Baseband Video Encoding

This chapter describes the video encoding capabilities of the Digital Content Manager (DCM).

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Introduction

A D9902 equipped with a Media Interface Card and an MFP MK2 Card is able to convert uncompressed SDI (serial digital interface) streams to MPEG2 (Motion Picture Experts Group 2)/AVC (advanced video coding) video streams. Therefore, the MFP mode of the card must be set to Premium Picture Quality Encode and the DCM is equipped with a Media Interface Card, for which the hardware configuration is set to SDI Input - SDI Input, and provided with SDI SFP (small form-factor pluggable) modules.

An MFP MK2 with a Media Interface Card in a DCM housing allows:

• Encoding incoming SD (standard definition) - SDI 480i25, SD - SDI 480i29.97, HD (high definition) - SDI 1080i25, HD - SDI 1080i29.97, HD - SDI 720p50, and HD - SDI 720p59.94 10 bit pixel baseband streams.

• Horizontal video screen transsizing of MPEG2 and H.264 video.

• HD to HD and HD to SD downscaling (or down conversion).

Important: For premium picture quality encoding, downscaling must be done on an HD engine slot. For high-density encoding, downscaling can be done on an HD or SD engine slot.
• PiP (picture-in-picture) stream creation.

• AAC-LC (advanced audio coding low complexity) (1.0, 1+1, 2.0 or 5.x), HE-AACv1 (high efficient advanced audio coding version1) (1.0, 1+1, 2.0 or 5.x), HE-AACv2 (high efficient advanced audio coding version 2) (2.0), MPEG-L2 (1.0, 1+1, or 2.0), Dolby Digital (AC-3) (1.0, 1+1, 2.0 or 5.x), or Dolby Digital Plus (E-AC-3) (1.0, 1+1, 2.0 or 5.x) audio encoding from PCM (pulse-code modulation) or pre-encoded audio sources.

• Pre-compressed audio pass-through.

• Audio leveling of encoded audio components.

• Audio meta data pass through.

• Logo Insertion. See Logo Insertion and Subtitle Burn-in.

• Creating multires profiles from incoming baseband video streams for adaptive bit rate (ABR) applications. See Adaptive Bit Rate.

When the Media Interface Card receives an SDI stream, it de-embeds the audio from the video stream and encapsulates the video as a component in a service. Before this service can be routed to a Premium PQ Encode engine of an MFP MK2, the appropriate de-embedded audio must be added to this service. The following illustration shows an incoming SDI stream on port 1 of a Media Interface Card (bottom virtual slot of I/O 1) with two audio components added to the service with the video stream.

URC Statistical Remultiplexing

Services encoded by an MFP card can also participate into a URC Statmux application. See URC Statmux Controller.

PCR Synchronization

For ABR or backup applications, the common PCR sync feature can be used for frequency synchronization between several D9902 housings. Therefore, a valid BlackBurst SDI video signal must be connected to the housing and the Synchronization mode must be set to Synchronize with BlackBurst Reference. See To Configure the Reference Clock Settings of a D9902 Housing.

Licensing

Encoding of incoming baseband streams is licensed. For more information about the required license keys, see Licensing.

Processing Possibilities

The bandwidth of the highway between a Media Interface Card through the main card to the MFP MK2 is limited. The bandwidth necessary to route an SDI service depends on the SDI standard (SD-SDI or HD-SDI).
A layer of an MFP MK2 is provided with two video engines and one audio engine. In SD mode, two slots per engine are present while only one slot per engine is present in HD mode. For multires profile creation, each video engine provides two slots.

The number of audio streams that the audio engine can handle depends on the audio conversion. The resource usage of an audio engine is shown during the configuration process of the audio streams. See Checking the Resource Usage, on page 60.

**Steps to Take**

The following list describes the steps to encode incoming baseband video. The steps to create multires profiles from incoming baseband video are described in Adaptive Bit Rate.

1. Install appropriate SDI SFPs in the SFP cages of the Media Interface Card. See the Cisco DCM Series D9902 Digital Content Manager - System Guide.

2. Connect the baseband SDI streams to the SDI SFPs.

3. Change the card Type of the Media Interface Card to SDI Input - SDI Input. See Configuring the Media Interface Card or 10GE Interface Card.

4. Enable the SDI ports and label these ports with a name. See Configuring an SDI Port of a Media Interface Card.

5. Change the MFP Mode of the MFP MK2 to Premium Picture Quality Encode. See Changing the Card Settings of an MFP Card.


7. Route the service from the input through an MFP MK2 engine to the output. See Routing a Service to the Output Through a Processing Card, on page 14.

8. Configure the settings of the video stream as described in Configuring the Video Components, on page 18.

9. Configure the audio streams as described in Configuring the Encoding Settings for Audio Components, on page 40.

10. If a PiP stream must be created from the encoded video stream, create the PiP stream as described in Configuring PiP Streams, on page 38.

11. Configure the service-related settings as described in Configuring the Service-Related Encode Settings of a Service, on page 67.

**Using the Service Overview Page for Services Encoded by an MFP MK2 Card**

The Service Overview table in the MFP Overview page provides an overview of all SDI services that are routed to a particular MFP MK2 layer and the multires profiles processed by the card (indicated by MR in the Slot column). The following illustration shows a Service Overview table with services and multires profiles.
In this table, the SDI services and the multires profiles are identified by the service ID, the service name, and the engine and the slot position of the card that processes the service or multires profile. The video, PiP stream, and audio processing states of each service are indicated by icons. The following table describes the icons in the Service Overview table.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td>The video or the audio component is processed. A PiP stream is generated.</td>
</tr>
<tr>
<td>✗</td>
<td>The video or the audio component is not processed. No PiP stream is generated.</td>
</tr>
<tr>
<td>🔴</td>
<td>A particular process is not allowed. Hover your mouse cursor on the icon to display a tooltip with additional information.</td>
</tr>
<tr>
<td>(no icon)</td>
<td>Component is not present. No video component present to generate the PiP stream.</td>
</tr>
</tbody>
</table>

The Service Overview table is provided with the links to display detailed information.

- Clicking the icon in a Video field of an SDI service or multires profile opens the MFP Video tab with the Video Settings table. The corresponding video component is highlighted. For more information about this table, see Configuring the Video Components, on page 18.

- Clicking the icon of a PiP field displays the MFP PiP tab with the PiP Video Settings table. The corresponding stream is highlighted. For more information about this table, see Configuring PiP Streams, on page 38.

- Clicking the icon in an Audio field of an SDI service opens the MFP Audio page with the Basic Audio Settings table. The corresponding audio component is highlighted. For more information about this table, see Configuring the Encoding Settings for Audio Components.

- Clicking VBI opens the MFP VBI page with VBI Settings table, see Handling VBI, on page 61.
Opening the Service Overview Page

**Procedure**

**Step 1**
In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2**
In the Processing tree, double-click the MFP MK2 for which the service overview page must be displayed. The MFP Overview page appears.

Checking the Processing Details of an Encoded Service or Multires Profile

**Procedure**

**Step 1**
In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2**
In the Processing tree, double-click the MFP MK2 engine with the service or multires profile for which the overview details must be checked. The MFP Overview page appears.

**Step 3**
In the Service Overview table, click the row of the corresponding service or multires profile. A dialog box with the processing details appears.

Hints:

- The dialog box with the processing details of a service can also be opened by right-clicking the service in the Processing tree and choosing Details.
• Clicking the arrow on the page identification string or the left or right arrows allows you to navigate to the details of the other services or multires profiles that are processed by the same MFP. You can also navigate using the Left and Right key.

The processing details dialog box has the following links:

• Clicking the Video column opens the MFP Video tab with the Basic Video Settings table. The corresponding video component is highlighted. For more information about this table, see Configuring the Video Components, on page 18.

• Clicking the PIP column displays the MFP PIP page with the PIP Video Settings table. The corresponding component is highlighted. For more information about this table, see Configuring PiP Streams, on page 38.

• Clicking an Audio column opens the MFP Audio page with the Basic Audio Settings table. The corresponding audio component is highlighted. For more information about this table, see Configuring the Encoding Settings for Audio Components, on page 40.

• Clicking beside View Bit Rate opens the Bit Rates Detail dialog box with the detailed processing service bit rates.

• Clicking VBI opens the MFP VBI page with VBI Settings table, see Handling VBI, on page 61.

Note
A multires profile does not have a processing overview table. Information about the profile can be found in the processing overview table of the service from which the profile is created.

Configuring the Incoming SDI Streams

To protect the baseband encoding application from bandwidth overshoots, the bandwidth of each SDI input port must be limited by determining the allowed video signal. The sum of the allocated input bandwidth for all SDI ports of a Media Interface Card cannot exceed the maximum bandwidth of the highway between the different boards. During configuring the allowed video signal for the SDI input ports, the used and remaining bandwidth is shown in the Allocated Input Bandwidth graph. This graph shows the bandwidth for both virtual layers of the card.

Allocated Input Bandwidth for I/O 2 and I/O 6

| HD | HD | HD | HD |

The bandwidth allocation at the left side shows the SDI input ports of the bottom virtual layer of the card and the allocations at the right side show the ports of the top virtual layer.

If more bandwidth is allocated than the maximum bandwidth of the highway, the bandwidth allocations of the corresponding virtual layer are red and a warning will be displayed after applying the settings.

Tip
The green/red colored blocks are the allocations of the virtual layer for which the settings are displayed.
Changing of Incoming SDI Stream Settings

**Procedure**

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2** In the **Inputs** tree, double-click the SDI port with the incoming SDI stream. The **Input SDI Streams** page appears.

**Step 3** In the **Input SDI Stream Settings** table, double-click the row of the port for which setting must be changed. The row becomes editable.

**Step 4** For a stream connected to a dual SDI SFP receiver, choose the connector that receives the stream from the **Connector** drop-down list: **Left** or **Right**.

**Step 5** In the **User Name** field, modify the name of the stream.

**Step 6** From the **Allowed Video Signal** drop-down list, choose the video signal formats allowed to be received by the port:

- **Up to SD SDI**—An SD SDI stream
- **Up to HD SDI**—An SD or HD SDI stream
- **Blocked**—No streams can be received

**Note:** For a port equipped with an SDI SFP receiver, **Up to HD SDI** cannot be chosen.

**Step 7** From the **Clock Mode** drop-down list, choose one of the following values:

- **SDI Signal**—The frame synchronizer of the DCM uses the SDI signal clock for signal locking. This setting can be used to avoid frame repeat or frame drop.
- **Chassis**—The frame synchronizer uses the internal clock of the device for signal locking.

**Important:** In **Chassis** clock mode, the end-to-end delay is one video frame longer than the configured value.

**Step 8** From the **Input Loss Mode** drop-down list, choose one of the following values:

- **Last Frame**—The last received frame is repeated in the video in case of SDI input loss.
- **Color Bars**—A static color bar pattern replaces the video in case of SDI input loss.

**Step 9** Click **Apply**.
Configuring the SightPlus Filter Settings

SightPlus filtering allows you to reduce Gaussian noise in the source video and precompressed artifacts such as blocking and mosquito noise. The SightPlus filter can be configured for each individual incoming SDI stream.

SightPlus filtering needs an ADVANCED_VIDEO_PRE_FILTERING license key for each individual SDI stream. For more information about licenses, see Licensing.

Procedure

Step 1  In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2  In the Inputs tree, double-click the SDI port with the incoming SDI stream. The Input SDI Streams page appears.

Step 3  Click the SightPlus Filter tab.  
Note: The SightPlus Filter tab is only available if the DCM is provided with ADVANCED_VIDEO_PRE_FILTERING license keys.

Step 4  In the Input SDI SightPlus Settings table, double-click the row of the ports for which SightPlus filter setting must be configured. The row becomes editable.

Step 5  Check the SightPlus - Enable check box to enable the filter and enter the filtering level in the SightPlus - Level field. The SightPlus - Level parameter can be set between 0 (no filtering) and 16 (full filter strength). The recommended value is 8.

Step 6  Check the Sharpening - Enable check box to apply sharpening to the video and configure the following parameters:

• Sharpening - Strength—The sharpness level: Low, Medium, High, or Aggressive. The recommended setting is Medium.
• Sharpening - Threshold—The threshold that controls the amount of edges on which sharpening is applied to: High, Medium, or Low. A Low threshold means that fewer edges will be identified for sharpening. A High threshold means that more edges will be identified for sharpening. The recommended setting is Medium.

Note: The Sharpening - Enable check box is dimmed if the SightPlus - Enable check box is unchecked.

Step 7  Click Apply.
Adding Preconfigured Streams

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2 In the Inputs tree, double-click the SDI port for which a preconfigured SDI stream must be created. The Input SDI Streams page appears.

Step 3 Refer to the Add Preconfigured Stream area.

Step 4 From the Port drop-down list, choose the port for which the preconfigured stream must be created.

Step 5 For a stream connected to a dual SDI SFP receiver, choose the connector that receives the stream from the Connector drop-down list: Left or Right.

Step 6 In the User Name field, enter a name for the stream.

Step 7 From the Allowed Video Signal drop-down list, choose the video signal formats allowed to be received by the port:

* Up to SD SDI—An SD SDI stream
* Up to HD SDI—An SD or HD SDI stream
* Blocked—No streams can be received

Note: For a port equipped with an SDI SFP receiver (dual SD SDI type), Up to HD SDI cannot be chosen.

Step 8 From the Clock Mode drop-down list, choose one of the following values:

* SDI Signal—The frame synchronizer of the DCM uses the SDI signal clock for signal locking. This setting can be used to avoid frame repeat or frame drop.
* Chassis—The frame synchronizer uses the internal clock of the device for signal locking.

Important: In Chassis clock mode, the end-to-end delay is one video frame longer than the configured value.

Step 9 From the Input Loss Mode drop-down list, choose one of the following values:

* Last Frame—The last received frame is repeated in the video in case of SDI input loss.
* Color Bars—A static color bar pattern replaces the video in case of SDI input loss.

Step 10 Click Add. The stream is added to the Input SDI Stream Settings table.

Handling Audio Source Components

Before an SDI service can be routed to a Premium PQ Encode engine of the MFP MK2, the required audio must be added to the SDI service.
Adding Audio Source Components

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2 In the Inputs tree, right-click the service of the SDI stream and choose Add Audio Component. The Add Audio Source Components dialog box appears.

Step 3 Refer to the Add Audio Source Components area.

Step 4 Next to Mode, click the Stereo or Multi Channel 5.1 radio button. For stereo audio:

- From the Source drop-down list, choose the audio input (packet 1 to 4; pair 1 or 2). The audio type is indicated between brackets.
- From the Allowed drop-down list, choose the audio source signal that is allowed to be received:
  - Any—PCM and non-PCM audio is accepted.
  - PCM—Only PCM audio is accepted.
  - Non-PCM—Only non-PCM audio is accepted.

