Dolby Digital Plus online delivery playback

System Testing Help

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Confidential information

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Dolby Laboratories, Inc.
1275 Market Street
San Francisco, CA 94103-1410 USA
Telephone 415-558-0200
Fax 415-645-4000
http://www.dolby.com

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1 Information for interactive test procedures

This documentation provides associated information for the interactive test procedures used to verify that a product can properly demultiplex, decode, and play back Dolby Digital Plus bitstreams contained in online delivery formats, including MPEG-DASH and HTTP Live Streaming.

- New in this version
- Using this test procedure
- Test materials
- Accessing the test materials
- Standards and Dolby documents
- Channel abbreviations
- Contacting Dolby

This documentation is part of the Dolby Digital Plus Online Delivery Kit, which contains all materials (such as test signals, test applications, web-based interactive test instructions, and so on) necessary for evaluating a playback product. Choose a method to use the kit:

- Download the kit package to your local web server.
- Access the test materials, and stream test signals to your playback products directly from the Dolby Interoperability Support Center.

1.1 New in this version

These updates have been made to the latest version of this document.

- Test applications for Android TV and Chromecast are added to the kit and described in this documentation.

1.2 Using this test procedure

To perform tests on a playback product, follow the detailed instructions generated from the Dolby System Interactive Test Procedure in conjunction with using this documentation.

This documentation and the Dolby System Interactive Test Procedure are major parts of the Dolby Digital Plus Online Delivery Kit, which contains all materials (such as test signals, testing tools, web-based interactive test instructions, and so on) necessary for evaluating a playback product.

The Dolby Digital Plus Online Delivery Kit is available from the Dolby Interoperability Support Center (DISC) at https://disc.dolbycustomer.com. DISC is an online service that enables you to access various Dolby online delivery kits and stream A/V test signals containing Dolby audio technology to playback products. It is designed to help you deploy Dolby audio technologies end to end across your over-the-top (OTT) workflows.

To perform playback tests, you must access the Dolby Digital Plus Online Delivery Kit on DISC to stream test signals to your playback product and to generate test instructions applicable for your product by using the Dolby System Interactive Test Procedure.

Alternatively, you can download the entire kit to your local disk from Dolby Deliverables on Demand server (DDoD).

1.3 Test materials

The system test materials included in the kit are listed in this section.

The system test materials include:

- *Dolby Digital Plus for Online Delivery Playback System Development Manual.*
- *Dolby Digital Plus for Online Delivery Playback System Testing Help.*
- *Dolby Digital Plus for Online Delivery Content Creation System Development Manual.*
- *Dolby Digital Plus for Online Delivery Content Creation System Testing Help.*
- A browser-based interactive test procedure: This script selects the appropriate test instructions for your product and exports the test results data. Two versions are supplied in the kit, one for content creation products and the other for playback products.
- Test signals for Dolby Digital Plus Online Delivery Kit. For each online delivery format, files for conducting tests and for reference are provided by test case:
  - Manifest files or playlist files
  - Multiplexed files of multiple encodings
- Test applications: A set of GUI-based applications with Dolby Digital Plus bitstream playback capability that are designed for these platforms:
  - Samsung 2013 Smart TV platform and later
  - LG 2013 Smart TV platform and later
  - Smart TV Alliance platform
  - HbbTV v1.5 and v2.0 platforms
  - Xbox 360
  - HTML5-supported web browsers
  - Android TV
  - Roku 4
  - Apple TV with tvOS 10
  - Google Chromecast
- Testing tools: A set of command-line based tools for validating the conformance of multiplexed streams to certain specifications.

The organization of the test materials in the kit is listed here:

- <parent directory>
  - Documentation
    - Playback
      - SDM
      - Interactive_test_procedure_help
      - Interactive_test_procedure
    - Content creation
      - SDM
      - Interactive_test_procedure_help

        - Interactive_test_procedure
      - Documentation.html
      - Interactive_test_procedure.html
  - Bootstrap
  - Test_Signals
    - elementary_streams
    - muxed_streams
      - DASH
      - HLS
      - MP4
      - MPEG2TS
    - Test_Signals.html
  - Test_Apps
    - Samsung_app
    - LG_app
    - SmartAlliance_app
    - HbbTV_app
    - HbbTV2_app
    - HTML5_app
    - AndroidTV_app
    - Xbox360_app
    - Roku
    - AppleTV
    - Chromecast_app
    - Test_Apps.html
  - Test_Tools
    - hlsvalidator.zip
    - mpvaidator.zip
    - mp4drop.zip
    - Test_Tools.html
  - Start_Here.html
  - ReleaseNotes.txt

Note: If the product to be tested contains other Dolby technologies, be sure that those technologies are also fully tested. For details on requirements and testing for other Dolby technologies, refer to the documentation specific to such technologies.

1.4 Accessing the test materials

All materials dedicated for online delivery system test can be found on DISC website at https://disc.dolbycustomer.com. Depending on your test environment setup, you are free to choose to either download the kit to your local web server or stream the test signals from the DISC website to your playback product.

About this task
The test materials package is also available for download from the DDoD server. You can choose either way to access the test materials.

Procedure

1. Log in to the DISC website at https://disc.dolbycustomer.com:
   - For new customers to request access to the DISC website, select **REQUEST ACCESS** in the login page and complete the registration.
   - Registration request will be processed within two working days. You will receive an email notification allowing you access directly to the DISC website.

   After successfully logging into the DISC website, you can browse all Dolby online delivery development kits, download test files for local testing, or stream test signals from the DISC website to your playback product directly.
2. Navigate to **Dolby Digital Plus Online Delivery Kit** for downloading or streaming.

   If you choose to run tests with your local web server, download the entire kit to your local web server (including all of the test signals).

   If you choose to stream test signals from the DISC website, you need to download only the test application for your testing platform.

Related information

Test materials on page 6

1.5 Standards and Dolby documents

Standards and Dolby documents provide additional information to assist you in designing your product.

Standards

- ETSI TS 102 366 v1.4.1 (2017), *Digital Audio Compression (AC-3, Enhanced AC-3) Standard*, Annex E (normative), available from http://www.etsi.org. This document describes the Dolby Digital Plus (E-AC-3) bitstream syntax.
- ISO/IEC 14496-12:2012, *Information Technology—Coding of Audio-Visual Objects, Part 12: ISO Base Media File Format*, available from http://www.iso.org. This documentation is Part 12 of the MPEG-4 specification and describes storage of content in a media file.
- ISO/IEC 14496-14:2003, *Information Technology—Coding of Audio-Visual Objects, Part 14: MP4 File Format*, available from http://www.iso.org. This documentation is Part 14 of the MPEG-4 specification. It is based on Part 12 and describes the MPEG-4 container file format.
- ISO/IEC 23009-1:2014, *Information Technology—Dynamic Adaptive Streaming over HTTP (DASH)—Part 1: Media Presentation Description and Segment Formats*, available from http://www.iso.org.

- ETSI TS 102 796 v1.4.1, *Hybrid Broadcast Broadband TV*, available from http://www.etsi.org.
- *HTTP Live Streaming—draft-pantos-http-live-streaming-23*, available from https://datatracker.ietf.org. (Search for "pantos".)
- ISO/IEC 13818-1:2013, *Information Technology—Generic Coding of Moving Pictures and Associated Audio Information: Systems*, available from http://www.iso.org.
- RFC 6381, *The 'Codecs' and 'Profiles' Parameters for "Bucket" Media Types*, August 2011, available from http://tools.ietf.org/html.
- ISO 639-2:1998, *Codes for the Representation of Names of Languages, Part 2: Alpha-3 Code*, as maintained by the ISO 639/Joint Advisory Committee, available from http://www.iso.org.

1.6 Channel abbreviations

This table lists the channel notations used in this document.

Table 1:

Abbreviation	Channel
L	Left
R	Right
C	Center
Lc	Left Center
Rc	Right Center
LFE	Low-Frequency Effects
Lfh	Left Front Height
Rfh	Right Front Height
S	Mono Surround
Cs	Center Surround
Ls	Left Surround
Rs	Right Surround
Lscr	Left Screen
Rscr	Right Screen
Lsd	Left Surround Direct
Rsd	Right Surround Direct
Lb	Left Back
Rb	Right Back
Cb	Center Back
Lb *	Left Back
Rb	Right Back
Lvh	Left Vertical Height
Cvh	Center Vertical Height
Rvh	Right Vertical Height
Lrs	Left Rear Surround
Rrs	Right Rear Surround

Table 1: (continued)

Abbreviation	Channel
Lrs	Left Rear Surround
Rrs	Right Rear Surround
Lw	Left Wide
Rw	Right Wide
Tbl	Top Back Left
Tbr	Top Back Right
Tfl	Top Front Left
Tfr	Top Front Right
Tl	Top Left
Tr	Top Right
Ts	Top Surround
Ltm	Left Top Middle
Rtm	Right Top Middle
Lts	Left Top Surround
Rts	Right Top Surround
SW	Subwoofer speaker output

* Lb and Rb correspond to the Lrs and Rrs channels as defined by SMPTE.

1.7 Contacting Dolby

Support services are available to address any questions and to provide advice about integrating Dolby technology into your product.

For product design or testing, contact Dolby at systemsupport@dolby.com. By utilizing Dolby expertise, especially during the design process, many problems that might require design revisions before a product is approved can be prevented.

Dolby is also available to review product plans, including preliminary design information, markings, displays, and control and menu layouts, with the goal of preventing problems early in the product development cycle.

If you have comments or feedback about this document, send us an email at documentation@dolby.com.

2 Test overview

General information relevant to the playback system test is provided to assist you in managing the tests within the interactive test framework.

- Testing a playback product
- Product features and testing
- Test signals
- Listening test
- Product configuration

2.1 Testing a playback product

This topic provides an overview of how to test a playback product by using the Dolby Digital Plus Online Delivery Kit.

About this task

Refer to the relevant section for detailed instructions.

Procedure

1. Access the Dolby Digital Plus Online Delivery Kit on DISC.
2. Download and install the test application on your product under test.
3. Complete the Dolby Digital Plus Online Delivery System Interactive Test Procedure questionnaire on DISC.
   This generates a test-case list with detailed test instruction for each test case.
4. Play back required streaming test signals hosted on the DISC server (or stored on your local disk) with the test application.
5. Analyze the resulting test signals using the specified method and tools provided in the Dolby System Interactive Test Procedure.
6. Submit the test results to Dolby for approval.

2.2 Product features and testing

Many feature-set variations are possible in a product that includes Dolby Digital Plus technology. Test the features that your product supports.

The Dolby System Interactive Test Procedure uses the form of a questionnaire to request information about which features are supported by a product, and then uses this information to provide test instructions for all applicable test cases. Unless otherwise stated in the individual test instructions, running each test case for each supported feature is generally recommended.

Factors influencing product features are described in this section.

2.2.1 Online delivery formats

A product may support playback of online content in one or more online delivery formats and profiles, including:

- MPEG Dynamic Adaptive Streaming over HTTP format (DASH)
  - MPEG-DASH Live profile
  - MPEG-DASH On Demand profile
  - Hybrid Broadcast Broadband TV (HbbTV)
- Apple HTTP Live Streaming format
- Progressive downloading of MP4
- Progressive downloading of MPEG-2 transport streams

2.2.2 Video encoding formats

A product may support one or more video encoding formats and profiles.

The table lists all video profiles included in the Dolby Digital Plus Online Delivery Kit.

Table 2: Video encoding formats and profiles

Encoding	Video profiles	Resolutions	Bit rate	Frame rates
H.264	Main profile at level 3.1	640 × 360p	1.5 Mbps	25 and 29.97 fps
	Main profile at level 4.0	1280 × 720p	3 Mbps	25 and 29.97 fps
	Main profile at level 4.1	1920 × 1080	5 Mbps	25 and 29.97 fps
H.265	Main 10 profile at level 4.0	1280 × 720p	1.5 Mbps	25 and 29.97 fps
	Main 10 profile at level 4.1	1920 × 1080	3 Mbps	25 and 29.97 fps
	Main 10 profile at level 5.1	3840 × 2106	10 Mbps	25 and 29.97 fps

It is possible to create a Licensed Product that does not support all of these video coding formats. For example, an HbbTV product targeted specifically at the European market could support 25 fps only.

Unless otherwise stated in the individual test instructions, run each test case for each supported video encoding format.

2.2.3 Audio encoding formats

In addition to Dolby Digital Plus, a product may support various audio codecs, such as Dolby Digital and HE AAC.

It is possible to create a Licensed Product that does not support all of these audio coding formats. For example, a playback product targeted specifically at the US market could support decoding of Dolby Digital Plus only.

Unless otherwise stated in the individual test instructions, run each test case for each supported audio encoding format.

2.2.4 Dual decoding

The Dolby Digital Plus decoder supports dual decoding of main and associated audio programs. This feature provides the means to support the audio description (AD) service as a receiver mix.

Note: Dual decoding can be used for many purposes. The most common use of dual decoding is to provide additional content. One application of dual decoding is to support audio description.

Some tests are specific to dual decoding and are not applicable to products that do not support this feature.

Support for dual decoding is required for products where Dolby Digital Plus is supported from broadcast inputs.

2.2.5 Multichannel and two-channel output

A product with a Dolby Digital Plus decoder can provide a variety of outputs, multichannel or two channel.

The test procedure questionnaire will request information about which output is considered the preferred output. The questionnaire will use this information to provide test instructions for this main output for all applicable tests. This can be any output at the preference of the tester. We do, however, recommend that you always use the maximum output channel configuration supported by your product to run each test case. If two-channel output is selected, make sure all channels available in test streams are correctly downmixed and clearly audible in the two-channel output.

This section provides expected channel routing by two-, 5.1-, and 7.1-channel products when playing the channel identification test signals.

Two-channel input

For input test signals with a two-channel configuration, confirm that all channel identifications in the input test signals are correctly reproduced in the speakers.

For 2.0-channel output product

With a 2.0-channel output product, confirm that the L and R channel identifications in the input test signals are correctly output to the 2.0 channels, as described in the table.

Left	Right
“Left channel“	“Right channel”

For 5.1-channel output product

With a 5.1-channel output product, confirm that the L and R channel identifications in the input test signals are correctly output to the 5.1 channels, as described in the table.

Left	Center	Right	Left Surround	Right Surround	LFE
“Left channel“	N/A	“Right channel”	N/A	N/A	N/A

For 7.1-channel output product

With a 7.1-channel output product, confirm that the L and R channel identifications in the input test signals are correctly output to the 7.1 channels, as described in the table.

Left	Center	Right	Left Surround	Right Surround	Left Rear Surround	Right Rear Surround	LFE
“Left channel“	N/A	“Right channel”	N/A	N/A	N/A	N/A	N/A

5.1-channel input

For input test signals with a 5.1-channel configuration, confirm that all channel identifications in the input test signals are correctly reproduced in the speakers.

For 2.0-channel output product

When the input test signal is 5.1 channel, confirm that all channel identifications are correctly downmixed and output to the L and R channels, as described in the table. The distribution of channels in the downmix depends on the downmix type (stereo or surround compatible).

Voice	Output in channel	
	Stereo (Lo/Ro)	Surround compatible (Lt/Rt)
100 Hz tone	L and R	L and R
"Left channel"	L	L
"Right channel"	R	R
"Center channel"	L and R	L and R
"Right Surround channel"	R	L and R
"Left Surround channel"	L	L and R

For 5.1-channel output product

With a 5.1-channel output product, confirm that all channel identifications in the input test signals are correctly output to the 5.1 channels, as described in the table.

Left	Center	Right	Left Surround	Right Surround	LFE
“Left channel“	“Center channel”	“Right channel”	“Left Surround channel” plus tone	“Right Surround channel” plus tone	100 Hz tone

For 7.1-channel output product

With a 7.1-channel output product, confirm that all channel identifications in the input test signals are correctly output to the 7.1 channels, as described in the table.

Left	Center	Right	Left Surround	Right Surround	Left Rear Surround	Right Rear Surround	LFE
“Left channel“	“Center channel”	“Right channel”	“Left Surround channel”	“Right Surround channel”	N/A	N/A	100 Hz tone

7.1-channel input

For input test signals with a 7.1-channel configuration, confirm that all channel identifications in the input test signals are correctly reproduced in the speakers.

For 2.0-channel output product

When the input test signal is 7.1 channel, confirm that all channel identifications are correctly downmixed and output to the L and R channels, as described in the table. The distribution of channels in the downmix depends on the downmix type (stereo or surround compatible).

Voice	Output in channel	
	Stereo (Lo/Ro)	Surround compatible (Lt/Rt)
100 Hz tone	L and R	L and R
"Left channel"	L	L
"Right channel"	R	R
"Center channel"	L and R	L and R
"Right Surround channel"	R	L and R
"Left Surround channel"	L	L and R
"Right Rear Surround channel"	R	R
"Left Rear Surround channel"	L	L

For 5.1-channel output product

With a 5.1-channel output product, confirm that all channel identifications in the input test signals are correctly output to the 5.1 channels, as described in the table.

Left	Center	Right	Left Surround	Right Surround	LFE
“Left channel“	“Center channel”	“Right channel”	“Left Surround channel,” “Left Rear Surround channel,” “Right Rear Surround channel” plus tone	“Right Surround channel” , “Left Rear Surround channel,” “Right Rear Surround channel”plus tone	100 Hz tone

For 7.1-channel output product

With a 7.1-channel output product, confirm that all channel identifications in the input test signals are correctly output to the 7.1 channels, as described in the table.

Left	Center	Right	Left Surround	Right Surround	Left Rear Surround	Right Rear Surround	LFE
“Left channel“	“Center channel”	“Right channel”	“Left Surround channel”	“Right Surround channel”	“Left Rear Surround channel”	“Right Rear Surround channel”	100 Hz tone

2.2.6 Output interfaces

Two-channel and multichannel outputs can be routed to a variety of interfaces, including:

- HDMI
- S/PDIF
- Line level
- Speakers
- Headphones

Certain tests must be repeated on all digital output interfaces (such as HDMI and S/PDIF) supported by the product under test. The Dolby Digital Plus 7.1-channel audio decoding and channel mapping test case specifically requires testing on the digital interfaces.

2.2.7 Dolby Atmos

A product may support playback of Dolby Digital Plus with Dolby Atmos content.

Some test streams contain Dolby Digital Plus with Dolby Atmos content in it. These test streams are designed to verify that a product has the capability of playing back Dolby Digital Plus and reproducing the Dolby Atmos content by using the object audio metadata contained in the stream.

For a product that includes an HDMI source (output) and supports playback of Dolby Digital Plus with Dolby Atmos content, it identifies Dolby Atmos content from online delivery formats, and by default passes it through the HDMI or Audio Return Channel (ARC) to an A/V receiver enabled for Dolby Atmos. For a product that does not support Dolby Atmos content, it drops the object audio metadata and decodes the stream as a normal Dolby Digital Plus stream with a backward-compatible downmixed channel configuration.

2.3 Test signals

Test signals are designed to verify that a product can properly demultiplex, decode, and play back Dolby Digital Plus bitstreams contained in online delivery formats.

Generally, test signals were created by multiplexing one or more audio elementary streams and one or more H.264 (or H.265) video elementary streams. Depending on the use case, the audio elementary streams can be in the Dolby Digital Plus or other format.

2.3.1 Test vectors

A test vector is a set of test signals that are involved in running a test case.

For the MPEG-DASH test cases, a test vector is composed of the test files as listed in the table.

MPEG-DASH profiles	Files in a test vector
MPEG-DASH Live	One Media Presentation Description (MPD) manifest file (.mpd file) A sequence of .mp4 files for each video stream A sequence of .mp4 files for each audio stream
MPEG-DASH On Demand	One MPD manifest file (.mpd file) One .mp4 file for each video stream One .mp4 file for each audio stream

For the MPEG-DASH HbbTV test cases, a test vector is composed of these test files:

- An MPD manifest file (.mpd file)
- For each audio stream:
  - A common initialization segment file (.mp4)
  - A sequence of media segment files (.mp4)
- For each video stream:
  - A common initialization segment file (.mp4)
  - A sequence of media segment files (.mp4)

For the HTTP Live Streaming test cases, a test vector is composed of these test files:

- Playlist files (.m3u8 files)
- A sequence of media segment files (.ts files)

- A sequence of ID3 format files (.ec3 or .aac files)

Each manifest (or playlist) file uses relative paths to the media files. The relative file locations between the media files and the manifest file must be kept while a test vector being copied or moved. This enables the manifest file to locate the media files for playback after you move the test vectors from one directory to another directory, including to a server location, to simulate a server/client media streaming process.

2.3.2 File-name channel configuration abbreviations

The test files of this kit include abbreviations that indicate the channel configuration of the test signal. For example, the manifest file ChID_voices_1280x720p_25fps_h264_2ch_128kbps_ddp.mpd contains stereo content. The table lists the channel configuration abbreviations.

Table 3: File-name channel configuration abbreviations

Abbreviation	Configuration
1ch	Mono
2ch	Stereo: Left, Right
6ch	5.1 channels: Left, Center, Right, Left Surround, Right Surround, Low-Frequency Effects
8ch	7.1 channels: Left, Center, Right, Left Surround, Right Surround, Left Rear Surround, Right Rear Surround, Low-Frequency Effects

2.3.3 Test file naming conventions

A generic naming convention is used for the test files included in the kit.

A test file name is structured in the pattern:

<additional info>_<stream contents>_<video resolution>_<video framerate>_<video codec>_<output channel configurations>_<bitrates>_<audio codecs>.<file extension>

The file name convention is described in this table.

Term	Description
<additional info>	Indicates additional information about the test signal, such as payload byte order. For example, LE indicates that the signal is in little-endian byte order.
<stream contents>	Indicates the stream contents. For example, ChID_voice indicates voice content for the channel identification test.
<video resolution>	Indicates the video resolution.
<video framerate>	Indicates the video frame rate.
<video codec>	Indicates the video codecs used by a test signal.
<output channel configurations>	Indicates output channel configuration.
<bitrates>	Indicates the bit rate at which a test file is encoded.
<audio codecs>	Indicates the audio codecs used by a test signal.
<file extension>	Indicates file formats.

For example, in the file ChID_voices_1280x720p_25fps_h264_2ch_128kbps_ddp.mpd, the name of the MPEG-DASH test vector represents one Dolby Digital Plus audio track encoded at 128 kbps with 2.0-channel output, and one H.264 video track with a resolution of 1280×720p at a frame rate of 25 fps.

If a test signal contains more than one video or audio track, the file name will not include the information that is associated with the multiple tracks. For example, a test signal contains two audio tracks, one 5.1-channel AAC track at 640 kbps and one 5.1-channel Dolby Digital Plus track at 256 kbps. The <audio codecs> and <bitrates> information will not be included in its file name.

ChID_voices_1280x720p_25fps_h264_multi_codec.mpd

2.4 Listening test

Listening tests enable you to check for audible failures in the decoding of Dolby Digital Plus. Listening tests can reveal obvious faults not apparent while conducting other tests.

Perform the listening tests by listening to the product outputs while playing the supplied test signals. Use these general guidelines for performing all listening tests:

- Choose the audio output to monitor.
- For most tests, it is sufficient to monitor the two-channel analog output using the line-level or headphone output. (Use the PCM output if no analog outputs are provided.) Make all necessary equipment connections and product UI selections to listen to this output.
- Unless otherwise indicated, you can instead choose to monitor the digital outputs (for example, HDMI or S/PDIF).
- Perform listening tests in a quiet environment.
- Listen carefully to the decoded output.
- Verify that the product reproduces the test signal as expected.
- Ensure that any additional processing (such as a virtualizer) is turned off.
- Listen for any loud pops, clicks, distortion, excessive mutes, or other audible objectionable behavior.
- Perform all of the listening tests for every feature the product supports.

2.5 Product configuration

Run every test with the default configuration settings unless different configuration settings are provided.

Dynamic range control mode	Default mode
Output channel configuration	Maximum supported by the output type
Channels to monitor	All, simultaneously if possible
Output type	All analog and digital outputs
Measurement tool	A number of speakers equal to the product maximum output channel configuration for the specified output type

3 Test hardware setup

To simulate the online delivery process and play back the test signals, an appropriate hardware setup for testing is required. Choose the setup best suited for your hardware and network environment.

- Hardware setup with a local web server
- Hardware setup with DISC
- External decoders

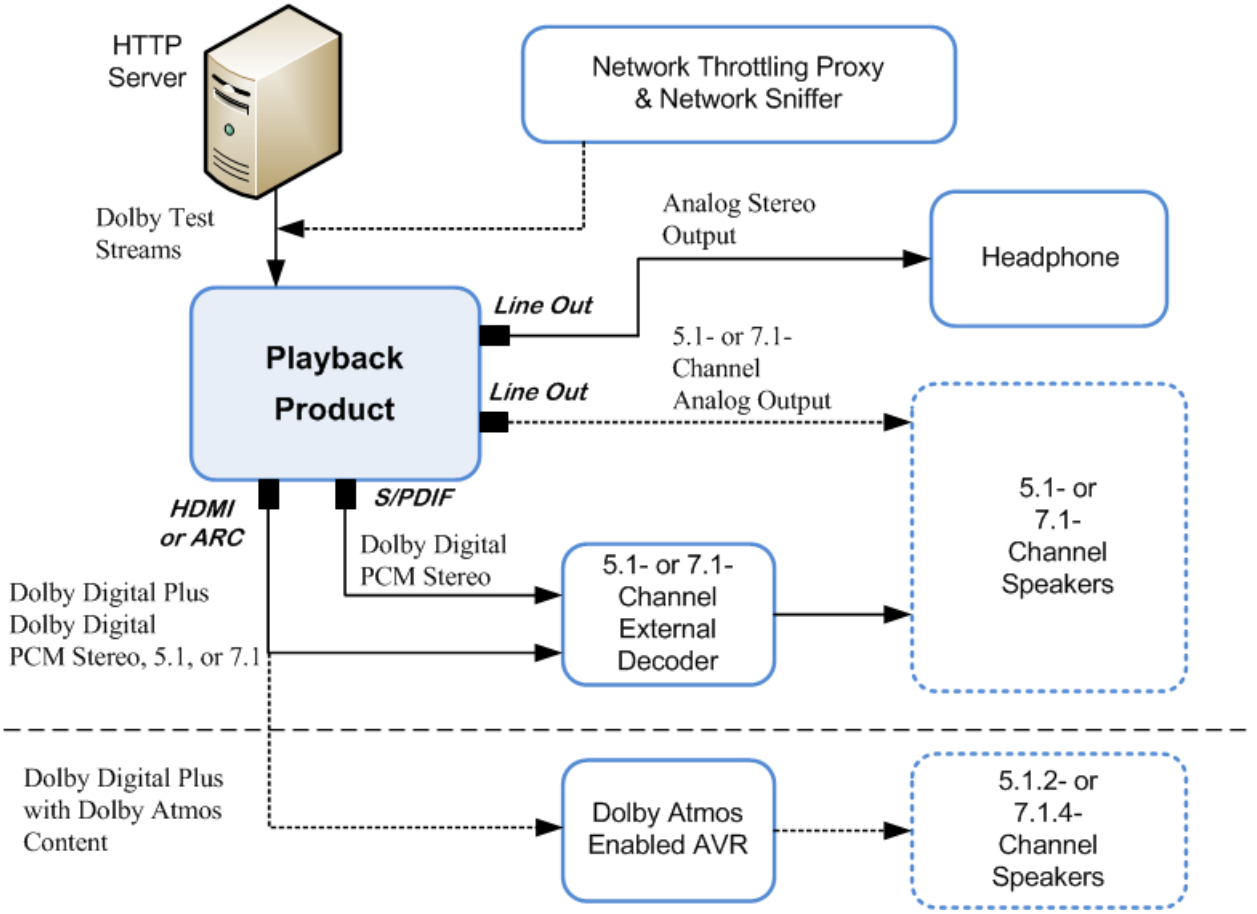
3.1 Hardware setup with a local web server

If you are accessing the Internet from behind a firewall or if you do not have a fast Internet connection, we recommend testing your playback product with a local web server.

