Edit VM Commands using Script Editor



When you click Edit button to add new VM Commands you will open either VM Blocks or VM Script Editor, depending on the settings. The VM Script Editor has many features that will help you to write a syntactically-correct script. It features syntax highlighting, auto completion and real time script checking. You can't write command that has the wrong syntax.



### 1 - The Edit window

Here you type the commands. The editor features syntax highlighting and auto completion.

#### Auto completion:

As you type you will notice the command is also being selected in the VM Commands list (4). By pressing the TAB key the selected command in the list will automatically be written at the place you're writing.

For example we start typing:

Link

A *LinkPGCN* is being selected in the list (4) as we type. By pressing TAB the text will be auto completed:

LinkPGCN

We can also select other commands, for example LinkPTT, and either press TAB or double click the item in the list (4)

### 2 - The Control Window

This is a very important window for automatic syntax guiding. As you type, this window will guide you by some hints and if the syntax is OK it will show you the full correct syntax.



### Auto-guidance.

The Auto-Guidance will give hints as you type and it will shows how the editor reads your line.

For example we would like to add line `if (GPRM1 ==2 ) LinkPGCN 4` on line 3. We start typing

We type	Control window shows	Details
if	Expecting 'if (...'	OK, we need to type parenthesis
if (	Expecting: if (GPRMx...	Next must be a GPRM parameter
if (GPRM1	Expecting operand: if (GPRMx ==, !=, >=, >, <=, <	and operator
if (GPRM1 ==	Expecting: if (GPRMx op 'GPRM/SPRM or constant'	then second parameter is expected
if (GPRM1 ==2	Expecting: if (...')	and close the parenthesis
if (GPRM1 ==2 )	✓ if (GPRM0 == 0) Nop	The syntax is ok, but we want to type more
if (GPRM1 ==2 ) LinkPGCN	✓ if (GPRM1 == 2) LinkPGCN 0	we are missing parameter which is interpreted as 0
if (GPRM1 ==2 ) LinkPGCN 4	✓ if (GPRM1 == 2) LinkPGCN 4	now the syntax is complete

### Line completion button

Whenever we see in control window ✓ and a command line we can transfer it to our line in editor. For example we type:

JumpSS VTSM

and the control window shows: ✓ JumpSS VTSM (vts 0, tt 0, menu 0)

This is how our command is interpreted, but obviously we need more parameters to specify.

Instead of typing this to our editor (1) we can simply click the Line completion button near the control window:

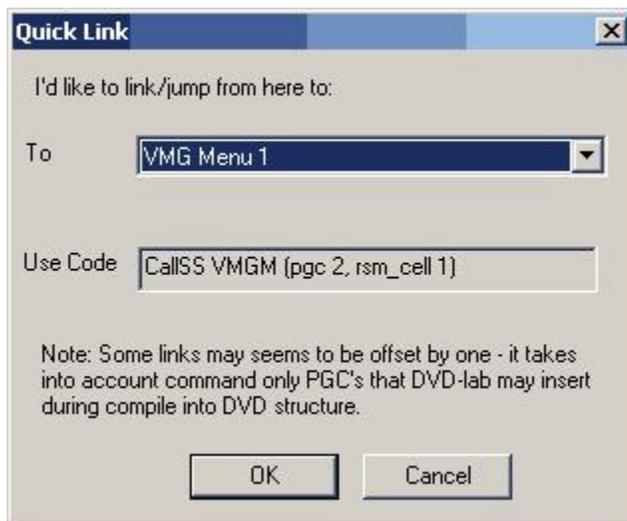


The whole line will appear in editor. Now we can change the zeros for numbers we need:

```
JumpSS VTSM (vts 1, tt 1, menu 3)
```

### Quick Link

This will help you to find a correct link to other objects in the DVD-lab project. Let's say we are editing VM command of a Movie and we would like to link to VMG menu from here. The Quick Link will suggest:



CallSS VMGM (pgc 2, rsm\_cell 1) \* see note below about PGC numbers

### Sub-Registers

Virtually divide GPRM register into smaller chunks. See more.

### 3 - Hex Preview

The hex preview shows how the VM command will be written to the DVD command space. This is good for advanced debugging.

### 4 - Command List

We already know that selecting a command and pressing TAB or double click will replace the currently edited command in editor. Below the list is a short description about the command and its domain of use.

For example for JumpSS VTSM we see this:



This tells us that we can use this command in First Play, VMG menu or VTS menu. We cannot use this command from movie.

### 5 - Reverse VM code

Sometimes we get the VM code in byte code hex format, for example from looking at previously compiled ifo file. As you type HEX numbers the Control Window (2) shows the byte code disassembled command.

### 6 - Note

You can add any note to the script (for example explanation of registers etc...)

## Syntax

There is not one exact way for people to write VM commands. There is no official VM language syntax . It varies from book to book and from software to software. VM Editor understands many different ways a VM line can be written.

For example a line

GPRM1 = 15

can be also written as

- MOV(GPRM1,15)
- MOV(GPRM1 15)
- MOV GPRM1 15
- GPRM1 mov 15
- mov GPRM1 0x0F
- g[1] = 15
- ....

You will see by ✓ that the syntax is correct but the Control window will always shows **only the one** syntax that DVD-lab uses. Also when you close and open the edit window no matter what syntax you typed it will be changed to the one used by DVD-lab. This is called Syntax Normalization and without this we will not be able to understand each other.

### Syntax normalization

When we close the VM Editor and then open it again all syntax will be normalized.

For example if we type

```
LinkPGN ( 2 , 3 )
```

and then close the editor, our command will be automatically normalized to :

```
LinkPGN 2 ( button 3 )
```

If we type

```
MOV ( GPRM1 , 0x0F )
```

the line will be normalized to

```
GPRM1 = 15
```

### ► PGC Numbers with DVD-lab Abstraction layer

As you get familiar with the VM commands and try the Quick Link you will realize that it suggests a PGC number that is always one bigger than you would logically pick.

For example we want to link from **Menu 2** to **Menu 1 (ROOT)** and the Quick link will suggest **LinkPGCN 2**. Why is that? Shouldn't it be LinkPGCN 1 ? No, because:

#### **For VM Command use, add 1 to the PGC number for all menus (VTS and VMG)**

**The first VTS menu that will shows in connections as ROOT is in DVD-lab PGCN 2.** There is always a shadow (hidden) menu for each VTS (PGCN 1) that has special purpose\*. To see its VM commands, right click in the Project window and from menu select *VTS Root VM...*

**The first VMG menu that will shows in connections as TITLE is in DVD-lab PGCN 2.** There is always a shadow (hidden) menu (PGCN 1) before other visible VMG menus that has special purpose\*. To see its commands, in Connections right click on the Title Button and select *Edit VM Commands*.



You can instruct the Connection window to display the true PGC number above all objects instead of item order by checking the **Show PGC Number** button. The PGC number appears in red in top left corner of object.

You can then use this number directly in VM Commands as PGC number

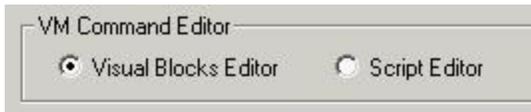
\*This doesn't apply if you plan to Compile without Abstraction Layer. Without AL there will be no shadow menu created and therefore the first visible menu in DVD-lab will also become PGC 1 as expected

You have to remember this, otherwise you will be surprised why your commands don't work properly.

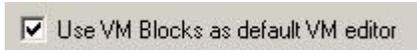
## 13.3 Visual VM Blocks

Edit VM Commands using Visual Block Editor

Depending on your settings, the Edit button in Customize VM commands will take you to Visual block Editor or Script Editor.



You can switch between these editors directly on the Customize VM commands dialog. By default Block editor is selected, but you can change the default settings in Project Properties - tab Advanced:



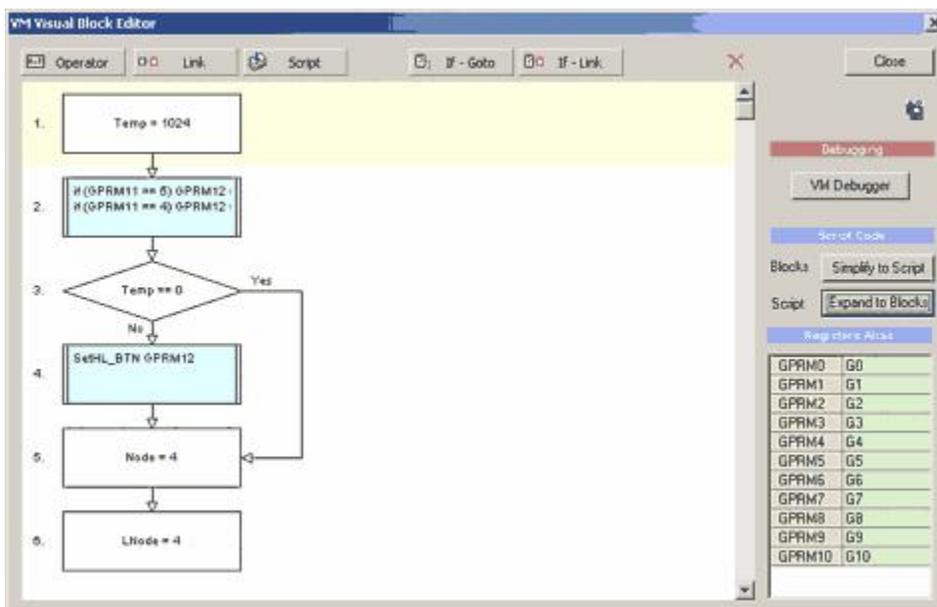
You can even switch between these editors if already a VM Script or VM blocks exist. The Software will inform you that

- *Blocks to Script*, the blocks will be translated to VM Commands code
- *Script to Blocks*, the script can either expand to blocks, or create single Script Block.

### Visual Block Editor

The VM Block editor is a special aid in writing VM commands. It overcome the old programming problem with static script code where for example having Goto 15 or Link PGC 10 works as long as we don't change the code in first case or order of objects in second case. If we do, then Goto may point to wrong line or Link command can point to object that is no longer the one we wanted.

VM Blocks will simplify writing VM commands by creating a dynamic code. *Goto* commands simply point to a block and keep the relation even if we reorder, add or delete blocks. *Link* commands will point to a named object like Menu 2 or Movie 10 and we don't have to worry that this will ever change if we reorder our objects. Also we don't have to remember what type of command is needed to execute such link, it may be JumpSS, LinkPGC, CallSS etc, the block editor will take care of using the correct one.

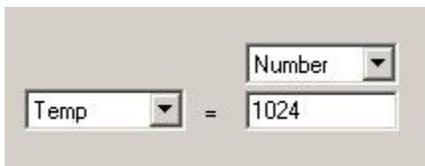


Block Editor is a very unique tool in DVD-lab PRO, that is both visual and highly functional.

There are five basic blocks:

- Operator
- Link
- Script
- if-Goto
- if-Link

You add the block by clicking on the top buttons with these basic names. A properties window will open with options how to set the block. For example Operator will open properties like the below:



A Script Block will open the old known VM Script Editor

### Editing Blocks

If you want to edit the blocks simply double-click on it.

### Rearrange Blocks

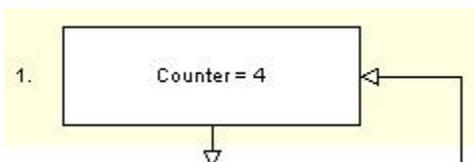
You can simply drag any block and move it up or down.

### Registers Alias

The GPRM registers can have alias in Block editor. So for example instead of  $GPRM0 = 4$  we can use  $Counter = 100$  if we change alias of  $GPRM0$  to  $Counter$ . Simply double click on the green area of the register alias and type new name.

GPRM0	Counter
GPRM1	G1
GPRM2	G2

This is dynamic, any time we change the name, all registers in VM Blocks will reflect the changes:

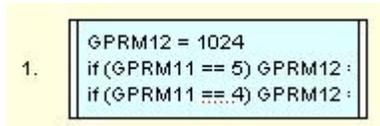


### Simplify and Expand

Blocks can be simplified to one Script block or a Script block can expand into normal blocks (if possible)



For example we can simplify the larger block diagram from above to one *Script Block*:

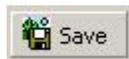


Then we can double click and edit it in VM Script editor.

In reverse we can select the Script Block and Expand it back to the diagram. Of course some VM blocks cannot be expanded further beyond VM Script and will remain as Script Block.

### Save Graph Image

You can save the blocks into an image and then use it directly for example on web, in documentation or on forums for explanation. Just click on the Save to Image button.



### Some notes

When you write a Script Block and use Goto command inside it, you have to make it correct only locally, and don't care where this script block actually is between other blocks.

For example we write on line 4 in our Script Block that we want to go to line 6. That's it. It doesn't matter if this Script Block will be first in front of other blocks or down below many others.

```

1  GPRM12 = 1024
2  if (GPRM11 == 5) GPRM12 = 0
3  if (GPRM11 == 4) GPRM12 = 0
4  if (GPRM12 == 0) Goto 6
5  SetHL_BTN GPRM12
6  GPRM11 = 4
7  GPRM15 = 4

```

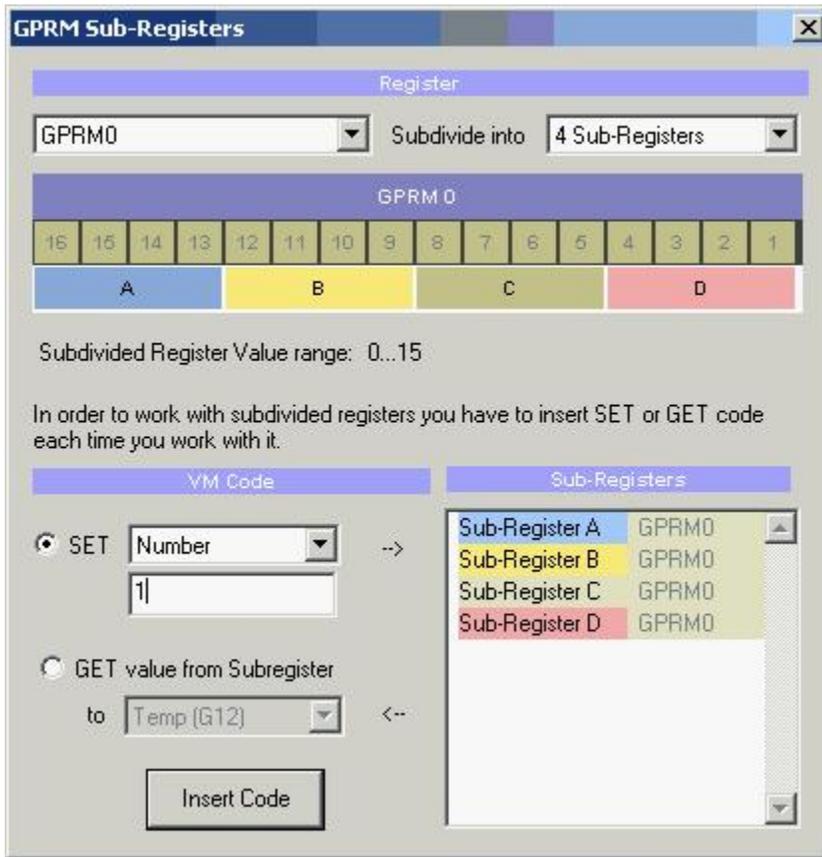
The actual line with Goto will be adjusted accordingly in the final stage in regard of the total position. Of course such if- goto command as we used above can be actually itself expanded to If-Goto block so there is really no need to write goto in Script Block.

## 13.4 VM Sub-Registers

Normally we have 16 GPRM registers GPRM0-GPRM15. The Abstraction Layer reserves GPRM11-GPRM15, so we have ten registers to play with.

A GPRM register is a double-BYTE word, that means it can have values 0..65535.

For some interactive projects we don't need to enter such high number (65535) but we would love to rather have more registers instead. The solution is to create Virtual Registers by Sub-dividing the GPRM registers into smaller parts and use these parts to store separate data. In order to work with these subdivided registers, you need to enter special GET or SET code each time you work with the Sub-register that will mask the bites in the register. For most of the people it is not easy to do it by hand, so The *GPRM Sub-Registers* wizard will help you with this.



First you need to decide how many Sub-registers you would like to create from the Register. (Each GPRM register can be divided into different number of Sub-Registers or left undivided) The number of parts will directly affect the maximum number that can be entered into each Sub-Register.

Subdivide into	Allowed Values
No division	0..65535
2 Sub-Registers	0..255
4 Sub-Registers	0..15
8 Sub-Registers	0..3
16 Sub-Registers	0..1

We see that if we divide a register into 16 parts, we can only store 0 or 1 (because each sub-register is now 1 bit)  
This could be useful for some projects, we can use for example 5 registers to create in total 80 one bit Sub-Registers.

#### VM Code

Each time we need to work with the Sub-Register we need to enter the special code using the *GPRM*

*Sub-Registers* wizard.

If we use the sample image above and divide GPRM0 into 4 Sub-Registers (each can have values 0..15) and then we would like to enter a value 1 into Sub-Registers "C" then the code the wizard will generate will be this:

```
GPRM12 = 1
GPRM12 &= 0x0F
GPRM12 *= 0x10
GPRM0 &= 0xFF0F
GPRM0 |= GPRM12
```

**Note:** GPRM12 is be used as temporary variable. The code is generated cleanly so it can be easily adapted later without going to the wizard again. If we for example change our mind and want to enter value 5 or use a register for our input value, we just need to change the first line GPRM12 = 5 or GPRM12 = GPRM6.

If we need to change the Sub-Register, the best way is to select all these lines and go to wizard again - which will replace the code with new one.

Similarly if we would like to get a value from our register we will generate GET code:

```
GPRM12 = GPRM0
GPRM12 /= 0x10
GPRM12 &= 0x0F
```

In this code we receive the value from the **C** Sub-Register of GPRM0 in the temp registers GPRM12. Then we can use it later in our code. You can have it generate the code with other register or you can replace the GPRM12 with a new register later in the code.

The software remembers the Register subdivision and saves it to the project file.

It is important to understand that this is a virtual subdivision. The registers are still, the same, we just pack a more data into them using the GET or SET code.

## 13.5 Operators

We have already shown some examples of operators that can be used with GPRM registers. Most notably you may recognize the obvious

```
GPRM1 = 15
```

from previous pages. This is one of the many operators and it is called simply Assign operator. On the previous page you may also have read about Syntax normalization and that DVD-lab VM editor is quite open minded to various syntaxes, however it will always change the command into its native syntax

Operator Name	DVD-lab Syntax Example	Alternative syntax	Meaning
Assign	GPRM1 = 15 GPRM1 = GPRM2 GPRM1 = SPRM1	mov GPRM1, 15 GPRM1 mov 15 MOV(GPRM1, 15)	Assign value or value from register to another register

Swap	GPRM1 <-> GPRM2	swp GPRM1, GPRM2 GPRM1 swp GPRM2 SWP(GPRM1,15)	Swap the two registers
Addition	GPRM1 += 15 GPRM1 += GPRM2	add GPRM1, 15 GPRM1 add 15 ADD(GPRM1,15)	GPRM1 = GPRM1 + 15
Subtraction	GPRM1 -= 15 GPRM1 -= GPRM2	sub GPRM1, 15 GPRM1 sub 15 SUB(GPRM1,15)	GPRM1 = GPRM1 - 15
Multiply	GPRM1 *= 15 GPRM1 *= GPRM2	mul GPRM1, 15 GPRM1 mul 15 MUL(GPRM1,15)	GPRM1 = GPRM1 * 15
Divide	GPRM1 /= 15 GPRM1 /= GPRM2	div GPRM1, 15 GPRM1 div 15 DIV(GPRM1,15)	GPRM1 = GPRM1 / 15
Remainder	GPRM1 %= 15 GPRM1 %= GPRM2	mod GPRM1, 15 GPRM1 mod 15 MOD(GPRM1,15)	Remainder or modulo after division GPRM1 = GPRM1 % 15
Random	GPRM1 rnd 15 GPRM1 rnd GPRM2	rnd GPRM1, 15 RND(GPRM1,15)	Random value between 0-15
AND	GPRM1 &= 15 GPRM1 &= GPRM2	and GPRM1, 15 GPRM1 and 15 AND(GPRM1,15)	Logical AND
OR	GPRM1  = 15 GPRM1  = GPRM2	or GPRM1, 15 GPRM1 or 15 OR(GPRM1,15)	Logical OR
XOR	GPRM1 ^= 15 GPRM1 ^= GPRM2	xor GPRM1, 15 GPRM1 xor 15 XOR(GPRM1,15)	Logical XOR

From the above table it is clear that the left side of an operator can only be a GPRM register. The right side of an operator can be another GPRM register, SPRM register or constant.

### If Condition

To check the condition of GPRM registers there is a command if (.....) .....

Example used previously:

```
if (GPRM1 ==2 ) LinkPGCN 4
```

But there are more operands than just ==

Operator	DVD-lab Syntax Example	Meaning
==	if (GPRM1 == 15) if (GPRM1 == GPRM2) if (GPRM1 == SPRM2)	if GPRM is equal (make sure you type two equal signs == )
!=	if (GPRM1 != 15) if (GPRM1 != GPRM2) if (GPRM1 != SPRM2)	if GPRM is not equal
>=	if (GPRM1 >= 15) if (GPRM1 >= GPRM2) if (GPRM1 >= SPRM2)	if GPRM is greater or equal
>	if (GPRM1 > 15) if (GPRM1 > GPRM2) if (GPRM1 > SPRM2)	if GPRM is greater
<=	if (GPRM1 <= 15) if (GPRM1 <= GPRM2) if (GPRM1 <= SPRM2)	if GPRM is less or equal
<	if (GPRM1 < 15) if (GPRM1 < GPRM2) if (GPRM1 < SPRM2)	if GPRM is less
&	if (GPRM1 & 15) if (GPRM1 & GPRM2) if (GPRM1 & SPRM2)	if logical and is not zero

From the above table it is clear that the left side of an operator can only be a GPRM register. The right side of an operator can be another GPRM register, SPRM register or a constant.