For multichannel 5.1 audio:
For L/R, C/LFE, and Ls/Rs, choose the audio inputs (Packet 1 to 4, Pair 1 or 2) from the corresponding Source drop-down list.

**Step 5** To define the audio language and type:

a) Check the Define Audio check box.
b) In the Audio Language field, enter the 3-character language code (as specified by ISO639-2 [15]).
c) From the Audio Type drop-down list, choose the audio service type: Undefined, Clean effects, Hearing impaired, or Visual impaired commentary.

**Step 6** Click Apply.

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Tip

To generate stereo audio source components for all available embedded audio pairs in a single action, click Generate. A warning is displayed to inform you that all existing audio components are removed. Click OK to confirm.

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**Modifying Audio Source Components**

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Inputs tree, right-click the audio source in the service of the SDI stream for which settings must be changed and choose Edit Audio Component. The Edit Audio Source Components dialog box appears.

**Step 3** Next to Mode, click the Stereo or Multi Channel 5.1 radio button. For stereo audio:

- From the Source drop-down list, choose the audio input (packet 1 to 4; pair 1 or 2). The audio type is indicated between brackets.
- From the Allowed drop-down list, choose the audio source signal that is allowed to be received:
  - Any—PCM and non-PCM audio is accepted.
PCM—Only PCM audio is accepted.
Non-PCM—Only non-PCM audio is accepted.

For multichannel 5.1 audio:

- For L/R, C/LFE, and Ls/Rs, choose the audio inputs (Packet 1 to 4, Pair 1 or 2) from the corresponding Source drop-down list.

**Step 4** To define the audio language and type:

a) Check the Define Audio check box.
b) In the Audio Language field, enter the 3-character language code (as specified by ISO 639-2 [15]).
c) From the Audio Type drop-down list, choose the audio service type: Undefined, Clean effects, Hearing impaired, or Visual impaired commentary.

**Step 5** Click Apply.

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**Removing Audio Source Components**

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu.
The Tree View page appears.

**Step 2** In the Inputs tree, right-click the audio source that must be removed from the SDI service and choose Delete.
A confirmation box may appear.

**Step 3** Click Yes.

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**Changing the Service Name**

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu.
The Tree View page appears.

**Step 2** In the Inputs tree, double-click the SDI port with the incoming SDI stream. The Input SDI Streams page appears.

**Step 3** Click Service. The Service page appears.

**Step 4** In the Input SDI Stream Settings table, double-click the row of the SDI stream for which the service name must be changed. The row becomes editable.

![Input SDI Service Settings](image)

**Step 5** In the User Name field, enter a name for the service. A name with maximum 99 characters can be entered, double-quotes in the name are not allowed.

**Step 6** Click Apply.

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**Checking the Stream Information**

Information about the incoming SDI streams can be found on the SDI In Video Signals page. The Video Signal Info table shows the frame rate, signal rate, video format, pixels per line, lines per frame, and the frame build-up (interlaced or progressive). The Audio Signal Info table shows the presence of audio signals.

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Inputs tree, double-click the SDI port with the incoming SDI stream. The Input SDI Streams page appears.

**Step 3** Click Signal Info. The SDI In Video Signals page appears with the Video Signal Info and Audio Signal Info tables.
Routing a Service to the Output Through a Processing Card

Once the incoming streams are properly configured, the corresponding services must be routed to the output through a free premium PQ encode engine slot of an MFP MK2.

Routing the Service from the SDI Port to the MFP Engine

Procedure

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Inputs tree, browse to the SDI service that must be passed.

**Step 3** Drag and drop the branch of this service to the branch of the MFP MK2 in the Processing tree.
Routing the Service from the MFP Engine to the Output

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2 In the Outputs tree, browse to the outgoing TS in which the service must be passed.

Step 3 In the Processing tree, browse to the service that must be passed to the output.

Step 4 Drag and drop the branch of this service to the branch of this outgoing TS (transport stream).

If the encoded service must participate in an MFP rate control group for rate shaping for bandwidth capacity optimization purposes, drag and drop the encoded service into the MFP rate control group. For more information, see Rate Control.

Passing or Blocking Components of Encoded Services

Component tracking rules allows you to block particular service components routed to an MFP card or to route service components automatically to the card. Tracking rules to block service components can be created by using the shortcut menu in the Processing tree or by using the MFP Service Components page. Tracking rules to pass service components can be created by using the MFP Service Components page.

Detailed information about component tracking rules can be found in Passing, Blocking, and Remapping Service Components.
Creating Component Tracking Rules Using the Shortcut Menu

Procedure

Step 1  In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2  In the Processing tree, expand the service with the component that must be blocked.

Step 3  Right-click this component and choose Block PID from the shortcut menu. A PID (packet identifier) level component tracking rule is created to block the component.

Creating Component Tracking Rules Using the MFP Service Components Page

Procedure

Step 1  In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2  In the Processing tree, right-click the MFP to which the service is routed and choose Settings. The MFP Overview page appears.

Step 3  In the main menu, click Component. The MFP Service Components page appears.

Step 4  In the Service Component Settings table, click Create Rule in the row of the service component for which a tracking rule must be created. A component tracking rule is added to the Component Tracking Rules table.

Step 5  From the Tracking - Type drop-down list, choose the component type that must be used to define the tracking rule: ES PID, Stream Type, or PCR.

- For stream type, enter the stream type value in the Tracking - Stream Type value field. For an audio stream type and if necessary, enter a language in the Tracking - Language field.
  - Check the Stream Type - Strict check box if the stream type must match exactly.
  - Check the Language - Strict check box if the language must match exactly.

- For ES (elementary stream) PID, enter the PID of the incoming component in the Input PID field.

Step 6  In the Output - SID field, enter the service identifier of the service to which the service component must be passed or enter the service identifier of the service for which the service component must be blocked.

Step 7  In the Output - PID field, enter a PID value for the outgoing service component if necessary. Note: The PID values, which belong to forbidden PID ranges of the outgoing TS, cannot be used.
Step 8: From the Status - New drop-down list, choose Pass or Block.

Step 9: Click Apply.

Note: A component tracking rule adaptation mostly results in a PMT adaptation. Meaning, each time a component tracking rule is added, changed, or deleted and applied, the PMT is updated. Therefore, we advise that you modify (adding, creating, and deleting) the complete set of component tracking rules before clicking Apply.

Changing the Tracking Rules

Procedure

Step 1: In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2: In the Processing tree, right-click the MFP to which the service is routed and choose Settings. The MFP Overview page appears.

Step 3: In the main menu, click Component. The MFP Service Components page appears.

Step 4: In the Components Tracking Rules table, double-click the row of the tracking rule that must be changed. The corresponding row is editable.

Step 5: Modify the parameters as described in Creating Component Tracking Rules Using the MFP Service Components Page, on page 16.

Step 6: Click Apply.

Deleting Tracking Rules

Procedure

Step 1: In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2: In the Processing tree, right-click the MFP to which the service is routed and choose Settings. The MFP Overview page appears.

Step 3: In the main menu, click Component. The MFP Service Components page appears.

Step 4: In the Components Tracking Rules table, check the check box of each tracking rule that must be removed and click Remove Checked Items.

Step 5: Click Apply.
Naming the Service in Processing Tree

To identify a service in the Processing tree, you can add a username to the service. For services processed by an MFP, this name can be used in the SDTa (service description table actual) of the outgoing service if the Used In SDTa parameter is enabled. Remark that this username is not displayed in the Outputs tree if the Used In SDTa parameter is disabled.

**Note**

This username does not replace the name of the service in the VCT (virtual channel table).

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Processing tree, double-click the MFP for which the service overview page must be displayed. The Service Overview table appears.

**Step 3** Double-click the row of the service in the Service Overview table to make the row editable.

**Step 4** In the User Name field, enter a name for the service.

**Step 5** Check the Use in SDTa check box if the username must be used in the SDTa of the outgoing service. Otherwise, uncheck this check box. This check box is dimmed for a multires main service (a service used to create a multires profile set).

**Step 6** Click Apply.

Configuring the Video Components

Configuring the Basic Video Settings

The following list describes the basic video settings for the encoded video streams or multires profiles.

- **Identification**—Identifies the services or multires profiles in the Basic Video Settings table. Multires (MR) profiles are also labeled with resolution, frame rate, and elementary stream bit rate.

- **Enable**—Enables or disables the encoding process.

- **Output - Video**—Determines the compression for the processed video component, H.264 or MPEG-2. For multires profiles, which are H.264 streams, this parameter is dimmed and indicates H.264.

- **Output - Rate Mode**—Determines the bit rate profile: CBR (constant bit rate), Capped VBR (variable bit rate), or Statmux. Statmux cannot be chosen for multires profiles.
• **Output - Format**—Determines the resolution of the outgoing video: **SD**, **HD**, or **HD to SD** (for HD to SD downscaling or down conversion). This parameter is dimmed for multires profiles.

• **Output - ES Rate (Mbps)**—Determines the maximum bit rate for the encoded video component. The following table provides the minimum and maximum configurable output bit rates for MPEG-2/ H.264 and SD/HD video streams.

<table>
<thead>
<tr>
<th>Audio stream</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPEG-2 SD</td>
<td>0.8</td>
<td>15</td>
</tr>
<tr>
<td>MPEG-2 HD</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td>H.264 SD</td>
<td>0.3</td>
<td>16</td>
</tr>
<tr>
<td>H.264 HD</td>
<td>0.5</td>
<td>55</td>
</tr>
</tbody>
</table>

### To Configure the Basic Video Settings

**Procedure**

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2** In the **Processing** tree, right-click the MFP MK2 branch with the service or multires profile for which the basic settings of the video component must be configured and choose **Video Settings**. The **MFP Video** page appears.

**Step 3** Click the **Basic** tab.

**Step 4** In the **Basic Video Settings** table, double-click the row of the service or multires profile for which the basic video settings must be configured. The row is editable.
For a multires profile, the Enabled, Output - Video, and Output - Format parameters are not applicable.

**Step 5** From the Enable drop-down list, choose Disabled or Encode.

**Step 6** From the Output - Video drop-down list, choose the video compression for the outgoing video stream: H.264 or MPEG-2.

**Step 7** From the Output - Rate Mode drop-down list, choose the bit rate profile: CBR, Capped VBR, or Statmux.

**Step 8** From the Output - Format drop-down list, choose the resolution for the outgoing video stream: SD, HD, or HD to SD.

**Step 9** In the Output - ES Rate (Mbps) field, enter the maximum bit rate for the outgoing video stream.

**Step 10** Click Apply All.
After changing video settings, the TS rate (TS Rate (kbps) column) will be changed accordingly.

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**Changing the Basic Video Settings Using the Update Basic Video Settings Function**

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Processing tree, right-click the MFP MK2 branch with the streams or multires profiles for which the basic video settings must be changed and choose Video Settings. The MFP Video page appears.

**Step 3** Click the Basic tab.

**Step 4** In the Basic Video Settings table, select the rows of the streams or multires profiles for which settings must be changed.

**Step 5** Refer to the Update Basic Video Settings area.

**Step 6** From the Enabled drop-down list, choose Disabled, Transcode, or Ignore.

**Step 7** From the Video drop-down list, choose MPEG-2, H.264, or Ignore.

**Step 8** From the Output - Rate Mode drop-down list, choose: CBR, Capped VBR, or Ignore.

**Step 9** From the Output - Format drop-down list, choose: SD, HD, HD to SD, or Ignore.

**Step 10** Check the ES Rate (Mbps) check box and enter the new value in the corresponding field.

**Step 11** Click Update All Selected.
The modified settings are applied to the selected services or multires profiles. A modified setting, which is not valid for a selected service or multires profile, is not adapted.

**Step 12** Click Apply All.

---

**Configuring the Video Preprocessing Settings**

The following list describes the video preprocessing settings of the video components.
- **Identification**—Identifies the video streams in the Video Pre-Processing Settings table.
- **Decode - MCTF Mode** (not for multires main services)—Enables or disables 3D motion-compensated temporal filtering (3D-MCTF) that is used to reduce the noise in the video picture sequences during encoding.
- **Decode - MCTF Strength** (not for multires main services)—Determines the filter strength. A value can be chosen between 0 (weakest filter strength) and 7 (strongest filter strength); the default value is 2.
- **Decode - Pre-Deblocking Filter** (not for multires main services)—Determines if deblocking filtering is applied to the video to improve the quality during video encoding by smoothing out the blocking artifacts. Three filter strengths can be applied: **Low**, **Medium**, or **High**.
- **Decode - Top Line Blanking**—Determines the number of blanked top lines of the video picture. A value can be chosen between 0 and 4 lines; the default value is 0.
- **Decode - Hor. Sharpness - Vert. Sharpness**—These filters determine the sharpness of the output video. The higher the filter values, the more the sharpness of the outgoing video approaches the sharpness of the incoming video. These parameters can be set between 1 and 14; the default values are 10.

  For a video for which the resolution follows the incoming video, 10 means that the sharpness of the outgoing video matches as much as possible the incoming video. Changing these values higher than 10 do no longer increase the sharpness.

  For a downscaled video, higher values preserve the sharpness but increase the downsampling artifacts. To smooth the downsampling artifacts, reducing the sharpness might be necessary.

- **Decode - Track Type** (not for multires main services)—Determines the video component that is processed. If, in service backup, the PID of the video component of the main and backup service does not match, then **Stream Type** track type can be used (default value).

**Note**

- Changing the **Decode - Top Line Blanking**, **Decode - Hor. Filter Strength**, or **Decode - Vert. Filter Strength** parameter interrupts the corresponding service.

- Changing the preprocessing settings apply to all encodes of these video components, such as PiP stream, multires profiles, and so on.

---

### To Configure Video Preprocessing Settings

**Procedure**

1. **Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.
2. **Step 2** In the **Processing** tree, right-click the MFP MK2 branch with the service for which the preprocessing settings of the video component must be configured and choose **Video Settings**. The **MFP Video** page appears.
3. **Step 3** Click the **Pre-Processing** tab.
The **Video Pre-Processing Settings** table appears.

**Step 4** In the **Video Pre-Processing Settings** table, double-click the row of each service for which video decode settings must be changed.

The rows are editable.

<table>
<thead>
<tr>
<th>Identification</th>
<th>SID</th>
<th>User Name</th>
<th>PID</th>
<th>MCTF Mode</th>
<th>MCTF Strength</th>
<th>Pre-Deblocking Filter</th>
<th>Top Line Blanking</th>
<th>Hor. Sharpness</th>
<th>Vert. Sharpness</th>
<th>IF Detection</th>
<th>Track Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPSE - SD 1</td>
<td>NEO3</td>
<td>250</td>
<td>MCTF</td>
<td>2</td>
<td>Disabled</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Disabled</td>
<td>Stream Type</td>
</tr>
<tr>
<td>PPSE - HD 1</td>
<td>NEO3</td>
<td>250</td>
<td>MCTF</td>
<td>2</td>
<td>Disabled</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Disabled</td>
<td>Stream Type</td>
</tr>
<tr>
<td>PPSE - HD 1</td>
<td>NEO3</td>
<td>250</td>
<td>MCTF</td>
<td>2</td>
<td>Disabled</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Disabled</td>
<td>Stream Type</td>
</tr>
</tbody>
</table>

**Step 5** From the **Decode - MCTF Mode** drop-down list, choose **MCTF** to enable 3D motion-compensated temporal filtering or choose **Disabled** otherwise.

