

DVB Subtitle Explorer

Overview

This is a very niche application to allow you to examine a DVB Compliant Transport stream for DVB Bitmap subtitles. It is born out of a need to try to work out why some subtitles were not working on specific set top boxes on a project I was working on. We were able to use DVB Analyser from DVB Control and it was incredibly useful but that's a bit expensive so I wanted to try to write something, and in the process, learn more about how the subtitles work.

The code is entirely based up on the excellent Subtitle Edit source code from <https://www.nikse.dk/> which, in my opinion, is up there with Media Info and VLC in the playout engineers open source toolkit (sitting on top of Notepad++).

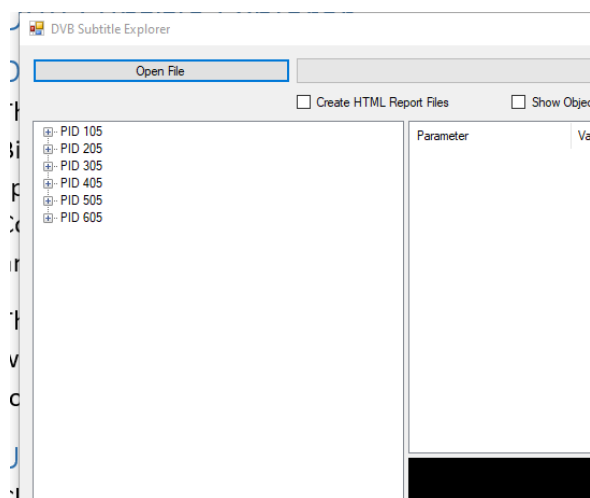
The application references the DVB Subtitle specification document from

https://dvb.org/wp-content/uploads/2019/12/a009_dvb_bitmap_subtitles_nov_2017.pdf

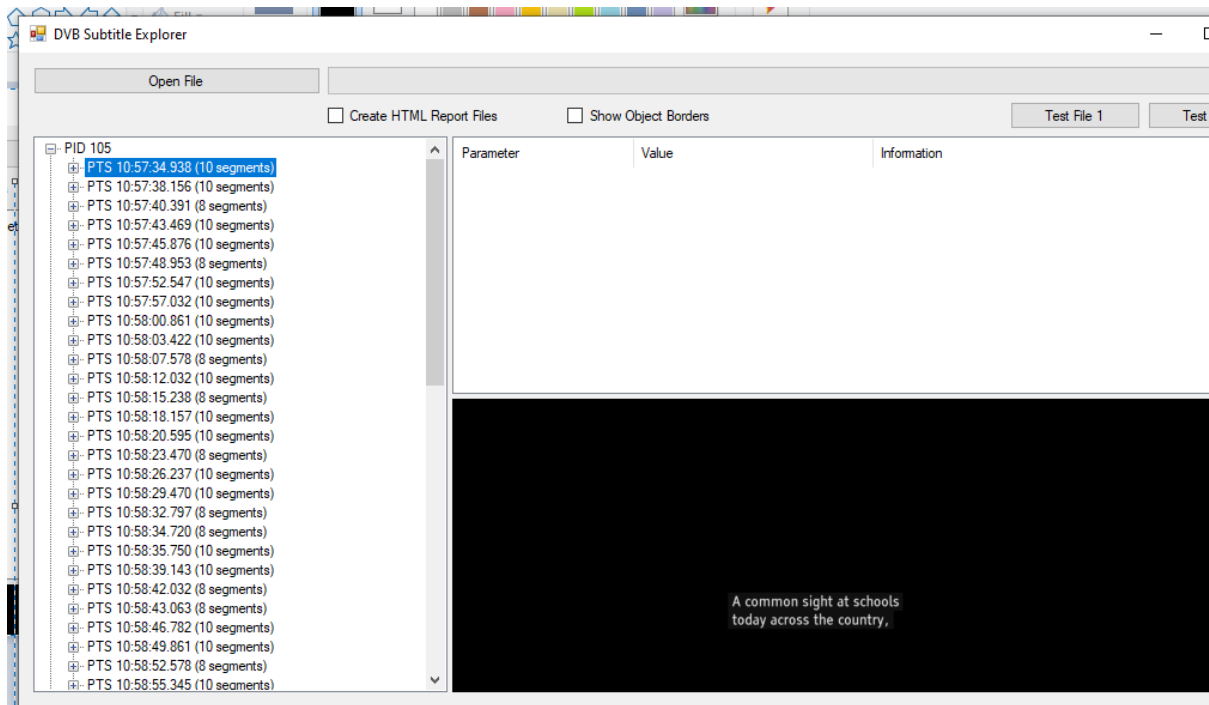
Usage

Click the "Open File" button. If you wish to create a basic HTML report for each PID, ensure that the "Create HTML Report Files" checkbox before you open the file – the report files will be created in the same folder as the source file.

