



# **A Beginner's Guide to authoring a bluray disc**

**based on V1.0.9.50**

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## Table of Contents

Introduction to Blu Disc Studio Lite .....	6
Limitations in the “Lite” version .....	7
Flexibility at a (labour) cost.....	7
The coverage by this tutorial .....	8
Getting started: Blu Disc Studio Lite (BDSL) requirements.....	10
Blu Disc Studio Lite installation.....	10
Bluray disc capacity.....	10
Bluray disc player specification.....	11
Blu Disc Studio Lite setup.....	12
BDSL project location .....	12
BDSL Movies – picture requirements .....	12
BDSL Movies – audio requirements.....	13
BDSL Movies – subtitles requirement.....	13
BDSL Menu requirements .....	14
Using Blu Disc Studio and customizing it .....	15
The Blu Disc Studio interface .....	15
Step 1: Get organized.....	16
Step 2: Specify your languages .....	18
Step 3: specify the Java version to use for menus.....	19
Project 1: Create the simplest bluray .....	20
The project goal .....	20
Step 1 Create new project .....	20
Step 2 Include the movies.....	21
What comes after the first movie? .....	24
Step 3 Creating chapters.....	25
Step 4 Build the disc.....	28
Final settings .....	28
Creating the disc files.....	29
Possible problems – including “line:0” errors.....	31
Step 5 Test running the disc.....	32
ISO image .....	33
Test run using software player.....	34

Step 6 Burn the bluray disc .....	34
Test run using a standalone player .....	34
Step 7 Problems with the final disc: some possible solutions .....	36
Project 2: Creating a simple menu-driven bluray disc .....	38
The project goal .....	38
What you need to know about menus and buttons first .....	38
Menu background video .....	38
Menu image .....	38
Menu buttons .....	39
Menu image size .....	42
Menu images and buttons as Photoshop layers.....	44
Menu and buttons as separate flat image files .....	44
Menu and button filename naming standards .....	44
Quick corrections once you get the hang of BDSL .....	45
Step 1: Get organized.....	46
Step 2: Include the movies.....	47
Step 3: Create the menus .....	47
Create a static background .....	47
Full sized menu .....	48
Creating buttons .....	49
Importing menu and button files as .psd PhotoShop file .....	51
Importing menu and button files as separate .png files .....	51
BDSL Menu files .....	52
Buttons in Designer View .....	53
Copying buttons .....	54
Adding buttons later .....	55
Sorting and aligning buttons and images.....	56
Button navigation and button actions .....	57
Navigation checks .....	59
Menu start .....	60
Movie action .....	60
Action Matrix .....	61
Step 4 Check the project.....	61

Menu structure .....	61
Simulation .....	62
Step 5 Create the project.....	63
Step 6 Test run the disc.....	65
Step 7 Burning the disc .....	65
Additional possibilities while creating a simple bluray disc.....	66
Creating an intro movie .....	66
Action: Where to go next.....	66
Navigation between buttons .....	66
Copying properties between movies .....	67
Changing background image of a menu .....	68
Project 3: Creating a bluray disc with setup menu for audio and subtitles.....	69
The project goal .....	69
What you need to know about Movie groups first.....	69
Step 1: Get organized.....	70
Step 2: Include the movies.....	70
Step 3: Add/Insert setup menu.....	71
Create Setup menu as set of background elements.....	71
Import Setup menu into project as psd file .....	72
Importing Setup menu into project using .png files .....	72
Customizing the setup menu .....	73
Updating the MainMenu with extra list option .....	75
Adding button state “Current” to prototype-button.....	76
Copying buttons from MainMenu to Setup Menu .....	77
Provide navigation between links.....	79
Step 4: Check the project.....	80
Step 5: Run simulation .....	80
Step 5: Create Bluray disc .....	81
Step 6: Burn the Bluray disc.....	81
Project 4: Creating a bluray disc with popup menus for chapters .....	82
The project goal .....	82
Add popup menus (text) .....	82
Add chapter menus (picture buttons) .....	82

Project 5: Creating a bluray disc using extended menus and popup menus.....	84
The project goal .....	84
The D.I.Y. project.....	84
Appendix A: Bluray specifications.....	85
America vs Most of the Rest of the World.....	85
HDMV versus BD-J playback .....	85
Player Profiles .....	85
MPEG-2 H.264/AVC movie profiles.....	86
Disc capacity.....	86
Stream data.....	87
Number of BDMV elements.....	87
Appendix B: Things to remember .....	88
Appendix C: External Tools .....	90
Bluray and DVD ripping.....	90
video editing .....	90
audio editing .....	91
image (menu and button) editing.....	91
subtitle editing .....	91
MKV container production and (de)muxing tools .....	92
software video and bluray players.....	92
bluray burning software.....	92
virtual disc drives .....	93
disc Cover Designers .....	93

## Introduction to Blu Disc Studio Lite

Everyone who is familiar with an end-user DVD authoring program and now wants to move up to do the same for bluray media, will be in for a surprise with Blu Disc Studio Lite. It is said to be intuitive for users. Depending on your background in authoring discs, it may be or may be totally the opposite.



The end user DVD authoring applications are aimed at quickly producing a disc, taking many limitations and built-in features for granted. The home-made discs will not have the rich range of features that are seen on commercial releases. But most of us are satisfied with “dropping” in some movies, generating some chapters, adding a menu title and linking the menu to the movie and presto: the DVD can be burned and played in any DVD player. I personally hate the elaborate menus of some Hollywood discs that take forever and ever to end and take even longer to start viewing the movie itself: the main reason for having the disc.

With Blu Disc Studio you won’t get far with the “quick and dirty” DVD authoring approach. Like the first DVD authoring programmes, you need to do a lot yourself instead of relying on “wizards” that do a lot for you, but also limit you in ways to do it.

Blu Disc Studio is a highly flexible environment allowing the creation of a feature-rich bluray disc menus. But you can also skip all that and take a minimalistic approach with a simple menu to get to the movie as quick as possible. Blu Disc Studio allows you any implementation between these two extremes, but in both cases you need to author it yourself. And that can be a laborious undertaking.

Depending on the version of the Blu Disc Studio family (Lite, Standard, MX, MX Pro, see [www.blu-disc.net](http://www.blu-disc.net)) more features are available. This document restricts itself to the free Lite. If it wets your appetite, the Lite version already has many capabilities and moving up the family tree will give even more flexibility whilst all versions will look and feel familiar.

As one of the few authoring programs, Blu Disc Studio allows to include multiple audio tracks and multiple subtitles, each of them as an option to be heard or shown. These features are often forgotten by American products that ignore the fact that most of the world does not speak or write English only. Most have a single audio track and if subtitles are allowed, only one is used and is hard-burned as part of the final video image. None of this is the case with Blu Disc Studio Lite which is of European origin and recognizes the need of several audio tracks and subtitles.

In addition it will not transcode the video or audio tracks but only “mux” them together. This process retains the original quality of the sources as any transcoding process reduces this – marginally or very visibly. The only requirement is that the video and audio tracks adhere to the bluray disc specifications. Many formats are not compliant (such as tv recorded interlaced “i” transmissions) and these will need to be transcoded into acceptable formats.

### Limitations in the “Lite” version

Some limitations of Blu Disc Studio Lite that are lifted in the commercial versions are:

- a maximum of 32 movies can be added to a project (commercial: no limit)
- a maximum of 32 (popup) menus can be added to a project (commercial: no limit)
- a maximum of 4 audio tracks per movie (commercial: 32, maximum of bluray specification)
- a maximum of 4 subtitle tracks per movie (commercial: 32, bluray specification allows for 255)
- drawing buttons: 1 way (commercial: 8 ways)
- no animation between menus or on pressing the “OK” button on the remote control
- no playlists (no two menu options to “play all” titles as well as “play single title”)
- no intro movie
- no resume movie after stopping it
- no 3D movies
- no Scenarist export (although this product is discontinued anyway)

A limit imposed on all Blu Disc Studio versions as menus are controlled through a Java implementation:

- all images in all menus may together not exceed 7 900 000 pixels. This limitation may require to re-use menu parts, texts or buttons. Re-use only counts once for pixel count. Part of the menu can also be moved into the background menu movie. That movie is not counted for any pixels.

### Flexibility at a (labour) cost

The flexibility of Blu Disc Studio however, comes at a price. The Lite edition, as well as its more versatile commercial family members, requires you to think through the bluray disc creation process for the disc you want to make. Blu Disc Studio Lite (to be called BDSL from here onwards) only puts together the movies and menus in a bluray specification compliant manner. If either part is not compliant itself, the disc will be unplayable:

- proper files but with the wrong extension: those files are not listed in navigation windows and cannot be selected
- files with the right file extension but which are improperly formatted: these can be selected and their incorrect nature will not show until much later – possibly only when you try to play the finalized disc.

Many external tools exist to ensure your video, audio, menu and subtitle files comply. See section “Appendix C: External Tools” at the end of this tutorial for a list of possible contenders.

Each bluray project consists of two elements that must be fully planned and made available:

- the whole disc navigation structure:
  - items such as background videos or stills, menus, popup menus, buttons, sounds
  - actions on items: what happens if a button is clicked, an item selected, navigation between buttons, a menu replaced, playing order
- the movie assets
  - video and audio tracks must be provided separately (demuxed) in bluray specification compliant formats, not as a combined movie-with-sound. Other formats are not accepted and need to be converted into acceptable formats outside BDSL.
  - Subtitles are provided in text based .srt or image based .sup format. Other formats are not accepted and need to be made compliant using external tools.

Both parts can be set up independently.

Menu navigation can be designed independently, using movie “placeholders” to point to the movies to be played. Those movies can be added at a later stage.

### The coverage by this tutorial

This tutorial will only scratch the surface of the capabilities of BDSL but once you feel familiar with the bare necessities you may either be pleased and satisfied or will go on and explore the other options of the product to make Hollywood-style authored bluray discs.

Once you’ve read it and made your own first disc projects, the online help of BDSL may start to make sense. As a starting point the online help files are very compact.

1. This document starts by creating a simple disc with some movies that start playing immediately. No menu required. You use the remote control of your bluray player to select audio track, subtitle track or chapter of choice.



2. The next project and chapter is to add a menu to select which movie to play. The remote control still is used for selecting audio and subtitles or chapters.
3. The final projects introduce menus with items that allow you to set those audio and subtitle tracks through selecting of an option on the menu. This can be done before the movie starts or while the movie is playing (then it is a “popup menu”).

## Getting started: Blu Disc Studio Lite (BDSL) requirements

This chapter discusses installation of BDSL and lists the requirements that disc components must meet in order to be acceptable as element of BDSL and be output to the final authored disc. If any component has a different format, you need to use a conversion tool to produce an acceptable format. See section “Appendix C: External Tools” at the end for tools that may be useful for this purpose.

### Blu Disc Studio Lite installation

If you haven’t installed BDSL already, you can do so by downloading and installing the product from its website. The product only runs on Windows based systems from Windows XP upwards (at least upto Windows 10). It also requires Windows.NET V4 or higher. The free Lite version currently is the V1.0 commercial release of the product. It has become freeware whilst its further development turned into commercial family members (at time of writing in their V2.5 release).

The download location is found at <http://blu-disc.net/download.html>. Follow instructions once you started the BDS\_Lite\_Setup\_1.0.9.exe installation program.

There is also a mute “Blu Disc Studio Quick Starter Guide in 10 Minutes” tutorial on YouTube as well as a paper instruction to go with it written by the author of this document and send upon request (email at [theo.de.klerk@gmx.com](mailto:theo.de.klerk@gmx.com)).

Obviously your pc must have sufficient horse power and memory to run the program and its large movie assets reasonably fast. It shows and can simulate menus but it will not play any movie title itself.

### Bluray disc capacity

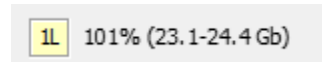
Whatever bluray disc project you try to create, the result must fit on a BR-25 single layer or BR-50 double layer disc. (See section “Disc capacity” in “Appendix A: Bluray specifications” at the end of this document).

- BR 25 can hold 23 866 Mb of data
- BR 50 can hold 47 732 Mb of data

Blu Disc Studio shows you the total size of your project (within 10%) on its toolbar at the far right end. There you can select between values of “1L” (single layer) and “2L” (double layer) capacity. Next to this label the toolbar shows the current size of the project as percentage of maximum size. If it is shown green, you’re in the clear, if it is yellow the project may be too large, if it shows red it is definitely too large. If you changed something in the project, clicking on the icon refreshes the information.

If the size is too large (and only after muxing the project you know the exact size), you need to either reduce the size of some movies, remove some movies or re-encode the entire project result with a tool like BD

Rebuilder. Alternatively, moving from BR-25 to a double sized BR-50 disc may be the solution.



The picture above shows a warning that a disc project may be a bit too big. The compiled version turns out to be indeed too big: 23.4 GB (25,226,452,992 bytes).

## Bluray disc player specification

The bluray consortium specified how movies should be stored on bluray disc. Any other format may be supported by standalone players, but there is no guarantee. See “Appendix A: Bluray specifications” for a listing of these.

Some tests on European bluray players showed all of them accepted 23.976p, 24p, 25p, 29.97p, 30p, 50p, 59.94p. Using “progressive” instead of “interlaced” formats is the recommended option.

Oddly enough any ripped DVD (creating .mpg files in interlaced format 576i PAL or 480i NTSC) can be split into .m2v /.ac3 files using tsMuxer. Adding these files to Blu Disc Studio produces a bluray that works fine. So no need to make these movies progressive first.

The mandatory playback capabilities for players are<sup>1</sup>:

- Video decoder circuitry for MPEG-2, MPEG-4 AVC/H.264, and SMPTE VC-1
  - Encoded frame rates of 23.976, 24, 29.97, and 59.94 (25 and 50 are optional) progressive
- Audio reproduction capability for –
  - Dolby Digital (.ac3 AC-3), 640 kbps, at least two channels (upto 5.1), 48 kHz sampling
  - DTS Digital Surround, at least two channels (.dts)
  - Linear PCM (.wav, LPCM) at 48, 96 and 192 kHz sampling, at least two (max. 7.1) channels
- There are four optional audio formats for Blu-ray Disc –
  - Dolby Digital Plus (.eac3), up to 7.1 channels
  - Dolby TrueHD, 4736 kbps, up to 7.1 channels, 48 kHz sampling
  - DTS Surround (.dts) 1509 kbps, 5.1 channels, 48 kHz sampling
  - DTS-HD Master Audio™, (.dts lossless) 3000 kbps, up to 7.1 channels, 48, 96 or 192 kHz sampling

The BDSL discs assume that the movies adhere to the above specifications.

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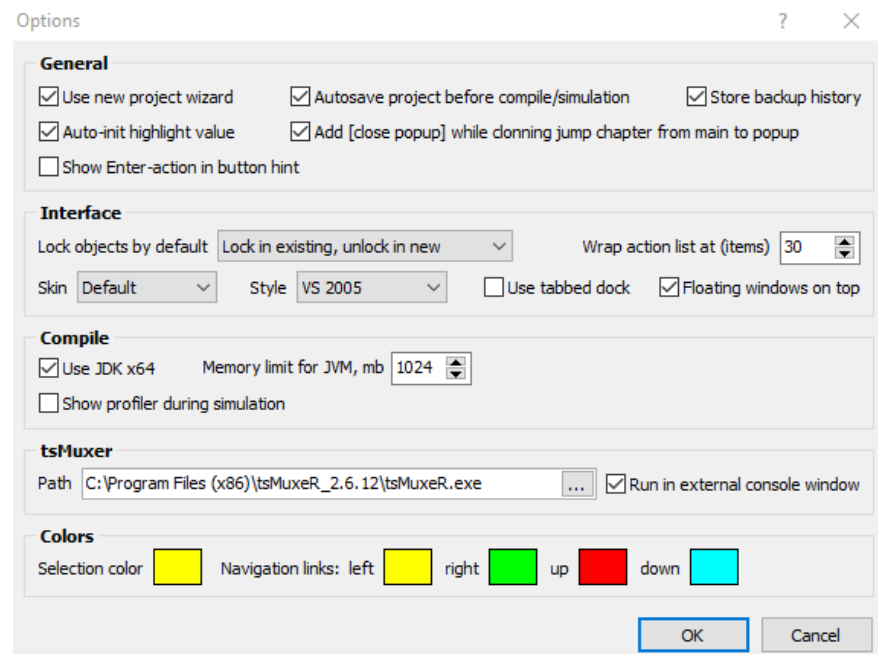
<sup>1</sup> from “Bluray Disc Demystified” chapter 7 “Players”

## Blu Disc Studio Lite setup

The Lite version does not have some elements present in the paid versions. This is outlined in the earlier section “Limitations in the “Lite” version” on page 7.

## BDSL project location

Projects are configured through the menu option Tools > Options. Here you specify the location of the tsMuxer program that is required to mux the movies (it is not part of BDSL). Additional options can also be set like whether to use the project wizard for creating new projects. Several other options are best left to their setting until they get more meaning once you get familiar with the program.



The same window also allows you to set a check at “Use JDK x64” in case you are running Blu Disc Studio on a 64-bits processor.

The bottom part allows you to set the colour of any item you select and the colour of the navigation arrows in a “show navigation links” assignment when you want to see how buttons on a menu are connected with one another.

## BDSL Movies – picture requirements

BDSL allows a maximum of 32 movies to be added to a project. When a movie is composed of various pieces, ensure that each section starts with a full frame (I-frame). When not, the transition from one scene into the next in the other section will show pixels and a stuttering picture.

Movies need to be split into separate video and audio tracks. One video track can have several audio tracks (original, dubbed translation, editor

comments, music-only and such) and subtitles (in different languages). When a movie has a combined video/audio track, it must be demuxed into its component tracks.

The acceptable movie file formats are given in the previous section “Bluray disc player specification”. They also must have the correct file type for BDSL to be seen in its menus:

- MPEG-2 – file type m2v. These are PAL or NTSC interlaced SD (standard definition) formats (576i or 480i respectively). They can remain interlaced. (DVD rippers may produce .vob files that can be demuxed into a .mpv video file that can be safely renamed into .m2v)
- AVC or H264 / MPEG-4 – HD (High Definition) with file type .264 (some editors create files with H264 encoding and give them file type .mp4 which usually includes audio – the video part after demuxing can be safely renamed to .264 if the demuxer doesn’t give this file extension by itself)
- H265 – with file type .265 = UHD files (Ultra High Definition or 4K)
- VC-1 – the SMPTE standard 421M video codec, based on Windows Media Video V9 – with file type .wmv

The acceptable pixel ratios for these formats (with number of frames per second, always showing in 16:9 aspect ratio) are

- Full HD 1920 x 1080
- HD: 1440 x 1080
- HD: 1280 x 720
- SD: 720 x 480 – DVD format NTSC

Many videos may not have the right aspect ratios from the start. Some video editors have default settings for different aspect ratios that may be different from what Bluray requires. Movies taken from YouTube or other internet sources or .mkv extracted files often only show the film pixels without black bars on top and bottom to compensate for the required 1280 x 1080 pixel aspect ratio. If this is the case, you need to transcode the movies to bluray standards. This may also be needed if the source material is interlaced (as it needs to be progressive).

### BDSL Movies – audio requirements

Acceptable audio formats on bluray are listed in the previous section “Bluray disc player specification”.

### BDSL Movies – subtitles requirement

Subtitles can be added to the movies on disc. To be acceptable, they have to be made in either of

- .srt - the well known subtitle format which is a text file with time codes (that can be edited to fit any fps speed)
- .sup – a transparent image with the subtitle as opaque image part. Basically it is a picture whose text cannot be edited (usually created when a ripped bluray .m2ts file demuxes .sup subtitle files). The tool “subtitle edit” can convert them into .srt by attempting to OCR the .sup images into text.

## BDSL Menu requirements

Menus consist of background movies, images and buttons. Blu Disc Studio insists that the background is a (short) movie. It would be wise to create this – either as black silent short movie or containing the still background image of the menus. The background movie *must be* of 1920 x 1080 pixels aspect ratio. Any other size may distort the final menu playback. The image(s) in the background movie do not count against the total pixel number (7 900 000) allowed for all menus.

Menu texts, buttons and other visible elements are created from .png files. Like .gif files (that are not supported) the .png files allow for transparent parts instead of filling it with some default colour.

The menu parts can be created separately or, using PhotoShop or other layered-image editor, as separate layers in a single .psd file. Importing such a file into BDSL will allow BDSL to create separate .png files from each layer and store it in a menu-specific folder of the project.

