

Matrox mvTopologyBuilder

User Guide

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Preliminary

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Contents

1

mvTopologyBuilder User Interface Overview

This chapter provides an overview of the mvTopologyBuilder window and explains the Main menu, Main toolbar, Topology view, Item tree, mvTopologyBuilder panes, Permanent memory manager, and mvTopologyBuilder Crash me tool.

About mvTopologyBuilder

The *mvTopologyBuilder* application provides a graphical representation of topology-based interfaces for controlling Matrox hardware. It allows users to control all the I/O and hardware-related operations for topology-based hardware, such as X.mio3 and DSX LE4. For details on the Matrox topology-based API and a description of the topology-based terminology, see the *Matrox DSX Topology API User Guide*.

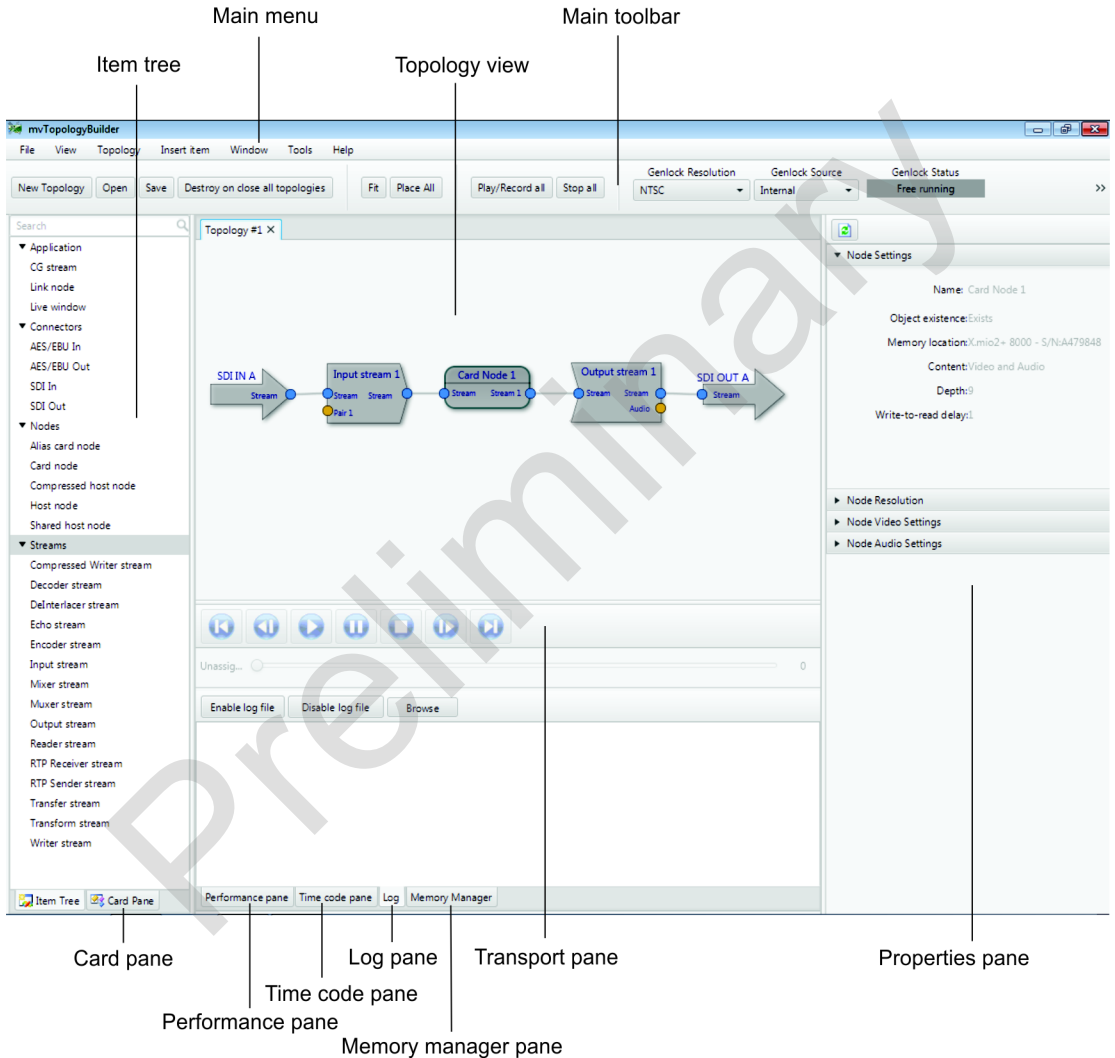
The *mvTopologyBuilder* application is a diagnostic tool designed to create and manage topologies that represent specific workflows. You can also intentionally crash the application to ensure that faulty behavior is reported properly.

This chapter provides details about the mvTopologyBuilder interface. For information on how to use mvTopologyBuilder to create a new system topology and add items to it, see [Chapter 2, “Using mvTopologyBuilder to Manage Topologies,”](#) on page 23. For system topologies examples, see [Chapter 3, “Working with System Topologies,”](#) on page 77.

Overview of the mvTopologyBuilder window

The **mvTopologyBuilder** window consists of a Main menu, a Main toolbar, an Item tree, several panes, and a Topology view.

mvTopologyBuilder window



The following is a brief overview of the **mvTopologyBuilder** window:

- **Main menu** This menu allows you to perform basic operations (see [“Using the Main menu”](#) on page 5).
- **Main toolbar** This toolbar provides a shortcut to common operations such as creating a new topology, opening a topology, and saving a topology (see [“Using the Main toolbar”](#) on page 7).
- **Topology view** This view displays the items contained in a topology that has been created (see [“Using the Topology view”](#) on page 8).
- **Item tree** This displays all the items that can be added to a topology (see [“Using the Item tree”](#) on page 9).
- **Card pane** This pane displays, in a tree structure, the available cards that are supported by the API along with topologies, software clocks, and watchdogs (see [“Card pane”](#) on page 15).
- **Performance pane** This pane displays the Matrox Control Engine (MCE) workload performance of the selected card (see [“Performance pane”](#) on page 17).
- **Time code pane** This pane displays the time code values of all the created input streams and the time code from a time code input connector that is available on certain cards (see [“Time code pane”](#) on page 18).
- **Log pane** This pane displays messages from the application in a log window (see [“Log pane”](#) on page 19).
- **Memory manager pane** This pane displays the amount of memory used (in MB) for the current process.
- **Transport pane** This pane is used to control the reader stream, writer stream, encoder stream, decoder stream, and RTP receiver stream (see [“Transport pane”](#) on page 16).
- **Properties pane** This pane displays the settings of the currently selected item in the Topology view or Card pane (see [“Properties pane”](#) on page 17).

Using the Main menu

The Main menu allows you to perform basic operations and contains the **File**, **View**, **Topology**, **Insert item**, **Window**, **Tools**, and **Help** menus (see figure “[mvTopologyBuilder window](#)” on page 3).

File menu

The **File** menu contains operations for creating, opening, and saving a topology, as well as the option to exit the application.

Note Creating, opening, and saving a topology are also available in the Main toolbar. For more information on the Main toolbar, see “[Using the Main toolbar](#)” on page 7.

View menu

The **View** menu allows you to open a Live window if it has been closed in the Topology View.