Almost all other commands can be used with comparison (there are some exceptions), however you can **not** always compare GPRM to a constant value.

For example:

```
if (GPRM1==2) LinkPGCN 1
```

is valid, but

```
if (GPRM1==2) JumpSS VMGM 1
```

is not valid. You have to use two lines

```
GPRM2 = 2
if (GPRM1==GPRM2) JumpSS VMGM 1
```

Generally JumpSS type, CallSS type and Set type (SetHL\_BTN for example) can't be used together in comparison with a **constant**.

### Combination Condition commands

Because some places on a DVD allow only one line of commands (most notably for button and cell commands), the DVD specs allow for special combination commands. What this means is, they can have up to 3 commands on one line where one is a condition, the second is an operator and the last is a link. There are also three different ways to put them together.

Note how the curly parenthesis differ on the first two lines:

- `if (GPRM1 == GPRM2) { GPRM1 = 5 } LinkTopC (button 1)`
- `if (GPRM1 == GPRM2) { GPRM1 = 5, LinkTopC (button 1) }`
- `GPRM1 = 5, if (GPRM1 == GPRM2) LinkTopC (button 1)`

The first is Condition then {operator} if condition is true and then link regardless the condition

Second is Condition then {operator and link} if condition is true

Third is operator, then condition and link if condition is true.

Unfortunately not all link commands can be used in this combo. Only link types of: LinkNoLink, LinkTopC,.....,LinkTopPG, .....LinkTopPGC, .... LinkTailPGC

It is not very probable you would need to use this type of command.

### Set combination commands

A few Set commands are allowed in combination with a Link (except in combination with a condition). These are useful for places such as Button in a menu.

`SetHL_BTN GPRM1, LinkPGCN 1`

Sets the highlighting register to value in GPRM1 and then Link to PGC 1

`SetSTN (audio=1 subp=2:on angle=3 ) LinkPGCN 2`

Set Audio/Subpicture/Angle Stream and then link to PGC 2. This can be used for example on menu to select subtitles and then immediately link to a different menu where the subtitles text is shown as selected.

## 13.6 Commands

Here is a list of DVD VM Commands.

Command	Parameters	Description	Example
Nop		No Operation.	
Goto		Go to a command line	
Break		Exit from the current command section	

Exit		Stop playback of DVD	
LinkPGCN	pgen	Link to a PGC in the same domain	from a menu to menu *
LinkPTT	pttn (button hl)	Link to a PTT in the current VTS	
LinkPGN	pgn (button hl)	Link to a program in the same PGC	
LinkCN	cn (button hl)	Link to a cell in the same PGC	
LinkNoLink	(button hl)	Highlight a specified button	
LinkTopC	(button hl)	Link to current cell in the same PGC	
LinkNextC	(button hl)	Link to next cell in the same PGC	
LinkPrevC	(button hl)	Link to previous cell in the same PGC	
LinkTopPG	(button hl)	Link to current program in the same PGC	
LinkNextPG	(button hl)	Link to next program in the same PGC	
LinkPrevPG	(button hl)	Link to previous program in the same PGC	
LinkTopPGC	(button hl)	Link to current PGC in the same domain	
LinkNextPGC	(button hl)	Link to next PGC in the same domain	
LinkPrevPGC	(button hl)	Link to previous PGC in the same domain	
LinkGoUpPGC	(button hl)	Link to calling PGC in the same domain	
LinkTailPGC	(button hl)	Link to post-command section of current PGC	
RSM		Resume Playback If a video is currently playing, RSM will most likely stop the player (show player screen)	Can be combined with button commands.
JumpTT	ttn	Jump to a video title	to movie from VMG

JumpVTS_ TT	ttn	Jump to a video title in the current VTS	to movie in same VTS
JumpVTS_ PTT	(tt , ptt)	Jump to a PTT in a specified TT	to chapter in a movie
JumpSS FP		Jump to First-Play PGC	
JumpSS VMGM	(pgcn)	Jump to a PGC in the Video Manager	to VMG menu *
JumpSS VTSM	(vts, ttn, menu)	Jump to a PGC, menu means: 1 - First play, 2 - Title, 3 - Root, 4- subpicture	from VMG to VTS root
CallSS FP	(rsm_cell)	Jump to a First-Play PGC from VTS	
CallSS VMGM	(menu, rsm_cell)	Jump to a PGC in VMG domain from VTS	
CallSS VMGM	(pgcn, rsm_cell)	Jump to a Title menu from VTS	from menu to VMG menu*
CallSS VTSM	(menu, rsm_cell)	Jump to a PGC in the Video Manager from VTS	
SetSTN	(audio=0 subp=0:on angle=0)	Set Audio/Subpicture/Angle Stream	
SetGPRM MD	counter (GPRM0=0x0)	Set GPRM register/counter mode	
SetHL_BT N	button	Set Highlight Menu Button	
SetNVTMR	(timer=0x0, pgcn=0)	Set Navigation Timer	
SetAMXM D	sval	Set Audio Mixing Mode for Karaoke	
SetTmpPM L	lvl, line#	Set Temporary Parental Management Level.	

\* Remember all PGC Numbers must be +1 because of shadow VTS and VMG menus in DVD-lab (Except if compiled without Abstraction Layer)



You can instruct the Connection window to display the true PGC number above all objects instead of item order by checking the **Show PGC** Number button. The PGC number appears in red in top left corner of object.

You can then use this number directly in VM Commands as PGC number

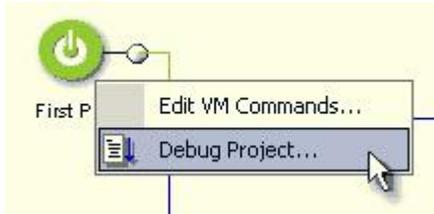
## 13.7 VM Debugger

VM Debugger is a unique feature of DVD-lab PRO that allows you to go step-by-step through your project VM commands and see the changes made in a player registry.

There are various places from where VM Debugger can be called.

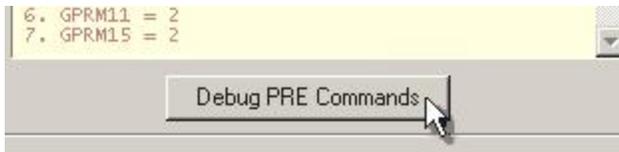
### Project-wide VM Debugger

This will start from First Play and continue from there



### Object VM Debugger

This will start on a specific code in either PRE or POST commands.



### Debugger window



The main areas of the window

- 1 - Currently running Object
- 2 - The VM command sequence

- 3 - Debugger control
- 4 - Output window
- 5 - GPRM registers
- 6 - SPRM registers
- 7 - Menu/Movie preview
- 8 - Menu/Movie/Remote control.

### Debugger Control



The controls in Debugger will suggest which button to press by blinking. For example if you start debugger the GO button will blink, if you waiting for next ste the Step Line will blink etc...

**Go** - Start Debugging the VM code from first line

**Step Line** - the next (highlited) line will be executed

**Stop** - The debugger will stop

**Auto Reset Registers** - Each time you press **Go** button, registers will reset to initial state.

**Follow Links** - if checked you will follow all links to other objects. If unchecked the debugger will simply stop on link commands. If you want to debug only the particular code you will uncheck the Follow Links. You may then examine the same code by simply entering different initial state of registers and run the code again with **Go** button.

### Current Line

1	GPRM12 = 1024
2	if (GPRM11 == 3) GPRM12 = 0
3	if (GPRM11 == 2) GPRM12 = 0

The line that will be executed by Step Line button is highlited. On the image above the GPRM12 is still 0 and when you press Step Line, the cursor will move to line 2 and the GPRM12 will be set to 1024.

GPRM12 (Temp)	1024
GPRM13 (Temp)	0

That means the highlited line is a line not yet executed!

### Initial State

A DVD player has certain initial state. All GPRM registers are 0 and SPRM registers have various default values. For example on english players SPRM0 is set to 25966 etc.

You can reset the registers to Initial state anytime using *Reset to Initial State* button.

### Editing Registers

At any time you can enter a value to any GPRM registers. Simply doubleclick on the number

and enter new value.

GPRM 2 (G2)	0
GPRM 3 (G3)	256
GPRM 4 (G4)	0

You can enter new values even during debugging.

### Wait for Input state (preview area blinks)

After you run Menu or Movie PRE command and the Follow Links is set to ON the debugger gets into Wait for input state.

```
7 > GPRM15 = 2
Code Finished. (No more commands)
>Menu Waits for input. Continue with Menu Button or Menu Timeout
```

This is the time when user is expect to do any selection.

In case of menu four things can be done:

- User press any button on menu
- Menu Timeout (will continue with POST command)
- User press Menu button on remote
- User press Title button on remote

This all can be simulated in the preview area. You can select any button or Choose Timeout, Menu or Title buttons.



In case of Movie, the image will display a still from the movie. This simply tells that normally the movie would play and you can choose Timeout which will move the movie to its end and run POST commands or Menu or Title button.

The debugger is a very strong tool in tuning your VM code and it is one of many unique features of DVD-lab PRO that are all worth the price of the software alone.

## 14 Global VM

### 14.1 Overview

After you start creating advanced interactive projects that involves large amount of scripting, you may ask if there is a better way to enter all that script into the objects. Yes, there is. It is called **Global VM**.

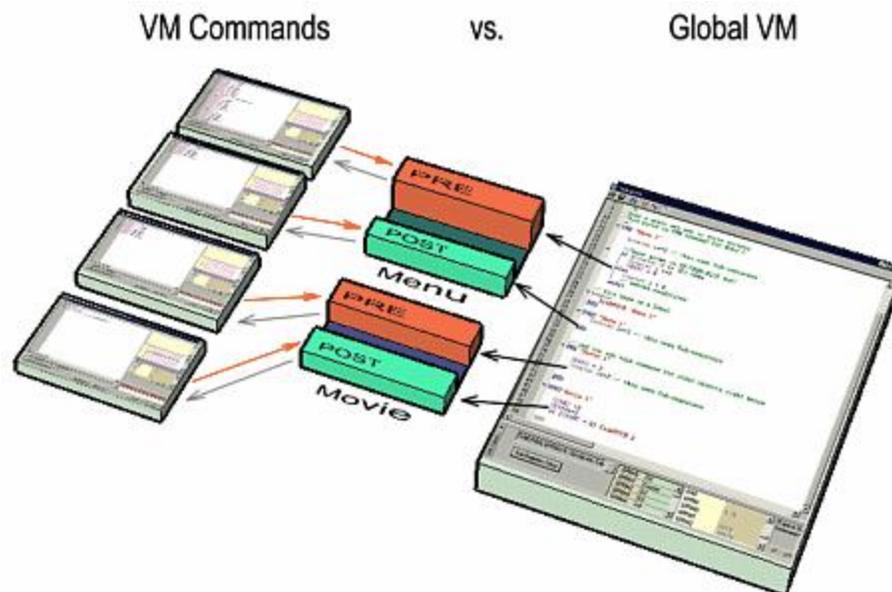
There is a reason that this topic comes after VM commands. While Global VM is a higher, more comfortable level of VM scripting, in order to see how all this fit into the place it is important that you already know how a normal VM script is created and how it relate to the object (Menu, Movie...).

When we previously used VM Commands, we had to open each object and then place the command sequence inside them. This is a more visual approach, good for small amount of code.

Global VM uses a programmers approach. In Global VM there is no separate script place for different objects. There is only one Global VM script that can (and will) have blocks of a code related to these different objects. You can easily save the script as a single text file and use it in different projects or share it with other people.

A Global VM script window can be opened simultaneously with other windows while you are working on the project.

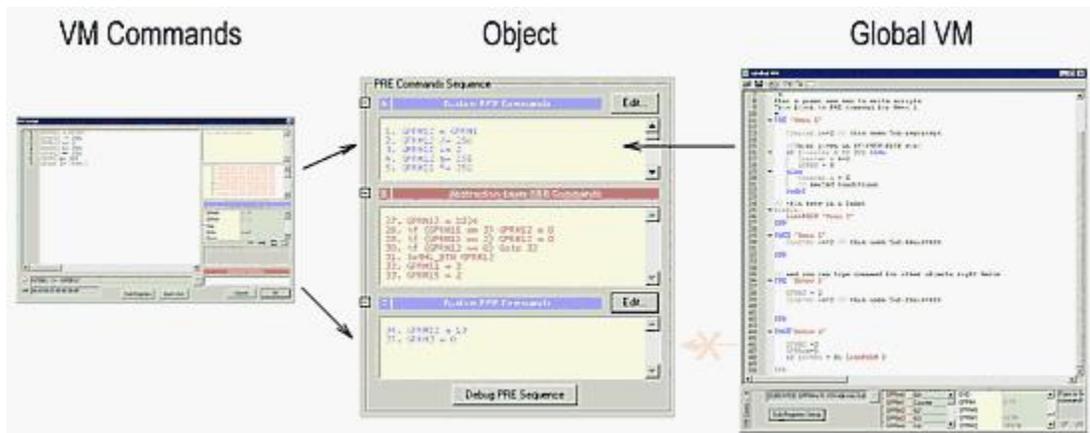
Here is a simplified relationship between the VM Commands and the Global VM



After the Global VM script is *Build*, it creates VM code and injects it into the Objects. This can be verified later by opening VM Commands of the object.

Some basic rules

- Global VM doesn't necessary have to change code for all the objects. You will specify code blocks only of objects you want to modify. The rest will remain unchanged.
- The Global VM script is not build automatically with the compilation - you have to Build it at least once and also each time you made changes to it. However, building Global VM is nothing more than just pressing Build button and then checking if it builds without errors or not.
- You can use VM Commands editing with Global VM at the same time, but you have to remember that Global VM it has priority over the code entered directly in VM Commands. Each time you Build Global VM, any manually entered code in the specified blocks will be overwritten.
- Global VM script can add its code only before the Abstraction Layer Code. This is illustrated by the following image:



The reason for this become quite obvious later when you check the VM code generated by the Global VM.

## 14.2 Basics

Global-VM is a higher level of VM scripting. It uses some enhancements that the standard VM script doesn't allow to have directly on DVD.

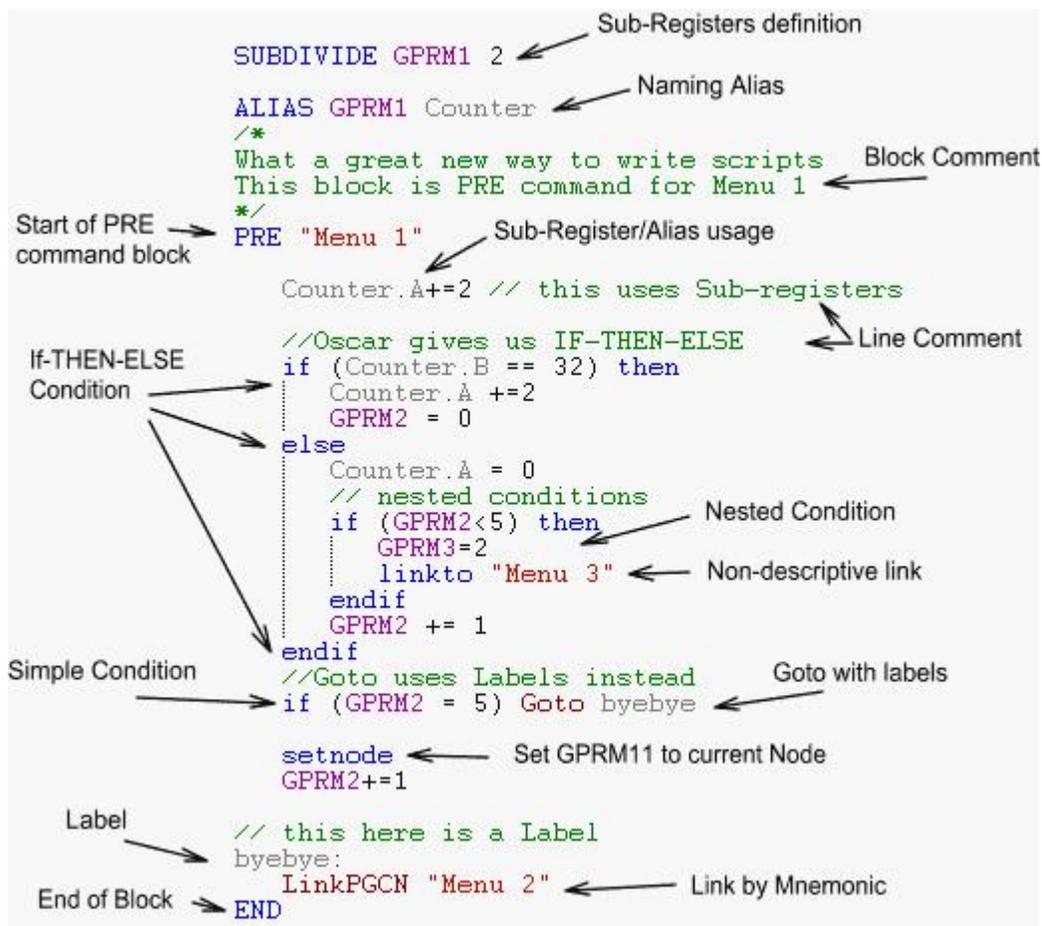
Therefore Global VM script will need to be "**Build**" to be functional - which is similar to the way how a program is Build in a programming language.

Simply said, *Build* will translate the Higher level script into the standard VM script that is accepted on DVD.

Here are some things that Global VM script offers, this includes:

- Directly using Sub-Registers in the code,
- Using Name Alias for GPRM registers
- If - then - else condition,
- Nested conditions,
- Simple way to link to another object
- Goto using labels
- Comments within the code

Let's see the usage of these enhancements in the code:



### 14.3 GVM Blocks

Block is the base for the Global VM script. Without at least one block, the script does nothing. The Block will specify to what object the code belongs to.

A simple block looks like this:

```

PRE "Menu 1"
    GPRM1+=2
END

```

This tells us that the code inside the block is a PRE command of Menu 1

You can easily add an empty block using the Add Block Handle function (as a button or in the menu *Global VM*):



This will open a dialog with all existing objects listed.



You can then choose what block you want to create: PRE, POST or Both. Optional feature "*Grab a Script from Object...*" will also get a VM command lines from the object if they exist in the Objects "A" Sequence of Custom Commands. (Note: Any Goto in VM Commands will be converted using labels)



This will create following:

```
//*** PRE "Menu 1" Command Sequence ***
PRE "Menu 1"
    GPRM1 = 2
END
```

**Please note:** An empty block without any commands will remove all commands from that section of Object. If you don't want the object to change commands (for example previously added in VM Command editor) then simply do not create any block for the object!

## Block types

There are few different type of blocks:

- PRE "Object"
- POST "object"
- FIRSTPLAY
- TITLEBUTTON

Each block must end with END.

Both PRE and POST object have the same syntax:

### PRE "Object"

where the Object is the name of the object as in Project tree, for example:

```
PRE "Menu 1"
```

The PRE block can have two special cases:

### PRE "NULL"

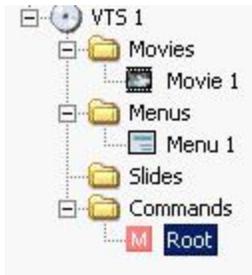
This allows for creating a dummy block - the script inside will be checked, translated to VM code, but it will be not written anywhere. This is good for just playing around or saving blocks to be used later for different objects. If you need to change particular object, just replace the NULL with the name of the

object (for example Menu 1) and Build. If you don't need the block, just replace the name of the object with NULL. It is faster than commenting out and un-commenting the code.

### PRE "VTSROOT n"

Where n is the VTS number (1...99) for example: PRE "VTSROOT 1"

This correspond to the code referred in Project as "Root". The Root is a special dummy menu (PGC1) that is inserted in front of all other menus in VTS and do some special work (like sending player to a certain menu from movie etc.)



Any link from VMG menu to the VTS Root menu (this means PGC 2 here) or from a VTS movie to any VTS menu will first go through this Root (PGC 1) command. Only PRE command is applicable, because the Abstraction Layer will not run the POST command of VTSROOT.

### FIRSTPLAY

This is a block for First Play code

### TITLEBUTTON

This is a block for Title Button code (VMG PGC 1)

## 14.4 GVM commands

All the VM commands are mostly the same as in VM Commands. There are few changes and few additions:

- Goto uses string labels, not a line number
- Sub-Registers can be used
- Aliases can be used for GPRM registers
- If -then-else condition
- you can have empty lines between code
- you can have comments within code

### Explicit Empty lines

Global VM will ignore any empty lines during Build. However if you really want to have empty lines in the final VM code (for example if you plan to add code manually using IFOedit or PGCedit after DVD compilation) then simply specify Nop as a command

A code:

```
PRE "Menu 1"
  Nop
  Nop
  Nop
  GPRM2 = 3
END
```

will generate three empty command lines before the set operation.

**Comments**

A line comment is created by typing double slash and then text. A comment can be on a new line, or simply after a line commands.