3.1.1 Hardware setup with a local web server for MPEG-DASH and HTTP Live Streaming

The figure depicts a generic hardware setup with a local server for MPEG-DASH and HTTP Live Streaming.

Figure 1: Hardware setup with a local web server for MPEG-DASH and Http Live Streaming



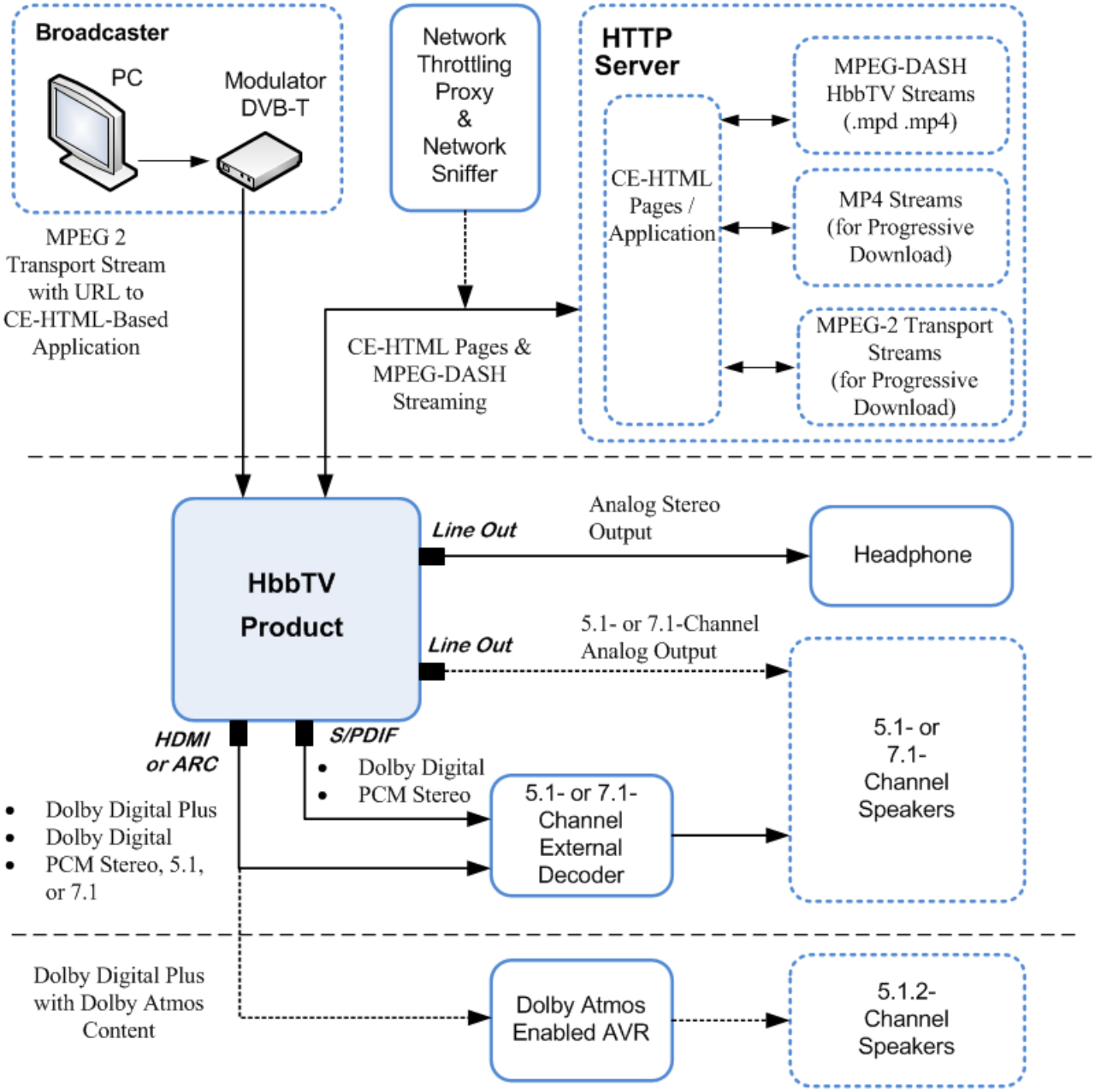
The following are required for MPEG-DASH and HTTP Live Streaming testing:

- An HTTP server must be used to deliver the test signals.
- Headphones connected to the headphone output (or line-level output) of the product under test.
- A/V unit with 5.1 or 7.1 speakers.
- If the product under test provides HDMI output, connect the HDMI output interface to an external decoder (such as an A/V receiver) capable of decoding the available digital outputs (Dolby Digital Plus and Dolby Digital).
- For the multiple bit-rate test case, it is necessary to limit the available bandwidth. Unless your client software has this feature (for example, in a debug mode), it may be necessary to use a manually controllable throttling proxy. In case the quality change caused by switching between different bit rates is not audible, it may be necessary to check which transport stream segments are actually accessed by analyzing the HTTP server logs or using a network analysis tool (network sniffer).
- For MPEG-DASH testing, the PlayReady DRM server is reachable over your network for playback of encrypted test files.
- If the playback product under test is capable of passing through Dolby Digital Plus with Dolby Atmos content, connect to the HDMI output interface an external decoder (such as an A/V receiver) capable of decoding the Dolby Digital Plus with Dolby Atmos content, and connect the decoder output to 5.1.2 speakers.

3.1.2 Hardware setup with a local web server for HbbTV

The figure depicts a generic hardware setup with a local server for HbbTV.

Figure 2: Hardware setup with a local web server for HbbTV



The following are required for HbbTV testing:

- An HbbTV product (with a remote control) supporting both broadcast and HTTP-based networks.
- An HTTP server for storage and serving of the CE-HTML application and test signals.
- A broadcaster module that consists of a PC and a DVB-T modulator (for example, a DekTec DTU-215 USB-2 VHF/UHF Modulator). MPEG-2 compliant transport stream playback software (for example, StreamXpress, which comes with the DekTec output device) must be installed on the PC, together with the DVB-T modulator, to simulate a DVB-compliant broadcast network based on unidirectional MPEG-2 transport streams.
- Headphones.
- A/V unit with 5.1 or 7.1 speakers.
- If the product under test provides HDMI output, prepare an external decoder (such as an A/V receiver) capable of decoding the available digital outputs (Dolby Digital Plus and Dolby Digital).

- For the multiple bit-rate test case, it is necessary to limit the available bandwidth. Unless your client software has this feature (for example, in a debug mode), it may be necessary to use a manually controllable throttling proxy. In case the quality change caused by switching between different bit rates is not audible, it may be necessary to check which transport stream segments are actually accessed by analyzing the HTTP server logs or using a network analysis tool (network sniffer).
- The PlayReady and Marlin DRM servers are reachable over your network for playback of encrypted test files.
- If the playback product under test is capable of passing through Dolby Digital Plus with Dolby Atmos content, connect to the HDMI output interface an external decoder (such as an A/V receiver) capable of decoding the Dolby Digital Plus with Dolby Atmos content, and connect the decoder output to 5.1.2 speakers.

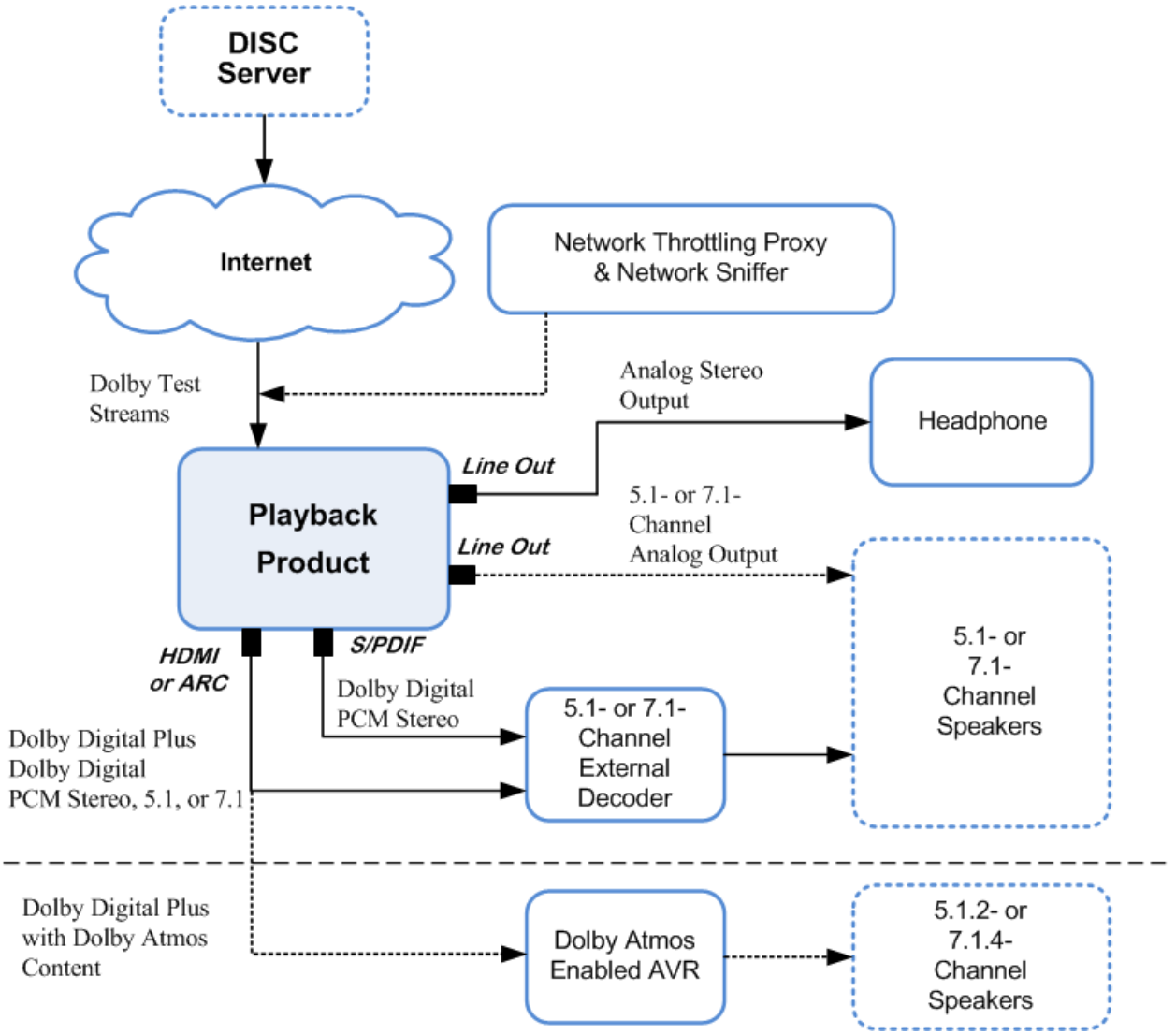
3.2 Hardware setup with DISC

Streaming test signals directly from the DISC website to your playback product saves you the effort in setting up the web server. Set up your hardware as depicted in this section for online streaming testing.

3.2.1 Hardware setup with DISC for MPEG-DASH and HTTP Live Streaming

The figure depicts a generic hardware setup with the DISC website for MPEG-DASH and HTTP Live Streaming.

Figure 3: Hardware setup with DISC for MPEG-DASH and HTTP Live Streaming



The following are required for MPEG-DASH and HTTP Live Streaming testing:

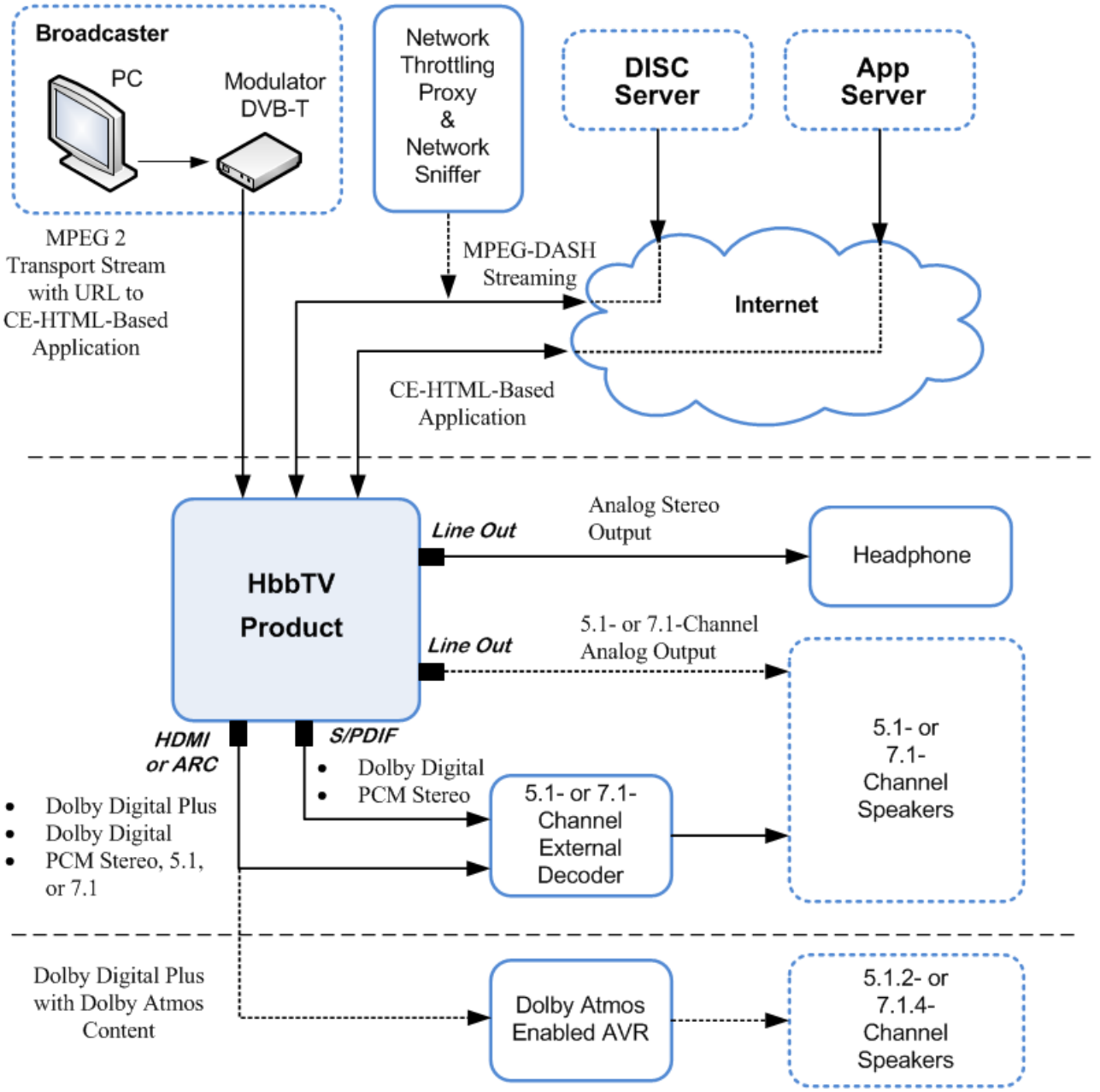
- Internet connection with adequate bandwidth for streaming test signals from the DISC website to your playback product.
- Headphones connected to the headphone output (or line-level output) of the product under test.
- A/V unit with 5.1 or 7.1 speakers.
- If the product under test provides HDMI output, connect the HDMI output interface to an external decoder (such as an A/V receiver) capable of decoding the available digital outputs (Dolby Digital Plus and Dolby Digital).
- For the multiple bit-rate test case, it is necessary to limit the available bandwidth. Unless your client software has this feature (for example, in a debug mode), it may be necessary to use a manually controllable throttling proxy. In case the quality change caused by switching between different bit rates is not audible, it may be necessary to check which transport stream segments are actually accessed by analyzing the HTTP server logs or using a network analysis tool (network sniffer).

- For MPEG-DASH testing, the PlayReady DRM server is reachable over your network for playback of encrypted test files.
- If the playback product under test is capable of passing through Dolby Digital Plus with Dolby Atmos content, connect the HDMI output interface to an external decoder (such as an A/V receiver) capable of decoding the Dolby Digital Plus with Dolby Atmos content, and connect the decoder output to 5.1.2 speakers.

3.2.2 Hardware setup with DISC for HbbTV

The figure depicts a generic hardware setup with the DISC website for HbbTV.

Figure 4: Hardware setup with DISC for HbbTV



The following are required for HbbTV testing:

- An HbbTV product (with a remote control) supporting both broadcast and HTTP-based networks
- Internet connection with adequate bandwidth for streaming test signals from the DISC website to your playback product.
- A broadcaster module that consists of a PC and a DVB-T modulator (for example, a DekTec DTU-215 USB-2 VHF/UHF Modulator). MPEG-2 compliant transport stream playback software (for example, StreamXpress, which comes with the DekTec output device) must be installed on the PC, together with the DVB-T modulator, to simulate a DVB-compliant broadcast network based on unidirectional MPEG-2 transport stream.
- Headphones.
- A/V unit with 5.1 or 7.1 speakers.
- If the product under test provides HDMI output, prepare an external decoder (such as an A/V receiver) capable of decoding the available digital outputs (Dolby Digital Plus and Dolby Digital).
- For the multiple bit-rate test case, it is necessary to limit the available bandwidth. Unless your client software has this feature (for example, in a debug mode), it may be necessary to use a manually controllable throttling proxy. In case the quality change caused by switching between different bit rates is not audible, it may be necessary to check which transport stream segments are actually accessed by analyzing the HTTP server logs or using a network analysis tool (network sniffer).
- The PlayReady and Marlin DRM servers are reachable over your network for playback of encrypted test files.
- If the playback product under test is capable of passing through Dolby Digital Plus with Dolby Atmos content, connect to the HDMI output interface an external decoder (such as an A/V receiver) capable of decoding the Dolby Digital Plus with Dolby Atmos content, and connect the decoder output to 5.1.2 speakers.

3.3 External decoders

If the product supports bitstream output over an available digital interface (for example, HDMI or Sony/Philips Digital Interconnect Format (S/PDIF)) output, an external decoder is required for testing.

To ensure that expected results of some tests can be correctly verified, the external decoder should be capable of displaying sample rate and channel configuration information for the signal being processed.

You can use an external decoder product (for example, an) with these characteristics:

- Support for Dolby Digital Plus 5.1-channel decoding.
- 5.1-channel speaker outputs.
- S/PDIF input that meets the requirements defined in the IEC 60958 and IEC 61937 specifications.
- An HDMI input for testing products that function as HDMI sources (for example, set-top boxes), or an HDMI output for testing products that function as HDMI sinks (for example, TVs). The HDMI must have these characteristics:
  - Capable of supporting a single IEC 61937 stream with an IEC 60958 sample rate of 128, 176.4, or 192 kHz
  - Implements version C or later of the CTA-861 standard

When testing an HDMI sink product that is enabled to use the HDMI Audio Return Channel (ARC) feature, ensure that the external decoder is also ARC enabled.

An external decoder with these capabilities enables you to use a single product to perform all tests requiring an external decoder.

Ensure that any effects (or other processing) on the decoder are turned off during testing.

4 The interactive test procedure

This development kit includes a browser-based interactive test procedure to assist you through the testing process for the playback kit Implementation.

4.1 Testing with the interactive procedure

Follow these instructions to generate and complete the interactive test procedure.

Prerequisites

- Before you start, make sure you are familiar with product variations.
- The interactive test procedure does not support Internet Explorer. We recommend using recent version of Mozilla Firefox.
- JavaScript support must be enabled in your browser.

Procedure

1. Log in to the DISC website at https://disc.dolbycustomer.com.
2. Navigate to the **Dolby Digital Plus Online Delivery Kit** > **Interactive Test Procedure** > **Interactive Test Procedure for Playback**.
   If this is the first time you run the interactive test procedure, an empty product configuration questionnaire appears. Otherwise, you may need to clear the settings from last time by clicking **Settings**  , and then **New session**.
3. Fill in the product configuration questionnaire.
   To obtain the list of relevant test cases for your system, you must answer some questions regarding system capabilities. The questionnaire may have multiple pages. In a completed questionnaire, every required question must have a ✔ sign.
   As you fill in the questionnaire, certain questions and answers automatically become inactive, because they are incompatible with the feature you are selecting.
   In case you wish to specify something to the Dolby team regarding a certain question, you can use the option **Add a comment**.
4. Click **Next** when you have completed each page, then click **Done** when you have completed the entire questionnaire.
   A test-case list is generated and appear in a new page, with the required and recommended tests for your system. You must complete all required tests listed for your system capabilities.
5. Click **Settings**  , and then **Download playlists**, to save a .zip playlist file to your local disk:
   - The playlist file contains test signal URLs and will be used by the some of the test applications provided in the Dolby Digital Plus Online Delivery Kit.
   - Click **Test Overviews** at the top of the page to go back to the test-case list view.
6. Optional: Sort, filter, and save the test-case list for better orientation and for future reference.

- You can show or hide columns using the check boxes on the side panel (for example, **Approach** or **Standard**). By default, the list shows **Test case**, **Purpose**, **Online Delivery Format**, **Digital Right Management**, **Video Profile**, **Requirement** and **Status**.
- You can sort the list by clicking the column headers.
- You can apply filtering criteria on a relevant column in the list, using the filtering check boxes on the side panel.
- You can save or load a session under **Settings** > **Session management**. The settings you filled in for your system are saved in a .json log file.

7. For each test case:
   a) Click the test case in the list, and read the test-case description and procedure.
   b) Follow the setup requirements and instructions on the page to complete the tests.
   c) Compare the test results with the expected results shown on the page, and select **Pass** or **Fail**.
   d) To go to the next test case in the list, click **Next**.
      If you want to see the entire list again and check the tests status, click **Up one level** or **Tests Overview**.

   100% **Test suite progress** indicates that you have completed all of the required tests.
8. Save the printable versions of the questionnaire and test cases under **Settings** > **Print versions**.
   Click **All** to generate a .html file that contains the complete questionnaire and the test-case list together with test results.

Related information

Test materials on page 6
Accessing the test materials on page 8

5 Test applications

GUI-based applications with the capability of playing back Dolby Digital Plus bitstreams are designed for several platforms.

- Test application for the Smart TV platform
- Test application for HbbTV compliant products
- Test application for HbbTV 2.0 compliant products
- Test application for Xbox 360
- Test application for an HTML5-supported web browser
- Test application for Android TV
- Test applications for Apple TV
- Test application for Roku TV
- Test application for Chromecast

5.1 Test application for the Smart TV platform

Dolby provides test applications for playing back Dolby Digital Plus bitstreams on Smart TV platforms, including Samsung Smart TV, Samsung Tizen TV, LG Netcast TV, LG WebOS TV and TV products compliant with the Smart TV Alliance specification.

Note: The method of installing the test application for a Smart TV Alliance product varies on a case-by-case basis. The LG Smart TV is used here as an example of a Smart TV Alliance product. The usage of the test application is similar on most Smart TV products.

5.1.1 Setting up testing infrastructure

To run tests with the test application, you must set up the testing infrastructure best suited for your environment. You can choose connecting the Smart TV to either a local web server or the DISC website.

Connecting the Smart TV to a local web server

If you are accessing the Internet from behind a firewall or if you do not have a fast Internet connection, set up your Smart TV as described in this section.

About this task

To simulate a server/client media streaming process, the Smart TV under test must be connected to a local web server that hosts the test signals.

Procedure

1. Set up hardware components as described in the section that addresses hardware setup with a local web server.
2. Download the entire playback kit onto your local web server from the DISC website (https://disc.dolbycustomer.com), and unpack it to an appropriate directory.
3. Configure the IP address of the local web server.
4. Assign a valid IP address for the Smart TV. (Usually, the IP is set automatically. For the procedure of setting the IP address for a Smart TV, refer to the user's manual of the Smart TV product.)
5. Verify the connection by accessing the Start_Here.html page of the kit in the Smart TV built-in web browser.

Related information

Hardware setup with a local web server on page 19

Connecting the Smart TV to the DISC website

If you have access to an Internet connection with adequate bandwidth for streaming a test signal to your playback product, set up your testing infrastructure as described in this section.

About this task

To stream test signals from the DISC website to the Smart TV under test, you must ensure that the Smart TV has an Internet connection and is able to access the DISC website.

Procedure

1. Set up hardware components as described in the section that addresses hardware setup with the DISC website.
2. Connect the Smart TV to Internet. (For the procedure for accessing the Internet, refer to the user's manual for the Smart TV product.)
3. Verify the connection by accessing the DISC website at https://disc.dolbycustomer.com in the Smart TV built-in web browser.

Related information

Hardware setup with DISC on page 22

5.1.2 Preparing a test signal list for the test application

You can first screen out the relevant test cases for your system by using the interactive test procedure, and then manually provide the test application with a list of the selected test signals and their URLs so that the test application is able to locate those test signals for playback.

Procedure

1. Log in to the DISC website at https://disc.dolbycustomer.com.
2. Navigate to the **Dolby Digital Plus Online Delivery Kit** , and within the kit, click **Interactive Test Procedure**.
3. Complete the entire questionnaire of the interactive test procedure, and then click **Done**.

   One step of the questionnaire requires information about the directory where the test signals are stored. Choose the correct location, **Local server** or **DISC website**. If **Local server** is selected, enter the path information in the text box as required.

A test-case list is generated and appears in a new page, with the required and recommended tests for your system. You must complete all required tests listed for your system configuration.

4. Click **Settings**  , and then **Download playlists**, to save a c_playlist.zip file to your local disk.

   This playlist file contains the URLs to the required test signals.

5. Unpack the c_playlist.zip file.

   This unzipped folder will be used later to import the test-case list to the test application.

6. To generate a new playlist for another set of test signals, repeat steps 3 to 5.

Related information

Testing with the interactive procedure on page 27

5.1.3 Deploying the test application on the Smart TV

Download the correct test application .zip file, and deploy the applications on your target Smart TV.

Deploying the test application on a Samsung Smart TV

Deploy the test application on a Samsung Smart TV for running tests.

Prerequisites

- You must have access to the Dolby Digital Plus Online Delivery Kit.
- You have created the playlist file for your product under test by using the interactive test procedure.
- You must prepare a USB flash drive with minimum memory space of 10 MB.

Procedure

1. Download or copy the Samsung_Orsay_app.zip file to an appropriate directory on your local PC.

   If you have downloaded and unpacked the kit on your local web server, locate the .zip file in the <kit parent directory>/Test_Apps/Samsung_app directory.

   Otherwise, download the .zip file from the web page <kit starting page>/Test_Apps/ on the DISC website (https://disc.dolbycustomer.com).

2. Unzip the file Samsung_Orsay_app.zip, and make sure the unzipped folder (Samsung) contains the files index.html and config.xml, the c_playlist folder, and other files and subfolders.