Topology menu

The **Topology** menu allows you to perform specific operations on the current topology.

The **Refresh document** option updates the settings of the current topology.

The **Refresh properties** option updates the settings of all topologies of the currently selected card.

The **Play/record all** option plays back or encodes certain streams of the current topology. The playback and encoding are synchronized to the same time stamp. You can also click **Play/record all** in the Main toolbar, or to playback or encode the selected stream only, click **Play** (▶) or **Record** (Ⓜ) in the Transport pane.

The **Stop all play/record** option stops all playback or encoding of the current topology. You can also click **Stop all** in the Main toolbar, or to stop the playback or encoding of the selected stream only, click **Stop** (◻) in the Transport pane.

The **Add to default state** option adds the current topology to the default state of the card. For more information on the default state, see “[Working with the default state of the card](#)” in the *Matrox DSX Topology API User Guide*.

The **Destroy topology** option destroys the current topology from the card. For more information on the different ways that you can destroy a topology, see “[Destroying a topology](#)” on page 6.

Insert item menu

The **Insert item** menu can be used to add an item to a topology. The items that can be added are: CG stream, link node, Live window, AES/EBU input, AES/EBU output, SDI input, SDI output, alias card node, card node, compressed host node, host node, shared host node, compressed writer stream, decoder stream, de-interlacer stream, echo stream, encoder stream, input stream, mixer stream, muxer stream, output stream, reader stream, RTP receiver stream, RTP sender stream, transfer stream, transform stream, and writer stream.

Note Items can also be added using the Item tree. For more information on the different ways that items can be added to a topology, see [“Adding items to a topology”](#) on page 4.

Tools menu

The Tools menu can be used to manage the permanent memory and contains utility methods used for debugging. The log file can be enabled or disabled. You can search for a particular log file, and the topology can be tested using Crash me. For more information on managing the permanent memory, see [“Using the Permanent memory manager”](#) on page 20. For more information on the Crash me, see and [“Using the mvTopologyBuilder Crash me tool”](#) on page 22.

Help menu

The Help menu contains information about short cuts and the application version.

Using the Main toolbar

The Main toolbar provides shortcuts to common operations. The following items are found on the Main toolbar (see figure “[mvTopologyBuilder window](#)” on page 3):

- **New topology** Creates a new topology (see “[Creating a new topology](#)” on page 3).
- **Open** Opens an existing topology from an *.mvst* file. For the different ways to open an existing topology, see “[Loading a topology](#)” on page 6.
- **Save** Saves all the settings of all the items of a topology to an *.mvst* file. For the different ways to save a topology, see “[Saving a topology](#)” on page 5.
- **Destroy topologies on close** Sets all topologies to **Destroy on close**. The next time any topology is closed, it will be destroyed.
- **Fit** Positions all the items in the current topology within the Topology view.
- **Place all** Positions all the items in the current topology in an orderly fashion in the Topology view window.
- **Play/record all** Plays back or encodes certain streams of the current topology. The playback and encoding are synchronized to the same time stamp. You can also choose **Topology > Play/record all**, or to playback or encode the selected stream only, click **Play** (▶) or **Record** (⊙) in the Transport pane.
- **Stop all** Stops all playback or encoding of the current topology. You can also choose **Topology > Stop all play/record**, or to stop the playback or encoding of the selected stream only, click **Stop** (■) in the Transport pane.
- **Genlock resolution, Genlock source, and Genlock status** Use these settings to select a genlock resolution and genlock source, and check the status of the genlock for the currently selected card in the Card pane. For more information on the genlock, see “Using genlock control” in the *Matrox DSX Topology API User Guide*. You can also use the Properties pane to select the genlock settings (see “[Properties pane](#)” on page 17).

Using the Topology view

The Topology view displays all the items contained in a topology and is positioned in the center of the **mvTopologyBuilder** window (see figure “[mvTopologyBuilder window](#)” on page 3). If more than one topology is open at the same time, each topology will be placed in a separate tab.

Note When an item in a topology is selected, the Properties pane reflects the settings of the currently selected item. For more information on the Properties pane, see “[Properties pane](#)” on page 17.

Zooming in or out of the Topology view

- Press **CTRL**, then using the mouse wheel:
 - Scroll up to zoom in.
 - Scroll down to zoom out.

Moving the Topology view left or right

- Press **SHIFT**, then using the mouse wheel:
 - Scroll up to move the Topology view to the right.
 - Scroll down to move the Topology view to the left.
- Drag the background of the Topology view to the left or to the right.

Moving the Topology view up or down

- Using the mouse wheel:
 - Scroll up to move the Topology view down.
 - Scroll down to move the Topology view up.
- Drag the background of the Topology view up or down.

Connecting items in the Topology view

- Drag an item’s output to another item’s input.

Note When dragging from an item’s output, a connecting line will appear. If the line is red, the connection is not good. If the line is white, the connection is good.

Disconnecting items in the Topology view

- Select the item’s connection and press **DELETE**.

For information on creating a topology, adding items, placing items, deleting items, playing a topology, saving a topology, loading a topology, closing a topology, and destroying a topology, see “[Creating a new topology](#)” on page 3.

Using the Item tree

The Item tree displays all the items that can be added to a topology. There are five categories of items that can be added (see figure “[mvTopologyBuilder window](#)” on page 3):

- **Application items** The application items represent software modules implemented only in the **mvTopologyBuilder** application that interact with the topology. These items send or retrieve data to or from the nodes in the topology. The application items consist of the CG stream, link node, and Live window. For more information, see “[Application items](#)” on page 9.
- **Connector items** The connector items represent available input and output connectors present on the card that can be added to a topology, and consist of SDI inputs, SDI outputs, AES/EBU audio inputs, and AES/EBU audio outputs. For more information, see “[Connector items](#)” on page 11.
- **Node items** The node items represent the different types of nodes that can be added to a topology and consist of the alias card node, card node, compressed host node, host node, and shared host node. For more information, see “[Node items](#)” on page 12
- **Hardware stream items** The hardware stream items represent hardware processing units on the card that can be added to a topology and consist of the input stream, output stream, transform stream (if created between two card nodes), mixer stream, and de-interlacer stream. For more information, see “[Hardware stream items](#)” on page 13.
- **Software stream items** The software stream items represent CPU processing units available in the DSX.sdk that can be added to a topology and consist of the compressed writer stream, decoder stream, echo stream, encoder stream, muxer stream, reader stream, RTP receiver stream, RTP sender stream, transfer stream, transform stream (if created between two host nodes), and writer stream. For more information, see “[Software stream items](#)” on page 13.

Application items

Application items represent software modules implemented only in the **mvTopologyBuilder** application that interact with the topology. These items send or retrieve data to or from nodes in the topology.

Remarks

- Application items do not reside in the card. Therefore, they cannot be saved to the default state of the card.
- Once an application item is added, it cannot be disconnected. However, it can be connected to a different item.