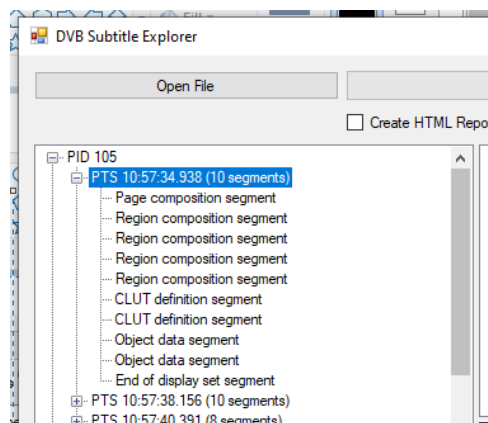
Once you select a file, the application will read it all and populate all the Subtitle PIDs in the tree view.



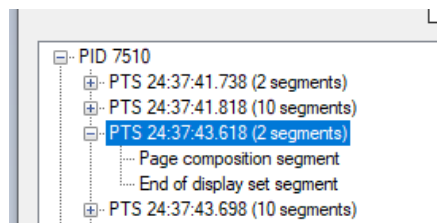
You can expand out each PID to see all subtitle PES packets with their Presentation Time Stamp, clicking on one of the Packets will show the subtitle rendered;



If you expand out the PES packet in the tree view, you can view the segments sent to construct the subtitle. These will vary depending on the specifics of the subtitling playlist. For example, in the packet below, there are 10 segments



With 4 regions, 2 Colour Lookup Tables and 2 Objects defined, but other packets may have more or less. For example, most playlists send a clear screen with only 2 segments (just the page composition segment and the end of display set);



Exploring the Segments

If you click on a segment in the tree view, more information will be populated in the right hand panes. Additionally note that the Information column shows a shortened version of the notes in the DVB specification, clicking on a row will show the full shortened version in the box below;

Parameter	Value	Information
General		
region_id	13	This 8-bit field uniquely identifies the region for which inform...
region_version_number	3	This indicates the version of this region. The version numb...
region_version_number	True	If set to '1', signals that the region is to be filled with the bac...
region_width	720	Specifies the horizontal length of this region, expressed in n...
region_height	36	Specifies the vertical length of the region, expressed in nu...
region_level_of_compatibility	2(4-bit/entry CLUT required)	This indicates the minimum type of CLUT that is necessary i...
region_depth	2 (4 bit)	Identifies the intended pixel depth for this region
CLUT_id	3	Identifies the family of CLUTs that applies to this region.
region_8bit_pixel-code	0	Specifies the entry of the applied 8-bit CLUT as background...
region_4bit_pixel-code	0	Specifies the entry of the applied 4-bit CLUT as background...
region_2bit_pixel-code	0	Specifies the entry of the applied 2-bit CLUT as background...
number of objects	0	

Specifies the entry of the applied 8-bit CLUT as background colour for the region when the region_fill_flag is set, but only if the region depth is 8 bit. The value of this field is undefined if a region depth of 2 or 4 bit applies.

Page Composition Segment;

Parameter	Value	Information
General		
page_time_out	30	The period, expressed in seconds, after which a page insta...
page_version_number	12	The version of this page composition segment. When any ...
page_state	1 (Acquisition Point (page refresh))	This field signals the status of the subtitles page instance d...
number of regions	2	
Region ID 0		
region_id	0	This uniquely identifies a region within a page. Each identi...
region_horizontal_address	0	This specifies the horizontal address of the top left pixel of t...
region_vertical_address	382	This specifies the vertical address of the top line of this regi...
Region ID 1		
region_id	1	This uniquely identifies a region within a page. Each identi...
region_horizontal_address	0	This specifies the horizontal address of the top left pixel of t...
region_vertical_address	418	This specifies the vertical address of the top line of this regi...