**Step 6** From the **Decode - MCTF Strength** drop-down list, choose the desired 3D motion-compensated temporal filtering strength.

This parameter is dimmed if the MCTF mode is disabled.

**Step 7** From the **Decode - Pre-Deblocking Filter** drop-down list, choose the desired predeblocking filter strength.

This parameter is dimmed if the MCTF mode is disabled.

**Step 8** From the **Decode - Top Line Blanking** drop-down list, choose the number of top lines that must be blanked.

**Step 9** From the **Decode - Hor. Sharpness** drop-down list, choose the desired horizontal sharpness value.

**Step 10** From the **Decode - Ver. Sharpness** drop-down list, choose the desired vertical sharpness value.

**Step 11** From the **Decode - Track Type** drop-down list, choose **Stream Type** or **PID**.

**Step 12** Click **Apply All**.

If the **Decode - Top Line Blanking**, **Decode - Hor. Filter Strength**, or **Decode - Ver. Filter Strength** parameter of a video component is modified, a warning is displayed to inform you that the corresponding services are interrupted. Click **Yes**.

---

### Changing Video Preprocessing Settings Using the Update Video Preprocessing Settings Function

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu.

The Tree View page appears.

**Step 2** In the Processing tree, right-click the MFP MK2 branch with the services for which the preprocessing settings of the video component must be configured and choose Video Settings.

The MFP Video page appears.

**Step 3** Click the Pre-Processing tab.
The **Video Pre-Processing Settings** table appears.

**Step 4** In the **Video Pre-Processing Settings** table, select the rows of the services for which settings must be changed.

**Step 5** In the **Update Video Pre-Processing Settings** area, choose the desired value from the drop-down list of the parameter that must be modified in the selected rows.

**Step 6** Click **Update All Selected**.
The modified settings are applied to the selected services.

**Step 7** Click **Apply All**.
If the **Decode - Top Line Blanking**, **Decode - Hor. Sharpness**, or **Decode - Vert. Sharpness** parameter of a video component is modified, a warning is displayed to inform you that the corresponding service is interrupted. Click **Yes**.

---

## Configuring the Video Encoding Settings

The following list describes the encoding settings for the video streams or multires profiles.

- **Identification**—Identifies the video stream or multires profile in the **Video Processing Settings** table.

- **Encode - Profile**—This parameter can be set to **Main**, **High**, or **Baseline** (for multires profiles only).

- **Encode - Resolution**—Determines the resolution of the encoded video component.

  For regular services

  - **Follow Input**—The resolution is the same of the incoming video component.

  - **Hor. Scaling** (horizontal video transsizing)

    The following rescaling combinations are supported:

    | Input Width | Video Definition | Horizontal Scaling Modes               |
    |-------------|------------------|----------------------------------------|
    | 1920        | HD               | 3:4, 2:3, 1:2 (all HD scaling modes)   |
    | 1280        | HD               | 3:4, 1:2                               |
    | 720         | SD               | 704, 640, 544, 528, 480, 368, 352, 320 (all SD scaling modes) |
    | 704         | SD               | 528, 352                               |

  - **Manual**—The resolution and frame rate (see next setting) must be defined.
    
    - For an SD video component:
      
      Horizontal resolution: 352, 480, 528, 544, 640, 704, or 720
      
      Vertical resolution: 480 or 576
    
    - For an HD video component:
Configuring the Video Encoding Settings

Horizontal resolution: 640, 960, 1280, 1440, or 1920
Vertical resolution: 720 (for horizontal resolution: 640, 960, and 1280) or 1080 (for horizontal resolution: 960, 1280, 1440, and 1920)

° If the Output - Format parameter is set to HD to SD (for HD to SD downscaling or down conversion) the Encode - Resolution drop-down list is dimmed (fixed to Manual) and the resolution and frame rate must be chosen from the corresponding drop-down lists.

° Horizontal resolution: 352, 480, 528, 544, 640, 704, or 720
° Vertical resolution: 480 or 576

For multires profiles: The horizontal resolution can be set between 96 and 1920 and the vertical resolution between 96 and 1080. The horizontal and vertical resolution must be a multiple of two and the value that can be entered, depends on the remaining resource usage and the available ABR license keys.

• Encode - Frame Rate
The following table shows the frame rate values that can be chosen for services for which the Resolution is set to manual.

<table>
<thead>
<tr>
<th>Vertical Resolution</th>
<th>Frame rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>480</td>
<td>29.97, 30 fps</td>
</tr>
<tr>
<td>576</td>
<td>25 fps</td>
</tr>
<tr>
<td>720</td>
<td>50, 59.94, 60 fps</td>
</tr>
<tr>
<td>108</td>
<td>25, 29.97, 30 fps</td>
</tr>
</tbody>
</table>

For multires profiles: The frame rate can be set to 60, 59.94, 50, 30, 29.97, 25, 23.98, 24, 15, 14.99, 12.5, 12, 11.99, 10, and 9.99 fps. 60, 59.94, and 50 fps are only applicable for profiles with a vertical resolution of 720. For the frame rate conversions supported by a DCM, see Adding Multires Profiles.

• Encode - Level (multires profiles only)—Determines the H.264 levels as specified by in Annex A of ISO/IEC 14496-10:2012. The values that can be chosen are: 1, 1b, 1.1, 1.2, 1.3, 2, 2.1, 2.2, 3, 3.1, 3.2, 4, 4.1, 4.2, and Auto. Auto means that the lowest level is used that covers the configured resolution, frame rate, and bit rate.

• Encode - Entropy (multires profiles only)—Determines the entropy encoding form that is used in the H.264 video encoding of a multires profile, CABAC (context-adaptive binary arithmetic coding), CAVLC (context-adaptive variable-length coding), or Auto. Auto means that the encoder determines which form is used depending on the chosen profile.

• Encode - Frame Field Encoding (not for multires profiles)—This parameter can be set to MBAFF or PAFF.
Both macroblock adaptive frame field (MBAFF) coding and picture adaptive frame field (PAFF) coding are encoding modes that have a positive impact on the picture quality when encoding interlaced content. Of the two modes, PAFF results in the overall best picture quality, especially for content that includes fast motion (for instance, sport content, some movie content). For H.264, we advise you to use PAFF and only switch to MBAFF when client interoperability problems are seen.
PAFF cannot be used for MPEG2 encoding.

Configuring the Video Encoding Settings

Procedure

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2** In the **Processing** tree, right-click the MFP MK2 branch with the video stream or multires profile for which the encoding settings must be configured and choose **Video Settings**. The **MFP Video** page appears.

**Step 3** Click the **Encode** tab. The **Video Processing Settings** table appears.

**Step 4** In the **Video Processing Settings** table, double-click the row of the stream or profile for which the video encoding settings must be changed. The row is editable.

**Step 5** From the **Encode - Profile** drop-down list, choose **Main**, or **High**.

**Step 6** From the **Encode - Resolution** drop-down list of a regular service, choose **Follow Input**, Hor. Scaling, or **Manual**. Remark that this parameter is automatically set to **Manual** if the Format parameter is set to **HD to SD** (for HD to SD downscaling).

- If **Hor. Scaling** is chosen for horizontal video transsizing, enter:
  - For an SD service, the desired frame width in the box next to the **Encode - Resolution** drop-down box: 320, 352, 368, 480, 528, 544, 640, or 704 pixels.
  - For an HD service, the aspect ratio with respect to the original frame width next to the **Encode - Resolution** drop-down box: 1:2, 2:3, or 3:4.

  **Important**: No rescaling is applied if a rescaling mode for a video stream is configured that is not supported. In this case, no warning is shown.

- If **Manual** is chosen:
  - For an SD video component:
    Horizontal resolution: 352, 480, 528, 544, 640, 704, or 720.
    Vertical resolution: 480 or 576.
  - For an HD video component:
Horizontal resolution: 640, 960, 1280, 1440, or 1920.
Vertical resolution: 720 (for width: 640, 960, and 1280) or 1080 (not for width: 640).

- For HD to SD downscaling, select the horizontal and vertical resolution in the corresponding **Encode - Resolution** fields.
  - Horizontal resolution: 640, 704, or 720.
  - Vertical resolution: 480 or 576.
- For a multires profile, enter the horizontal resolution (between 96 and 1920) and the vertical resolution (between 96 and 1080). The horizontal and vertical resolution must be a multiple of two.

**Step 7** From the **Encode - Frame Rate** drop-down list (only for multires profiles or services with **Encode - Resolution** = **Manual**), choose the desired frame rate.

**Step 8** From the **Encode - Level** drop-down list (multires profiles only), choose 1, 1b, 1.1, 1.2, 1.3, 2, 2.1, 2.2, 3, 3.1, 3.2, 4, 4.1, 4.2, or **Auto**.

**Step 9** From the **Encode - Entropy** drop-down list (multires profiles only), choose **CABAC**, **CAVLC**, or **Auto**.

**Step 10** From the **Encode - Frame Field Encoding** drop-down list (not for multires profiles), choose **MBAFF** or **PAFF**. **PAFF** cannot be used for MPEG2 encoding.

**Step 11** Click **Apply All**.

### Changing Video Encoding Settings Using the Update Video Encoding Settings Function

**Procedure**

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2** In the **Processing** tree, right-click the MFP MK2 branch with the video streams or multires profiles for which the encoding settings must be changed and choose **Video Settings**. The **MFP Video** page appears.

**Step 3** Click the **Processing** tab. The **Video Processing Settings** table appears.

**Step 4** In the **Video Processing Settings** table, select the rows of the streams or profiles for which settings must be changed.

**Step 5** Refer to the **Update Processing Video Settings** area.

**Step 6** In the **Update Processing Video Settings** area, choose the desired value from the drop-down list of the parameter that must be modified in the selected rows.

**Step 7** Click **Update All Selected**. The modified settings are applied to the selected streams. A modified setting, which is not valid for a selected stream or profile, is adapted.

**Step 8** Click **Apply All**.
Configuring the GOP Settings of the Video Components

The following list describes the GOP (group of pictures) settings for the video streams or multires profiles.

- **Identification**—Identifies the video stream and multires profile in the GOP Settings table.

- **GOP - Mode**—Determines the structure of the GOPs in the outgoing video:
  - **Custom**—The GOP structure of the outgoing video depends on the configured GOP Size, B-Pictures, and Hierarchical setting. The GOP length can be increased or decreased for video quality purposes, for instance, during a scene change. Remark the GOP size is a target value, the actual size may vary.
  - **Dynamic**—The encoding algorithm selects between different GOP structures (including hierarchical structures for H.264 video) based on video content (scene’s spatio-temporal complexity). Remark: the GOP size is a target value, the actual size may vary.
  - **Fixed**—The GOP structure of the outgoing video is fixed depends on the configured GOP Size, B-Pictures, and Hierarchical settings. Scene change detection and fade detection are disabled and the GOP length follows the GOP size value restrictively.

For multires profiles for which the encoding profile is set to Baseline, the GOP - Mode parameter is dimmed and automatically set to Dynamic. No B-pictures are inserted in the GOPs.

- **GOP - Size**—Determines the number of pictures in the GOPs of the outgoing video. For dynamic GOPs, this parameter determines the average/target size of the GOPs.

- **GOP - Max Size**—Determines the maximum number of pictures in the GOPs of the outgoing video. This parameter can be set between the configured GOP size and two times this GOP size. This parameter is dimmed if the mode is set to Fixed.

- **GOP - B-Pictures**—Determines the number of B pictures in the GOPs of the encoded video. This parameter can be set between 0 and 7; the default value is 3 for MPEG2 encoding and 5 for H.264 encoding. The B-Pictures parameter is only applicable if the Mode parameter is set to Custom.

For multires profiles for which the encoding profile is set to Baseline, no B-frames are inserted and the GOP - B-Pictures parameter is dimmed.

- **GOP - Hierarchical**—Enables or disables hierarchical B coding for outgoing H.264 video streams. This parameter is only applicable for outgoing H.264 video streams.

- **GOP - Closed GOPs** (not for multires profiles)—Determines if all GOPs at the output are closed GOPs or not.

- **IDR Insertion - Interval** (not for multires profiles)—Enables or disables IDR (instantaneous decoder refresh) picture insertion in the GOPs of the encoded video. When enabled, the interval between two consecutive IDR-pictures can be configured.
To Configure the GOP Settings

Procedure

Step 1  In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2  In the Processing tree, right-click the MFP MK2 branch with the video stream or multires profile for which the GOP settings must be configured and choose Video Settings. The MFP Video page appears.

Step 3  Click the GOP tab.

Step 4  In the GOP Settings table, double-click the row of the stream for which the video encoding settings must be changed. The row becomes editable.

The GOP - Closed GOP and IDR Insertion - Interval parameters are dimmed for multires profiles.

Step 5  From the GOP - Mode drop-down list, choose Custom, Dynamic, or Fixed.

Step 6  In the GOP - Size field, enter the number of pictures in the GOPs for the encoded video component.

Step 7  In the GOP - Max Size field and if the GOP - Mode parameter is set to Custom or Dynamic, enter the maximum number of pictures in the GOPs of the encoded video component.

Step 8  In the GOP - B-Pictures field, enter the number of B-pictures in the GOPs of the encoded video component.

Step 9  Check the GOP - Hierarchical check box to enable hierarchical B coding for outgoing H.264 video streams or uncheck this check box otherwise.

Step 10  Check the GOP - Closed GOP check box if all outgoing GOPs must be closed or uncheck this check box otherwise.

Step 11  Check the IDR Insertion - Interval check box to enable IDR-picture insertion in the GOPs of the encoded video and enter the interval between two consecutive IDR-pictures in the field next to this check box. A value can be entered between 1 and 255 frames. Uncheck this check box to disable this feature.

Notes:

- Enabling the GOP - Closed GOP parameter automatically enables IDR-picture insertion with an interval set to 1. Both IDR Insertion - Interval parameters are dimmed.