3. Import the customized test-signal playlist by replacing the c_playlist subfolder in the Samsung folder with the unzipped c_playlist folder generated by using the interactive test procedure.

   The new c_playlist contains links to test signals that are relevant to your product under test only. If you do not use the customized playlist, a default test-signal playlist will appear when running the test application.

   If you need to test another set of test signals, you must generate a new playlist with the **Playback Kit Interactive Test Procedure**, and then manually replace the playlist folder with the updated one.

Make sure that the file names and subfolders structure within the unzipped Samsung folder are unchanged.

4. Copy the entire folder Samsung to the root directory of the USB flash drive.
5. Switch on the Smart TV.
6. Press the **SMART HUB** button on the remote control.
7. Select **More Apps** from the bottom of the TV screen.

   The user interface for accessing the **More Apps** page may differ across different Smart TV versions. Refer to the Smart TV user's manual for more information.
8. Connect the USB flash drive to the TV.

   Note: The TV may not detect the test application in the USB flash drive if you connect it to the TV earlier than this step.

   If the **New device connected** message prompts, press the return (back) button on the remote control.

   The OttTestApp appears in the **More Apps** list and is ready for use.
9. Click on the application icon to run it.

   Note: This version of the test application cannot be installed on the Samsung Smart TV. You must keep the USB flash drive connected to the TV while using the test application.

Related information

Accessing the test materials on page 8

Deploying the test application on a Samsung Tizen TV

To install the Dolby test application to a Samsung Tizen TV, you must connect the TV under test to a computer with the Samsung Tizen TV system development kit properly installed on it.

Setting up the development environment

Set up the development environment for deployment of the test application.

Preparing the Samsung TV for development
The TV under test must switch to the development mode for installing the Dolby test application.

Procedure

1. Update the TV firmware to the latest version (later than 1400.0).
2. Set the TV to **Developer Mode**.
   a) Switch on the TV, and press the **Smart Hub** button on the remote control.
   b) Enter the **Apps** screen.
   c) In the **Apps** screen, press the number buttons **1**, **2**, **3**, **4**, **5** in sequence on the remote control.

      An interface appears for setting **Developer Mode**.
   d) Set the **Developer Mode** to **On**.
   e) Enter the IP address for the PC that will be connected to this TV.
   f) Reboot the TV.

      It might be necessary to disconnect the TV power plug to make the settings effective.

      If the TV is successfully set to the development mode, a red sign reading **Developer Mode** will appear on the **Apps** screen after rebooting.

For detailed information, see http://www.samsungdforum.com/TizenGuide.

3. Verify the IP address for the TV, and make sure the TV and the PC are connected to the same network (same router).

   The Samsung system development kit will be installed on the PC for deployment of the test application.

Installing the Samsung Tizen TV system development kit

Install the Samsung Tizen TV system development kit on a PC to deploy the Dolby test application on a Samsung Tizen TV.

Procedure

1. Download and install the Tizen TV system development kit on a PC that will be used to deploy the test application on the TV.

   Tizen TV system development kit is available at http://www.samsungdforum.com/TizenDevtools/SdkDownload. Choose the version that suits your operating system.

   Note: The PC must run Windows 8.1 or later. We recommend using Windows 10.

2. Run the Tizen 2.4 IDE, and create the security profile as described in http://www.samsungdforum.com/TizenGuide/tizen1261/index.html.

   Refer to the security profiles section only.

3. Check the IP address for the PC, and make sure that the TV and the PC are connected to the same network (same router).

Deploying the test application

Use the Tizen 2.4 IDE to deploy the Dolby test application on the Samsung Tizen TV.

Prerequisites

- You must have access to the Dolby Digital Plus Online Delivery Kit.
- The TV and the PC are connected to the same network (same router).
- A PC running Window 8.1 (or later) is required. We recommend Windows 10.
- The development environment has been correctly established.
- You have created the playlist file for your product under test by using the interactive test procedure.

Procedure

1. Download or copy the Samsung_tizen_app.zip file to an appropriate directory on the local PC.

   If you have downloaded and unpacked the kit on your local web server, locate the .zip file in <kit parent directory>/Test_Apps/Samsung_app directory.

   Otherwise, download the .zip file from the web page <kit starting page>/Test_Apps/ on the DISC website (https://disc.dolbycustomer.com).

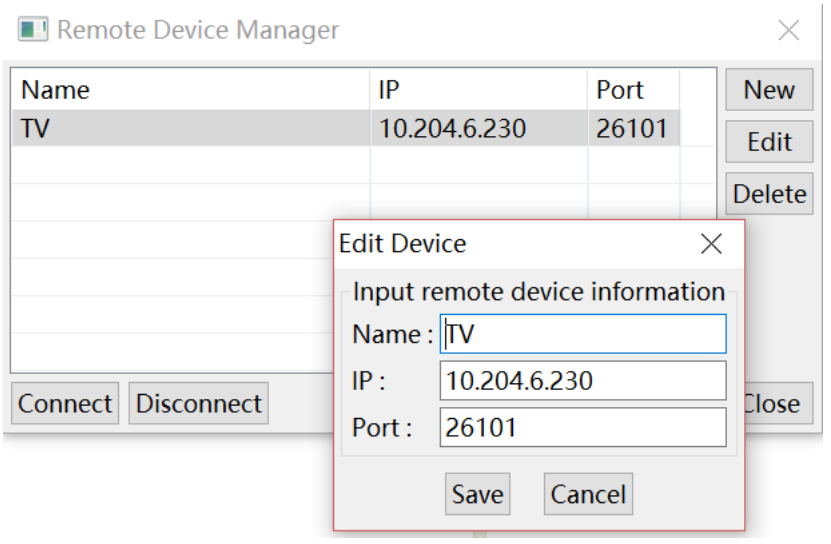
2. Import the customized test-signal playlist by replacing the c_playlist subfolder in the Samsung_tizen_app.zip file with the unzipped c_playlist folder generated by using the interactive test procedure.

   The new c_playlist contains links to test signals that are relevant to your product under test only. If you do not use the customized playlist, a default test-signal playlist will appear when running the test application.

If you need to test another set of test signals, you must generate a new playlist with the **Playback Kit Interactive Test Procedure**, and then manually replace the playlist folder with the updated one.

Make sure the .zip file name and the files and subfolder structure within the .zip file are unchanged.

3. Switch on the target TV.
4. Launch **Tizen IDE-2.4** in **Tizen SDK-2.4** on the PC.
5. Import the Dolby test application project into **Tizen IDE-2.4**.
   a) In the **Project Explorer** panel, right-click on the blank space and select **Import**.
   b) In the **Import** window, select **General** > **Existing Projects into Workspace** > **Next** > **Select archive file** > **Browse...**.
   c) Navigate to the Samsung_tizen_app.zip file, and select it.
   The project content appears in the **Projects** box.
   d) Click **Select All** > **Finish**.
6. Establish a connection between the PC and the Samsung TV under test:
   a) In the **Connection Explorer** panel, click the **Remote Device Manager** icon.
   The **Connection Explorer** panel can be opened by clicking **Window** > **Show View** > **Connection Explorer**.
   b) In the **Remote Device Manager** window, click **New**, fill in the required information, and then click **Save**.
   Here is an example. The **IP** field must match the IP address displayed on the target TV screen.
   Figure 5: Connecting the PC and the Samsung TV



   c) In the **Remote Device Manager** window, highlight the TV that you want to connect to, and click **Connect**.
   The connected TV will be shown in the **Remote Device Manager** window.
7. Deploy the test application on the target TV.
   a) In the **Project Explorer** panel, right-click on the test application project name (for example, ottTestApp - tv -samsung- 2.4).
   b) Click **Run As** > **1 Tizen Web Application**.

The deployment process may take a few minutes.

Results
After the deployment process completes successfully, the test application runs automatically on the TV.

Deploying the test application on an LG Netcast TV

Deploy the test application on an LG Netcast TV for running tests.

Prerequisites

- You must have an LG developer account. You can apply for one from http://developer.lge.com/main/Intro.dev.
- You must have access to the Dolby Digital Plus Online Delivery Kit.
- You have created the playlist file for your product under test by using the interactive test procedure.
- You must prepare a USB flash drive with minimum memory space of 10 MB.

Procedure

1. Download or copy the LG_netcast_app.zip file to an appropriate directory on your local PC.

   If you have downloaded and unpacked the kit on your local PC, locate the .zip file in the <kit parent directory>/Test_Apps/LG_app directory.

   Otherwise, download the .zip file from the web page <kit starting page>/Test_Apps/ on the DISC website (https://disc.dolbycustomer.com).

   The LG_netcast_app.zip contains:

   - LG_app_raw.zip:
     - index.html and other files and subfolders
   - icon.png

2. Import the customized test-signal playlist by replacing the c_playlist subfolder in the LG_app_raw.zip file with the unzipped c_playlist folder generated by using the interactive test procedure.

   The new c_playlist contains links to test signals that are relevant to your product under test only. If you do not use the customized playlist, a default test-signal playlist will appear when running the test application.

   If you need to test another set of test signals, you must generate a new playlist with the **Playback Kit Interactive Test Procedure**, and then manually replace the playlist folder with the updated one.

   The importing step can also be performed after the registration procedure.

   Make sure the .zip file name and the files and subfolders structure within the .zip file are unchanged.

3. Register the test application at the LG developer website http://developer.lge.com/apptest/retrieveApptestReg.dev:

   a) Upload the LG_app_raw.zip file to the LG website for DRM packaging.

   b) Download the resulting DRM-packaged application .zip file to your local PC.

   For detailed instruction, refer to http://webostv.developer.lge.com/develop/app-test/.

   The resulting DRM-packaged application file (.zip) contains this folder structure:

- <XXXX> (contains index.html, manifest.xml, .png images, and other files and subfolders)

<XXXX> is an ID number created by the LG website.

4. Unzip the <XXXX>.zip file, and manually place it in this folder structure:
   - lgapps
     - installed
       - <XXXX> (contains index.html, manifest.xml, .png images, and other files and subfolders)
5. Copy the entire lgapps folder to the root directory of a USB flash drive.
6. Switch on the Smart TV.
7. Press the **SMART HUB** button on the remote control.
8. Select **More Apps** from the bottom of the TV screen.
9. Connect the USB drive to the TV.

   You may need to choose the USB icon  in the upper-right corner of the GUI to designate the data source.

   The application name appears in the **More Apps** list and is ready for use.
10. Click on the application icon to run it.

Note: This version of the test application cannot be installed on the LG Smart TV. You must keep the USB drive connected to the TV while using the test application.

Related information

Accessing the test materials on page 8

Deploying the test application on an LG WebOS TV

To install the Dolby test application to a LG WebOS TV, you must connect the TV under test to a PC with the LG WebOS TV system development kit properly installed on it.

Setting up the development environment

Prepare the development environment for the webOS TV under test and the development PC.

Prerequisites

- The PC is connected to the network.
- The webOS TV has access to the Internet.

About this task

This document lists the main setup steps only. For detailed instruction on how to prepare an LG webOS TV for deploying a test application, refer to the webOS developer website at http://webostv.developer.lge.com/.

Procedure

1. Install the system development kit for the webOS TV on your PC.

   The system development kit contains an IDE tool for connecting the PC to the webOS TV.
2. Create an LG developer site account at http://developer.lge.com/main/Intro.dev.
3. Install the developer mode app on the TV under test.

   The developer mode app is available for download at the LG store.
4. Enable the developer mode on the TV under test.

Note: The developer mode is enabled for a limited time only. You must extend the Developer Mode session before the time expires. See http://webostv.developer.lge.com/develop/app-test/ for more information.

5. Use the IDE to connect the computer to the TV under test.

   For detailed information, refer to *Connecting with IDE* at http://webostv.developer.lge.com/develop/app-test/.

Deploying the test application

With the TV and PC connected successfully, you can deploy the Dolby test application with the IDE.

Prerequisites

- You must have access to the Dolby Digital Plus Online Delivery Kit.
- The TV and the PC are connected with IDE.
- The developer mode is enabled on the target TV.
- You have created the playlist file for your product under test by using the interactive test procedure.

Procedure

1. Download or copy the LG_webos_ide_app.zip file to an appropriate directory on your local PC.

   If you have downloaded and unpacked the kit on your local PC, locate the .zip file in the <kit parent directory>/Test_Apps/LG_app directory.

   Otherwise, download the .zip file from the web page <kit starting page>/Test_Apps/ on the DISC website (https://disc.dolbycustomer.com).

2. Unpack the LG_webos_ide_app.zip file.
3. Import the customized test-signal playlist by replacing the c_playlist subfolder in the LG_webos_ide_app folder with the c_playlist folder generated by using the interactive test procedure.

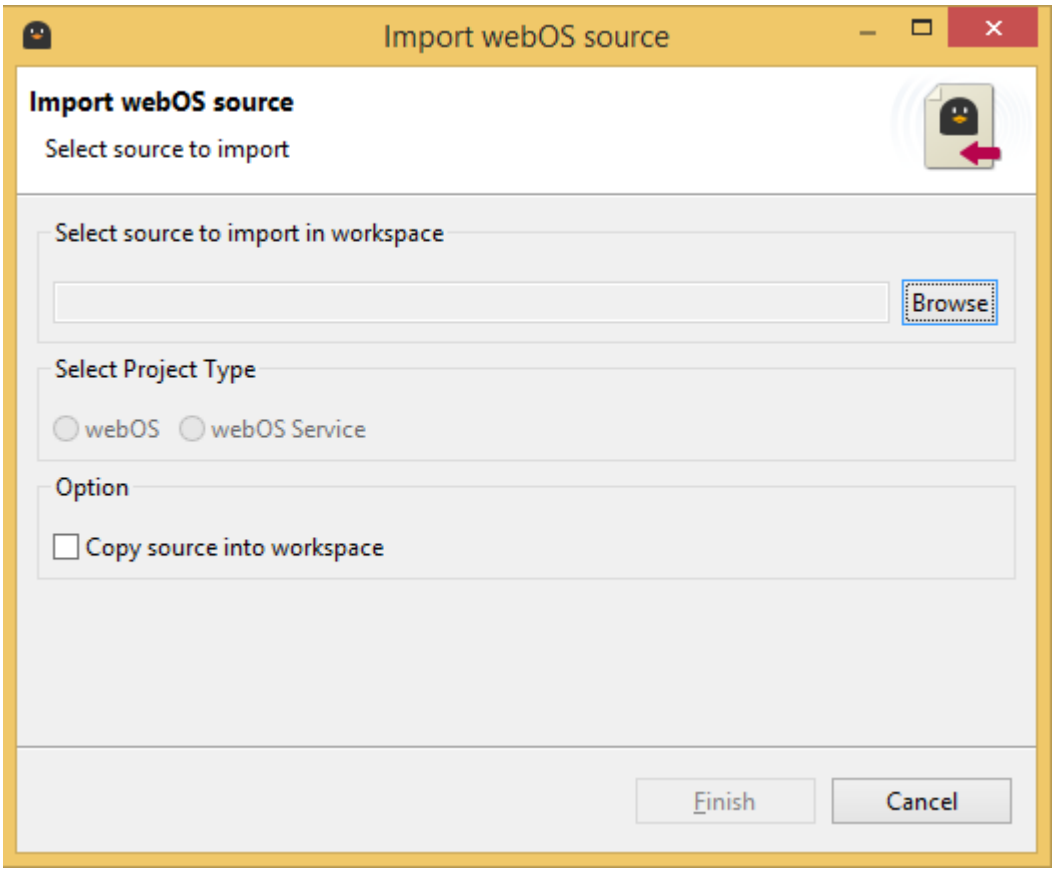
   The new c_playlist contains links to test signals that are relevant to your product under test only. If you do not use the customized playlist, a default test-signal playlist will appear when running the test application.

   If you need to test another set of test signals, you must generate a new playlist with the **Playback Kit Interactive Test Procedure**, and then manually replace the playlist folder with the updated one.

   Make sure that the file names and subfolders structure within the LG_webos_ide_app folder are unchanged.

4. Launch the **webOS TV IDE**.
5. Import the Dolby test application project into **webOS TV IDE**.

   a) In the menu bar, select **webOS Menu** > **Import webOS Project** > **Browse**.



b) Navigate to the LG_webos_ide_app folder, and select it.

The project content appears in the **Projects** panel.

c) Click **Select All** > **Finish**.

6. Deploy the test application on the target TV.

a) In the **Project Explorer** panel, right-click on the test application project name (for example, LGTestApp).

b) Click **Run As** > **Run Configuration**.

c) Click the **Target** drop-down list to select the target TV.

d) Click the **Run** button.

The deployment process may take a few minutes. Reboot the target TV as needed.

Results

After the deployment process completes successfully, the test application runs automatically on the TV.

5.1.4 Test application controls

Operate the test application to perform different types of test cases.

Controls on the test application can be adjusted by:

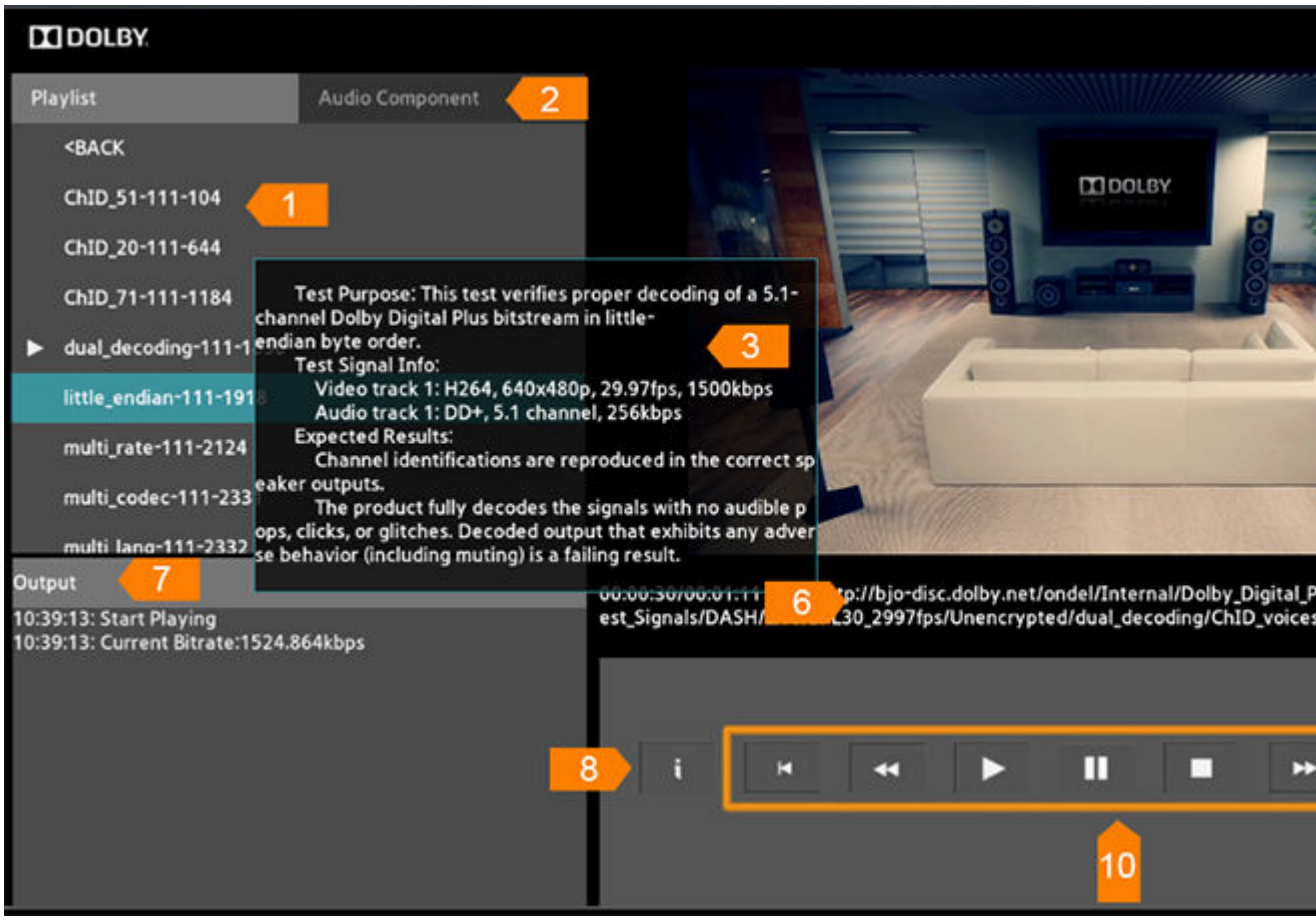
- Using the arrow keys on the remote control to focus on the needed function in the GUI, and then pressing the **Enter** key on the remote control
- Using the remote control key dedicated to a certain function
- GUI overview

- Output messages
- Playing test signals on the Smart TV
- Fast-forwarding and rewinding
- Switching between different audio tracks

GUI overview

All application functions can be managed through the GUI workspace.

Figure 6: Test application GUI



1 Playlist

Displays a list of test signals. Test signals are organized in a hierarchy. Use the arrow and return keys on the remote control to navigate through different levels.

2 Audio Component

Displays audio and video tracks with different encodings presented in a test stream.

3 Test signal description

Displays information on a selected test signal, such as bit rate, available audio and video tracks, the purpose of the test signal, and so on.

4 Playback window

Displays video content of a currently playing test signal.

5 Menu

Contains functions such as exit, help, and so on.

6 URL information

Displays the URL of the currently playing test signal.

7 Output
Displays information, such as playback status, bit rate, error messages, and so on.

8 Information
Click this key to display information on a selected test signal, such as bit rate, available audio and video tracks, the purpose of the test signal, and so on.

9 Full screen
Click this key to play back video content in full-screen mode.

10 Playback control
Use these keys to control the playback process (from left to right: previous, rewind, play, pause, stop, fast forward, and next).

Output messages

The **Output** area provides information including playback status, bit rates, error, and so on.

Table 4: Output messages from the test application

Output messages	Description
Loading	Indicates the status of test signal buffering.
End of playback	Indicates that the playback has stopped.
Current bitrate: # kbps	Indicates the bit rate of an audio track that is currently playing. With this message, you can verify whether switching between tracks with different bit rates occurs. This information is especially useful for the multi_rate and multi_av_rate test cases. This message does not display if your product does not support switching.
Connection failed	Indicates that the test application fails in an attempt to connect to the web server.
Network disconnected	Indicates that the network connection is broken.
Render error	Indicates an internal error.
Stream not found	Indicates that the specified test signal does not exist.
Unknown: # (error code)	Error code returned by the player integrated in the test application. The returned error code can be used for debugging.

Playing test signals on the Smart TV

Prerequisites

- The Smart TV must have access to the test signals:
  - If a local web server is used, ensure that all test signals have been downloaded and stored in that server.
  - If the DISC website is used, ensure that the Smart TV has an Internet connection and is able to access the DISC website.
- The USB flash drive containing the test application files must be connected to the Smart TV.
- The playlist file has been successfully imported into the test application.

Procedure

1. Start the test application.
   The application GUI appears.
2. Navigate to and highlight the test signal you want to play in the **Playlist** panel by using the arrow keys on the remote control:

- If you have successfully imported a playlist to the test application, only those selected test signals are displayed in the **Playlist** panel. Test signals are organized in hierarchical structure. Higher-level items are indicated by a folder icon next to them.
- Information about a highlighted test signal is displayed next to the **Playlist** panel for approximately 15 seconds. To toggle the display on and off, press the **info** key on the remote control.
- You can return to the parent-level playlist by pressing the **Return** key on the remote control.

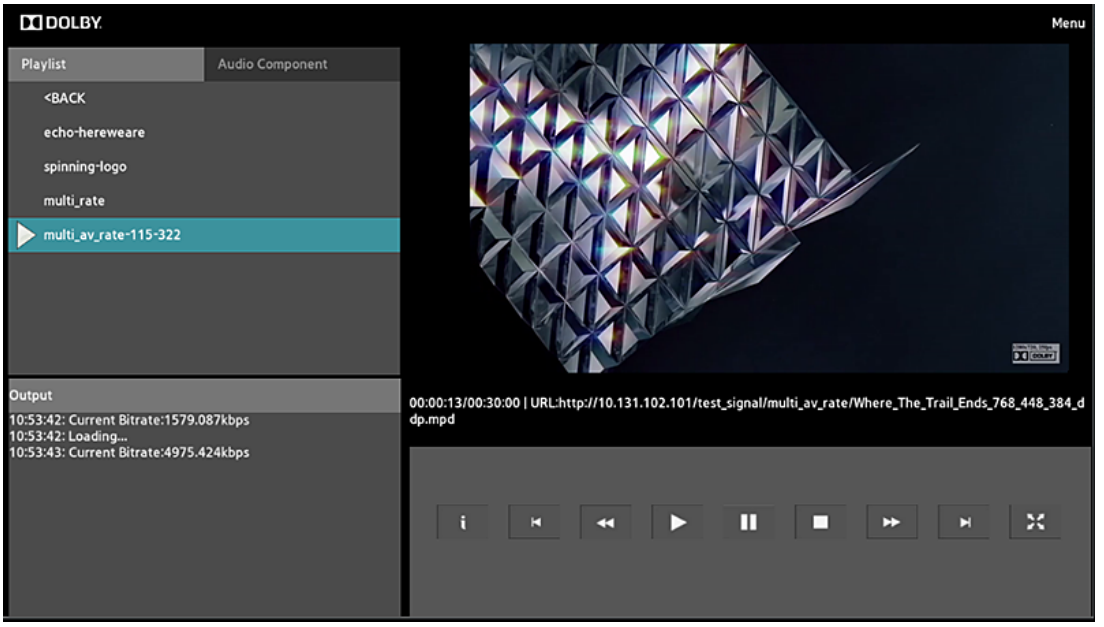
3. Play the highlighted test signal by pressing the **Enter** key on the remote control.

   The test signal being played has a triangle icon on its left side.

   - If playback of a test signal is successful, the **Output** panel displays **Loading...** and then the **Current bitrate: # kbps**, and the video plays back in the window in correct alignment with the audio.

     Note: The current version of LG Smart TV does not support displaying bit-rate information.

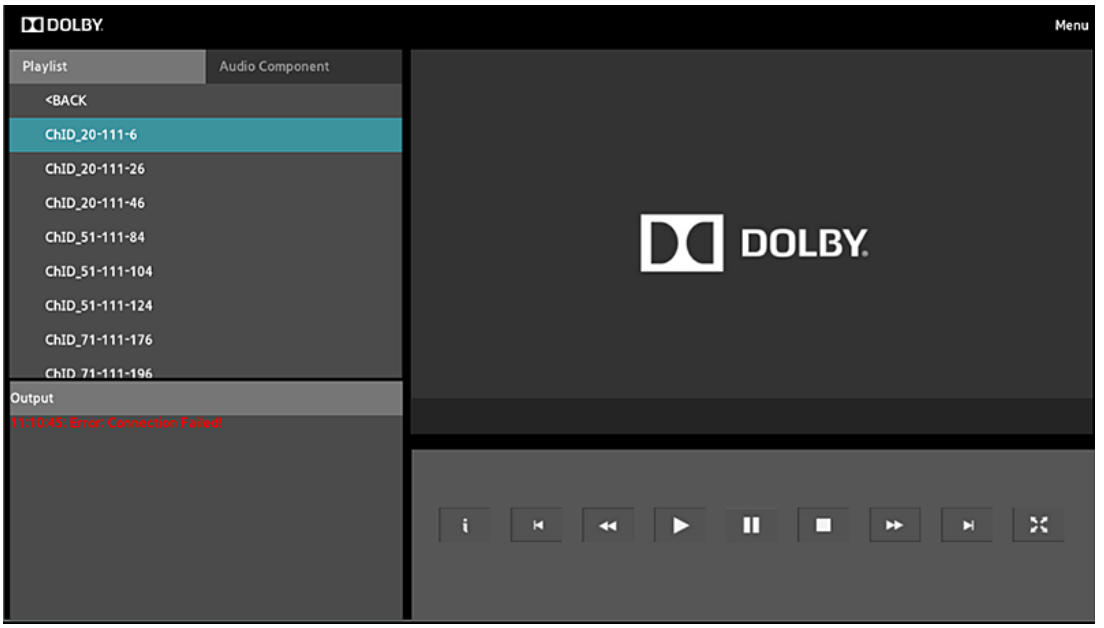
     Figure 7: Playing a test signal



   - If playback of a test signal fails, the **Output** panel displays error messages.