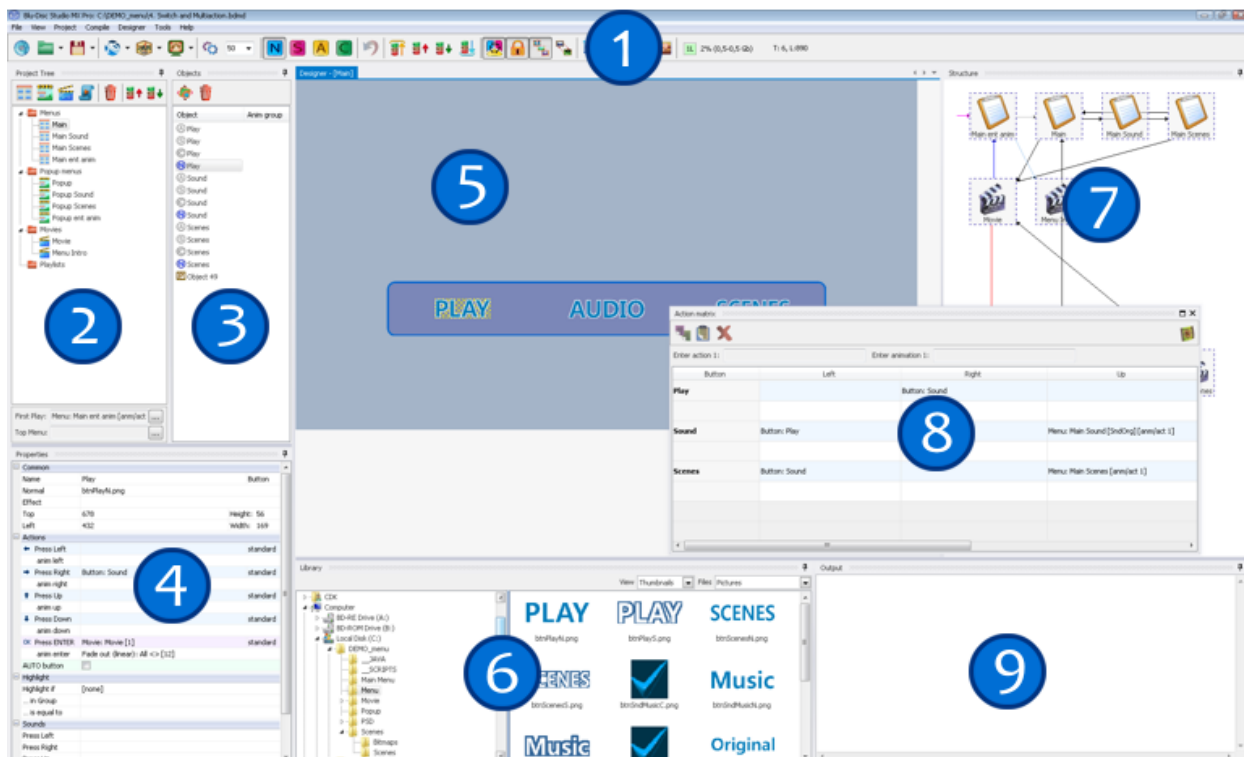
# Using Blu Disc Studio and customizing it

## The Blu Disc Studio interface

The BDSL interface has many elements that all are useful at some point in the project. To create a basic project you may use the wizard that is invoked through File > New. This will ask for a movie (with all its streams), the main menu (composed by a .psd file with layers or set of .png files) and popup-menus. Any element you do not have you simply skip by clicking on the “next” button of the wizard. Those missing elements are added later manually. The wizard sets up a basic project to which you can add any element at any later time.

Alternatively, you just specify File > New and only specify project name and project folder and leave it at that for the moment. The required elements will be added later.

The user interface of Blu Disc Studio looks a bit like the figure below – but this too can be customized to fit your needs. The option “View > Rearrange windows” provides some choices to quickly arrange the windows of the interface.



We will build the project manually to make you familiar with the interface. There are various independent windows that show information of the project and allow you to modify it. These windows are made visible using the “View” menu option that lists the various windows. They can be positioned independently.

The default arrangement is helpful as most of the information required at some point in the authoring process is shown neatly together.

In the sections that follow we will indicate what window to use. But for completeness sake the figure above shows all of them:

1. Main menu and Toolbar - The area containing pull-down menu options and the bar that contains shortcuts to menu and other commands.
2. Project tree - shows all menus, movies and playlists.
3. Objects - shows objects of the selected menu.
4. Properties window - shows properties for the selected menu, movie and graphic object.
5. Designer window - shows the selected menu, where you can select objects and move them.
6. Library window - shows graphic, video and audio assets to import in the project.
7. Project structure window - displays an overview of the current project - a flow of menus and movies.
8. Action matrix - used for copy actions, animations and highlights between buttons.
9. Output window (basically used during compile/export).

## Step 1: Get organized

When you're an organized person you can skip this preliminary step as you obviously know where you put everything.

But for all others: make sure you know where you get your stuff, where you leave your stuff and what you create in the middle phases. Making a mess of a project with elements all over the place and possibly with duplicate items, is guaranteed to create a nightmare for you.

Basically "getting organized" means that you devise some project folder structure where everything is collected and where it can be found consistently. As a suggestion for a basic structure:

```
\projectname
  \output
  \films
  \imported_sources
```

The toplevel \projectname is chosen when a new project is created. It cannot be renamed later (well... it can, but then the project needs to be re-created under that new name).

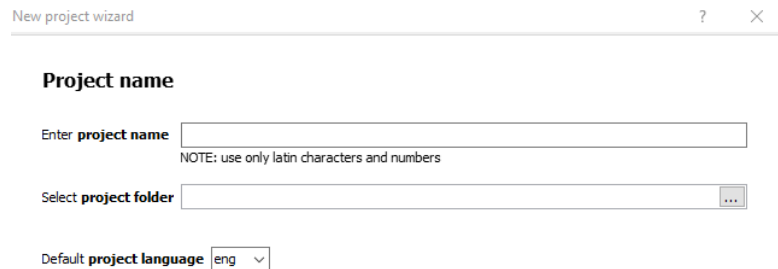
You can subdivide the project folder in additional folders of course, like having demuxed movies, subtitles and (additional) audiostreams in separate subfolders of \films.



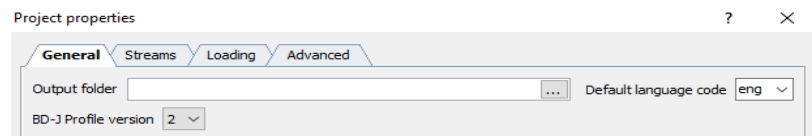
The \imported\_sources folder can be used to store your PhotoShop layered .psd files or the flat (and mostly transparent) .png files that will be imported into the project for buttons and backgrounds.

All of the folders can be referenced in the properties of certain project objects:

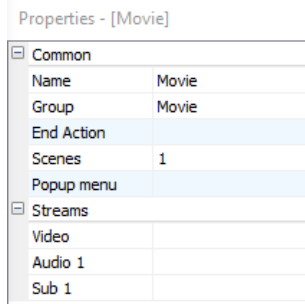
- The \projectname is set when creating a new project through the New Project Wizard (through menu item File > New project or Ctrl/N). It asks first for the project name (e.g. “XXX”) and root folder to use (e.g. “D:\YYY”). Choose the folder carefully as once specified, it cannot be changed anymore! The wizard will then create the bluray project in specified root folder (e.g. “D:\YYY\XXX”). At times therefore it is handy to specify a project folder as D:\ which results in a project stored under D:\projectname.



- The \output folder is specified in Project > Project properties > General tab. (SHIFT Ctrl/F11). BDSL uses \output as default name, but you can change it into anything else you fancy (such as “disc”). It is a folder under the project folder, and created by BDSL.



- The \films folder you must specify in each of the movie properties for the streams “Video” and “Audio 1”, “Audio 2”, etc. If the movie has subtitles, it is also referenced in the “Sub 1”, “Sub 2”, etc streams. Each movie can be stored in a folder of its own if you desire. The movies have to be demuxed in separate video and audio streams.



- The \imported\_sources folder is specified when you create a new menu or popup as you specify the location from where to import the .psd layered file or the .png flat files for buttons.

In addition to the mentioned user defined folders, BDSL will create additional folders of its own within the specified project. For example, BDSL creates a separate folder for each menu in the project. It will store the .png files created from the sources for menus and buttons when they are imported into the project. This is explained in the later section “Menu and button filename naming standards”.

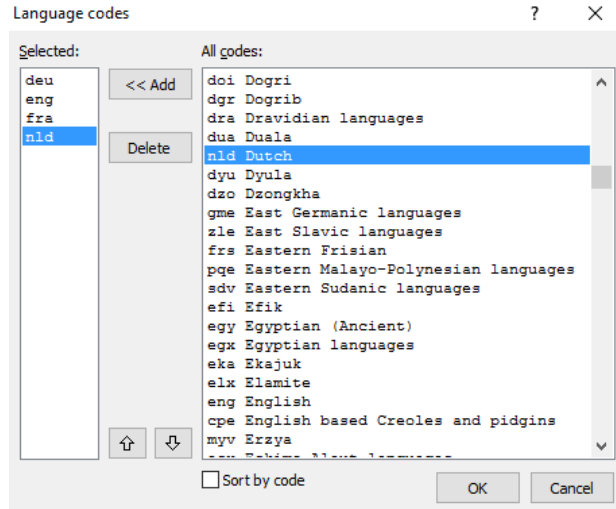
## Step 2: Specify your languages

For any audio or subtitle stream using a particular language, you need to ensure that language is part of the list of languages from which you can choose. By default BDSL has a short list of languages which reveals its east european origin.

Set the required language codes by going to the main menu option File > Languages. The popup menu allows you to remove unwanted languages and add desired ones into the “Selected” column.

The languages are listed by their name, not their code or country. So “Dutch” will be found under “D” and not under “N” for “Netherlands”. A checkbox allows you to sort the list in code-order. Then “nld” will be found under “N” for the Dutch language code.

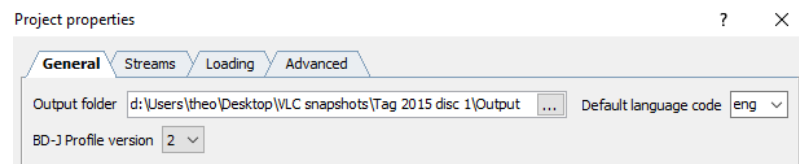
The most applicable language can be moved to the top of the selected list using the up/down arrow keys on the popup window.



The default language to use in a project is set in the Project Properties window (Menu Project > Project Properties) in its “General” tab indicating the “Default language code”. This will set any video, audio and subtitle track by default as being that language. You can still change this language assignment manually for each track.

### Step 3: specify the Java version to use for menus

While you’re at it, you may also wish to change the BD-Java profile version to V2 in the same “General” tab. This allows for a larger total pixel size of all menus together (upto 7 900 000 pixels).



## Project 1: Create the simplest bluray

### The project goal

The goal is to produce a bluray that simply plays a movie directly after inserting it in a bluray player. And if there is a second movie, start playing that one after the first. When all is done, either you author it to start again (loop) or stop.

No menus, no frills. But the movie has chapter points that can be moved to using the remote control buttons.

### Step 1 Create new project

Before going to the next step, make sure you set up the BDSL program with your desired preferred settings as described in the previous chapter.

A new project must be created first. Go to File > New and specify a project name (e.g. "MovieBD1") and project folder (e.g. "D:\\" if we want the project to be based as top level folder D:\MovieBD1 ).

New project wizard

**Project name**

Enter **project name**   
NOTE: use only latin characters and numbers

Select **project folder**

Default **project language**

Click repeatedly on the "Next" button until you can click "Finish" to complete creating the project. The created project folder has the Project.bdmd file as BDSL project file and its backup .bak file (in case you make changes and decide not to save them).

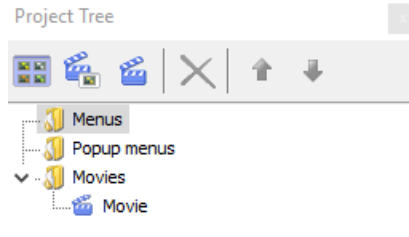
To be organized, the created folder D:\MovieBD1 is manually enhanced by adding the folder

D:\MovieBD1\films

where we will store all demuxed movie files. These consist of video, audio and subtitles. The resulting set of files is shown in the File Explorer of Windows as shown below.

Name	Date modified	Type	Size
films	2017-02-27 21:48	File folder	
Project.bak	2017-02-27 21:34	BAK File	6 KB
Project.bdmd	2017-02-27 21:34	BDMD File	6 KB

The resulting project has a minimum of entries, as the Project Tree window shows.



## Step 2 Include the movies

The movies to add to the project must be in bluray compliant format for each of its video, audio and subtitle streams. See section “Bluray disc player specification” earlier. BDSL requires separate streams.

The \files folder is populated with the movie files. We add two episodes of the 2015 animated tv series “Thunderbirds are Go”, called “Space Race” and “Crosscut”. The video files have file extension .264. There are two audio files for each episode (.ac3), one in Dutch (marked NL in the file spec) and one in English (marked UK in the file spec). There are also two subtitle files (.srt), again one in Dutch and one in English.

	Name	Size	Date modified	Length
Data (D:)				
Movavi				
MovieBD1				
<b>films</b>				
Nero				
Temp				
Users				
Win XP media sounds				
Win10 AnnUpdate				
Recover (E:)				
	Tag S1 E03 Space Race NL.ac3	62,007 KB	2016-08-23 22:49	00:22:02
	Tag S1 E03 Space Race NL.srt	20 KB	2016-08-24 01:43	
	Tag S1 E03 Space Race UK.ac3	62,007 KB	2016-08-23 22:49	00:22:02
	Tag S1 E03 Space Race UK.srt	21 KB	2016-08-18 11:51	
	Tag S1 E03 Space Race.264	744,981 KB	2016-08-23 22:49	
	Tag S1 E04 Crosscut NL.ac3	62,252 KB	2016-08-23 22:33	00:22:08
	Tag S1 E04 Crosscut NL.srt	21 KB	2016-08-26 14:36	
	Tag S1 E04 Crosscut UK.ac3	62,252 KB	2016-08-23 22:33	00:22:08
	Tag S1 E04 Crosscut UK.srt	22 KB	2016-08-22 14:00	
	Tag S1 E04 Crosscut.264	747,421 KB	2016-08-23 22:33	

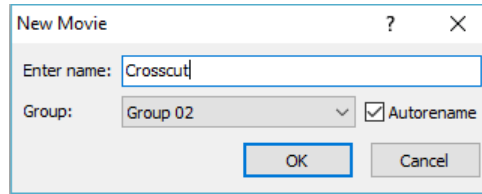
During the disc building process the files of each episode will be muxed together into a single .m2ts file where video, audio and subtitles are combined.

We now need to add the movie files to the BDSL project. For two episodes we require two movie placeholders in the project.

To add a movie placeholder to the project go through these steps:

1. Open the Project Tree window (View > Project Tree (F3))
2. Right-click on “Movies” and select “New Movie” (SHIFT Ctrl/V)
3. Give a useful name to the movie you’re going to add and click OK (this will add the movie entry to the project window but also show it on the Structure window (F7)). In our example: “Space Race” is added.

Each added movie is put into its own group. This is fine for now. Only when we want to set audio and subtitle tracks the same for all movies, they need to reside in one single group.

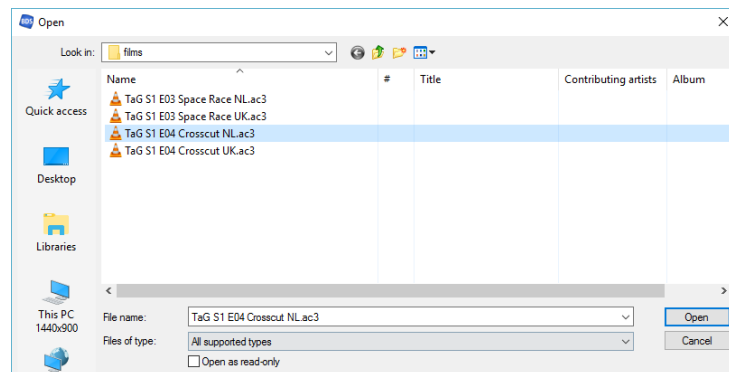


These steps suffice to add a movie placeholder. These placeholders are used to set up the entire menu navigation first. What movie is actually represented by this movie placeholder is specified by the placeholder properties. Because we don't have menus in this project, we must continue to complete the movie properties by adding the file specifications of the video, audio and subtitles associated with each movie.

4. Open the "Properties" window (View > Properties (F11)). This will show the properties of the movie title added. (In default project view this window is already shown). You may need to click on the "+" button next to "Common" if this part is collapsed and does not show the name of the movie or the group it belongs to.
5. Under "Streams" select the video stream. This will show the "..." button at the far end at the right of the text line. Click on this to open a window to navigate to the compliant video stream.

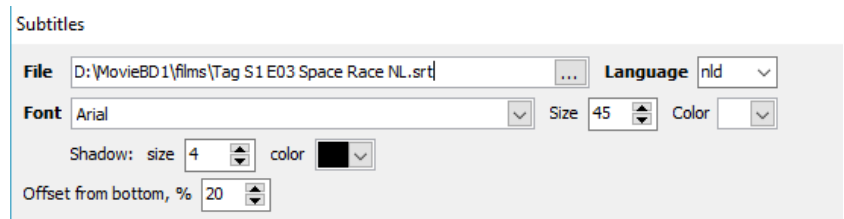
The file must have the right file extension (like .264) or otherwise it will not show and cannot be selected even if it is a proper file. An invalid file with the right extension can be selected but will cause problems later during the muxing and building of the disc. This may be the case if the file does not meet the bluray standards. So make sure the video file has a right format and the right extension.

6. Repeat the previous step for any of the audio streams to go with the video and indicate the audio language. After "Audio 1" is used, automatically a blank "Audio 2" stream is shown for an additional language. Select the language code for each stream. The language codes to choose from are those you selected in section "Step 2: Specify your languages" on page 18 earlier. For your own sanity and that of the future viewer of your disc, keep the order of language tracks the same for all movies on the disc!

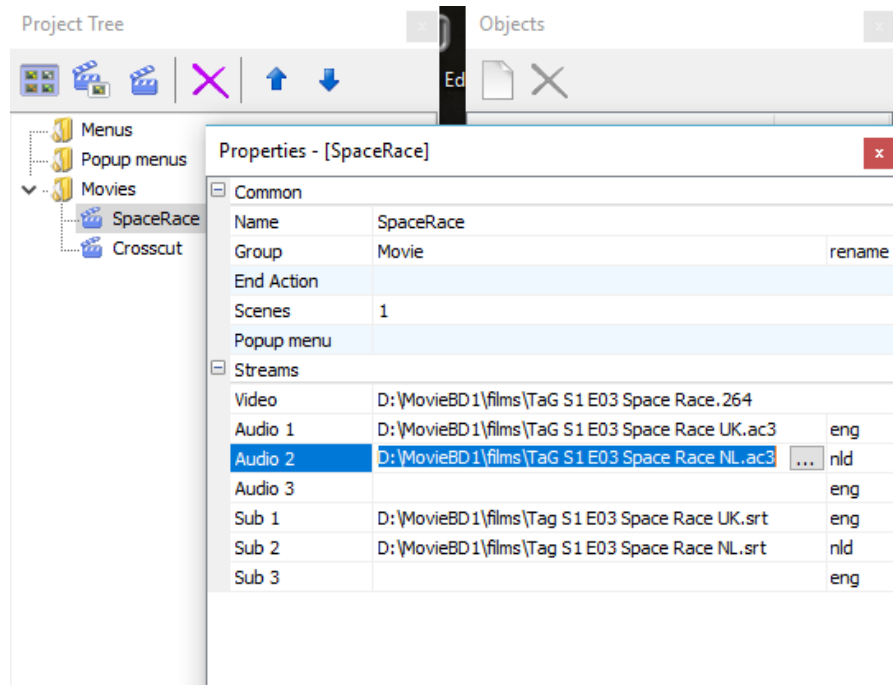


7. Repeat the steps for any subtitle stream. This will open a “Subtitles” window with a “File” selection box where the .srt or .sup files can be selected. You can indicate subtitle font, size and color. It can have a shadow (size 0 means no shadow) and you can specify the position (close to the bottom or higher up in the picture). And finally you specify the language of the subtitles. For your own sanity and that of the future viewer of your disc, keep the order of language subtitle tracks the same for all movies on the disc! Click “OK” to complete the settings.

**Note** that for western languages with diacritical characters such as ä, ø etc, it is best to have these subtitle files in ANSI (Windows 1252) format. Many subtitle editors output to UTF-8 which is a better choice, but in bluray subtitling using tsMuxer to mux the UTF-8 subtitles into the movie, diacritical characters come out wrong like “@R>”. This is caused by ANSI being 1 byte characters, UTF-8 uses multiple bytes.

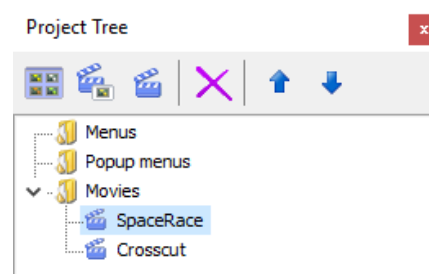


You now have added one movie (placeholder) with all its trimmings (properties) to the project. By repeating the previous steps you can add additional movies to the project, as long as the total size of the movies does not exceed the 25 GB disc capacity of a bluray BD-25 disc and leaves some room for buttons and (generated) java scripts and indices. Each movie has its own set of properties that specify what it is composed of. The properties of the movie “Space Race” is shown below in a separate window. The default project view has this window as part of the project view.



If by error you added an audio or subtitle track too many, you can delete it by selecting its row and pressing the keyboard <delete> key. If you want to rename the movie, simply select the “Name” field and type a new name.

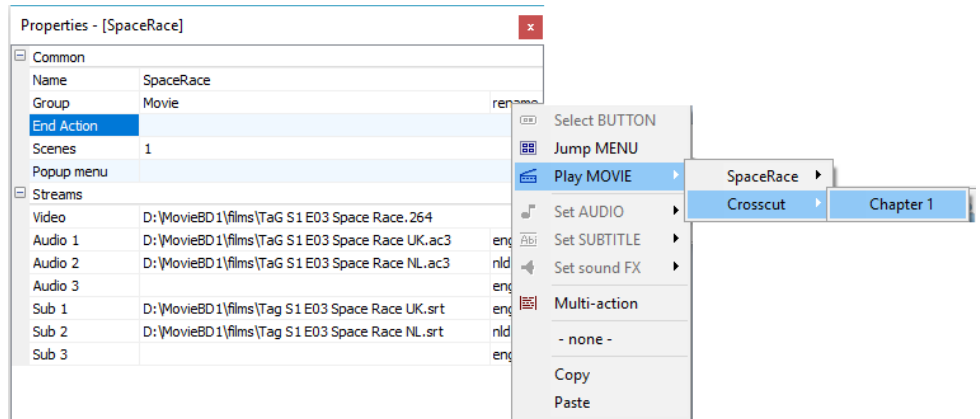
The Project Tree window will show all movies added. The branches for “Menus” and “Popup menus” remain empty.



What comes after the first movie?

In the movie properties of the first movie “Space Race” there is also an “End Action” property. Specify here what is to happen after the movie ends. In our simple case, we start the next movie, “Crosscut”. Click on the “>” button of the “End Action” line of “Space Race” and select the right action from the menu that is shown: in our case the action should play a movie and select which movie and what chapter (usually the first to start at the beginning).