- If IDR-picture insertion is enabled and the interval parameter is set to 1, the GOP - Closed GOP parameter is automatically enabled and both IDR Insertion - Interval parameters are dimmed.
Changing the GOP Settings Using the Update Settings Function

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.
Step 2 In the Processing tree, right-click the MFP MK2 branch with the video stream or multires profile for which the GOP must be configured and choose Video Settings. The MFP Video page appears.
Step 3 Click the GOP tab.
Step 4 In the GOP Settings table, select the row of each stream for which GOP settings must be changed.
Step 5 Refer to the Update GOP Settings area.
Step 6 From the GOP Mode drop-down list, choose Custom, Dynamic, Fixed, or Ignore.
Step 7 Check the GOP Size check box to change the GOP size and enter the size in the corresponding field.
Step 8 Check the Max GOP Size check box to change the maximum GOP size and enter the maximum number of pictures in the GOPs of the encoded video component.
Step 9 Check the GOP B-Pictures check box if the number of B-pictures in the GOPs of the encoded video streams must be changed and enter the number of GOPs in the corresponding field.
Step 10 From the GOP Hierarchical drop-down list, choose Enable, Disable, or Ignore.
Step 11 From the Closed GOP drop-down field, choose Enable, Disable, or Ignore.
Step 12 From the IDR Insertion Interval drop-down list, choose Enable, Disable, or Ignore. If Enable is chosen, enter the interval between two consecutive IDR-pictures in the corresponding field.
Step 13 Click Update All Selected.
Step 14 Click Apply All.

Configuring the Advanced Settings of Encoded Video Streams

The following list describes the advanced setting of the encoded video components of services:

- **Adaptive Quantization** (not for multires profiles)—The encoding algorithm of the DCM uses adaptive quantization to improve the quality of the encoded video streams. For some reason, for instance, for set-top-boxes that cannot handle such video streams, this adaptive quantization can be disabled.
To Configure the Advanced Settings

Procedure

Step 1  In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2  In the Processing tree, right-click the MFP MK2 branch with the services for which the advanced settings of the video component must be configured and choose Video Settings. The MFP Video page appears.

Step 3  Click the Advanced tab.

Step 4  In the Advanced Settings table, double-click the row of each video stream for which advanced settings must be changed. The rows are editable.

Step 5  Check the Adaptive Quantization check box to enable this function or clear this check box otherwise.

Step 6  Click Apply All.

Changing the Advanced Settings Using the Update Settings Function

Procedure

Step 1  In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2  In the Processing tree, right-click the MFP MK2 branch with the services for which the advanced settings of the video component must be configured and choose Video Settings.
The MFP Video page appears.

**Step 3** Click the **Advanced** tab.

**Step 4** In the **GOP Settings** table, select the row of each video stream for which advanced settings must be changed.

**Step 5** Refer to the **Update Advanced Settings** area.

**Step 6** From the **Adaptive Quantization** drop-down box, choose **Enable**, **Disable**, or **Ignore**.

**Step 7** Click **Update All Selected**.

**Step 8** Click **Apply All**.

---

**Handling the Closed Captioning for Encoded Video Components**

The DCM is capable to transfer the closed captioning (EIA 608/708), which are embedded in the incoming video signal, to the outgoing stream.

**Configuring the Closed Captions**

**Procedure**

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2** In the **Processing** tree, right-click the MFP MK2 branch with the video stream or multires profile for which closed captions must be configured and choose **Video Settings**. The **MFP Video** page appears.

**Step 3** Click the **Closed Caption** tab.

**Step 4** Refer to the **Closed Caption Settings** table.

**Step 5** From the **Closed Caption - Source** drop-down list, choose the source of the closed captions: **VANC-708**, **VBI Line 21** (SD video encoding only), or **Disabled**.

**Step 6** If **VANC-708** is chosen from the **Closed Caption - Source** drop-down list, choose one of the following values from the **Closed Caption - Output 1** drop-down list:

- **CEA 708**—The EIA-608 caption data of the incoming video signal is up-converted to CEA-708 caption data and transferred together with the caption data in the VANC-708 packets of the incoming video stream to the outgoing stream.
Handling the Closed Captioning for Encoded Video Components

- **CEA-708 (Pass 608 Only)**—Only the CEA-608 caption data of the incoming video signal is up-converted to CEA-708 caption data and transferred to the outgoing stream.
- **SCTE-20**—For MPEG-2 SD video only, EIA-608 caption data of the incoming video signal is formatted as caption date compliant with SCTE-20 and embedded in the encoded video stream.

**Step 7** To determine the caption service descriptor for the video component, choose **Add** from the Caption Service Descriptor - Mode drop-down list.

**Step 8** If the Caption Service Descriptor - Mode is set to **Add**, a caption service can be added by clicking ![Add Button]. The Add Caption Service Item dialog box appears.

**Step 9** If the caption service is a line 21 field, check the **Line 21** check box, otherwise uncheck this check box.

**Step 10** For a line 21 field caption service, choose the field from the Field drop-down list. This parameter is dimmed if the **Line 21** check box is unchecked.

**Step 11** If the caption service is not a line 21 field, enter the number of the caption service in Caption Service Number field. This field is dimmed if the **Line 21** check box is checked.

**Step 12** In the Language field, enter the 3-character language code (as specified by ISO 639-2 [15]) that corresponds with the caption.

**Step 13** Check the **Easy Reader** check box to include easy reader captions or uncheck this check box otherwise.

**Step 14** Check **Wide Aspect Ratio** check box for wide aspect ratio video services (16/9) or uncheck this check box otherwise.

**Step 15** Click **OK**. The caption service is added to the Caption Services field of the corresponding service.

**Step 16** Repeat Step 7 to 15 for each caption service that must be added to the caption service descriptor.

**Step 17** Click **Apply All**.

---

**Note** A caption service, which is manually added to the caption service descriptor, can easily be removed by clicking ![Remove Button] in the row of the corresponding caption service and clicking **Apply All**.

---

**Modifying Closed Caption Settings Using the Update Closed Caption Settings Function**

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu.
The Tree View page appears.

**Step 2** In the Processing tree, right-click the MFP MK2 branch with the video streams for which closed caption settings must be changed and choose Video Settings. The MFP Video page appears.

**Step 3** Click the Closed Caption tab.

**Step 4** In the Closed Caption Settings table, select the row of each service for which the closed caption settings must be changed.

**Step 5** Refer to the Update Closed Caption Settings area.

**Step 6** From the Closed Caption Source drop-down list, choose Ignore, Disabled, VANC-708, or VBI Line 21.

**Step 7** From the Closed Caption Output 1 drop-down list, choose Ignore, CEA 708, CEA-708 (Pass 608 Only), or SCTE-20.

**Step 8** From the Caption Service Descriptor Mode drop-down list, choose Ignore, Add, or None.

**Step 9** If caption services in the caption service descriptors must be added, check the Caption Services check box and click +. The Add Caption Service Item dialog box appears.

**Step 10** If the caption service is a line 21 field, check the Line 21 check box, otherwise uncheck this check box.

**Step 11** For a line 21 field caption service, choose the field from the Field drop-down list. This drop-down box is dimmed if the Line 21 check box is unchecked.

**Step 12** If the caption service is not a line 21 field, enter the number of the caption service in Caption Service Number field. This field is dimmed if the Line 21 check box is checked.

**Step 13** In the Language field, enter the 3-character language code (as specified by ISO 639-2 [15]) that corresponds with the caption.

**Step 14** Check the Easy Reader check box to include easy reader captions or uncheck this check box otherwise.

**Step 15** Check Wide Aspect Ratio check box for wide aspect ratio video services (16/9) or uncheck this check box otherwise.

**Step 16** Click OK. The caption service is added beside the check box.

![Add Caption Service Item dialog box](image)

In the Add Caption Service Item dialog box, a caption service can be removed by clicking ✗ next to the caption service. After clicking ✗ and the Delete Confirmation on Single Click Delete option is enabled, a confirmation box will be displayed. Click OK to confirm.

**Step 17** Repeat the last eight steps for all caption services that must be added to the caption service descriptor.

**Step 18** Click Update All Selected. Remark that the existing caption services of the selected services are replaced by the configured ones.

**Step 19** Click Apply All.

---

**Configuring the AFD and AR Settings for the Encoded Video Streams**

The following list contains the active format description (AFD) and aspect ratio (AR) settings of the video components.
Configuring the AFD and AR Settings for the Encoded Video Streams

**Configuring the AR and AFD Settings**

**Procedure**

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2** In the **Processing** tree, right-click the MFP MK2 branch with the service for which the AR/AFD signaling must be configured and choose **Video Settings**.

---

**Identification**—Identifies the services in the AR/AFD Video Settings table.

**Source AFD/AR - Mode**—Determines if the AR/AFD signaling is taken from the incoming stream or must be selected manually.

* Manual—The AR/AFD signaling of the incoming video is overruled by the **Source AFD/AR - AR** and **AFD** value.

* Auto—The AR/AFD signaling of the incoming video is not overruled. The **Source AFD/AR - AFD** value is used if the AFD signaling of the incoming video is missing.

**Source AFD/AR - Type**—Determines the source from which the AR/AFD signaling must be extracted: SMPTE-2016, WSS, and VII.

This parameter is dimmed if the **Source AFD/AR - Mode** parameter is set to **Manual**.

**Source AFD/AR - AR**—If the **Output AR - Mode** parameter is set to manual, this parameter determines the AR for the processed video. The following values can be selected: 4:3, 14:9, or 16:9.

The **Source AFD/AR - AR** is dimmed if the **Source AFD/AR - Mode** parameter is set to **AUTO**.

**Source AFD/AR - AFD**—Determines how the monitor must display the coded video image when the monitor does not match this video image. The following values can be selected: 1:1 Full Frame (default), Box 16:9 (top), Box 14:9 (top), 4:3 (center), 16:9 (center), 14:9 (center), 4:3 (with shoot and protect 14:9 center), 16:9 (with shoot and protect 14:9 center), and 16:9 (with shoot and protect 4:3 center).

**Output AR - Mode**—Determines if the AR signaling for the outgoing video must be taken from the incoming AR or must be selected manually.

* Manual—The AR signaling of the incoming video is overruled by the **Output AR - AR** value.

* Auto—The AR signaling of the incoming video is not overruled. The **Output AR - AR** value is used if the AR signaling of the incoming video is missing.

**Output AR - AR**—If the **Output AR - Mode** parameter is set to manual, this parameter determines the AR signaling for the outgoing video. The following values can be selected: 4:3, 14:9, or 16:9.

The AFD signaling of the outgoing video, which depends on the AR of the outgoing video and the AFD of the incoming video, can be different from the AFD of the incoming video. The AFD signaling is used for signaling to the set-top box or IRD how the coded video must be displayed when the monitor does not match the coded video.
The MFP Video page appears.

**Step 3** Click the AR/AFD tab. The AR/AFD Video Settings table appears.

**Step 4** In the AR/AFD Video Settings table, double-click the row of each service for which AR/AFD signaling settings must be changed. The rows are editable.

<table>
<thead>
<tr>
<th>AR/AFD Video Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
</tr>
<tr>
<td>Engine Site</td>
</tr>
<tr>
<td>PMG-1 - 1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

**Step 5** From the Source AFD/AR - Mode drop-down list, choose Auto or Manual.

**Step 6** If the mode parameter is set to Manual, check the Source AFD/AR - Type check box of each source from which the AFD/AR signaling must be extracted: SMPTE-2016, WSS, or VII. The Source AFD/AR - Type check boxes are dimmed if the mode is set to Auto.

**Step 7** If the mode parameter is set to Manual, choose the AR signaling from the Source AFD/AR - AR drop-down list: 4:3, 14:9, or 16:9.

**Step 8** From the Source AFD/AR - AFD drop-down list, choose 1:1 Full Frame (default), Box 16:9 (top), Box 14:9 (top), 4:3 (center), 16:9 (center), 4:3 (with shoot and protect 14:9 center), 16:9 (with shoot and protect 14:9 center), and 16:9 (with shoot and protect 4:3 center).

**Step 9** From the Output AR - Mode drop-down list, choose Auto or Manual.

**Step 10** From the Output AR - AR drop-down list, choose 4:3, 14:9, or 16:9.

**Step 11** Click Apply All.

---

**Changing the AR and AFD Settings Using the Update AR/AFD Video Settings Function**

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Processing tree, right-click the MFP MK2 branch with the services for which the AR/AFD signaling must be changed and choose Video Settings. The MFP Video page appears.

**Step 3** Click the AR/AFD tab. The AR/AFD Video Settings table appears.

**Step 4** In the AR/AFD Video Settings table, select the row of each service for which settings must be changed.

**Step 5** Refer to the Update AR/AFD Video Settings area.

**Step 6** Modify the parameters as required.

The Source AFD Type check boxes are three-state check boxes with: ■ ignore, □ disabled, and △ enabled.
Configuring the SCTE-104 Processing Settings

The DCM is able to extract SCTE-104 information from the VANC data of the incoming baseband signal and to convert this information into SCTE 35 messages.

- **SCTE-35 Bandwidth - Max (bps)**—Determines the maximum bandwidth for the DPI (digital program insertion) stream. This parameter can be set between 1504 and 90,240 bps; the default value is 90,240 bps. 1504 bps means 1 packet per second and 90,240 bps means 60 packets per second.

- **SCTE-35 Bandwidth - Reserve BW**—Enables or disables the bandwidth reservation packet generation. If enabled, the packets are generated at a rate as specified by the **SCTE-35 Bandwidth - Max (bps)** parameter.

- **SCTE-35 Bandwidth - Heartbeat (s)**—Determines the time between two consecutive null (heartbeat) packets. This parameter can be set between 0 and 3600 second. 0 (default value) means that no heartbeat packets are sent. These heartbeat packets are used to signal a live DPI PID connection.

- **Max Pre-Roll (s)**—Determines the maximum preroll time for SCTE-35 messages. This parameter can be set between 4 and 65 seconds; the default value is 8 seconds.

- **IDR/I-Frame - Messages Types**—Determines if an I frame (for MPEG2) or an IDR frame (AVC) insertion is required or not at a particular splice event. This can be determined for the following events:
  - At the start of the splice event.
  - At the end of the splice event.
  - At the end of the break duration time.
  - At the time signal time.

The check boxes of these splice events are by default checked.

To Configure the SCTE-104 Processing Settings

**Procedure**

- **Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

- **Step 2** In the Processing tree, right-click the MFP MK2 branch with the service for which SCTE-104 processing settings must be configured and choose Video Settings. The MFP Video page appears.

- **Step 3** Click the DPI tab.
The SCTE-104 Processing Settings table appears.

**Step 4** In the SCTE-104 Processing Settings table, double-click the row of this service. The row becomes editable.

**Step 5** Check the Enable check box to enable SCTE-104 processing or uncheck this check box otherwise.

**Step 6** In the SCTE-35 Bandwidth - Max (bps) field, enter the maximum bandwidth for the SCTE-35 component. This parameter can be set between 1504 and 90,240 bps; the default value is 90,240. The SCTE-35 Bandwidth - Max (kbps) field is dimmed if the Enable check box is cleared.

**Step 7** Check the SCTE-35 Bandwidth - Reserve BW check box to enable the bandwidth reservation packet generation or uncheck this check box otherwise.