*Example:*

```
// This is comment
GPRM1 = 15 //This is another comment
```

A block comment is created by surrounding text inside `/*` and `*/`

*Example:*

```
/*
This is a block comment
It will be ignored
*/
```

You can also comment out any code if you don't want to use it in the build.

**Object**

Any references to the objects must be surrounded in quotation marks. Example:

```
LinkPGCN "Menu 1"
linkto "Movie 1"
```

## 14.5 Goto Command

In Global VM, Goto is not used with a line number, but with a string label.

*Example:*

```
if (GPRM1>0) Goto setprm
GPRM1 = 15
Goto finish:
setprm:
GPRM2 = 10
GPRM3 += 1
finish:
```

The label is any unique string without spaces or special characters ending with colon. Make sure you don't use any label that looks like VM command, register or a register alias.

## 14.6 If-then-else

Unlike normal VM Commands, the Global VM can have advanced If condition, with multiple lines and also with else statement.

A normal VM Command if statement looks like this:

```
if (GPRM1 > 2) LinkPGCN 1
```

In normal VM code only one command can be used with if.

The Global VM script can also use the same if statement plus more advance If-then-else with multiple lines.

**Simple statement**

As described in VM Commands, the simple if statement can have only one command, all next lines will be executed regardless of the if condition.

*Example:*

```
if (GPRM1 > 2) LinkPGCN 1
GPRM2 = 0
```

Only **LinkPGCN 1** belongs to the condition, the **GPRM2 = 0** will be run regardless of the condition result.

**Note:** DVD system allows only certain commands to be used within line with if condition. For example LinkPGCN is one of them, but JumpSS is not.

These can be generally used with one line if command:

- LinkPGCN (and similar links like LinkCN ...)
- Goto "label"
- GPRM1 += GPRM2 and other simple register operations

For other commands you will need to use Multi-Line if-then-endif command.

#### **Multi-Line Statement 'if - then -endif'**

A multi-line statement must have word '*then*' in the condition line, the commands belonging to the condition body must start on new line and it must be closed by '*endif*'

*Example*

```
if (GPRM1 > 2) then
    LinkPGCN 1
    GPRM2 = 0
endif
GPRM3 = 0
```

Both **LinkPGCN 1** and **GPRM2 = 0** belongs to the condition body and will be executed only if condition is true. The line **GPRM3 = 0** after *endif* will be executed regardless of the condition.

#### **Multi-Line Statement 'if - then - else - endif'**

The last type of statement uses else block. If the condition is true then lines between *then* and *else* will be executed, if it is false then lines between *else* and *endif* will be executed.

*Example*

```
if (GPRM1 > 2) then
    LinkPGCN 1
    GPRM2 = 0
else
    GPRM3 = 0
    GPRM4 = 0
endif
```

## 14.7 Alias

Alias are mnemonic names for GPRM registers. The Alias table is saved with the project. You can change the Alias directly in the GPRM table

GPRM0	G0
GPRM1	Counter
GPRM2	G2
GPRM3	G3
GPRM4	G4
GPRM5	G5
GPRM6	G6
GPRM7	G7
GPRM8	G8

Simply double click on any item and type the new Alias:

GPRM2	G2
GPRM3	LoopPoint
GPRM4	G4

You can use both in the code - the GPRM name and its alias:

```
GPRM3 += 2
LoopPoint += 2
```

#### Alias definition in the code

You can also change the Alias table directly from the code. This is a good way to make sure the Alias table is always set correctly.

The best way is to add the ALIAS before any block

```
ALIAS GPRM3 LoopPoint
```

```
PRE "Menu 1"
  LoopPoint += 2
...
```

Alias name is not case sensitive.

If you define ALIAS using code rather than GPRM table, you need to do at least one Test Build or Build before the Syntax Check line will recognize the new ALIAS

```
24
25     if (GPRM0 != 1024) Counter += 1
26
```

Line 25 : 'Counter' Unrecognized command

After Test Build:

```
✓ if (GPRM0 != 1024) GPRM1 += 1
```

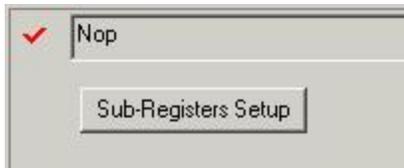
## 14.8 Sub-Registers

As we explained before in VM Commands, Sub-Register is a register that is divided into smaller parts. Each part can be used as if it is virtually separate.

The only consideration is the maximum value a divided Sub-Register can hold. See the table:

Subdivide into	Allowed Values
No division	0..65535
2 Sub-Registers	0..255
4 Sub-Registers	0..15
8 Sub-Registers	0..3
16 Sub-Registers	0..1

To divide Register, you can use Sub-Registers Setup button:



Here you can select GPRM register and then Subdivide it into 2, 4, 8 or 16 parts:



### Subdividing inside the code.

To make sure the subdivision is set correctly each time you run script you can set up the registers from code using SUBDIVIDE command. The best place is similarly to the ALIAS, before any block.

```
SUBDIVIDE GPRM1 2
```

```
PRE "Menu 1"
  GPRM1.A = 2
```

This divides the GPRM1 into 2 parts.

### Usage

If you look at the diagram on Sub-Registers Setup, it shows you the naming convention for each sub-registers.

The sub-registers are defined as A, B, C, D... etc after the register (or alias name) and a dot.

### Example

```
GPRM1.A = 2
GPRM1.B += 1
if (Counter.D == 2) then..
```

### Sub-Registers and GPRM12 (Temp)

The internal code to unfold sub-register on DVD will use GPRM12. That means after any Sub-Register

operation GPRM12 will be changed.

*Example*

```
GPRM12 = 3
GPRM1.A +=10
//GPRM12 is no longer 3
```

```
GPRM12 = 3
if (GPRM1.A > 2) LinkPGCN 2
//GPRM12 is no longer 3
```

It is therefore not safe to use GPRM12 to store values if you are using Sub-Registers.

#### **Alternative Safe usage of GPRM12**

if you really need to use GPRM12 (you run out of registers) you still can, but make sure you don't carry any value in GPRM12 behind any Sub-Register operation (including if comparison). You can however safely assign value from/to GPRM12 and Sub-Register.

*Example:*

```
GPRM12 = 3
GPRM12 += GPRM3
// or any other normal operation with GPRM12
// assign GPRM12 to sub-register is OK.
GPRM1.A = GPRM12
//GPRM12 is now changed, we can use it again for other new things until any sub-reg operation
GPRM12 = 0
```

*Example*

```
//Assigning value to GPRM12 from subregister is OK
GPRM12 = GPRM1.A
GPRM12 += 2
//or any other normal operations with GPRM12 until any sub-register operation
```

#### **Avoid un-necessary Sub-Register operations**

Unfolding and folding Sub-Registers takes up to 5 lines of VM command on a DVD.

A code like this:

```
GPRM1.A += 2
```

actually takes 7 lines of vm code as it uses both folding and unfolding code.

if you write a simple code like this:

```
// here we do all operations directly on Sub-Registers
GPRM1.A += 2
GPRM1.A *= 2
if (GPRM1.A >6) LinkPGCN 2
if (GPRM1.A >3) LinkPGCN 3
```

it will expand it into 20 lines of code. This is because each Sub-Register operation will need to be expanded separately.

Instead we can write a smarter code where we avoid unnecessary operation on Sub-Registers by first assigning sub-register into a normal register, then doing operations on the normal register and eventually sending the register back to Sub-Register if needed:

```
// this code does the same as the one above
// but first we assign the subregister into normal register
GPRM0 = GPRM1.A
```

```
// then do the operations on full register
GPRM0 += 2
GPRM0 *= 2
// then set it back
GPRM1.A = GPRM0
// compare the full register instead of sub-register - saves lines of VM commands on DVD
if (GPRM0 >6) LinkPGCN 2
if (GPRM0 >3) LinkPGCN 3
```

the above script will create only 12 lines of VM code on the DVD.

## 14.9 Linking

You can use two ways of linking to another object

- using the VM Commands LinkPGC, CallSS, JumpTT or JumpSS with direct value or Object name
- using **linkto** command

There are various limitations posed by the DVD system when using direct VM linking commands. Which command you use depends on the type of link. For example if you link Menu to menu you use LinkPGCN, Linking Movie to Movie or VTS Menu to Movie you can use JumpVTS\_TT, Linking Movie with VMG menu you use CallSS VMGM, linking VMG Menu to movie you use JumpTT and linking VMG menu to VTS menu you use JumpSS VTSM.

As in VM Commands you can simply type:

```
LinkPGCN 2
```

This will link (from Menu) to Menu PGC 2 (which is the first menu - if you don't know why, read the bottom page here)

In Global VM commands you can also type this:

```
LinkPGCN "Menu 1"
```

This will link (from Menu) to Menu 1. If such menu doesn't exist you will get error while building script. As described before, you cannot just use any link command, you have to use correct link command for the type of link.

### linkto Command

To make this easier, Global VM has a **linkto** command.

```
linkto "Menu 1"
linkto "VMG Menu 2"
```

The linkto command will choose the correct VM command for you during Build. In first case of "Menu 1" it will choose LinkPGCN, in second case with "VMG Menu 1" it will choose JumpSS VMGM. (provided of course the block is for a VTS menu, for other objects the result command may be different)

### IF condition

You can't use **linkto** with a *simple one line* If condition:

```
if (GPRM1 ==1) linkto "Menu 1" <<< this will show error on Build
```

You need to make advanced if -then -endif condition

```

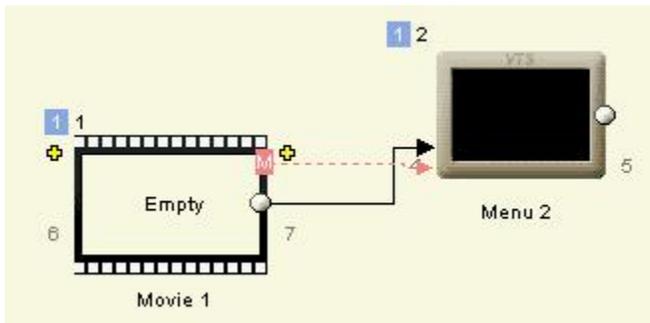
if (GPRM1 ==1) then
  linkto "Menu 1"
endif

```

**Note:** Linking between VTS menus and Movies require that they are from the same VTS.

#### Special case VTS Movie to VTS Menu:

There is a special case if you use **linkto** in a Movie PRE or POST block and the target is a VTS Menu that is **not** the Root (for example Menu 2 etc..). Because DVD doesn't allow explicit linking using VM Commands between Movie and Menu, this case will use Abstraction Layer for help to fill the link. The **linkto** will (only in this case) actually physically draw a connection between the two objects. The type of it depends on PRE (will use menu button link) or POST (will use end link) command.

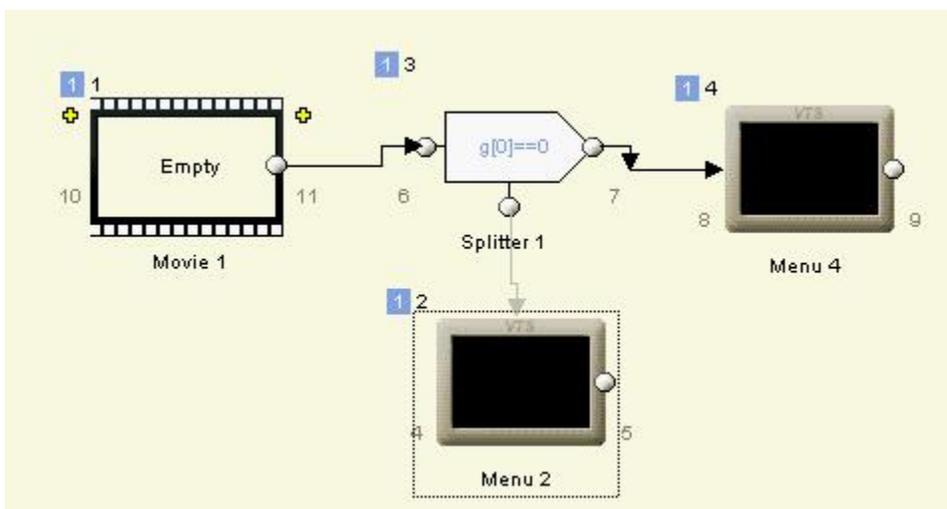


You have to keep this in mind. By simply deleting the **linkto** command and Building script again will NOT remove these links (unlike in all other cases).

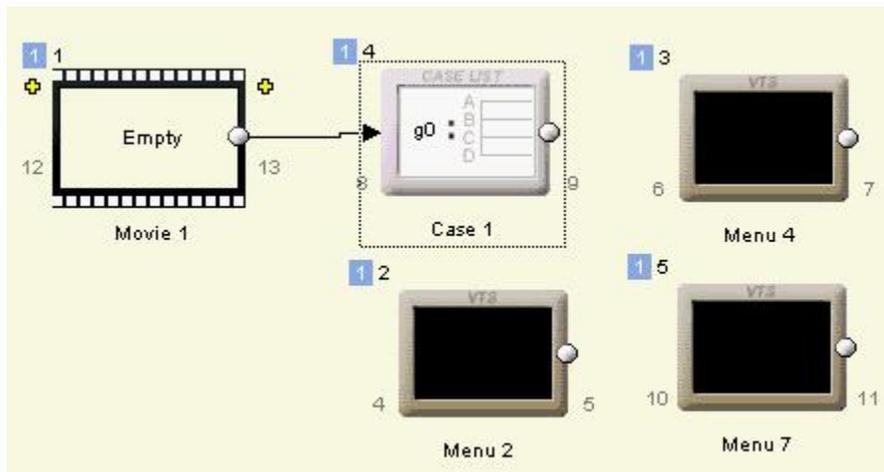
#### Best way to link Movie to different VTS Menus

This special case mentioned above has always only one possible link. That means, you cannot make the *Movie* to link to two different menus simply by using condition and **linkto** command - it will not work, you have to add one more "*distributor*" object in the VTS Menu domain...

The simplest way is to use aCondition splitter object:



or if you need more than two different targets (menus) you can use Case List Object:



All you need to do is to set the comparison register (in the images above it is GPRM0) in the Movie PRE or POST blocks depending to which Menu you want to link to.

## 14.10 Test and Build

There are two operations that will build the script:



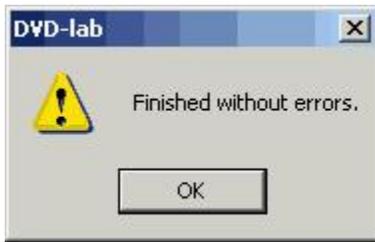
- 1) Build
- 2) Test Build

In both cases the script will be checked for errors and then Build using standard VM Commands. In the case of *Test Build*, these commands will end up on your screen rather than in the Object:

```

Global VM - Show VM Code
The Global VM Script has Block Handles for these Objects
Menu 1:PRE
Test-Build VM code
1. if (GPRM2 == 1) Goto 3
2. Goto 4
3. JumpSS VMGM (pgc 2)
4. Nop
  
```

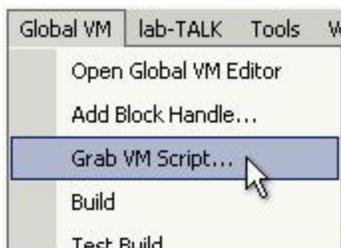
A Build will add the VM Commands to the objects only if there are no errors.



This indicates that the Object VM commands were updated.

## 14.11 Grab VM Script

You can grab a script from all objects (for example from from a previous project) using this command:



This will go through all the objects in project (Menus, Movies, VM Commands, First Play etc.) and check if it has Custom Commands in the "A" section (before Abstraction layer)



If yes, a new block will be created with the script. If object has no custom commands then no block will be created.

If you need to grab VM Code from only one particular object use Add Block Handle instead.

## 14.12 Misc

`setnode` command

`setnode` command will set `GPRM11` with the node of the object. This is to satisfy Abstraction Layer if you are cutting out the execution of AL by having a `Break` command or simply make sure the `GPRM11` is set to the current node (for example prior using a link to other objects)

```
PRE "Menu 1"

    if (GPRM2==GPRM4) then
        linkto "VMG Menu 1"
    endif
    setnode
    Break
END
```

A `Break` command will exit the current VM command section on that object. Any object has Abstraction

Layer commands inserted after the "A" Custom Commands section. The Abstraction Layer section set the GPRM11 for each object with unique number we call Node to keep track of few functions, most notably the redirection from Movie to a VTS Menu. By cutting the script using Break command the GPRM11 will not be modified with the actual Node and as a consequence some functions (minor) may not work properly.

You may also use the GPRM11 in your own code - since it is unique for each object PRE and POST commands, you can always tell where the link comes from and so modify the behaviour.

For example by comparing the GPRM11 on a menu you can tell which movie viewer just watched and if he interrupted it (the GPRM11 will be even number) or watched it till the end (GPRM11 will be odd number).

#### **BUTTON** command

The **BUTTON** command is a supplemental command to change the VM command of a button. The command can be only one line.

Syntax:

```
BUTTON "Button label" vm_command
```

This will replace VM command of the button with specified label on cell 1 of the menu. If more than one buttons have that same label, only the first one will be replaced.

Note: This is a supplemental command. Setting buttons in script is prone to user errors as there is no feedback. It is better to set buttons from within interface. to make sure we are setting the correct object.

## 15 LabTALK

### 15.1 LabTALK

LabTALK is an internal scripting language that is used to create smart components, smart templates, macros or various script effects.

An example of LabTALK usage could be the keypad component in Plug-ins, Components tab:



After you drag the component to Connection window its script will run and display an input dialog. After pressing "OK", the script will create all the necessary objects and links depending on the selection. This is example of a smart component that uses LabTALK script.

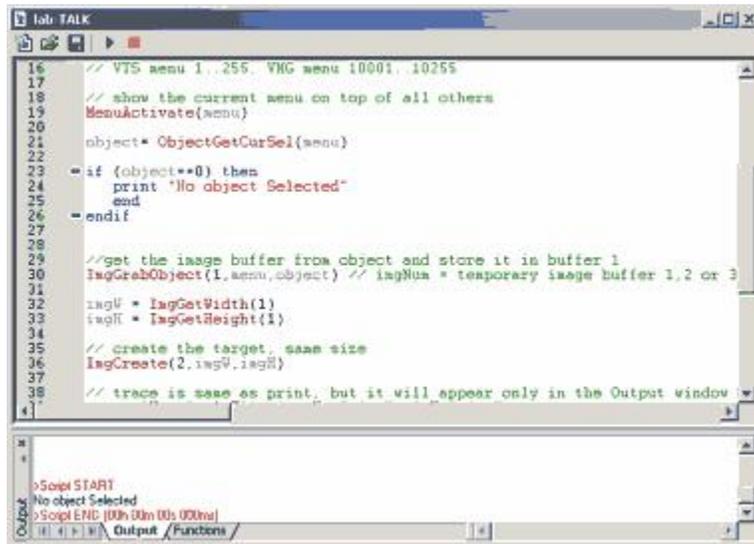
It is not necessary to learn labTALK for any DVD related problems. LabTALK has nothing to do with the DVD itself, it is rather a scriptural access to the DVD-lab functions and commands.

If you are DVD author and don't have the direct need for scripting in DVD-lab then there is nothing to gain for you. You can simply skip all the LabTALK part.

## Lab-TALK

Lab-TALK is a BASIC type of language and it is a pure interpreter. That means it will not detect error until the execution of the program reaches the erroneous line.

LabTalk can be accessed from the lab-TALK menu - Open Script Editor:



The top part of the window is the editor, while on the bottom part there is output window with Output tab and Functions definition.

When you write a script you can press Run button



And the script will start. In the output window you will see errors, print or trace commands.

## Usage of LabTALK scripts

When you save a LabTALK script \*.talk it will appear under the tab Plug-ins, Script in Assets.



Double-clicking on the script will open it back in the LabTALK editor. The script assumes that it can be directly run by drag-and-dropping it from the Assets Plug-ins to the appropriate window (for example, a menu).

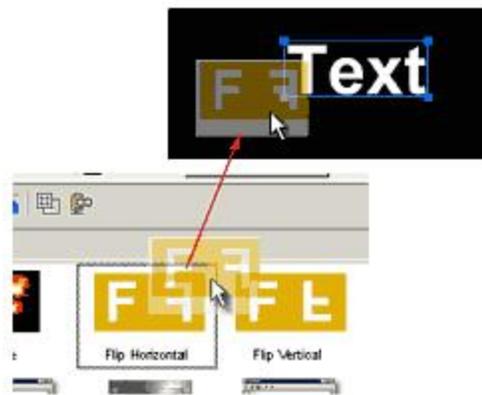
You can examine some of the default scripts by reading their source code.

*Example:*

Open menu and type Text in it:



Now open Plug-ins in the Assets window, then click Script tab and drag Flip Horizontal script over to the Text in menu



The script will be directly applied to the object



Now double click on the Flip Horizontal script to open it in the editor window and examine it.

The script will show essentially something like this (comment lines are not reproduced here)

```
menu = MenuGetCurSel()  
MenuActivate(menu)  
object= ObjectGetCurSel(menu)  
if (object==0) then  
    print "No object Selected"  
end  
endif  
ImgGrabObject(1,menu,object)  
imgW = ImgGetWidth(1)  
imgH = ImgGetHeight(1)  
ImgCreate(2,imgW,imgH)  
trace "W =",imgW, " H=",imgH  
ProgressBar(0,imgW,"Flipping!")  
for x=1 to imgW  
    ProgressSetPos(x)  
    ImgCopyCol(1,x,2,imgW-x+1)  
next x  
ImgSetToObject(2,menu,object)
```

## 15.2 Definitions

LabTALK is an interpreter language based on the BASIC language. The task of this document is not to teach BASIC, but rather to point out the similarities and differences between it and LabTALK. Therefore the documents below assume that you have some general programming knowledge.