     Note: Adverse behaviors during playback (such as audible pops, clicks, or muting) cannot be detected by the test application, and no error indication will display.

Figure 8: Error message



- If network bandwidth fluctuates during playback, the **Current bitrate: # kbps** changes, indicating that audio track switching occurs to adapt to the current bandwidth.

Related information

Preparing a test signal list for the test application on page 30
Deploying the test application on a Samsung Smart TV on page 31
Deploying the test application on an LG Netcast TV on page 35
Output messages on page 40
Accessing the test materials on page 8

Playing a test signal by specifying a URL

It is also possible to play a test signal by pointing at its URL.

Procedure

1. Go to the **Menu**, and select **Load Single URL**.
   A text box appears with a virtual keyboard.
2. Enter the URL of an individual test stream in the text box.
3. Select the **Load** button to play the test signal.
   If the URL is entered incorrectly, clicking the **Load** button returns the application to its main view.
   If successfully loaded, the test signal starts playing back.

Fast-forwarding and rewinding

Procedure

1. Click the fast-forward button on the GUI once to jump forward ten seconds.
2. Click the rewind button on the GUI to jump back ten seconds.

Switching between different audio tracks

For test cases such as multiple languages and multiple codecs, you must switch between different audio tracks.

Procedure

1. Select the **Components** tab on the upper-left corner of the GUI.

   Note: Your product may not support switching between tracks; in this situation, the **Components** tab displays **Switching between tracks is not supported**.

2. Make sure that the tracks information listed in the **Audio Component** panel matches what is described in the **Information** box.

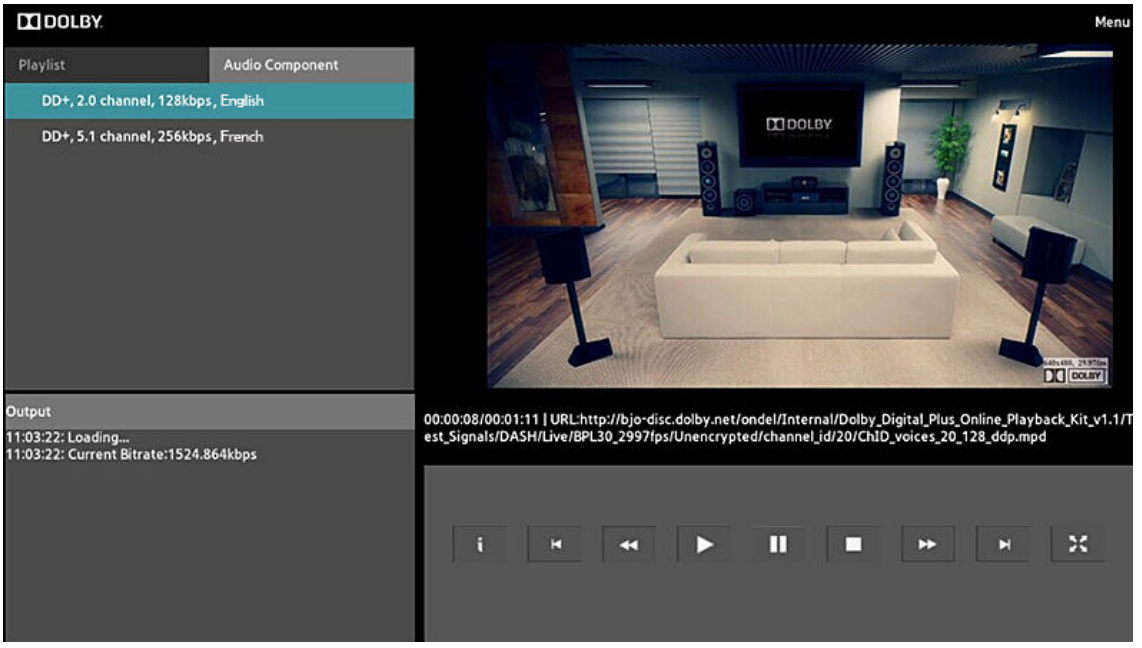
   The tracks information listed in the **Audio Component** panel is extracted directly from the test signal. If this information does not match what is described in the **Information** box, the test signal is not correctly decoded.

3. Highlight the audio track you want to play.

4. Press the **Enter** key on the remote control.

   The selected track has a tick on the right side.

   Figure 9: Audio component panel in the test application



5.2 Test application for HbbTV compliant products

This test application is designed for playing back Dolby Digital Plus bitstreams on HbbTV-compliant products.

Note: In this release, use this link https://d9zmmjtv72w5o.cloudfront.net/OnDelKits/DDP/Dolby_Digital_Plus_Online_Delivery_Kit_v1.4/Start_Here.html for accessing test materials.

5.2.1 Setting up testing infrastructure

To run tests with the test application, you must set up the testing infrastructure best suited for your environment. You can choose to connect the HbbTV product to either a local web server or to the servers set up by Dolby for running HbbTV tests.

The servers set up by Dolby consist of an app server that hosts the CE-HTML–based HbbTV test application and the DISC website that contains all of the test signals.

Setting up the HbbTV hardware components and local web server

If you are accessing the Internet from behind a firewall, or if you do not have a fast Internet connection, set up your HbbTV product and local HTTP server as described in this section.

Prerequisites

The HTTP server used for streaming test signals must have Hypertext Preprocessor (PHP) installed on it.

About this task

To simulate a server/client media streaming process, the HbbTV product under test must be connected to a local HTTP server that hosts the test signals and to a broadcaster module that serves the DVB-T transport stream.

Procedure

1. Download the entire playback kit onto your local HTTP server from the DISC website (https://disc.dolbycustomer.com), and unpack it to an appropriate directory on the local HTTP server.
2. Configure the IP address of the HTTP server. If you want use the example DVB-T transport stream (example_mpeg2ts_local_AIT.ts) provided in the playback kit package, configure the HTTP server IP to `192.168.0.10`.
3. Copy everything in the <kit parent directory>/Test_Apps/HbbTV_app/ directory of the playback kit package to the Http_Server_URL/HbbTV_app/ directory of the HTTP server.

   Within this document, Http_Server_URL constitutes a reachable HTTP server address (for example, http://testserver/).

   The HbbTV application is contained in the <kit parent directory>/Test_Apps/HbbTV_app/ directory. When copying, make sure that all the contained subdirectories and files are included and the directories structure is not flattened.
4. Ensure that all test signals (subdirectories and files) are available in the Http_Server_URL/<kit parent directory>/Test_Signals directory of the HTTP server. Make sure that the directories structure is not flattened.
   For example, if you unpacked the kit to the root directory of the local HTTP server, all of the test signals must be available in Http_Server_URL/Dolby_Digital_Plus_Online_Delivery_Kit_v1.4/Test_Signals.
5. Connect the HbbTV product under test to the HTTP server with an Ethernet connection:
   a) Assign a valid IP address for the HbbTV. (Usually, the IP address is set automatically. For the procedure of setting the IP address for a HbbTV, refer to the user's manual of the HbbTV product.)
   b) Verify the connection by accessing a web page with Http_Server_URL in the HbbTV built-in web browser.
6. Connect a PC to a DVB-T modulator.

   The PC and the DVB-T modulator comprise the broadcaster module.
7. Connect the HbbTV to the DVB-T modulator with a coaxial cable.
8. Verify the connection between the HbbTV and the broadcaster module:
   a) Copy the example .ts file (example_mpeg2ts.ts) to the PC.

      The example .ts file is contained in the playback kit package at <kit parent directory>/Test_Apps/HbbTV_app/data/example_mpeg2ts.ts.
   b) Run the MPEG-2 transport stream player (for example, StreamXpress) on the PC.

c) Open and play the example .ts file (example_mpeg2ts.ts) in the MPEG-2 player (StreamXpress).

d) Search for the HbbTV channel on the HbbTV product. If the content of the .ts file can be correctly displayed on the HbbTV, the connection is successful. Otherwise, check the cable connection, or refer to the user's manual of the DVB-T modulator for further information.

9. Set up the audio output hardware components as described in the section that addresses hardware setup.

Related information

Hardware setup with a local web server for HbbTV on page 20

Connecting the HbbTV to the DISC website

If you have access to an Internet connection with adequate bandwidth for streaming test signals to your playback product, set up your testing infrastructure as described in this section.

About this task

To stream test signals from the DISC website to the HbbTV product under test, you must ensure that the HbbTV product has an Internet connection and is able to access both the DISC website and the app server hosting the CE-HTML–based HbbTV test application.

Procedure

1. Connect the HbbTV product to the Internet. (For the procedure of accessing the Internet, refer to the user's manual of the HbbTV product.)
2. Access streaming.dolby.com with the HbbTV built-in web browser to verify the network connectivity between the HbbTV product and the app server that hosts the HbbTV test application.
3. Access the DISC website at https://disc.dolbycustomer.com with the HbbTV built-in web browser to verify the network connectivity between the HbbTV product and the DISC website that hosts the test signals.
4. Connect a PC to a DVB-T modulator.

   The PC and the DVB-T modulator comprise the broadcaster module.
5. Connect the HbbTV to the DVB-T modulator with a coaxial cable.
6. Verify the connection between the HbbTV and the broadcaster module.

   a) Download the example .ts file (example_mpeg2ts.ts) to the PC from the web page <kit starting page>/Test_Apps/HbbTV_app/data/ on the DISC website (https://disc.dolbycustomer.com).

   b) Run the MPEG-2 transport stream player (for example, StreamXpress) on the PC.

   c) Open and play the example .ts file (example_mpeg2ts.ts) in the MPEG-2 player (StreamXpress).

   d) Search for the HbbTV channel on the HbbTV product. If the content of the .ts file can be correctly displayed on the HbbTV, the connection is successful. Otherwise, check the cable connection, or refer to the user's manual of the DVB-T modulator for further information.
7. Set up the audio output hardware components as described in the section that addresses hardware setup.

Related information

Hardware setup with DISC for HbbTV on page 24

5.2.2 Loading the HbbTV test application

Before starting testing, the HbbTV test application (files at Http_Server_URL/hbbtv_app/) must be loaded to the HbbTV product under test.

The most efficient way to do that is to enter the debug mode of the HbbTV product and then start the test application loading manually. Otherwise, an RF-modulated DVB-T transport stream carrying the test application URL must be fed to the HbbTV product so that the product can load the application at the URL. Depending on your test hardware setup, you can choose to load the test application from either your local web server or the DISC server.

Loading from the local HTTP server with the example DVB-T transport stream

If conducting tests with a local HTTP server, you can use the example DVB-T transport stream we provide in the playback kit package for loading the HbbTV test application from your local HTTP server.

Prerequisites

- You must have access to the *Dolby Digital Plus Online Delivery Kit*.
- All test hardware components are correctly set up.

Procedure

1. Copy the example .ts file (example_mpeg2ts_local_AIT.ts) to your local testing PC.

   The example .ts file (example_mpeg2ts_local_AIT.ts) is located in the <kit parent directory>/Test_Apps/hbbtv_app/data/ directory.

2. Configure the IP address of the HTTP server (Http_Server_URL) to `192.168.0.10`.
3. Play the example transport stream (example_mpeg2ts_local_AIT.ts) using an MPEG-2 transport stream playback software application (for example, DecTek StreamXpress).
4. Select the correct program on the HbbTV product.

   The DVB-T stream content is displayed first, and then after a few seconds, the HbbTV test application is automatically displayed. If the application GUI does not appear, press the red button on the remote control to manually load the application.

Loading from the app server with the example DVB-T transport stream

If conducting tests with the servers set up by Dolby, you can use the example DVB-T transport stream we provide in the playback kit package for loading the HbbTV test application from the app server.

Prerequisites

- You must have access to the *Dolby Digital Plus Online Delivery Kit*.
- All test hardware components are correctly set up.

Procedure

1. Download the example .ts file (example_mpeg2ts_streaming_AIT.ts) to your local testing PC from the web page <kit starting page>/Test_Apps/ on the DISC website (https://disc.dolbycustomer.com).
2. Play the example transport stream (example_mpeg2ts_streaming_AIT.ts) using an MPEG-2 transport stream playback software application (for example, DecTek StreamXpress).
3. Select the correct program on the HbbTV product.

The DVB-T stream content is displayed first, and then after a few seconds, the HbbTV test application is automatically displayed. If the application GUI does not appear, press the red button on the remote control to manually load the application.

Loading the HbbTV test application with customized DVB-T transport stream

Alternatively, you can create a new transport stream to load the HbbTV test application.

Prerequisites

- You must have access to the *Dolby Digital Plus Online Delivery Kit*.
- All test hardware components are correctly set up.

Procedure

1. Create a DVB-T transport stream with an AIT table that carries the URL of the HbbTV test application.

   The DVB-T transport stream must contain an AIT table. In the AIT table, the URL_base line indicates the HbbTV application URL on the server. In your test, this URL points to where the HbbTV test application is stored. For example, the HbbTV test application is in the <root directory>/hbbtv_app/ directory on your local HTTP server with the IP address set to 192.168.0.10. You must set the URL_base to http://192.168.0.10/hbbtv_app/ as indicated in the following code.

```
AIT[dvb]:
    table_id_extension: 0x0010
    common_descriptors:
    applications:
      Application:
            organisation_id: 0x00000071
            application_id: 0x0064
            application_control_code: 0x01
            app_descriptors:
               TransportProtocolDescriptor:
                  protocol_id: 0x0003
                  transport_protocol_label: 0x01
                  HttpUrl:
                         URL_base: "http://192.168.0.10/hbbtv_app/"

                         URL_extensions:
               ApplicationDescriptor:
                  application_profiles:
                      ApplicationProfile:
                          application_profile: 0x0000
                          version_major: 0x01
                          version_minor: 0x02
                          version_micro: 0x01
                  service_bound_flag: 0x01
                  visibility: 0x03
                  application_priority: 0x01
                  transport_protocol_label: "\x01"
              ApplicationNameDescriptor:
                  names:
                      AppName:
                          ISO_639_language_code: eng
                          application_name: "Dolby BJO TEST HbbTV App."
```

```
                SimpleAppLocationDescriptor:
                initial_path: "index.html"
#    CRC_32: 0x7dd4bba6
```

2. Send the DVB-T transport stream to the HbbTV product by playing the stream on the local PC, using the MPEG-2 transport stream playback software application (for example, DecTek StreamXpress).
3. Select the HbbTV channel on the HbbTV product.

   The DVB-T stream content is displayed first, and then after a few seconds, the HbbTV test application is automatically displayed. If the application GUI does not appear, press the red button on the remote control to manually load the application.

5.2.3 Test application controls

Operate the test application to perform different types of test cases.

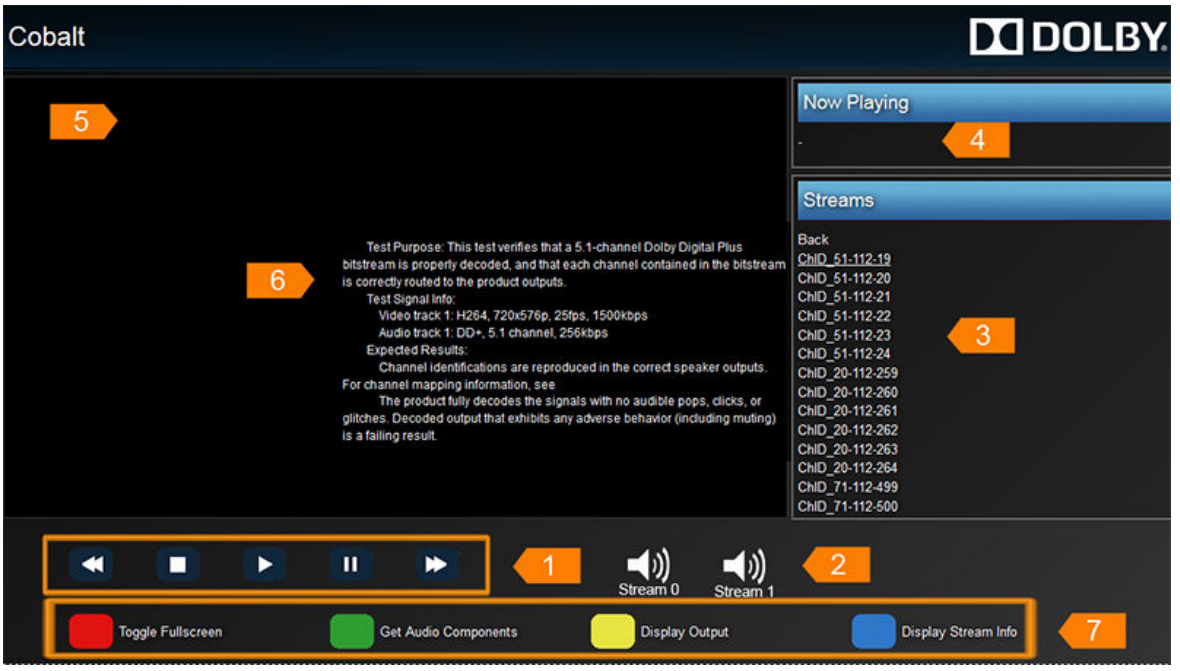
Controls on the test application can be adjusted by:

- Using the arrow keys on the remote control to navigate through test signals, and then pressing the **Ok** button to play the selected test signal
- Using the four-color function keys on the remote control
- Using the playback control keys on the remote control to control playback process

GUI overview

All application functions can be managed through the GUI workspace.

Figure 10: Test application GUI



1 Playback control

Press the playback control buttons on the remote control to control playback progress.

2 Audio component

Indicates the audio component (language or codec) available in a test stream. Pressing the green button on the remote control displays the audio component information. Each component is numbered (**0** or **1**) in the GUI. Select a component to play by pressing the

corresponding number button on the remote control. The component being selected is highlighted in green.

3 Stream list/output

- This section displays a list of test streams for selection when no test stream is playing. Test signals are organized in hierarchy. Use the arrow and return keys on the remote control to navigate through different levels. A selected test stream is underscored.
- After you start playing a test stream, this section shows output information of the currently playing stream, such as playback status and error messages.

4 Now playing
Displays URL of a currently playing test stream.

5 Display area
Displays the playback information of a currently playing stream.

6 Test signal description
Displays information on a selected test signal, such as bit rate, available audio and video tracks, purpose of the test signal, and so on.

7 Function buttons

Toggle full screen
During playback of a test stream, press the red button on the controller to display the page full screen.

Get audio components
Press the green button on the controller to display the audio component available in the audio component area.

Display output
Press the yellow button on the controller to display the output information.

Display stream info
Press the blue button on the controller to switch on/off display of information on a selected test stream.

Locating a test signal from the test application GUI

After you have completed the questionnaire from **Playback kit Interactive Test Procedure**, a test-case list required for your system is generated. With information shown in the test-case list, you can locate the correct test signal from the test application GUI for testing.

About this task

The test-case list contains this information: the online delivery format, profile, video codec, and test-case type.

Figure 11: An example of a test-case list generated in the interactive test procedure

Dolby Digital Plus Online Delivery kit Interactive Test Procedure for Playback tests

Test case	Purpose	Online Delivery Format	Video Codec	Status
01.01.01.01.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_Live	h264	
01.01.01.02.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_Live	h264	
01.02.01.01.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_OnDemand	h264	
01.02.01.02.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_OnDemand	h264	
01.07.01.01.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	HLS	h264	

In the **Test case** column, the first two digits indicate the test-case type.

Table 5: Test-case type

First two digits	Test-case type
01	ChID_2ch
02	ChID_6ch
03	ChID_8ch
04	ChID_6ch_atmos
05	little_endian
06	dual_decoding
07	multi_lang
08	multi_codec
09	multi_av_rate
10	multi_video_rate
11	music
12	crc
13	box
14	codec
15	av_sync
16	av_sync_6ch_atmos

In the test application, test signals are organized by supported features in this structure:

- <Online_delivery_format_profile>
  - <Video_codec>
    - <Test_case>

You must reference the information indicated in the test-case list to locate a specific test signal from the test application GUI. For example, to locate the test signal of the first row shown in this figure, you must follow these steps.

Procedure

1. In the test application GUI, select the correct <Online_delivery_format_profile> (in this case, **DASH_Live**).
2. Select the correct <Video_codec> (in this case, **H.264**).
3. Select the correct <Test_signal> to play (in this case, **ChID_2ch**).
   For inquiring the test case type, see the table Table 5 on page 50.
4. You must repeat steps 1 to 3 to complete all required tests listed for your system capabilities.

Playing test signals on the HbbTV product

Prerequisites

- The HbbTV product must have access to the test signals.
  - If local web server is used, ensure that all test signals have been downloaded and stored in that server.

- If DISC website is used, ensure that the HbbTV product has an Internet connection and is able to access the DISC website.

- The test application must be successfully loaded to the HbbTV product.

Procedure

1. Load the test application.
   The application GUI appears.
2. Navigate to and highlight the test signal you want to play in the test stream list panel by using the arrow keys on the remote control:
   - By default, all available test signals are listed by the test application. you must select those required ones to play by referencing the resulting page that contains the test-case list generated by the **Playback Kit Interactive Test Procedure**.
   - Information about the underscored test signal is displayed in the display area.
   - You can return to the parent level playlist by pressing the **Return** key on the remote control.
3. Play a highlighted test signal by pressing the **Ok** key on the remote control:
   - If playback of a test signal is successful, the **Debug** panel displays **Connecting...>Buffering...>Playing...**, and the video plays back in the window in correct alignment with the audio.
   - If playback of a test signal fails, the **Debug** panel displays error messages.

     Note: Adverse behaviors during playback (such as audible pops, clicks, or muting) cannot be detected by the test application, and no error indication will display.

Related information

Loading the HbbTV test application on page 46
Locating a test signal from the test application GUI on page 49

Fast forwarding and rewinding

About this task

Procedure

1. Click the fast-forward button on the remote control once to jump forward ten seconds.
2. Click the rewind button on the remote control to jump back ten seconds.

Switching between different audio tracks

For test cases such as multiple languages and multiple codecs, you must switch between different audio tracks.

Procedure

1. Press the green **Get audio component** key on the remote control to display any audio components available in the test stream.

Icons indicating audio components appear in the audio component area of the GUI. (Each icon has an index number underneath.)

2. Press the number key on the remote control to play back the corresponding audio component.

5.3 Test application for HbbTV 2.0 compliant products

This test application is designed for playing back Dolby Digital Plus bitstreams on HbbTV 2.0–compliant products.

Note: In this release, use this link https://d9zmmjtv72w5o.cloudfront.net/OnDelKits/DDP/Dolby_Digital_Plus_Online_Delivery_Kit_v1.4/Start_Here.html for accessing test materials.

5.3.1 Setting up testing infrastructure

To stream test signals from the DISC website to the HbbTV product under test, you must ensure that the HbbTV product has an Internet connection and is able to access both the DISC website and the app server hosting the HTML5–based HbbTV test application.

Connecting the HbbTV 2.0 product to the DISC website

Procedure

1. Connect the HbbTV 2.0 product to the Internet. (For the procedure of accessing the Internet, refer to the user's manual of the HbbTV 2.0 product.)
2. Access streaming.dolby.com with the HbbTV built-in web browser to verify the network connectivity between the HbbTV 2.0 product and the app server that hosts the HbbTV 2.0 test application.
3. Access the DISC website at https://disc.dolbycustomer.com with the HbbTV built-in web browser to verify the network connectivity between the HbbTV 2.0 product and the DISC website that hosts the test signals.
4. Connect a PC to a DVB-T modulator.

   The PC and the DVB-T modulator comprise the broadcaster module.
5. Connect the HbbTV to the DVB-T modulator with a coaxial cable.
6. Verify the connection between the HbbTV and the broadcaster module.
   a) Download the example .ts file (example_mpeg2ts.ts) to the PC from the web page <kit starting page>/Test_Apps/HbbTV2_app/data/ on the DISC website (https://disc.dolbycustomer.com).
   b) Run the MPEG-2 transport stream player (for example, StreamXpress) on the PC.
   c) Open and play the example .ts file (example_mpeg2ts.ts) in the MPEG-2 player (StreamXpress).
   d) Search for the HbbTV channel on the HbbTV 2.0 product. If the content of the .ts file can be correctly displayed on the HbbTV, the connection is successful. Otherwise, check the

cable connection, or refer to the user's manual of the DVB-T modulator for further information.

7. Set up the audio output hardware components as described in the section that addresses hardware setup.

5.3.2 Loading the HbbTV 2.0 test application

Before starting testing, the HbbTV test application must be loaded from the app server (files at Http_Server_URL/hbbtv2_app/) to the HbbTV 2.0 product under test by using the example DVB-T transport stream we provide in the playback kit package.

Prerequisites

- You must have access to the *Dolby Digital Plus Online Delivery Kit*.
- All test hardware components are correctly set up.

Procedure

1. Download the example .ts file (example_mpeg2ts_streaming_AIT_for_cobalt20.ts) to your local testing PC from the web page <kit starting page>/Test_Apps/ on the DISC website (https://disc.dolbycustomer.com).
2. Play the example transport stream (example_mpeg2ts_streaming_AIT_for_cobalt20.ts) using an MPEG-2 transport stream playback software application (for example, DecTek StreamXpress).
3. Select the correct program on the HbbTV product.

   The DVB-T stream content is displayed first, and then after a few seconds, the HbbTV test application is automatically displayed. If the application GUI does not appear, press the red button on the remote control to manually load the application.

5.3.3 Test application controls

Operate the test application to perform different types of test cases.