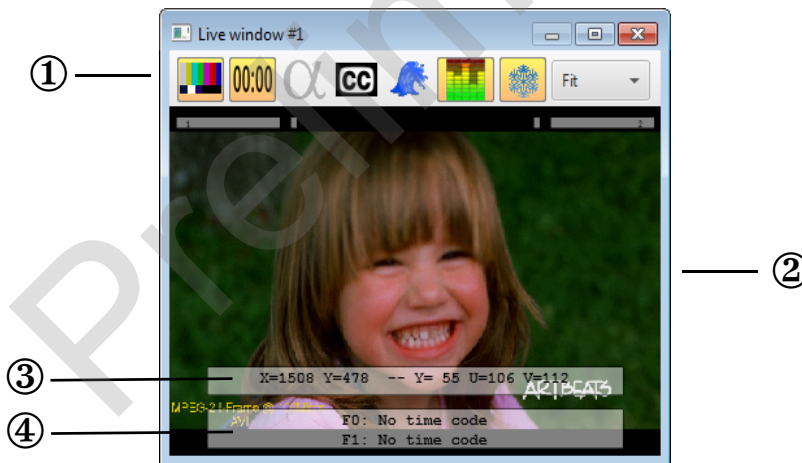
The application items that can be added consist of the following:

- **CG stream** Generates video from a graphic file (such as *.422*, *.bmp*, *.mgf*, and *.tga* files), constant color, or a string. Audio data can be generated at a different intensity, frequency, and phase on all 16 channels. The CG stream can also generate test VITC and LTC time code data. As well, it can generate a moving bar over a black background. For information on creating a CG stream, see “[Creating a CG stream](#)” on page 20.
- **Link node** Accesses data from a host node in any topology of the same process. For information on creating a link node, see “[Creating a node](#)” on page 31.
- **Live window** Displays the contents of a node. For more information on this item, see “[Live window item](#)” on page 10.

Live window item

The Live window item is used to display the content of a node. It can be used to display video, alpha (key), VANC, time code, and monitor audio levels (through VU meters or a waveform). For more information on creating a Live window, see “[Creating a Live window](#)” on page 73.

Note Once a Live window is added, it cannot be disconnected. However, it can be connected to the output of a different node.











The Live window contains the following four areas:

- ① **Toolbar** Use the toolbar to select the display mode.
- ② **Data area** Displays the node content. The data that is displayed depends on the display mode selected in the toolbar.

- ③ **Color picker** Displays the color values used at the coordinates the mouse pointer hovers over.
- ④ **Information area** Displays the time code associated with the node content.

The Live window retrieves only data specified in the Properties pane. For more information on using the Properties pane, see “[Properties pane](#)” on page 17. The Live window data area uses OpenGL to draw the data.

The toolbar contains the following buttons:

-  **Video** Displays the video content of the node.
-  **Time code** Displays the time code information associated with the node content.
-  **Alpha channel** Displays the alpha (key) channel of the node image.
-  **VANC** Displays the actual digital information of the VANC data. The VANC data is not interpreted.
-  **Waveform** Displays the audio waveform.
-  **VU meters** Shows or hides the audio levels through VU meters.
-  **Freeze** Freezes or unfreezes a frame in the Live window. When a video frame is frozen, the state of the frame can be viewed.
-  **Scale factor** Zooms in or out of the video or key data. When zoomed in, you can drag the image to see the other parts of the image.

Note When the data area of the Live window displays video or key data, you can use the mouse wheel to zoom in and out of the image to monitor specific pixels of the image more precisely. When zoomed in, you can drag the image to see the other parts of the image.

Connector items

Connector items represent the physical connections on the card. The connector items that can be added to a topology consist of the following:

- **SDI In** Represents an SDI input connector on the card. The connector transmits the SDI data stream including the video, audio, VANC, and time code to an input stream.
- **SDI Out** Represents an SDI output connector on the card. This item takes data from an output stream and sends it to the proper SDI output connector.
- **AES/EBU In** Represents an AES/EBU input connector on the card. The connector transmits an AES/EBU audio data pair to the input stream and replaces an embedded SDI audio pair.
- **AES/EBU Out** Represents an AES/EBU output connector on the card. This item takes audio data from an output stream and sends it to the proper AES/EBU output connector.

When you create an input or output stream, the selected SDI input or output connector is automatically added to the topology and connected to the stream. If you want to also use an AES/EBU input or output connector, you must manually add the connector and connect it to the stream. For information on adding connector items to a topology, see [“Adding items to a topology”](#) on page 4.

When a connector item is added, it does not need to be connected. However, an input connector can only be connected to an input stream and an output connector can only be connected to an output stream. You cannot delete a connector from a topology when it is connected to a stream. To delete the connector, you must first delete the stream to which it is connected (see [“Deleting items in a topology”](#) on page 5).

When adding a connector to a topology, the Properties pane shows the connector’s properties. For more information on using the Properties pane, see [“Properties pane”](#) on page 17.

Node items

A node item is an element in a system topology that contains video, audio, and VANC data. The data contained in the node is received by a maximum of three streams and passed to one or more streams. It is a connection point between streams. Depending on the type of node, the node’s data can be located in host memory or a card’s onboard memory. For more information on creating a node, see [“Creating a node”](#) on page 31.

The different types of node items that can be added to a system topology consist of the following:

- **Alias card node** Represents a read-only card node that is used to access the data contained in a card node owned by another or the same process.
- **Card node** Represents a node located in a card’s onboard memory.
- **Compressed host node** Represents a node located in host memory that contains compressed video data, compressed audio data, compressed VANC data, or transport stream (TS) muxed buffers.
- **Host node** Represents a node located in host memory.
- **Shared host node** Represents a node located in host memory that is used to access host node data from other processes.

Note Host nodes, compressed host nodes, and shared host nodes do not reside in the card. Therefore, they cannot be saved to the default state of the card.

Hardware stream items

Hardware stream items represent physical hardware present on the card that can be added to a topology.

The hardware items that can be added consist of the following:

- **Input stream** Represents one input channel on a card. An input stream receives data from an input connector and sends it to a node. For information on creating an input stream, see [“Creating an input stream”](#) on page 37.
- **Output stream** Represents one output channel on a card. An output stream receives data from a node and sends it to an output connector. For information on creating an output stream, see [“Creating an output stream”](#) on page 41.
- **Transform stream** Processes data from one card node and sends it to another card node. A transform stream can include in-line processing such as scaling, processing ancillary data, and copying audio. For information on creating a transform stream, see [“Creating a transform stream”](#) on page 45.
- **Mixer stream** Mixes video from multiple nodes into one node to perform video compositing. Audio and VANC data can be copied from any of the sources to the node containing the composited video. For information on creating a mixer stream, see [“Creating a mixer stream”](#) on page 48.
- **De-interlacer stream** Takes interlaced video data from a card node, modifies the video data to remove interlace or motion artifacts, and sends the result to another card node containing progressive video data. Audio and VANC data can be copied from the input card node to the output card node containing the progressive video data. For information on creating a de-interlacer stream, see [“Creating a de-interlacer stream”](#) on page 58.

Software stream items

Software stream items represent CPU processing units available in the DSX.sdk that can be added to a topology.

Remarks

- Software stream items do not reside in the card. Therefore, they cannot be saved to the default state of the card.
- Once a software stream item is added, it cannot be disconnected. However, it can be connected to a different item.

The software items that can be added consist of the following:

- **Compressed writer stream** Takes compressed video, audio, and VANC data from a compressed host node, and writes it to a file. For information on creating a compressed writer stream, see [“Creating a compressed writer stream”](#) on page 56.
- **Decoder stream** Uncompresses video, audio, and VANC data from a compressed host node using a supported decoder, and sends it to a host node. For

information on creating a decoder stream, see [“Creating a decoder stream”](#) on page 57.