**Step 8** In the SCTE-35 Bandwidth - Heartbeat (s) field, enter the time between two consecutive heartbeat packets. Enter 0 to disable the heartbeat packet transmission.

**Step 9** In the Max. Pre-Roll (s) field, enter the maximum preroll time for SCTE-35 messages.

**Step 10** In the IDR/I-Frame - Messages Types column, check the check box of each event for which an I frame (for MPEG2) or an IDR frame (AVC) insertion is required or uncheck the check box otherwise.

**Step 11** Click **Apply**.

### Updating the SCTE-104 Processing Settings

#### Procedure

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The Tree View page appears.

**Step 2** In the Processing tree, right-click the MFP MK2 branch with the service for which SCTE-104 processing settings must be changed and choose **Video Settings**. The MFP Video page appears.

**Step 3** Click the **DPI** tab. The SCTE-104 Processing Settings table appears.

**Step 4** In the SCTE-104 Processing Settings table, select the row of each service that must be changed.

**Step 5** Refer to the Update SCTE-104 Processing Settings area.

**Step 6** From the **Enable** drop-down list, choose **Enabled**, **Disabled**, or **Ignore**.

**Step 7** In the SCTE-35 Bandwidth - Max (bps) field, enter the maximum bandwidth for the SCTE-35 component. This parameter can be sent between 1504 and 90,240 bps; the default value is 90,240. The SCTE-35 Bandwidth - Max (kbps) field is dimmed if **Disabled** is chosen from the **Enable** drop-down list.

**Step 8** Click **Update All Selected** and the click **Apply**.
Configuring PiP Streams

The AVC video, which is encoded from a baseband stream, can be used to create a PiP (picture-in-picture) stream. Remark that only one PiP stream can be created from a video component and a PiP stream with resolution 96 x 96 cannot be created from a 1080i stream (resolution 1920 x 1080).

These parameters are:

- **Resolution**—Determines the video resolution of the outgoing PiP stream. The video resolutions that can be chosen are: 96*96, 128*96, 176*144, or 192*192.

- **ES Rate (kbps)**—Determines the bit rate of the video component of the PiP stream (without packetization overhead and PCR [program clock reference]). This parameter is by default set to 400 kbps and can be changed between 150 and 500 kbps.

- **Profile**—This parameter can be set to Main or Baseline (default). Baseline profile does not support P-pictures and hierarchical GOPs.

- **GOP Mode**—Determines the structure of the GOPs in the outgoing PiP stream:
  - **Custom**—The GOP structure of the outgoing video depends on the configured GOP size, B-pictures, and hierarchical settings. The GOP length can be increased or decreased for video quality purposes, for instance, during a scene change.
  - **Fixed**—The GOP structure of the outgoing video is fixed depends on the configured GOP size, B-pictures, and hierarchical settings.

- **GOP Size**—Determines the number of frames per GOP. A value can be chosen between 1 to 30 frames; the default value is 30 frames.

Similar to the encoded video stream, the closed captions for the PiP stream can also be configured. Remark that the source for the PiP stream cannot be configured separately from the video stream from which the PiP stream is created. The same source is used. For more information about closed captions, see Handling the Closed Captioning for Encoded Video Components, on page 31.

Creating a PiP Stream

**Procedure**

**Step 1**  
In the DCM GUI, choose Service > Tree View from the main menu.  
The Tree View page appears.

**Step 2**  
In the Processing tree, right-click the MFP MK2 engine with the video service from which a PiP stream must be created and choose Settings.  
The MFP Overview page appears.

**Step 3**  
Click the PIP tab.
The MFP PIP page appears.

**Step 4** In the **PIP Video Settings** table, double-click the video component from which a PiP stream must be created. The row becomes editable.

*Note:* Do not double-click the check box of a row.

**Step 5** Check the **Settings** check box to enable PiP stream creation. The other settings of the row become editable.

**Step 6** From the **Resolution** drop-down list, choose the desired video resolution for the PiP stream: 96*96, 128*96, 176*144, or 192*192.

**Step 7** In the **ES Rate (kbps)** field, enter the desired bit rate for the outgoing PiP stream. A value can be entered between 150 and 400 kbps; the default value is 400 kbps.

**Step 8** From the **Profile** drop-down list, choose **Main** or **Baseline**.

**Step 9** From the **GOP Mode** drop-down list, choose **Custom** or **Fixed**.

**Step 10** Click **Apply All**.

After changing PiP settings, the TS rate (TS Rate (kbps) column) will be changed accordingly.

## Changing the PiP Settings Using the Update PiP Video Settings Function

When settings of multiple PiP streams must be changed to similar values, the Update Settings function of the GUI can be used.

**Procedure**

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2** In the **Processing** tree, right-click the MFP MK2 engine with the video service from which a PiP stream settings must be changed and choose **Settings**. The **MFP Overview** page appears.

**Step 3** Click the **PIP** tab. The **MFP PIP** page appears.

**Step 4** In the **PIP Video Settings** table, select the rows of the streams for which PiP settings must be changed.

**Step 5** In the **Update PIP Video Settings** area, modify the corresponding settings and click **Update All Selected**. All selected rows become editable and get these new values.

**Step 6** Click **Apply**.
Configuring the Encoding Settings for Audio Components

General

A DCM allows you to encode PCM or transcode pre-encoded audio components to components with format AAC-LC (1.0, 1+1, 2.0 or 5.x), HE-AACv1 (1.0, 1+1, 2.0 or 5.x), HE-AACv2 (2.0), MPEG-L2 (1.0, 1+1, or 2.0), Dolby Digital (AC-3) (1.0, 1+1, 2.0 or 5.x), or Dolby Digital Plus (E-AC-3) (1.0, 1+1, 2.0 or 5.x) with following elementary stream bit rates:

- **AAC-LC**
  - Mono: 32 to 288 kbps
  - Stereo (2.0) or dual mono (1+1): 32 to 576 kbps
  - Multichannel (5.x): 64 to 640 kbps

- **HE-AACv1**
  - Mono: 32 to 144 kbps
  - Stereo (2.0) or dual mono (1+1): 32 to 288 kbps
  - Multichannel (5.x): 64 to 576 kbps

- **HEAACv2 stereo (2.0): 32 to 144 kbps**

- **MPEG-L2**
  - Mono: 32, 48, 56, 64, 80, 96, 112, 128, 160, or 192 kbps
  - Stereo (2.0) or dual mono (1+1): 64, 96, 112, 128, 160, 192, 224, 256, 320, 384 kbps

- **Dolby Digital (AC-3)**
  - Mono: 56, 64, 80, 96, 112, 128, 160, 192, 224, 256, 320 kbps
  - Stereo (2.0) or dual mono (1+1): 96, 112, 128, 160, 192, 224, 256, 320, 384, 448, 512, 576, or 640 kbps
  - Multichannel (5.x): 224, 256, 320, 384, 448, 512, 576, or 640 kbps

- **Dolby Digital Plus (E-AC-3)**
  - Stereo (2.0) or dual mono (1+1): 64, 72, 80, 88, 96, 104, 112, 120, 128, 144, 160, 176, 192, 200, 208, 216, 224, 232, 240, 248, 256, 272, 288, 304, 320, 336, 352, 368, 384, 400, 448, 512, 576, 640, 704, 768, 832, 896, 960, and 1024 kbps

After changing PiP settings, the TS rate (**TS Rate (kbps)** column) will be changed accordingly.

Audio Up and Downmixing

Audio downmixing, which is the process to convert incoming audio streams with multiple channels to streams with fewer channels, and upmixing, which is the process to convert incoming audio streams to streams with more channels, has some limitations. The following table provides an overview of the audio up and downmix capabilities for baseband encoding.

<table>
<thead>
<tr>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 1.0: Mono</td>
</tr>
<tr>
<td>• 1+1: Dual mono</td>
</tr>
<tr>
<td>• 2.0: Stereo</td>
</tr>
<tr>
<td>• 5.x: Surround</td>
</tr>
</tbody>
</table>

(1): For dual mono to mono downmixing, either the left or right channel must be selected.
(2): Upmixing mono audio to 5.x audio: the mono audio is converted to the center channel.
(3): Upmixing stereo audio to 5.x audio: the left channel of the stereo audio is converted to the front left channel and the right channel to the front right channel.
(4): Only if the **Metadata Mode** is set to **Auto**, otherwise the outgoing audio is Dolby Digital (Plus) 5.x.

(5): Audio channel mode (acmod) limitation (Dolby requirement).

(6): Mono input is duplicated in the left and right output.

**About Audio Resources**

For audio encoding, an MFP MK2 card is provided with a DSP (digital signal processor) that has several audio resources. Encoding of an audio component consumes some audio resources. Each time encoding settings are configured for an audio component, several audio resources are allocated depending on the format of the incoming audio component, the format to which the component must be encoded, and the complexity of the audio.

Because the complexity of the audio component changes in time, the amount of audio resources necessary to encode an audio component fluctuates. During configuring the audio settings, a theoretical maximum amount of audio resources (worst-case value) is assigned to the component. This means that more resources are allocated than actually needed. Exceeding the total amount of audio resources with a few percent gives usually no encoding problems. Exceeding an actual load of 90% is not recommended. The **Resource Usage** table on the **MFP Audio** page provides a graphical representation of the allocated and free audio resources, see **Checking the Resource Usage**, on page 60.

**About Audio Leveling**

To bring the audio loudness to a desired level and to eliminate irritating loudness jumps during, for instance, commercial breaks, the automatic level control (ALC) feature can be used. The ALC feature provides an input gain amplifier/attenuator, a leveler, and a limiter. Next to these parts, the ALC feature is also foreseen with loudness and true-peak measurement.

The ALC feature is licensed and channel-based. Meaning, each channel for which ALC is enabled occupies one **MFP_AUDIO_LOUDNESS_CONTROL** license key. See **Licensing**.

**About Meta Data Pass Through**

The meta data that is carried in the audio bit stream and required to control downstream encoders/decoders or to reproduce the audio by, for instance, the set top boxes in the home, depends on the type of audio stream, audio stream content, number of channels, and so on. The incoming meta data is derived from the VANC (vertical ancillary data) data in the incoming SDI stream, with meta data according to SMPTE RDD6.

To determine the meta data in the encoded audio stream, two different modes can be used. When the **Meta Data** mode is set to manual, most of this data must be configured manually. Changing this mode to **Auto** gives the following benefits:

- **Alignment of meta data and audio**—The meta data, that is attached to a certain audio frame, remains aligned with the audio samples in that audio frame. Any processing delay on the audio path (PCM) is also taken into account on the meta data path, making sure that both types of information remain synchronized.

- **Meta data translation, decoding and PCM processing** (compared to manual mode)—In auto mode, Dolby Digital meta data is automatically dealt with. Some meta data fields are set to defaults while others are passed through from decoder to encoder.

  - **Decoder DRC**—When downmixing, the decoder is operated in line mode to prevent signal overflows caused by the downmixing process. In all other cases, the decoder is operated in custom 0 mode with cut and boost set to zero. As a result, the audio is decoded with any DRC being applied.

  - **Encoder Bit Stream Mode**—This meta data element is transcoded from input to output.
• **Encoder DRC**—None when downmixing (since DRC was already applied at the decoder in line mode). In all other cases, the DRC is recalculated in the encoder and the profile is user-selectable. The default is film standard.

• **LFE (low-frequency effects)**—User-selectable

• **LFE Low Pass filter**—Off

• **Surround 90 deg phase shift**—Off

• **Surround channel Att**—Off

• **Production Info Exists/Room Type/Mixing Lvl**—This metadata element is transcoded from input to output.

• **Dialnorm**—In a downmix scenario, the dialnorm is set to a value of −31. This matches the reference level of Line mode which is used in this case. In all other cases, the dialnorm is transcoded from the input to the output.

• **XBSI**—The encoder always uses the extended bitstream syntax, even if the input is not.

• **Lt/Rt downmix coefficient** and **Lo/Ro downmix coefficient** are set to a default value of −3 dB when these are not present in the input bitstream. Otherwise they are transcoded from input to output.

• **Dolby surround**—This metadata element is passed from input to output.

Remark that Auto mode is only supported for Dolby Digital or Dolby Digital Plus to Dolby Digital or Dolby Digital Plus audio encoding.

### Duplicating Audio Entries

When a service is dropped from the input to an MFP engine, the GUI provides one audio entry for each audio component in the service or multires main service. When multiple audio streams must be encoded from the same audio source, first, the **Encode** parameter of the audio component in the **Processing** tree must be set to **Encode PCM**, **Encode Dolby-E / PCM**, **Transcode**, or **Passthrough** (see Configuring the Basic Audio Setting, on page 45) and then, extra audio entries must be duplicated as described in following procedure.

In the **Processing** tree, such duplicated audio streams are accommodated under the corresponding audio stream branch.

- ES 5.1 (CD audio Stereo PCM → 8x03: MPES-1 Layer 2 audio)
- ES 4:8 (CD audio Stereo PCM → b004 – MPES-2 Layer 2 audio)
- ES 4:8 (CD audio Stereo PCM → b000 – DolbyDigitalPlus audio)

You can remove a duplicated stream by right-clicking the stream and choosing **Delete** from the shortcut menu.

---

**Note**

Maximum eight audio encodes can be created from a single audio source.
Duplicating Audio Entries Using the Processing Tree

Procedure

**Step 1**
In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2**
In the Processing tree, right-click the audio component from which an additional audio stream must be created and choose Add Audio Encode. The audio entry is added to the Processing tree.

Tip
To remove a duplicate, right-click the duplicate in the Processing tree and choose Delete.

Duplicating Audio Entries Using the Basic Audio Settings Table

Procedure

**Step 1**
In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2**
In the Processing tree, right-click the MFPMK2 branch with the audio component that must be duplicated and choose Audio Settings. The MFP Audio page appears.

**Step 3**
Click the Basic tab. The Basic Audio Settings table appears.

**Step 4**
In the row of the audio component that must be duplicated, click . A duplicate is added to the table. Hint: To sort the table on audio component with duplicates, click the PID header.

**Step 5**
Configure this component as described in the following topics.
Configuring the Basic Audio Setting

**Important**
Changing audio settings interrupts the corresponding service.

**Procedure**

**Step 1**
In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2**
In the **Processing** tree, right-click the MFP MK2 branch with the audio component for which encoding settings must be configured and choose **Audio Settings**. The **MFP Audio** page appears.

**Step 3**
Click the **Basic** tab. The **Basic Audio Settings** table appears.

**Step 4**
Double-click each row for which settings must be changed. The corresponding rows become editable.

The **Decode** parameter is automatically set to **SMPTE-302** or **Auto** and cannot be changed.