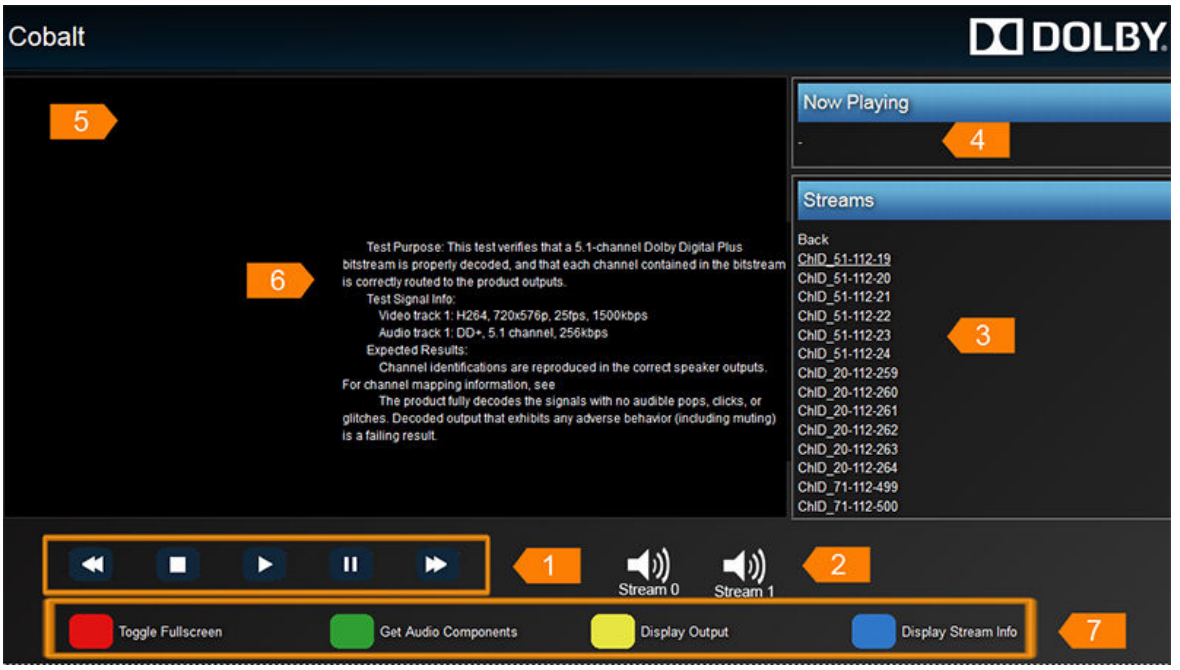
Controls on the test application can be adjusted by:

- Using the arrow keys on the remote control to navigate through test signals, and then pressing the **Ok** button to play the selected test signal
- Using the four-color function keys on the remote control
- Using the playback control keys on the remote control to control playback process

GUI overview

All application functions can be managed through the GUI workspace.

Figure 12: Test application GUI



1 Playback control

Press the playback control buttons on the remote control to control playback progress.

2 Audio component

Indicates the audio component (language or codec) available in a test stream. Pressing the green button on the remote control displays the audio component information. Each component is numbered (**0** or **1**) in the GUI. Select a component to play by pressing the corresponding number button on the remote control. The component being selected is highlighted in green.

3 Stream list/output

- This section displays a list of test streams for selection when no test stream is playing. Test signals are organized in hierarchy. Use the arrow and return keys on the remote control to navigate through different levels. A selected test stream is underscored.
- After you start playing a test stream, this section shows output information of the currently playing stream, such as playback status and error messages.

4 Now playing

Displays URL of a currently playing test stream.

5 Display area

Displays the playback information of a currently playing stream.

6 Test signal description

Displays information on a selected test signal, such as bit rate, available audio and video tracks, purpose of the test signal, and so on.

7 Function buttons

Toggle full screen

During playback of a test stream, press the red button on the controller to display the page full screen.

Get audio components

Press the green button on the controller to display the audio component available in the audio component area.

Display output
Press the yellow button on the controller to display the output information.

Display stream info
Press the blue button on the controller to switch on/off display of information on a selected test stream.

Playing test signals on the HbbTV 2.0 product

Prerequisites

- The HbbTV 2.0 product must be able to access the DISC website and the test signals.
- The test application must be successfully loaded to the HbbTV product.

Procedure

1. Load the test application.
   The application GUI appears.
2. Navigate to and highlight the test signal you want to play in the test stream list panel by using the arrow keys on the remote control:
   - By default, all available test signals are listed by the test application. you must select those required ones to play by referencing the resulting page that contains the test-case list generated by the **Playback Kit Interactive Test Procedure**.
   - Information about the underscored test signal is displayed in the display area.
   - You can return to the parent level playlist by pressing the **Return** key on the remote control.
3. Play a highlighted test signal by pressing the **Ok** key on the remote control:
   - If playback of a test signal is successful, the **Debug** panel displays **Connecting...>Buffering...>Playing...**, and the video plays back in the window in correct alignment with the audio.
   - If playback of a test signal fails, the **Debug** panel displays error messages.

     Note: Adverse behaviors during playback (such as audible pops, clicks, or muting) cannot be detected by the test application, and no error indication will display.

Fast forwarding and rewinding

About this task

Procedure

1. Click the fast-forward button on the remote control once to jump forward ten seconds.
2. Click the rewind button on the remote control to jump back ten seconds.

Switching between different audio tracks

For test cases such as multiple languages and multiple codecs, you must switch between different audio tracks.

Procedure

1. Press the green **Get audio component** key on the remote control to display any audio components available in the test stream.

Icons indicating audio components appear in the audio component area of the GUI. (Each icon has an index number underneath.)

2. Press the number key on the remote control to play back the corresponding audio component.

5.4 Test application for Xbox 360

This test application is designed for playing back Dolby Digital Plus bitstreams on the Xbox 360.

Note: All of the procedures depicted in this section can only be performed on a development version of an Xbox 360. Do not try them on a retail version Xbox 360.

5.4.1 Preparing the development environment for Xbox 360

To deploy the Dolby test application for the Xbox 360 platform, you must have the Xbox 360 and PC on the same network, and prepare the development environment.

Software applications referred in this section are available for download from https://developer.xboxlive.com/. You must also have an account to access this page.

1. Installing the Xbox 360 XDK on a PC
2. Flashing Xbox 360 firmware
3. Creating a user profile on Xbox 360
4. Adding Xbox 360 to the Microsoft Visual Studio environment

Installing the Xbox 360 XDK on a PC

Prerequisites

- You must have an account to access the https://developer.xboxlive.com/ page.
- The PC for development runs the Windows 7 operation system.
- Microsoft Visual Studio 2010 must be installed on the PC.

Note: Reboot the PC if required during the installation process.

Procedure

1. Uninstall all Silverlight components from the development PC.

   Go to **Control Panel** > **Uninstall a program**, and uninstalled all applications with Silverlight in the names. Silverlight version 5 or later may interfere with the installation process.

2. Install Silverlight 3 Development Runtime.

   Silverlight 3 Development Runtime cannot be installed from Silverlight 3 development tools; separate installer files are required. Use version 3.0.50106.0 or later. It is available for download from http://go.microsoft.com.

3. Install Silverlight 3 SDK.

   Xbox ADK requires some libraries from Silverlight 3. Use version 3.0.40818.0 or later. It is available for download from http://www.microsoft.com/.

4. Install Silverlight 4 Development Runtime.
5. Disable Silverlight 4 Development Runtime automatic updates by navigating to the **Windows Start** > **Microsoft Silverlight** > **Updates** tab, and checking **Never check for updates**.

Note: This must be done immediately after the installation of Silverlight 4 Development Runtime. If Silverlight Development Runtime updates to version 5 or later, you may need to perform this procedure again.

6. Install Silverlight 4 SDK.

   It is available for download from http://www.microsoft.com/.

7. Install Silverlight 4 development tools.

   It is available for download from http://www.microsoft.com/.

8. Install Xbox XDK. Use version XDKSetupXenon21250.7.exe or later.
   The installed XDK is visible as SDK on your PC.

9. Install Xbox ADK. Use version Xbox360ADK_April_2012.msi or later.

10. Follow the instructions in the installation wizard, and choose the options best suited for your working environment.

Flashing Xbox 360 firmware

To make the Xbox 360 a viable platform for development, you must prepare it by flashing its firmware.

Prerequisites

The Xbox 360 under test must be a development version.

Procedure

1. Connect a TV to the Xbox 360 console with an HDMI cable, and turn them both on.
2. Connect the game controller to the Xbox 360 console.
3. Connect the Xbox and the development PC to the same network.

   IP addresses should be allocated for both the Xbox and the PC with the DHCP service. Otherwise, you must manually set IP addresses for both machines. Information regarding the steps necessary to set an IP address is not within the scope of this document.

4. Locate the recovery tool (use the version XDKRecoveryXenon21250.2.exe or later), and launch it on the PC.

   A UI appears to assist you through the process.

5. Click **Next** until you see the page that requires the Xbox 360 IP address.
6. Enter the Xbox 360 IP address in the **Destination Xbox 360 Development Kit** field.

   The Xbox 360 IP address can be found in the upper-right corner of the Xbox 360 GUI displayed on the TV.

7. Click **Next**.

   This starts the connection between the PC and the Xbox 360. The process take 30 seconds or more, during which the Xbox 360 GUI on the TV may turn off for a short time, and the recovery tool may seem to stop responding.

   When successfully connected:

   - The Xbox 360 displays this on the TV screen:

     ```
     Updating…
     Starting Recovery…
     Do not power off or reboot!
     ```

- The recovery tool prompts the **Reset Xbox 360 Development Kit Settings to Default States** page.

8. On the PC, select the current version (for example, 16197 - Current Production Flash) from the **Select a system version to install** drop-down list in the **Reset Xbox 360 Development Kit Settings to Default States** page.
9. Check all check boxes in the **Reset Xbox 360 Development Kit Settings to Default States** page, including:
   - **Reset Xbox 360 Development Kit settings to default states**
   - **Format console dard drive**
   - **Install optional files (content and samples)**
   - **Install System Extended Packages (enhanced experience)**
10. Click **Next**.
    1. During the updating process:
       - The Xbox 360 displays this on the TV screen:

         ```
         Updating…
         E\samples…
         Do not power off or reboot!
         ```

       - The recovery tool display a progress bar indicating the update progress.
    2. When the update is complete, the Xbox 360 console will reboot and a simple setup wizard then displays.
    3. Click **Finish** on the PC.
11. Choose language (English) with the **A** button (green button) on the Xbox 360 controller.

Creating a user profile on Xbox 360

After flashing the Xbox 360, you must re-create a user profile.

Prerequisites
The Xbox 360 is connected into the Internet.

Procedure

1. Navigate from the Xbox 360 main screen to **Tools** > **Xbox Live Tools** > **Create a new profile** by using the game controller.

   Key instruction appears in the lower-left corner of the Xbox UI on the TV screen.
2. Select or create an Xbox Gamertag, and then click **OK**.
3. Select an avatar.
4. Select **Yes** to make this the default profile.
5. Select **Yes** to make this profile Xbox Live enabled.
6. Leave the pass code empty.
7. Set your country to US.
8. Set the subscription to gold.

Results
The screen shows this message:

```
Creating user profile…
```

The progress takes approximately a minute.

Adding Xbox 360 to the Microsoft Visual Studio environment

To make the Xbox 360 available in Microsoft Visual Studio, you must use the Xbox 360 Neighborhood tool.

About this task

Note: If the IP address of the Xbox 360 under test is assigned by a DHCP server, it can be changed every time the Xbox 360 reboots. In such a case, you must repeat this procedure to make the Xbox 360 available in Microsoft Visual Studio. Otherwise, you may set the static IP address for the Xbox 360.

Procedure

1. Launch the Xbox 360 Neighborhood tool by clicking on your development PC **Menu Start** > **All Programs** > **Microsoft Xbox 360 SDK** > **Xbox 360 Neighborhood**.
2. Run the **Add Xbox 360**.
   The **Add New Xbox 360 Development Kit** window appears.
3. Follow the instruction to complete these steps:
   a) Enter the IP address of the Xbox 360 into the field.
      The Xbox 360 IP address can be found in the upper-right corner of the Xbox 360 GUI displayed on the TV.
   b) Select the option to make the connected Xbox 360 the default.

   The Xbox 360 appears as an icon on the Xbox 360 Neighborhood tool.

5.4.2 Deploying the test application project

This test application is supplied as a Visual Studio solution in the Dolby Digital Plus Online Delivery Kit. To run tests with the test application, you must deploy the entire solution for your Xbox 360.

Prerequisites

- You must have access to the *Dolby Digital Plus Online Delivery Kit* .
- You must have the Xbox 360 development environment prepared.
- The playlist file has been prepared as described in the section that addresses how to prepare a test signal list.

Procedure

1. Download or copy the Xbox360_app.zip file to an appropriate directory on your development PC.

   If you have had the kit downloaded and unpacked on your local PC, locate the .zip file in the <kit parent directory>/Test_Apps/ directory.

   Otherwise, download the .zip file from the web page <kit starting page>/Test_Apps/ on the DISC website (https://disc.dolbycustomer.com).
2. Unzip the file Xbox360_app.zip, and make sure the unzipped folder Xbox360_app contains an .sln file and a subfolder.
3. Open the .sln file with Microsoft Visual Studio.

In Microsoft Visual Studio 2010, click **File** > **Open** > **Project/Solution**, and select the .sln file.

4. Build and deploy the test application for the Xbox 360.
   a) In Microsoft Visual Studio 2010, click **BUILD** > **Build Solution**.
   b) Click **BUILD** > **Deploy Solution** .

What to do next

- The test application must be launched from Visual Studio 2010 by using the **Start Debugging** function.

5.4.3 Setting up the testing infrastructure

To run tests with the test application, you must set up the testing infrastructure best suited for your environment. You can choose to connect your device under test to either to a local web server or to the DISC website.

Connecting the product under test to a local HTTP server

If you are accessing the Internet from behind a firewall or if you do not have a fast Internet connection, set up your playback device under test as described in this section.

About this task

To simulate a server/client media streaming process, the device under test must be connected to a local HTTP server that hosts the test signals.

Procedure

1. Set up hardware components as described in the section that addresses hardware setup with a local HTTP server.
2. Download the entire playback kit onto your local HTTP server from the DISC website (https://disc.dolbycustomer.com), and unpack it to an appropriate directory.
3. Configure the IP address of the local HTTP server.
4. Assign a valid IP address for the Xbox 360 under test. (Usually, the IP is set automatically. For the procedure of setting the IP address for your device under test, refer to the user's manual that addresses the device under test.)
5. Verify the connection by accessing the Start_Here.html page of the kit in the device under test built-in web browser.

Related information

Hardware setup with a local web server for MPEG-DASH and HTTP Live Streaming on page 19

Connecting the device under test to the DISC website

If you have access to an Internet connection with adequate bandwidth for streaming test signal to your playback product, set up your testing infrastructure as described in this section.

About this task

To stream test signals from the DISC website to the Xbox 360 under test, you must ensure that the device under test has an Internet connection and is able to access the DISC website.

Procedure

1. Set up hardware components as described in the section that addresses hardware setup with the DISC website.
2. Connect the device under test into Internet. (For the procedure that addresses accessing the Internet, refer to the user's manual of the device under test.)
3. Verify the connection by accessing the DISC website at https://disc.dolbycustomer.com in the Xbox 360 built-in web browser.

Related information

Hardware setup with DISC for MPEG-DASH and HTTP Live Streaming on page 22

5.4.4 Test application controls

Operate the test application to perform different types of test cases.

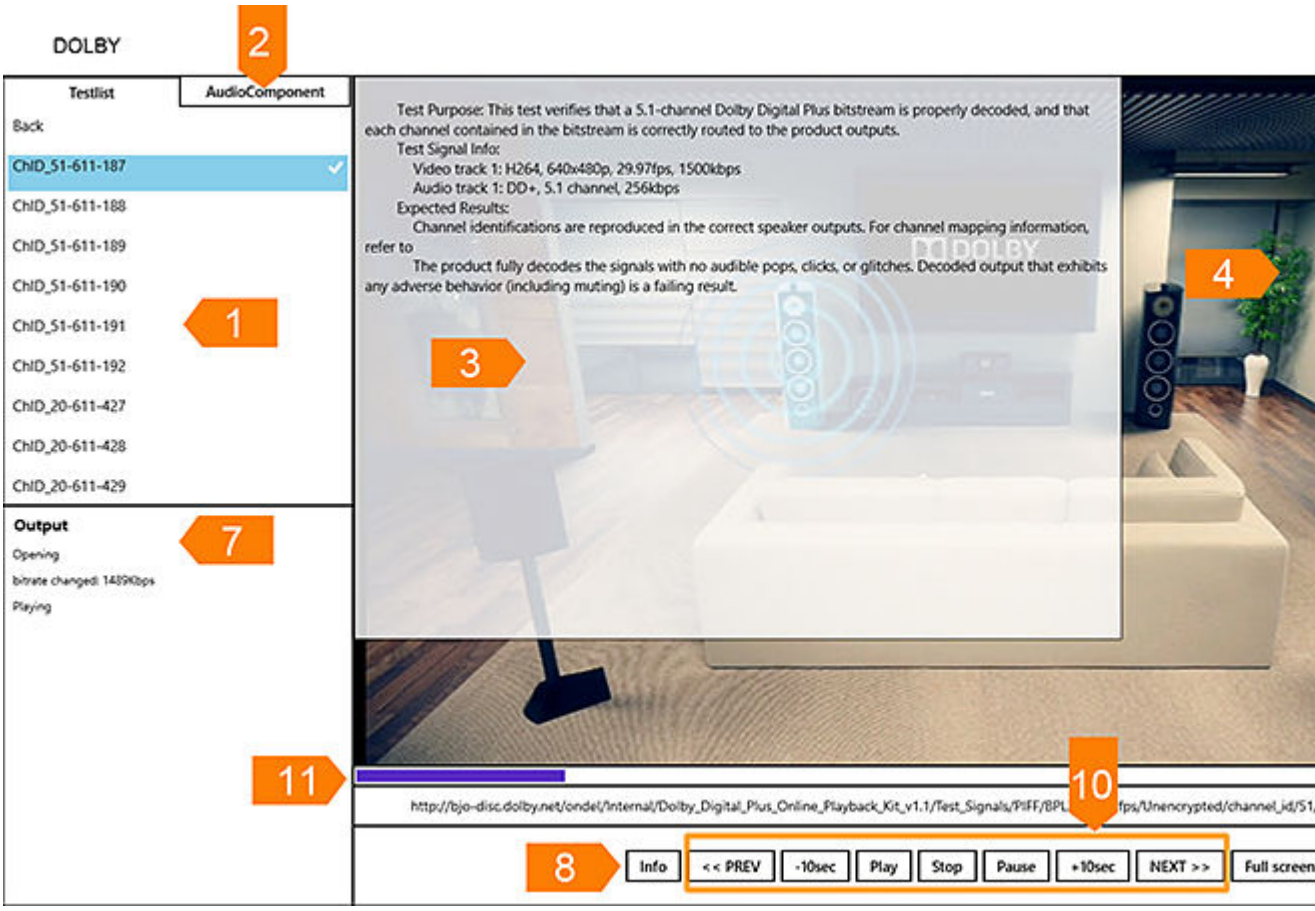
GUI controls on the test application can be adjusted by:

1. Pressing the **B** button on the game controller to display the green outline of the area currently active in the application GUI.
2. Using the analog sticks on the game controller to navigate around areas.
3. Pressing the **A** button on the game controller to choose an area as the active area.
4. Using the analog sticks on the game controller to focus on the desired function in the GUI, and then pressing the **A** button on the game controller to execute.

GUI overview

All application functions can be managed through the GUI workspace.

Figure 13: Test application GUI



1 Test list

Displays a list of test signals. Test signals are organized in a hierarchical structure.

2 Audio component

Displays audio tracks with different encodings presented in a test stream.

3 Information

Displays information about a currently playing test signal, such as bit rate, available audio and video tracks, purpose of the test signal, and so on.

4 Playback window

Displays video content of a currently playing test signal.

5 Menu

Contains functions such as **Exit**, **Back**, **Load Single URL**, and **Load Playlist from HTTP Server**.

6 URL information

Displays the URL information of the currently selected test signal.

7 Output

Displays information, such as playback status, bit-rate information, error messages, and so on.

8 Information

Click this key to display or hide information on a selected test signal, such as bit rate, available audio and video tracks, purpose of the test signal, and so on.

9 Full screen

Click this key to play back video content in full-screen mode.

10 Playback control
Use these keys to control the playback process. (From left to right, these keys include previous, rewind ten seconds, play, pause, stop, fast forward ten seconds, and next.)

11 Playback slider
Use this slider to seek to a desired position in a stream for playback.

Locating a test signal from the test application GUI

After you have completed the questionnaire from **Playback kit Interactive Test Procedure**, a test-case list required for your system is generated. With information shown in the test-case list, you can locate the correct test signal from the test application GUI for testing.

About this task

The test-case list contains this information: the online delivery format, profile, video codec, and test-case type.

Figure 14: An example of a test-case list generated in the interactive test procedure

In the **Test case** column, the first two digits indicate the test-case type.

Table 6: Test-case type

First two digits	Test-case type
01	ChID_2ch
02	ChID_6ch
03	ChID_8ch
04	ChID_6ch_atmos
05	little_endian
06	dual_decoding
07	multi_lang
08	multi_codec
09	multi_av_rate
10	multi_video_rate
11	music
12	crc
13	box
14	codec
15	av_sync
16	av_sync_6ch_atmos

In the test application, test signals are organized by supported features in this structure:

- <Online_delivery_format_profile>
  - <Video_codec>
    - <Test_case>

You must reference the information indicated in the test-case list to locate a specific test signal from the test application GUI. For example, to locate the test signal of the first row shown in this figure, you must follow these steps.

Procedure

1. In the test application GUI, select the correct <Online_delivery_format_profile> (in this case, **DASH_Live**).
2. Select the correct <Video_codec> (in this case, **H.264**).
3. Select the correct <Test_signal> to play (in this case, **ChID_2ch**).
   For inquiring the test case type, see the table Table 6 on page 63.
4. You must repeat steps 1 to 3 to complete all required tests listed for your system capabilities.

Playing test signals from the DISC website on the Xbox 360

The built-in playlist points to all available test signals located on the DISC website. You can follow the instructions in this section to perform testing if you stream test signals from the DISC website.

Prerequisites

- The device under test must have access to the test signals.
- The test application has been successfully deployed.

About this task
If you choose to set up a local IIS server for testing, you must ensure that all test signals have been downloaded and stored in that server, generate a playlist that contains the IIS server URL with the **Playback Kit Interactive Test Procedure**, and use the **Load Playlist from HTTP Server** function to load the test signals.

Procedure

1. Launch the test application from Visual Studio 2010 by using the **DEBUG** > **Start Debugging** function (or pressing <F5>):
   - The application GUI appears on the TV screen.
   - All available test signals appear in the **Playlist** panel. Test signals are organized by variations.
2. Navigate to the test signal you want to play in the **Playlist** panel by selecting its variations:
   - By default, all available test signals are listed by the test application. you must select those required ones to play by referencing the resulting page that contains the test-case list generated by the **Playback Kit Interactive Test Procedure**.
   - Highlighting a test signal displays information about the signal. You can toggle the information on and off by clicking the **Info** key on the bottom.

- You can return to the parent-level playlist by selecting **Back** at the top of the **Playlist** panel.

3. Play a test signal by pressing the **A** key on the game controller:
   - If playback of a test signal is successful, the **Output** panel displays **Opening** > **bitrate changed: # Kbps**>**Playing**, and the video plays back in the window in correct alignment with the audio.
   - If playback of a test signal fails, the **Output** panel displays error messages.

     Note: Adverse behaviors during playback (such as audible pops, clicks, or muting) cannot be detected by the test application, and no error indication will display.
   - If network bandwidth fluctuates during playback, **Current bitrate: # kbps** changes to indicate that audio track switching is occurring to accommodate to current bandwidth.

Related information

Deploying the test application project on page 59
Accessing the test materials on page 8
Locating a test signal from the test application GUI on page 49

Playing a test signal by specifying a URL

It is also possible to play a test signal by pointing at its URL.

About this task

Note: You must have a physical keyboard to use this function.

Procedure

1. Go to the **Menu**, and select **Load Single URL**.
   A text box appears.
2. Enter the URL of an individual test stream in the text box by using a physical keyboard.
3. Select the **Load** button to play the test signal.

   If an incorrect URL is entered, clicking the **Load** button returns the application to its main view.

   If successfully loaded, the test signal starts playing back.

Playing test signals by loading a playlist from an HTTP server

With an HTTP server, you can use the **Load Playlist from HTTP Server** function to import a playlist that contains test cases suited for your system capabilities only.

About this task

By default, all available test signals are shown in the test application. If you want the test application to list only those required test signals for your system, you must follow the procedure described in this section. This function has no regard for the location where the test signals are stored.

Procedure

1. Generate the c_playlist.zip file from **Playback Kit Interactive Test Procedure**.

For detailed information, refer to the section that addresses how to use **Playback Kit Interactive Test Procedure**.

2. Download and unzip the c_playlist.zip to the HTTP server.
3. Launch the test application.
4. Go to the **Menu**, and select **Load Playlist from HTTP Server**.
   A text box appears in a new page.
5. Enter the URL of the unzipped c_playlist folder in the text box.
6. Select the **Load** button to import the test-case list to the test application.

   If an incorrect URL is entered, clicking the **Load** button returns the application to its main view.

   If successfully loaded, the test-case list appears in the **Testlist** panel.
7. Play test signals.

Fast forwarding and rewinding

About this task

A playback slider is available on the test application GUI. During playback, you can activate this area, and use the analog stick to seek to a specific position. Alternatively, you can use the playback control keys to fast forward or rewind.

Procedure

1. Click the **+10sec** button on the GUI once to jump forward ten seconds.
2. Click the **-10sec** button on the GUI once to jump back ten seconds.

Switching between different audio tracks

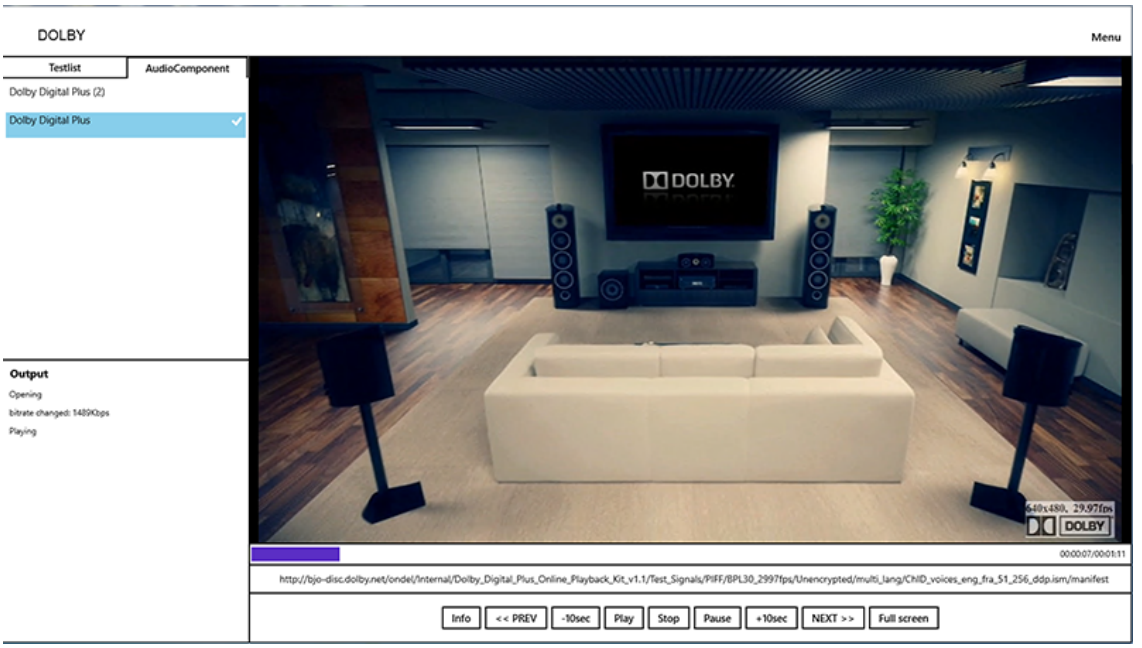
For test cases such as multiple languages, you must switch between different audio tracks.