### Variables

LabTALK can work with integer, float and string variables. There is no forward declaration of variables like in advanced languages (C, or Pascal..) The variable becomes the type as soon as you assign a value to it for first time.

```
a = 10
```

will create integer variable 'a'

```
b = 10.5
```

will create float variable 'b'

```
name = "Hello!"
```

will create string variable 'name'. If you need to enter '\' you need to do it like in the C language with double '\\'

```
file = "c:\\myfile.txt"
```

You can create your very first program quite easily:

```
string = "Hello!"  
print string
```

Then hit the Run button  and watch the output tab:



## Arrays

Arrays don't have to be declared as to type or number of elements. They all could be integer, float or string.

```
myarray[0] = 10  
myarray[1] = 20
```

Arrays in LabTALK can go even to negative:

```
myarray[-1] = 10
```

is still valid. In fact you can mix various types within one array - but of course this is not advised and is of little benefit.

The array index may be a constant, another variable or an expression. See the code below:

```
a = 5  
myarray[a] = 10  
myarray[a+1] = 20  
print myarray[6]
```

The printed result is of course 20.

## Expressions

LabTALK has fully developed integer and float expressions.

```
b = 3  
a = 3 + 2 * 5 + 4 * (10 + b * (23 + b))  
print a
```

The result is 365. You can use expressions directly in any function.

## String operations

LabTALK can use various string operations as well. See the code below:

```
c = "Os" + "car"
```

```
str = "Hello"+ CHR(32) + c + "!"
print str
```

Result is: Hello Oscar

### Comments

Everything in a line after // is deemed to be a comment

```
menu = MenuGetCurSel() // VTS menu 1..255, VMG menu
10001..10255
```

Whole line can be just a comment

```
// ***** The loop starts here *****
```

You can comment block of the text with /\* and \*/

```
/* This text is just a comment
It will never run
*/
```

### Language.

The whole language can be divided into two parts. One are commands of the basic language - the definition of the language. The other part are functions that are specific to DVD-lab.

### CORE of language

Commands	Syntax example	Description
for to next	for x=1 to 10 ... next x	loop, can be nested
if then else endif	if (x==0) then ..... else ..... endif	condition, can be nested
print	print "Variable ", a, "Other Variable ", b	print to Output window or if run directly show a message
print msg	print msg "Variable ", a	always show a message
trace	trace "Variable ", a	print only to output window, if run directly nothing is shown (good for debugging)

input	input "Enter value", a	Input box for multiple parameters
end		End of the script
goto	goto 100	got label 100
gosub	gosub 100	goto subroutine label 100
return		return from subroutine

### Defined functions

Functions	Syntax example	Description
RND	a = RND(5)	random value 0..5
INT	a = INT(b)	integer value from float
FLOAT	a = FLOAT(b)	create float from integer
CHR	c = CHR(32)	generates character from ascii number (32 is space for example)
ABS	a = ABS(b-5)	absolute value
STR	c = STR(5)	Convert integer number to string. In our example the C will become c= "5"
sin	a =sin(3.14)	Sine
cos	a =cos(3.14)	Cosine
MIN	a = MIN(b,c)	minimum value from two parameters
MAX	a = MAX(b,c)	maximum value from two parameters
RGB	color = RGB(255,0,0)	color value from red, green, blue components (in our example result is red color)
GETR GETG GETB	red = GETR(color)	Get red, green or blue component from color value
VMG	firstVMGmenu = VMG(1)	adds 10000 to the parameter. For menu coding, see more functions

LEFT	string = LEFT(input, x)	gets first x character from left of the input string
RIGHT	string = RIGHT(input, x)	gets first x character from right of the input string
LOW	string = LOW(string1)	convert the string to lowercase
Predefined Values		
TRUE		1
FALSE		0
NULL		0

### 15.3 Core Details

This page describes in greater detail the core of the BASIC language used in LabTALK. Again it is not a tutorial about programming and it assumes users have some knowledge about programming. It is here more for reference and in form of examples. If you don't know what a for-next loop does then it won't help you to know its syntax.

#### ► Loop: for - next

The loop expects to be counting only upwards and its syntax is as in the example below

```
for i = 1 to 10
  print i
next i
```

You can exit from loop anytime by simply overwriting the loop variable value

```
for i = 1 to 10
  print i
  if (i > 4) then
    i = 10
  endif
next i
```

loops can be also nested

```
for x = 1 to 10
  for y = 1 to 10
    print x, ", ", y
  next y
next x
```

#### ► Condition: if -then- else -endif

A typical basic condition using if - then

```
a = 10
b = 20
if (a+b==30) then
    print "true!"
endif
```

You have to always close if with endif!

```
a = 40
b = 20
if (a+b==30) then
    print "true!"
else
    print "false!"
endif
```

Inside the condition you can use these boolean operators and these operands:

Operand	Syntax example	Description
&	if ( a ==1 & b==2) then	AND
	if ( a ==1   b==1) then	OR
==	if ( a ==1) then	is equal
!=	if ( a != 1 ) then	is not equal
<>	if ( a <> 1 ) then	
<=	if ( a <=1 ) then	if less or equal
<	if ( a < 1 ) then	if less
>=	if ( a >= 1 ) then	if bigger or equal
>	if ( a > 1 ) then	if bigger

### ▶ Printing to screen: print, trace, print msg

Printing values of variables is done with print command. There are few flavors of it, each has the same syntax:

Command	How it works
print	Output to Output window if run from within lab-TALK script editor If run directly (drag-and dropping) it will show a pop-up window

trace	Output only to Output window. If run directly, nothing will be print. Good for debugging
print msg	like print, but it will always pop-up message and never print to output window. The pop-up window will have "Continue Script?" thext added that allows to break the script run.

The syntax of all print commands is simple. Consider the sample below:

```
a = 10
b = " Hello"
print "just text"
print a
print a+10
print "Variable:", a
print "Variable:", a , " String", b
```

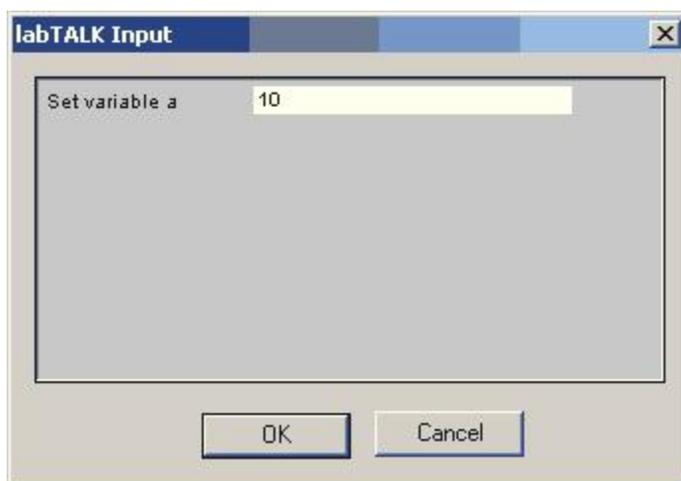
#### ► Input command

This command is used to popout an input dialog where user can change one or more variables.

A simple usage is this:

```
a = 10
input "Set variable a", a
```

When you run the script a labTALK input dialog will be shown:

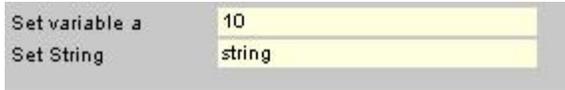


Obviously there places for more variables on the input dialog and indeed, you can use:

```
a = 10
```

```
b = "string"
input "Set variable a", a, "Set String", b
```

Running this will show:



### Special input commands.

The input dialog can also modify the way how you enter the data.

#### Checkbox

This is done by setting CHECK: inside the string

```
a = TRUE
input "CHECK:Set checkbox", a
```



#### File box with browse button

This is done by setting FILE: inside the string

```
a = "C:\\myfile.txt"
input "FILE:Set file", a
```



#### Color box with color selection button

This is done by setting COLOR: inside the string

```
a = RGB(255,0,0)
input "COLOR:Set color", a
```

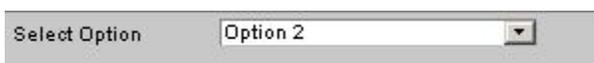


#### Option box (combo box)

The options follow after ':' and are divided by '|'. The variable is from 0 ...number of options - 1

```
a = 1
input "Select Option:Option 1|Option 2|Option 3", a
```

In the above example, the return value (in "a") will be 0, 1 or 2.



A variable bCancelInput will become TRUE if user press Cancel on the input dialog.

A code below will exit the script if user press Cancel:

```
input "COLOR:Select Color ", color1
//allow cancel
if bCancelInput then
    trace "Cancelled"
end
endif
```

#### ▶ end - finish script

The command end will simply finish the script

```
if bCancelInput then
    end
endif
```

It is not necessary to put "end" at the end of script, but if you have subroutines, you have to put end before them, see gosub below.

#### ▶ goto - go to a label

The label is a number. Any number will do. Please do not confuse the labels with line numbers. It has nothing to do with them.

```
10 input "Value 1 or 2", a
if (a==1) then
    goto 100
endif
if (a==2) then
    goto 200
endif
print "I can understand 1 or 2"
goto 10

100 print msg "You entered One"
end
200 print msg "You entered Two"
end
```

The program will loop until you enter 1 or 2 then it will display the message. The labels don't have to be in sequential order, but it makes the program look more logical. (The numerical labels come from the time of first computers when every line written in BASIC had its own number, but we no longer use that so only the labels remained)

#### ▶ Gosub - go to subroutine

Subroutines in BASIC have to be at the very end of the script and must be labeled by label

number (this has nothing to do with line numbers). Returning from a subroutine is done with the return command.

```
print "1"  
gosub 100  
print "2"  
end
```

```
100 print "subroutine"  
return
```

The printed result will be:

```
1  
subroutine  
2
```

Note the end command before the subroutine will finish the script. It is required to have an "end" statement before you write any subroutines.

## 15.4 Functions and Commands

Here is a list of labTALK DVD-lab-related Functions and Commands. Unlike the core of the language described in previous pages, these commands here are specific to DVD-lab.

### VTS Functions

All commands that works with menus or movies assume for simplicity they are in currently selected VTS. To select different VTS you need to use SetCurrentVTS function.

Command	Parameters and Usage	Comments
---------	----------------------	----------

SetCurrentVTS	SetCurrentVTS",1,6,"SetCurrentVTS(nVTS)	V T S 1.. 99 , S e t t h e V T S a s c u r r e n t
GetCurrentVTS	nVTS = GetCurrentVTS()	r e t u r n s w h i c h V T S i s c u r r e n t l y S e l e c t e d

## Menu

Menu commands are used to access menu functions. A menu is referred by its number. VTS menus have number 1...255, VMG menus have number 10001..10255

All functions assume this reference. that means command **MenuActivate(10001)** will activate first VMG Menu.

For clarity you can use function **VMG(vmgmenu)** that simply add 10000 to the input parameter.

Therefore the command **MenuActivate(VMG(1))** does the same as above - select first VMG menu.

Command	Parameters and Usage	Comments
---------	----------------------	----------

MenuGetCount	nC = MenuGetCount()	Get number of menus in current VTS
MenuGetVMGCount	nC = MenuGetVMGCount()	Get number of VMG menus in current VTS
MenuGetCurSel	menu = MenuGetCurSel()	Get number of currently selected menu. VTS menu 1..255, VMG menu 10001..10255
MenuAdd	menu = MenuAdd(IsVMG,"Name",openWindow)	Add new Menu
MenuAddFrom	menu = MenuAddFrom(IsVMG,"Name",openWindow,sFile)	Add new menu from menu template (file)
MenuDelete	MenuDelete(menu)	Delete menu
MenuActivate	MenuActivate(menu)	Activate (open) the menu in DVD-lab
MenuSetPBC	MenuSetPBC(menu,timeout,nFOSEL,nFOACT)	Set playback functions Timeout (0-255), ForceSelected button (0 - no button), ForceActivated button (0 - no button)

MenuSetMapSel	MenuSetMapSel(menu,nGroup,nColor,nContrast)	Set Selected Color Mapping. nGroup: 0=Antialias, 1,2,3= normal group nColor - 0 to15 nContrast - 0 to 16
MenuSetMapAct	MenuSetMapAct(menu,nGroup,nColor0to15,nContrast0to16)	Set Activated Color Mapping. nGroup: 0=Antialias, 1,2,3= normal group nColor - 0 to15 nContrast - 0 to 16
MenuEndLink	MenuEndLink(menu, toMenu)	Set end link of menu to other menu
MenuSetMotion	MenuSetMotion(menu, sVideoFile, sAudioFile)	Set files for motion menu
MenuCopy	MenuCopy(menuFrom, menuTo)	Copy all from other menu
MenuGroupWith	MenuGroupWith(menu, withMenu,withMovie)	Group menu (create Component) with either menu or movie

MenuPlace Near	MenuPlaceNear(menu, nearMenu, nearMovie, fromWhichSide)	Position the menu in Connections near other object. FromWhichSide clockwise 0=top, 1=top right 2=right etc..
MenuSetComponent	MenuSetComponent(menu, setIn, setOut)	Set the menu in component to be In and/or Out type setIn, setOut = TRUE or FALSE
MenuRemovePRECommands	MenuRemovePRECommands(menu)	Remove all PRE commands
MenuAddPRECommand	MenuAddPRECommand(menu, commandstring)	Add line of PRE command
MenuRemovePOSTCommands	MenuRemovePOSTCommands(menu)	Remove all POST commands
MenuAddPOSTCommand	MenuAddPOSTCommand(menu, commandstring)	Add line of POST command
LinkFPtoMenu	LinkFPtoMenu(menu)	Link First Play to menu
LinkTBtoMenu	LinkTBtoMenu(menu)	Link Title Button to menu

## Object

Object commands gives access to a specific object in a menu (therefore menu number is

always one of the parameters).

Command	Parameters and Usage	Comments
ObjectGetCount	ObjectGetCount(menu)	Get number of objects in a menu
ObjectGetCurSel	object= ObjectGetCurSel(menu)	Get currently selected object in a menu

ObjectGetType	type= ObjectGetType(menu,object)	type: 1-RECTANGLE, 2-BITMAP, 3-TEXT, 4-DUMMYY, 5-FRAME
---------------	----------------------------------	---

ObjectAdd

```
object = ObjectAdd(menu,type,color,"Text")
```

Ad  
d  
ne  
w  
ob  
jec  
t  
ty  
pe:  
1-  
R  
E  
C  
T  
A  
N  
G  
L  
E  
,2-  
B  
I  
T  
M  
A  
P,  
3-  
T  
E  
X  
T,  
4-  
D  
U  
M  
M  
Y,  
5-  
F  
R  
A  
M  
E  
Af  
ter  
tha  
t  
yo  
u  
ne  
ed  
to  
us  
e

ObjectAddFrom	object = ObjectAddFrom(menu,sFile)	Add object from the file (image)
ObjectSetSize	ObjectSetSize(menu,object,nWidth,nHeight)	Set size of the object
ObjectSetPos	ObjectSetPos(menu,object,nX,nY)	Set position of the object

ObjectGetXPos	$x = \text{ObjectGetXPos}(\text{menu}, \text{object})$	Get X (left) position of object
ObjectGetYPos	$y = \text{ObjectGetYPos}(\text{menu}, \text{object})$	Get Y (top) position of object
ObjectGetWidth	$nW = \text{ObjectGetWidth}(\text{menu}, \text{object})$	Get object width
ObjectGetHeight	$nH = \text{ObjectGetHeight}(\text{menu}, \text{object})$	Get object height

ObjectDelete	ObjectDelete(menu,object)	De let e ob jec t
ObjectSetColor	ObjectSetColor(menu,object,color)	Se t col or of the ob jec t. the col or is R G B (re d, gr ee n, bl ue )
ObjectSetAttr	ObjectSetAttr(menu,object,transparency,mode)	Se t ob jec t att rib ute s

ObjectSetFont	ObjectSetFont(menu,object,"Arial",size)	Set font for text objects
ObjectSetText	ObjectSetText(menu,object,sText)	Set text of text objects
ObjectSetShadow	ObjectSetShadow(menu,object,color,type)	Set shadow of object
ObjectShadowOffset	ObjectShadowOffset(menu,object,xoffset,yoffset)	Set shadow offset

ObjectShadowAttr	ObjectShadowAttr(menu,object,intensity,blur)	Set other shadow attributes
ObjectToBitmap	ObjectToBitmap(menu,object)	Convert any object to a bitmap object (for example text to bitmap)

ObjectMergeShadow	ObjectMergeShadow(menu,object)	Merge shadow with the bit map object
ObjectUnion	ObjectUnion(menu,object,menu,object2)	Combine two bit map objects together

ObjectSetVisibility	ObjectSetVisibility(menu,object,visibility,locked)	Set Visibility of object 0-visible, 1-Invisible Normal etc ..
ObjectAutoAction	ObjectAutoAction(menu,object,autoaction)	Set if object has autoaction (FALSE, TRUE)

<p>ObjectLinkToMenu</p>	<p>ObjectLinkToMenu(menu,object,menuTo)</p>	<p>Se t lin k of thi s ob jec t to ot he r me nu</p>
-------------------------	---	--

ObjectLinkToMovie	ObjectLinkToMovie(menu,object,MovieNumber,ChapterNumber)	Set link of this object to movie and/or chapter number (starts from 1)
-------------------	--	--

ObjectCopy	newObject = ObjectCopy(menu,object,menuTo)	Create new object by copying. You can create that object in different menu.
------------	--	---

ObjectGetLabel	sLabel = ObjectGetLabel(menu,object)	Get label of the object. Label is internal name of the object that can be used for identification
----------------	--------------------------------------	---

ObjectSetLabel	ObjectSetLabel(menu,object,sLabel)	Set label of the object
ObjectGetFromLabel	objText1 = ObjectGetFromLabel(menu,"text1")	Finds object from the specified Button Label. Returns -1 if none found.

ObjectGetMenuLink	nMenu = ObjectGetMenuLink(menu,object)	Get to which menu the object links 0-if no menu link
ObjectGetMovieLink	nMovie = ObjectGetMovieLink(menu,object)	Get to which movie the object links 0-if no movie link

ObjectGetChapterLink	nChapter = ObjectGetChapterLink(menu,object)	Get to which chapter of movie the object links, 1-Movie start
----------------------	--	---

## Image

Image is a special set of commands that allows access to the bitmap data of a menu objects. Text, rectangles or frames will be first converted to bitmap.

The image functions never access the image data directly, but first creates a copy of it with `ImgGrabObject` then allows you to freely change the data and after that set that image back to object (or any other object in fact) with `ImgSetToObject`. You have 3 image buffers where you can store these data, or directly create empty buffer with `ImgCreate`. These buffers are referred to by the `imgNum` parameter in every `Img` command.

So the typical scenario for a script that can change the object on a menu would be:

menu = MenuGetCurSel()	Get the currently opened menu
object= ObjectGetCurSel(menu)	Get currently selected object on the menu
ImgGrabObject(1,menu,object)	Put the bitmap data into buffer 1
imgW = ImgGetWidth(1) imgH = ImgGetHeight(1)	get the dimensions of the bitmap data (for example for loop)

.....	do whatever you want to the buffer with ImgSet etc.
ImgSetToObject(1,menu,object)	Put the buffer 1 back to the object

Direct image data manipulation in a loop is a slow process.

It is important to note that `ImgSetToObject` will not resize the object if the image buffer is different size than the object. You can resize the object afterwards to the same size like image buffer with the object command: `ObjectSetSize(menu,object,imgW,imgH)`

Command	Parameters and Usage	Comments
---------	----------------------	----------

<p>ImgGrabObject</p>	<p>ImgGrabObject(imgNum,menu,object)</p>
----------------------	--

Gr  
abi  
ma  
ge  
dat  
a  
fro  
m  
ob  
jec  
t  
im  
gN  
u  
m  
=  
te  
m  
po  
rar  
y  
im  
ag  
e  
bu  
ffe  
r  
1,  
2  
or  
3")  
If  
ob  
jec  
t  
is  
0  
the  
n  
a  
ba  
ck  
gr  
ou  
nd  
wi  
ll  
be  
gr  
ab  
be  
d

ImgSetToObject	ImgSetToObject(imgNum,menu,object)	Set image data to Object
ImgCreate	ImgCreate(imgNum,width,height)	Create empty image data with defined size
ImgHasData	bHasData = ImgHasData(imgNum)	Does the image buffer has any data?