Repeat these steps for all movies so that the end of one movie starts the playback of the next movie. The last movie to be played either leaves the “End Action” empty (disc stops playing) or specifies the first movie again in which case you created an endless loop.

In addition there is a “Popup Menu” property entry. This is not used in our simple disc – there is nothing (no menu) to pop up.

### Step 3 Creating chapters

Most movies allow you to jump forwards and backwards through its contents by defining chapters. These are called playmarks in BDSL.

These playmarks can be manually defined or they can be generated automatically at almost fixed time intervals. You should always select “I” frames (complete pictures) as possible playmark.

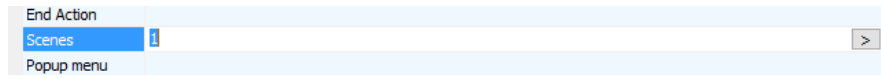
To generate playmarks, you revisit the movie’s Properties window. If closed, open it using View > Properties. The properties window shows the properties of any movie that is selected in the Project Tree window.

There is always a playmark at the very start of a movie but you may want to add one at the very end of a movie. The latter allows the viewer to jump to the end of the movie by remote control and go to the next movie connected to the current one.

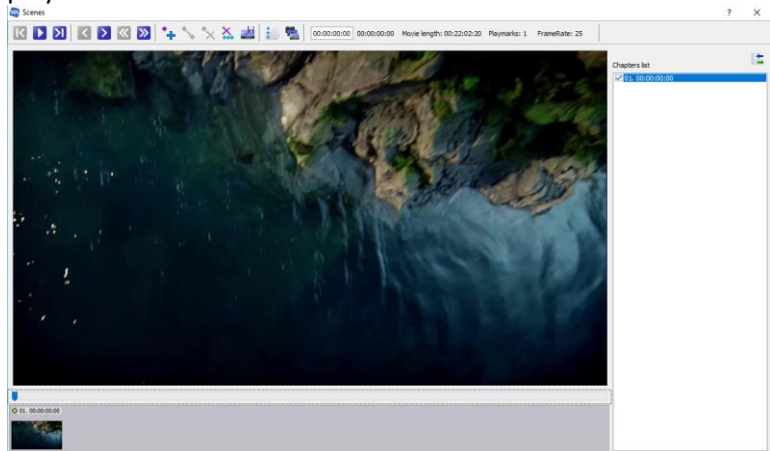
In general any new playmarks are added to existing ones. You may want to set some manual playmarks before generating additional ones. The end result will be the sum of both sets of playmarks.

Perform the following steps to create playmarks to the movie:

1. Look for the “Scenes” property of the movie. Initially it will indicate “1” as the only playmark is the beginning of the movie.
2. Click on the “>” button at the far end. This starts the indexing process that may take a little while (about 1 minute for every 10 running time minutes) and creates a .idx and .inf file in the \films folder). If this process has been done before, the available information is opened quickly and shown.



3. The “Scenes” window of “Space Race” will show only one playmark if none were ever added before.



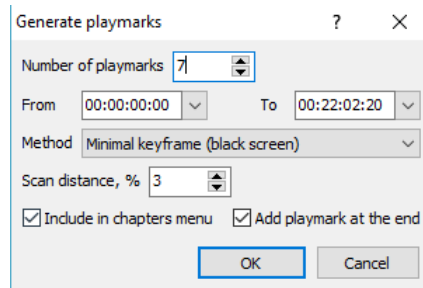
4. By manually moving the slider underneath the picture, you can select a scene and make it a playmark by clicking the “Add playmark” (Ins) button. It is preferable to use the “>>” button in the menu bar to move to the next complete picture (“I” frame) before clicking the “Add playmark” button. Once set, it can be deleted by selecting it and clicking the “Delete Playmark” (Ctrl/Del) key. Instead of deleting a playmark and creating a new one elsewhere, you can select the old one, move the slider to the new position and click “Move selected playmark here” (Ctrl/Ins). All playmarks (apart from the one at the start) can be deleted by clicking “Delete all playmarks”.



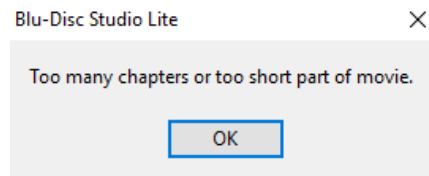
Proper positioning can be done using the “next frame” and “next I frame” buttons and play buttons on the left hand side of the menu bar.



5. Playmarks can also be generated automatically. Generation is done by clicking the “Generate Playmarks” button (Ctrl/M). This opens up the “Generate playmarks” window where you can specify how many playmarks you want.



Between two playmarks a minimum amount of time is required (by the looks of it, of about 30 seconds). If too many playmarks are specified an error message is shown telling you too many chapters are specified or that the movie is too short for that number. This error never occurs on manual positioning of chapter marks.



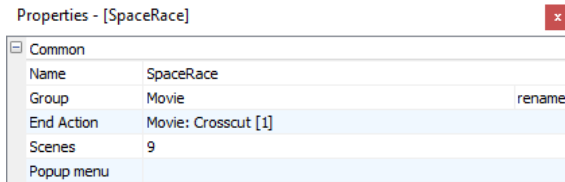
The “Scan Distance” rules the accuracy of the positioning. The larger the value (ranges between 3% and 49%), the more freedom BDSL has to position the marker according to the specified method. It is best to play with the settings to see what you like best. At 49% you will see that the chapter marks may be very unevenly spread out. Use 3% to position the marks almost at fixed intervals.

The result is shown as set of playmarks under the video image and a list is shown to the right. Check boxes indicate whether the playmark will show up in a chapter menu (which we won’t make here, so it doesn’t matter). The end-of-movie marker should be unchecked.



When satisfied, you close the chapter window by clicking the “X” “close window” button at the top right hand corner. There is no other close mechanism.

6. Note that upon generation you get always 2 more playmarks than specified: the one at the start and at the very end are also counted. This number is reflected in the final “Scenes” property of the movie.



When you create playmarks, BDSL creates three index files (.idx, .idx.inf and .inf). The information in these files is used when showing the chapter marks later or when the disc is created.

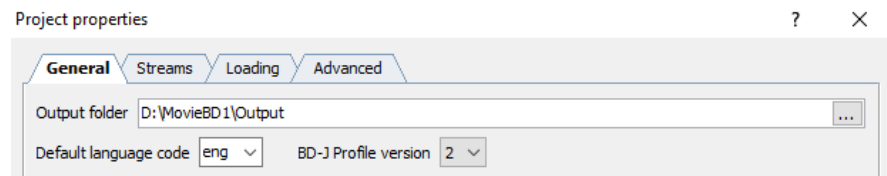
If for some reason you replace the video file (because of another resolution or bitrate), these index files are invalidated but not deleted. You must restart the playmark generation process (best to delete all playmarks first). Not doing so will open the playmarks window but all old playmarks are positioned strangely (on bit position which is incorrect when the movie is transcoded to a different bitrate) and the assumed playing time of the movie is incorrect.

## Step 4 Build the disc

### Final settings

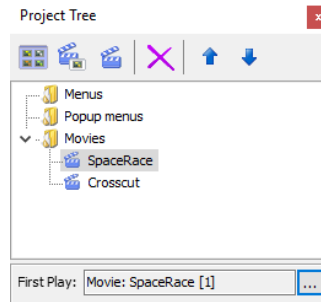
During the final build of the disc, BDSL requires all movies to have their chapter index files – even if it only has the start of movie chapter. If you never created them during authoring, the files are created during disc build.

To create the disc, you have to specify the output location through the menu Project > Project Properties window (Ctrl Shift F11) using the General tab.



The project is created by muxing all elements together into this output folder.

You must also specify what item to play first once the disc starts playing. This is specified in the Project Tree view in the “First Play” box. Here we specify the first movie, “Space Race”. The [1] indicates starting at the first chapter (i.e. at the beginning of the movie).



The above view shows a single movie and this one is to be played first, starting at the beginning (the (1) indicates the first chapter).

### Creating the disc files

The muxing starts by clicking the “Mux by tsMuxing” (Ctrl/F9) menu icon (⚙️). BDSL opens a progress window showing each step along the way, supplemented by additional come-and-go tsMuxer windows for each movie it muxes until done. This window is always shown on the default project view as the window in the bottom righthand corner.

The first step re-runs the Simulator to ensure all files for the menus are present. This includes a check on the presence of all (menu) video, audio files needed for this.

The next stage is the most time consuming: remixing the movies from their video, audio and subtitle files. This process can take upto almost an hour for a 50 GB double disc on a moderately fast pc.

If during the muxing process you suddenly see very quick completion of lengthy movie files you can rest assured that some files for the muxing are missing (renamed, removed?). This will show at the start of the final step: the updating of the movie playlist. The dreaded uninformative “Line:0” error will show. All you can do is check each movie and menu item referring to files that do exist and are accessible.

```

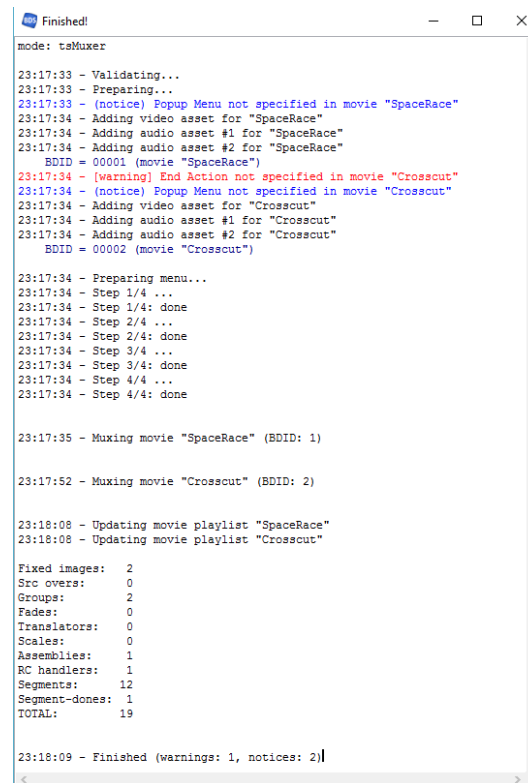
C:\Program Files (x86)\tsMuxer_2.6.12\tsMuxer.exe
Network Optix tsMuxer. Version 2.6.12. www.networkoptix.com
Decoding H264 stream (track 1): Profile: High@4.0 Resolution: 1920:1080p Frame rate: 25
H.264 muxing fps is not set. Get fps from stream. Value: 25
0.0% complete
H264 bitstream changed: insert nal unit delimiters
H264 bitstream changed: insert pict timing and buffering period SEI units
Decoding AC3 stream (track 2): Bitrate: 384Kbps Sample Rate: 48KHz Channels: 5.1
Decoding AC3 stream (track 3): Bitrate: 384Kbps Sample Rate: 48KHz Channels: 5.1
Decoding PGS stream (track 4): Resolution: 1920:1080 Frame rate: 23.976
Decoding PGS stream (track 5): Resolution: 1920:1080 Frame rate: 23.976
H264 bitstream changed: insert SPS/PPS units
34.9% complete

```

The final step is the “Updating movie playlist” which is rather quick and connects menu items with movies to play.

It is in this phase also that “Line:0” errors may occur although the muxing process went well and those files are present in the output \BDMV\STREAM folder. In this case most likely one of the files that make up the movie (audio or subtitles) may seem corrupt to BDSL. The last movie listed in the “Updating” list is the culprit. See section “Possible problems – including “line:0” errors” on page 31 for more details.

The final window (project log window) indicates BDSL's work done.



```
mode: teMuxer
23:17:33 - Validating...
23:17:33 - Preparing...
23:17:33 - (notice) Popup Menu not specified in movie "SpaceRace"
23:17:34 - Adding video asset for "SpaceRace"
23:17:34 - Adding audio asset #1 for "SpaceRace"
23:17:34 - Adding audio asset #2 for "SpaceRace"
        BDID = 00001 (movie "SpaceRace")
23:17:34 - [warning] End Action not specified in movie "Crosscut"
23:17:34 - (notice) Popup Menu not specified in movie "Crosscut"
23:17:34 - Adding video asset for "Crosscut"
23:17:34 - Adding audio asset #1 for "Crosscut"
23:17:34 - Adding audio asset #2 for "Crosscut"
        BDID = 00002 (movie "Crosscut")

23:17:34 - Preparing menu...
23:17:34 - Step 1/4 ...
23:17:34 - Step 1/4: done
23:17:34 - Step 2/4 ...
23:17:34 - Step 2/4: done
23:17:34 - Step 3/4 ...
23:17:34 - Step 3/4: done
23:17:34 - Step 4/4 ...
23:17:34 - Step 4/4: done

23:17:35 - Muxing movie "SpaceRace" (BDID: 1)

23:17:52 - Muxing movie "Crosscut" (BDID: 2)

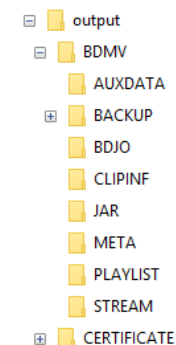
23:18:08 - Updating movie playlist "SpaceRace"
23:18:08 - Updating movie playlist "Crosscut"

Fixed images: 2
Src overs: 0
Groups: 2
Fades: 0
Translators: 0
Scales: 0
Assemblies: 1
RC handlers: 1
Segments: 12
Segment-dones: 1
TOTAL: 19

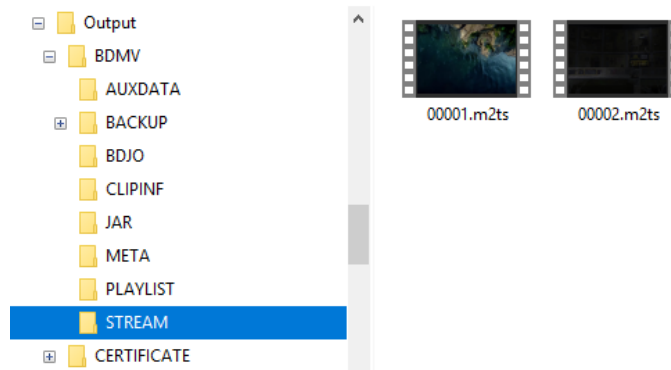
23:18:09 - Finished (warnings: 1, notices: 2)
```

There is one red coloured error that may be safely ignored in this project. It specifies that once the movie "Crosscut" finishes playing, there is no action to continue. The bluray disc will stop playing after the last movie has been shown. Which is what we want. If you want to return to the beginning and create an endless loop, the "End Action" of movie "Crosscut" can be set to play movie "Space Race" from chapter 1 onwards.

The bluray compliant file structure is written in the folder indicated in the Project Properties:



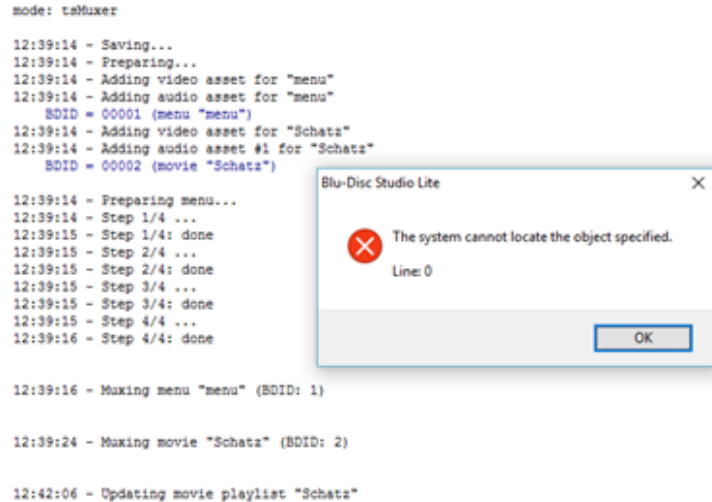
with the actual video movies stored in the STREAM folder – just as large as their original source input (before they were demuxed).



### Possible problems – including “line:0” errors

The muxing of the final disc may encounter problems still that remained undetected earlier during simulations. The errors are mostly caused by incompatible movie files as that is the one thing Blu Disc Studio does not check during authoring.

- “The system cannot locate the object specified. Line: 0” – audio  
This error may occur when a movie has the LPCM audio (uncompressed) mode rather than Dolby .ac3 or DTS. This error should not happen but if there is an LPCM audio track, transcode it to Dolby and try again.
- Movie remains black – sound audible, no subtitles seen.  
This error may occur when a movie is not meeting the bluray aspect ratio criteria. It must be 1920x1280 or 1280x720, 720x480 pixels or other allowed aspect ratio. Some YouTube or .mkv movies have different aspect ratios eliminating top and bottom black bars (letterbox) that are required to fill the bluray allowed ratios. Transcode the movie to a proper ratio and try again. The movies must also be progressive and not interlaced.
- “The system cannot locate the object specified. Line: 0”  
The muxing of the movies will succeed (and the \output\BDMV\STREAM folder will contain the .m2ts files with all audio and subtitles muxed), but the final step of the building will fail. This is when the muxing progress window starts its “Updating....” phase. The movie mentioned last before the process is stopped and the error message is shown, is the one where BDSL found a problem.  
BDSL tries to compose its menus and provide links to movies or their audio and subtitle tracks. For some reason or other it cannot link to (one of) these tracks and then fails. Without telling you what link it cannot create.



This problem can only be figured out by trial-and-error and some deductive thinking. The problem lies in either:

- movie file is not in bluray specification aspect ratio
- audio file(s) are corrupt
- subtitle file(s) are corrupt
- one or more files listed in the properties of the movie do not exist (were renamed, deleted or made inaccessible)

To figure out the problem:

- save the current project under a different name
- start removing all movie files but the offending one
- remove the item you suspect (audio, subtitle) and remux
- if the error still occurs, remove another item
- if success, the removed item must be re-made: sometimes a simple opening and explicit closing (save-as instead of "save") does the trick. For subtitles you may wish to save in Windows 1252 format instead of UTF-8 or something else currently used
- Go back to the original project and remux. If the offending file is corrected, it should now complete successfully unless further down the line another movie has offending parts

## Step 5 Test running the disc

You can now play the disc. Either by taking your chances, burn it and play in it a standalone player. There are rewritable discs for this purpose., Or by first checking it with a software player on your pc. This allows you to correct any missing items or wrong behavior without actually losing a write-once bluray disc.

Keep in mind that all movies and their tracks must comply with the bluray standard if you want to be sure they play in any standalone player.



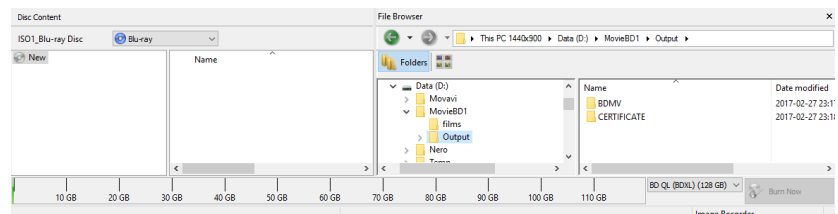
The total size must also not exceed either the 25 GB or 50 GB capacity of a bluray disc. If it does, some items must be removed from the disc, compressed tighter or... you may rebuild the entire disc using a “recoder” program such as BD Rebuilder or Nero Recode. This squeezes all elements as much as needed to make the entire disc output fit on the desired disc size. This squeezing comes at the price of stronger compression and some loss of resolution.

### ISO image

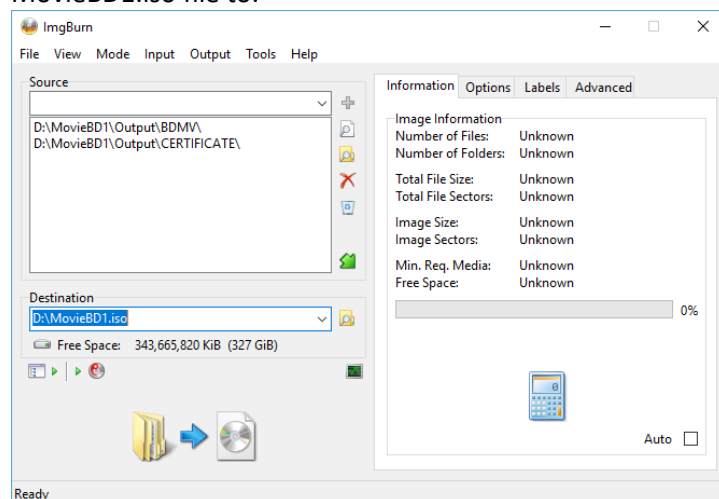
Some software players only accept an .iso image of the disc or a real disc to play. In both cases an .iso file is needed as container of all bluray files. Instead of a real disc you can use a disc emulator to create a new bluray station (such as Y:\ ) from the .iso file. Virtual CloneDrive is such a freeware program).

To create this, you can use

- Nero BurningROM: set device to “image recorder”, use the BD Video templates and select “Blu-ray (iso)” option. Drag the \output folders to the Disc Content region.



- ImgBurn freeware software (select “Create image file from files/folders” from the mode EZ-Picker). The BDSL produced \output subfolders \BDMV and \CERTIFICATE are specified as starting folder, using data type Mode1/2048, UDF 2.50 file system, recurse subdirectories). Indicate a location to write the MovieBD1.iso file to.



### Test run using software player

Not all software players seem to be fully reliable to play a bluray disc. Some do one aspect better than others, the expensive ones I did not try:

- Leawo bluray player: only runs from (virtual) discs. It doesn't show menu and does not allow to select or change audio or subtitle tracks. Starts playing a track and not any other.
- Nero 12 Bluray player (discontinued product) – doesn't display some video track correctly from the bluray disc folder or as .iso image. It has a problem showing interlaced video but works fine for progressive video (1080p, 720p) as well as DVD 576i.
- VLC: runs only (virtual) discs. Allows right-click change of audio or subtitle track. Through its "Title" you can select another video track. It does not show menus. Clicking on its menu button starts first video track from the main menu.
- Cyberlink PowerDVD 12 OEM edition – show menus. Allows to open the bdmv\stream files, change audio track but doesn't see any subtitle tracks.
- Cyberlink PowerDVD 15 – rather expensive program for "just" playing back bluray and DVD discs – being restricted by the DVD or Bluray regional setting (that's not a problem for your own created discs that by default are "region free").