Note that this page defines 2 regions with their position set at (X/Y) 0/382 and 0/418 – i.e. the two lines of text. The region IDs refer to the region composition segments below.

Region Composition segment;

Parameter	Value	Information
General		
region_id	6	This 8-bit field uniquely identifies the region for which inform...
region_version_number	0	This indicates the version of this region. The version numb...
region_version_number	True	If set to '1', signals that the region is to be filled with the bac...
region_width	720	Specifies the horizontal length of this region, expressed in n...
region_height	36	Specifies the vertical length of the region, expressed in nu...
region_level_of_compatibility	2(4-bit/entry CLUT required)	This indicates the minimum type of CLUT that is necessary i...
region_depth	2 (4 bit)	Identifies the intended pixel depth for this region
CLUT_id	0	Identifies the family of CLUTs that applies to this region.
region_8bit_pixel-code	0	Specifies the entry of the applied 8-bit CLUT as background...
region_4bit_pixel-code	0	Specifies the entry of the applied 4-bit CLUT as background...
region_2bit_pixel-code	0	Specifies the entry of the applied 2-bit CLUT as background...
number of objects	1	
Object ID 12498		
object_id	12498	Identifies an object that is shown in the region.
object_type	0 (basic_object, bitmap)	Identifies the type of object
object_provider_flag	0 (provided in the subtitles stream)	A 2-bit flag indicating how this object is provided
object_horizontal_position	90	Specifies the horizontal position of the top left pixel of this o...
object_vertical_position	0	Specifies the vertical position of the top left pixel of this obj...
foreground_pixel_code		Specifies the entry in the applied 8-bit CLUT that has been ...
background_pixel_code		Specifies the entry in the applied 8-bit CLUT that has been...

A 2-bit flag indicating how this object is provided

Note that this region references an Object (which is defined later) and that the region height and width are set. The position of this region on the page was already set in the page composition

segment. Note also that there are 4 regions defined but the page composition segment only referenced the first 2. The last 2 are not used and also do not contain any objects either.

CLUT definition segment;

UVB subtitle explorer

Open File

☐ Create HTML Report Files ☐ Show Object Borders

Test File 1Test File 2

PID 105

- PTS 10:57:34.938 (10 segments)
- PTS 10:57:38.156 (10 segments)
 - Page composition segment
 - Region composition segment
 - Region composition segment
 - Region composition segment
 - Region composition segment
 - CLUT definition segment
 - CLUT definition segment
 - Object data segment
 - Object data segment
 - End of display set segment
- PTS 10:57:40.391 (8 segments)
- PTS 10:57:43.469 (10 segments)
- PTS 10:57:45.876 (10 segments)
- PTS 10:57:48.953 (8 segments)
- PTS 10:57:52.547 (10 segments)
- PTS 10:57:57.032 (10 segments)
- PTS 10:58:00.861 (10 segments)
- PTS 10:58:03.422 (10 segments)
- PTS 10:58:07.578 (8 segments)
- PTS 10:58:12.032 (10 segments)
- PTS 10:58:15.238 (8 segments)
- PTS 10:58:18.157 (10 segments)
- PTS 10:58:20.595 (10 segments)
- PTS 10:58:23.470 (8 segments)
- PTS 10:58:26.237 (10 segments)