ImgGetWidth	<code>imgW = ImgGetWidth(imgNum)</code>	Get width of the image buffer
ImgGetHeight	<code>imgH = ImgGetHeight(imgNum)</code>	Get Height of the image buffer
ImgGetR	<code>r = ImgGetR(imgNum,x,y)</code>	Get red color of pixel at x, y
ImgGetG	<code>g = ImgGetG(imgNum,x,y)</code>	- green-

ImgGetB	b = ImgGetB(imgNum,x,y)	- bl ue -
ImgGetA	a = ImgGetA(imgNum,x,y)	- alp ha tra ns pa re nc y-
ImgSetR	r = ImgSetR(imgNum,x,y,nValue)	Se t Re d col or to the pi xel at x,y
ImgSetG	g = ImgSetG(imgNum,x,y,nValue)	- gr ee n-
ImgSetB	b = ImgSetB(imgNum,x,y,nValue)	- bl ue -
ImgSetA	a = ImgSetA(imgNum,x,y,nValue)	- alp ha tra ns pa re nc y-

ImgFill	ImgFill(imgNum,color)	Fill whole buffer with color
ImgFillAlpha	ImgFillAlpha(imgNum,alpha)	Fill alpha channel of buffer with alpha value 0-255
ImgFillCol	ImgFillCol(imgNum,x,color)	Fill x column with color

ImgFillRow	ImgFillRow(imgNum,y,color)	Fill row with color
ImgCopyCol	ImgCopyCol(imgNumFrom,xFrom,imgNumTo,xTo)	Copy column from one buffer to another
ImgCopyRow	ImgCopyRow(imgNumFrom,yFrom,imgNumTo,yTo)	Copy row from one buffer to another

<p>ImgCopy</p>	<p>ImgCopy(imgNumFrom,imgNumTo,xOffset,yOffset)</p>	<p>Copy image data from one buffer to another. You can specify the offset from where to start copy in g</p>
----------------	---	---

ImgCopyAlpha	ImgCopyAlpha(imgNumFrom,imgNumTo,xOffset,yOffset)	Copy only alpha data from one buffer to another
ImgOverlay	ImgOverlay(imgNumFrom,imgNumTo,xOffset,yOffset)	Overlay one image buffer on top of another

<p>ImgGrabChapterFrame</p>	<p>ImgGrabChapterFrame(imgNum,nMovie,nChapter)</p>	<p>Gr ab a vi de o fra me fro m ch apt er to im gN u m bu ffe r. nC ha pte r = 0 - &gt; M ov ie sta rt</p>
----------------------------	--	--

ImgGrabMenuFrame	ImgGrabMenuFrame(imgNum,nMenu)	Grab how a menu looks like to an image buffer
ImgResize	ImgResize(imgNum,nW,nH)	Resize buffer to any size
ImgBlur	ImgBlur(imgNum,nBlurValue)	Blur buffer. nBlurValue 1-255

ImgBlurAlpha	ImgBlurAlpha(imgNum,nBlurValue)	Bl ur on ly alp ha ch an nel nB lur Va lue 1- 25 5
ImgSharpen	ImgSharpen(imgNum,nSharpen)	Sh ar pe n Im ag e bu ffe r nS ha rp en 1- 10 0

ImgInflate	ImgInflate(imgNum,nAddW,nAddH)	Add empty border around the image buffer
------------	--------------------------------	--

## Movie

Movie commands are not fully finished yet. There is no way to add for example chapters, slides to slideshow etc...

Command	Parameters and Usage	Comments
---------	----------------------	----------

MovieGetCount	nC = MovieGetCount()	How many movies object we have in current VTS
---------------	----------------------	---

MovieGetCurSel	movie = MovieGetCurSel()	Currently selected movie (movie window that is in front of other windows)	
MovieAdd	movie = MovieAdd(IsSlideshow,"Name",openWindow)		
MovieDelete	MovieDelete(movie)		
MovieActivate	MovieActivate(movie)		

<p>MovieSetFiles</p>	<p>MovieSetFiles(movie,sVideo,sAudio)</p>	<p>For m u l t i p l e x e d m p g u s e s V i d e o a n d s A u d i o t h e s a m e f i l e</p>
----------------------	---	--

## Others

Here are few other support commands..

<p>Command</p>	<p>Parameters and Usage</p>	<p>Co m m e n t s</p>
----------------	-----------------------------	---

ProgressBar	ProgressBar(nFrom,nTo,"Text")	Cr eat es pr og res s ba r wi th ra ng e nF ro m to nT o
-------------	-------------------------------	---

<p>ProgressSetPos</p>	<p>ProgressSetPos(nPos)</p>	<p>Set progress in the progress bar to nPos value (n From &lt; nPos &lt; nT o)</p>
<p>SaveInteger</p>	<p>SaveInteger("uniquekey",variable)</p>	<p>Store in registry</p>
<p>LoadInteger</p>	<p>var = LoadInteger("uniquekey",default)</p>	<p>Read from registry</p>

## Variables

LabTALK will fill up few variables.

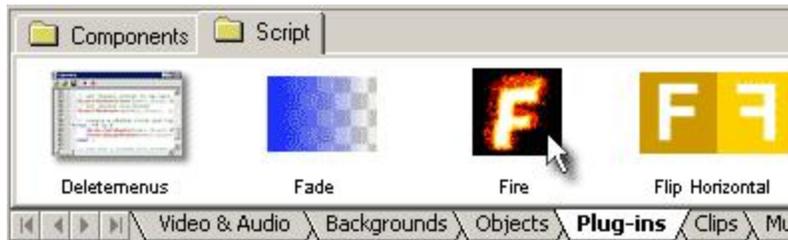
Command	Parameters and Usage	Comments
bCancelInput	if (bCancelInput) then end endif	If user press cancel on previous input command this variable will become TRUE

<p>menusInBlackBox</p>		<p>Important array for script inside Components, see components for more details</p>
<p>vmgsInBlackBox</p>		<p>--/</p>
<p>moviesInBlackBox</p>		<p>--/</p>

## 15.5 Plug-in SDK

DVD-lab allows creating plug-ins in different programming languages. The compiled plug-ins have extension \*.cplg and can be located in the folder Extras - Script. They will appear in the Plug-ins-Script tab of assets. The plug-in SDK calls directly the same commands that are used in lab-TALK therefore you need some knowledge how lab-TALK works. The major benefit of the compile cplg plug-in is speed.

A typical example is Fire plug-in:



The Fire plug-in started out as lab-TALK script, but due to the large number of pixel operations it was later translated to C++ and compiled to fire.cplg to speed it up.

 **Note:** Plug-ins are run when dropped to Menu or Connection window.

## SDK

A cplg plug-in is a normal windows dll (renamed with extension cplg).

 **Note:** We will use c++ for all our plug-in example. But because of the simplicity of API, it can be done also in other languages.

There are just two API functions:

Command	Parameters and Usage
<pre>PLUGINDLL_API char* PL_GetAbout(void)</pre>	Returns description about the plug-in. It will appear if user double-clicks on the plug-in in assets.
<pre>PLUGINDLL_API void PL_RunScript (PLCallback pCallback,HWND hWnd)</pre>	Entry point that is called when plug-in is dropped on object. It gives your plug-in access to DVD-lab callback function and sends the hWnd of the main DVD-lab window.
DLL export definition	
<pre>#define PLUGINDLL_API extern "C" __declspec (dllexport)</pre>	

## PLCallback definition

PLCallback is the main and only callback function that you call from the plug-in.

code	Parameters and Usage

```
typedef void (*PLCallback)
(char* sName,
_PLVariable *result,
_PLVariable *param1,
_PLVariable *param2,
_PLVariable *param3,
_PLVariable *param4);
```

sName - the name of the DVD-lab function (that is identical to the labTALK function.)  
 result - result of the function  
 param1 .. param4 - input parameters of function

## PLVariable definition

Object commands gives access to a specific object in a menu (therefore menu number is always one of the parameter).

Command	Parameters and Usage
<pre>struct _PLVariable { int m_nVariableType; float m_fValue; int m_nValue; char* m_sValue; };</pre>	<p>m_nVariableType - type of variable, can be one of the:</p> <ul style="list-style-type: none"> <li>• #define typeVariableInt 0</li> <li>• #define typeVariableFloat 1</li> <li>• #define typeVariableString 2</li> </ul> <p>depending on the type, the m_fValue, m_nValue or m_sValue are used</p>

## Example

Here is example how to access the labTALK function ObjectGetCurSel(nMenu)

### Listing 1

```
int nMenu = 1;

_PLVariable param1;
param1.m_nVariableType = typeVariableInt;
param1.m_nValue = nMenu;
param1.m_sValue = NULL;

_PLVariable ParamResult;

pCallback("ObjectGetCurSel", &ParamResult, &param1, NULL, NULL, NULL);

int objectcount = ParamResult.m_nValue;
```

All labTALK functions can be accessed this way. Only the type and number of input parameters vary from function to function.

## Helper functions

Since the code of our plugin would get messy if we call all functions as in Listing 1, we can create a helper functions. A most common function is one that has all parameters integer and also return integer.

### *Listing 2*

```
int CALLSCRIPT(char* sName, int nParam1=0, int nParam2 = 0, int nParam3
=0, int nParam4 = 0 );

int CALLSCRIPT(char* sName, int nParam1, int nParam2, int nParam3, int
nParam4 )
{
    _PLVariable param1;
    param1.m_nVariableType = typeVariableInt;
    param1.m_nValue = nParam1;
    param1.m_sValue = NULL;

    _PLVariable param2;
    param2.m_nVariableType = typeVariableInt;
    param2.m_nValue = nParam2;
    param2.m_sValue = NULL;

    _PLVariable param3;
    param3.m_nVariableType = typeVariableInt;
    param3.m_nValue = nParam3;
    param3.m_sValue = NULL;

    _PLVariable param4;
    param4.m_nVariableType = typeVariableInt;
    param4.m_nValue = nParam4;
    param4.m_sValue = NULL;

    _PLVariable ParamResult;

    m_pCallback(sName, &ParamResult, &param1, &param2, &param3, &param4);

    return ParamResult.m_nValue;
}
```

Having defined this function we can then substitute the Listing 1 with:

```
int objectcount = CALLSCRIPT("ObjectGetCurSel", nMenu)
```

We can also define directly the ObjectGetCurSel to even more simplify entering the commands. We will get:

```
#define ObjectGetCurSel(nMenu) (CALLSCRIPT("ObjectGetCurSel", nMenu))

int objectcount = ObjectGetCurSel(nMenu);
```

This way we can define all labTALK functions that we need. Of course some labTALK functions require string as input parameter so we would need to define another helper function that allow for this:

### Listing 3

```
// another version of helper, second param is char

int CALLSCRIPT2(char* sName, int nParam1=0, char* chParam2 = NULL, int
nParam3 =0, int nParam4 = 0 );

int CALLSCRIPT2(char* sName, int nParam1, char* chParam2, int nParam3,
int nParam4 )
{
    _PLVariable param1;
    param1.m_nVariableType = typeVariableInt;
    param1.m_nValue = nParam1;
    param1.m_sValue = NULL;

    _PLVariable param2;
    param2.m_nVariableType = typeVariableString;
    param2.m_nValue = 0;
    strcpy(param2.m_sValue, chParam2);

    _PLVariable param3;
    param3.m_nVariableType = typeVariableInt;
    param3.m_nValue = nParam3;
    param3.m_sValue = NULL;

    _PLVariable param4;
    param4.m_nVariableType = typeVariableInt;
    param4.m_nValue = nParam4;
    param4.m_sValue = NULL;

    _PLVariable ParamResult;

    m_pCallback(sName, &ParamResult, &param1, &param2, &param3, &param4);

    return ParamResult.m_nValue;
}

```

This helper function can be used to define for example MenuAdd:

```
#define MenuAdd(bIsVmg, sName, bOpen) (CALLSCRIPT2("MenuAdd", bIsVmg, sName,
bOpen))

```

This way you can define in your \*.h file all functions in labTALK so they can be used in the exact same syntax as in labTALK script.

## Get Image buffer

One "secret" command that is not described in Lab-TALK (because it has no meaning there) `ImgGetRGBABuffer` returns the pointer to the RGBA buffer

Be careful what you writing to it, because you can crash DVD-lab if you write beyond the boundaries

The size of buffer is `ImgGetWidth(imgNum)*ImgGetHeight(imgNum)*4`

 **Note:** The `BYTE` is defined as *unsigned char*.

#### Listing 4

```
#define ImgGetRGBABuffer(imgNum) (CALLSCRIPT("ImgGetRGBABuffer",imgNum))
#define ImgGetWidth(imgNum) (CALLSCRIPT("ImgGetWidth",imgNum))
#define ImgGetHeight(imgNum) (CALLSCRIPT("ImgGetHeight",imgNum))
#define ImgGrabObject(imgNum,nMenu,nObject) (CALLSCRIPT("ImgGrabObject",
imgNum,nMenu,nObject))
#define ImgSetToObject(imgNum,nMenu,nObject) (CALLSCRIPT("ImgSetToObject"
,imgNum,nMenu,nObject))
#define MenuGetCurSel() (CALLSCRIPT("MenuGetCurSel"))
#define ObjectGetCurSel(nMenu) (CALLSCRIPT("ObjectGetCurSel",nMenu))

// get current menu and current object

int menu = MenuGetCurSel();
int object= ObjectGetCurSel(menu);

ImgGrabObject(1,menu,object);
// imgNum = temporary image buffer 1,2 or 3

BYTE* pBuffer = (BYTE*)ImgGetRGBABuffer(1);

if (pBuffer==NULL)
return;

int imgW = ImgGetWidth(1);
int imgH = ImgGetHeight(1);

for (y=0; y<imgH;y++)
{
for (x=0;x<imgW;x++)
{

BYTE r = pBuffer[y*imgW*4+x*4];
BYTE g = pBuffer[y*imgW*4+x*4+1];
BYTE b = pBuffer[y*imgW*4+x*4+2];
BYTE alpha = pBuffer[y*imgW*4+x*4+3];

// do something with it and then set it back to pBuffer
}
}

//put the buffer to object
ImgSetToObject(1,menu,object);
```

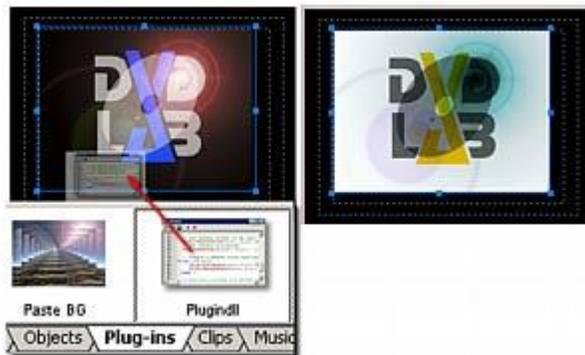
## Full Example

Here is a short example in c++ that when dropped on menu object, it will make all colors negative.

See the source file for plugin.dll example in Appendix.

plugin.dll.cpp  
plugin.dll.h

After compiling it in VC++ the dll was renamed with \*.cplg extension and moved to folder \Extras\Script\ in DVD-lab. Then it can be used as any other script.



 **Note:** You can create asset thumbnail image for the plugin in 256 color bmp format, that has to have the same name (in our example: plugin.dll.bmp), it has to be in the same folder and have dimensions 85x60

## 16 Other Tools

### 16.1 Tools

Menu: *Tools*

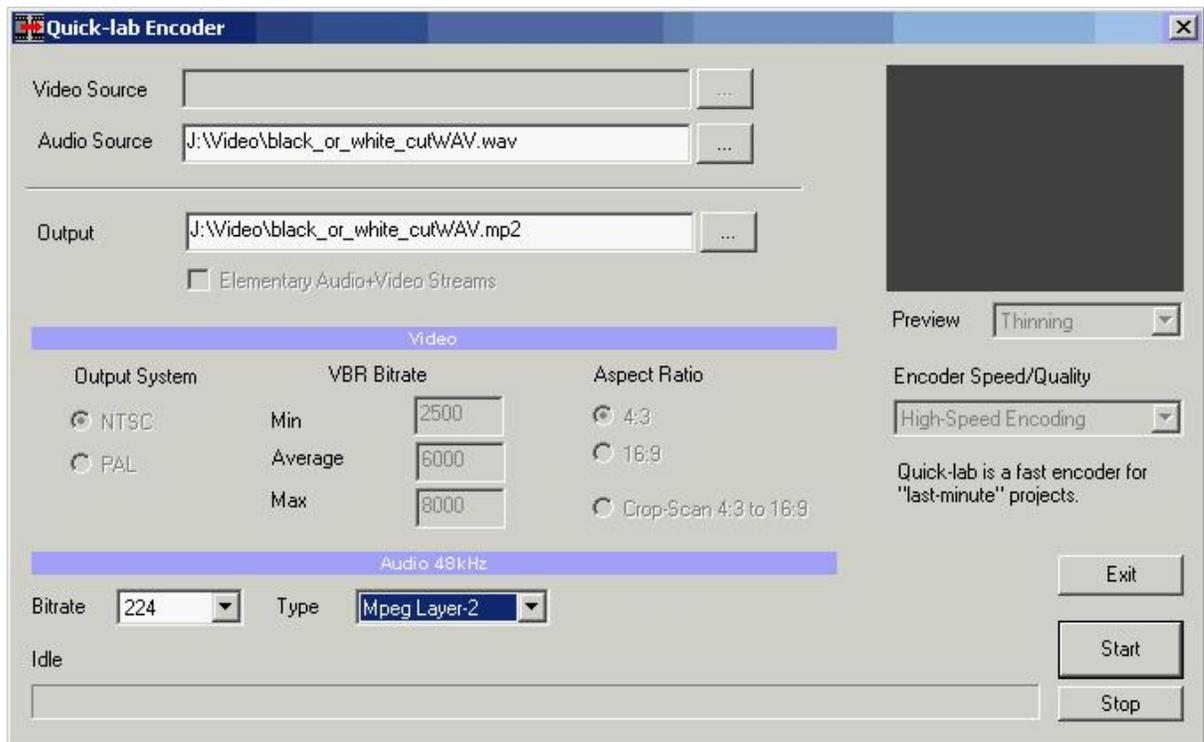
DVD-lab provides a number useful utilities and tools available in this menu.



These tools are the essential toolbox for fixing, patching and processing DVD files.

### ▶ **Audio/Video transcoder**

DVD-lab provide a tool to transcode audio that is not DVD-compliant into a DVD-compliant format, either by its internal engine or utilizing a codec/dll found in your computer.

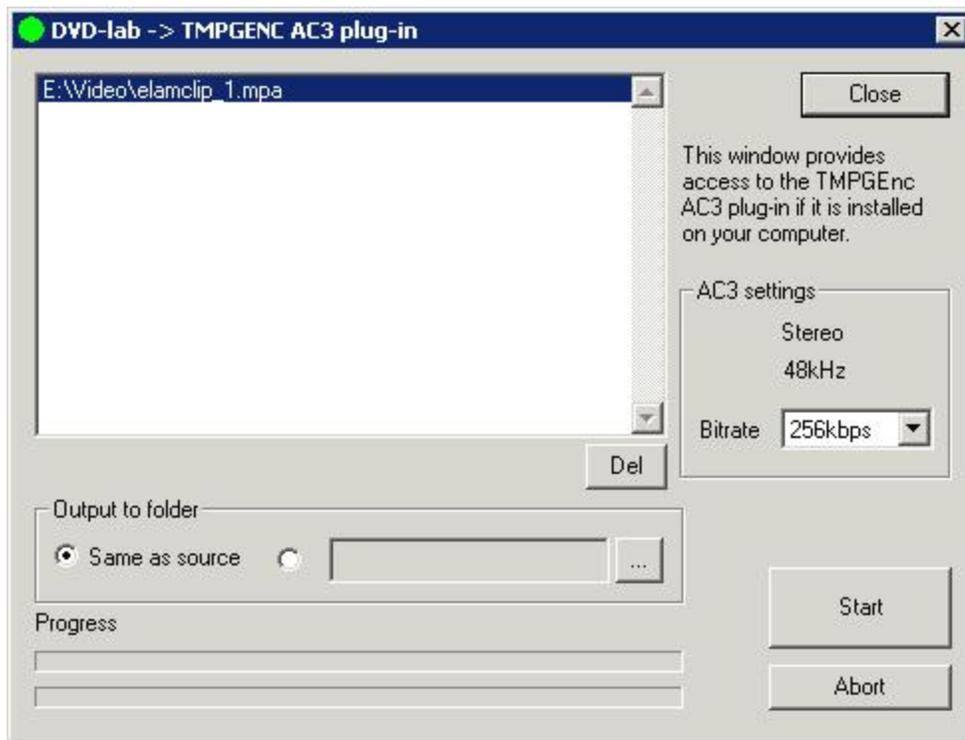


The Quick-lab provides a very simple to use tool for audio/video transcoding. Select a bitrate and the audio format. A basic formats are MPEG Audio and LPCM wav. If an usable codec library is found on your computer that can convert to AC3, this option will be also available.

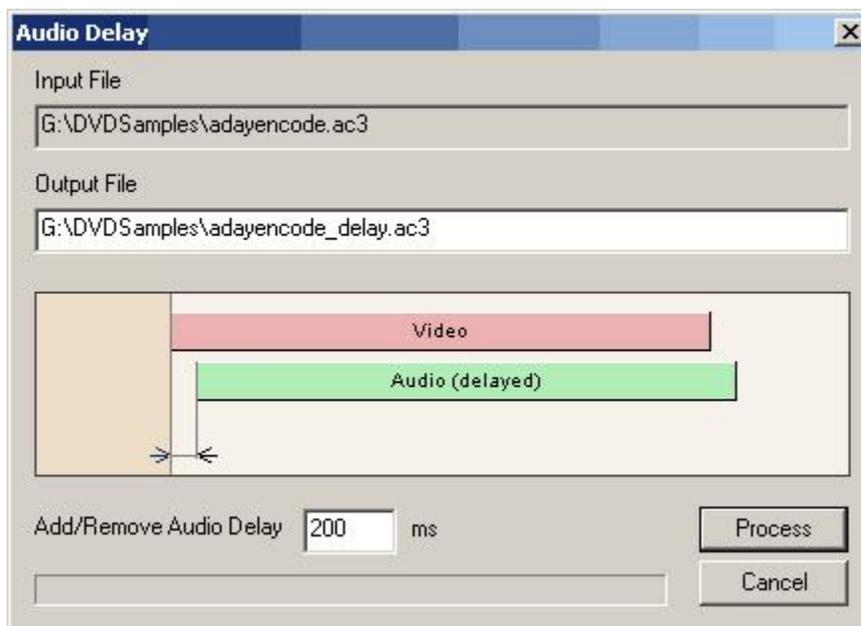
 **Note:** AC3 encoders need to be certified and licensed by Dolby Digital. DVD-lab and Mediachance highly endorse usage only of licensed encoders. Using unlicensed software may result in patent lawsuit from the owners of these patents. Also, if such software has not been certified by Dolby Digital it may create invalid or problematic AC3 steams. If you have AC3 plugin from TMPGEnc, use the Transcode to AC3 option below.