About this task

Procedure

1. Display available audio components the by selecting the **AudioComponent** tab.
2. Make sure that the track information listed in the **AudioComponent** panel matches what is described in the **Information** box.

   The track information listed in the **AudioComponent** panel is extracted directly from the test signal. If this information does not match what is described in the **Information** box, the test signal is not correctly decoded.
3. Select the audio track to start playback.



5.5 Test application for an HTML5-supported web browser

This test application verifies that a web browser that supports HTML5 is able to play back Dolby Digital Plus bitstreams.

When playing back a test signal in a web browser that does not support Dolby Digital Plus correctly, the video part plays properly but the audio part is muted.

Note: Currently, this test application supports these web browsers only: Safari 9 (El Capitan) (Mac OS X 10.11) and Microsoft Edge.

5.5.1 Accessing the test application

The test application is a web-based video player that can be opened in any supported web browser.

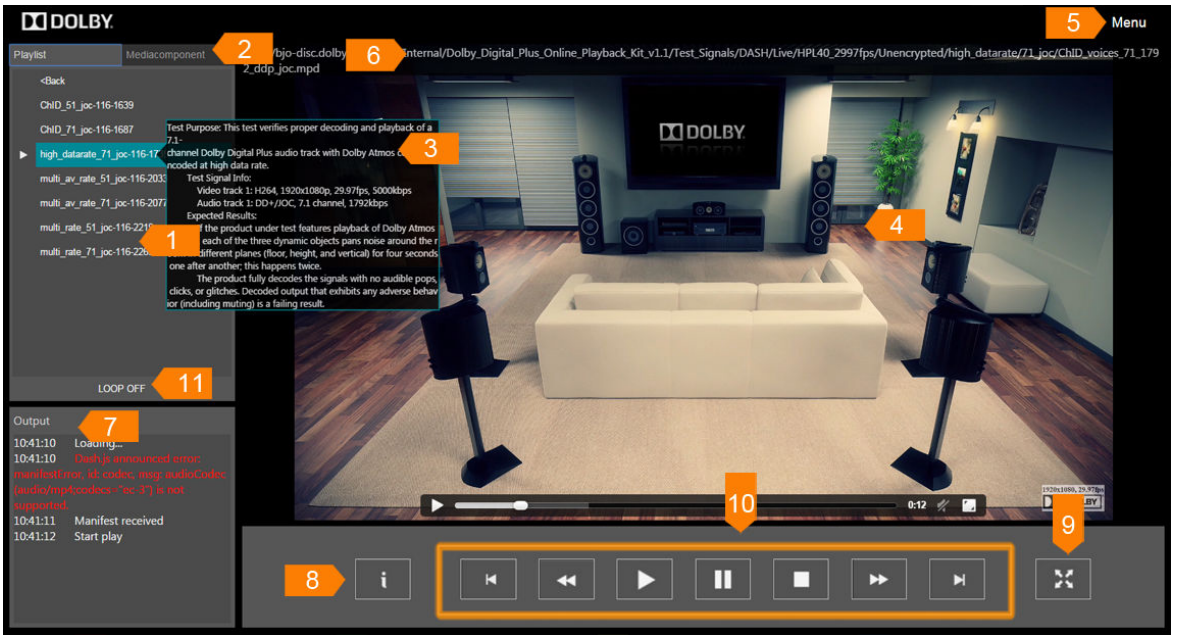
Procedure

Access the test application at https://d9zmmjtv72w5o.cloudfront.net/OnDelKits/DDP/Dolby_Digital_Plus_Online_Delivery_Kit_v1.4/Test_Apps/HTML5/index.html in a web browser.

5.5.2 GUI overview

All application functions can be managed through the GUI workspace.

Figure 15: Test application GUI



1 Playlist

Displays a list of test signals. Test signals are organized in a hierarchy.

2 Media component

Displays audio and video tracks with different encodings presented in a test stream. This tab works for MPEG-DASH test streams only.

3 Information box

Displays information about a selected test signal, such as bit rate, available audio and video tracks, purpose of the test signal, and so on.

4 Playback window

Displays video content of a currently playing test signal.

5 Menu

Contains options: **Load a signal**, **About**, and **Back**.

6 URL information

Displays the URL information of the currently playing test signal.

7 Output

Displays information such as playback status, bit-rate information, error messages, and so on.

8 Information button

Click this key to display information about a selected test signal, such as bit rate, available audio and video tracks, purpose of the test signal, and so on.

9 Full screen

Click this key to play back video content in full-screen mode.

10 Playback control

Use these keys to control the playback process. (From left to right, keys include previous, rewind, play, pause, stop, fast forward, and next.)

11 Loop on/off

With the loop function on, the test application plays back each test signal continuously one after another until it finishes playing the final available test signal.

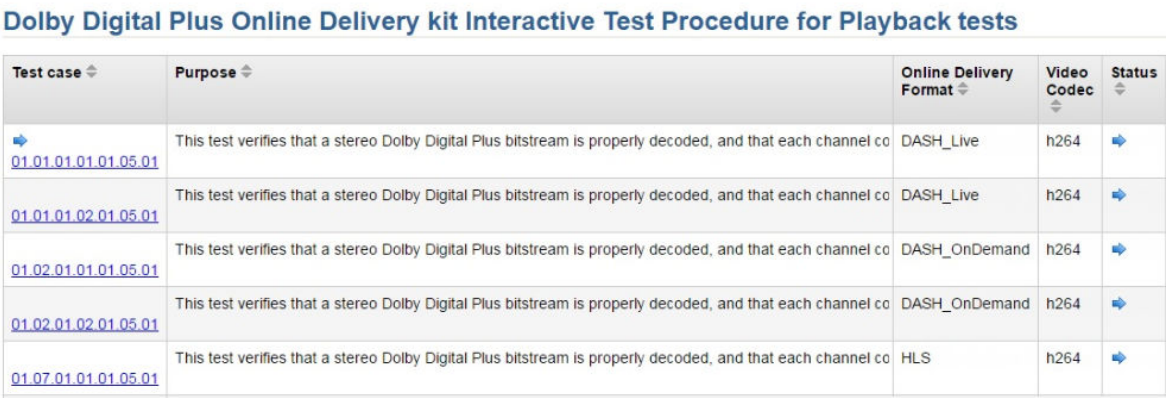
5.5.3 Locating a test signal from the test application GUI

After you have completed the questionnaire from **Playback kit Interactive Test Procedure**, a test-case list required for your system is generated. With information shown in the test-case list, you can locate the correct test signal from the test application GUI for testing.

About this task

The test-case list contains this information: the online delivery format, profile, video codec, and test-case type.

Figure 16: An example of a test-case list generated in the interactive test procedure


Dolby Digital Plus Online Delivery kit Interactive Test Procedure for Playback tests

Test case	Purpose	Online Delivery Format	Video Codec	Status
01.01.01.01.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_Live	h264	
01.01.01.02.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_Live	h264	
01.02.01.01.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_OnDemand	h264	
01.02.01.02.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_OnDemand	h264	
01.07.01.01.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	HLS	h264	

In the **Test case** column, the first two digits indicate the test-case type.

Table 7: Test-case type

First two digits	Test-case type
01	ChID_2ch
02	ChID_6ch
03	ChID_8ch
04	ChID_6ch_atmos
05	little_endian
06	dual_decoding
07	multi_lang
08	multi_codec
09	multi_av_rate
10	multi_video_rate
11	music
12	crc
13	box
14	codec
15	av_sync
16	av_sync_6ch_atmos

In the test application, test signals are organized by supported features in this structure:

- <Online_delivery_format_profile>
  - <Video_codec>

- <Test_case>

You must reference the information indicated in the test-case list to locate a specific test signal from the test application GUI. For example, to locate the test signal of the first row shown in this figure, you must follow these steps.

Procedure

1. In the test application GUI, select the correct <Online_delivery_format_profile> (in this case, **DASH_Live**).
2. Select the correct <Video_codec> (in this case, **H.264**).
3. Select the correct <Test_signal> to play (in this case, **ChID_2ch**).
   For inquiring the test case type, see the table Table 7 on page 69.
4. You must repeat steps 1 to 3 to complete all required tests listed for your system capabilities.

5.5.4 Playing test signals

Test signals are streamed from the DISC server.

All available test signals are listed in the **Playlist**. You can play a test signal by single-clicking on it. Alternatively, you can use the **Loop on/off** function to play all of the test signals one after another automatically starting from the currently playing signal.

Playing back status is indicated in the **Output** panel. When encountering issues during playback, error messages are displayed in the **Output** panel. For detailed information about possible error messages, see http://www.w3.org/TR/html5/embedded-content-0.html#error-codes.

Playing a test signal by specifying a URL

It is also possible to play a test signal by entering its URL.

Procedure

1. Go to the **Menu**, and select **Load Single URL**.
2. Enter the URL of an individual test stream in the address bar.
3. Select the **Load** button to play the test signal.
   If an incorrect URL is entered, clicking the **Load** button returns the application to its main view.
   If successfully loaded, the test signal starts playing back.

5.5.5 Fast forwarding and rewinding

Procedure

1. Click the fast-forward button on the GUI once to jump forward ten seconds.
2. Click the rewind button on the GUI to jump back ten seconds.

5.5.6 Switching between different audio tracks

For test cases such as multiple languages and multiple codecs, you must switch between different audio tracks.

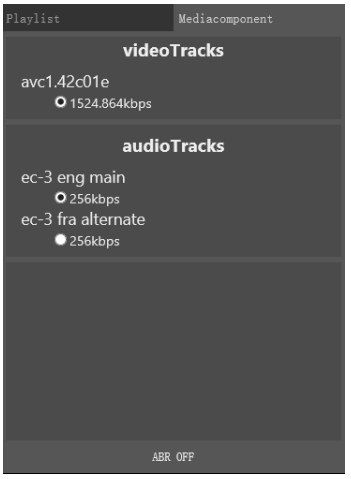
Procedure

1. Start playing back a test signal by single-clicking on it.
2. Display available audio components the by selecting the **MediaComponent** tab.

   Audio track information will appear in the **MediaComponent** tab during playback.
3. Make sure that the track information listed in the **MediaComponent** panel matches what is described in the **Information** box.

   The track information listed in the **MediaComponent** panel is extracted directly from the test signal. If this information does not match what is described in the **Information** box, the test signal is not correctly decoded.
4. Switch between available audio tracks during playback.

   Figure 17: Audio track switching



   For an audio track with multiple bit rates, switch off the **ABR** button, and choose which bit rate to play back manually.

5.6 Test application for Android TV

Dolby provides test applications for playing back Dolby Digital Plus with Dolby Atmos content bitstreams on an Android TV platform.

In this documentation, Google Nexus Player is used as an example to show how to install the Dolby test application on an Android TV.

Note: In this release, use https://d9zmmjtv72w5o.cloudfront.net/OnDelKits/DDP/Dolby_Digital_Plus_Online_Delivery_Kit_v1.4/Test_Apps/Test_Apps.html for accessing test materials.

Note: Unless otherwise stated, all PC-related operations described in this instruction are performed on a PC running Windows.

5.6.1 Preparing the development environment for Android TV

To install the Dolby test application onto an Android TV, you must have the Android TV and a testing PC connected, and the development environment prepared.

Prerequisites

These items are required:

- The Android TV. (In this document, we use Nexus Player as the example device.)
- A display device (for example, a TV).
- A Windows PC.
- A USB cable for connecting the Android TV to the PC.

Procedure

1. Connect the Nexus Player to a testing PC with a USB cable.
2. Connect the Nexus Player to a display with an HDMI cable.
   This display is for presenting the Android TV output.
3. Enable the Nexus Player for development.
   For detailed information about enabling a device for development, refer to its user's manual:
   a) For the Nexus Player, use its remote control to navigate to **Settings** > **Preferences** > **Developer options** > **Debugging** > **USB debugging**, and select **On**.
4. Install USB drivers for ADB onto the PC.
   For detailed information about USB driver installation, see http://developer.android.com/tools/device.html.
5. Install the ADB tool on the PC.
   For information on how to install the ADB tool, see http://developer.android.com/tools.
6. Add ADB to the PATH system variable:
   a) For a Windows 7 system, navigate to **Start** > **Computer** > **Properties** > **Advanced system settings** > **Advanced tab** > **Environment Variables**.
   b) Under the **System variables** section, locate **Path**, click on it, and click **Edit**.
   c) In the **Edit System Variable** window, add the ADB installation path (for example, C:\Users\AppData\Local\Android\) to the **Variable value** text box, separated by semicolons from other path variables.

   These steps enable Windows to locate the ADB executable when it is required.
7. Verify that the ADB tool is properly installed by running this command in a command-line prompt window on the PC.

```
adb
```

5.6.2 Installing the test application onto a Nexus Player

Install the Dolby test application onto the Nexus Player by using a Windows PC.

Prerequisites

- You must have access to the Dolby Digital Plus Online Delivery Kit.
- The development mode has been enabled for the Nexus Player.
- ADB tool has been installed on the Windows PC.
- The Nexus Player is connected to a display device (for example, a TV).

About this task
The Dolby test application is not available from the Google shop; you must follow the steps described in this section for installation.

Procedure

1. Download or copy the AndroidTV_app.zip file to an appropriate directory on the PC.

   If you have had the kit downloaded and unpacked on your local PC, locate the .zip file in the <kit parent directory>/Test_Apps/AndroidTV/ directory.

   Otherwise, download the .zip file from the web page <kit starting page>/Test_Apps/AndroidTV/ on the DISC website (https://disc.dolbycustomer.com).

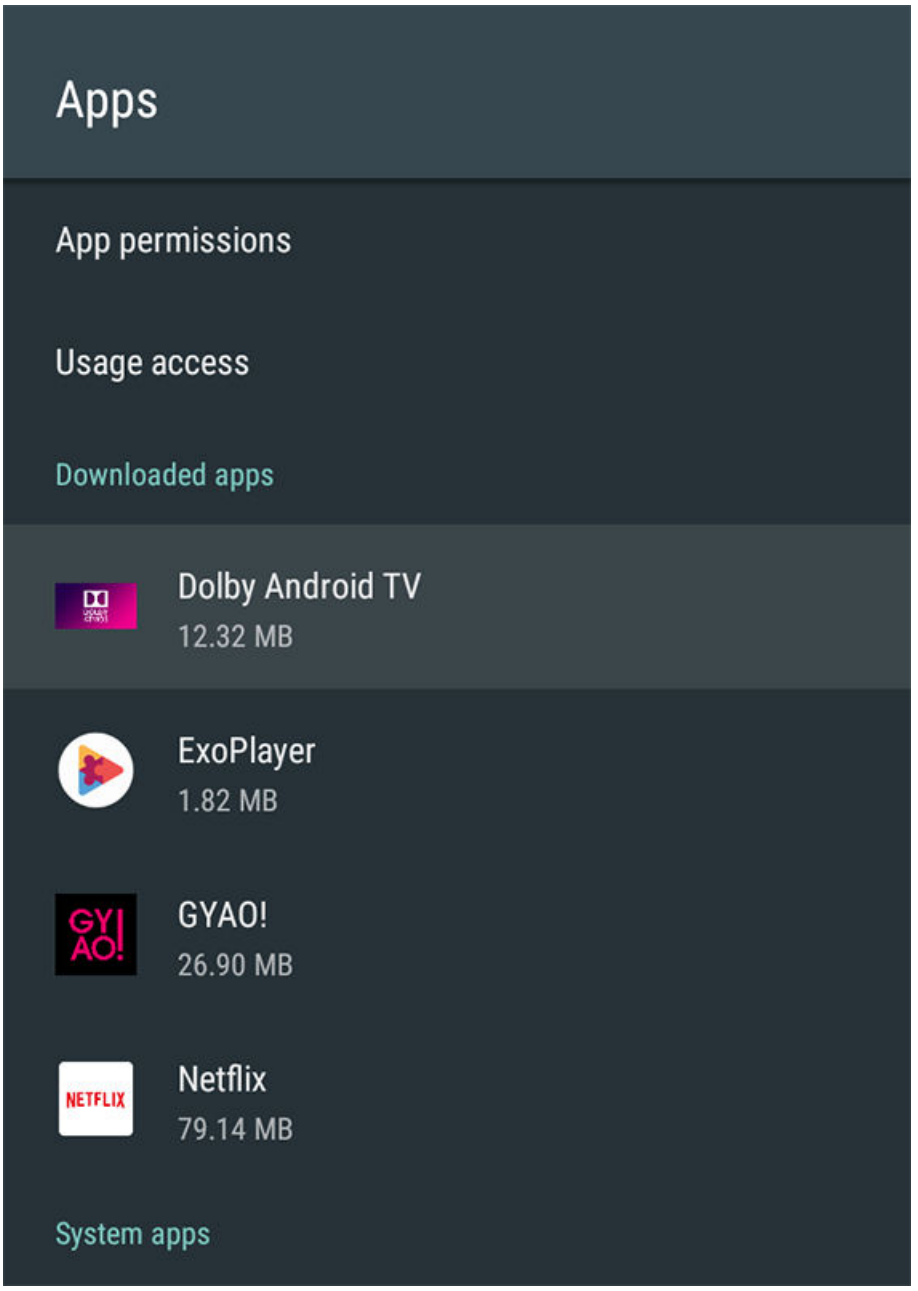
2. Unzip the file AndroidTV_app.zip, and make sure the unzipped folder AndroidTV_app contains a AndroidTV.apk file.

3. Connect the Nexus Player to the PC with a USB cable.

4. Open a command-line prompt window from the PC, and run this command from under the AndroidTV_app folder.

   ```
   adb install AndroidTV.apk
   ```

   After the installation has completed, the test application icon will appear on the main page of the Nexus Player. If the icon is not displayed on the main page, find it in **Settings** > **Device** > **Apps** > **Downloaded apps**.



5.6.3 Preparing a test signal list for the test application

You can first screen out the relevant test cases for your system by using the interactive test procedure, and then manually provide the test application with a list of the selected test signals and their URLs so that the test application is able to locate those test signals for playback.

Procedure

1. Log in to the DISC website at https://disc.dolbycustomer.com.
2. Navigate to the **Dolby Digital Plus Online Delivery Kit** , and within the kit, click **Interactive Test Procedure**.
3. Complete the entire questionnaire of the interactive test procedure, and then click **Done**.

   One step of the questionnaire requires information about the directory where the test signals are stored. Choose the correct location, **Local server** or **DISC website**. If **Local server** is selected, enter the path information in the text box as required.

A test-case list is generated and appears in a new page, with the required and recommended tests for your system. You must complete all required tests listed for your system configuration.

4. Click **Settings**  , and then **Download playlists**, to save a c_playlist.zip file to your local disk.

   This playlist file contains the URLs to the required test signals.

5. Unpack the c_playlist.zip file.

   This unzipped folder will be used later to import the test-case list to the test application.

6. To generate a new playlist for another set of test signals, repeat steps 3 to 5.

Related information

Testing with the interactive procedure on page 27

5.6.4 Copying the playlist to the Nexus Player or a local web server

You can copy the playlist that contains the URLs to the required test signals to either the Nexus Player or a local web server for playback.

Prerequisites

- Hardware components are connected correctly.
- ADB tool has been installed on the Windows PC.

Procedure

1. Copy the playlist to the Nexus Player.
   a) Open a command-line window from the PC, and run this command from under the c_playlist folder.

   ```
   adb push ott_app_playlists.xml /sdcard/Movies/
   ```

   ```
   adb push Playlist /sdcard/Movies/
   ```

   The unpacked c_playlist folder contains the master playlist file ott_app_playlists.xml and a folder named Playlist. The /sdcard/Movies/ folder on the Nexus Player device is used as the default location for storing the playlist. You can also store the playlist in other folders on the device.

   b) Check the ADB log to ensure that no errors are reported.

2. Copy the unpacked c_playlist folder to a local web server.

   You can also use a local web server for hosting the playlist (for example, http://192.168.1.200/c_playlist/ott_app_playlists.xml).

5.6.5 Test application controls

Operate the test application to perform different types of test cases. Controls on the test application can be adjusted by using the remote control.

Loading the playlist

Choose a playlist for playback.

Prerequisites

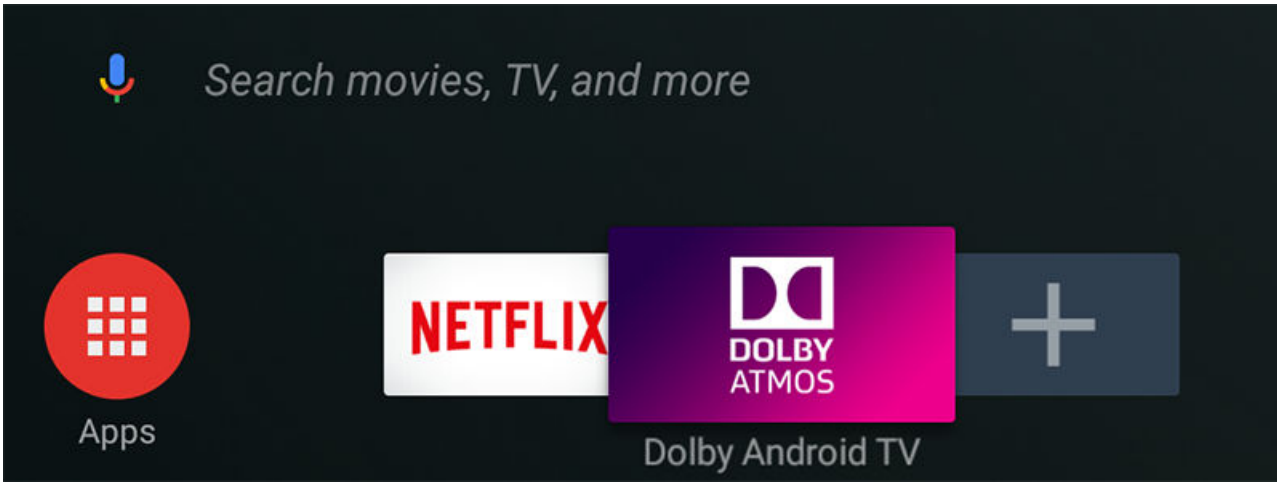
- The Nexus Player is connected to a TV.
- The Nexus Player has an Internet connection and is able to access the DISC website.

About this task

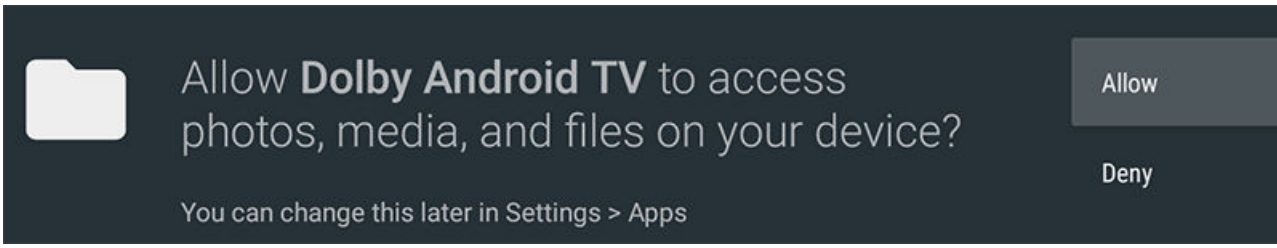
A default playlist contains all of the test signals Dolby designs for all use cases. A customized playlist generated through using the **Interactive Test Procedure** contains test signals that are required for your system only. Depending on your test scheme, the playlist can be placed on the Android TV device or on a local web server, or it can be accessed directly from Dolby web server.

Procedure

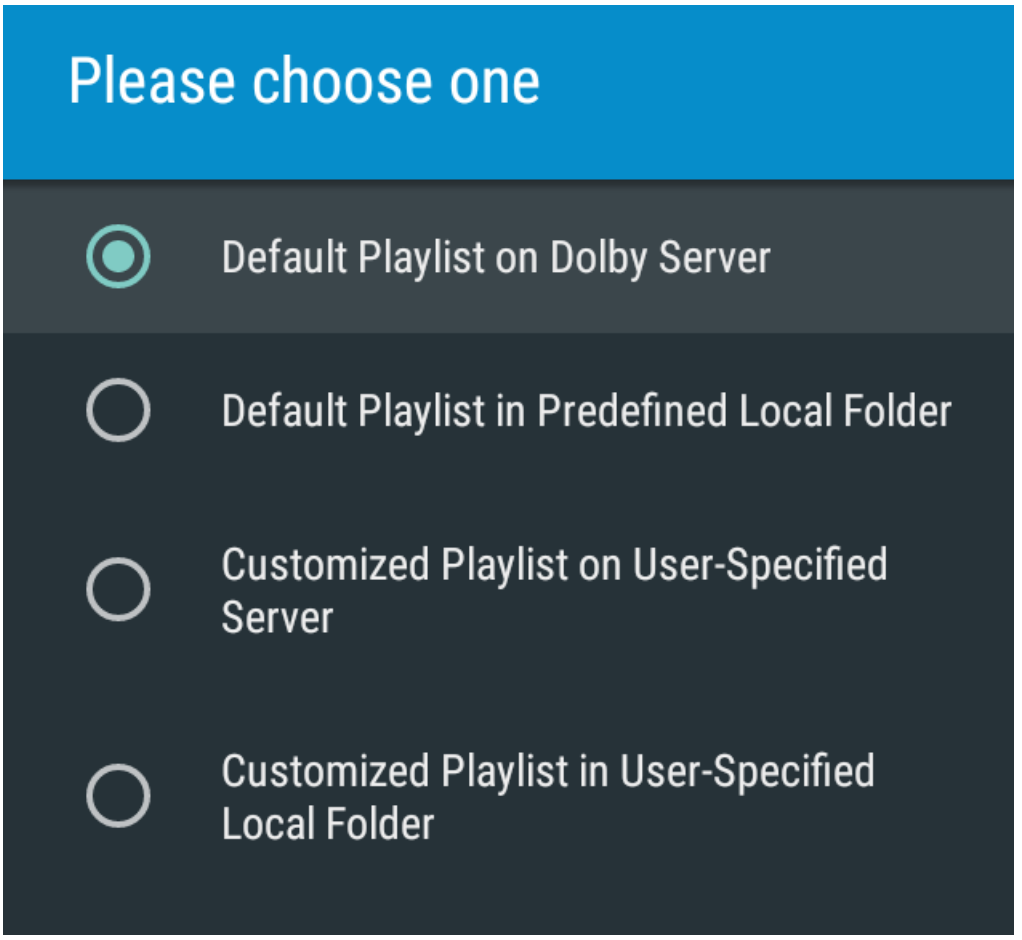
1. Start the test application from the Nexus Player GUI.



2. Allow the test application to access files on the Nexus Player device.
   This window pops up the first time you run the test application. Choose **Allow**.



3. Select a playlist by going to **Settings** > **Playlist Preference** and checking one of the options shown in this screen.