**Step 5**
From the **Enable** drop-down list, choose one of the following values:

- **Encode PCM**—The incoming PCM audio is encoded.
- **Encode Dolby-E / PCM**—The incoming Dolby-E audio is encoded.
- **Disabled**—The incoming audio component is not processed or passed to the output.
- **Transcode**—The incoming pre-encoded audio is transcoded.
- **Passthrough**—The audio component is passed to the output without encoding.

If **Passthrough** is chosen, all audio settings are dimmed.

**Step 6**
From the **Encode - Format** drop-down list, choose the format to which the audio component must be encoded, **MPEG-L2**, **Dolby Digital**, **Dolby Digital Plus**, **AAC-LC**, **HE-AACv1**, or **HE-AACv2**. **Note**: If the **Enable** parameter is set to **Encode Dolby-E / PCM**, only **Dolby Digital** or **Dolby Digital Plus** can be chosen.
Step 7  From the Encode - Channels drop-down list, choose the number of channels for the encoded audio component: Mono, Dual Mono, Stereo, or Multichannel (5.x).
Note: For HE-AACv2 audio, this parameter is automatically set to Stereo and cannot be modified.

Step 8  In the Encode - ES rate (kbps) field, select or enter the bit rate for the encoded audio component.

Step 9  In the Encode - Lip Sync (ms) field, enter a positive value for delaying or a negative value for advancing the audio if the audio is not in sync with the video component. This parameter can be set between -300 and +300 ms.

Step 10 From the Encode - Sample Rate drop-down list, choose the sample rate for the encoded audio component: 32.0, 44.1, or 48.0 kHz.
Note: The Dolby encoder only supports a sample rate of 48 kHz.

Step 11 Click Apply All.

After changing audio settings, the TS rate (TS Rate (kbps) column) will be changed accordingly.

Note
- When encoding is enabled for an audio component and the audio settings are properly configured and applied, the appropriate license keys are occupied and the amount of audio resources, which is needed for the encoding process, is allocated. See Checking the Resource Usage, on page 60.
- For HE-AACv1, AAC-LC, Dolby Digital (AC-3), and Dolby Digital Plus (E-AC-3) audio encoding, encoding and processing specific settings can be configured. See Configuring the Pre-Processing Settings, on page 52 or Configuring the Processing Settings, on page 53.

Changing the Basic Audio Settings Using the Update Function

When basic audio settings of multiple audio components must be changed to similar values, the Update Basic Audio Settings function of the GUI can be used.

Procedure

Step 1  In the DCM GUI, choose Service > Tree View from the main menu.
The Tree View page appears.

Step 2  In the Processing tree, right-click the MFP MK2 branch with the audio component for which encoding settings must be changed and choose Audio Settings.
The MFP Audio page appears.

Step 3  Click the Basic tab.
The Basic Audio Settings table appears.

Step 4  Select each row for which settings must be changed.

Step 5  In the Update Basic Audio Settings area, modify the corresponding settings and click Update All Selected.
All selected rows become editable and get these new values.

Step 6  Click Apply All.
Configuring the Audio Leveling Setting

To configure the automatic level control (ALC) feature to bring the audio loudness to a desired level and to eliminate irritating loudness jumps, the following settings can be modified:

- **Input Gain (dB)**—Determines the input gain that is applied to the audio before processing. A value can be entered between –20 and +20 dB in steps of 0.1 dB; the default value is 0 dB.

- **ALC Mode**:
  - **Enable**—Enables automatic loudness control (ALC).
  - **Measure**—Enables the loudness measurement.
  - **Measure with True Peak**—Enables the true-peak measurement.
  - **Bypass**—Bypasses automatic loudness control.

- **Target (LKFS)**—Determines the target audio loudness. A value can be entered between –40 and 0 in steps of 0.1; the default value is –23.

- **Compensation Delay (ms)**—Determines the delay that is used to apply a leveling gain. The longer this delay, the better the dynamics are preserved. The following compensation delay values can be chosen: 100, 200, 300 (default value), 400, and 500 ms.

- **Integrated Measurement Duration (min)**—Determines the integration time for integrated loudness calculation. A value can be entered between 1 and 60 minutes in steps of 1 minute; the default value is 60 minutes.

- **Leveler**—Enables or bypasses the audio leveler.

- **Noise Threshold (LKFS)**—Audio signals below this threshold are considered as noise and is bypassed without processing. A value can be entered between 0 and 70 in steps of 0.1; the default value is –70.

- **Max Deviation (LU)**—Determines the maximum acceptable deviation in gain value from the target audio loudness. A value can be entered between 3 and 20 in steps of 0.1; the default value is 5.

- **Attack Coefficient**—Determines the speed of the audio gain reduction toward the target audio loudness when an increase in audio loudness arises. The higher the number, the faster the reduction to the target value is. This parameter can be set between 0 and 2 in steps of 1; the default value is 1.

- **Release Time (s)**—Determines the time to achieve a 10 dB gain by the leveler. This parameter can be set between 1 and 1000 sec. in steps of 1 sec.; the default value is 10.

- **Max Gain (dB)**—Determines the maximum gain that is given to the input audio on leveling the audio toward the target audio loudness. A value can be entered between 0 and 20 dB in steps of 0.1; the default value is 20 dB.

- **Background Loudness (LKFS)**—If the loudness of the input signal goes below the background loudness, leveler does not update the gain and the previous gain is maintained. A value can be entered between –70 and 0 in steps of 0.1; the default value is –60.

- **Transient Factor**—The higher this parameter, the faster the leveling adaptation at a scene change is. A value can be chosen between 0 and 2, the default value is 1.
True Peak—Enables or disabled true peak measurement (interpolating sample values with a factor of four). If true peak measurement is enabled, limiting is done in true peak mode.

Limiter—Enables or bypasses the audio limiter.

Limiter Ref Level (dBFS)—Determines the absolute value to which the PCM samples is limited. This parameter can be set between 0 and −20 dBFS in steps of 0.1 dBFS; the default value is −10 dBFS.

Limiter Release Coefficient—Determines the dynamic behavior of the limited signal. The higher this value, the faster the release time of the limiter is. A value can be chosen between 0 and 4; the default value is 1.

ALC Encode Measurements - Enable—Enables or disables the ALC measurements of the encoded audio signal.

Enable True Peak Measurement—Enables or disables true peak measurements of the encoded audio signal.

If automatic loudness control (ALC), loudness measurement, or the true-peak measurement is enabled, the following ALC source measurements can be checked: momentary loudness, short-term loudness, integrated loudness, LRA (loudness range) low, LRA high, and true peak. See Loudness Measurement & True-peak measurement ITU Standard ITU-R.BS1770-3.

If ALC encode measurements are enabled, the following measurements can be checked: momentary loudness, short-term loudness, integrated loudness, LRA low, and LRA high. If true peak measurement is enabled for the encoded audio signal, the true peak value can be checked. See Loudness Measurement & True-peak measurement ITU Standard ITU-R.BS1770-3.

Note: The leveling parameters are only applicable if the DCM is provided with MFP_AUDIO_LOUDNESS_CONTROL license keys.

Tip: When automatic loudness control is enabled for audio components, the leveling parameters are configured with default values. When particular settings must be changed to the same value, the default values of these parameters can be changed. See Changing the Default Audio Leveling Settings, on page 50.

Configuring the Basic Audio Leveling Setting

Procedure

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Processing tree, right-click the MFP MK2 branch with the audio component for which audio leveling settings must be configured and choose Audio Settings. The MFP Audio page appears.

**Step 3** Click the Leveling tab.
The Audio Leveling Settings table appears.

**Step 4** Double-click each row for which basic audio leveling settings must be changed. The corresponding rows become editable.

![Audio Leveling Settings table](image)

**Step 5** Modify the settings and click Apply.
For Dolby Digital and Dolby Digital Plus encoding and if the target level is different from the Main or Aux dialog normalization level (DialNorm), a dialog box appears to set the target level as DialNorm. Click Yes to confirm this.

For information about the setting, see Configuring the Audio Leveling Setting, on page 47.

### Changing the Basic Audio Leveling Settings Using the Update Function

When audio leveling settings of multiple audio components must be changed to similar values, the Update Audio Leveling Settings function can be used.

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu.
The Tree View page appears.

**Step 2** In the Processing tree, right-click the MFP MK2 branch with the audio component for which audio leveling settings must be changed and choose Audio Settings.
The MFP Audio page appears.

**Step 3** Click the Leveling tab.
The Audio Leveling Settings table appears.

**Step 4** Select row of each audio for which the settings must be changed

**Step 5** In the Update Audio Leveling Settings area, modify the corresponding settings and click Update All Selected.
All selected rows become editable and get these new values.

**Step 6** Click Apply.

For information about the setting, see Configuring the Audio Leveling Setting, on page 47.
Configure the Advanced Audio Leveling Settings

Procedure

Step 1  In the DCM GUI, choose Service > Tree View from the main menu.
        The Tree View page appears.

Step 2  In the Processing tree, right-click the MFP MK2 branch with the audio component for which advanced audio
        leveling settings must be configured and choose Audio Settings.
        The MFP Audio page appears.

Step 3  Click the Leveling tab.
        The Audio Leveling Settings table appears.

Step 4  In the Audio Leveling Settings table, click \( \square \) in the row of the audio component.
        A dialog box appears.
        The audio leveling detail settings can only be configured if the ALC Mode is set to Enable.

Step 5  Configure the advanced settings and click Apply.
        For information about the setting, see Configuring the Audio Leveling Setting, on page 47.

The ALC Source Measurements and ALC Encode Measurements areas in this dialog box show the current
and maximum figures before and after audio leveling. The maximum figures can be reset by clicking Reset Max.

Changing the Default Audio Leveling Settings

Procedure

Step 1  In the DCM GUI, choose Configuration from the main menu and double-click the MFP MK2 card in the
        Configuration tree.
        The Interface page of the MFP MK2 Card appears.

Step 2  Click Default Settings > Audio.
        The Leveling Settings area appears.

Step 3  Modify the default leveling settings and click Apply.

For information about the setting, see Configuring the Audio Leveling Setting, on page 47.
Configuring the Advanced Audio Setting

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2 In the Processing tree, right-click the MFP MK2 branch with the audio component for which encode settings must be configured and choose Audio Settings. The MFP Audio page appears.

Step 3 Click the Advanced tab. The Advanced Audio Settings table appears.

Step 4 Double-click each row for which settings must be changed. The corresponding rows are editable.

The Meta Data, Audio Descriptor Overrule, and Add Unref PCR parameters are dimmed if the Enable parameter is set to Passthrough or Disabled.

Step 5 For a duplicated audio stream, enter a new PID (packet identifier) in the Dup. PID field. If the DCM participates in an application with ROSA VSM, ROSA VSM is able to remap the audio component by using tracking rules. In this case, the initial and the remapped value is shown.

Step 6 From the Track Type drop-down list, choose one of the following values:

- Stream Type (default)—The component, with matching stream type and language, is processed.
- PID—The component, with matching PID, is processed.

This parameter is useful to determine the audio component that must be processed after, for instance, a service backup. If the backup service contains an audio component with another stream type but matching PID, then Track Type must be set to PID.

Step 7 If an audio descriptor must be inserted:

1. Check the Audio Descriptor Overrule check box and enter the 3-character language code (as specified by ISO 639-2 [15]) in the Language field.
2 From the Audio Type drop-down list, choose the audio service type: Undefined, Clean effects, Hearing impaired, or Visual impaired commentary.

Step 8 From the PES - Frame - Mode drop-down list, choose Aligned or Not Aligned. Aligned means that the data_alignment_indicator flag of the PES (packetized elementary stream) header is set, the PES packet header is immediately followed by the sync word of an audio frame, and the PES packet only contains one audio frame. The TS packet with the final bytes of an audio frame has adaptation field stuffing to align the next frame in the next PES packet.

Step 9 To insert an extra unreferenced PCR on the audio component, check the Add Unref PCR check box. Otherwise uncheck this check box.

Step 10 Click Apply All.

Changing the Advanced Audio Settings using the Update Function

When advanced audio settings of multiple audio components must be changed to similar values, the Update Advanced Audio Settings function of the GUI can be used.

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu.
   The Tree View page appears.

Step 2 In the Processing tree, right-click the MFP MK2 branch with the audio component for which encode settings must be configured and choose Audio Settings.
   The MFP Audio page appears.

Step 3 Click the Advanced tab.
   The Advanced Audio Settings table appears.

Step 4 In the Advanced Audio Settings table, select the rows for which setting must be changed.

Step 5 In the Update Advanced Audio Settings area, modify the corresponding settings and click Update All Selected.
   All selected rows are editable and get these new values.

Step 6 Click Apply All.

Configuring the Pre-Processing Settings

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu.
The Tree View page appears.

Step 2 In the Processing tree, right-click the MFP MK2 branch with the audio component for which encode settings must be configured and choose Audio Settings.
The MFP Audio page appears.

Step 3 Click the Basic tab.
The Basic Audio Settings table appears.

Step 4 In the Basic Audio Settings table, click the Processing arrow of the corresponding audio component.
The MFP Audio Processing page appears.

Step 5 Click the Pre-Processing tab.
The PCM Pre-Processing Settings appear.

Step 6 From the Stereo Down Mix Mode drop-down list, choose the desired stereo downmix: Lo/Ro, Lt/Rt, or Auto. Auto means that this information is taken from the incoming stream. This parameter is only useful for an incoming surround audio (5.x) that must be downmixed to stereo audio (2.0).

Step 7 From the Center Mix Level (dB) drop-down list, choose the desired level shift for the center channel if the channels must be downmixed on the set-top boxes. The options for this parameter are: 0 (default), –1.5, –3, –4.5, –6, –7.5, –9, and –Infinite expressed in dB.

Step 8 From the Surround Mix Level (dB) drop-down list, choose the desired level shift for the surround channels if the channels must be downmixed on the set-top boxes. The options for this parameter are: 0 (default), –1.5, –3, –4.5, –6, –7.5, –9, and –Infinite expressed in dB.

Step 9 From the Mono Down Mix Mode drop-down list, choose the channel of the incoming audio that must be encoded for outgoing mono audio: Left, or Right, or choose Sum for stereo-to-mono summing.

Step 10 Click Apply All.

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Configuring the Processing Settings

Setting up the AAC Processing Settings

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu.
The Tree View page appears.

Step 2 In the Processing tree, right-click the MFP MK2 branch with the service for which AAC processing settings for an audio component must be configured and choose Audio Settings.
The MFP Audio page appears.

Step 3 In the Audio Settings table, click the Processing arrow of the corresponding audio component.
The MFP Audio Processing page appears.

**Step 4** Refer to the **AAC Processing Settings** area.

**Step 5** From the **Bit Stream Mode** drop-down list, choose the format of the bit stream that the transcoder must generate: **MPEG-2 ADTS** (not for HE-AACv2 encoding), **MPEG4 ADTS**, **MPEG LATM/LOAS**, or **MPEG4 LATM/LOAS Explicit** (not for AAC-LC encoding).