#### ► Transcode to AC3 (plugin)

This is interface to TMPGENC AC3 plugin. You have to have mpa or wav files in Video & Audio bin in order for this to run and you need TMPGEN AC3 plug-in installed. (Unfortunately it cannot be included with DVD-lab, you have to purchase it separately). TMPGEnc AC3 plugin is officially licensed and tested by Dolby Laboratories.



### ▶ Audio Delay



Audio Delay (AC3 only) can set a delay between the exact start time of the video and the audio. This is to match the sync between video and audio. In some cases, the elementary AC3 audio is encoded with a delay. This tool helps you to remove that delay by moving the audio in opposite direction. If there were a delay of 300 ms, then to correct this we will move the

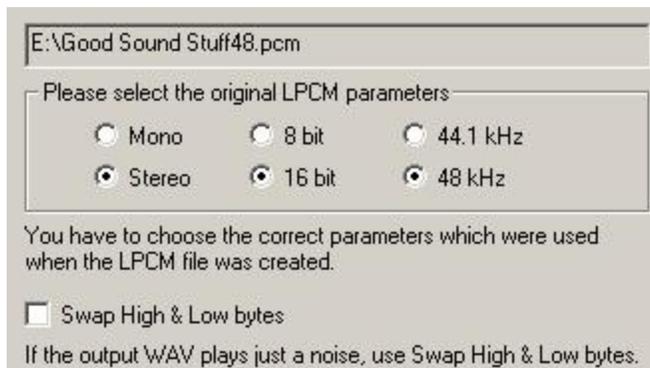
audio to -300 ms to be in perfect sync.

The tool will produce a new AC3 file with the newly added/removed delay so that the new audio file would start play at precisely 00:00 and be in sync with the video that starts at 00:00.

The only parameter is the delay in ms (milliseconds). It can be positive or negative.

### ▶ LPCM->WAV

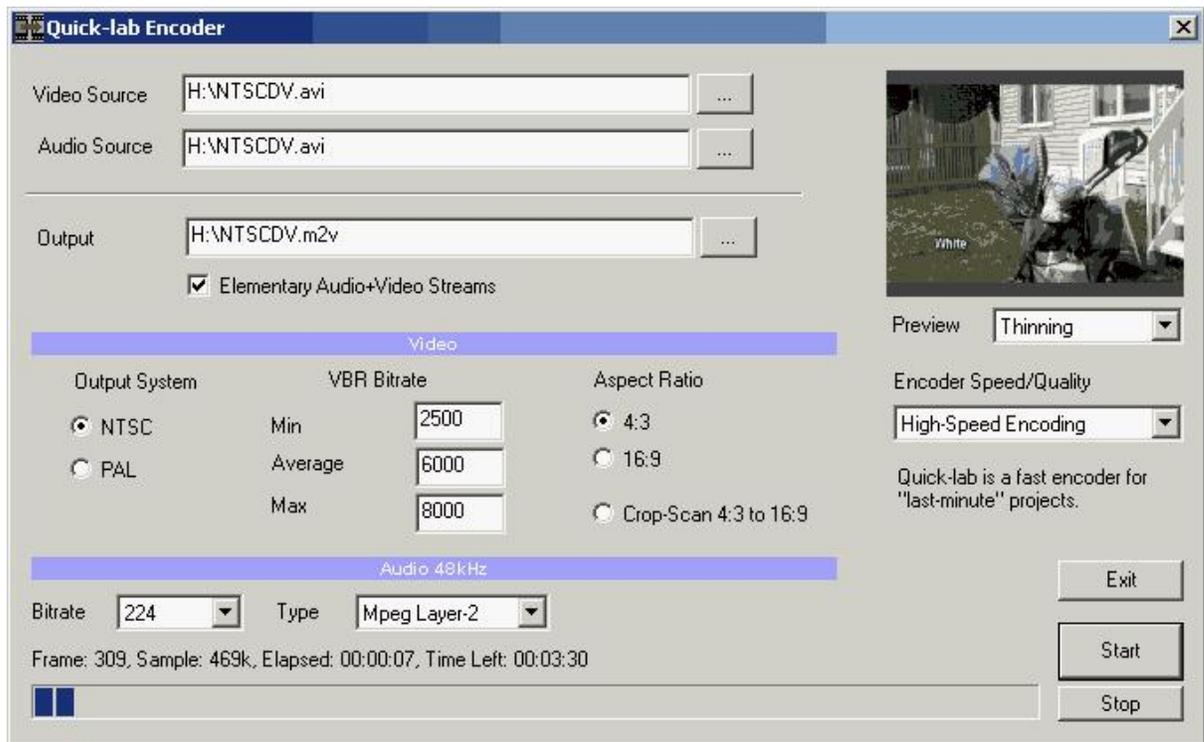
This tool converts a PCM file to WAV file. PCM files are audio data only. A PCM file has no embedded parameters, so you will have to know what specs of the PCM file are to start with. Set those parameters using the radio buttons for Mono/Stereo, 8/16 bit, 44.1/48 kHz.



A 16-bit RAW file can be encoded in Motorola or Intel byte order. If you create a WAV file which just produces noise, then you have the wrong byte order. Try converting the original file again with PCM to WAV with the **Swap High & Low bytes** box checked.

### ▶ Quick-lab Encoder

This is a fast audio/video encoder/transcoder that is included in the DVD-lab PRO. While this encoder produces reasonable video output, it should not be taken as a replacement for the high-quality encoders (that often cost more than DVD-lab PRO itself). We call it a "last-minute" encoder since it is often used when you need to re-encode a file at the very-last moment while designing the project such as various logos or advertisements.



The Quick-lab is designed to be simple to use. All you need to do is to add input files, set output files and adjust very few settings.

The Quick-lab can encode either video, audio or both.

If you want to encode audio only, load only audio file (or drag and drop audio file from explorer)

If you want to encode video, load video. In most cases the video will contain also the audio. You can also replace the audio with a different file.

The output can be saved as Elementary streams (DVD-lab recommended) which will make the video and audio as separate file.

### Video Settings:

**Output System** - select in what system will be the output created. You can use it to translate PAL <->NTSC videos between these systems.

**VBR Bitrate** - set the bitrate for the video. The default are as pictured above and should work for most of the cases.

**Aspect Ratio** - set in which aspect ratio is the source and therefore also the output.

Special case

### Crop-Scan 4:3 to 16:9

This is a special case for a "fake" aspect conversion. You can input a normal 4:3 video and the Crop-Scan will create a regular looking 16:9 (non-letterboxed) video by actually removing the top and bottom portion and then resizing it to full 16:9 frame.



If you are cautious enough during framing (filming) the 4:3 footage and always leave enough leg and head space, this trick can be used successfully to create a "fake" 16:9 from old 4:3 sources (for example to match other widescreen videos)

**Note:** During the aspect conversion the video will be deinterlaced.

### Audio Settings

This has only the audio bitrate and the audio format: Mpeg audio Layer 2 or LPCM.

### Encoder Speed/Quality

The Encoder has two settings one for better quality output and the other for faster speed of encoding (almost realtime)

### ▶ Fix Stream Headers

If you were to record content from TV with a MPEG capture card, it may happen that DVD-lab doesn't like that file. The file's header may be wrong or get corrupted and will not start within DVD-lab. Almost no software will accept such a file, you will be may not even able be to transcode it with an MPEG transcoders such as TMPGenc.



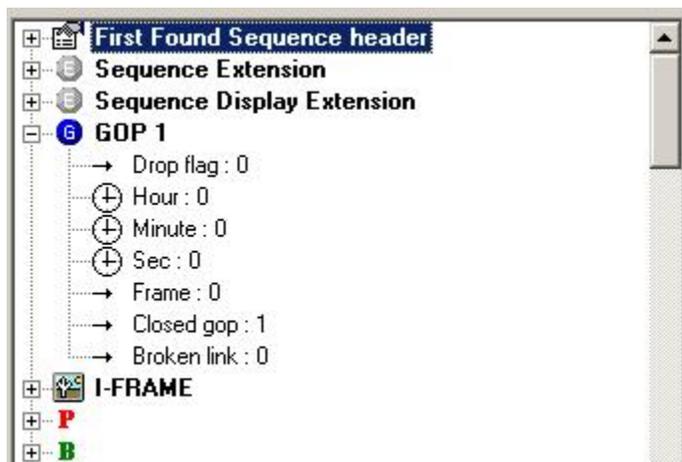
DVD-lab can fix this by cutting a part of the file. First, load the MPEG file with the **Load MPEG** button, then click **Fix Headers**. If there is something to fix, you will be notified and prompted to save new file.



The new file will usually not make any visible sync problems, since it is often cut by just few hundred kbytes.

### ► MPEG Parse

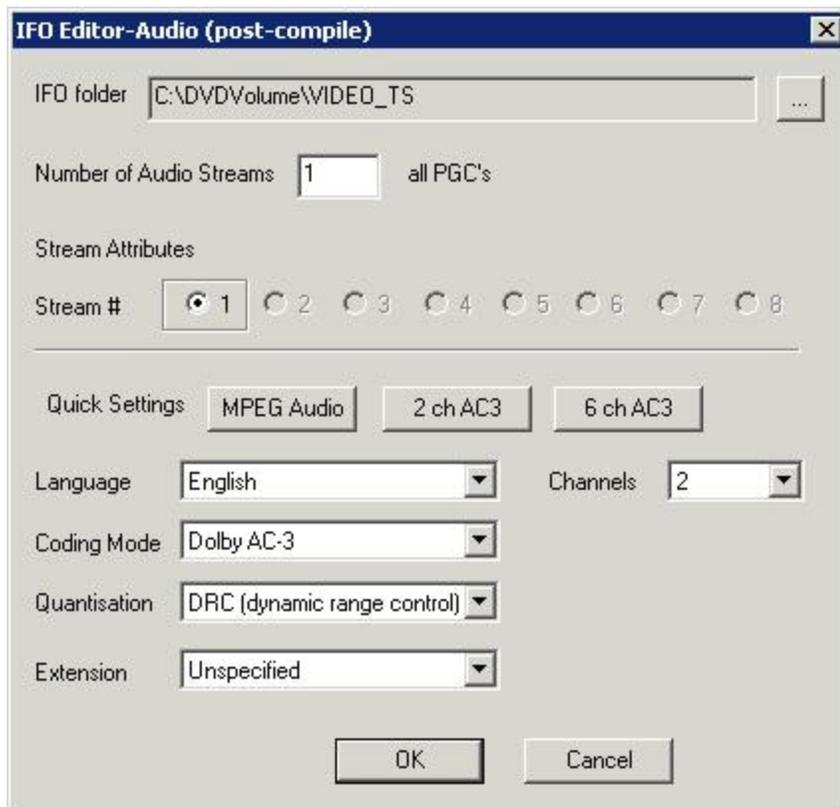
This tool works only on elementary video stream files. It will parse the file and show the headers, GOP and frames.



This is a great way to debug an invalid MPEG stream, but it requires knowledge about the complex MPEG file structure. You can also save the parsed data to a file (Save Description) and then later load the data into a second window (Compare with Description) to compare two MPEG streams.

### ► IFO-Edit Audio

This advanced tool was added to optionally adjust post-compile audio parameters in IFO files.



 **Note:** This will change the information about audio written in already created IFO files. You can change the number of audio streams and change the audio properties of each stream.

#### ► Bitrate Viewer

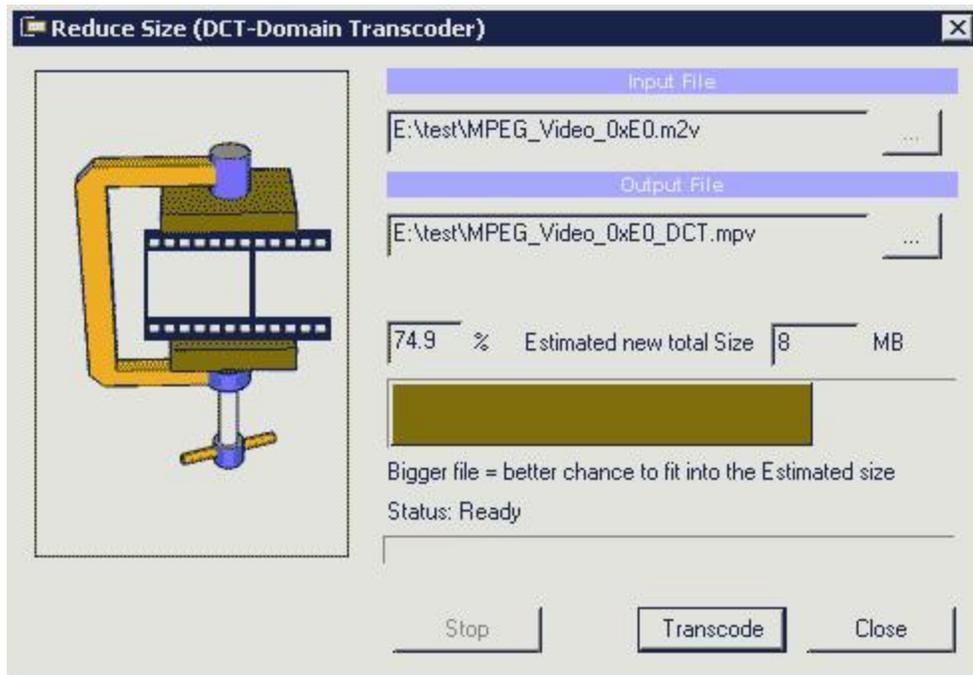
Runs Bitrate Viewer on selected movie file in asset. The tool is good to examine if the file doesn't go over the DVD maximum bitrate specifications.

#### ► Rewrite GOP timecodes

This tool will rewrite a timecodes in GOP of the video file based on actual video frame count. The GOP timecode is used for displaying timeline over the movie and for placing correct chapter points (in fast GOP mode). Wrong timecode may cause problems with chapterpoints (wrong time or doesn't work at all). An alternative method to fixing GOP timecode is to use Frame Indexing.

#### ► Reduce MPEG size

This will reduce bitrate of the mpeg file and its size using DCT-Domain Transcoder. DCT is not a full file transcoding, it reuses the existing Motion vectors and therefore the recompression is extremely fast. The reasonable resizing is up to 70%. The DCT transcoder will try to resize as much as possible to the desired new size, however this may not be actually realistic for sizes below 50% of original size. or for short movies. It works on elementary streams only.

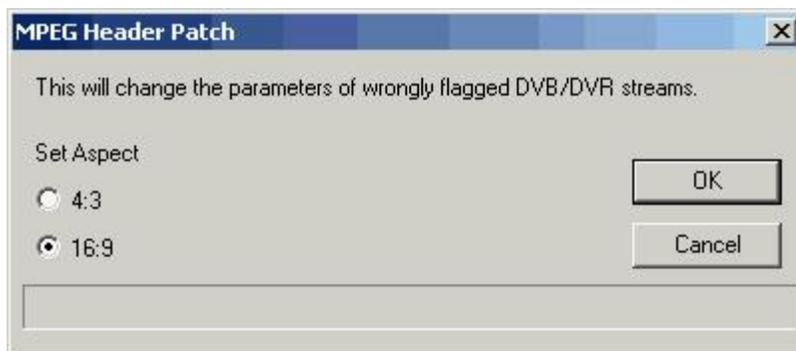


DCT-Transcoder should be used only in extreme cases when you need quickly reduce file size/bitrate. A full mpeg transcoding will produce better result.

#### ► Aspect Ratio Patch

This simple tool will parse the input mpeg stream (selected in assets) and patch the Aspect ratio flag.

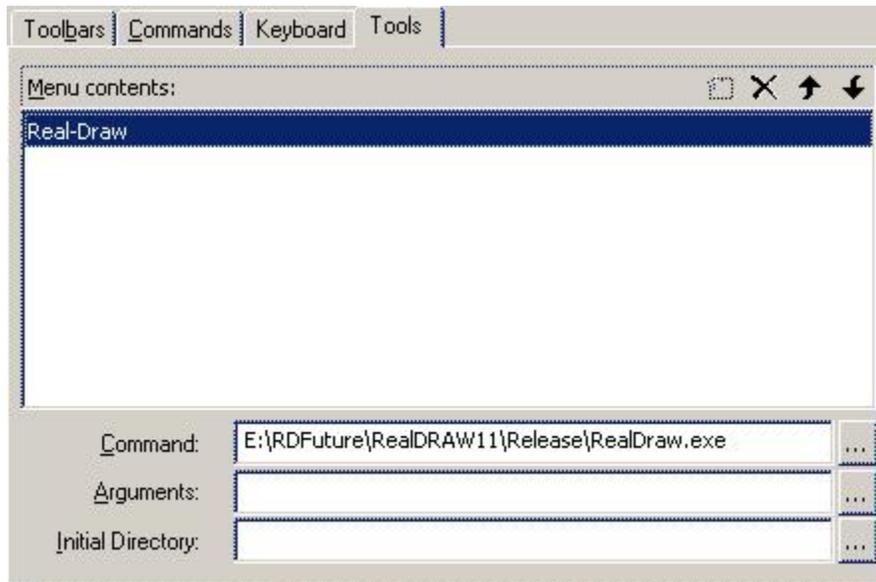
This tool is used for example when the mpeg file comes from DVR (recorder). Most of the DVR's will flag the recorded file as 4:3 even if you record 16:9 (very few DVR's have manual option to set the widescreen flag for recording). Such wrongly flagged file will show as compressed on sides on a normal TV when the DVD is played. All you need to do is to rewrite flags of such file to 16:9 and it will show correctly on booth 16:9 and 4:3 TV



Please note, this doesn't change the MPEG data in any way, it only set the correct flag. The DVD player uses this flag to determine how to output the file on screen.

#### ► Customize tools

DVD-lab allows you to customize its own Tool menu, by adding menu options for running other software that you might like to use while working with DVD-lab. Using the Tools tab shown here, you can create a DVD-lab menu selection for your own software, available in the Tools menu for quick launch.



Here, we added a menu option for Real-DRAW Pro. This option will now be available within the DVD-lab Menu, under the menu Tools for our quick access.



## 16.2 Tools - Regional coding

Menu: *Tools - Regional Coding*

Regional Coding is used to prevent the playback of discs depending upon the geographical area it is played in. This has been added to DVD specifications on request of major film studios mostly because it allows them to give different local distribution rights to each region.

**Important:** No special action is needed. Regional Coding is a restriction type of flag (like UOPs). That means you are not allowing in which regions the DVD can play, but restricting in which regions the DVD **cannot** play.

By default the DVD is set to be playable in *all regions*.

Unless you are a large movie studio with worldwide local distribution, there is absolutely no point in setting a restriction based on region.

Another important fact is that DVD Forum specify regional coding only for DVD-Video. For DVD-R/+R the DVD Forum say that the regional coding is not permitted and the Prohibited Regional Mask should remain 0 (all regions). The fact is that most players will accept Regional Coding restrictions also on DVD-R/+R even if it is against DVD specifications.

 **Tip:** Before you start clicking on checkboxes, you have to ask yourself what is the true reason why you need to prohibit the playback on some region. In many cases by setting regional coding you just cut yourself from many potential buyers.

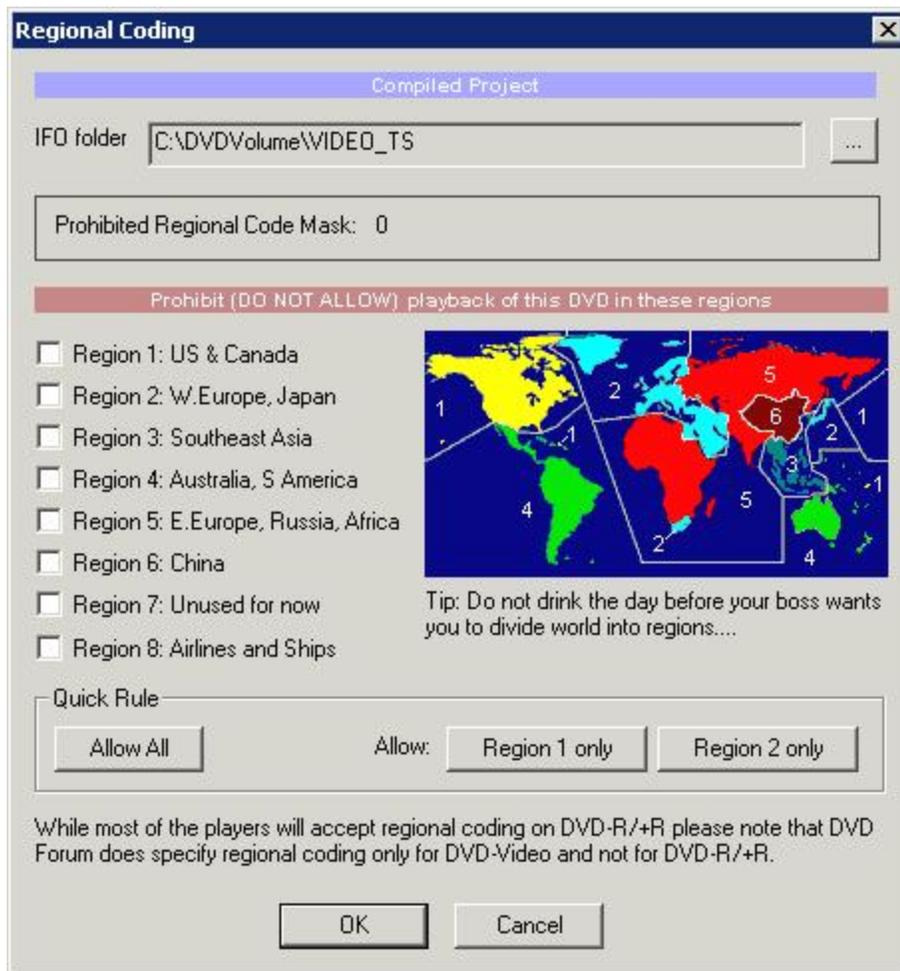
Not a good reason:

- Disc is in PAL or NTSC system.  
This has nothing to do with regional coding, it is a technical issue. Many players in Europe can play NTSC discs without problem. On PC you can play both PAL or NTSC.
- You produce discs with different languages.  
Again not a good reason since people migrate very often from continent to continent. Many people living in one country would love to watch DVD in their mother tongue.
- Big studios do it, so do I.