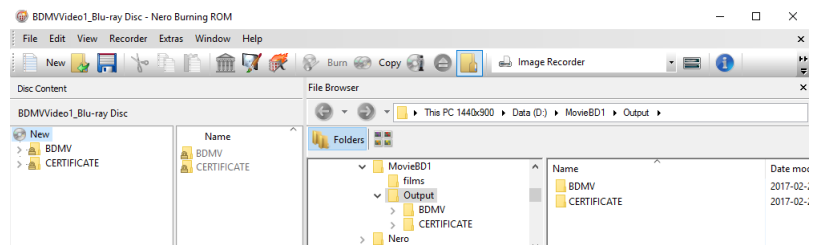
### Step 6 Burn the bluray disc

#### Test run using a standalone player

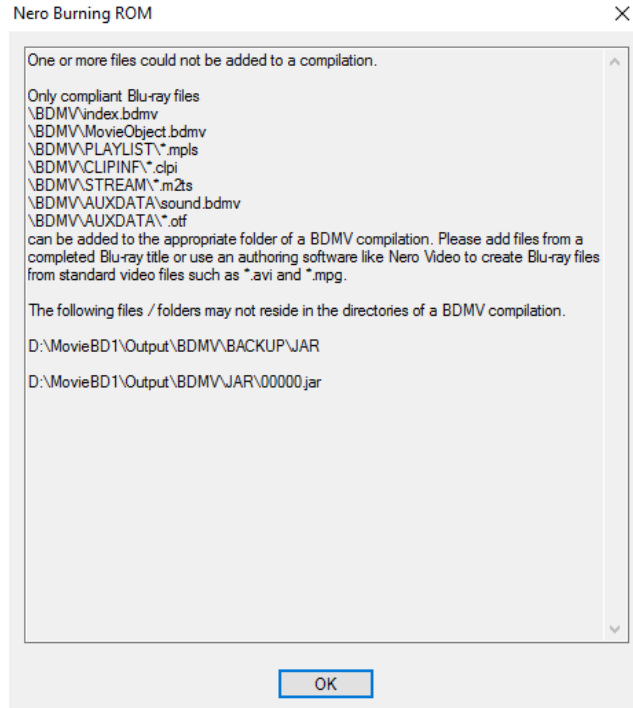
The ultimate test is to burn a Bluray disc .iso file or the \output folder of BDSL to a BR-25 or BR-50 (re)writable disc and upon completion play it in a "real" bluray player. Rewritable discs are preferred if you test the disc: they can be reused after changes have been made until the disc is to your satisfaction.

To burn the disc you can use Nero BurningRom or freeware ImgBurn.

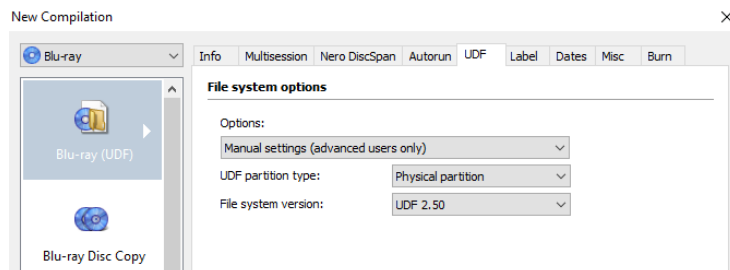
- Nero 12: use the "Bluray" templates and select "BDMV video" template. Upon opening, drag the folders in BDSL \output folder in the file browser to the disc content left hand part of the interface.



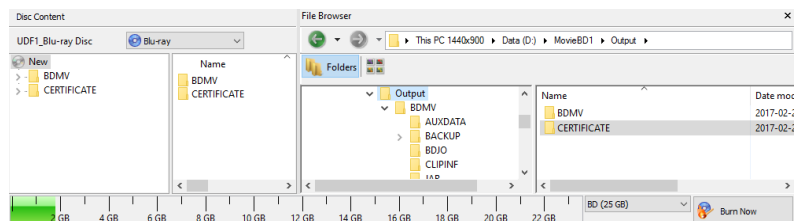
This may produce some warnings that can be ignored as the burned disc will play:



To avoid these warnings, you can also burn the disc folder using the “Blu-ray” option, select the “Blu-ray (UDF)” template, select the UDF tab at the right and select “manual settings” and indicate “physical partition” and “UDF 2.50”. UDF 2.5 is the official standard partition format for bluray discs.

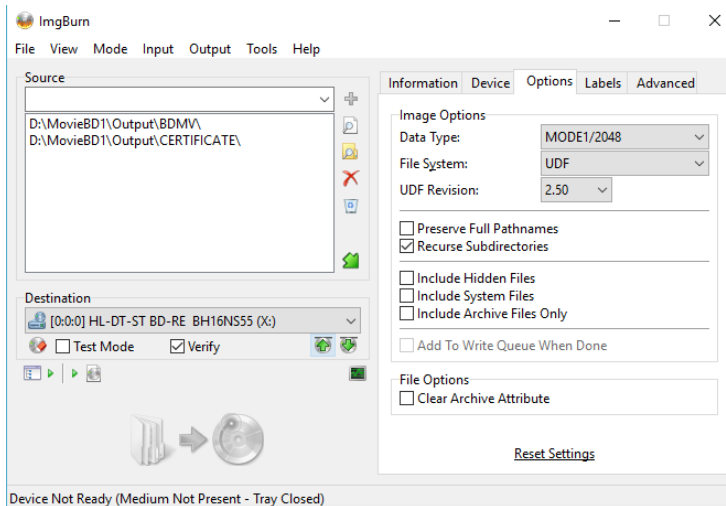


Once the “Disc Content” window opens, you drag the two main folders BDMV and CERTIFICATE from the File Browser area to the disc content area and start the burn process.



*Note:* It is my impression that using this UDF V2.50 method produces a disc that switches much quicker between menu items and movies than the disc made using the BDMV template.

- ImgBurn: select “Write files/folders to disc” (if this does not show, select the menu option Mode > EZ-mode picker). From the next screen:
  - select the “Options” tab and fill in the Image Options box with:
    - Data Type specify “Mode 1/2048”
    - File system UDF
    - UDF Revision: 2.50
  - select the bluray drive in the “Destination” field
  - check the “verify” box if you want to check the disc burned.
  - Select the “labels” tab and specify a disc label.
  - Burn the disc



## Step 7 Problems with the final disc: some possible solutions

Running the created disc with a software player may uncover most navigational errors in the menu transitions. These can be corrected in BDSL and the entire disc can be recreated and re-checked.

Sometimes one or more of the videos may not show properly, either using a software player or a standalone player. Check if your video for the following:

- are all video files muxed to the standards that all players must support (see the section “Bluray disc player specification” earlier)? If not, correct this and rebuild the disc.
- does a software player not show subtitles and you did include them? Try opening the movie file from the `\OUTPUT\BDMV\STREAM\*.m2ts` file and play it using a video movie player like VLC (the sequence number should be its

position in the movie list of the Project Tree view or the BDID number listed during muxing). If that does show the subtitles, nothing is wrong. If not, you need to find the reason why subtitles are not included in the muxed movie file.

- if the movie seems jumpy, does the video have a stable time base? Often these problems can be solved by using TS Doctor to recreate the .ts or .m2ts source file without making any changes to the source. It will provide a new time base. If necessary transcode the resulting file to bluray standards and finally demux the file into video/audio components for BDSL and rebuild the disc.

## Project 2: Creating a simple menu-driven bluray disc

### The project goal

This chapter will show how to make a simple bluray disc with a static menu showing the titles of the movies contained on the disc. By using the remote control arrow keys you switch between the various movie titles and select one. By pressing on the “OK” or “Enter” key, the selected movie plays. At the end, the menu is shown again.

Selection of any audio or subtitle track is done via the remote control buttons for this purpose. You can also shift to previous and next chapters using these buttons. They are not selectable through a bluray menu displayed on screen. That is postponed to the next chapter.

This project extends the previous one by:

1. adding a full screen menu shown at startup
2. use buttons with “Normal” and “Selected” states
3. add navigation between and action to buttons
4. use a single button as prototype of all buttons

### What you need to know about menus and buttons first

#### Menu background video

BDSL insists that the very lowest menu background is a movie. If you don’t want this (as we don’t really need it in this simple disc build), it still has to be there. Create a small movie of pixel size 1920 x 1080 and make it entirely black with no audible (silent) sound track. It will show itself as an entirely black screen. On top of this we can add menu pictures and the buttons.

*The background movie **must** be 1920x1080 pixels in size. Any other will deform the final menu as shown on screen.*

*We experienced some problems if the (silent) audio track was LPCM (.wav) formatted – use Dolby Digital (.ac3) instead.*

Alternatively, you want some music playing while the background is shown as still image. In that case, add the still image or black video with a music audio track as the video/audio track on all menus that are related through button jumps. Switching between menus lets the music continue to play and doesn’t start again with each new menu.

#### Menu image

One part of a disc image is composed of some inactive images. These can be picture or text. If part of the menu must look like a movie, that part must be implemented in the menu background movie. A movie editor must be used to do this. If only some part of the menu should show a moving image, the background movie must still provide the entire 1080x1920 pixel area. However this can be entirely black apart from the small part that is showing the moving image. Commercial discs

often have a moving background menu movie on top of which text and buttons are shown.

### Menu buttons

The other part of a menu consists of buttons. Using the remote control you navigate between buttons to select your choice from the list of options shown on the static menu text.

In fact, while navigating between buttons you do not move the button, you often make one button invisible (or dimmed) and the next one visible (or highlighted). That looks to the eye as “moving the button”.

Each possible option on your menu has one button which is be in one of four possible states:

- normal
- selected
- active
- current

Only the “Normal” and “Selected” states are required for implementation. The other two states are “nice to have” but not essential.

### Normal

The “Normal” state shows the button when it is not selected. When a menu offers 10 choices, 9 of them will have a button showing its “normal” state and only one in the “Selected” state. The “Normal” state is *always* visible (unless transparent). Other button states are shown on top of the normal state image.

**Note:** Any non-normal state image of a button therefore must cover the normal state image. If such a state has a transparent part, the Normal state image can be seen through this transparent part.

The “Normal” state can be a dimmed version of the “Selected” state, but often it is totally invisible. This means that the “Normal” state .png file (or corresponding PhotoShop file layer) is totally transparent (but those pixels do count against the total pixel count allowed).

### Selected

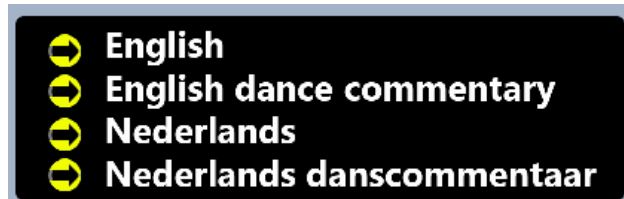
The “Selected” state will always be a visible state of the button. It can be a bright arrow or some other indication of what menu item you currently selected using your remote control. Its image differs from that of the “Normal” state in order to highlight the selected button.

### Normal and Selected states of buttons on menu

In the figure below a small menu item is shown as static black image with white text. At the left of the text the “Normal” state of four buttons is shown. Often this state is transparent. Here we choose to make them gray outline circles so they can be seen.

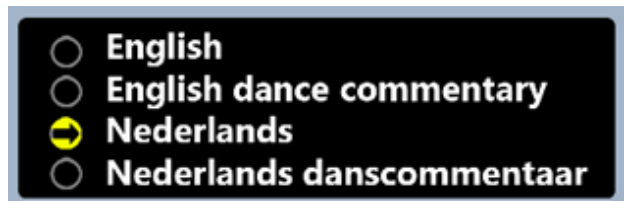


The same buttons are shown again, but now their “Selected” state.



Notice that all four buttons have a “Selected” state looking like a yellow circle with arrow. When the bluray plays, only a single button will show its “Selected” state while the other three show their “Normal” state.

For example, if you navigate to the third option on the list, the menu on a player would look like the image below.



By using the remote control and moving the selection upwards or downwards, other buttons will become “Selected” and show their yellow arrow circle, while the current third one reverts from yellow “Selected” to its grey “Normal” state showing the gray outlined button “Normal” state again.

#### *Activated*

The other two states are not needed and will never show. However, if you do implement an image (.png file) for the “Activated” state it will briefly show this button state if it is currently selected and you decide to press the “OK” button on the remote to activate this selection. This is the case if you want to show the indicated movie or jump to the specified menu. The Activated state has little use in BDSL other than briefly changing the button state image. It is more useful if this state is associated with a gradual change of the menu before the movie starts. However, these “playlist” like features are not available in the Lite version.

#### *Current*

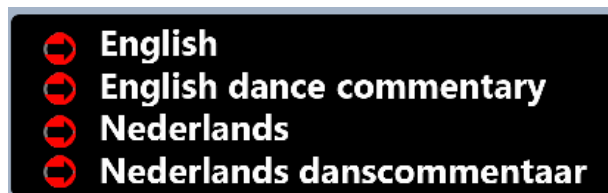
The “Current” state is most useful in type of menus where you pre-set a choice in language or subtitle. The “Current” state of a button will show up if that choice was made on a previous visit to the menu. It reminds



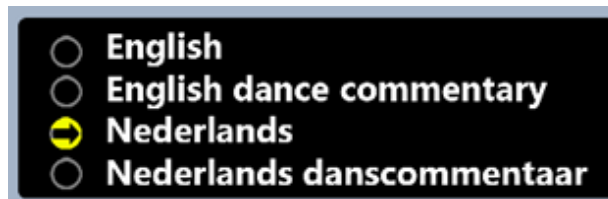
the viewer what the current setting (choice) for the audio track or subtitle track is. Using the navigation buttons on the remote you can still move through all options on the menu – changing a button state between “Normal” and “Selected” state as before.

When exiting the menu without activating any button, the current choice remains. When activating (pressing OK) a new selection, then this selection becomes both Active as well as the new “Current” state.

The image below gives you the same menu list as before, but with button state “Current”: a red circle with arrow for each of the four buttons.

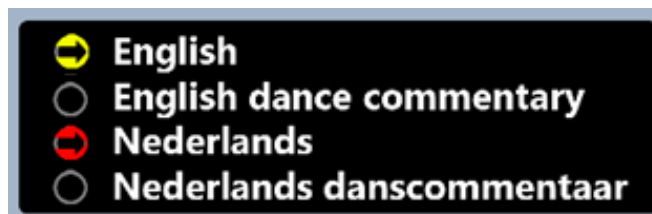


When “Nederlands” is selected (3<sup>rd</sup> button) using the remote control the button state will become “Selected” and shows a yellow circle.



When activated (by pressing “OK”) as preferred choice, the Dutch language track will be activated and set as the new current one.

Revisiting this menu later, the choice is remembered showing the button near “Nederlands” as “Current”. You can still change your selection to “English” showing the yellow circle.

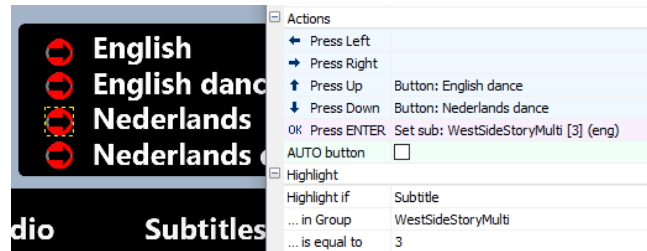


If you press on “OK” on the remote, the English audio will become current. If you exit without changing your choice, the Dutch track will remain current.

The useful thing about these “Current” settings is that once made, the choice applies to all movies that belong to the same movie group. The group name is listed in the button property list. This way you only specify the setting once and it applies to all movies in the group.

When all movies on the disc belong to the same group, you only need to specify audio track or subtitle track once, and it applies to all movies in the group.

The button properties indicate this, as we will show in one of the later projects.



In the figure above the properties of the third button are shown during BDSL development. Its navigational properties are indicated in the “Actions” properties and show what happens if you press the up, down or OK (Enter) button on the remote control. The “Highlight” section comes into play when a current state is defined for the button. Here it states that the “Current” state of the button must be shown on screen if the third subtitle is selected and activated previously. It will apply to all movies that belong to the movie group “WestSideStoryMulti”. This means that any movie belonging to a different group is not affected. This may be the case for a bonus or extra movie that does not have a Dutch subtitle and therefore no 3<sup>rd</sup> subtitle track or possibly it has a different language on the third track.

The “Highlight” section is automatically filled by BDSL when a Current state is defined for a button, but you can change the settings if you like.

### Menu image size

The total number of pixels allowed in all menus together is limited to 7 900 000. This is a BDS limitation for both free and commercial versions and has to do with the Java implementation of menu navigation. The size may increase in a future edition.

Menu images are created with image editors that can produce .png images (this format also allows transparent pixels to allow “a hole” in a menu where the background movie shines through).

Alternatively, rather than single .png files, a layered image editor such as PhotoShop can be used. When a .psd layered image is imported into BDSL, the layers are converted into single .png files and stored in a menu-specific folder of the disc project.

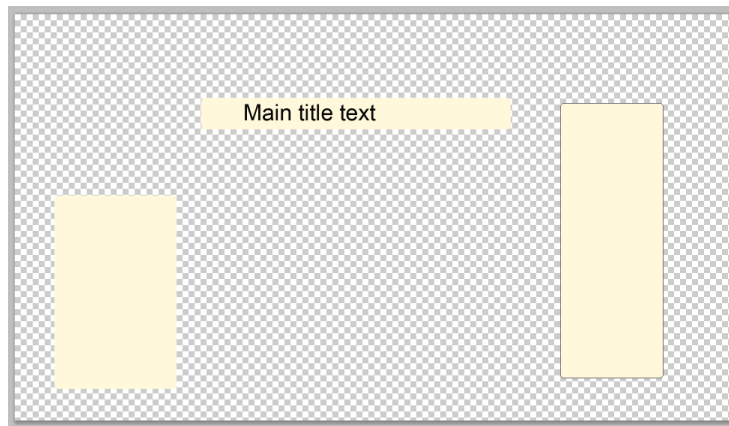
Because of the maximum number of pixels for all menus together, it is wise to show restraint in making large sized menus and re-use elements where possible. With four full-sized 1080x1920 pixel images you already exceed this limit.

If you have three or less of such screen filling images, they will remain within this maximum number of 7 900 000 pixels. Together with the menu buttons

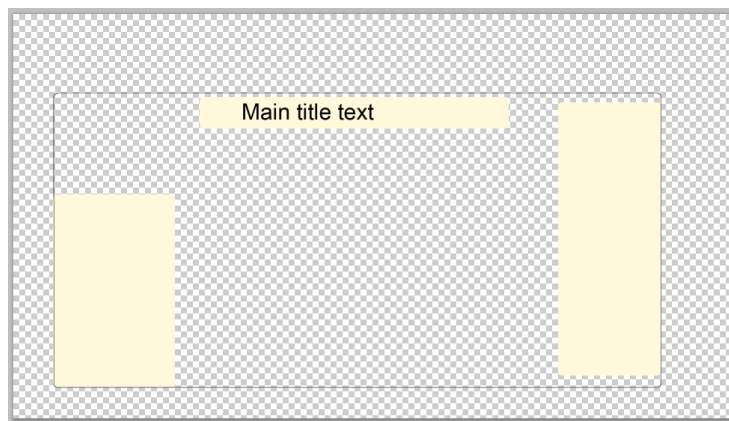
the pixel number may still be below the maximum number and you may not have to worry about trying to economize on pixels.

Menu images are always rectangular, regardless whether there is a visible picture in the entire rectangle or that part of it is transparent. Transparent pixels count as pixels. The most efficient way of filling menus is by using rectangular blocks showing what it needed (image or text) but do not occupy any needless space. Better to use 5 small rectangles filled than one big one covering the same area but with “empty” holes in it.

To visualize this, examine the two figure below. The first menu consists of 3 small rectangles.



The pixels of all 3 rectangles count against the total of 7 900 000 pixels. The checkered background is “transparent” and will show the background menu movie. Those transparent parts do not count as menu pixels.



The second image incorporates all three parts into a single rectangle, part of which is made transparent. The entire rectangular area, including the transparent pixels, counts against the 7 900 000 pixels – much more than the three coloured rectangles by themselves.

You can check on how many pixels are used as all menu images are stored in the final bluray disc output folder as a Java .jar container in folder \BDMV\JAR\00000.jar. If you rename this file to 00000.zip and open it, the zip container will show an m1.png file which contains all pixels of all menus. You can extract it or open it with an image editor to see whether its total size exceeds the current limit of 7 900 000 pixels.

The .png files for menu images or (states of) buttons must adhere to specific naming conventions for them to be recognized as image or button. This is also true if the .png files are made up from layers in an image file created by PhotoShop. Anything not adhering to the naming convention automatically becomes an (inactive) menu image part.

#### Menu images and buttons as Photoshop layers

Menus and buttons can be combined in a single layered image files. These must be 32-bits files (8 bits per layer of which there are 4).

Layers for a single button must be named “btn:name:state” where the *name* is some unique name for the button and *state* is one of “N” (Normal), “S” (Selected), “C” (Current) or “A” (Activated). For example “btn:MainMenu:N” is the normal state of a button named “MainMenu”.

One .psd file can contain many buttons, each with their own set of layers – one for each state a button can be shown in.

#### Menu and buttons as separate flat image files

Any image editor producing flat files is acceptable, provided it can output files with transparent backgrounds as 32-bit .png files. The commonly used .jpg, .tif, .bmp or .gif and other file formats for images are not acceptable to BDSL.

#### Menu and button filename naming standards

Files that make up (the states of) a button must adhere to a strict naming standard. In all other cases these files are considered images.

When a .psd file with button layers is provided, the layers must stick to the layer naming standard.

In both cases, BDSL will create a separate folder in its project directory and insert .png files for each of the specified .png files or creates .png files from the PhotoShop layers. The names BDSL uses to create its .png files is (slightly) different from the ones you are required to use as “source” for the menus.