Parameter	Value	Information
General		
CLUT_id	0	Uniquely identifies within a page the CLUT family whose da...
CLUT_version_number	1	Indicates the version of this segment data. When any of th...
number of regional clut entri...	9	
CLUT Entry ID 0		
CLUT_entry_id	0	Specifies the entry number of the CLUT. The first entry of t...
2-bit/entry_CLUT_flag	False	If set to '1', this indicates that this CLUT value is to be load...
4-bit/entry_CLUT_flag	True	If set to '1', this indicates that this CLUT value is to be load...
8-bit/entry_CLUT_flag	False	If set to '1', this indicates that this CLUT value is to be load...
full_range_flag	True	If set to '1', this indicates that the Y_value, Cr_value, Cb_v...
Y_value	0	The Y output value of the CLUT for this entry. A value of z...
Cr_value	0	The Cr output value of the CLUT for this entry.
Cb_value	0	The Cb output value of the CLUT for this entry.
T_value	0	The Transparency output value of the CLUT for this entry. ...
Colour	Color [A=0, R=0, G=135, B=0]	
CLUT Entry ID 1		
CLUT_entry_id	1	Specifies the entry number of the CLUT. The first entry of t...
2-bit/entry_CLUT_flag	False	If set to '1', this indicates that this CLUT value is to be load...
4-bit/entry_CLUT_flag	True	If set to '1', this indicates that this CLUT value is to be load...
8-bit/entry_CLUT_flag	False	If set to '1', this indicates that this CLUT value is to be load...
full_range_flag	True	If set to '1', this indicates that the Y_value, Cr_value, Cb_v...
Y_value	220	The Y output value of the CLUT for this entry. A value of z...

The Colour Lookup Table is a pallet of colours and here, 2 are defined.

Object data segment;

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☐ Create HTML Report Files ☐ Show Object Borders

Test File 1Test File 2

PID 105

- PTS 10:57:34.938 (10 segments)
- PTS 10:57:38.156 (10 segments)
 - Page composition segment
 - Region composition segment
 - Region composition segment
 - Region composition segment
 - Region composition segment
 - CLUT definition segment
 - CLUT definition segment
 - Object data segment
 - Object data segment
 - End of display set segment
- PTS 10:57:40.391 (8 segments)

Parameter	Value	Information
General		
object_id	12498	Uniquely identifies within the page the object for which dat...
object_version_number	0	Indicates the version of this segment data. When any of th...
object_coding_method	0 (coding of pixels)	Specifies the method used to code the object
non_modifying_colour_flag	False	If set to '1' this indicates that the CLUT entry value '1' is a n...
top_field_data_block_length	1565	Specifies the number of bytes contained in the pixel-data_s...
bottom_field_data_block_le...	1585	Specifies the number of bytes contained in the data_sub-bl...
number_of_codes	0	Specifies the number of character codes in the string (whe...

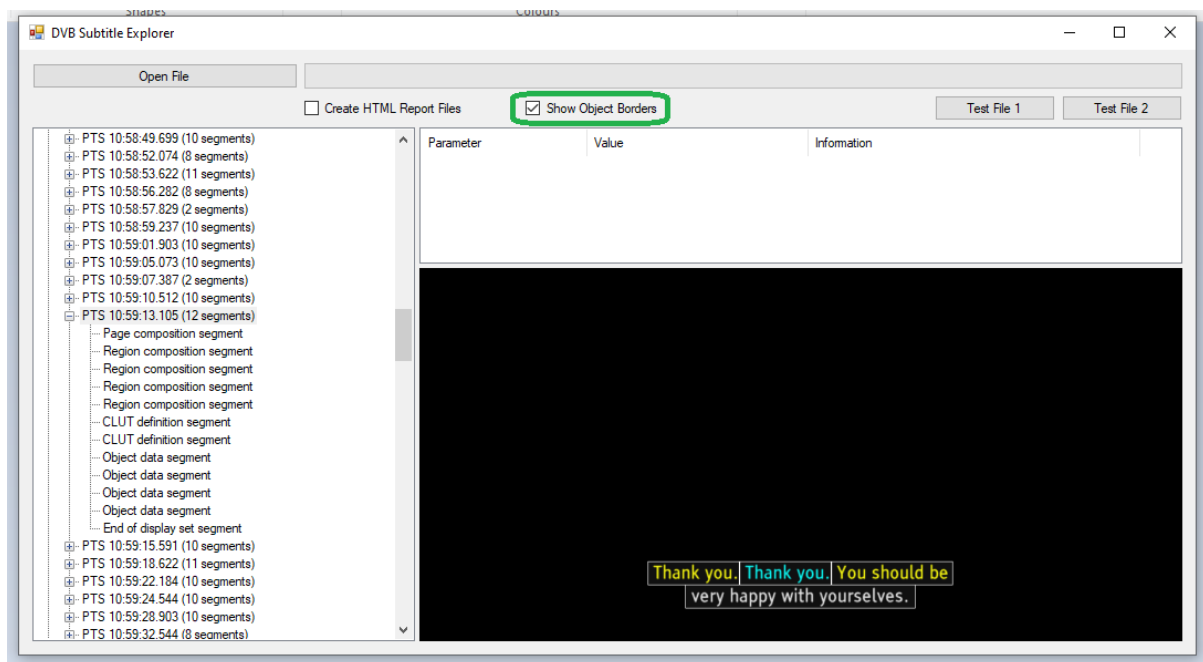
The object data segment holds the actual bitmap data. There's not too much metadata and the raw data is not shown in the GUI.