**Step 6** From the **Advanced Encoding Tools** drop-down list (AAC-LC encoding only and if the Bit Stream Mode is not set to **MPEG-2 ADTS**), choose the compression tools: **None** (AAC-LC), **TNS**, or **PNS + TNS**.

- **Temporal Noise Shaping (TNS)**—The basic idea of TNS relies on the duality of time and frequency domain. TNS uses a prediction approach in the frequency domain to shape the quantization noise over time. It applies a filter to the original spectrum and quantizes this filtered signal. Also, quantized filter coefficients are sent in the bit stream. These coefficients are used in the decoder to undo the filtering performed in the encoder, leading to a temporally shaped distribution of quantization noise in the decoded audio signal. (This means that the noise can appear shortly after or even before the exciter signal, so it is an intentional post/pre-echo, but not noticeable if implemented correctly, this is, below the masking threshold.) TNS, which provides higher coding efficiency, can be used more commonly for speech (and speech alike) signals.

- **Perceptual Noise Substitution (PNS)**—The PNS tool increases the coding efficiency of AAC by substituting noise-like signal components with a compact signal representation of that sound instead of coding the exact waveform. The decoder generates a model of the noise from this representation and inserts it in the appropriate spectral region according to the power level. PNS is used mostly for low bit rates and recommended for bit rates lower than 32 kbps per channel.

**Step 7** Check the **ADTS CRC** check box to include a frame CRC (cyclic redundancy check) in the ADTS (audio date transport stream) header or uncheck this check box otherwise. CRC is useful in noisy environments where bit errors are likely to occur. This allows the consumer's decoder to detect an error in the incoming bit stream and output silence instead of loud noise. This parameter is dimmed if the **Bit Stream Mode** is set to **MPEG4 LATM/LOAS** or **MPEG4 LATM/LOAS Explicit**.

**Step 8** Refer to the **Multi Channel Specific** area.

**Step 9** Check the **LFE Channel Enable** check box if an LFE (low-frequency effects) channel must be present in the output audio stream or uncheck this check box otherwise.

**Step 10** Refer to the **General** area.

**Step 11** Check the **Copyright** check box if the encoded audio component is protected by copyright or uncheck this check box otherwise.

**Step 12** Check the **Original** check box if the encoded audio component is an original or uncheck this check box otherwise.

**Step 13** Click **Apply All**.
Setting up the MPEG-L2 Processing Settings

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2 In the Processing tree, right-click the MFP MK2 branch with the service for which MPEG-L2 processing settings for an audio component must be configured and choose Audio Settings. The MFP Audio page appears.

Step 3 In the Audio Settings table, click the Processing arrow of the corresponding audio component. The MFP Audio Processing page with the MPEG-L2 processing settings appears.

Step 4 In the MPEG-L2 Encode Settings area, check the Auto Joint Stereo check box for joint stereo encoding or uncheck this check box otherwise.

Step 5 Refer to the General area.

Step 6 Check the Copyright check box if the encoded audio component is protected by copyright or uncheck this check box otherwise.

Step 7 Check the Original check box if the encoded audio component is an original or uncheck this check box otherwise.

Step 8 Click Apply All.

Setting up the Dolby Digital Processing Settings

Note If the Meta Data mode is set to Auto, particular meta data for the transcoded audio is taken from the incoming stream and only a part of the meta data is configurable.

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2 In the Processing tree, right-click the MFP MK2 branch with the service for which Dolby Digital processing settings for an audio component must be configured and choose Audio Settings. The MFP Audio page appears.

Step 3 In the Audio Settings table, click the Processing arrow of the corresponding audio component. The MFP Audio Processing page with the Dolby Digital processing settings appears.

Step 4 Refer to the Metadata Settings area.

Step 5 From the Metadata Mode drop-down list, choose one of the following values:

• Manual—The metadata for the encoded audio stream must be configured manually.
• **Auto**—The metadata for the encoded audio stream is taken from the incoming stream (VANC space).

When the **Metadata Mode** is set to **Manual**, the **DRC Override** and **Dial Norm Override** check boxes are dimmed.

**Step 6** From the **Reversion Mode** drop-down list, choose one of the following values:

- **Manual**—If the incoming metadata is missing at the input, the manually configured metadata is inserted in the encoded audio stream.
- **Manual 2.0** (stereo) or **Manual 1.0** (mono)—If you select 5.1 audio encoding and the selected program of the RDD6 metadata (in Dolby E or in the VANC data) is 5.1, then the output is 2.0 or 1.0 respectively if the RDD6 metadata is no longer available. For Dolby E, this means that the stereo pair contains no longer Dolby E but just linear PCM.
- **Hold Last**—If the incoming metadata is missing at the input, the last correct incoming metadata is inserted in the encoded audio stream.

**Step 7** Check the **DRC Override** check box if the DRC value in the metadata must be overridden or uncheck this check box otherwise.

**Step 8** Check the **Dial Norm Override** check box if the **Dial Norm** value in the metadata must be overridden or uncheck this check box otherwise.

**Step 9** Refer to the **Dolby Digital Processing Settings** area.

*Note:* The **Dolby Digital Processing Settings** are only applicable if the **Metadata Mode** parameter is set to **Manual**, see **Configuring the Advanced Audio Setting**, on page 51. The **Dynamic Range Control (Line)** and **Dynamic Range Control (RF)** parameters are also applicable if the **DRC Override** check box is checked. The **Main Dialnorm (dB)** and **Aux Dialnorm (dB)** parameters are also applicable if the **Dialnorm Override** check box is checked.

**Step 10** From the **Bit Stream Mode** drop-down list, choose the type of information that the bit stream conveys: Complete **Main** (default), **Music** and **Effects**, **Visual Impaired**, **Hearing Impaired**, **Dialogue**, **Commentary**, or **Emergency Flash**.

**Step 11** From the **Dynamic Range Control (Line)** drop-down list, choose the desired dynamic range compression preset that is built in the Dolby Digital encoding algorithm to be applied to the audio stream in line mode: **None**, **Film Standard** (default), **Film Light**, **Music Standard**, **Music Light**, or **Speech**.

**Step 12** From the **Dynamic Range Control (RF)** drop-down list, choose the desired dynamic range compression preset that is built in the Dolby Digital encoding algorithm to be applied to the audio stream in RF mode: **None**, **Film Standard** (default), **Film Light**, **Music Standard**, **Music Light**, or **Speech**.

**Step 13** If **Dial Norm Override** is enabled, enter the value in the **Main DialNorm (dB)** field. The range is from –31 to –1 dB; the default value is –23.

**Step 14** For stereo audio, the **Dolby Surround Mode** parameter indicates whether a two-channel audio stream is provided with a Dolby Surround encoded program. The possible options are: **Not indicated** (default), **Dolby Surround Disabled**, or **Dolby Surround Displaced**.

**Step 15** Refer to the **Multi Channel Specific** area (5.x Dolby Digital / Dolby Digital Plus audio only).

*Note:* The **Multi Channel Specific** area is only present if the **Encode - Channels** parameter is set to **Multi Channel** (5.x). The **Center Mix Level (dB)** and **Surround Mix Level (dB)** parameter are dimmed if the **Extended BSI Bit Stream Mode** is set to XBSI.
Step 16 Check the LFE Channel Enable check box if an LFE channel must be present in the output audio stream or uncheck this check box otherwise.

Step 17 From the Center Mix Level (dB) drop-down list (Dolby Digital audio stream only), choose the desired downmix level for the center channel with respect to the left and right channel if the surround channels must be output as stereo. The options for this parameter are: -3.0 (default), -4.5, and -6.0 dB.

Step 18 From the Surround Mix Level (dB) drop-down list (Dolby Digital audio stream only), choose the desired downmix level for the surround channels with respect to the left and right channel if the surround channels must be output as stereo. The options for this parameter are: -3.0 (default), -6.0 dB, or Off.

Step 19 Check the LFE Low Pass Filter check box if a 120 Hz eighth-order lowpass filter must be applied to the LFE channel during transcoding or uncheck this check box otherwise. This parameter is only applicable if the LFE Channel Enable parameter is set.

Step 20 Check the Surround 90 deg Phase Shift check box if the encoder must apply a 90-degree phase shift to the surround channels or uncheck this check box otherwise.

Step 21 Check the Surround Channel Attenuation check box if the surround channels must be attenuated during encoding or uncheck this check box otherwise.

Step 22 Refer to the General area.

Step 23 Check the Copyright check box if the encoded audio component is protected by copyright or uncheck this check box otherwise.

Step 24 Check the Original check box if the encoded audio component is an original or uncheck this check box otherwise.

Step 25 Click Apply.

Setting up the Dolby Digital Channel Settings

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2 In the Processing tree, right-click the MFP MK2 branch with the service for which channel meta data must be configured and choose Audio Settings. The MFP Audio page appears.

Step 3 In the Audio Settings table, click the Processing arrow of the corresponding audio component. The MFP Audio Processing page with the Dolby Digital processing settings appears.

Step 4 Click the Channels/XBSI tab.
The Dolby Digital Channels Settings and Extended BSI Settings area appear.

**Step 5** Refer to the Dolby Digital Channels Settings area.

**Step 6** From the Main Room Type drop-down list, choose the type of the mixing room used for the final audio mixing session. Possible options are: Not Indicated, Small Room (default), and Large Room.

**Step 7** In the Main Peak Mixing Level (dB) field, enter the acoustic sound pressure level of the dialog level that is used during the final audio mixing session. A value can be entered between 80 and 111 dB; the default value is 105 dB.

**Step 8** Click Apply All.

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### Configuring the Extended BSI

#### Procedure

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Processing tree, right-click the MFPMK2 branch with the service for which channel metadata must be configured and choose Audio Settings. The MFP Audio page appears.

**Step 3** In the Audio Settings table, click the Processing arrow of the corresponding audio component. The MFP Audio Processing page with the Dolby Digital processing settings appears.

**Step 4** Click the Channels/XBSI tab.
The Dolby Digital Channels Settings and Extended BSI Settings area appear.

**Step 5** Refer to the Extended BSI Settings area.

**Step 6** From the Preferred Stereo Downmix Mode drop-down list, choose one of the following options: Lt/Rt downmix preferred, Lo/Ro downmix preferred, Dolby Pro Logic II preferred (Dolby Digital Plus audio only), or Not indicated.

**Step 7** From the Lt/Rt Center Mix Level (dB) drop-down list, choose the desired level shift for the center channel if the channel must be downmixed to an Lt/Rt output on the set-top boxes. The options for this parameter are: 3.0 dB, 1.5 dB, 0 dB, –1.5 dB, –3.0 dB (default), –4.5 dB, –6.0 dB, and Off.

**Step 8** From the Lt/Rt Surround Mix Level (dB) drop-down list, choose the desired level shift for the surround channels if the channels must be downmixed to an Lt/Rt output on the set-top boxes. The options for this parameter are: –1.5 dB, –3.0 dB (default), –4.5 dB, –6.0 dB, and Off.

**Step 9** From the Lo/Ro Center Mix Level (dB) drop-down list, choose the desired level shift for the center channel if the channels must be downmixed to an Lo/Ro output on the set-top boxes. The options for this parameter are: 3.0 dB, 1.5 dB, 0 dB, –3.0 dB (default), –4.5 dB, –6.0 dB, and Off.

**Step 10** From the Lo/Ro Surround Mix Level (dB) drop-down list, choose the desired level shift for the surround channels if the channels must be downmixed to an Lo/Ro output on the set-top boxes. The options for this parameter are: –1.5 dB, –3.0 dB (default), –4.5 dB, –6.0 dB, and Off.

**Step 11** From the Dolby Surround EX Mode drop-down list (Dolby Digital audio streams only), select one of the following values: Not Indicated, Not Encoded in Dolby Surround EX (Default), or Encoded in Dolby Surround EX.

**Step 12** Click Apply All.

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**Checking the Incoming Dolby Digital Metadata**

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Processing tree, right-click the MFP MK2 branch with the service for which AAC processing settings for an audio component must be configured and choose Audio Settings. The MFP Audio page appears.

**Step 3** In the Basic Audio Settings table, click the Processing arrow of the corresponding audio component. The MFP Audio Processing page appears.

**Step 4** Click the Metadata Status tab. The Dolby Digital Metadata Source area appears.
Configuring the E-AC3 Descriptor for Passthrough Audio Components

For E-AC3 audio components that are passed through from the incoming SDI stream to the output through the MFP MK2 Card, the E-AC3 descriptor for the outgoing SI can be configured.

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Processing tree, right-click the MFP MK2 branch with the passthrough audio component for which the E-AC3 descriptor must be configured and choose Audio Settings. The MFP Audio page appears.

**Step 3** In the Basic Audio Settings table, click the Processing arrow of the corresponding audio component. The E-AC3 Descriptor Settings (ATSC) area appears.

**Step 4** From the Bit Stream Mode drop-down list, choose Complete Main, Music and Effects, Visual Impaired, Hearing Impaired, Dialogue, Commentary, and Emergency Flash.

**Step 5** From the Dolby Surround Mode drop-down list, choose Not Indicated, Dolby Surround Disabled, or Dolby Surround Enabled.

**Step 6** Click Apply.

Remark that the Bit Stream Mode and Dolby Surround Mode parameters are only useful in ATSC (Advanced Television Systems Committee) applications.

Checking the Resource Usage

The Resource Usage table on the MFP Audio page provides a graphical representation of the allocated and free audio resources for audio encoding.

**Procedure**

**Step 1** In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

**Step 2** In the Processing tree, double-click the MFP MK2 branch for which the free and allocated audio resources must be checked. The MFP Overview page appears.

**Step 3** Click Audio and then click the Basic, Leveling, or Advanced tab. The MFP Audio page appears with the Resource Usage table.
Hints:

- The legend of the graphical representation is shown beside the table.
- The amount of audio resources that is freed up or allocated by changing the encoding configuration of audio components is indicated in the Change column. + Means the amount of resources that is occupied and - means the amount of resources that is released by the modification.

Important

We strongly recommend that you do not exceed 90 percent of the actual audio processing load.

Handling VBI

A DCM supports EBU (European broadcasting union) (EN 300 472) and DVB (Digital Video Broadcasting) (EN 301 775) component generation with the VBI of the incoming SDI signals. EBU information is extracted from the VBI (SMPTE-2031 or OP47) of incoming HD video signals (1080i25 or 720p50) or from the analog VBI of incoming SD sources (576i25). DVB VBI is extracted from the analog VBI (WSS/WST or OP42) of incoming SD video signals (576i25).

For analog VBI (576i25), the VBI is encoded and offered to the MFP as SMPTE-2031 VANC data. Therefore, at the input, each line must be specified from which VBI must be extracted and its VBI type, World System Teletext (WST), Wide Screen Signaling (WSS), or Transparent.