The table below lists the names of the .png files you create and those that in the end BDSL creates in its menu folders. As example, a user created file “MyButton\_normal.png” ends up in a menu specific folder by BDSL created name “btnMyButtonN.png”.

state	name	postfix + file type
normal	file_name	_n.png

		_norm.png _normal.png .png (no postfix)
BDSL creates:	btn<filename>	N.png
selected	file_name	_s.png _sel.png _select.png _selected.png _selection.png
BDSL creates:	btn<filename>	S.png
activated	file_name	_a.png _active.png _action.png _activate.png _activated.png _press.png _pressed.png
BDSL creates:	btn<filename>	A.png
current	file_name	_c.png _cur.png _curent.png (spelling error!) _current.png
BDSL creates:	btn<filename>	C.png

When you provide menu and buttons as layers in a PhotoShop .psd file, the output is listed in the table below. As example, a user created file “MyMenu.psd” with many layers (the background images as well as one layer for each of the states of each button) ends up in a menu specific folder by BDSL with one .png file for each button and button state plus the background images. For example, the Normal state image for the button MyButton which is defined in layer btn:MyButton:N is stored in “btnMyButtonN.png”.

state	layer name	postfix + file type
normal	btn:name:N	
BDSL creates:	btn<name>	N.png
selected	btn:name:S	
BDSL creates:	btn<name>	S.png
activated	btn:name:A	
BDSL creates:	btn<name>	A.png
current	btn:name:C	
BDSL creates:	btn<name>	C.png

Quick corrections once you get the hang of BDSL

Making modifications to an existing menu can be done quickly if you modify the .png file in the BDSL created menu specific folder of the

project rather than your original source files. If the following sounds like “acracadabra” at this point – simply skip it until a later point in time.

If the menu was created from a PhotoShop .psd source file, you can modify the .psd file and import it as a (new) menu again.

The original and modified menus share the same menu folder (as they have the same name) created by BDSL. To update the BDSL menu, take the following steps:

1. change the contents of the .psd file of the menu. Existing layers keep their name.
2. import it as a new menu: this creates a “menuname 1” menu and creates new .png files in the menu folder for all new layers created and replaces the existing .png files if their layers were modified. Layers you deleted still remain present as .png files in the menu folder. You may choose to delete them manually or simply leave them there as they do no harm.
3. delete the “menuname 1” menu again. The .png files created are not deleted – they remain in the menu folder
4. open the original “menuname” menu in the Project View and Designer View. The menu now shows the updated version of itself.
5. In the “Objects View” and “Designer View” you may need to add additional (reused) buttons to new menu text selection options. The properties of the new objects must also be modified: what .png file to (re)use. For example for newly added buttons: in the new button object properties change its name tag “picture” into “button” and then load the individual button layers for the button states)

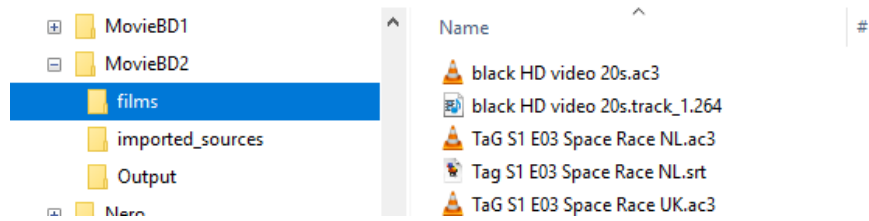
## Step 1: Get organized

This step is mostly identical to the steps specified in section “Step 1 Create new project” of the previous chapter.

To differentiate different projects in this tutorial, we copy the D:\MovieBD1 folder and subfolders to a new top level folder D:\MovieBD2 and open the project.bdmd file. This project file must be updated as it requires that all movie properties point to this new folder rather than the original.

However, you may simply add to the current \MovieBD1 project if you like.

Now that we are introducing menus into the project, the project folder needs to be enhanced by adding a new folder \imported\_sources for the menu sources such as PhotoShop layered files or set of .png files.



## Step 2: Include the movies

This step is identical to the steps described in section “Step 2 Include the movies” of the previous chapter. It may be postponed till after the menu has been defined and its navigation specified and checked during simulation.

The files need to be demuxed into audio and video streams that are compliant with the bluray specifications. Chapters are added. The Movie placeholders properties must be filled in with actual movie files.

In addition one menu background movie must be specified. If you have multiple menus, the same menu movie can be used. Switching between menus then will let the background movie continue to play. Here our silent black movie is called “black HD video 20s” that runs for 20 seconds (but BDSL repeats is endlessly in a loop).

## Step 3: Create the menus

Rather than starting the movie directly, in this project we add a menu that opens when the disc starts. From the menu we then select which movie to play.

We need to provide a menu structure to show the viewer of the disc which allows him to make a selection of what movie to play. Because movies and menus are independent structures, you may start creating the menus and their navigation first, using the movies only for their movie-entry placeholders.

This project uses a very basic menu: just a screen showing the available titles and allowing to select any one of those for playback. Once playing, the remote control buttons are used to change audio, subtitles and jump from chapter to chapter the same way as was done in the earlier project.

### Create a static background

The opening menu screen is a still image showing the titles of the movies. This menu must be created outside BDSL. It can be a .png file or a PhotoShop .psd file. In both cases BDSL will import them and store the menu in a menu specific folder. All buttons are also stored as .png file for each of their states.

Our simple project uses a single menu screen that lists the two movies with their titles and a button next to each title so you can select the movie and activate it (play it).

There are two ways to make a menu:

- full screen 1080x1920 pixel image with text and buttons
- several small parts. Each part only has the text or image to show. The rest of the menu is filled by the background menu movie

If it is a simple disc with a single (or maximum 3) menus, the full screen menu image can be used. If you have more menus, the second option of small parts must be used. The total pixel count of all menus must remain below 7 900 000 pixels.

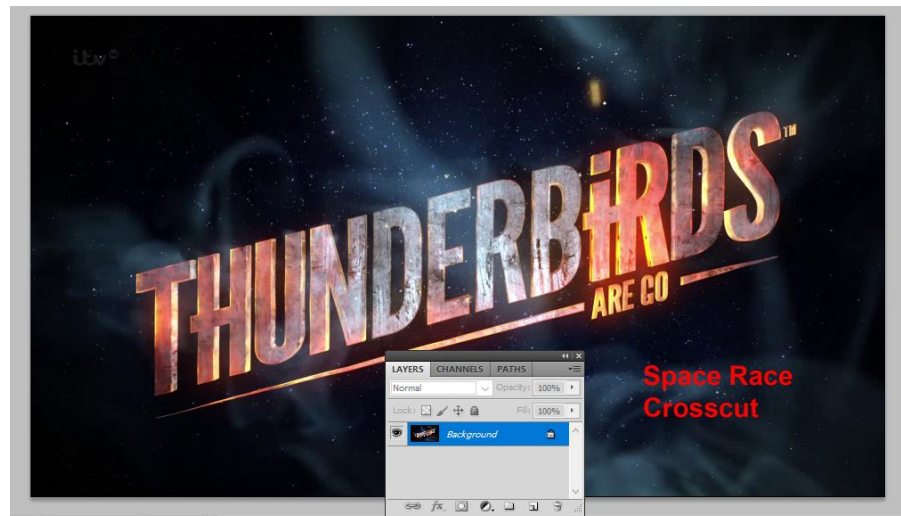
We will show you both approaches. In this project we'll use the full sized menu. In the next project, where we will add a setup-menu. this setup menu will be composed of smaller parts.

### Full sized menu

This method only works if a single menu (or maximum 3) are needed in the project.

Use any image editor to create a full sized (1080x1920 pixels) background image consisting of pictures and text. Buttons will come later in either different layers or as set of additional .png files.

In our project we use a layered .psd file with the background as a single bottom layer.



By default, PhotoShop names the background the “Background” layer. If you want to specify a different name, copy the background in a separate layer with its own name (and delete the background). Any layer not conforming to the naming convention for buttons is automatically becoming a flat picture image within BDSL. The .psd file is stored in the BDSL project directory folder D:\MovieBD1\MainMenu.psd .

If you do not use PhotoShop you create the background directly as separate .png image. Any name will do – BDSL will create its own .png file in a specific project menu folder it creates.



The background image is complete: all menu text is included, the buttons will follow later.

### Creating buttons

Buttons are selectable locations on the menu. We will create them with two states: “Normal” (which is always visible unless transparent) and “Selected”.

The two buttons we will add to the movie titles on the menu need to be added to the menu .psd file. Each button will have two states: normal and selected. This means that each button has 2 layers. In total we have 2 x 2 buttons and therefore 4 layers apart from the background layer.

For the “Selected” state of each button we create a yellow circle with a transparent (black since the background is mostly black) arrow. The “Normal” state is the outline of a grey circle.

Note: if the normal state is completely invisible (a blank layer) in PhotoShop, it is not imported into BDSL and it will look like there is no normal state. When you try to perform a “simulation” BDSL will tell you there is no “Normal” state image. The solution is to open the .png file of “S” state that is made by BDSL in the menu folder, to copy it under the same name but with “N” rather than “S”. Open that file, select the entire “S” image and delete it (make it transparent). Then save the file with its transparent content.

The yellow circle for the “Selected” state is in fact a text character from the “Wingdings” font (glyph number 0xDC, in normal text fonts it is usually “Ü”): ➤ where the black circle is coloured yellow by taking a yellow font colour. The font size is increased to fit the text of the menu background.

Of course for any project you can make the image as elaborate as you wish: small part of a photo, a home-made icon, anything. But here we keep it simple: a simple Wingdings character.

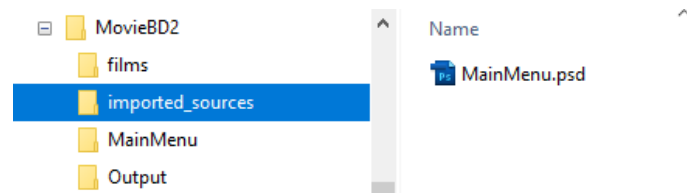
In PhotoShop a new text layer is created and only this one character is typed. The layer is stored under the name btn:Button:S .

The grey outline circle is another character from the Wingdings font (glyph 0xA1, usually “i” in normal text fonts): ○ where the font colour is chosen to be greyish. This layer is stored as btn:Button:N .

This way we have the two states of the button represented as two layers in the PhotoShop .psd file. When the .psd is imported as a menu, BDSL will show the menu background and a single button with two states.

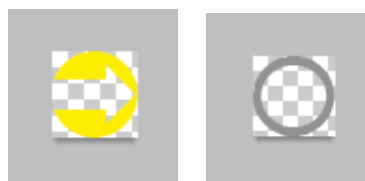
Within BDSL we can copy the button multiple times (reuse! the pixels only count once against the maximum of 7 900 000!). Each copy will get its own name and in its properties it will be connected to the specific movie or menu it can activate.

The final PhotoShop file with menu image and button layers is saved in the project folder under the new subfolder \imported\_sources under the name MainMenu.psd.



The figure above shows the two states of the button and the three layers in the PhotoShop file.

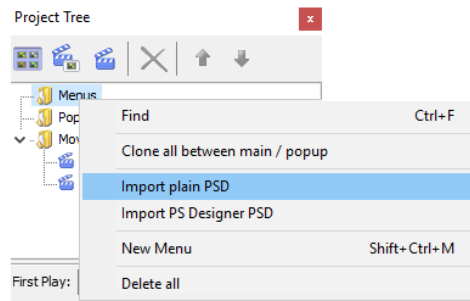
Each layer can also be created separately as 3 .png files (1 background + 2 button states). In this case the files are very small, completely transparent (checked background) except for the circle images. Both states are shown below as separate images as Button\_s.png (arrow) and Button\_n.png (circle) respectively.



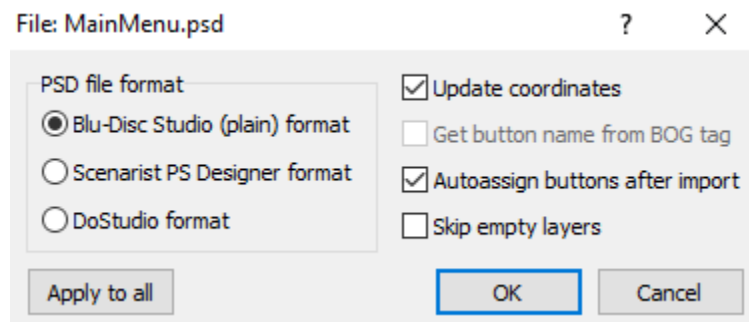
Although the two states of a button will overlap each other in the final disc production, they are shown here next to each other. Within the BDSL Designer View we can individually move those states until they overlap and “make” the one button.

### Importing menu and button files as .psd PhotoShop file

The menu becomes part of the BDSL project when it is imported into



the project. For this, the .psd file is imported using the Project Tree window of BDSL and right-click on the “menus” branch and select “Import plain PSD”. Navigate to the stored \imported\_sources\MainMenu.psd file and start the import. Once you selected your image file, BDSL wants to know what sort of file it is and how it should be interpreted. So it shows the next window.



For plain PhotoShop file leave the default choice of “Blu-Disc Studio (plain) format” enabled. If the menu was created using Scenarist or DoStudio software, you select those.

If your image file also contains empty layers (e.g. there is no image for the “Normal” state of buttons) do not check the “skip empty layers”.

### Importing menu and button files as separate .png files

If menu and button states are made as separate .png files, the import process is slightly different from importing a PhotoShop file. It requires using the “Library View” window of BDSL. This window is opened through View > Library or by pressing F6. This view is BDSL’s version of the Windows File Explorer.

Once open, you navigate to the \MovieBD2\imported\_sources folder where you saved the individual source files for menu and button states.

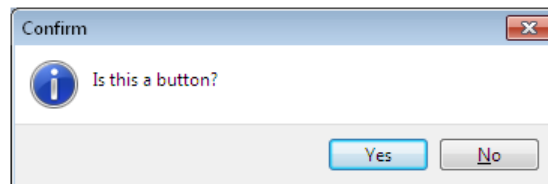
All .png files must adhere to a strict naming convention specified in the earlier section “Menu and buttons as separate flat image files” on page 44.

To import these files into BDSL you need to drag the set of files for all states of a single button from the Library window onto the Designer window. The process is repeated for each button.

You select those files by selecting each of them individually through mouse clicks while keeping the CTRL key pressed

The Designer window is opened via View > Designer (F2). To create a button for a particular menu, first select the menu from the Project Tree window. This synchronizes the Designer window for that menu. Whatever is already part of that menu is shown on the Designer window.

Now drag all files that make up one button from the Library view onto the Designer window. BDSL recognizes files that together make a button by asking:

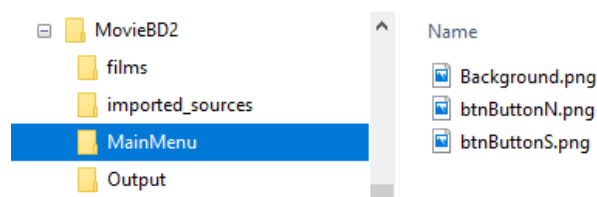


Confirming with “Yes” will create the button. Saying “No” will not import the files and not create a button.

Any file dragged onto the Designer window that is not part of a button automatically becomes part of the static (background) image.

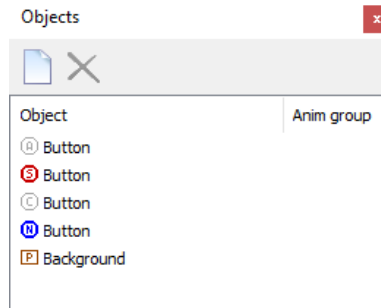
### BDSL Menu files

BDSL will then create the \MainMenu folder in the project directory and store the resulting .png files created from the imported files.



From this moment on, the menu in BDSL is built from these \MainMenu files. Any change made to these files directly immediately is reflected in the menu in BDSL.

Within the BDSL project, all elements that are part of a menu are shown in a separate window of the BDSL project: the “Objects” view. This is opened through View > Objects or by pressing F4. Currently there is one menu composed of one background image (P) and one button with two implemented states (N and S).



The menu bar has a set of “state visibility” icons. These allow you to specify which states are shown on the Designer View but also which ones are highlighted on the Objects View.



The icons with blue background state visibility for the Normal, Selected, Activated, Current state respectively. By default only the Normal state is shown. For our current project with buttons with Normal and Selected states, it is useful to enable/make visible the Normal and Selected states (purple and red button).

The names of image and button are the same as those given to the individual .png files or the PhotoShop layers.

There is a 1-to-1 correspondence between the .png files stored in the menu folder created by BDSL and the objects shown in the Objects window.

### Buttons in Designer View

The Designer window is opened via View > Designer (F2). The buttons shown on the Designer View can be manipulated:

- states of the same button can be positioned on top of each other
- the position of a button can be changed to align with the menu text it belongs to
- a button can be duplicated

Only the buttons and their states are shown that are set visible through the “state visibility” icons on the menu bar as mentioned in the previous section.



Like movies, buttons also have properties. These will specify what happens when a button is selected or activated. One property is important: the name of the button must be unique. BDSL will give them unique names as “Button”, “Button1” etc but these are less than

informative. The first thing to do once a menu has all its buttons positioned correctly, is give each button a descriptive name.

Buttons and background images are also ordered much in the same way Photoshop layers have a particular order and can hide lower lying elements.

The top most button is the one that is initially in its selected state when a menu is displayed on screen.





The buttons at the top of the list may occlude lower listed buttons. For this reason, static pictures of the menu background should be at the bottom of the list. Any position higher up the list may hide some of the buttons.

### Copying buttons

In our current menu there is but a single button defined although there are two movie titles listed. Each title should have its own button.

Fortunately, this is easy to do through the Designer View window. The Designer window is opened via View > Designer (F2). The “Normal” and “Selected” states are set visible.

Buttons are fixed in their position until you allow them to be moved:

- move all states of the button at the same time by “unlocking” the fixed position of the button by clicking on the menu bar icon  so the lock opens . You can now move each button to the position you want. All state images remain in their respective positions.
- move state images individually. This first of all requires that the button can be moved at all (see previous) but in addition you must be able to move state images separately in order to place them on top of each other to make the “one button”. This is achieved by clicking the icon  such that it becomes 


Initially we have the one button with 2 states.

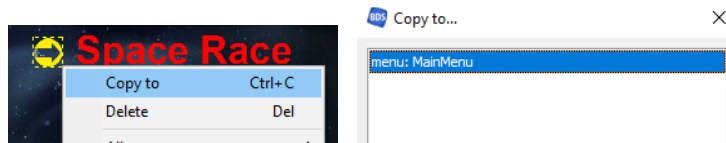


By unlocking the states we can position both state images on top of each other:



This still is a single button. We need a second one for the “Crosscut” movie. For this:

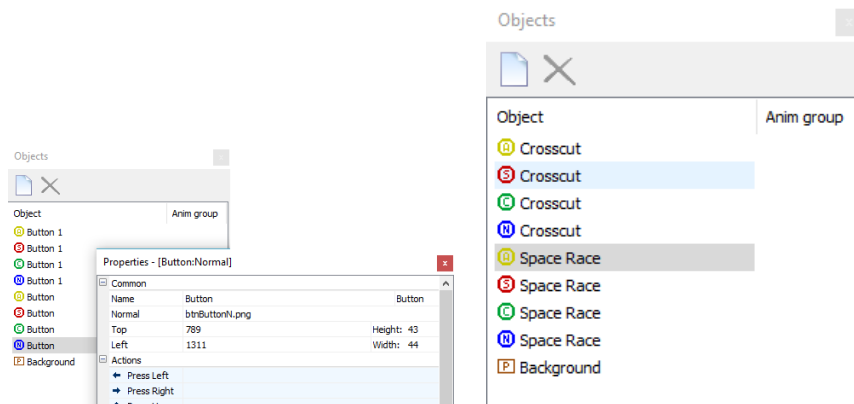
- we “lock” the states again 
- Right-click on the yellow button and on the opening popup window specify “Copy To” and select the menu to where the button must be copied to. We only got one menu, so we select that.



- The copy is positioned on top of the original. Therefore, use the mouse to select the copy and drag it to its new position



- Repeat the last two steps for as many copies as we need of the button
- Click on each button in the Designer View and open the properties View of that button and give it a proper name. (Alternatively: click on a button in the Objects View and the properties of that button will be shown).




The new names of “Button 1” and “Button” now reflect the movie the button is positioned to (“Crosscut” and “Space Race” respectively).

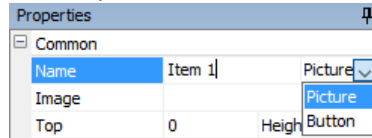
### Adding buttons later


In some cases you will create a new project but would like to reuse some of the button images from an earlier project.

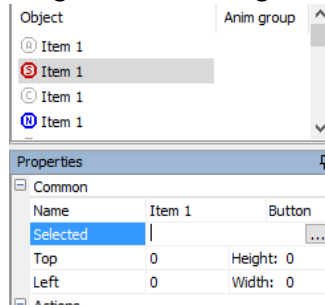
In this case, you create the background parts of the image by importing the PhotoShop file or separate .png images.

Look in the “Objects” view of the menu once it is imported into BDSL. It will only show “P”-type picture elements as menu backgrounds.

- Click on the “Add object” button (  ).
- The object view now shows a new “Item1” under “name” and assigns it a “picture” property
- Change the “picture” into “button” by selecting another value in the dropdown box.



- Ensure all states of a button are shown in the object view by enabling these states by clicking on the “state visibility” icons 
- Select each state of the button in turn and assign what .png image should be assigned to that state.



- You have now completed all properties of the button

If multiple copies of the same button are required, you can copy them (select, copy, paste) on the menu as described in the previous section “Copying buttons” on page 54.

Once done, you need to rename them to a sensible name. After that each button is assigned additional properties (what action to take when selected, how to navigate to other buttons etc) as will be described in the sections below.