End of Display set segment

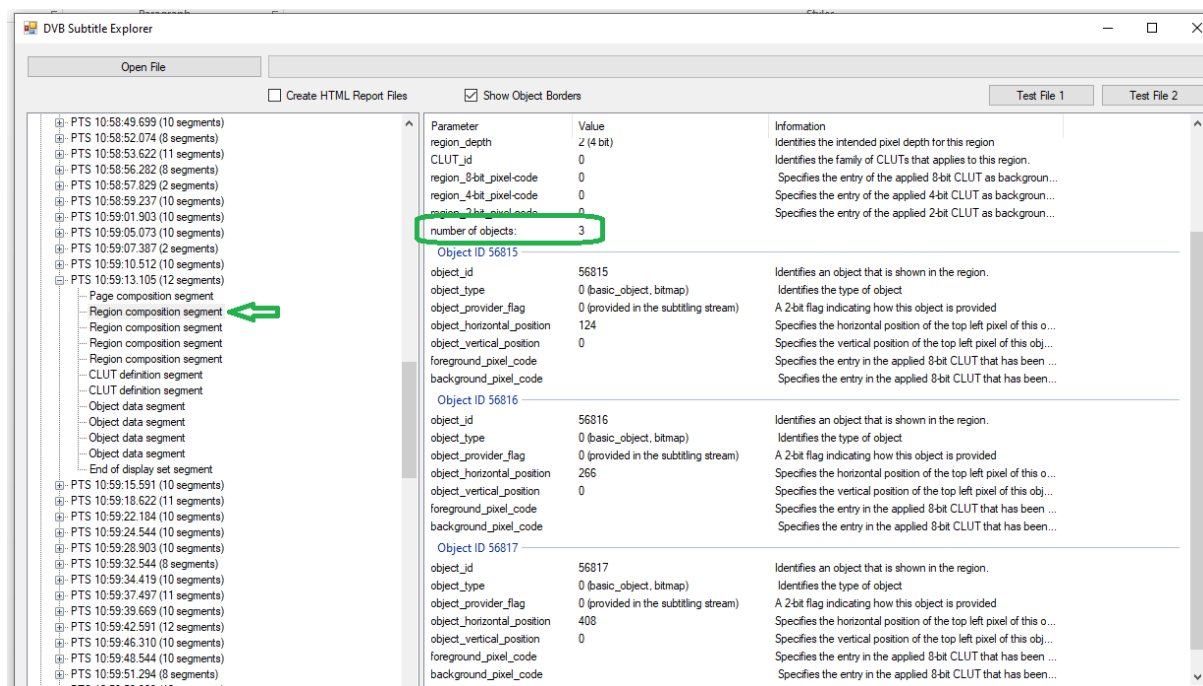
The End of Display set segment contains no data and is just a marker.

“Show Object Borders”

If you check this checkbox, it will add a border to each object to allow you to better see how it sits in the region, e.g. here 4 objects are used...



You can also see that this page was constructed from 2 (active) regions, one for each line. The first region holds 3 of the objects;



With the 2nd Region holding the last object;

DVB Subtitle Explorer

Open File

☐ Create HTML Report Files ☒ Show Object Borders

Test File 1

PTS 10:58:49.699 (10 segments)
 PTS 10:58:52.074 (8 segments)
 PTS 10:58:53.622 (11 segments)
 PTS 10:58:56.282 (8 segments)
 PTS 10:58:57.829 (2 segments)
 PTS 10:58:59.237 (10 segments)
 PTS 10:59:01.903 (10 segments)
 PTS 10:59:05.073 (10 segments)
 PTS 10:59:07.387 (2 segments)
 PTS 10:59:10.512 (10 segments)
 PTS 10:59:13.105 (12 segments)
 Page composition segment
 Region composition segment
 Region composition segment
 Region composition segment
 CLUT definition segment
 CLUT definition segment
 Object data segment
 Object data segment
 Object data segment
 Object data segment
 End of display set segment
 PTS 10:59:15.591 (10 segments)
 PTS 10:59:18.622 (11 segments)
 PTS 10:59:22.184 (10 segments)
 PTS 10:59:24.544 (10 segments)
 PTS 10:59:28.013 (10 segments)