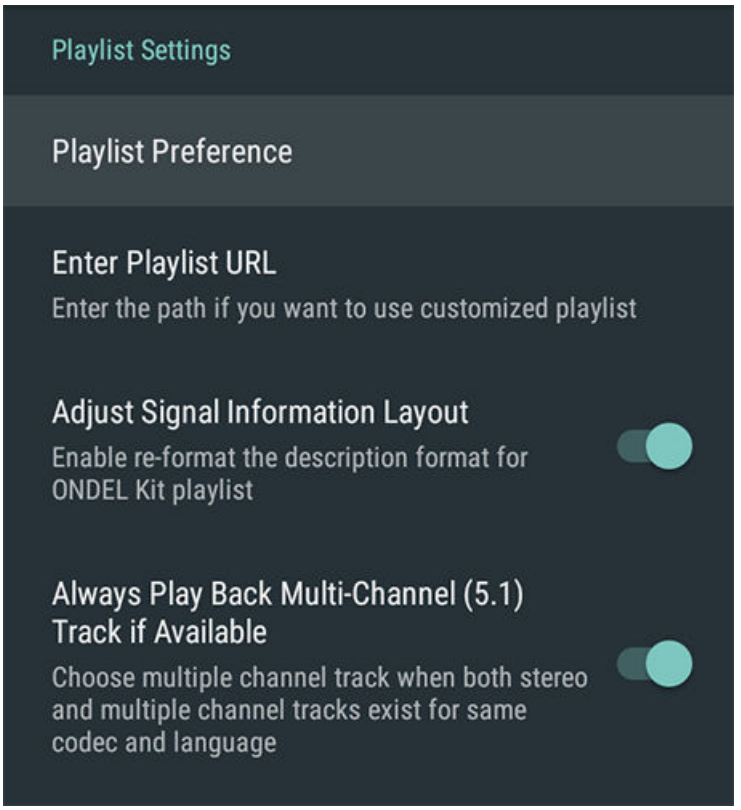


To use the second option, you must first copy the playlist to the /sdcard/Movies/ folder on the Nexus Player device as described in *Copying the playlist to the Nexus Player or a local web server*.

4. Enter the playlist URL by going to **Settings** > **Enter Playlist URL**.

   You must specify the full file path to the master playlist file (for example, http://192.168.1.200/c_playlist/ott_app_playlists.xml).

   Perform this step only if you have chosen **Customized Playlist on User-Specified Server** or **Customized Playlist in User-Specified Local Folder** in the preceding step.



5. To switch to another playlist file, you must first clear the cached playlist data. Perform this step before loading a different playlist than the one used previously:
   a) Quit the test application.
   b) From the Nexus Player main GUI, select **Settings** > **Apps** > **Downloaded apps** > **Dolby Android TV** > **Clear data**.
6. Restart the test application.
   The test signals referenced in the chosen playlist appear in the main view of the test application.

Related information

Copying the playlist to the Nexus Player or a local web server on page 75

Playing test signals on the Android TV

Play back test signals by using the Dolby Android TV test application.

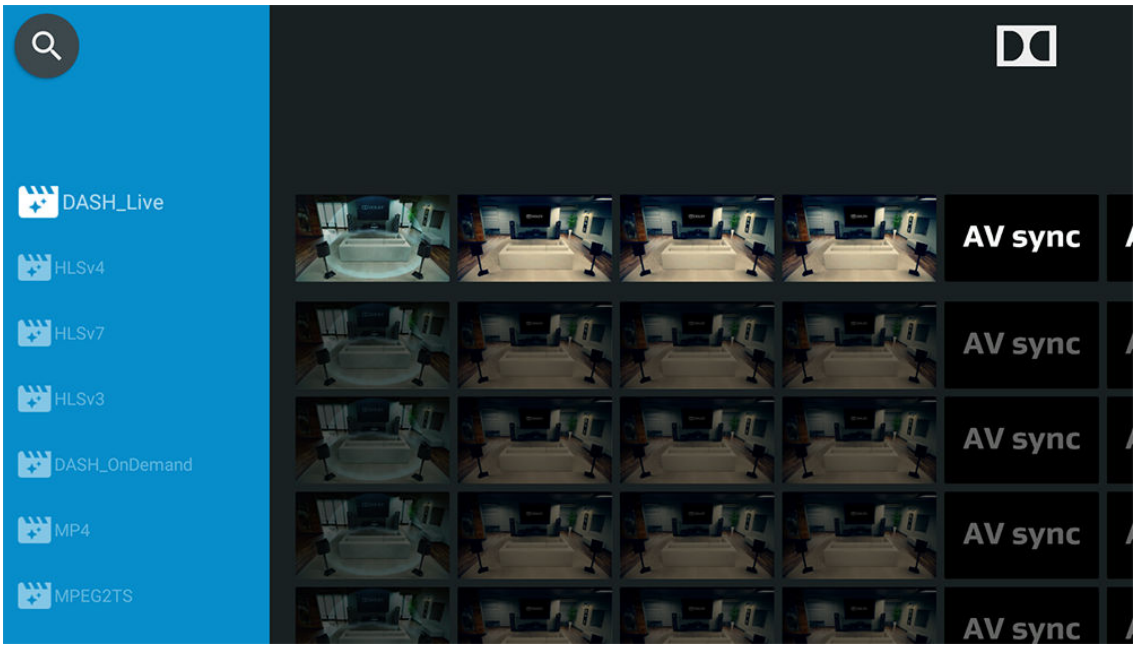
Prerequisites

- The playlist been loaded to the test application.

Procedure

1. Start the test application.
   The application GUI appears.

Figure 18: Selecting the online delivery format



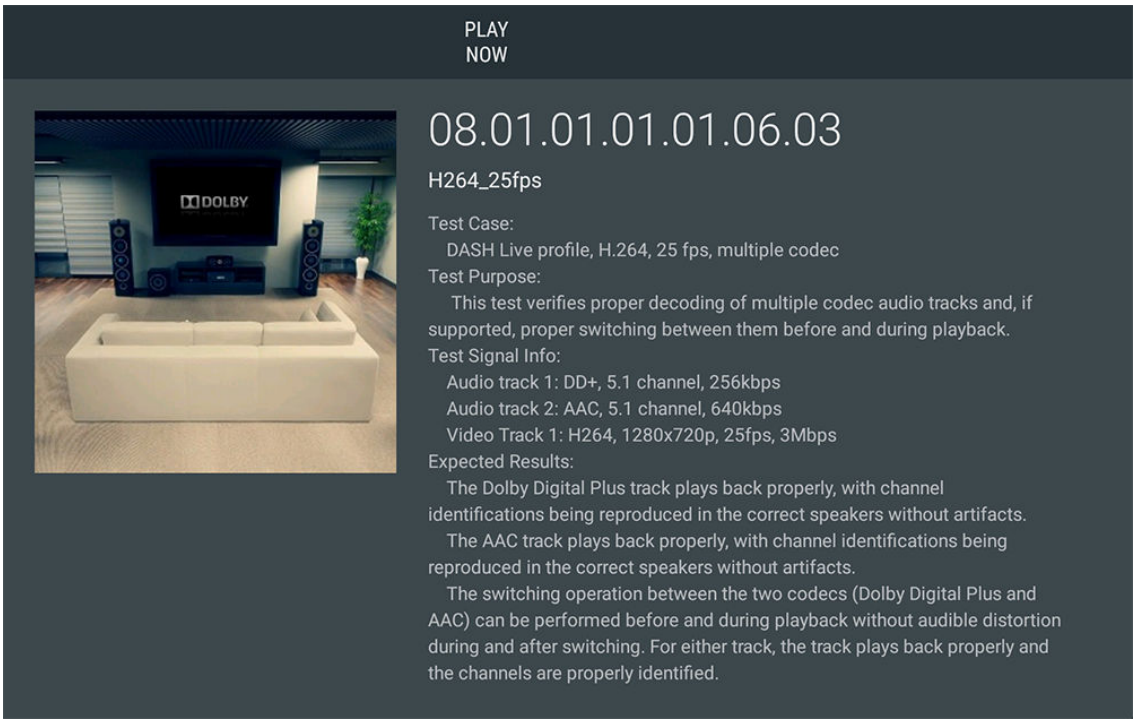
2. Select the online delivery format of the test signals.

   Available test signals appear on the right-hand side.

3. Select a test signal.

   Navigate through the available test signals, and select one to show the test signal description information.

4. Select **PLAY NOW** on the top of the test signal description page to start playback.



Fast forwarding and rewinding

Procedure

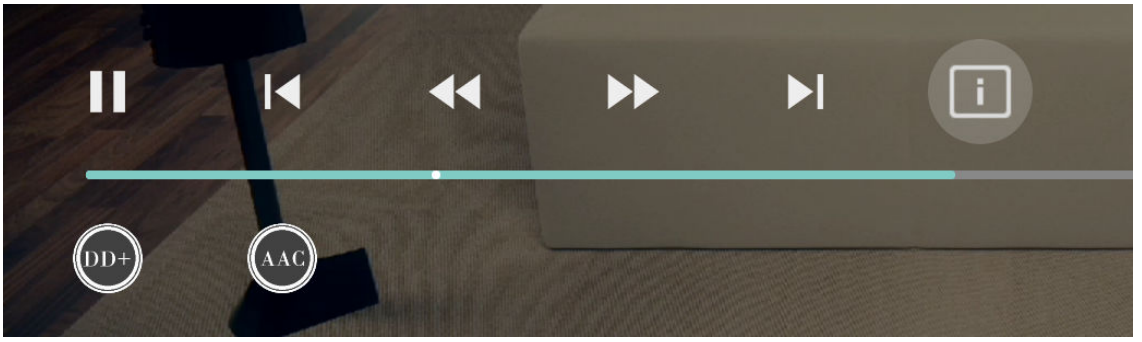
1. Click the fast-forward button on the GUI once to jump forward ten seconds.
2. Click the rewind button on the GUI to jump back ten seconds.

Switching between different audio tracks

For test cases such as multiple languages and multiple codecs, switch between and play back different audio tracks.

Procedure

1. To show available variant tracks, select the information icon during playback.
   - For multiple-codec test signals, codec options **DD+** and **AAC** appear under the playback slider.
   - For multiple-language test signals, language options **En** and **Fr** appear under the playback slider.
   - Otherwise, message appears reading `Only one audio track is available`.



2. Select the audio track you want to play back.

5.7 Test applications for Apple TV

Two versions of test applications (Apple Television Markup Language [TVML] and Apple Swift) are designed for playing back Dolby Digital Plus bitstreams on Apple TV.

5.7.1 About TVML and Swift versions

Both the TVML and Swift versions of the test applications are supplied within the Dolby Digital Plus Online Delivery Kit in the form of source code.

For the purpose of playing back Dolby Digital Plus bitstreams, build and deploy either version on an Apple TV directly. They are functionally the same in terms of supporting playback of Dolby Digital Plus.

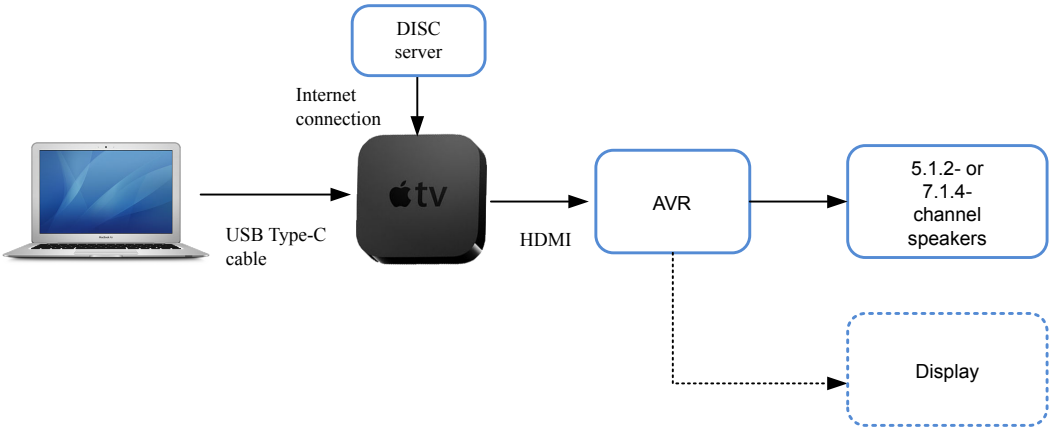
For developing your own player application that supports Dolby Digital Plus, use either the TVML or Swift version as sample code, and integrate into your code the version that best suits your needs.

5.7.2 Setting up the testing infrastructure

To run tests with the test application, you must set up the testing infrastructure.

Procedure

1. Connect an Apple laptop to the Apple TV with a USB Type-C cable.
   This connection is used for deploying the test application to the Apple TV.
   Figure 19: Testing infrastructure for Apple TV



2. Connect the Apple TV to an A/V receiver with an HDMI interface.
   A TV display and multiple-channel speakers (or headphones) can be connected to the A/V receiver.
3. Connect the Apple TV to the Internet.
   This can be a wireless connection. Refer to the Apple TV user's manual of the Apple TV for more information on connecting to the Internet.)

5.7.3 Deploying the test application on an Apple TV

Deploy the test application on an Apple TV for running tests. This is the same for both the TVML and Swift versions of the test application.

Prerequisites

- You must have an Apple laptop with Xcode installed.
- Ensure that the Apple TV is connected to the Apple laptop properly.
- Ensure that you are using the correct versions of Xcode, tvOS, and macOS. Update them as needed:
  - Xcode 8.1 Build 8B62
  - tvOS 10.0.1 Build 14U71 (To update the tvOS, you need iTunes 12.5.3.)
  - macOS Sierra 10.12.1 Build 16B2657

Procedure

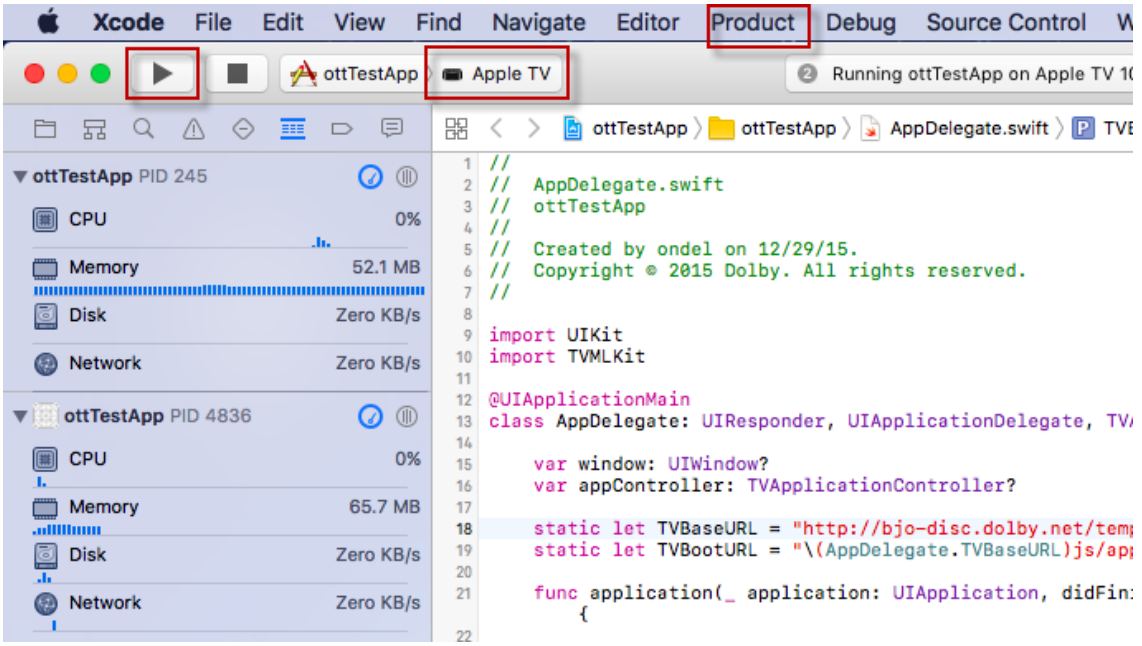
1. Download or copy the test application .zip file (either AppleTV_tvml_app.zip or AppleTV_swift_app.zip) to an appropriate directory on your Apple laptop.

If you have had the kit downloaded and unpacked on your Apple laptop, locate the .zip file in the <kit parent directory>/Test_Apps/ directory.

Otherwise, download the .zip file from the web page <kit starting page>/Test_Apps/ on the DISC website (https://disc.dolbycustomer.com).

2. Extract the file (for example, AppleTV_tvml_app.zip), and make sure the folder contains an .xcodeproj file.
3. Launch Xcode, and load the project file for the Apple TV test application.

   In the Xcode UI, go to **File** > **Open** and open the project file .xcodeproj.
4. Select Apple TV as the target device for deployment.



   If the Apple TV is switched on and connected to the Apple laptop properly, it can be detected by Xcode automatically.
5. Start deploying by either clicking on the triangle button or selecting **Product** > **Run**.

Results

The test application automatically launches on the Apple TV.

5.7.4 Controls for the TVML version test application

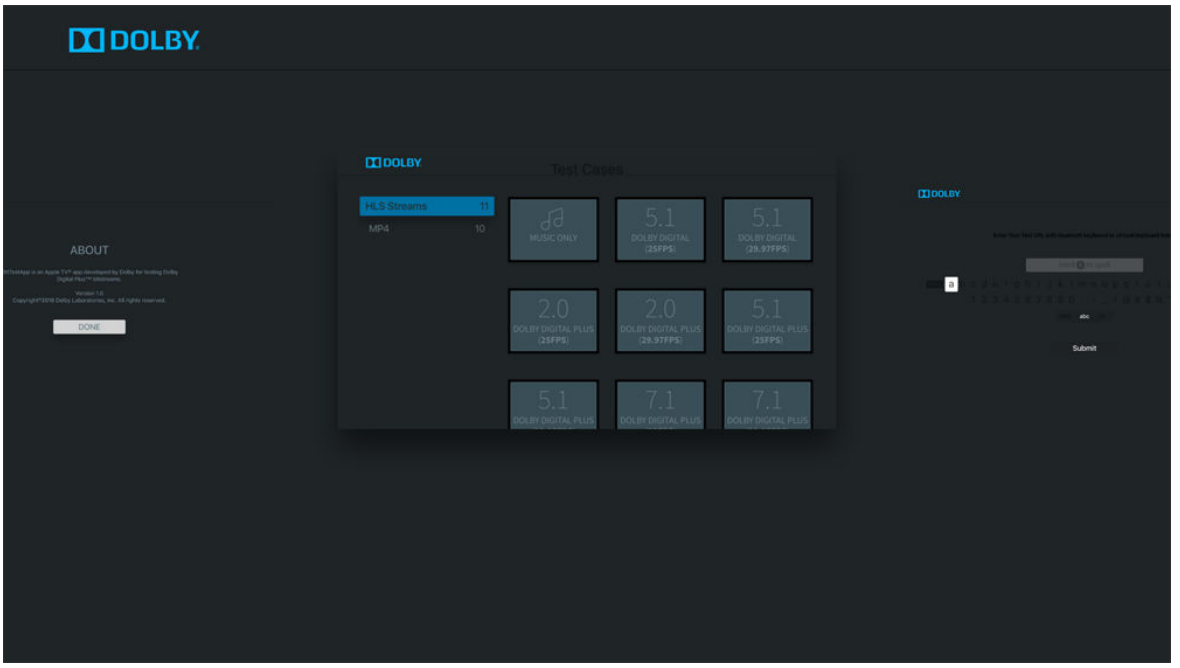
Operate the test application to perform different types of test cases.

Controls on the test application can be adjusted by using the track pad on the Apple TV remote.

GUI overview

All application functions can be managed through the GUI workspace.

With the application launched, three pages display. Swipe your finger on the track pad to switch focus.



Test cases
: This page lists all of the test signals that are required to run.

About
: This page displays version information about the test application.

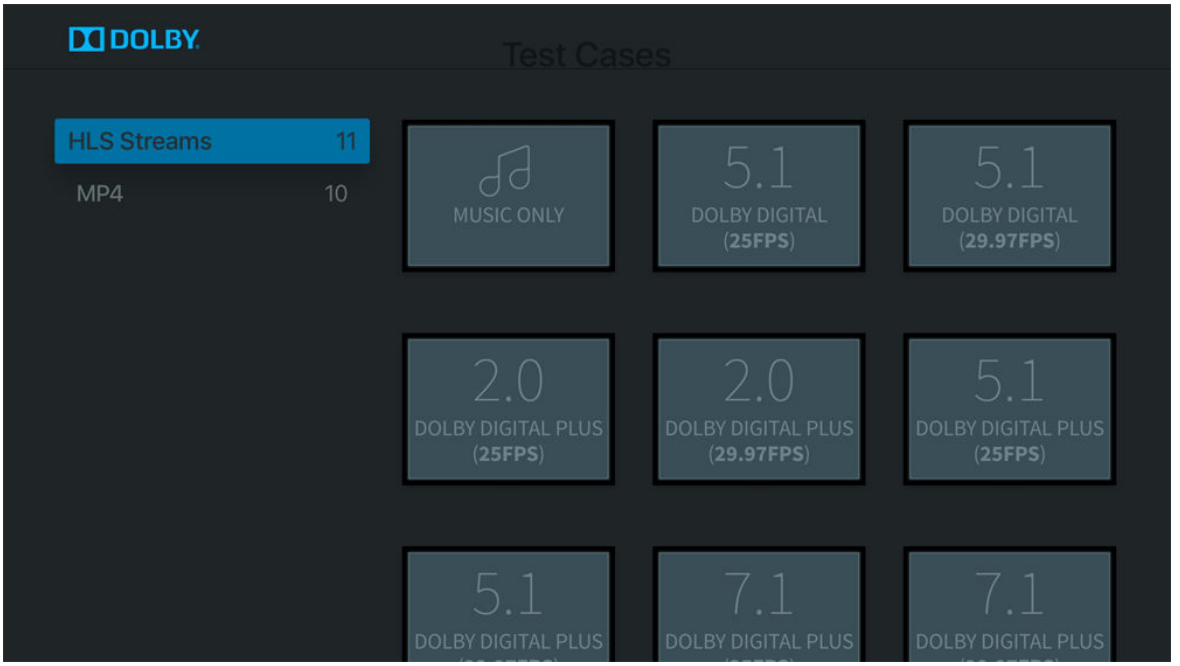
URL entering
: This page allows you to play a test stream by entering its URL.

Playing test signals

Test signals are streamed from the DISC server. All test signals listed in the **Test Cases** page are required for verifying the capability of handling Dolby technology.

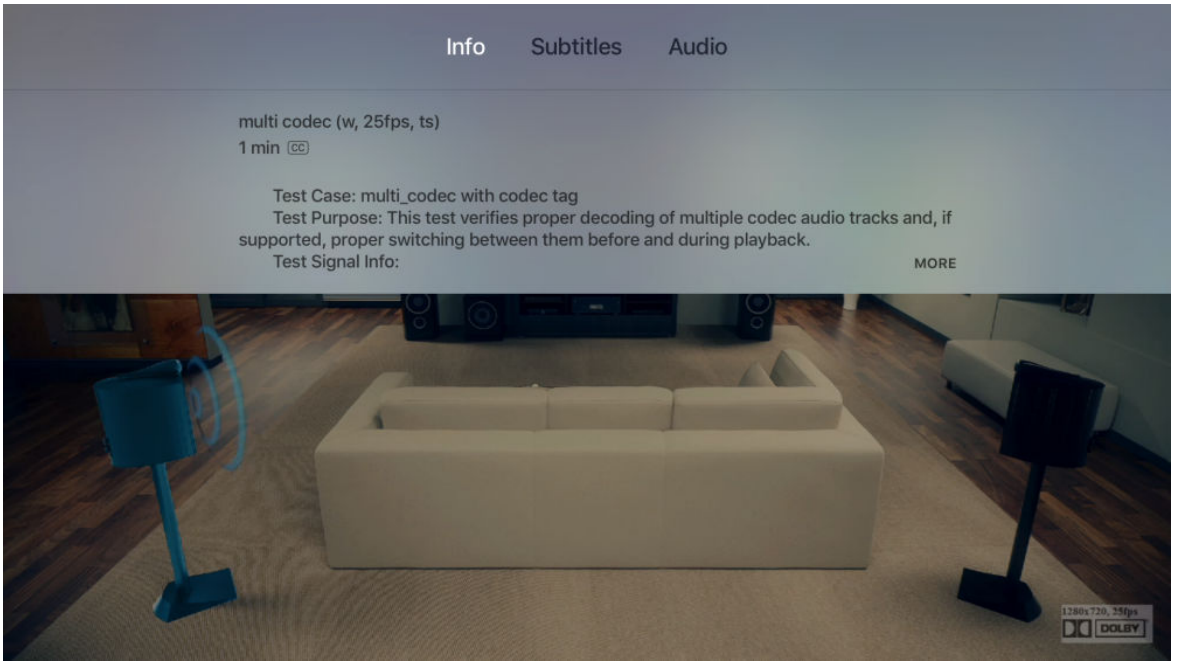
Enter the **Test Cases** page by pressing the track pad. Swipe left, right, up, or down to select a test signal to play. All test signals must be played.

Figure 20: Selecting a test signal



Alternatively, you can play a test signal by entering its URL in the **URL entering** page. This is useful when you play a streaming test signal that is hosted on a different server than the DISC.

During playback of a test signal, swipe down from the top edge of your track pad to access the option bar. The **Info** option displays description of the currently playing test signal, including bit rate, available audio and video tracks, purpose of the test signal, and so on.



To return to the test signal selection page, press the **MENU** button on the remote control.

Fast forwarding and rewinding

Procedure

1. Click the right edge on the track pad to fast forward.
2. Click the left edge on the track pad to rewind.

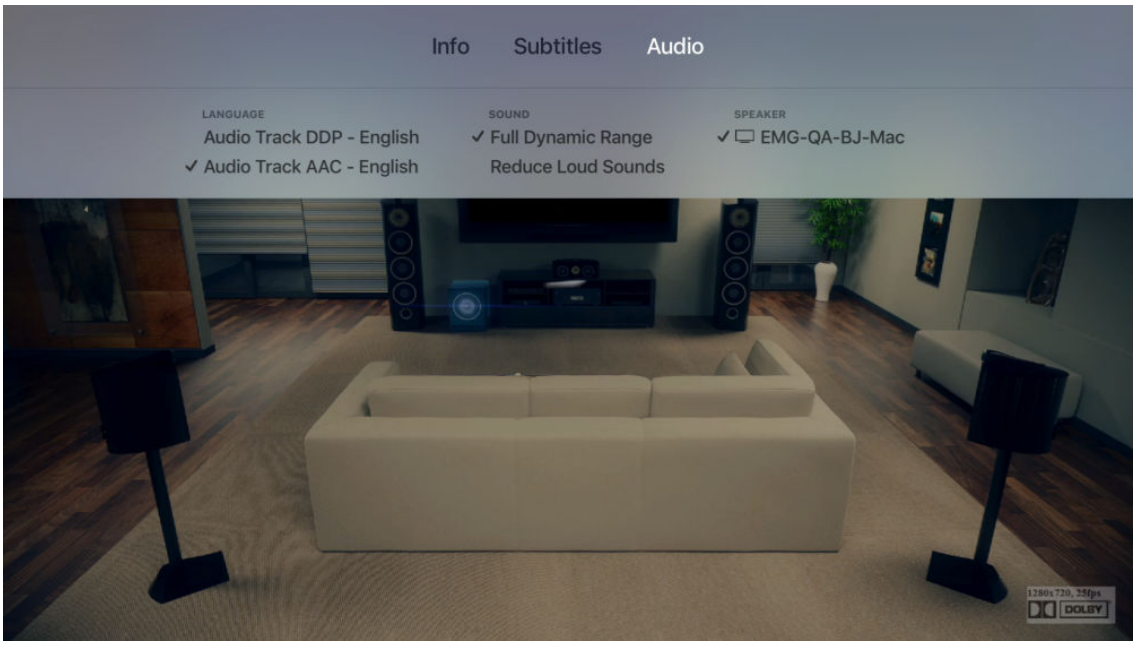
Switching between different audio tracks

For test cases such as multiple languages and multiple codecs, you must switch between different audio tracks.