### Sorting and aligning buttons and images

Looking at the button order in the Objects View shows that the Crosscut button is the top most one and therefore the one shown as selected by default when the menu opens. This is not what we want. We must re-arrange the button order.

You do this by:

- open the Objects View
- select a button (any visible state will do)
- move its position up or down using the positioning icons on the project menu bar

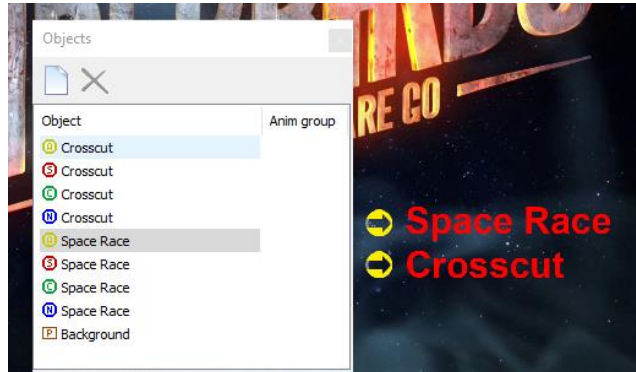




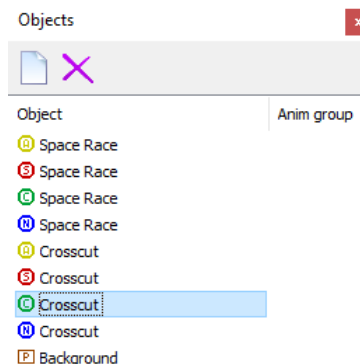
where icons indicate “move to the top”, “one position upwards”, “one position downwards” and “move to the bottom” respectively.

- Repeat these steps for all buttons until the order is as desired. Ensure that all buttons are in a higher position than the static backgrounds.

The initially incorrect order shown below



is set straight after rearranging the buttons.



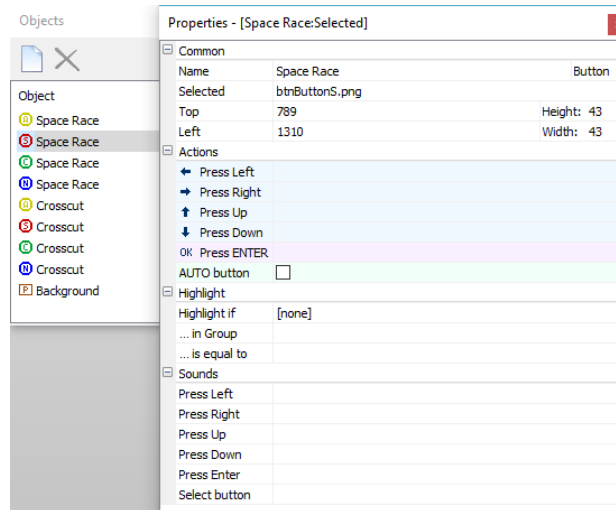
You can further align buttons with their left/right sides, top/bottom sides by selecting these buttons in the Objects View and via right-click select the “Align” menu choice.

### Button navigation and button actions

Now that all buttons are in place, the navigation needs to be completed by filling in the properties of each button. This requires the “Properties” window to be open (View > Properties (F11)).

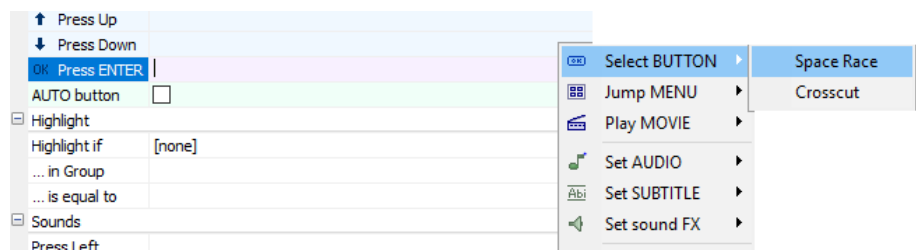
The important settings are:

- what to do when an up / down / left / right button is pressed on the remote control. What button will then get selected?
- what to do when the “OK” or “Enter” button is pressed?



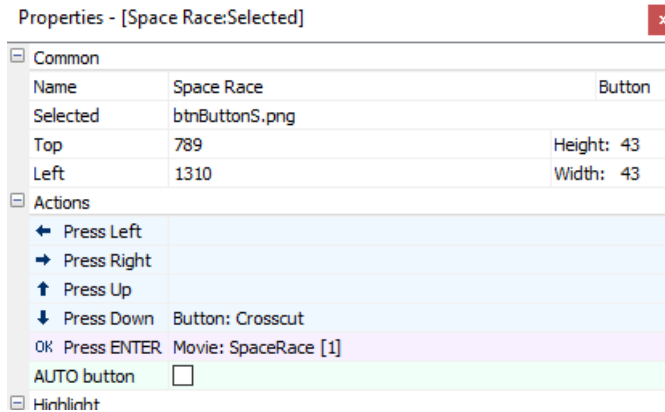
To specify this follow these steps for each button's properties:

1. Select "Press Left". When the next button is only up or down, leave this empty. Otherwise use the ">" button at the far right to specify what other menu or button to go to.
2. Select "Press Right" and repeat the previous considerations
3. Press "Up". When there is a button above the selected button, indicate it. If there is no button you may want to roll on to the bottom one. Or you may want to do nothing since you're already on the top. Use the ">" button at the far right to indicate what to do.
4. Select "Press Down" and repeat the previous considerations.
5. Select "Press Enter" and indicate what to do when this button is activated: start a new menu, start a movie.



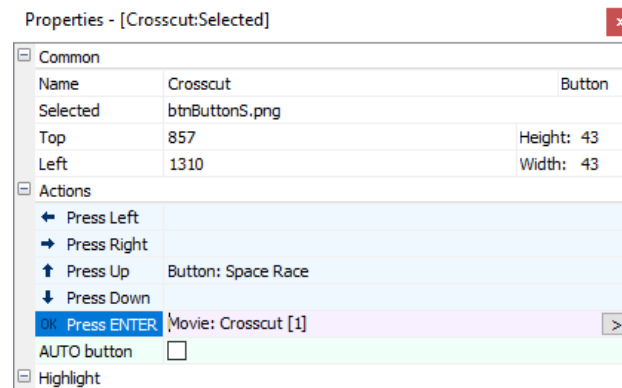
For the two movies with their buttons, the top button (next to Space Race) is set to respond only to

- Press Down moves to next button (Crosscut)
- Press OK starts movie "SpaceRace" from chapter 1




The second button only responds to:

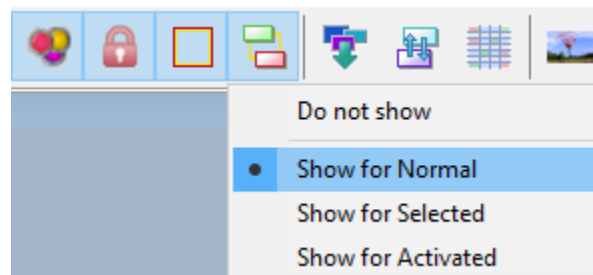
- Press Up moves to the previous button (Space Race)
- Press OK starts movie “Crosscut” from chapter 1



### Navigation checks

A new feature added in V1.0.9.50 is the new menu button (  )

to allow you to show the navigation you specified in the properties windows for the various buttons. Clicking on the button allows you to select what navigation to show.



The menu button is in the same block as the locking of button states. It only shows navigation between normal states, selected states, depending on your choice specified in the menu.

Showing the normal button navigation on the project we created shows the links indicated as in the illustration below.



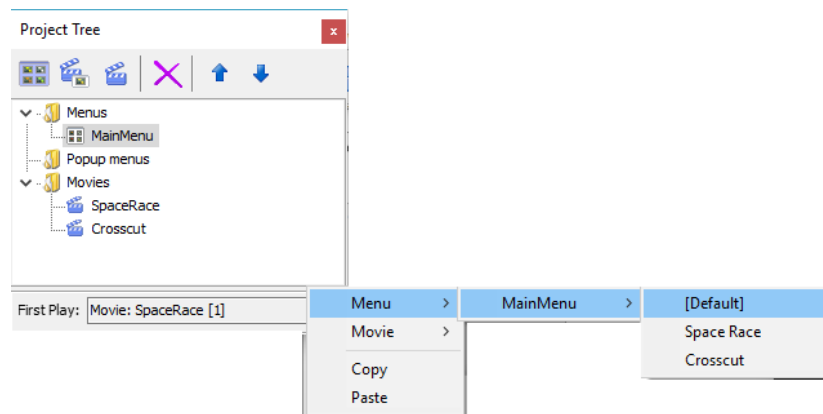
The colours of the arrows can be set using the menu option Tools > Options.



### Menu start

When the bluray disc starts it shows one item first. We must specify what item this is.

The Project Tree window (View > Project Tree (F3)) has a "First Play" item at the bottom of the window. Here we specify it must start with the MainMenu and select the Default button. On first opening this is the top most button. Hence the importance of proper objects sorting. Alternatively, you can specify explicitly which button you want to select.

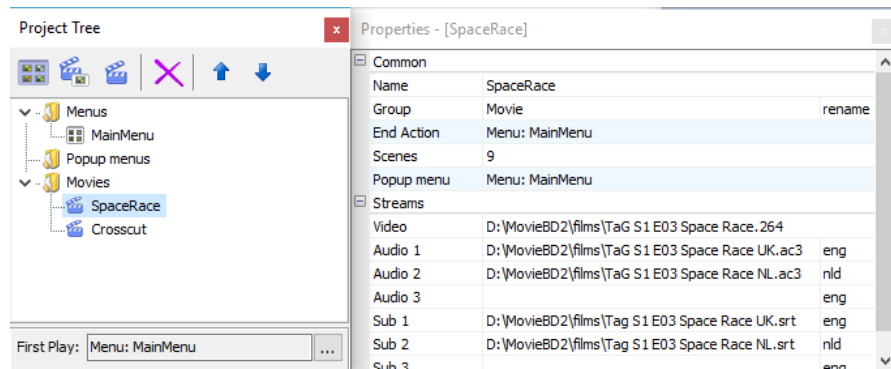


### Movie action

Once a movie plays, you need to specify what will happen once it is finished. This is specified in the "End Action" property of the movie.


A movie can also be interrupted using the "popup menu" on the remote control. You also need to specify what happens then. Without popup menus, we currently jump back to the main menu too.

Selecting the menu's "default" will select the same button as was selected when the menu was shown earlier. You can steer navigation here. When a movie ends, the End Action may specify that the menu is shown again but with the next movie on the list as selected item.



**Note:** the Lite edition does not allow for a menu where you can both select a single movie to be played and afterwards return to the menu as well as a “play all” option. It’s either one or the other. The paid versions like BDS Standard allows this as it requires the use of playlists that is not part of the Lite version.

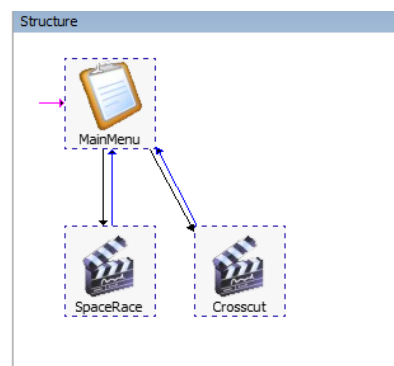
### Action Matrix

The actions specified for all buttons are also conveniently shown in the Action Matrix window (View > Action Matrix (F8) or by menu icon ) and rather than using the properties window you can define the actions directly into the Action Matrix too. The contents of the Action Matrix window changes with what is selected in the Project Tree window.

## Step 4 Check the project

### Menu structure

The whole set of navigational and action instructions specified are shown graphically in the “Structure” window (View > Structure (F7)),




It shows with a red arrow how the disc starts playing (with a menu) and how from a menu one can perform an action (black arrow) to play a movie and what happens at the end of the movie (blue arrow back to menu). This menu structure visually represents the navigation implemented. It can quickly indicate if there are orphan elements that are present but can never be reached or whether there are dead-end alleys in which you can get but never can get out of.

With many movies or menus this structure overview quickly becomes less useful as action lines seem to merge together. The ultimate test is to perform a navigation simulation

### Simulation

Simulation only checks the navigational elements of the project. You can exercise these thoroughly to ensure all menus are linked together, each button can be reached.

The menu has a special “Play” button  to simulate the working of the menu navigation you specified. (Simulation (Test Menu) (F9)).

Before simulation starts, BDSL first compiles the project to ensure all elements are present and connected. Where a movie placeholder property has no “End Action” or “Popup Menu” action defined, this is logged and you can take action to correct this first before starting a new simulation.

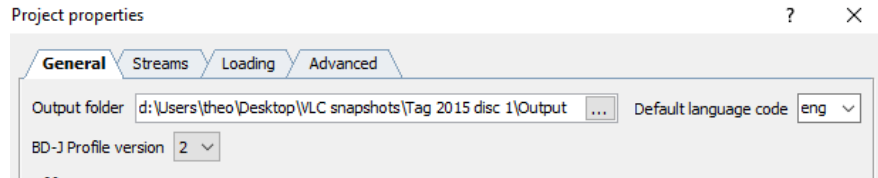
The result of the simulation is shown in a separate window. In the default project view this window is part of the project view (in the right bottom corner).

```
BDS Running...
mode: Simulation

19:35:24 - Validating...
19:35:24 - Preparing...
19:35:24 - Adding video asset for "MainMenu"
19:35:24 - Adding audio asset for "MainMenu"
          BDID = 00001 (menu "MainMenu")
19:35:24 - Adding video asset for "SpaceRace"
19:35:24 - Adding audio asset #1 for "SpaceRace"
19:35:24 - Adding audio asset #2 for "SpaceRace"
          BDID = 00002 (movie "SpaceRace")
19:35:24 - Adding video asset for "Crosscut"
19:35:24 - Adding audio asset #1 for "Crosscut"
19:35:24 - Adding audio asset #2 for "Crosscut"
          BDID = 00003 (movie "Crosscut")

19:35:24 - Preparing menu...
19:35:24 - Step 1/4 ...
19:35:25 - Step 1/4: done
19:35:25 - Step 2/4 ...
19:35:25 - Step 2/4: done
19:35:25 - Step 3/4 ...
19:35:25 - Step 3/4: done
19:35:25 - Step 4/4 ...
19:35:25 - Running ...|
```

If an error occurs stating “Image buffer overflow in profile 1”, change the project properties to use profile 2 (menu Project > Project Properties > General tab, “BD-J profile version” set to 2).



You use the keyboard arrows to move between buttons and use the <enter> key to simulate pressing the OK on the remote control. If this OK jumps to another menu, this menu will show. Upon return to the earlier menu you can check whether the specified button or the “default” (=last OK-ed) button is selected.

Only when the “OK” button is pressed to activate a movie, the movie is not shown. Instead, a black window is opened where the movie should be. This “movie” can be stopped by pressing F5 after which you return to the menu.

The simulation stops when the simulation window with the shown menu is closed. Any navigational errors you found (wrong links between buttons, no links, a menu is not opened etc) can be rectified. Repeat simulations until you’re satisfied the entire navigational structure is correct.

## Step 5 Create the project

This step is identical again to the step described in the previous chapter (see “Step 4 Build the disc” on page 28).

The progress of the muxing and final result of the building is shown in a separate window shown below. When you use the default project view this window is part of the project view and is located in the bottom righthand corner.

```

Finished!
19:40:13 - Preparing...
19:40:13 - Adding video asset for "MainMenu"
19:40:13 - Adding audio asset for "MainMenu"
          BDID = 00001 (menu "MainMenu")
19:40:13 - Adding video asset for "SpaceRace"
19:40:13 - Adding audio asset #1 for "SpaceRace"
19:40:13 - Adding audio asset #2 for "SpaceRace"
          BDID = 00002 (movie "SpaceRace")
19:40:13 - Adding video asset for "Crosscut"
19:40:13 - Adding audio asset #1 for "Crosscut"
19:40:13 - Adding audio asset #2 for "Crosscut"
          BDID = 00003 (movie "Crosscut")

19:40:13 - Preparing menu...
19:40:13 - Step 1/4 ...
19:40:14 - Step 1/4: done
19:40:14 - Step 2/4 ...
19:40:14 - Step 2/4: done
19:40:14 - Step 3/4 ...
19:40:14 - Step 3/4: done
19:40:14 - Step 4/4 ...
19:40:15 - Step 4/4: done

19:40:15 - Muxing menu "MainMenu" (BDID: 1)

19:40:16 - Muxing movie "SpaceRace" (BDID: 2)

19:40:37 - Muxing movie "Crosscut" (BDID: 3)

19:40:56 - Updating movie playlist "SpaceRace"
19:40:56 - Updating movie playlist "Crosscut"

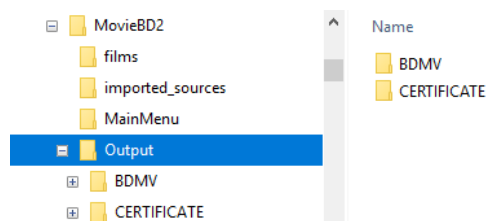
Fixed images: 7
Src overs: 5
Groups: 11
Fades: 0
Translators: 0
Scales: 0
Assemblies: 2
RC handlers: 2
Segments: 15
Segment-dones: 1
TOTAL: 43

19:40:57 - Finished!

```

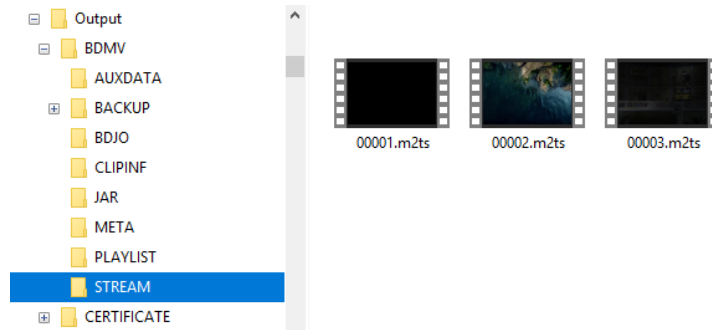
This window must be closed once the build process completed before you can do anything else.

The bluray compliant file structure is written in the folder indicated in the Project Properties:



with the actual video movies stored in the STREAM folder – just as large as their original source input (before they were demuxed).





### Step 6 Test run the disc

This step again is identical to the one described in the previous chapter (section Step 5 Test running the disc on page 32).

If you don't see the background video displayed properly, check that it does have 1920x1080 pixels. Any other may result in improper backgrounds that may show only part of the video or none at all.

### Step 7 Burning the disc

This step is identical to the one described in the previous chapter (section Step 6 Burn the bluray disc on page 34)

## Additional possibilities while creating a simple bluray disc

This chapter simply provides some additional features you can use while making a simple bluray with menus. Features that may limit the tedious amount of work while connecting all the elements of a menu.

### Creating an intro movie

Officially you cannot make an introduction movie that is played when the disc is started.

But you can make a sort-of introduction:

1. Add a movie object to the Project Tree
2. Provide the audio and video track information
3. Set the “First play” of the Project Tree to play this intro movie.
4. In the intro movie property specify “End Action” (as well as “Pop up menu”) and indicate the real main menu to show when the intro finishes (and specify which item to select by default).

Running the disc now will start the intro movie and jump on to the main menu.


Please note that you ought to add this intro as one of the last things you do on the disc. Because it is the “First Play” setting, it will “run” when the simulation mode is used. Simulation does not play back movies and you get “stuck” with a black screen during simulation. Stop the simulation (close window or press F5), set “First Play” to your main menu and simulate again. Only when satisfied with all, modify the “First Play” back to the intro movie (and ensure it points to the main menu once its run completes).

### Action: Where to go next

All movies mentioned must revert back to the menu they are listed on when the movie is interrupted or ends:

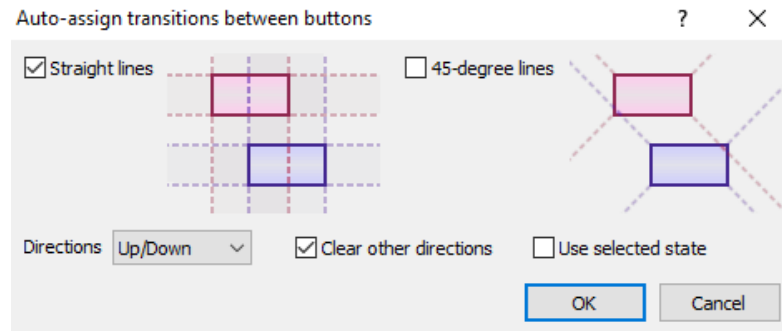
- if interrupted by pressing the “popup menu” button (sometimes called “Title”) on the remote, return to the main menu (specified in the “Popup Menu” property) and highlight the button that starts the movie
- If completed, the “End Action” can specify the same menu but go to next movie button on the list.

### Navigation between buttons


When buttons are aligned in a row or column, often you want the “up” and “down” navigation to be performed to the adjacent button. Rather than specifying this all manually in the property items of each button, you can automate this process using the “auto assign” button () in the menu.

First open the Object View and select all buttons that take part in this automated navigation assignment. Then click on the menu button “auto

assign” which gives you two options: “auto assign between buttons” and “auto assign between music”. Select the “auto assign between buttons” option. This opens the next window in which you can specify how the navigation must take place: top down, bottom up, left right, right left or diagonal.



After the selection and pressing OK, the “Press UP” and “Press DOWN” (or “Press Left” and “Press Right”) properties of the buttons is automatically filled.

You can check on the result by inspecting the links created using the “Show navigation links” button (  ) on the menu bar.

## Copying properties between movies

Any film clip to show, must be a “movie” entry in the Project Tree view. When you insert multiple movies you need to set all their properties. Again, if some properties are the same between movies, BDSL helps you by copying information.

Select a movie with the appropriate settings, right click on it in the Project Tree window to show its popup menu.