A good reason:

- You produce disc that is specific for each region (for example a promotion disc that offers services that are different in America than in Europe)
- You have sole distributors for each region that sells with different prices and therefore they need to protect themselves from grey market
- A contents of disc is illegal in some regions or you have no distribution rights for some regions

The Regional Coding can be set on already compiled project with the Regional Coding tool in Tools menu. You don't have to recompile the project, just set the regional coding restriction and press OK which will quickly update the original IFO and BUP files. You can change it as many times as you need.



## Code regions

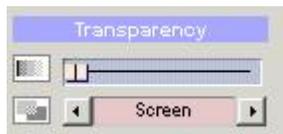
- 1 USA, Canada & US Territories
- 2 Europe, Japan, South Africa, Middle East (including Egypt)
- 3 South East Asia, East Asia (including Hong Kong but not China!?)
- 4 Austrlia, New Zealand, Mexico, Central & South America, Caribbean and Pacific Islands.
- 5 Former Soviet Union, Indian Subcontinent, Africa, North Korea, and Mongolia
- 6 China (excluding Hong Kong)
- 7 Unused
- 8 International territory (airplanes, cruise ships, etc.)

## 17 Appendix

### 17.1 Blend Modes

*Menu Editor (Color tab, Transparency section)*

The Blend Mode defines how an object is combined with other objects, such as the background image underneath it. Blending modes are a useful tool for image/object composing in the hands of an experienced DVD Author and a fun tool for artistic experimentation.



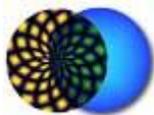
*The Transparency Mix Control*

#### Normal



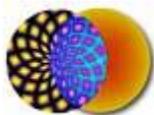
The default mode and the most often used blend mode. It simply blends the objects with a transparency value set by the Transparency Mix.

#### Multiply



Multiplies the background and the object color. The resulting color is always darker. Multiplying any color with black produces black. Multiplying any color with white leaves the color unchanged. The effect is similar to looking at two overlapping slides.

#### Difference



Subtracts either the Object color from the background or the background color from the Object color, depending on which is brighter.

#### Screen



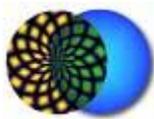
Multiplies the inverse of the objects and background. The resulting color is always lighter than the background or object. Screening with black leaves the color unchanged. Screening with white produces white. The effect is similar to projecting two slides on the same screen.

### Overlay



Combines Multiply and Screen modes - depending on the background color. The background color is not replaced, but is mixed with the Object color.

### Darken



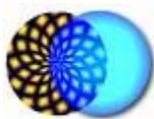
The resulting color is background or Object - whichever is darker.

### Lighten



The resulting color is background or Object - whichever is lighter.

### Hard Light



Multiplies or screens the colors, depending on the Object color. That's the difference from Overlay.

If the Object color is lighter than 50% gray, the image is lightened (screened). If the Object color is darker than 50% gray, the image is darkened (multiplied).

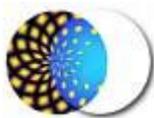
### Soft Light



Darkens or lightens the colors, depending on the Object color. The effect is similar to shining a diffused light on the image.

If the Object color is lighter than 50% gray, the image is lightened and if the Object color is darker than 50% gray, the image is darkened.

### If Lighter



The Object Color will appear on the areas where the Object is lighter than the Background.

### If Darker



The Object will appear on the areas where the Object is darker than the background .

### Negative



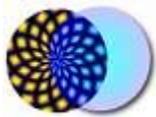
Creates a negative of the background.

### Tint



The object is more visible on a dark background than on bright background. It will disappear on white!

### Colorize



It will take the color from the object but will use the intensity from the background. The background under the object will appear colored by the color of the object.

## 17.2 DVD Basics

### DVD Crash Course

All DVDs are created from **one** or **more** VTSs - Video Title Sets. VTS is called the "**set**" because there can be more titles (movies) inside each one. Each VTS can also have a place for a Menu. Similarly in the menu domain you can have more than one Menu. However, in DVD-parlance, the term "Menu" is a bit misleading. DVD Menus do not need to display anything, they can simply be used to contain navigation commands - indeed, this is one of their most useful features.

Each VTS can have 99 Movies and 250 menus.

This is of course enough for most of the projects, but there is a small limitation. All movies in one VTS must have similar properties: the same frame size (720x480 for example), the same aspect ratio (4:3 for example) and also the same type of audio format (AC3 for example).

If you want to add videos to your DVD that have different properties - for example, typically different aspect ratios - one is Full Screen (4:3) and the other Widescreen (16:9) - then you have to make at least two Video Title Sets and place each of the movies in its own VTS. Of course it wouldn't be a DVD if there were no drawbacks: a DVD player can't navigate from

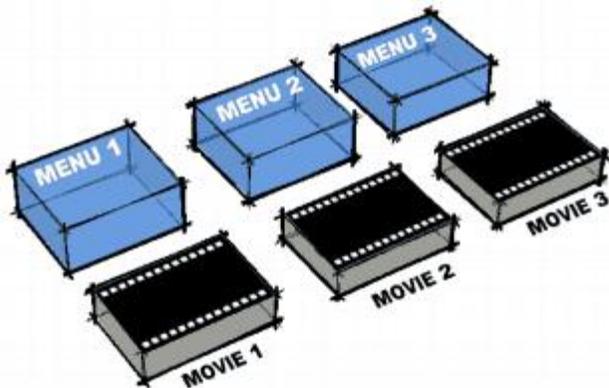
one VTS directly to another, for this it needs something called the Video Manager or VMG.

You may think of DVD structure as being similar to the tree control you see in Windows Explorer when you explore your disks. Each VTS is like a folder on your disk and inside each you can have many movies and menus. If you open one folder it is easy to see all the menus and movies it contains, but then you don't really see what is in the other folders. To see other folders, you have to go up and then open next folder. You can place also few files outside the folders to the very top level - this is your VMG.

Authoring software can be divided into few categories depending on how they use VTS:

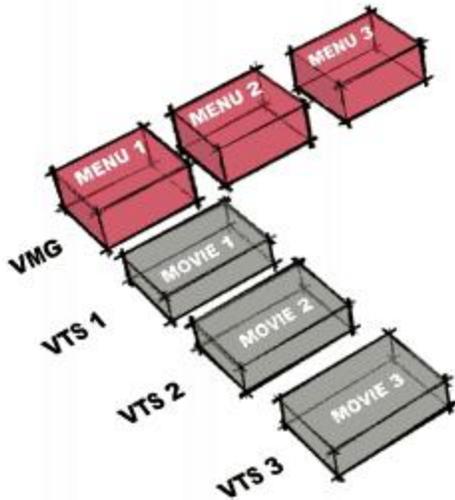
- Single VTS
- Auto-VTS - each movie is placed on its own VTS, but it will place only one Movie per each VTS.
- Full Multi-VTS - Each VTS can have a number of Movies and Menus and you can have many of these VTSES

1. A Single VTS DVD structure may look like this:



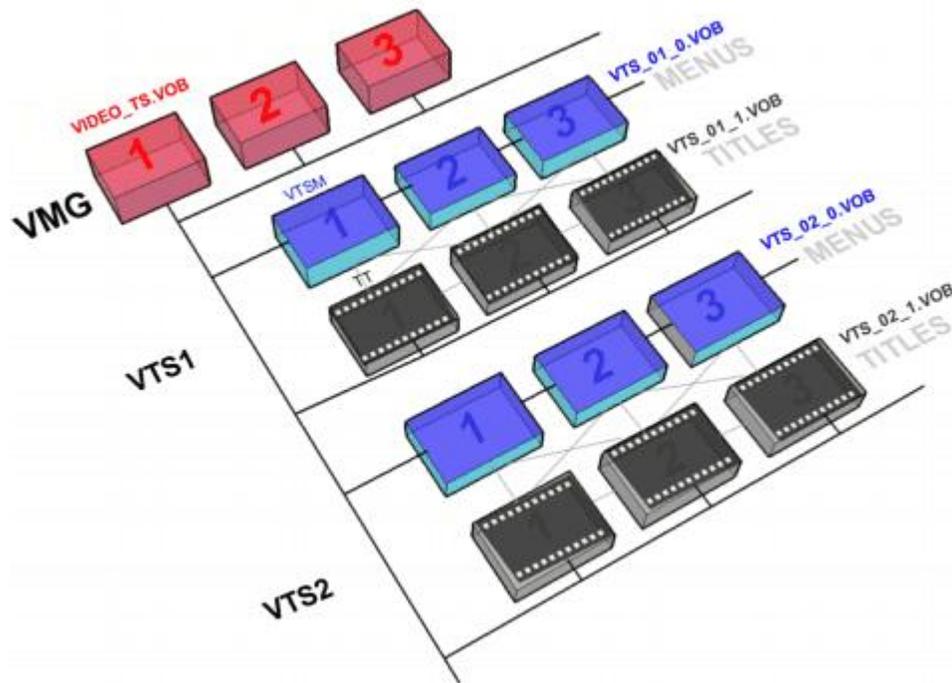
We have multiple menus, multiple movies and player can move quite freely between them. This type of structure is employed by authoring solutions such as DVD-lab Standard and ReelDVD® from Sonic™ Solutions. The benefit of this structure is that you can simply link from any menu to any other menu or to a movie. The only limitation is as described above - all movies must be similar in structure, you can't mix aspect ratios for example. It is ideal for small projects.

2. Auto-VTS may look like the image below. The Red boxes are VMG menus, that is menus placed in the Video Manager (the top level of DVD). Such a menu is necessary so the player can access each separate VTS.



A lot of authoring software goes into this category. Because of the limitations in linking between VTSeS, such software doesn't allow much freedom and the structure is more or less template-based. Most of the time the author doesn't even have any idea about the underlying structure, the authoring application will choose to add VMG or VTS menus as it best suits it. This is good for people who don't really want to go any deeper into DVD-authoring and most of the entry level software uses this scenario.

### 3. True Multi-VTS software



True Multi-VTS authoring software takes the full range of the Single-VTS structure and

multiplies it many times. This creates a full DVD structure where the user can decide where to put his movies and menus. Multi-VTS software can create any structure described above and its combination without any unnecessary restrictions. The benefit is that user has much more creative freedom and is not restricted to creating a "template"-driven DVD.

Any retail DVD is created with this structure. For example the main menu is in the VMG, then the main widescreen movie is in VTS 1 together with scene-selection menus being there as well. Then we have special features movies that may be all in VTS2 . You can have also a full screen movie with its scene selection menus in VTS3... But take any retail movie and you will realize each one has different structure.

## 17.3 Jog-Shuttle

If you have any Jog-Shuttle device on your computer, you may set it up for DVD-lab PRO.

The Shuttle devices works by sending keystrokes to the application. For list of short-keys you may refer to Shortkey topic in each part of this help file or see the Summary here. DVD-lab PRO has keystrokes set such way so you can create comfortable layout on the Shuttle Devices.

In this document we will suggest a setting for Shuttle controller ShuttlePRO v2 from Contour Design. It is easy to adapt these settings for any other similar controller.

### Shortkey Summary

Function	Keystroke	Frequency	In Movie	In Menu	In Co nn ect io ns
Previous Chapter /Object	Page Down		Select Previous Chapter	Select Previous Object	Se lec t Pr evi ou s It em

Next Chapter/ Object	Page Up	Select Next Chapter	Select Next Object	Select Next Item
Insert Chapter/ Link	Space	Insert Chapter point	Display Link choices	-
Remove Chapter/ Link	Shift + Del	Delete selected Chapter	Display Remove link	-
Delete	Del	delete movie, audio	delete object	del ete ite m
Zoom In	NumPad +	Zoom in	Zoom In	Zo o m In
Zoom Out	NumPad -	Zoom Out	Zoom Out	Zo o m Ou t
Connections Window	Ctrl+Home	Bring up Connection Window		
Tool 1	1	-	Arrow	Ar ro w
Tool 2	2	-	Text	Dr aw lin ks
Tool 3	3	-	Rectangle	Dr aw Bu tto n lin ks

Tool 4	4	-	Group Hotspot	Menu transition
Tool 5	5	-	3D Rotate	Menu Button link
Tool 6	6	-	Cardinal Shape	Create Component
Tool 7	7	-	Frame	Move view
Tool 8	8	-	Simulation	Table
Tool 9	9	Scroll Movie Left	-	Move view Left

Tool10	0		Scroll Movie Right	-	Move View Right
Jog Left	Mouse Wheel Down		Scroll Movie Left	Zoom Out	Move View Down
Jog Right	Mouse Wheel Up		Scroll Movie Right	Zoom In	Move View Up
Shuttle Left 1	[	5 x /sec	Scroll Fast 1 Left	-	Move View Left
Shuttle Left 2	[	15 x /sec	Scroll Fast 2 Left	-	-  -
Shuttle Left 3	[	45 x /sec	Scroll Fast 3 Left	-	-  -
Shuttle Left 4	;	15 x /sec	Scroll Faster Left	-	-  -
Shuttle Left 5	;	30 x /sec	Scroll Faster Left	-	-  -
Shuttle Left 6	;	45 x /sec	Scroll Faster Left	-	-  -
Shuttle Left 7	9	30 x /sec	Scroll Fastest Left	-	-  -

Shuttle Right 1	]	5 x /sec	Scroll Fast 1 Right	-	M o v e V i e w R i g h t
Shuttle Right 2	]	15 x /sec	Scroll Fast 2 Right	-	-  -
Shuttle Right 3	]	45 x /sec	Scroll Fast 3 Right	-	-  -
Shuttle Right 4	'	15 x /sec	Scroll Faster Right	-	-  -
Shuttle Right 5	'	30 x /sec	Scroll Faster Right	-	-  -
Shuttle Right 6	'	45 x /sec	Scroll Faster Right	-	-  -
Shuttle Right 7	0	30 x /sec	Scroll Fastest Right	-	-  -

**A recommended ShuttlePRO layout\***

Tool 2

Tool 3

Tool 1

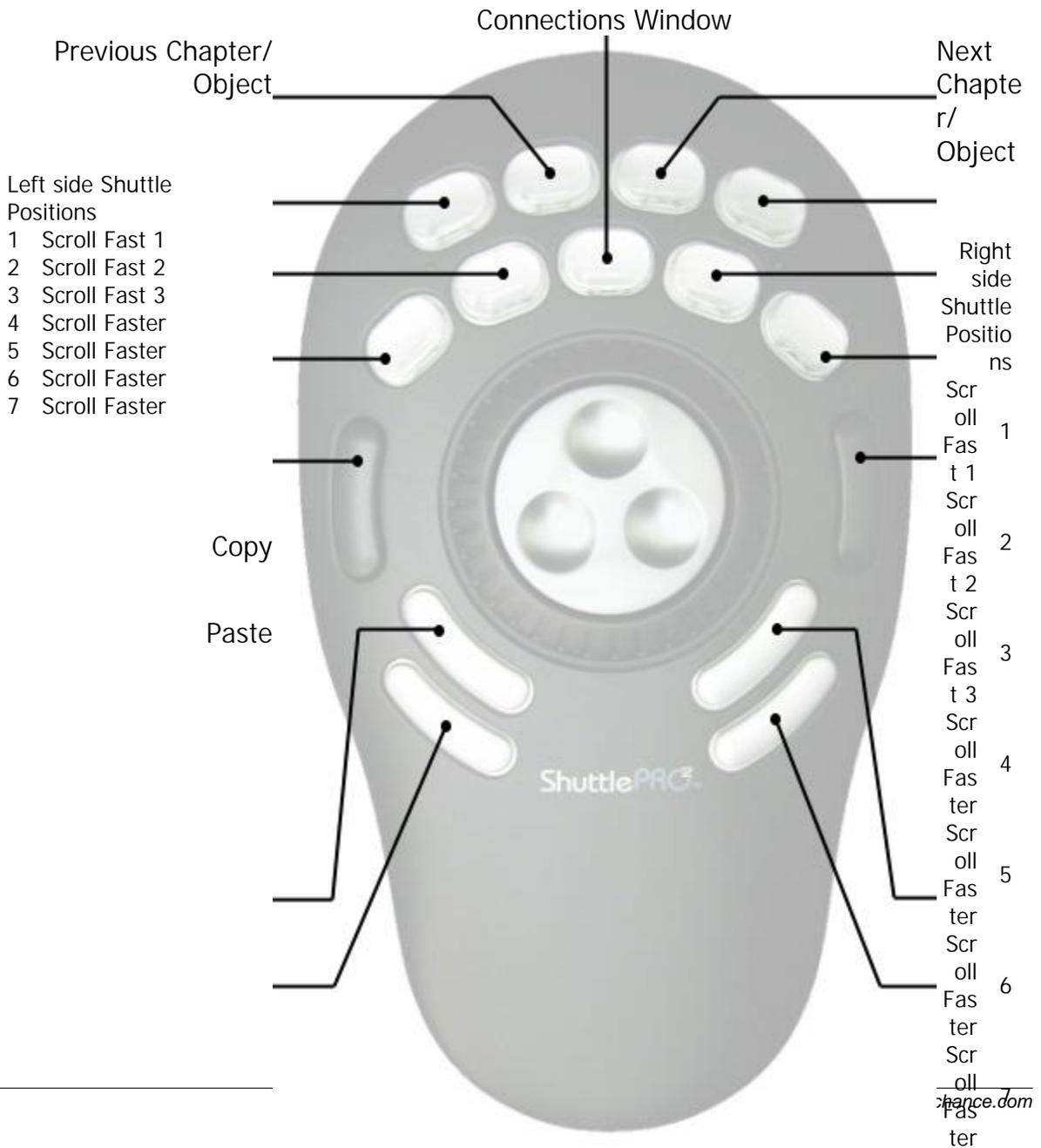
Tool 7

Zoom Out

Tool 8

Zoom In

Delete



\*ShuttlePRO (c) and (tm) of Contour Design.

## 17.4 DVD History

During the early 1990s there were two high density optical storage standards in development:

- Multimedia Compact Disc (MMCD) backed by Philips and Sony
- Super Disc (SD) supported by 8 major consumer electronics giants including Toshiba, Matsushita and Time-Warner.

IBM led an effort to unite the various companies behind a single standard to avoid the format war between VHS and Betamax

DVD format was announced in September of 1995. The official DVD specification is maintained by the DVD Forum, formerly the DVD Consortium

### Founding members

Hitachi  
 Matsushita Electric Industrial Co  
 Mitsubishi Electric Corporation  
 Pioneer  
 Royal Philips  
 Sony  
 Thomson (RCA, Grass Valley, Technicolor)  
 Time Warner  
 Toshiba  
 Victor Company of Japan (JVC)

Today, membership includes more than 230 companies.