- **Echo stream** Propagates VANC data from a compressed host node to a host node without altering the data, and vice-versa. For information on creating an echo stream, see [“Creating an echo stream”](#) on page 60.
- **Encoder stream** Compresses video, audio, and VANC data from a host node using a supported encoder, and sends it to a compressed host node. For information on creating an encoder stream, see [“Creating an encoder stream”](#) on page 61.
- **Muxer stream** Multiplexes compressed video, audio, and VANC elementary streams from compressed host nodes into a single MPEG-2 program transport stream (SPTS) muxed buffer, and sends it to a compressed host node. For information on creating a muxer stream, see [“Creating a muxer stream”](#) on page 62.
- **Reader stream** Reads video, audio, and VANC data from a file, decompresses it, and sends it to a host node. The reader stream can read different file types in sequence, as long as the frame rate of the file is the same as the frame rate of the host node and a suitable decompressor is available. For information on creating a reader stream, see [“Creating a reader stream”](#) on page 51.
- **RTP receiver stream** Receives compressed MPEG-2 transport stream (TS) data from a specified IP address and sends it to a compressed host node. For information on creating an RTP receiver stream, see [“Creating an RTP receiver stream”](#) on page 67.
- **RTP sender stream** Transforms a stream containing TS packets from a compressed host node into RTP packets, and then sends the packets to the specified IP address (IPv4) using UDP (User Datagram Protocol). For information on creating an RTP sender stream, see [“Creating an RTP sender stream”](#) on page 65.
- **Transfer stream** Takes video, audio, and/or VANC data from a node and transfers it to another node at a different memory location. The input node settings and the output node settings must be the same. The data is copied without any modification. For information on creating a transfer stream, see [“Creating a transfer stream”](#) on page 69.
- **Transform stream** Processes data from one host node and sends it to another host node. A transform stream can include in-line processing such as scaling, processing ancillary data, and copying audio. For information on creating a transform stream, see [“Creating a transform stream”](#) on page 45.
- **Writer stream** Takes video, audio, and VANC data from a host node, compresses it, and writes it to a file. The writer stream can be configured to compress the video data only, the audio data only, the video and audio data, the

video and VANC data, or the video, audio, and VANC data. For information on creating a writer stream, see [“Creating a writer stream”](#) on page 53.












Using the mvTopologyBuilder panes


The *mvTopologyBuilder* panes allow you to configure items in the API, as well as provide feedback concerning hardware events. The *mvTopologyBuilder* panes consists of a Card pane, Transport pane, Properties pane, Performance pane, Time code pane, Log pane, and Memory manager pane. The following sections provide more detail on each of these panes.

Card pane

The Card pane displays, in a tree structure, the available cards that are supported by the API along with system topologies, software clocks, and watchdogs. When an item in the tree structure is selected, information related to the selected item is displayed in the Properties pane. Depending on the item that is selected, different properties will be displayed in the Properties pane. For more information on the Properties pane, see [“Properties pane”](#) on page 17.

The toolbar in the Card pane contains the following buttons:

-  **Refresh all** Updates the settings of all topologies by querying the currently selected card.
-  **Topology menu:**
 -  **Open** Opens the currently selected topology in the Topology view. For different ways to open an existing topology, see [“Loading a topology”](#) on page 6.
 -  **New** Creates a new topology. For more information on how to create a new topology, see [“Creating a new topology”](#) on page 3.
 -  **Destroy** Destroys the currently selected topology from the card. For different ways to destroy a topology, see [“Destroying a topology”](#) on page 6. This button is available only when a topology is currently selected.
-  **Watchdog menu:**
 -  **New** Creates a new watchdog. For more information on creating a watchdog, see [“Creating a watchdog”](#) on page 24.
 -  **Destroy** Destroys the currently selected watchdog from the card. This button is available only when a watchdog is selected.
-  **Software clock menu:**
 -  **New rendering** Creates a new rendering clock. For more information on creating a rendering clock, see [“Creating a new rendering clock”](#) on page 25.
 -  **New universal** Creates a new universal clock. For more information on creating a universal clock, see [“Creating a new universal clock”](#) on page 26.

-  **Destroy** Destroys the currently selected clock. This option is available only when after a rendering clock or universal clock is created.









Transport pane

The Transport pane is used to control the reader stream, writer stream, encoder stream, decoder stream, and RTP receiver stream (see figure “[mvTopologyBuilder window](#)” on page 3). Different controls are available depending on the stream that is selected.

Note The Transport pane can only be used if a stream is selected.



Transport pane for the reader stream

When a reader stream is selected, the Transport pane contains the following buttons:

-  **Play** Plays back the reader stream of the current topology.
-  **Pause** Pauses the playback of the reader stream.
-  **Stop** Stops the playback of the reader stream.
-  **Next frame** Skips to the next frame in the playback.
-  **Previous frame** Rewinds to the previous frame in the playback.
-  **Start of file** Goes to the start of the file.
-  **End of file** Goes to the end of the file.
-  **Scrubbing bar** Drag the slider to go to a specific frame in the file.

Transport pane for the writer, encoder, decoder, and RTP sender stream

When a writer stream, encoder stream, decoder stream, or RTP receiver stream is selected, the Transport pane contains the following buttons:


-  **Record** Encodes or decodes the stream of the current topology.
-  **Stop** Stops the encoding or decoding of the stream.

Properties pane

The Properties pane displays the settings of the currently selected item in the topology (see figure “[mvTopologyBuilder window](#)” on page 3). Depending on the item that is selected, different properties will be displayed in the Properties pane. The Properties pane can be used to view the properties of the selected item, as well as edit the properties that were defined when the item was created. For some items, you can define additional properties that were not available when the item was created.

Note You may be required to expand the properties in the Properties pane to view or edit the settings.

The Properties pane contains the following button:

-  **Refresh** Refreshes the properties in the Properties pane to show the values that are currently being used in the hardware.

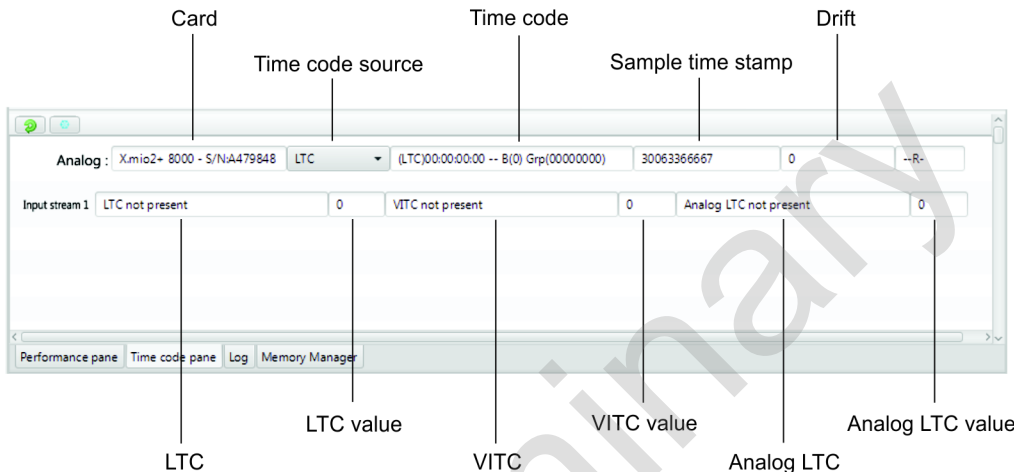
Performance pane

The Performance pane displays the Matrox Control Engine (MCE) workload performance of an X.mio2 Plus card (see figure “[mvTopologyBuilder window](#)” on page 3). As you perform operations on this card, the Performance pane displays the current workload performance of the MCE in a graph. Certain operations, such as adding a topology to the default state requires a greater workload, while other operations require a smaller workload. The performance of all operations on the card are reflected in a graphical representation in the Performance pane.