Find	Ctrl+F
Copy properties to all	
Copy properties to all empty	
Clone tree item	Ctrl+C
Clone tree item as static	
Clone between main / popup	
Clone all between main / popup	
Import plain PSD	
Import PS Designer PSD	
Move Up	Alt+Up
Move Down	Alt+Down
New Movie	Shift+Ctrl+V
Delete tree item	Del
Open scenes	Enter
Open scenes (direct editing)	Shift+Enter

“Copy properties to all” is useful to copy the same properties to all other movie entries regardless overwriting whatever is specified (including any specified movie, audio and subtitle tracks).

“Copy properties to all empty” is more subtle: it fills only the empty properties of the movies, leaving any set property (such as what movie to play) alone.

### Changing background image of a menu

Since the background image is based on a .png file that BDSL created in its own menu specific folder, any modification of the background to reflect in the project must be made to this created file.

The file name is mentioned in the Object view for the background properties.

Properties - [Main Menu:Image]

Common	
Name	Main Menu
Image	Main Menu.png
Top	0
Left	0

Modify the file to your liking and BDSL will use the new version from here on.

Alternatively, you may modify your own source file and re-import it into BDSL as a new menu. However, many of the menu parts as well as the BDSL menu folder name are the same. The import by BDSL ensures that many of the newly created .png files replace the old ones. Therefore the changes in the menu are seen on the original menu as well as the newly created menu. Simply delete the new menu and all modifications made in your own .psd file or set of .png files show up in the original BDSL menu. This is what is referred to on page 45 in section “Quick corrections once you get the hang of BDSL”.

## Project 3: Creating a bluray disc with setup menu for audio and subtitles

### The project goal

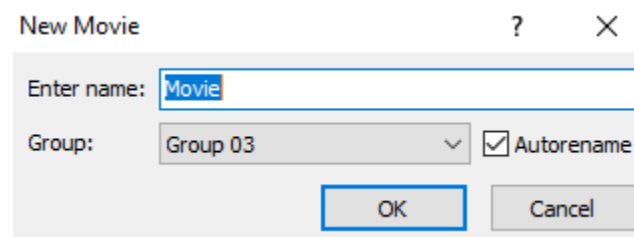
We expand the created second project by adding a new menu item on the main menu, called “Setup” that will open up a new menu to show the languages that can be selected as audio and/or subtitle. This Setup menu is a new, second menu. It will be made of individual parts rather than being a full screen image. This way fewer pixels are used (only a total of 7 900 000 is allowed for all menus together). This approach works for all menus of course. But if you have fewer than 3 menus you can use 3 full screen menu backgrounds without running into trouble.

The setup menu also uses the “Current” state of the buttons to show what the current setting for audio and subtitles is. This project extends the previous one by:

1. adding a second menu that is referred to from the main menu and that can return to the main menu
2. using button “Current” state as well as “Normal” and “Selected”
3. building the menu of parts rather than full screen

### What you need to know about Movie groups first

You may have noticed that adding a new movie placeholder to the project automatically creates a new group in which the movie is added. If a check is set on the “Autorename” box the generic “Group XX” name is automatically changed into the movie name. Effectively, each movie will be in its own group.



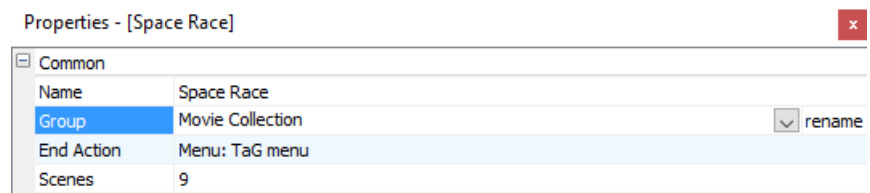
What’s the point of a group? The settings for audio and subtitles are the same for all movies that share a group. This makes it easy to have a setup menu for the movie group to select the audio and subtitle streams to use and apply that choice to all movies in the group.

Since the setup specifies what track number to use, you must ensure that all movies have the all tracks sorted identically. For example, all movies with 2 audio tracks have audio track 1 for English dialogue and track 2 for the Dutch dubbing. If you set audio to track 2 it is that track that is played regardless. That should be the Dutch track, but if by mistake one movie has a French track as audio 2, the viewer will hear French despite of the setup for “Dutch” (in fact for track 2). The property indications “eng” and “nld” for both languages are used to be displayed on screen when audio is selected by the remote control audio select

button. It is not used internally by BDSL. The program uses the track number.

Movies can be joined to a group by changing the “Group” property of the movie placeholder accordingly. This can be done by using the dropdown list icon “V” in the “Group” property and select one of the already existing groups. If a new name is wanted, double click on the “rename” button and rename the group name shown on the Group property line. A single click on “rename” does nothing.

**Note:** to rename a group name, double click the “rename” text at the end of the “Group” property value. There is no special “group” item in BDSL. The group names are entered as text value in the movie property. A new string value indicates a new group.



## Step 1: Get organized

This step is mostly identical to the steps specified in section “Step 1 Create new project” of the first project.

To differentiate different projects in this tutorial, we copy the D:\MovieBD2 folder and subfolders to a new top level folder D:\MovieBD3 and open the project.bdmf file. This project file must be updated as it requires that all movie properties point to this new folder rather than the original. This is true for all objects and their images (like buttons and background image on menu).

In normal situations you would simply stay in the first project and make changes there. There is no problem if you decide to do this yourself.

There are no new folders to add nor movie files. We will add a new setup menu and button state in due course.

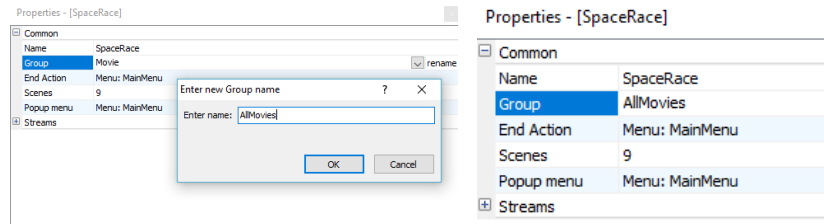
## Step 2: Include the movies

This step is identical to the steps described in section “Step 2 Include the movies” of the first project. It may be postponed till after the two menus have been defined and their navigation on menu and between menus is specified and checked during simulation.

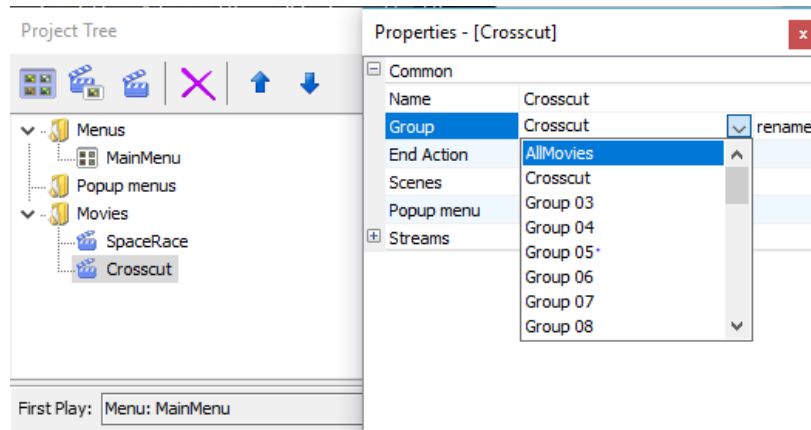
We do need to move all movies into the same movie group. (If in another project not all movies have the same audio and subtitle tracks, only add the movies into one group that have the same track types).

To do this, open each movie placeholder property window and specify a groupname. In this example project we use “AllMovies” as group name.

The name “AllMovies” does not yet exist. Therefore, open one movie (e.g. SpaceRace) and double click on “Rename” on its Group property and change the current group name into “AllMovies”.



The remaining movies must also be added to this group but the new name is now listed in their dropdown list of the group and easily selected.



All movies are now part of the “AllMovies” group and setting audio and subtitles for this group sets them for all those movies.

### Step 3: Add/Insert setup menu

#### Create Setup menu as set of background elements

Rather than using the remote control buttons to select audio and subtitle track, we implement it as separate menu. The remote control can still be used for this purpose if so desired.

The menu will consist of a static image and the text:

- Audio
  - English
  - Nederlands
- Subtitles / Ondertitels
  - English
  - Nederlands
  - None / Geen
- Main Menu

The text lines will get buttons to set the preference and the Main Menu item is needed to return to the main menu to select the movie to play.

The text block can be made of individual pieces or as one .png file or PhotoShop layer. The image will be a separate layer. We will reuse the button from the Main Menu so it will be copied into the menu later.

Here we will use a PhotoShop file with two layers: one of the image and one for the text. The size of the image is set to 1080x1920 pixels so we know the boundaries within which our elements must fit.

You can create separate .png files for the menu and import those as elements of the menu. This will be explained shortly.

The final setup menu may look like the picture below. The two layers (red text and picture) are visible on a transparent (checked) background. This background will be provided by the menu movie. Since this is chosen to be entirely black and silent, the menu will appear to have a black background.



You need not worry about proper positioning yet. Once made part of BDSL you can use the Designer View window to move objects around to their final location. The one thing you cannot do in BDSL is resize the objects. You need to use the right size in your menu design, but need not worry about the final positioning.

The setup menu file is stored in the D:\MovieBD3\imported\_sources folder als SetupMenu.psd.

#### [Import Setup menu into project as psd file](#)

The Setup menu becomes the second menu in the project. It is added by opening the Project Tree and right-click on the “Menus” branch. From the dropdown menu, select the “Import plain PSD file” and navigate to the SetupMenu.psd file.


After import, the Project Tree view shows two menus. Ppen the “Objects”, “Properties” and Designer views also.

#### [Importing Setup menu into project using .png files](#)

Each layer can be created using an image editor that can output .png files and allow those files to have transparent parts.

When each file looks similar to a layer in PhotoShop, you perform the following steps:

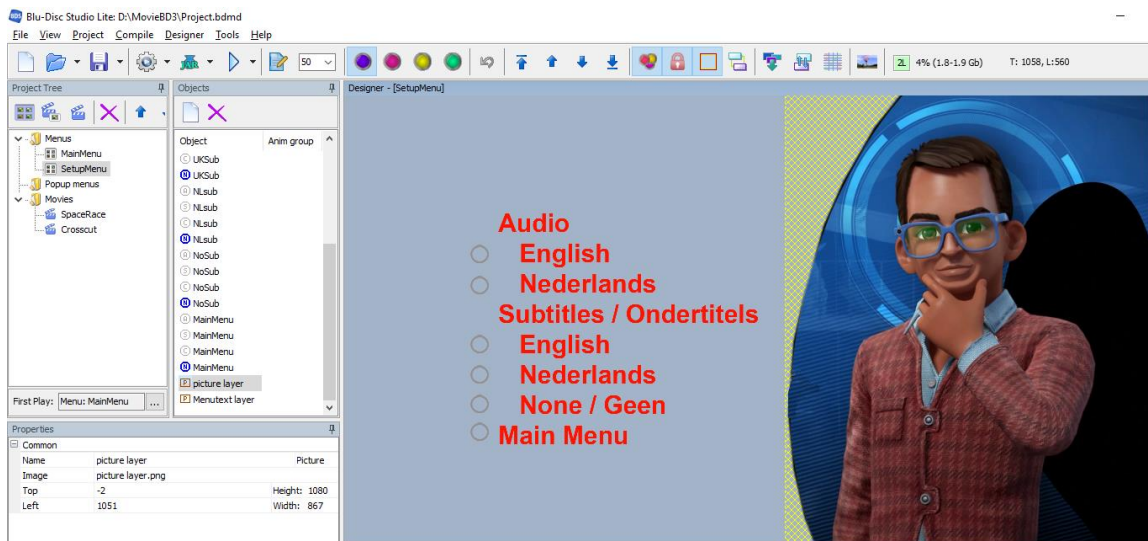


1. Right click on the “Menus” branch of the Project View Window
2. From the dropdown menu select “New Menu” and provide it with the name “SetupMenu”. This creates a blank menu without objects.
3. Open the Objects View. Select “SetupMenu” on the Project View. This will synchronize the Objects View for the menu. There are no objects yet
4. On the Objects View, click on “Add” (icon ). This creates an object named “Item X”.
5. Open the properties View. Select “Item X” on the menu objects view.
6. Rename the name of “Item X” to something meaningful (such as “menu text” if we’re going to open the menu text file)
7. Click on the property “Image” . This opens a file navigation window. Navigate to your source file (for example the file containing the menu text) and open it. The Setup menu now has its first object.
8. Repeat steps 4 to 7 for each new object on the menu. In our example setup there are only 2 objects: image and menu text.


If you want to add buttons as objects, use the same procedure as in the previous project (drag button state files from Library view onto Designer View and go from there).

### Customizing the setup menu

Clicking on the “SetupMenu” of the Project Tree view synchronises the other windows to show their information on the SetupMenu.

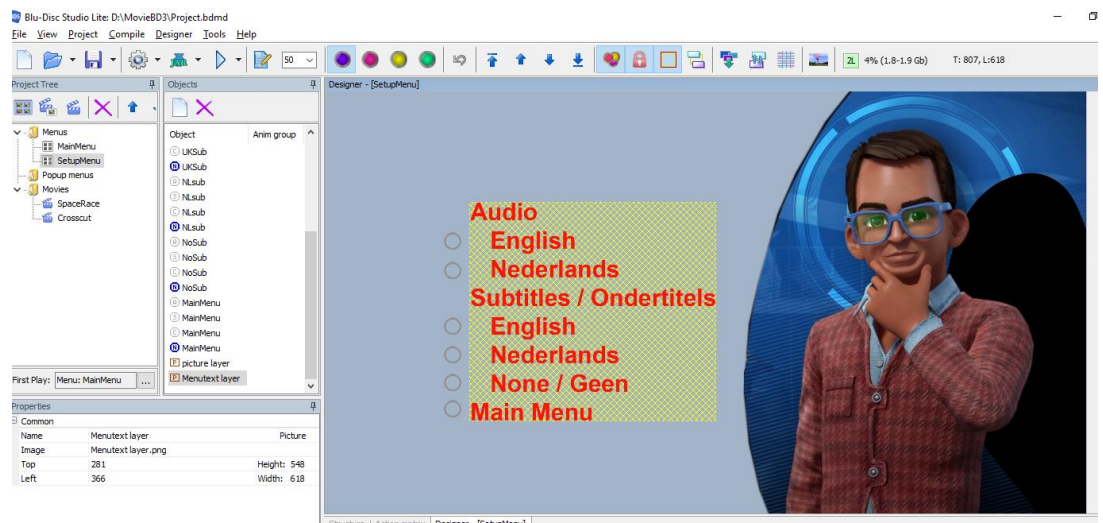


It shows in the Designer View the two layers against the gray background (to be filled by the menu movie). It has two objects, one called “picture layer” and one “menu text layer” (the names of the two



PhotoShop layers or of the individual .png files). When the “picture layer” is selected as object, this is highlighted on the Designer View by a yellow hatched box provided the “Show Selection” button on the menu bar is enabled (  ).

Notice that according to the property information shown above, the picture only takes a rectangle of pixels (1080 high and 867 wide) instead of full screen 1920. The curved left side is fitted within the narrowest rectangle possible. The transparent pixels shown as grey background within the rectangle do count as pixels for the maximum total pixel count of 7 900 000.

Selecting the menu text layer object surrounds the menu text with the yellow hatched box that is sized 548x618 pixels.



Rather than selecting any object in the Objects View, you can also select an object directly in Designer View. That will automatically synchronize the other windows (objects, properties) with the selected object.

Using the Designer View you can move around the individual objects to their final location. Note that this only works when you unlock the objects by setting the icon  to the state  by clicking on it in the menu bar.

You cannot resize the objects nor change them (adding or removing text). This needs to be done in the original source files or the .png files created by BDSL.

The import of the new menu objects resulted in BDSL creating a new folder in the project folder, containing its own .png files made from the Photoshop .psd or your own .png files.



Any change made directly to these files will show on the BDSL project. Any changes made to your own files do not – unless imported again.

All that remains to be done is to assign a menu movie to the SetupMenu. Take same same one as used for the MainMenu. This way switching between menus will not interrupt or restart the menu movie but let it continue.

#### Updating the MainMenu with extra list option

Although we can move from the SetupMenu to the MainMenu (once the buttons are in place), the MainMenu has no option for the Setup Menu. There are two ways of accomplishing this:

1. Modify the sources, import them again as a new menu and delete the new menu.
2. Edit the .png files made by BDSL in the specific menu folder

The second option seems the easiest one for those using separate .png files. Here we will modify the original MainMenu.psd file and re-import it as option 1 suggests.

The only change to be made is in the background layer of the MainMenu: add a line with “Setup”.

It may become a separate text layer, but we’ll merge it with the rest of the image – saves pixels as otherwise the total 1080x1920 pixel image of the background layer would be increased by an extra text layer.



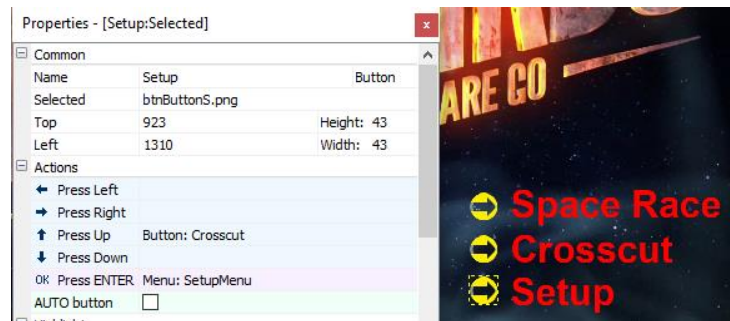
Then the following steps are taken:

1. Save the MainMenu file, overwriting the old one without the Setup line.
2. Use the BDSL Project Tree view to import this MainMenu.psd file as we did before. This will create a new menu item “MainMenu

- 1". This menu will have the new "Setup" line as well as the one button in two states.
3. The original MainMenu also has the same background as MainMenu 1 since the same set of .png files are used since the new imported menu shares the same "MainMenu" menu folder of BDSL since the imported file has the same name as the original main menu. The original MainMenu has two buttons however and their states overlap – just as they were made in the previous project.
4. Delete the new "MainMenu 1" menu. The .png files BDSL created or replaced in step 2 remain.

We only need to "patch up" the main menu by providing an extra button to place in front of the "Setup" text and fill in the properties of the button:

1. Copy the Crosscut button and paste is copy into the MainMenu. Rename it from "Crosscut 1" into "Setup" (see section Copying buttons in page 54)
2. Ensure from the Objects View of the MainMenu that the Setup button is the last button on the list (each new button is by default placed on top).
3. During navigation from the Setup button the Press UP action must point to the "Crosscut" button (at the same time, the "Crosscut" button must be modified that it has a Press DOWN property that now points to the Setup button)
4. The Press ENTER property of the Setup button jumps to the SetupMenu.



### Adding button state "Current" to prototype-button

The Setup menu is now part of the project but has no buttons – just background elements.

The one button that does exist, has two states, and in the \MainMenu folder of BDSL each state is represented by one file. Either btnButtonS.png (Selected state) or btnButtonN.png (Normal state).

We need a “Current” state for the buttons on the Setup menu. For simplicity we want it to look like the Selected state but in red colour rather than yellow.

The easiest way to do this is to open the btnButtonS.png file in the MainMenu with an image editor and recolour it red and then save it under a new name: btnButtonC.png. This name is required by the naming conventions of BDSL.

We save the new state file in the \MainMenu folder as this keeps all button state files in one location. Any other location is fine: as long as the property of the button state refers to the correct file.


The end result will have the content of the btnButtonC.png file as shown below.









In PhotoShop you may use the “eyedropper” to select the yellow colour and then fill the selection with a red colour.

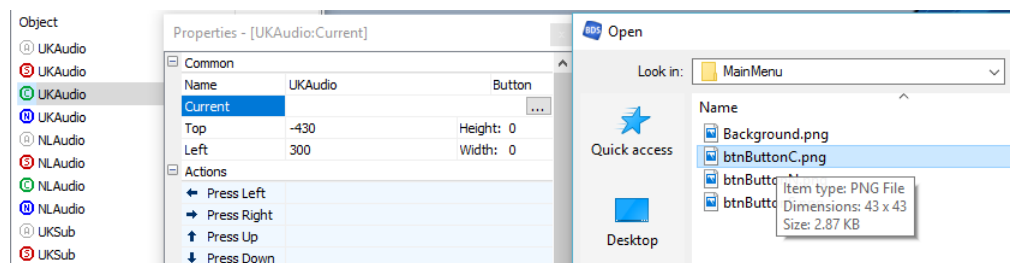
### Copying buttons from MainMenu to Setup Menu

We will copy the same button from the MainMenu to the SetupMenu going through the following steps:

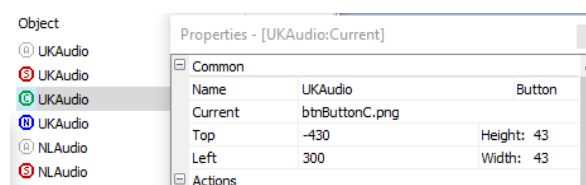
1. Open the Designer View for the MainMenu
2. Select a button, for example the one in front of “Space Race”
3. Right-click and specify Copy To: menu:SetupMenu
4. Select SetupMenu on the Project View. This will also show the SetupMenu on the Designer View
5. Ensure objects on the menu are not locked (menu icon  unlocks objects and  unlocks states of a button)
6. Move the button to the location of the “Main Menu” text
7. Copy the button repeatedly and move the copy to the text lines for subtitles “None”, “Nederlands”, “English” and for audio “Nederlands” and “English”.  
(By working from bottom to top the new button copies are already in the right order in the SetupMenu objects list)
8. A total of six buttons must be on the SetupMenu by now. Rename all button copies (currently named after their “father” on the main menu) to proper names indicating the choice of the menu they stand for
9. Check if audio/English is indeed the top object and that all picture objects are at the bottom of the list. If not, rearrange the buttons in the object view until they are in the proper order
10. Align all buttons by selecting them together in the Object view and with a Right-click select “Align” > Left



11. Enable the visibility of the “Current” state (click on green circle on menu bar). This will now show the green  icons in the object view. But no image is yet connected to this state. (In the following steps if you get confused about button images and their state, use the “make visible” icons     that can either show or not show those states. Handy if the images overlap and one is behind the other!)
12. Select the first button with the  state. (In our project it was renamed to “UKAudio” as the first menu option for English audio). Its property “Current” (the state name) has no image. Click on the “...” at the end of the line and navigate to the btnButtonC.png file and select/open this.