Procedure

1. During playback of a test signal, swipe down from the top edge of your track pad to access the option bar.
2. Select the **Audio** option.

Figure 21: Switching audio tracks



3. Select the audio track you want to play back.
   The selected track has a tick next to it.

5.7.5 Controls for the Swift version test application

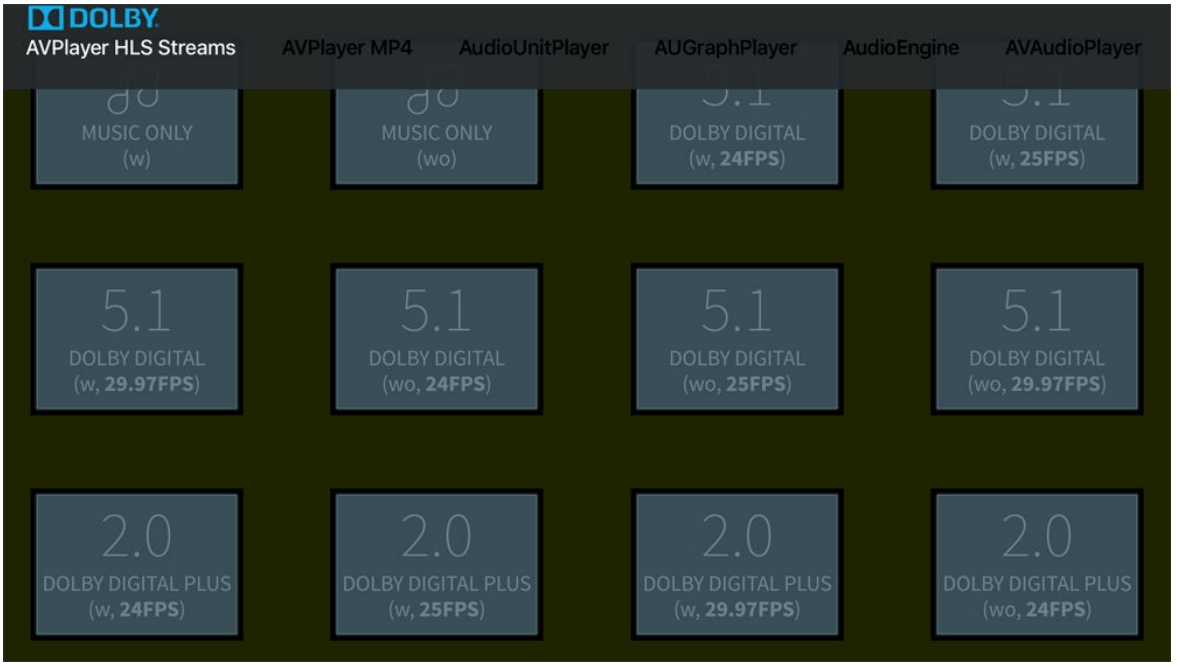
Operate the test application to perform different types of test cases.

Controls on the test application can be adjusted by using the track pad on the Apple TV remote.

GUI overview

All application functions can be managed through the GUI workspace.

With the application launched, the entry page displays API modules on the menu bar.



Six API modules are available for testing. Among the six APIs, `AVPlayer` is the only one that supports playback of both audio and video by itself.

AVPlayer
This item calls the `AVPlayer` API, which supports HTTP Live Streaming and MP4 formats.

AudioUnitPlayer
This item calls the `AudioUnit and Audio File Service` APIs, which support elementary stream and MP4 format.

AUGraphPlayer
This item calls the `Audio Processing Graph` API, which supports elementary stream and MP4 format.

AudioEngine
This item calls the `AVAudioEngine` API, which supports elementary stream and MP4 format.

AVAudioPlayer
This item calls the `AVAudioPlayer` API, which supports elementary stream and MP4 format.

AudioQueuePlayer
This item calls the `Audio Queue` API, which supports elementary stream and MP4 format.

Playing test signals

Test signals are streamed from the DISC server. All test signals listed under an API module are required for verifying its capability of handling Dolby technology.

Procedure

1. Launch the test application by pressing the center of the track pad.
2. With the menu bar on, swipe your finger left or right on the track pad to switch focus on the API modules.

   Not all of the APIs are able to be displayed at the same time due to the width of a screen.
3. With one API module highlighted, swipe your finger down to access the test signals.
4. Swipe left, right, up, or down to select a test signal to play.

   Figure 22: Selecting a test signal

5. With a test signal highlighted, press the play/pause button on the track pad to start playing.

All test signals must be played.

Test signals for the **AVPlayer** API module play back with video content. Test signals are audio-only content for other API modules.

6. To return to the test signal selection page, press the **MENU** button on the remote control.

Fast forwarding and rewinding

Only test signals for the AVPlayer API module support this function.

Procedure

1. Click the right edge on the track pad to fast forward.
2. Click the left edge on the track pad to rewind.

Switching between different audio tracks

For test cases such as multiple languages and multiple codecs, you must switch between different audio tracks.

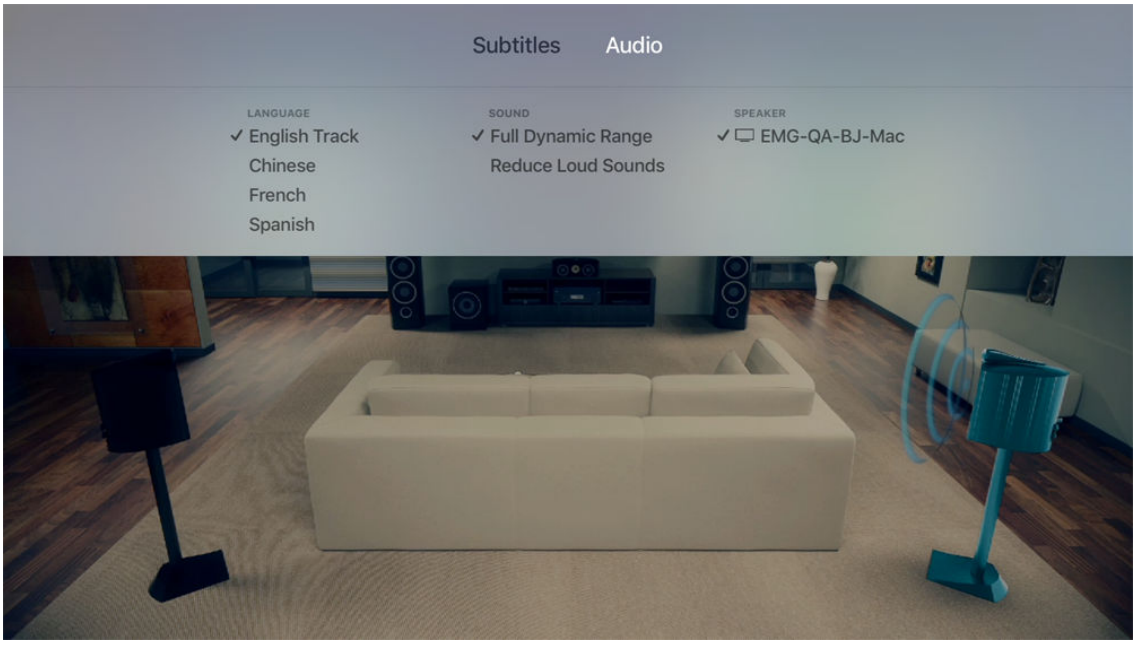
About this task

Only test signals for the AVPlayer API module support this function.

Procedure

1. During playback of a test signal, swipe down from the top edge of your track pad to access the option bar.
2. Select the **Audio** option.

   Figure 23: Switching audio tracks



3. Select the audio track you want to play back.

   The selected track has a tick next to it.

5.8 Test application for Roku TV

This test application is designed for playing back Dolby Digital Plus bitstreams on Roku TV.

5.8.1 Preparing the development environment for a Roku TV

To install the Dolby test application onto a Roku TV, you must first enable the Roku Developer Application Installer.

Prerequisites

- The Roku TV is connected to a display (for example, a TV).

About this task

Only the essential steps are provided here. For detailed information about enabling a Roku device for development, refer to the Roku *Developer setup guide* at https://developer.roku.com.

Procedure

1. Enter this sequence with the Roku remote control to enter the **Developer Settings** page.

2. Save the Roku TV URL.

   The Roku TV URL is shown in the **Developer Settings** page (for example, `http://10.12.12.13`).

3. Set a password for the Roku TV, and reboot the device.

5.8.2 Installing the test application onto the Roku TV

Install the Dolby test application onto the Roku TV by using a web browser.

Prerequisites

- You must have access to the Dolby Digital Plus Online Delivery Kit.
- The Roku Developer Application Installer is enabled.
- Both the Roku TV and the PC for deploying the test application must be connected to the same subnet.

Procedure

1. Download or copy the Roku_app.zip file to an appropriate directory on the PC.

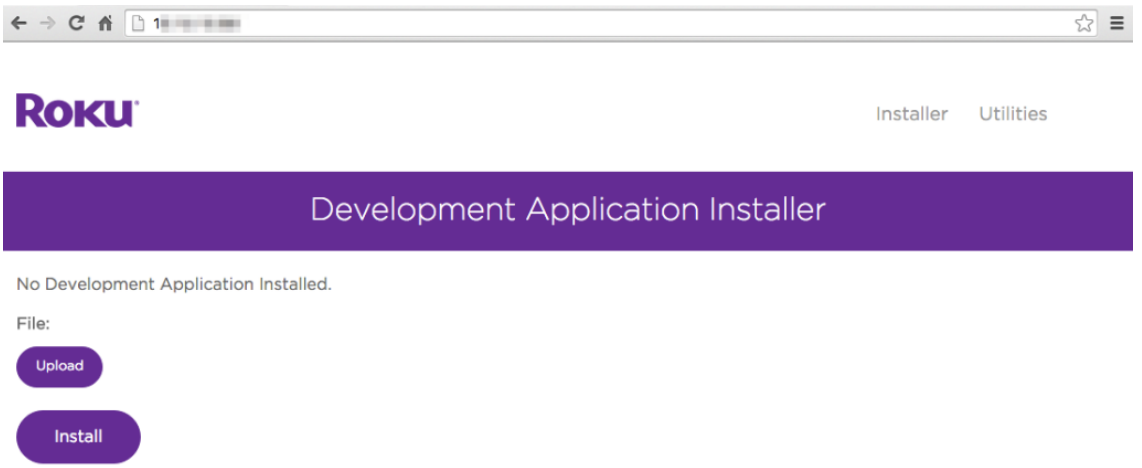
   If you have had the kit downloaded and unpacked on your local PC, locate the .zip file in the <kit parent directory>/Test_Apps/ directory.

   Otherwise, download the .zip file from the web page <kit starting page>/Test_Apps/ on the DISC website (https://disc.dolbycustomer.com).

2. Open a web browser on the PC, and enter the Roku device URL (for example, `http://10.12.12.13`).

3. Enter the user name and password.

   The main page for installing an application appears.



4. Click **Upload**, and select the Roku_app.zip file.
5. Click **Install**.
   The test application icon appears on the Roku TV.

5.8.3 Test application controls

Operate the test application to perform different types of test cases. Controls on the test application can be adjusted by using the remote control.

Playing test signals on the Roku TV

The test signals are organized by online delivery formats. Use the remote control to start playing test signals.

Procedure

1. Start the test application.
2. Use the remote control to navigate through test signals, and play a highlighted test signal by pressing the **OK** key on the remote control.

Fast forwarding and rewinding

Procedure

1. Click the right arrow on the remote control to fast forward the video.
2. Click the left arrow on the remote control to rewind the video.

5.9 Test application for Chromecast

This test application verifies that the Chromecast device is able to play back Dolby Digital Plus bitstreams.

5.9.1 Accessing the test application

The test application is a web-based video player that can be opened in the Google Chrome web browser.

About this task

We recommend using a PC or Mac for running the test. You may need to upgrade the Chrome web browser to the latest version to have the cast capability.

Procedure

1. Connect the Chromecast device to a TV.

   For detailed information, see https://store.google.com. Make sure that the Chromecast device and your testing PC is in the same LAN network. We recommend using cable connections to the same router.

2. Open the Chrome web browser on the PC, and enter this URL:

   http://d9zmmjtv72w5o.cloudfront.net/OnDelKits/DDP/Dolby_Digital_Plus_Online_Delivery_Kit_v1.4/Test_Apps/ChromeCast_app/index.html

   The test application GUI appears.

   Figure 24: Chromecast test application GUI

3. Mirror the content from the PC to the TV.

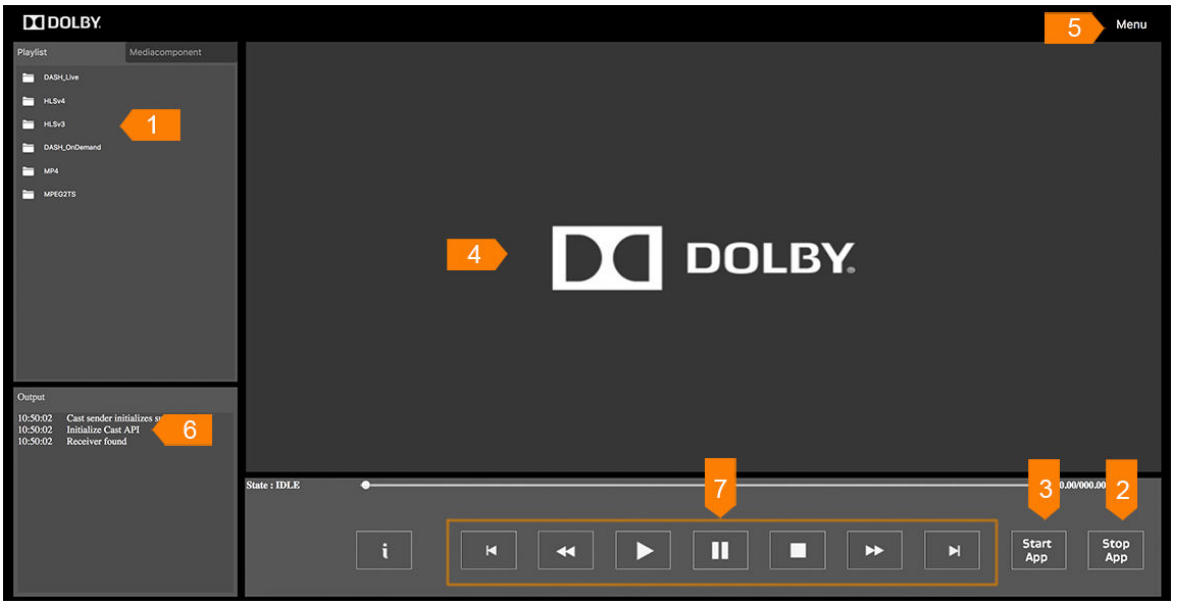
   To mirror the content, you can either click the **Cast** icon available on the upper-right corner of the Chrome web browser, or click the **Start App** button on the lower-right corner of the test application UI.

   To stop mirroring, click the **Cast** icon again or the **Stop App** button.

5.9.2 GUI overview

All application functions can be managed through the GUI workspace.

Figure 25: Test application GUI



1 Playlist
Displays a list of test signals. Test signals are organized in a hierarchy.

2 Stop App
Stops mirroring content to a TV.

3 Start App
Starts mirroring content to a TV.

4 Playback window
Displays video content of a currently playing test signal.

5 Menu
Contains options **Load a single URL**, **About**, and **Back**.

6 Output
Displays information such as playback status, bit-rate information, error messages, and so on.

7 Playback control
Use these keys to control the playback process. (From left to right, keys include previous, rewind, play, pause, stop, fast forward, and next.)

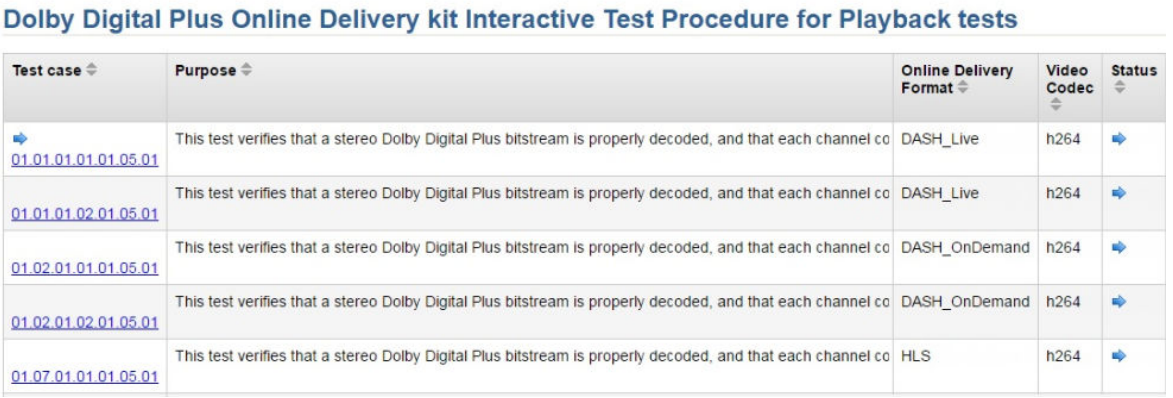
5.9.3 Locating a test signal from the test application GUI

After you have completed the questionnaire from **Playback kit Interactive Test Procedure**, a test-case list required for your system is generated. With information shown in the test-case list, you can locate the correct test signal from the test application GUI for testing.

About this task

The test-case list contains this information: the online delivery format, profile, video codec, and test-case type.

Figure 26: An example of a test-case list generated in the interactive test procedure



Dolby Digital Plus Online Delivery kit Interactive Test Procedure for Playback tests

Test case	Purpose	Online Delivery Format	Video Codec	Status
01.01.01.01.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_Live	h264	
01.01.01.02.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_Live	h264	
01.02.01.01.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_OnDemand	h264	
01.02.01.02.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	DASH_OnDemand	h264	
01.07.01.01.01.05.01	This test verifies that a stereo Dolby Digital Plus bitstream is properly decoded, and that each channel co	HLS	h264	

In the **Test case** column, the first two digits indicate the test-case type.

Table 8: Test-case type

First two digits	Test-case type
01	ChID_2ch
02	ChID_6ch
03	ChID_8ch
04	ChID_6ch_atmos
05	little_endian
06	dual_decoding
07	multi_lang
08	multi_codec
09	multi_av_rate
10	multi_video_rate
11	music
12	crc
13	box
14	codec
15	av_sync
16	av_sync_6ch_atmos

In the test application, test signals are organized by supported features in this structure:

- <Online_delivery_format_profile>
  - <Video_codec>
    - <Test_case>

You must reference the information indicated in the test-case list to locate a specific test signal from the test application GUI. For example, to locate the test signal of the first row shown in this figure, you must follow these steps.

Procedure

1. In the test application GUI, select the correct <Online_delivery_format_profile> (in this case, **DASH_Live**).
2. Select the correct <Video_codec> (in this case, **H.264**).
3. Select the correct <Test_signal> to play (in this case, **ChID_2ch**).
   For inquiring the test case type, see the table Table 8 on page 92.
4. You must repeat steps 1 to 3 to complete all required tests listed for your system capabilities.

5.9.4 Playing test signals

Test signals are streamed from the DISC server.

All available test signals are listed in the **Playlist**. You can play a test signal by single-clicking on it. Alternatively, you can use the **Loop on/off** function to play all of the test signals one after another automatically starting from the currently playing signal.

Playback status is indicated in the **Output** panel. When encountering issues during playback, error messages are displayed in the **Output** panel.

Playing a test signal by specifying a URL

It is also possible to play a test signal by entering its URL.

Procedure

1. Go to the **Menu**, and select **Load Single URL**.
2. Enter the URL of an individual test stream in the address bar.
3. Select the **Load** button to play the test signal.
   If an incorrect URL is entered, clicking the **Load** button returns the application to its main view.
   If successfully loaded, the test signal starts playing back.

5.9.5 Fast forwarding and rewinding

Procedure

1. Click the fast-forward button on the GUI once to jump forward ten seconds.
2. Click the rewind button on the GUI to jump back ten seconds.

Glossary

A/V
Audio/video.

AAC
Advanced Audio Coding. A perceptual audio coding system that is described by ISO/IEC 14496-3.

access unit
All of the frames required by a Dolby Digital Plus decoder to produce 1,536 samples of decoded audio for each channel present in the bitstream (including all substreams). The first frame of an access unit has a substream type of 0 and a substream ID value of 0. If the access unit consists of frames that contain one, two, or three blocks of audio, the first frame of the access unit has the convsync parameter set to 1.

AC-4 simple transport frame
Frame in AC-4 simple transport format that encapsulates a raw AC-4 frame, as defined in ETSI TS 101 154 v1.11.1.

AIT
Application Information Table. A part of the digital video broadcast specification that defines information that a broadcast receiver requires to be able to run applications available from the program manager. This can include class files, data files, and activation state, among others.

ARC
Audio Return Channel. A feature of HDMI that enables audio to be sent through the HDMI cable from the sink to the source.

bed object
An object with positional metadata that does not change over time and is described by a predefined speaker position.

block
A portion of a frame.

CE-HTML
Consumer Electronics Hypertext Markup Language. An XHTML language for designing web-based material for consumer electronic devices on Universal Plug and Play networks, as defined in CTA-2014-B.

CRC
Cyclic redundancy check.

DASH
Dynamic Adaptive Streaming over HTTP. An adaptive bit-rate streaming protocol that enables high-quality streaming of media content over the Internet delivered from HTTP.

DECE
Digital Entertainment Content Ecosystem.

DISC
Dolby Interoperability Support Center.

dynamic object
An object with positional metadata that may vary over time and is described by three coordinates (x, y, z).

elementary stream
A bitstream that is the output of an audio or video encoder and contains only one type of data, such as audio or video.

E-AC-3
Enhanced AC-3.

Dolby Digital Plus, also known as Enhanced AC-3 or E-AC-3, is a digital audio compression coding system for transport and storage of multichannel digital audio specified in Annex E of ATSC A/52 and Annex E of ETSI TS 102 366.

The file extension for a Dolby Digital Plus file is .ec3.

frame
In audio, a series of PCM samples or encoded audio data representing the same time interval for all channels in the configuration. Metadata pertaining to the frame can be carried within the frame or separately, depending on context.

frame set
Six consecutive blocks of Dolby Digital Plus audio data from a single substream. A frame set always represents 1,536 samples of audio data from a single substream.

GUID
Globally unique identifier. A unique reference number used as an identifier in software.

HDMI
High-Definition Multimedia Interface. A high-speed, high-capacity format for transferring digital information and the specific hardware interface for the format.

HEVC
High-Efficiency Video Coding. See H.265.

HLS
HTTP Live Streaming. An adaptive streaming protocol for delivery of media content developed by Apple.

ISO
International Organization for Standardization.

JDK
Java Development Kit.

joint object coding
An algorithm used to efficiently code object-based audio content.

media assets
A collection of files that contains a multimedia presentation formatted for adaptive streaming. Generally, a media asset consists of multiplexed and fragmented media and one or more files that describe how to play back the media (for example, playlist or manifest files).

media presentation
A collection of files that contains media content prepared for adaptive streaming. The presentation includes media files that contain the content and files that describe how to access and play the content.

MP4 sample
A single ISO base media file track sample, as defined in section 3.1.10 of *ISO/IEC 14496-12*.

MPD
Media Presentation Description. A manifest used in MPEG Dynamic Adaptive Streaming over HTTP (MPEG-DASH) to describe the available streaming content, its various alternatives, URL addresses, and other characteristics, as well as segments that contain the actual multimedia bitstreams in the form of chunks, in single or multiple files.

MPEG
Moving Picture Experts Group. An ISO/IEC working group that develops video and audio encoding standards. Also the name of a family of digital video and audio coding standards.

MPEG-4
An MPEG standard (ISO/IEC 14496) for a group of audio and video coding formats and related technologies.

object
An audio signal plus associated object audio metadata.

object audio metadata
Information used for rendering an audio object. Comprises metadata such as positional metadata, content metadata, or metadata for personalization. Each object must at least have associated positional metadata containing specific information for the renderer. The specification of positional metadata is different for each object type.

object audio renderer
Renders object-based audio to a specific speaker layout. The input is composed of objects, and the outputs are speaker feeds.

PAT
Program Association Table. Program Association Table of an MPEG-2 transport stream.

PCR
Program clock reference. A periodically transmitted value of 42 bits that provides a sample of the system time clock in the encoder and which is used to properly demultiplex packets and to ensure that audio and video are synchronized.

PES
Packetized elementary stream. An elementary stream that is split into small chunks (packets) for transmitting and combining multiple streams within a transport stream. Each PES is identified by a unique packet identifier (PID).

PID
Packet identifier. A unique code that identifies a packetized elementary stream (PES) within a transport stream. The PID is contained in the transport stream packet header and is listed in the service information (SI) for a transport stream.

playlist
An extended .m3u8 file that contains one or more uniform resource identifiers (URIs). A URI can point to another playlist or to a media file.

PMT
Program Map Table. A table within an MPEG-2 transport stream that defines the set of elementary streams associated with a specific program.

presentation
References to AC-4 substreams to be decoded and presented simultaneously.

presentation configuration
Set of metadata to describe how a presentation must be decoded.

PTS
Presentation time stamp. The presentation time stamp is contained in the packetized elementary stream (PES) packet header that indicates when an access unit should be decoded and presented for output. The PTS is used in combination with other time stamp parameters to synchronize audio and video.

raw AC-4 frame
The actual codec frame that consists of a table of contents plus several byte-aligned substreams.

S/PDIF
Sony/Philips Digital Interconnect Format. A digital interface protocol and specification for a physical connector for carrying digital audio signals, defined in IEC 60958.

substream
A decodable unit that represents a specific channel configuration (mono, stereo, or 5.1) and contains audio data and corresponding metadata.

substream ID
A metadata field in a Dolby Digital Plus bitstream for numbering a substream. The substream ID, in combination with the substream type, identifies a substream within a Dolby Digital Plus stream, as defined in Annex E of ETSI TS 102 366.

substream type
A metadata field in a Dolby Digital Plus bitstream that describes a substream. There are different types of substreams that make up a Dolby Digital Plus bitstream. As defined in Annex E of ETSI TS 102 366, independent substreams (type 0) may be decoded independently of any other substreams that might exist in the bitstream. Dependent substreams (type 1) must be decoded in conjunction with the independent substream with which it is associated.

time slice
A collection of Dolby Digital Plus frames that represents the audio data from the same point in time across multiple substreams. A time slice may represent one, two, three, or six blocks of audio data, depending on the number of blocks used per frame.

transport stream
As defined in ISO/IEC 13818-1, a packetized bitstream that is used to transmit audio and video information. A transport stream is made up of multiplexed program elementary streams.

transport stream segment
A single .ts file that is part of an HTTP Live Streaming (HLS) transport stream.

URI
: Uniform Resource Identifier. A group of characters identifying a resource on a network (typically, the Internet).

variant playlist
: A playlist that contains Uniform Resource Identifiers (URIs) that point to alternative content for a presentation, such as alternative language versions of the content. A variant playlist lists URIs for each variant presentation so that a playback client can switch between playback of the streams dynamically based on parameters such as language, bit rate, and channel configuration.