Note If the card is other than an X.mio2 Plus, the Performance pane will not display anything in the graph.

Time code pane

The Time code pane displays the time code values of all the created input streams and allows you to see the time code from the time code input connector that is available on certain cards (see figure “mvTopologyBuilder window” on page 3). For more information on time code, see the *Matrox DSX Topology API User Guide*.



The Time code pane contains the following:

-  **Reset drift** Resets the time code drift calculation to zero.
-  **Pause** Freezes or unfreezes the update of the time code value.
- **Card** Displays the card for which the time code information is displayed.
- **Time code source** Use this to select the time code source. The different sources are the linear time code (LTC) input and the black burst reference input. The LTC input source extracts the analog LTC, whereas the black burst reference input source extracts vertical interval time code (VITC).
- **Time code** Displays the time code of the currently selected card.
- **Sample time stamp** Displays the system time corresponding to the time code displayed.
- **Drift** Displays the difference in time between the system time and the time code of the card.
- **LTC** Indicates whether or not LTC is present.
- **LTC value** Displays the SMPTE 12M-2 LTC value.
- **VITC** Indicates whether or not VITC is present.
- **VITC value** Displays the SMPTE 12M-2 VITC value.
- **Analog LTC** Indicates whether or not analog LTC is present.

- **Analog LTC value** Displays the SMPTE 12M-1 analog LTC value.

Log pane

The Log pane displays messages from the application (see figure “[mvTopologyBuilder window](#)” on page 3). It displays error codes of calls that failed, status messages, and information messages.

The Log pane contains the following buttons:

- **Clear log window** Clears the currently displayed messages in the Log pane.
- **Enable log to file** Saves the Log pane messages to a log file.
- **Disable log to file** Stops sending Log pane messages to a log file.
- **Browse** Selects the file name and location of the log file that you would like to save.

Remarks

- The Log pane displays the last 2 MB of text.
- The speed of incoming log messages may be faster than the speed that they can be displayed. In this case, the messages accumulate until they can be processed. However, if more than 1000 messages accumulate, the log window will skip displaying them. However, if you enable saving the Log pane messages to a log file, all messages automatically get saved to a log file. No messages are dropped from the log file even if you clear the Log pane window.
- Each time you would like to create a new log file, click **Enable log to file**. The file name of the new log file is displayed in the Log pane, and contains the date and time it was created.

Memory manager pane

The Memory manager pane displays the amount of memory used (in MB) for the reader stream, writer stream, and any compressed host node (see figure “[mvTopologyBuilder window](#)” on page 3). As operations are performed, the Memory manager pane displays the amount of memory used in a graph.

To display the amount of memory used in the graph:

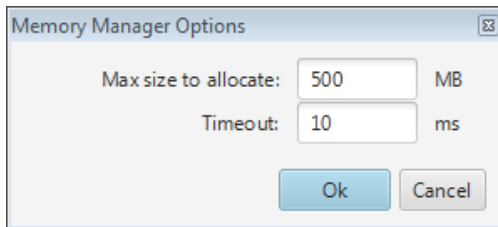
- Click **Start**.

The graph displays the amount of memory (in MB) being used (as a function of time). The table on the right is updated with the maximum value (in MB) that can be displayed in the graph, the amount of memory currently being used, the maximum memory size that can be allocated, and the timeout value.

Note To stop displaying the amount of memory being used, you can click **Stop** at any time.

To modify the Memory manager graph settings:

- 1 Click **Configure**. The **Memory manager options** dialog box opens.



- 2 In the **Max size to allocate** box, enter the maximum amount of memory (in MB) that you would like to allocate. This value is displayed on the y-axis of the graph.
- 3 In the **Timeout** box, enter the amount of time to wait (in milliseconds) before the application requests for more memory to be allocated if the maximum amount of memory to allocate has been surpassed.
- 4 Click OK.

The y-axis of the graph is modified to display the maximum value (in MB) that was entered. The legend on the right is updated with the maximum value that can be displayed in the graph and the timeout (in milliseconds).

To change the time at which the data in the graph is refreshed:

- Drag the **Refresh rate** slider.

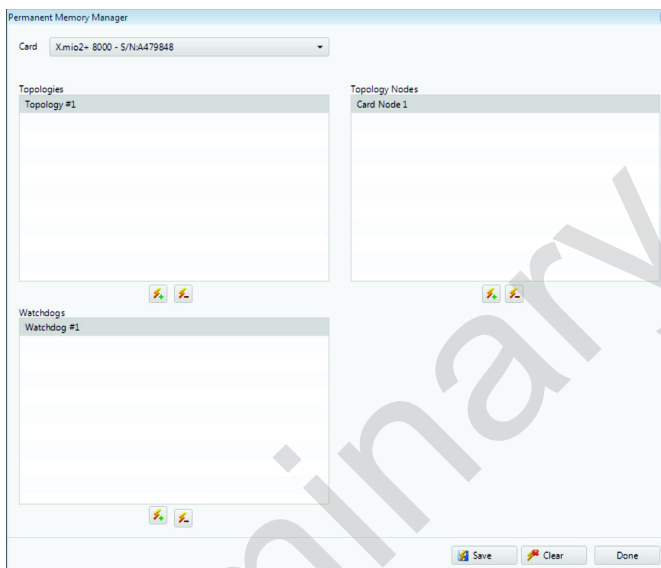
The data in the graph can be refreshed at any time between 0.02 to 2 seconds.

Using the Permanent memory manager

The Permanent memory manager is used to add or remove topologies and watchdogs to or from the default state. As well as save or clear the default state to or from the permanent memory of the card. On an X.mio2 Plus card, node content can be saved to or removed from the permanent memory of a card. For more information on the default state and the permanent memory of a card, see “Working with the default state of the card” in the *Matrox DSX Topology API User Guide*.

To use the Permanent memory manager:

- 1 Choose **Window > Permanent memory manager**. The **Permanent memory manager** dialog box opens.





- 2 From the **Card** list, select the card whose permanent memory you would like to modify.



The topologies and watchdogs available to be added or removed from the default state appear under **Topologies** and **Watchdogs**, respectively. If you selected an X.mio2 Plus card, available card nodes will appear under **Topology nodes**.


- 3 If required, click any of the following:


- Under **Topologies** and **Watchdogs**:

-  **Add to default state** Adds the currently selected topology or watchdog to the default state.
-  **Remove from default state** Removes the currently selected topology or watchdog from the default state.

- Under **Topology nodes**:

-  **Save to permanent memory** Saves the currently selected card node to the permanent memory of the card.
-  **Remove from permanent memory** Removes the currently selected card node from the permanent memory of the card.