Transparent means that no interpretation is done of the analog signal. The analog signal is then routed to the MFP card where it can be passed to the output by enabling the DVB-VBI PID. In this case, no alarm can be generated.

For HD sources, the VANC packet mode is automatically detected and the WST and subtitles are included. To carriage VANC data in an outgoing TS (SMPTE 2038), VANC data can be transparently passed to the output. Therefore, the VANC data must be identified in the incoming SDI stream by filtering on DID/SDID, see Identifying VANC Data in HD Sources for Transparently Passing, on page 66. And then, the ST-2038 PID parameter must be enabled, see Configuring the EBU and DVB Component Generation, on page 64.

When particular VBI information is not or no longer present in the incoming stream, an alarm can be generated.

Note

- Frame rate conversion from p50 to i25 or conversely is not supported. If a frame rate conversion is detected of a service, the EBU component is blocked.
- If no SMPTE-2031 and OP47 data is available in the HD source or no OP42 data is available in the SD source, no EBU or DVB component is generated. If no valid data is available to generate the EBU or DVB component, a component is generated with stuffing.
Specifying the Analog VBI to Be Extracted from an SD Video Stream

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu.
The Tree View page appears.

Step 2 In the Inputs tree, double-click an SDI port.
The Input SDI Streams page appears.

Step 3 In the Input SDI Stream Settings table, click the VBI arrow in the row of the VBI stream from which analog SD VBI must be extracted.
The Input SDI Streams VBI page appears.

Step 4 From the Video drop-down list, choose SD.

Step 5 Refer to the Add Line To Extract area.

Step 6 From the Type drop-down list, choose one of the following VBI data types:

• WST—World System Teletext.
• WSS—Wide Screen Signaling. To signal the intended aspect ratio to receivers.
• Transparent—The analog signal is routed to the MFP card without interpretation.

Step 7 From the Field drop-down list, choose Field 1 or Field 2.

Step 8 From the Line drop-down list, choose the location of the VBI data.

Step 9 Click Add.
The corresponding line appears in the SD VBI table.

Step 10 Repeat Step 6 to 9 for all VBI data lines that must be extracted.

Step 11 Click Apply.

Changing Analog VBI Data Line Settings and the Alarm Triggering for SD Sources

Procedure

Step 1 In the DCM GUI, choose Service > Tree View from the main menu.
The Tree View page appears.

Step 2 In the Inputs tree, double-click an SDI port.
The Input SDI Streams page appears.

Step 3 In the Input SDI Stream Settings table, click the VBI arrow in the row of the stream from which settings must be changed.
The **Input SDI Streams VBI** page appears.

**Step 4**  In the **SD VBI** table, double-click each line for which settings must be changed or alarm triggering must be configured for SD sources. The rows become editable.

![SD VBI table](image)

**Step 5**  From the **Type** drop-down list, choose the desired VBI data types:

- **WST**—World System Teletext.
- **WSS**—Wide Screen Signaling. To signal the intended aspect ratio to receivers.
- **Transparent**—The analog signal is routed to the MFP card without interpretation.

**Step 6**  From the **Field** drop-down list, choose **Field 1** or **Field 2**.

**Step 7**  From the **Line** drop-down list, choose the location of the VBI data.

**Step 8**  Check the **Trigger - Enable** check box to enable alarm generation if the VBI data line disappears or uncheck this check box otherwise.

**Step 9**  In the **Alarm Debounce (ms) - Begin** field, if alarm generation is enabled, enter the time (between 1 and 5000 ms) that the error must be present before an alarm message is generated.

**Step 10**  In the **Alarm Debounce (ms) - End** field, if alarm generation is enabled, enter the time (between 1 and 5000 ms) that the error must be cleared before the alarm message is cleared.

**Step 11**  Click **Apply**.

---

**Tip**

If a particular VBI data line must no longer be extracted from the SDI source, click **X** in the row of the line.

---

### Configuring Alarm Triggering for HD Sources

**Procedure**

**Step 1**  In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2**  In the **Inputs** tree, double-click an SDI port.
The **Input SDI Streams** page appears.

**Step 3** In the **Input SDI Stream Settings** table, click the **VBI** arrow in the row of the stream for which alarm triggering for HD sources must be configured.

The **Input SDI Streams VBI** page appears.

**Step 4** From the **Video** drop-down list, choose **HD**.

**Step 5** In the **HD VBI** table, double-click the row. The row becomes editable.

**Step 6** Check the **Alarm Trigger - Enable** check box to enable alarm generation if the VBI data disappears or uncheck this check box otherwise.

**Step 7** In the **Alarm Debounce (ms) - Begin** field, if alarm generation is enabled, enter the time (between 1 and 5000 ms) that the error must be present before an alarm message is generated.

**Step 8** In the **Alarm Debounce (ms) - End** field, if alarm generation is enabled, enter the time (between 1 and 5000 ms) that the error must be cleared before the alarm message is cleared.

**Step 9** Click **Apply**.

---

**Configuring the EBU and DVB Component Generation**

**Procedure**

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu.

The **Tree View** page appears.

**Step 2** In the **Processing** tree, double-click the service for which VBI must be configured.

The **MFP Overview** page appears.

**Step 3** Click **VBI**.

The **MFP VBI** page appears.

**Step 4** In the **VBI Settings** table, double-click the row of the service for which VBI must be configured.

The row becomes editable.
Step 5 Check the **EBU PID - Enable** check box to enable EBU component generation.
Step 6 Check the **DVB PID - Enable** check box to enable VBI component generation (576i25 sources only).
Step 7 In the **DVB PID - Include** column and if the **DVB PID - Enable** check box is checked, check the check box of the VBI information that must be included.
Step 8 In the **Delay (ms) - Relative** field, enter a value between −600 and +600 ms in steps of 1 ms; default value is 0. This parameter allows you to synchronize the EBU/VBI component with the video component in the encoded service.
Step 9 Click **Apply**.

## Setting up a Teletext Descriptor

The DCM allows you to configure the generation of a Teletext Descriptor (ETSI EN 300 468) for each encoded service. For each service, 16 different loops can be specified and each loop describes the language, the type of teletext that is situated on specific magazines, and the pages in these magazines. This descriptor is added at elementary stream level in the corresponding PMT (program map table).

### Procedure

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2** In the **Processing** tree, double-click the service for which the generation of a Teletext Descriptor must be configured. The **MFP Overview** page appears.

**Step 3** Click **VBI**. The **MFP VBI** page appears.

**Step 4** In the **VBI Settings** table, click $\square$ in the row of the corresponding service. The following dialog box appears.

**Step 5** Perform the following steps for each loop that must be added:  
  a) Click **Add Row**.  
     An empty row is added to the **Teletext Descriptor Data** table.
  b) In the **Language** field, enter the 3-character language code (as specified by ISO 639-2 [15]).
  c) From the **Type** drop-down list, choose one of the following Teletext types:
     - **Initial Page**—The first teletext page.
     - **Subtitle**—Teletext subtitle page.
• **Subtitle For Hearing Impaired**—Teletext subtitles for hearing impaired people.
• **Program Schedule**—For program schedule.
• **Additional Information**—For various information.

d) In the **Magazine** field, enter a number in the range from 0 to 7. On a teletext decoder, magazine 1 is seen as page 100, magazine 2 as page 200, and so on. Magazine 0 denotes teletext on pages 800 and above.
e) In the **Descriptor Page** field, enter the page number as a decimal number in the range from 0 to 255. Although the page number is entered as a decimal number, the teletext decoder displays a hexadecimal number. For example, Magazine 2 page 152 is displayed as page 298, where 0x98 corresponds to 152 decimal.
f) Click **Apply**.

**Step 6**
If all loops are added, click **Close**.

---

**Note**
To remove Teletext Descriptor loops, select the rows of the loops in the **Teletext Descriptor Data** table and click **Remove All Selected**.

---

**Identifying VANC Data in HD Sources for Transparently Passing**

The following procedure describes how to identify VANC data in an incoming SDI stream by filtering on DID/SDID.

**Procedure**

**Step 1**
In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2**
In the **Inputs** tree, double-click an SDI port. The **Input SDI Streams** page appears.

**Step 3**
In the **Input SDI Stream Settings** table, click the **VBI** arrow in the row of the VBI stream for which VANC data must be identified. The **Input SDI Streams VBI** page appears.

**Step 4**
From the **Video** drop-down list, choose HD. The **HD VBI** table appears.

**Step 5**
Double-click the row to be modified. The row becomes editable.

**Step 6**
Click $\triangleright$ in the **ST 2038 - DD:SDID** field. The **ST-2038 Configuration** dialog box appears.

**Step 7**
Click **Add Row** and specify the DID and SDID in the new entry.

**Step 8**
Repeat Step 7 for each entry to be added. Remark that only three entries can be added.

**Step 9**
Click **OK**.
The DID and SDID of the entries are shown beside the icon.

**Step 10** Click Apply.

---

### Configuring the Service-Related Encode Settings of a Service

The DCM GUI allows you to change the following service-related settings for an encoded service.

- **Adapt (P)SI** — After encoding a baseband stream, particular PSI/SI/PSIP (program-specific information / service information / program and system information protocol) information can be added to the corresponding service. The inserted information depends on the standard mode: DVB, Legacy ATSC, or ATSC/DC-II (DigiCipher-II). The PSI/SI/PSIP insertion can also be disabled.

- **Maximum Bit Rate Descriptor Mode** — The maximum bit rate descriptor indicates the maximum bit rate including the transport overhead of the services or the components.
  - **Not Present** — No descriptor is generated.
  - **Generate for ES** — A descriptor is generated by the DCM for each component with the maximum bit rate based on the configured ES rate.
  - **Generate for Program** — A descriptor is generated by the DCM for the service. The maximum bit rate must be entered in the **Max TS Rate** field.
  - **Generate for both** — A descriptor is generated by the DCM for each component with the maximum bit rate based on the configured ES (elementary stream) rate and for the service. The maximum bit rate for the service level maximum bit rate descriptor must be entered in the Max TS Rate field.

- **PCR Interval (ms)** — This parameter determines the playout interval of the PCR. A value can be entered between 10 and 300 ms; the default value is 37 ms. Remark that this parameter has no effect if the PCR belongs to an encoded audio component, for instance, to an audio-only service.

- **PCR Location Mode** — This parameter determines if the PCR is forced on the video component.
  - **Separate PID** (default) — The PCR is not inserted on the encoded video component.
  - **On Video** — The PCR is inserted on the encoded video component and referenced in the PMT.

- **End to End Delay (ms)** — This parameter shows the end-to-end delay (5000 ms).

For PiP streams, the **PCR Interval** parameter can also be configured.

### To Configure the Service Encode Settings

**Procedure**

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu.
The **Tree View** page appears.

**Step 2** In the **Processing** tree, double-click the service for which service settings must be configured. The **MFP Overview** page appears.

**Step 3** Click **Service**, and then click the **Settings** tab. The **MFP Service Settings** table appears.

**Step 4** Double-click the row for which settings must be changed. The corresponding row is editable.

- **Step 5** Check the **Adapt (P)SI** check box to insert PSI/SI/PSIP information or uncheck this check box otherwise. Choose the standard mode from the **Adapt (P)SI** drop-down list: DVB, Legacy ATSC, or ATSC/DC-II.

- **Step 6** From the **Maximum Bit Rate Descriptor Mode** drop-down list, choose **Generate for ES**, **Generate for Program**, **Generate for Both**, or **Not Present**.

- **Step 7** If the **Maximum Bit Rate Descriptor Mode** is set to **Generate for Program** or **Generate for Both**, enter the maximum bit rate in the **Max TS Rate (Mbps)** field.

  **Note:** If a PiP stream is created from the encoded video stream, click the row of the service. A dialog box appears. Enter the maximum bit rate in the **Max TS Rate (Mbps)** field of the corresponding streams and click **OK**.

- **Step 8** In the **PCR Interval (ms)** field, enter the playout interval for the PCR packets.

- **Step 9** From the **PCR Location Mode** drop-down list, choose **Separate PID** or **On Video**.

- **Step 10** Click **Apply**.

---

**Changing Service Encode Settings Using the Update Function**

When settings of multiple services must be changed to similar values, the Update Service Settings function of the GUI can be used.

**Procedure**

- **Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

- **Step 2** In the **Processing** tree, double-click the service for which service settings must be configured. The **MFP Overview** page appears.

- **Step 3** Click **Service**, and then click the **Settings** tab.
The **MFP Service Settings** table appears.

**Step 4** In the **Service Settings** table, select the rows for which setting must be changed.

**Step 5** In the **Update Service Settings** area, modify the corresponding settings and click **Update All Selected**. All selected rows are editable and get these new values.

**Step 6** Click **Apply**.

---

### Configuring the Service Related Encode Settings of a PiP Stream

#### Procedure

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2** In the **Processing** tree, double-click the PiP stream for which service settings must be configured. The **MFP Overview** page appears.

**Step 3** Click **Service**, and then click the **PIP** tab. The **MFP Service PIP** table appears.

**Step 4** In the **PIP Service Settings** table, double-click the row for which settings must be changed. The corresponding row is editable.

<table>
<thead>
<tr>
<th>PID</th>
<th>PCR Interval (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>258</td>
<td>27</td>
</tr>
</tbody>
</table>

**Step 5** In the **PCR Interval (ms)** field, enter the playout interval for the PCR packets.

**Step 6** Click **Apply**.

---

### Changing Service Related Encode Settings of PiP Streams Using the Update Function

When this setting of multiple services must be changed to similar values, the Update Settings function of the GUI can be used.

#### Procedure

**Step 1** In the DCM GUI, choose **Service > Tree View** from the main menu. The **Tree View** page appears.

**Step 2** In the **Processing** tree, double-click the PiP stream for which service settings must be configured.
Removing Services

The following topics describe the different ways to remove services from an encoding engine.

**Note**
Deleting a service that is routed to the output is not possible.

Removing Services Using the Right-Click Menu

**Procedure**

Step 1  In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2  In the Processing tree, right-click the service that must be removed and choose Delete.

**Note**: To protect the application from accidentally removing of services, an extra confirmation can be asked. To enable or disable this confirmation feature, see Changing the Tree Settings. When this feature is enabled, a confirmation box is displayed. Click Yes.

The service is removed from the tree.

Removing Services Using the Service Overview Table

**Procedure**

Step 1  In the DCM GUI, choose Service > Tree View from the main menu. The Tree View page appears.

Step 2  In the Processing tree, double-click the MFP MK2 branch from which services must be removed.
Removing Services Using the Service Overview Table

The **MFP Overview** table of the selected card appears.

**Step 3**

In the **Service Overview** table, click **X** in the row each service that must be removed or select all the services that must be removed and click **Delete Selected Items**.

**Hint**: After clicking **X** and the **Delete Confirmation on Single Click Delete** option is enabled, a confirmation box will be displayed. Click **OK** to confirm.
Removing Services Using the Service Overview Table