13. Now the button has a visible Current state represented by the image in the btnButtonC.png file



14. From the Top/Left positioning information you can see this image does not coincide with the other images for the button.

15. Repeat step 12-14 for all button C states in the SetupMenu.



All buttons are in position on the Setup menu at this point. We need to specify the navigation between the buttons.

The action to be specified for Press ENTER is different:

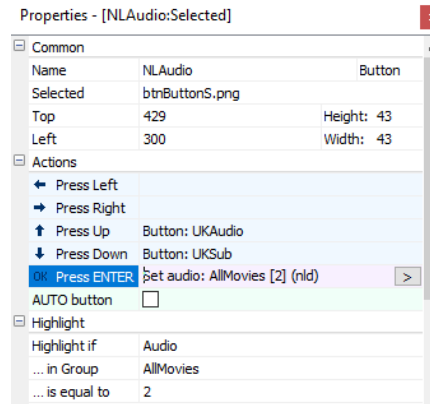
- the “Main Menu” button must jump to the MainMenu menu. This way we can switch between the two menus. Either it jumps to the “Default” in MainMenu (selecting the last selected button on it) or a specific button can be specified to be selected
- The first audio button (English Audio) must specify SET AUDIO > group AllMovies > Track 1 (which is the English audio track)





Notice how automatically the “Highlight” section of the button is filled it: it will highlight the “Current” state if this audio choice is made.

- The second audio button does the same but specifies track 2, the Dutch audio. The Current state will show when track 2 is set.



- The subtitle tracks are handled the same way: SET SUBTITLE > AllMovies > Track 1 for English subtitles. Again, the Current state is filled in for subtitle track 1 if this button is activated
- The button for no subtitle track uses the Press ENTER action SET SUBTITLE > AllMovies > -none-

#### Step 4: Check the project

This step checks if all links are present and is no different from the description in section “Step 4 Check the project” on page 61.

#### Step 5: Run simulation

Once the entire menu structure has been set up, the simulation will allow you to run through all scenarios and see if the links are set correctly.

If during simulation compilations errors are detected (no menu movie, no End Action or Popup action specified or other omissions) you can correct these first and start simulation again.

The new setup menu must be reachable from the main menu and you must be able to return there.

The setup menu looks like the image below.





It has English audio and no subtitles as starting value – hence the red coloured Current state buttons. You can still move through all buttons which in turn will turn yellow, including the one that are currently red.

Exiting this menu by selecting “Main Menu” retains the two red coloured buttons. If you change the default subtitles to “Nederlands” then that button will show “current”. You can move the cursor to the “Main Menu”, return to the main menu, select a movie and... it will show the Dutch subtitles because both movies belong to the AllMovies group for which you just selected “Nederlands” for subtitles.



#### Step 5: Create Bluray disc

This step is identical to section “Step 5 Create the project” on page 63.

#### Step 6: Burn the Bluray disc

This step is identical to section “Step 7 Burning the disc” on page 65.

## Project 4: Creating a bluray disc with popup menus for chapters

### The project goal

In previous sections you created a bluray disc with movies that had audio and subtitle tracks, each to be selected through a setup menu (as well as through the remote control buttons).

From the first project, each movie had chapters, but jumping from chapter to chapter remained an action using the remote control. For many that will suffice.

However when you take painstaking care to insert chapter marks at precise points in the movie rather than at fixed intervals, you may want a special menu to allow selection of that particular chapter.

BDSL allows you to do this in three manners:

- create a menu like the earlier Setup menu. This lists all chapters (like “Opening”, “The Chase” etc), possibly with a small image, and each item is linked to the movie chapter of that scene. The creation of this type of chapter menu is similar to creating the setup menu (without the need of “current” states for buttons)
- create a menu with visual list of opening pictures for each chapter. Each picture functions as button to jump to the chapter. This list is created automatically by BDSL itself.
- create a popup menu as visual list of opening pictures to show when a movie plays. The list is created by BDSL itself

This chapter will use the second/third method as the first one is already described in the third project, adding a (setup) menu.

### Add popup menus (text)

A popup menu is created the same way as a normal menu (through a .psd file or set of .png files) and it created in the Popup Menus branch of the Project Tree instead of the Menus branch.

Because a popup is shown on top of a playing movie, it is normally never full screen, but uses only a part of the screen – such as a rectangular black bar. How such a smaller menu is created is described in the project 3 where a Setup menu is created of image parts and buttons.

From ordinary menus there is no link to the popup menus. But popup menus can refer to other popup menus.

A complete illustration of making a popup menu is shown in the “10 Minutes Quick Start to Blu Disc Studio” tutorial (YouTube and document).

### Add chapter menus (picture buttons)

BDSL allows you to create a chapter menu automatically. Each starting image of a chapter is used as button to select and activate (meaning jumping to the chapter).

This chapter menu can be positioned on the popup menu background.

The entire procedure is described in the “10 Minutes Quick Start to Blu Disc Studio”.

## Project 5: Creating a bluray disc using extended menus and popup menus

### The project goal

This final section describes the use of menus often encountered on commercial bluray discs. A small main-menu is shown on top of the background menu movie. Selecting any item of this menu shows an add-on menu with specific choices. The “10 minutes quick guide” shows how an “Audio” menu item expands in the various audio options (like dts, stereo, commentary, music-only etc) available to the movie.

Such menus and expansions of them can also be shown while a movie plays. Then they are called “pop up” menus. It depends on your remote control on how to make these visible. This can be the “Title” button, sometimes “pop up” or some other button.

This project creates the disc using these menus rather than mostly full-screen menus used in previous sections.

### The D.I.Y. project

With all information from previous projects you should be able to complete this one entirely on your own.

But some tips:

- you may create an all dancing no talking main menu movie and superimpose the menu options on top. This can be a text layer and some buttons. The rest of the screen is filled with the menu movie.
- The menu movie may have a black rectangle on top of which the menu items are shown. Alternatively, the menu may have a black image object that blocks part of the menu movie and gives clear room for menu options and buttons
- The popup menu (only shown while a movie plays) should be mostly transparent since it is projected on top of the playing movie. A menu consisting of a black rectangular area in which the menu options and buttons are shown makes them clearly stand out from the playing movie.
- Popup menus are mostly used to change audio or subtitle tracks to the movie or to show a chapter list from which you can move position in the movie. Popup menus usually disappear after a selection is made or when the “popup menu” button on the remote control is pressed again
- An example popup-menu is given in the “10 minutes Quick Start Blu Disc Studio” guide – both as YouTube video as well as written accompanying tutorial.

## Appendix A: Bluray specifications

The following data indicates the Bluray Disc Association (BDA) decisions on capabilities bluray discs and standalone players must have. This will also reveal in how far Blu Disc Studio adheres to these standards.

An interesting description of all these details is found in a book by Jim Taylor a.o. “Blu-ray Disc Demystified” (McGraw-Hill Publishers, 2009, ISBN 978-0-07-159092-1)

### America vs Most of the Rest of the World

For Blu-ray, all players must support 23.976/24 Hz, 29.97/30 Hz and 59.94/60 Hz progressive.

Optionally, players in 50 Hz (25 or 50 fps) countries (such as Europe) may also support 24.97/25 Hz progressive.

This means that a disc can be created for all regions (24 Hz/30 Hz) unless the video is specifically targeted for the 24.97/25 Hz markets.

Note that some software players will playback 50i and 59.94i but most standalone bluray players only play progressive rates (incl. 50p, 59.94p). To be on the safe side, ensure your movies are progressive instead of interlaced.

### HDMV versus BD-J playback

There are two programming modes for Blu-ray – HDMV and BD-J. Blu Disc Studio uses BD-J.

Generally, there tends to be fewer incompatibility issues with HDMV playback than with BD-J, mainly because the BD-J environment has many more options and is based on a wide array of specifications. With BD-J, the chance for misinterpretation and differences in interpretation, are great. At the core of BD-J is the Java Virtual Machine (JVM). Some player manufacturers have licensed the JVM code from Sun Microsystems. Others have decided to implement their own version of JVM.

Within the BD-J specification, there are several libraries or packages that do virtually the same function. Some of the early players did not implement all libraries properly, but the manufacturers are working diligently with the BDA to improve testing routines to remedy these situations.

One limitation within the BDS products that use BD-J for navigation between menus is the maximum limit for total number of pixels in all menus together: these must be less than 7 900 000 .

### Player Profiles

Standalone players can handle everything up to a certain “profile level”.

- Profile 1, version 1.0, players introduced before November 1, 2007,

- Profile 1, version 1.1. players introduced after October 31, 2007,
- Profile 2 (optional, required for BD-Live),
- Profile 3 (optional audio-only player),
- Profile 4 (real time recording and editing).

Blu Disc Studio is ignorant on profiles – the video and audio streams must adhere to them, but all BDSL does is muxing the streams together regardless of profile, as long as the muxer muxes. Bluray players can upgrade their firmware – unlike the older DVD players.

## MPEG-2 H.264/AVC movie profiles

MPEG-2 is a standard compression method for video and by itself independent of bluray discs. One of the compression modes is H.264/AVC.

It recognizes several “profiles” that determine the quality of the video based on types of frames used, chroma (color) format etc.

- BP basic profile, low-end, video conferencing, mobile apps. Uses I,P frames
- MP main profile, HD tv broadcasts, DVB standard, uses I,P,B frames
- HP high profile, HDTV DVB broadcasts, bluray storage, uses I,P,B frames. This profile is recommended when you transcode movies to use in BDSL authoring.

The level specifies the bitrate with which the picture is shown. Levels exist from 1 upwards but only after 4 they become useful for HD recordings.

level	resolution @max framerate	MP bitrate kbps	HP bitrate kbps
4	1280x720@68.3 1920x1080@30.1	Medium@4.0 20,000	High@4.0 25,000
4.1	1280x720@68.3 1920x1080@30.1	Medium@4.1 50,000	High@4.1 62,500
5	1920x1080@72.3	Medium@5.0 135,000	High@5.0 168,750

## Disc capacity

Bluray discs come as single and dual layered discs

disc	marketing 10 <sup>9</sup> (GB) bytes	actual bytes in GB	capacity in number of DVDs	video typical play time	video min-max play time
BD-25	25.025	23.306	5.3	2.3 h	1.2h-37h
BD-50	50.050	46.613	10.6	4.6 h	2.3h-74.1h

The size of the discs is 120 mm with inner spindle hole 15 mm and reflectivity 35%-70%. Data is read with 4.9 m/s on playback

## Stream data

To show pictures, the video is encoded in bit stream rates. The table below indicates typical streaming rates in Mbps

<b>video</b>	minimum (Mbps) (poor)	typical (Mbps)	maximum (Mbps) (best)
MPEG-4 AVC	4	16	40
SMPTE VC-1	4	18	40
MPEG-2	4	24	40
<b>audio</b>			
Dolby Digital 2.0	0.064	0.192	0.640
Dolby Digital 5.1	0.384	0.448	0.640
Dolby Digital 7.1	0.640	1.024	4.736
DTS 5.1	0.192	1.509	1.509
DTS-HD 7.1	0.768	1.509	3.000

Data streams from bluray disc to player are also subjected to maximum limits:

ts transport stream	48 Mbps
video stream 1080x1920	40 Mbps
text subtitle stream	48 Mbps
DTS-HD	24.5 Mbps

## Number of BDMV elements

angles	9
audio streams	32
text subtitle stream	255
pop-up menus	32
chapters (play mark lists)	999
playlists	2000
playitems per playlist	999
movie objects (.bdjo files)	1001
JAR files	to disc capacity
fonts	255
menu sounds (in sound.bdmv)	128

## Appendix B: Things to remember

BSDL assumes certain things that may cause you to raise your eye brow. Here is a list of things you need to remember. See also section “Possible problems – including “line:0” errors” on page 31.

- maximum menu pixel size is 7 900 000 pixels. Regardless the number of menus or buttons used, their total size may not exceed 7 900 000 pixels.
  - try to reuse identical backgrounds (such as a black 1920x1080 png image) for all menus
  - try to reuse identical button states (such as checkmarks for “select” or pointers for “current”) for all menus
  - limit the amount of graphics or text on a menu
  - do not let a text or graphics image extend to the full screen width but limit it to its own size
  - Two small blocks making up an L-shape take fewer pixels than one rectangular block (the transparent pixels in the L-shape are counted as pixels in a rectangular shape)
  - make a “static image” into a background movie. Menu movies do not count in the total pixel count. It may liven up the menus as well.
- “current” settings do not show correctly on playback
  - check if the movies for which you set a current setting belong to the same movie group. All subtitle or audio settings in a group must adhere to the same order for all movies. You cannot have an English audio track as track 1 in one movie and as track 2 in another. If that needs to happen the movies cannot share the same group. Also check the position of the button state. It may be different from the other states and “way off” screen.
- “current” state not found
  - a movie menu specifies an action for a button, but the action (set subtitle / audio) is specified for another movie (especially if movie is moved to another group)
  - in the properties window the state is associated with a file that no longer exists or was moved or renamed
- size exceeds the BR-25 25 GB limit
  - use a BR-50 disc to burn on
  - reduce the size to BR-25 size using a compression tool such as BD Rebuilder (<http://www.videohelp.com/software/BD-Rebuilder> )
- subtitle does not show
  - check if added to the movie properties. The .srt files are simply text files with timings – based on whatever frame rate you used. Not showing while being sure they are there may be a deficiency of your software bluray player. Check the muxed movie file first. It is one of the



files created in \OUTPUT\BDMV\STREAMS\\*.m2ts files. Play the right file (the BDID id during muxing tells you which sequence number it has – unusually the same one as its position in the movie list of the project tree view) using a movie player such as VLC. If you can enable the subtitles and they play in sync with the dialogue, nothing is wrong. Otherwise you need to figure out why those titles are not included.

## Appendix C: External Tools

Because BDSL assumes its menu and movie elements adhere to bluray disc specifications and doesn't thoroughly check on these requirements, some of the following external tools may be found useful to convert any movie, subtitle or menu image to meet these requirements. Use a search engine on the internet to find out where they can be downloaded and for more specific information or help about them.

As with most freeware tools: be careful on what links you click as most of their webpages are loaded with irrelevant adverts that try to redirect you to other commercial tools. The installation files may also lure you to "also install our recommendation" and before you know it a lot of bloatware gets installed also.

### Bluray and DVD ripping

- MakeMKV (<http://www.makemkv.com/>) tool to convert blurays into .mkv containers, but it also allows to make a "backup" of the entire disc on a hard disc drive folder, removing bluray encryption. All movie files are stored in the BDMV/streams folder. The backup facility is free to use for 30 days. After that you may look at forum page <http://www.makemkv.com/forum2/viewtopic.php?f=5&t=1053&p=3548&hilit=key+code#p3548> for a renewal temporary key that lasts for 2 months.
- AnyDVD HD (<https://www.redfox.bz/en/anydvdhd.html>) continuation of the Slysoft AnyDVD software that removes all encryption and allows a disc (DVD or bluray) to be played regardless of region or encryption. And files can be copied unencrypted.
- DVDFab (<http://www.dvdfab.cn/>) software to rip DVDs and blurays and shrink them to size if needed. Trialware.

### video editing

- The standard site for video help is [www.videohelp.com](http://www.videohelp.com) and [www.doom9.org](http://www.doom9.org) – their pages contain many pointers to software, guides, forums
- TS Doctor ([http://www.cypheros.de/index\\_e.html](http://www.cypheros.de/index_e.html)) – a basic editor for .ts files produced by satellite receivers. It can remove audio, subtitle and Ceefax/teletext streams that are not wanted and produces a .ts file as output. Make sure that at cuts you start a new section with a complete (I) frame. Shareware.
- Cuttemaran (<http://www.cuttemaran.de/en/default.aspx>) is a .mpeg-2 file editor with LPCM (wav), ac3 or DTS audio for frame-accurate cutting (requires TEMPGEnc 2.5) and Microsoft .NET Framework 3.5 SP1
- SmartCutter (<http://www.fame-ring.com/>) a paid (\$40) editor for H264, AVCHD and other video formats. Frame-accurate.
- TSSniper – A .ts file editor (<http://forum.team-mediaportal.com/threads/free-ts-mpeg2-h-264-editing->

[software.80842/](http://software.80842/)) freeware. Cuts on GOP boundaries (not frame-accurate)

- Handbrake (<https://handbrake.fr/>) – freeware. Converts videos to different formats (transcoder) and bluray specific aspect ratios, audio-pass through, .srt subtitles
- iWisoft Free Video Converter (<http://www.iwisoft.com/videoconverter/>) freeware – editor and transcoder that can convert between encodings, and has some basic editing (trim, crop).

## audio editing

- WAV to AC3 Encoder (<https://github.com/wieslawsoltes/wavtoac3encoder>) – freeware tool to convert uncompressed .wav (LPCM) audio files into compressed Dolby Digital .ac3 files. Although both formats are acceptable for bluray, the .wav file can take up seven times more disc space than the .ac3 version of the same audio. For most ears the differences are neglectible (the way .mp3 files may be acceptable replacements for .wav).

## image (menu and button) editing

- Gimp (<https://www.gimp.org/>) Freeware image editing program that resembles PhotoShop capability.
- PhotoShop (<http://www.adobe.com>), PaintShop Pro (<http://www.corel.com>) or any other image editing tool that allows its files with several layers to be saved in .psd format. Commercial software.  
BDSL regards a button as a set of picture layers. You can make a button as a single .psd Photoshop file with multiple layers. Alternatively, you can provide each layer as separate .png file using strict naming conventions that show which file represents which layer.

## subtitle editing

- Jubler ([www.jubler.org](http://www.jubler.org)) – freeware subtitle editor allowing you to create subtitles, splitting or joining titles, shifting or stretch timings, translate titles (side-by-side with original lines) and many other features
- Subtitle Edit (<http://www.nikse.dk/subtitleedit/>) – freeware subtitle editor. Also capable of reading .sup files and change these into .srt files through a Tesseract ocr process. Sup files may occur when an .mkv or .ts file is decomposed into elements and subtitles come out as .sup which are pictures rather than text. It can also synchronise timings of one subtitle file with another that is known to be in sync (sync by timing). It also allows to specify some subtitles as anchor points (with modified correct timings) after which all other subtitles are given new timings to fit between those anchor points.

## MKV container production and (de)muxing tools

- MakeMKV – see section “Bluray and DVD ripping”
- MKVToolnix (<https://mkvtoolnix.download/>) – this is a freeware tool using mkvmerge to create Matroska mkv videocontainers from separate video sources. It is a sort of zip-file containing a videostream and multiple audio and subtitle streams together. Many bluray disc players but also Windows media players can play these files.  
An mkv file is a good candidate to check if video, audio and subtitle streams are in sync with one another. If your bluray player accepts these files and you’re not interested in menus, you may even decide to burn the .mkv files to a DVD or bluray data disc and forget about (bluray) authoring altogether.
- tsMuxer (<http://www.videohelp.com/software/tsMuxeR>) – a freeware tool to split a .ts file into its separate components such as .264 (H264 video) and .ac3 (Dolby Digital audio). This “muxer” can both mux (put together) or demux (split into streams). It’s a requirement for use with BDSL to perform the muxing part of the process.
- MKVExtract – (<https://sourceforge.net/projects/mkvextractgui-2/>) – freeware tool to extract elements from an MKV file.

## software video and bluray players

- VLC player (<http://www.videolan.org/vlc/>) – this is a freeware tool that seems to play almost any format video and/or audio file, including mkv, ts, mpeg or mp4 video and ac3 or wav audio. It allows you (via right-mouse click) to select the audio or subtitle stream of your choice.
- Leawo Bluray Player (<http://www.leawo.com/blu-ray-player/>) – a freeware bluray player capable of playing blurays on a pc bluray device but also to play bluray file folders or .iso images on disc rather than a bluray disc itself. It requires Windows XP or later.
- Nero 12 bluray player – discontinued part of commercial Nero burning package (available upto V12). It does allow BDSL folders to be played (interlaced only at 50i and 59.94i but interlaced is not supported by several standalone bluray disc players).

## bluray burning software

- ImgBurn (<http://www.imgburn.com>) – a freeware program to burn a folder or .iso image to a physical disc (CD, DVD or Bluray) provided the files or .iso image to burn are compliant for the medium to burn it to. ImgBurn also allows to create an .iso file from a compliant folder. Hence the Blu Disc Studio output (a set of files in Bluray specific folders) can be converted to an .iso file or be burned directly to a bluray disc.
- Nero BurningROM – commercial package including Bluray and DVD burning templates as well as complete suite for audio and video editing and bluray creation (but limited freedom in how to do this).

- BD Rebuilder (<http://www.videohelp.com/software/BD-Rebuilder>) – freeware tool to resize a bluray folder to fit a BD-25, DVD-9 or DVD-5 sized disc before burning.

## virtual disc drives

- Virtual Clonedrive (<https://www.redfox.bz/virtual-clonedrive.html>) – virtual disc drive station freeware – program that allows you to “play” an .iso image of a bluray disc as if it ran from a real bluray drive inside your computer. You can mount the .iso file and suddenly a new drive letter appears (such as Y:) that is “running” your disc. Useful program if your software player only accepts “real” bluray discs and cannot play a bluray folder.

## disc Cover Designers

- Nero CoverDesigner ([www.nero.com/eng/downloads](http://www.nero.com/eng/downloads)) – freeware tool to create CD, DVD and Bluray covers, booklets as well as disc images to print on printable discs.
- Canon ImageGarden ([https://printinginnovations.cusa.canon.com/pixma/my\\_image\\_garden](https://printinginnovations.cusa.canon.com/pixma/my_image_garden)) – comes on CD with a Canon printer capable of printing discs but can also be downloaded from the Canon website.