-  **Save** Saves the default state to the permanent memory of the card.

-  **Clear** Clears the default state from the permanent memory of the card.

Remarks

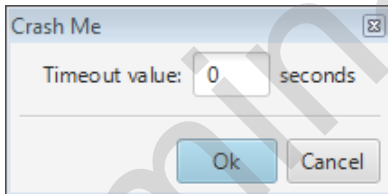
- Topologies and watchdogs are added to or removed from the default state in MCE memory.
- Node content is saved to or removed from the permanent memory. Because saving or deleting node content is not instantaneous, a dialog box appears to show the progress of the operation.
- Saving or clearing the default state to or from permanent memory is not instantaneous. When **Save** or **Clear** is clicked, a progress dialog box appears.

Using the mvTopologyBuilder Crash me tool

The *mvTopologyBuilder* Crash me tool allows you to crash the application so that you can test the watchdog behavior.

To use the Crash me tool:

- 1 Choose **Tools > Crash me**. The **Crash me** dialog box opens.



- 2 In the **Timeout value** box, enter the amount of time to wait (in seconds) before the application crashes.
- 3 Click **OK**.

Once the timeout has elapsed, the application does a NULL pointer access which causes it to throw an exception error resulting in a crash. If the watchdog has been configured properly, the watchdog will be triggered.

Preliminary

2

Using mvTopologyBuilder to Manage Topologies

This chapter explains how to use mvTopologyBuilder to create a new system topology and add items to it.

Overview

Before creating a topology using *mvTopologyBuilder*, you must select the genlock resolution and source. After you have selected the genlock resolution and source, you can create a new topology and add items to it. In most cases, the first item that must be added to a topology is a node. After adding a node, other items can be added. You can save and load a topology at any time. You can also delete a topology when it is no longer needed.

Selecting the genlock settings

In *mvTopologyBuilder*, you must select the genlock resolution and source before creating or opening a topology. For more information on genlock, see “Using genlock control” in the *Matrox DSX Topology API User Guide*.

To select the genlock settings:



- 1 In the Card pane, select the card for which you would like to select the genlock settings (if required, refer to the figure “[mvTopologyBuilder window](#)” on page 3).
- 2 Do one of the following to select the genlock settings:
 - In the Main toolbar, select the genlock resolution and source from the **Genlock resolution** list and **Genlock source** list.
 - In the Properties pane, expand **Genlock settings** (if required) and select the genlock resolution and source from the **Resolution** list and **Source** list.

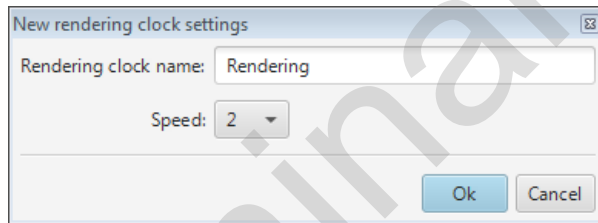
The genlock resolution and source are set for the selected card.

Creating a new software clock

If you would like to use a software clock, such as a rendering clock or universal clock, it must be created before creating a new system topology. Otherwise, it will not be available for selection when defining the new topology's settings. For more information on the DSX system clock, see "DSX System Clock" in the *Matrox DSX Topology API User Guide*.

Creating a new rendering clock

- 1 In the Card pane, select the card for which you would like to create a rendering clock (if required, refer to the figure "mvTopologyBuilder window" on page 3).
- 2 Select **New rendering** () from the **Software clock** menu ().
The **New rendering clock settings** dialog box opens.



- 3 In the **Rendering clock name** box, enter a name for the rendering clock.
- 4 From the **Speed** list, select the speed at which you would like the rendering clock to operate.

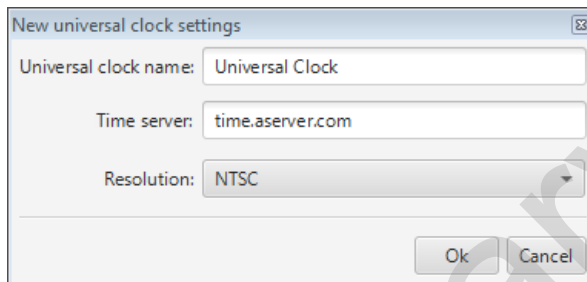
Note The possible values are one, two, four, or eight times the speed of the genlock.

- 5 Click **OK**.

A new rendering clock is added below the selected card in the Card pane.

Creating a new universal clock

- 1 In the Card pane, select the card for which you would like to create a universal clock (if required, refer to the figure “mvTopologyBuilder window” on page 3).
- 2 Select **New universal** (🌐) from the **Software clock** menu (🕒).
The **New universal clock settings** dialog box opens.




The screenshot shows a dialog box titled "New universal clock settings". It contains three input fields: "Universal clock name" with the text "Universal Clock", "Time server" with the text "time.aserver.com", and "Resolution" with a dropdown menu showing "NTSC". At the bottom right, there are two buttons: "Ok" and "Cancel".

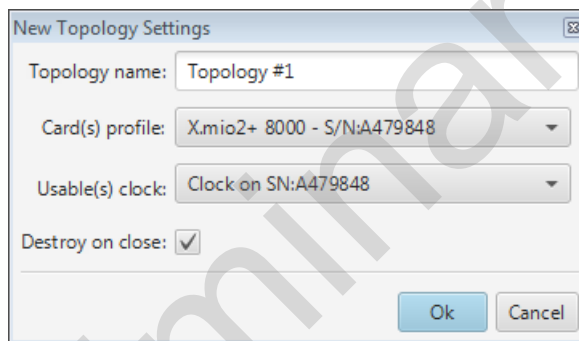
- 3 In the **Universal clock name** box, enter a name for the universal clock.
- 4 In the **Time server** box, enter the IP address (IPV4, such as 172.17.1.20) or the host address (such as time.aserver.com) that will be used by the universal clock.
- 5 From the **Resolution** list, select the resolution for the universal clock.
- 6 Click **OK**.
A new universal clock is added below the selected card in the Card pane.

Creating a new system topology

After selecting the genlock resolution, you can create a new system topology. For more information on topologies, see “Creating system topologies” in the *Matrox DSX Topology API User Guide*.

To create a new topology:

- 1 Do one of the following to open the **New topology settings** dialog box (if required, refer to the figure “mvTopologyBuilder window” on page 3):
 - Choose **File > New**.
 - In the Main toolbar, click **New topology**.
 - In the Card pane toolbar, select **New** from the **Topology** menu ().



- 2 In the **Topology name** box, enter a name for the topology.
- 3 From the **Card profile(s)** list, select the card for which you would like to create the topology.
- 4 From the **Usable clock(s)** list, select the clock source you would like to use.

Remarks

- When a genlock clock is selected as the clock source, the genlock resolution cannot be changed after the topology is created. The only way to change the genlock resolution is to destroy the topology and create a new topology with the required genlock resolution.
 - If you create a topology using an input system clock, you will not be able to add an output stream to the topology.
- 5 If you would like to destroy the topology when you close the Topology view, select **Destroy on close**.

6 Click OK.

A new topology is created, and is displayed in the Topology view and in a tree structure below System Topologies in the Card pane.