Parameter Value Information

General

region_id: 10 This 8-bit field uniquely identifies the region for which inform...

region_version_number: 1 This indicates the version of this region. The version numb...

region_version_number: True If set to '1', signals that the region is to be filled with the bac...

region_width: 720 Specifies the horizontal length of this region, expressed in n...

region_height: 36 Specifies the vertical length of the region, expressed in nu...

region_level_of_compatibility: 2(4-bit/entry CLUT required) This indicates the minimum type of CLUT that is necessary i...

region_depth: 2 (4 bit) Identifies the intended pixel depth for this region

CLUT_id: 1 Identifies the family of CLUTs that applies to this region.

region_8-bit_pixel-code: 0 Specifies the entry of the applied 8-bit CLUT as backgroun...

region_4-bit_pixel-code: 0 Specifies the entry of the applied 4-bit CLUT as backgroun...

region_2-bit_pixel-code: 0 Specifies the entry of the applied 2-bit CLUT as backgroun...

number of objects: 1

Object ID 56818

object_id: 56818 Identifies an object that is shown in the region.

object_type: 0 (basic_object, bitmap) Identifies the type of object

object_provider_flag: 0 (provided in the subtitling stream) A 2-bit flag indicating how this object is provided

object_horizontal_position: 182 Specifies the horizontal position of the top left pixel of this o...

object_vertical_position: 0 Specifies the vertical position of the top left pixel of this obj...

foreground_pixel_code: 0 Specifies the entry in the applied 8-bit CLUT that has been ...

background_pixel_code: 0 Specifies the entry in the applied 8-bit CLUT that has been...

The remaining 2 regions carry no objects;

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☐ Create HTML Report Files ☒ Show Object Borders

Test File 1

PTS 10:58:49.699 (10 segments)
 PTS 10:58:52.074 (8 segments)
 PTS 10:58:53.622 (11 segments)
 PTS 10:58:56.282 (8 segments)
 PTS 10:58:57.829 (2 segments)
 PTS 10:58:59.237 (10 segments)
 PTS 10:59:01.903 (10 segments)
 PTS 10:59:05.073 (10 segments)
 PTS 10:59:07.387 (2 segments)
 PTS 10:59:10.512 (10 segments)
 PTS 10:59:13.105 (12 segments)
 Page composition segment
 Region composition segment
 Region composition segment
 Region composition segment
 CLUT definition segment
 CLUT definition segment
 Object data segment
 Object data segment
 Object data segment
 Object data segment
 End of display set segment
 PTS 10:59:15.591 (10 segments)
 PTS 10:59:18.622 (11 segments)
 PTS 10:59:22.184 (10 segments)
 PTS 10:59:24.544 (10 segments)
 PTS 10:59:28.013 (10 segments)

Parameter Value Information

General

region_id: 14 This 8-bit field uniquely identifies the region for which inform...

region_version_number: 2 This indicates the version of this region. The version numb...

region_version_number: True If set to '1', signals that the region is to be filled with the bac...

region_width: 720 Specifies the horizontal length of this region, expressed in n...

region_height: 36 Specifies the vertical length of the region, expressed in nu...

region_level_of_compatibility: 2(4-bit/entry CLUT required) This indicates the minimum type of CLUT that is necessary i...

region_depth: 2 (4 bit) Identifies the intended pixel depth for this region

CLUT_id: 2 Identifies the family of CLUTs that applies to this region.

region_8-bit_pixel-code: 0 Specifies the entry of the applied 8-bit CLUT as backgroun...

region_4-bit_pixel-code: 0 Specifies the entry of the applied 4-bit CLUT as backgroun...

region_2-bit_pixel-code: 0 Specifies the entry of the applied 2-bit CLUT as backgroun...

number of objects: 0