DVD-lab/DVD-lab PRO is produced by the official books, using licensed format specification from DVD LLC

## 17.5 Script Sample 1

*script1.talk*

---

```
// Script for Region Check 1.0
// by Oscar (14 APR 2004)
// This is a more complex example than the Keypad 1.0
// Please note that you should look at tutorial that examines the lines
// otherwise it may be too overwhelming

// This script runs automatically after you load the Component
// You can bypass the script when you hold SHIFT

// Component access to the objects:
// in order to know which objects belongs to the component
// three array variables are filled up:menusInBlackBox, vmgsInBlackBox, movies
```

```

        // menusInBlackBox returns the number of menus in box and
        // menusInBlackBox[1] returns what is the order number relative to project of the
        // see this example below:
        /*
print "Number of Menus in this Component: ",menusInBlackBox
for menu=1 to menusInBlackBox
print "Menu #",menu," in Component is a Menu #",menusInBlackBox[menu]," in a whole project"
next menu
*/
        // note, the number returned by vmgsInBlackBox[x] is in range 1...255,
        // while all Menu functions uses vmg in range 10001-10255
        // that means you have to add 10000 or use function VMG(vmgInBlackBox[x])

region=1
regionzero=1
input "This is a region code check component.", "Allowed Region (1..6)", region, "Region"
// terminate script if pressed cancel
if bCancelInput then
    end
endif
// see note in header about component
// since it is VMG, we need to use VMG() function to get the correct menu number
commandobject = VMG(vmgInBlackBox[1])
// remove all precommands
MenuRemovePRECommands(commandobject)
// get region info of player from sprm
MenuAddPRECommand(commandobject, "GPRM1 = SPRM20")
// regions are set as bits, it means region 1 = 1, region2 = 2 region3 = 4; region 4 = 8
regiontab[0] = 0
regiontab[1] = 1
regiontab[2] = 2
regiontab[3] = 4
regiontab[4] = 8
regiontab[5] = 16
regiontab[6] = 32
trace regionzero
// find the PGC of 'Wrong Region' VMG menu (# 2 in component)
// because DVD-lab has first VMG dummy we need to have +1
sPGCWrong = STR(vmgInBlackBox[2]+1)
// disallow region zero
if (regionzero==0) then
    sLine = "if (GPRM1 == 0) LinkPGCN "+sPGCWrong
    MenuAddPRECommand(commandobject, sLine)
endif
// test the main region
sLine = "if (GPRM1 != "+ STR(regiontab[region]) +") LinkPGCN "+sPGCWrong
MenuAddPRECommand(commandobject, sLine)
// Set first Play and Title button to our Command object
LinkFPtoMenu(commandobject) // First Play to menu
LinkTBtoMenu(commandobject) // Title Button to menu
// Now try to link end of command object to VTSM or VMG
nVMGc = MenuGetVMGCount()
nVTSMc = MenuGetCount()
if (nVTSMc>0) then
    MenuEndLink(commandobject, 1)
endif
// prefer VMG
// we have right now at least 2 VMGs already (this component) so check for 3 VMG's or
if (nVMGc>2) then

```

```

    MenuEndLink(commandobject, VMG(1))
endif

```

Created with DVD-lab Pro

## 17.6 Component Script Sample 2

### *Keypad.talk*

---

```

// Script for Keypad 2.0 (advanced)
// by Oscar (4 Jan 2004)
// This is a more complex example than the Keypad 1.0
// Please note that you should look at tutorial that examines the lines
// otherwise it may be too overwhelming

// First it asks for the secret access code which can be any length (unlike the 1.0)
// and all necessary menus and connections are created by script.
// This script runs automatically after you load the Component
// You can bypass the script when you hold SHIFT

// Component access to the objects:
// in order to know which objects belongs to the component
// three array variables are filled up:menusInBlackBox,  vmgsInBlackBox, moviesInBlackBox

// menusInBlackBox returns the number of menus in box and
// menusInBlackBox[1] returns what is the order number relative to project of the menu
// see this example below:
/*
print "Number of Menus in this Component: ",menusInBlackBox
for menu=1 to menusInBlackBox
print "Menu #",menu," in Component is a Menu #",menusInBlackBox[menu]," in a whole project"
next menu
*/
// note, the number returned by vmgsInBlackBox[x] is in range 1...255,
// while all Menu functions uses vmg in range 10001-10255
// that means you have to add 10000 or use function VMG(vmgsInBlackBox[x])

// Get The secret code from user
// use only numbers 1-9
nCode=123
input "This is a keypad component that allows access by code.", "The access code can be any length"
// terminate script if pressed cancel
if bCancelInput then
    end
endif
// some global font settings for the text object that will be created
fontSize = 70
fontFace = "Arial"
fontX = 317
fontY = 100
// now get the secret access sequence into array
// we will simply divide it by 10 untill there is no more digits
nNum = 1
nTempCode = nCode
//***** nice and happy goto loop :-) *****
10 nNewCode = INT(nTempCode/10)
// get the digit

```

```

codes[nNum] = nTempCode-nNewCode*10
// show it in output for debug
trace codes[nNum]
nNum=nNum+1
nTempCode = nNewCode
// still something left - loop to label 10
if (nNewCode>0) then
    goto 10
endif
//***** end of the goto loop *****
// here we are, the digits are in the codes array, but in wrong direction: codes[1]
// remember that later !!!!
nNumberOfDigits = nNum-1
// we have this many digits in our secret code
// this determines the number of menus
trace nNumberOfDigits
// create a BAD 1 menu
//*****
menu = MenuAdd(FALSE,"BAD 1",FALSE)
// copy from the first in black box to the new created menu
MenuCopy(menusInBlackBox[1], menu)
// now link all objects from menusInBlackBox[1] to menu
// how many objects in the menu
nOb = ObjectGetCount(menusInBlackBox[1])
// link all from start to bad 1
for x=1 to nOb
    ObjectLinkToMenu(menusInBlackBox[1],x,menu)
next x
// put a star as text for user feedback
stars = "*"
object = ObjectAdd(menu,3,RGB(0,0,0),stars)
ObjectSetPos(menu,object,fontX,fontY)
ObjectSetFont(menu,object,fontFace,fontSize)
ObjectSetShadow(menu,object,0,0)
MenuPlaceNear(menu, menusInBlackBox[1], 0, 4)
MenuGroupWith(menu, menusInBlackBox[1],0)
// remeber the last good and bad menu
prevbad = menu
prevgood = menusInBlackBox[1]
// counter for codes array
codecounter = nNumberOfDigits
// now we need nNumberOfDigits-1 menu pairs
//*****
for y=1 to nNumberOfDigits-1
    name = "GOOD "+CHR(48+y)
    menuGood = MenuAdd(FALSE,name,FALSE)
    MenuCopy(menusInBlackBox[1], menuGood)
    // Place the box right of previous good and add it to the component
    MenuPlaceNear(menuGood, prevgood, 0, 2)
    MenuGroupWith(menuGood, prevgood,0)
    name = "BAD "+CHR(48+y+1)
    menuBad = MenuAdd(FALSE,name,FALSE)
    MenuCopy(menusInBlackBox[1], menuBad)

    // Place the box right of previous bad and add it to the component
    MenuPlaceNear(menuBad, prevbad, 0, 2)
    MenuGroupWith(menuBad, prevbad,0)

    // now link this good menu and previous bad menu to the bad menu
    for x=1 to nOb

```

```
        ObjectLinkToMenu(menuGood,x,menuBad)
        ObjectLinkToMenu(prevbad,x,menuBad)
    next x
    //link the object corresponding to the secret digit from last good menu to this good menu
    ObjectLinkToMenu(prevgood, codes[codecounter], menuGood)

    // add the star so users see feedback how many keys he entered
    // we defined the stars before loop
    trace stars
    // add text object
    object = ObjectAdd(menuGood,3,RGB(0,0,0),stars)
    ObjectSetPos(menuGood,object,fontX,fontY)
    ObjectSetFont(menuGood,object,fontFace,fontSize)
    ObjectSetShadow(menuGood,object,0,0)
    // the bad has one star more
    stars=stars+"*"
    object = ObjectAdd(menuBad,3,RGB(0,0,0),stars)
    ObjectSetPos(menuBad,object,fontX,fontY)
    ObjectSetFont(menuBad,object,fontFace,fontSize)
    ObjectSetShadow(menuBad,object,0,0)
    // because the array is in opposite order
    codecounter = codecounter-1
    // now remember the previous bad and good
    prevbad = menuBad
    prevgood = menuGood
next y
// BAD end *****
// the last bad menu doesn't link to anything - it is the dead end ACCESS DENIED
for x=1 to nOb
    // since the ObjectDelete change the object order
    // we need to delete just the first object few times
    ObjectDelete(prevbad,1)
next x
// delete also the stars text, we will put access denied
ObjectDelete(prevbad,1)
object = ObjectAdd(prevbad,3,RGB(0,0,0),"WRONG CODE")
ObjectSetPos(prevbad,object,fontX,fontY+5)
ObjectSetFont(prevbad,object,fontFace,fontSize/3)
ObjectSetShadow(prevbad,object,0,0)
// link it to the start
MenuEndLink(prevbad, menusInBlackBox[1])
// set timer to 1 sec before we go to the start
MenuSetPBC(prevbad,1,0,0)
// GOOD END *****
// this is the last menu
menuGood = MenuAdd(FALSE,"GOOD END",FALSE)
MenuCopy(menusInBlackBox[1], menuGood)
// right of last good menu
MenuPlaceNear(menuGood, prevgood, 0, 2)
// put it inside the Component
MenuGroupWith(menuGood, prevgood,0)
// delete all objects
for x=1 to nOb
    // since the ObjectDelete change the object order
    // we need to delete just the first object few times
    ObjectDelete(menuGood,1)
next x
ObjectLinkToMenu(prevgood, codes[codecounter], menuGood)
// it should be 1, since this is the last digit = first in the array)
trace "Last Digit ",codecounter
```

```

// put a ACCESS OK text
object = ObjectAdd(menuGood,3,RGB(0,0,0),"ACCESS OK")
ObjectSetPos(menuGood,object,fontX,fontY+5)
ObjectSetFont(menuGood,object,fontFace,fontSize/3)
ObjectSetShadow(menuGood,object,0,0)
// set 2 sec timeout
MenuSetPBC(menuGood,2,0,0)
// set this menu to be an output object in connection
MenuSetComponent(menuGood, FALSE, TRUE)
// now you need to connect the GOOD END with any menu
Created with DVD-lab Pro

```

## 17.7 Component Script sample 3

### *Set Audio.talk*

```

// Set Audio,
// (c) Oscar 2004
// this creates a menu for selecting audio track
// the menu shows an arrow on currently selected audio
// we use switched menu for this trick.
sText1 = "Audio Track 1"
sText2 = "Audio Track 2"
sText3 = "Audio Track 3"
sText4 = "Audio Track 4"
input "Menu for setting audio","What do you want to call the audio tracks in the menu"
// terminate script if pressed cancel
if bCancelInput then
    end
endif
// first is component then menus
menu[1] = menusInBlackBox[2]
menu[2] = menusInBlackBox[3]
menu[3] = menusInBlackBox[4]
menu[4] = menusInBlackBox[5]
// now remember objects in the menu[1]
// get the object from its label, a simple and effective way
// label is not case sensitive
objText1 = ObjectGetFromLabel(menu[1],"text1")
objText2 = ObjectGetFromLabel(menu[1],"text2")
objText3 = ObjectGetFromLabel(menu[1],"text3")
objText4 = ObjectGetFromLabel(menu[1],"text4")
objArow = ObjectGetFromLabel(menu[1],"arrow")
ArrowX = ObjectGetXPos(menu[1],objArow)
ArrowY = ObjectGetYPos(menu[1],objArow)
objBack = ObjectGetFromLabel(menu[1],"back")
// since we will copy the menus from first, these object will be valid for every menu
// link the back button to VTS root (1)
ObjectLinkToMenu(menu[1],objBack,1)
MenuCopy(menu[1], menu[2])
MenuCopy(menu[1], menu[3])
MenuCopy(menu[1], menu[4])
// now set vm command for each menu
MenuRemovePRECommands(menu[1])
MenuRemovePRECommands(menu[2])
MenuRemovePRECommands(menu[3])
MenuRemovePRECommands(menu[4])
MenuAddPRECommand(menu[1], "SetSTN (audio=0)")

```

```

MenuAddPRECommand(menu[2], "SetSTN (audio=1)")
MenuAddPRECommand(menu[3], "SetSTN (audio=2)")
MenuAddPRECommand(menu[4], "SetSTN (audio=3)")
// now set text and links on each menu
for n=1 to 4

    // on each menu the next button will be selected by default

    MenuSetPBC(menu[n],255,n,0)

    ObjectSetText(menu[n],objText1,sText1)
    ObjectSetText(menu[n],objText2,sText2)
    ObjectSetText(menu[n],objText3,sText3)
    ObjectSetText(menu[n],objText4,sText4)

    ObjectLinkToMenu(menu[n],objText1,menu[1])
    ObjectLinkToMenu(menu[n],objText2,menu[2])
    ObjectLinkToMenu(menu[n],objText3,menu[3])
    ObjectLinkToMenu(menu[n],objText4,menu[4])

// set arrow position
ObjectSetPos(menu[n],objArow,ArrowX,ArrowY)
// move arrow to next text
ArrowY = ArrowY + 45
next n
// delete objects and menus that are nonfunctional
if (sText4=="") then
    ObjectDelete(menu[1],objText4)
    ObjectDelete(menu[2],objText4)
    ObjectDelete(menu[3],objText4)
    MenuDelete(menu[4])
    // check track 3
    if (sText3=="") then
        ObjectDelete(menu[1],objText3)
        ObjectDelete(menu[2],objText3)
        MenuDelete(menu[3])
    endif
endif

endif
Created with DVD-lab Pro

```

## 17.8 pluginDll\_h.htm

```

#define PLUGINDLL_API extern "C" __declspec(dllexport)
#define typeVariableInt 0
#define typeVariableFloat 1
#define typeVariableString 2
#define MAX(x,y) (x>y?x:y)
#define MAX3(x,y,z) MAX(MAX(x,y),z)
#define MIN(x,y) (x>y?y:x)
#define MIN3(x,y,z) MIN(MIN(x,y),z)
// to have life easy, here are few defines of the commands
// TODO: fill the rest according the lab-Talk
#define MenuGetCount() (CALLSCRIPT("MenuGetCount"))
#define MenuGetCurSel() (CALLSCRIPT("MenuGetCurSel"))
#define MenuAdd(bIsVmg,sName,bOpen) (CALLSCRIPT2("MenuAdd",bIsVmg,sName,bOpen))
#define MenuDelete(nMenu) (CALLSCRIPT("MenuDelete",nMenu))
#define MenuActivate(nMenu) (CALLSCRIPT("MenuActivate",nMenu))
// etc

```

```

#define ObjectGetCount(nMenu)          (CALLSCRIPT("ObjectGetCount",nMenu))
#define ObjectGetCurSel(nMenu)        (CALLSCRIPT("ObjectGetCurSel",nMenu))
#define ObjectGetType(nMenu,nObject)  (CALLSCRIPT("ObjectGetType",nMenu, nObject))
// etc..
#define ObjectGetXPos(nMenu,nObject)  (CALLSCRIPT("ObjectGetXPos",nMenu, nObject))
#define ObjectGetYPos(nMenu,nObject)  (CALLSCRIPT("ObjectGetYPos",nMenu, nObject))
#define ObjectGetWidth(nMenu,nObject) (CALLSCRIPT("ObjectGetWidth",nMenu, nObject))
#define ObjectGetHeight(nMenu,nObject)(CALLSCRIPT("ObjectGetHeight",nMenu, nObject))
#define ObjectSetSize(nMenu,nObject,nWidth,nHeight) (CALLSCRIPT("ObjectSetSize",nMenu,
nObject,nWidth,nHeight))
#define ObjectSetPos(nMenu,nObject,nX,nY) (CALLSCRIPT("ObjectSetPos",nMenu, nObject,nX,nY))
// etc...
#define ImgGrabObject(imgNum,nMenu,nObject) (CALLSCRIPT("ImgGrabObject",imgNum,nMenu,nObject))
#define ImgSetToObject(imgNum,nMenu,nObject) (CALLSCRIPT("ImgSetToObject",imgNum,nMenu,nObject))
#define ImgInflate(imgNum,addW,addH) (CALLSCRIPT("ImgInflate",imgNum,addW,addH))
#define ImgBlurAlpha(imgNum,nBlur) (CALLSCRIPT("ImgBlurAlpha",imgNum,nBlur))
#define ImgGetWidth(imgNum) (CALLSCRIPT("ImgGetWidth",imgNum))
#define ImgGetHeight(imgNum) (CALLSCRIPT("ImgGetHeight",imgNum))
// etc...
// etc....
// One "secret" command that is not described in lab-talk (because it has no sense the
// ImgGetRGBABuffer returns the pointer to the RGBA buffer
// be careful what you writing to it!
// the size of buffer is ImgGetWidth(imgNum)*ImgGetHeight(imgNum)*4
#define ImgGetRGBABuffer(imgNum) (CALLSCRIPT("ImgGetRGBABuffer",imgNum))
void RunScript();
struct _PLVariable
{
    int      m_nVariableType;
    float    m_fValue;
    int      m_nValue;
    char*    m_sValue;
};
typedef void (*PLCallback)(char* sName, _PLVariable *result,_PLVariable *param1,_PLVar
PLUGINDLL_API void PL_RunScript(PLCallback pCallback,HWND hWnd);

```

## 17.9 pluginDll\_cpp.htm

```

// pluginDll.cpp : Defines the entry point for the DLL application.
//
#include "stdafx.h"
#include "pluginDll.h"
#include <stdlib.h>
PLCallback m_pCallback = NULL;
HWND m_hWnd = NULL;
BOOL WINAPI DllMain( HANDLE hModule,
                    DWORD ul_reason_for_call,
                    LPVOID lpReserved
                    )
{
    // we don't care about this one
    return TRUE;
}
// make calling the script simpler by defining HELPER functions using the m_pCallback
int CALLSCRIPT(char* sName, int nParam1=0, int nParam2 = 0, int nParam3 =0, int nParam4 =0)
int CALLSCRIPT2(char* sName, int nParam1=0, char* chParam2 = NULL, int nParam3 =0, int nParam4 =0)
// the most common case all params are integers, return integer
int CALLSCRIPT(char* sName, int nParam1, int nParam2, int nParam3, int nParam4 )
{

```

```

    _PLVariable param1;
    param1.m_nVariableType = typeVariableInt;
    param1.m_nValue = nParam1;
    param1.m_sValue = NULL;
    _PLVariable param2;
    param2.m_nVariableType = typeVariableInt;
    param2.m_nValue = nParam2;
    param2.m_sValue = NULL;
    _PLVariable param3;
    param3.m_nVariableType = typeVariableInt;
    param3.m_nValue = nParam3;
    param3.m_sValue = NULL;
    _PLVariable param4;
    param4.m_nVariableType = typeVariableInt;
    param4.m_nValue = nParam4;
    param4.m_sValue = NULL;
    _PLVariable ParamResult;
    m_pCallback(sName, &ParamResult, &param1, &param2, &param3, &param4);
    return ParamResult.m_nValue;
}
// another version, second param is char
int CALLSCRIPT2(char* sName, int nParam1, char* chParam2, int nParam3, int nParam4 )
{
    _PLVariable param1;
    param1.m_nVariableType = typeVariableInt;
    param1.m_nValue = nParam1;
    param1.m_sValue = NULL;
    _PLVariable param2;
    param2.m_nVariableType = typeVariableString;
    param2.m_nValue = 0;
    strcpy(param2.m_sValue, chParam2);
    _PLVariable param3;
    param3.m_nVariableType = typeVariableInt;
    param3.m_nValue = nParam3;
    param3.m_sValue = NULL;
    _PLVariable param4;
    param4.m_nVariableType = typeVariableInt;
    param4.m_nValue = nParam4;
    param4.m_sValue = NULL;
    _PLVariable ParamResult;
    m_pCallback(sName, &ParamResult, &param1, &param2, &param3, &param4);
    return ParamResult.m_nValue;
}
// ***** Description of the plugin ABOUT box *****
PLUGINDLL_API char* PL_GetAbout(void)
{
    // let the DVD-lab display the about box
    return "Test plugin, it will make colors negative";
    // or display your own About box and then return ""
    /*
    *
    *   MessageBox(NULL, "Hey, this is nice plug-in", "About my Plug-in", MB_OK);
    *   return "";
    */
}
// *****
// this is the entry point
// we call all functions in DVD-lab with the PLCallback which uses the same syntax as
// this simplifies the SDK and yes, it is brilliant

```

```

PLUGINDLL_API void PL_RunScript(PLCallback pCallback,HWND hWnd)
{
    // parameters passed from the DVD-lab
    m_hWnd = hWnd;
    m_pCallback = pCallback;
    // this one is a must!
    if (m_pCallback==NULL)
        return;
    RunScript();
}
void RunScript()
{
    int menu = MenuGetCurSel();
    // VTS menu 1..255, VMG menu 10001..10255
    // show the current menu on top of all others
    MenuActivate(menu);
    int object= ObjectGetCurSel(menu);
    // Example: call the same function directly
    // *****
    _PLVariable param1;
    param1.m_nVariableType = typeVariableInt;
    param1.m_nValue = menu;
    param1.m_sValue = NULL;
    _PLVariable ParamResult;
    m_pCallback("ObjectGetCurSel",&ParamResult,&param1,NULL,NULL,NULL);
    int object2 = ParamResult.m_nValue;
    // *****
    if (object==0)
    {
        MessageBox(m_hWnd,"No object Selected","Plug-in",MB_OK);
        return;
    }
    //get the image buffer from object and store it in buffer 1
    ImgGrabObject(1,menu,object); // imgNum = temporary image buffer 1,2 or 3
    int imgW = ImgGetWidth(1);
    int imgH = ImgGetHeight(1);
    BYTE* pBuffer = (BYTE*)ImgGetRGBABuffer(1);
    if (pBuffer==NULL)
        return;
    int y = 0;
    int x = 0;
    for (y=0; y<imgH;y++)
    {
        for (x=0;x<imgW;x++)
        {
            // get rgb values from buffer
            BYTE r = pBuffer[y*imgW*4+x*4];
            BYTE g = pBuffer[y*imgW*4+x*4+1];
            BYTE b = pBuffer[y*imgW*4+x*4+2];
            // we don't need alpha here, but anyway:
            BYTE alpha = pBuffer[y*imgW*4+x*4+3];
            // make negative
            r = 255-r;
            g = 255-g;
            b = 255-b;
            // put the value back to buffer
            pBuffer[y*imgW*4+x*4] = r;
            pBuffer[y*imgW*4+x*4+1] = g;
            pBuffer[y*imgW*4+x*4+2] = b;
        }
    }
}

```

```
        }  
    }  
    // put this all to the object  
    ImgSetToObject(1, menu, object);  
}
```