Note If you would like to add or remove a topology to or from the default state of a card, see [“Using the Permanent memory manager”](#) on page 20.

Adding items to a topology

Once a topology is created, items can be added to it. You can use the Insert item menu or the Item tree to add items to a topology.

Note Depending on the workflow that you are creating, you may be required to add a node as the first item in your topology. Once a node is added, other items can be added.

To use the Insert item menu to add an item to a topology:

- Choose **Insert item**, and then select the item that you would like to add.
The item’s settings dialog box opens.

To use the Item tree to add an item to a topology, do one of the following:

- Double-click the item.
The item’s settings dialog box opens.
- Drag the item into the Topology view.
The item’s settings dialog box opens.

Once the item’s settings dialog box opens, the settings can be defined and the item can be created. For more information on creating the different items, refer to the appropriate item creation topic in the following sections.

Note After an item is created, except for nodes, the item’s properties can be edited using the Properties pane. For more information on the Properties pane, see [“Properties pane”](#) on page 17.

Placing items in a topology

After an item is created, it appears in the Topology view. The item is inserted in the Topology view according to the manner in which it is created and may not be placed in the best viewable manner.

To place items in a topology, do one of the following:

- Choose **Place all** in the Main toolbar. All the items are positioned in an orderly manner within the Topology view.
- Drag the items into the order you want in the Topology view.

Deleting items in a topology

If an item is no longer needed in a topology, it can be deleted.

To delete an item:

- Select the item and press **DELETE**.

Note A node cannot be deleted when it is connected to a stream.

To delete a node that is connected to a stream:

- 1 Delete the stream or connect the stream to another node.
- 2 Select the node to delete and press **DELETE**.

Playing/recording items in a topology

After a topology is created, items in the topology can be played/recorded. Some items start processing automatically after they are added to the topology. Items that do not do this, must be played/recorded.

To play/record items in a topology, do one of the following:

- Choose **Topology > Play/record all**.
- In the Main toolbar, click **Play/Record all**.
- In the Topology view, click the item that you would like to play/record, and in the Transport pane, click **Play** (▶).

Saving a topology

A topology can be saved at any time. Saving a topology saves all the settings of all the items in the topology to an *.mvst* file. However, it will not save the genlock and watchdog settings of the card.

Note An *.mvst* file is an XML representation of all the settings of all the items in the topology.

To save a topology:

- 1 Do one of the following to open the **Save topology** dialog box:
 - Choose **File > Save**.
 - In the Main toolbar, click **Save**.
- 2 In the **File name** box, enter a file name for the topology and specify the location where you would like to save the topology.
- 3 Click **Save**.

The topology is saved to an *.mvst* file.

Note The topology name and the *.mvst* file name do not have to be the same.

Loading a topology

When a topology is loaded, a new topology is created in the Topology view with all the settings of all the items saved in the topology of the `.mvst` file.

To load an existing topology, do one of the following:


- Choose **File > Open**.
- In the Main toolbar, click **Open**.

Note If you make modifications to a topology after loading it and would like to keep the changes, make sure that you save the topology because you will not be asked if you want to save the topology before it is closed.

Closing a topology in the Topology view

When a topology in the Topology view is closed, hardware items will not be destroyed from the card unless you selected **Destroy on close** when the topology was created.

To close a topology in the Topology view:



- If **Destroy on close** was not selected when the topology was created, click the Close button () in the Topology view tab.

Note When a topology is closed, application items (such as CG streams, link nodes, and Live windows) will be destroyed.

Destroying a topology

When a topology is destroyed, all the items in the topology are automatically destroyed. This eliminates the need to destroy all the items in the topology before destroying the topology.

To destroy an existing topology, do one of the following:

- In the Card pane, select **Destroy** from the **Topology** menu ()
- Choose **Topology > Destroy topology**.
- If **Destroy on close** was selected when the topology was created, click the Close button () in the Topology view tab.

Creating a node

After creating a new topology, you can start adding items to it. Most items require a node before they can be created. The types of nodes that can be added are:

- card node
- host node
- compressed host node
- alias card node
- shared host node
- link node

For more information on nodes, see “Creating nodes” in the *Matrox DSX Topology API User Guide*.

Remarks

- Once a node is created, the node’s properties cannot be changed.
- The maximum number of card nodes and alias card nodes that can be allocated in all system topologies on a card is limited to the card’s onboard memory, whereas the maximum number of host nodes, compressed host nodes, and shared host nodes that can be allocated is limited to the amount of memory that can be allocated by the process.
- An alias card node and a shared host node are used to access data from other processes.
- A link node is not part of the Matrox DSX Topology API. It is only available in the *mvTopologyBuilder* application and is used to access data from a host node in any topology of the same process.

Creating a card, host, or shared host node

- 1 Add a card, host, or shared host node. For information on the different ways to add a node, see [“Adding items to a topology”](#) on page 28.

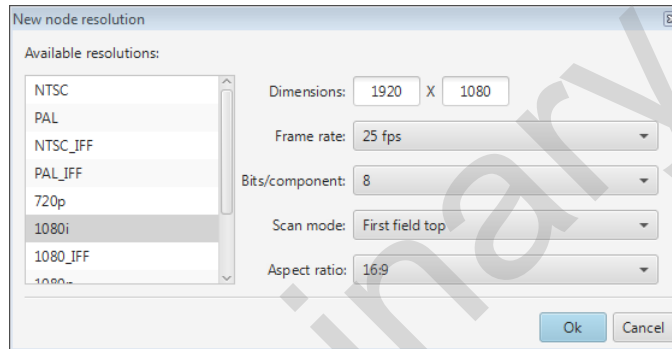
The **New card node settings** (for a card node), **New host node settings** (for a host node), or **New shared host node settings** (for a shared host node) dialog box opens.

The screenshot shows the 'New node settings' dialog box with the following values:

- Node Name: Host Node 1
- Memory location: Host
- Content: Video
- Write-to-read delay: 2 Frame(s)
- Depth: 8 Frame(s)
- Video resolution: 720x486, 8bpc, 29.97, 4:3, 2nd fr
- Video surface format: YUYV 422
- Video colorimetry: ITUR BT 601
- Audio channel type: Stereo
- Audio data type: PCM
- Audio bits per sample: 24 bits in 32 bits
- VANC format: YUYV 422
- VANC bits per component: 10 bits

- 2 In the **Node name** box, enter a name for the node.
- 3 From the **Memory location** list, select the location in which to save the node's data.
In the case of a card node, the card node's data is saved to the card's onboard memory. Whereas, the host node's or shared host node's data is saved in host memory.
- 4 From the **Content** list, select the type of content contained in the node.

- 5 In the **Write-to-read delay** box, enter the write-to-read delay that you would like to apply to the node. For information on applying a write-to-read delay, see “Applying a write-to-read delay to a node” in the *Matrox DSX Topology API User Guide*.
- 6 In the **Depth** box, enter the node depth (number of previous frames to be kept in the node).
- 7 Expand the **Video resolution** list (...). The **New node resolution** dialog box opens.



- a Select the resolution, frame rate, bits per component, scan mode, and aspect ratio.
- b Click **OK**.

The video resolution of the node is displayed in the **Video resolution** field.

- 8 Select or enter the remaining settings for the node in the **New card node settings** (for a card node), **New host node settings** (for a host node), or **New shared host node settings** (for a shared host node) dialog box.

Remarks

- If the **VANC format** is **YUYV422 (Legacy)**, you must enter **10 VANC bits per component**.
- If the **VANC format** is **Ancillary Data**, you must enter **16 VANC bits per component**.

- 9 Click **OK**.

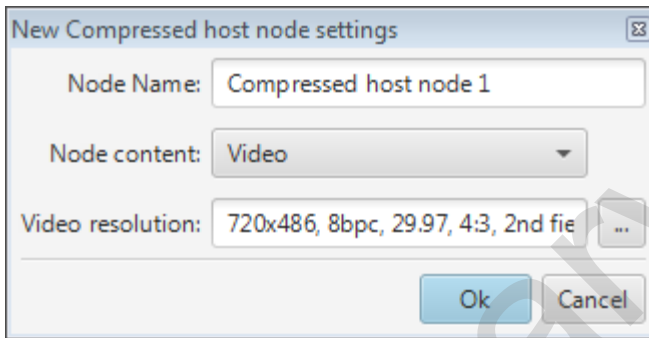
A new card, host node, or shared host node is added to the Topology view.

Note On an X.mio2 Plus, if you would like to save or remove a card node’s content to or from the permanent memory of a card, see “Using the Permanent memory manager” on page 20.

Creating a compressed host node

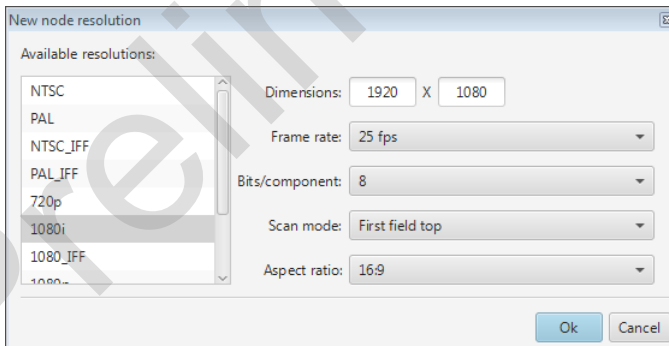
- 1 Add a compressed host node. For information on the different ways to add a compressed host node, see “Adding items to a topology” on page 28.

The **New compressed host node settings** dialog box opens.



- 2 In the **Node name** box, enter a name for the compressed host node.
- 3 From the **Node content** list, select the type of content contained in the compressed host node.
- 4 Expand the **Video resolution** list (...).

The **New node resolution** dialog box opens.



- a Select the resolution, frame rate, bits per component, scan mode, and aspect ratio.
- b Click **OK**.

The video resolution of the compressed host node is displayed in the **Video resolution** field of the **New compressed host node settings** dialog box.

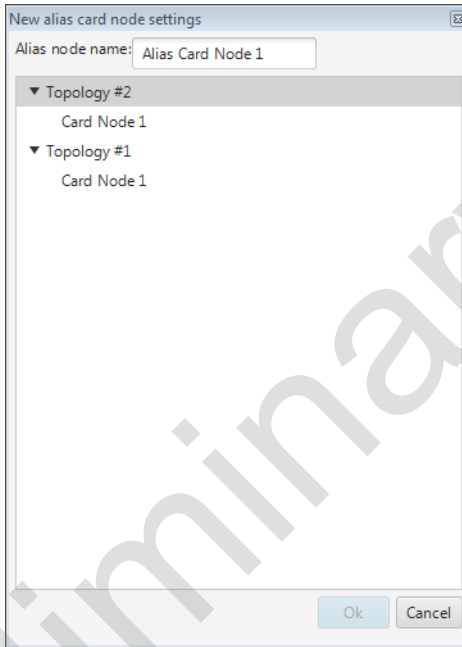
- 5 Click **OK**.

A new compressed host node is added to the Topology view.

Creating an alias card node

- 1 Add an alias card node. For information on the different ways to add an alias card node, see “Adding items to a topology” on page 28.

The **New alias card node settings** dialog box opens.



- 2 In the **Alias node name** box, enter a name for the alias card node.
- 3 From the topologies listed, select the card node whose data you would like to access.

Note You can select a card node located in any process.

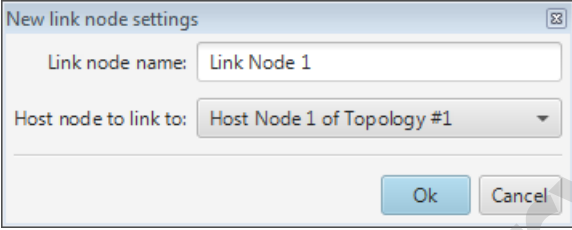
- 4 Click **OK**.

A new alias card node is added to the Topology view.

Creating a link node

- 1 Add a link node. For information on the different ways to add a link node, see [“Adding items to a topology”](#) on page 28.

The **New link node settings** dialog box opens.



The screenshot shows a dialog box titled "New link node settings". It has a close button in the top right corner. The dialog contains two input fields: "Link node name:" with the text "Link Node 1" and "Host node to link to:" with a dropdown menu showing "Host Node 1 of Topology #1". At the bottom right are "Ok" and "Cancel" buttons.

- 2 In the **Link node name** box, enter a name for the link node.
- 3 From the **Host node data to access** list, select the host node whose data you would like to access.
Note You can select a host node located in any topology of the same process.
- 4 Click **OK**.

A new link node is added to the Topology view.

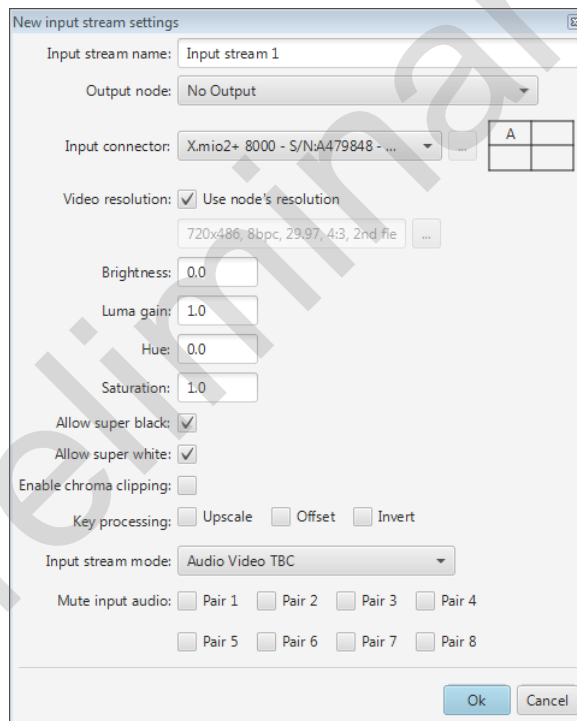
Creating an input stream

Unlike other streams, you are not required to have a card node before creating an input stream. If you already have a card node, you can use it as the output of the input stream. Otherwise, you can create the card node at a different time and connect the input stream to it when required (see [“Creating a node”](#) on page 31). For more information on input streams, see [“Input streams”](#) in the *Matrox DSX Topology API User Guide*.

To create an input stream:

- 1 Add an input stream. For information on the different ways to add an input stream, see [“Adding items to a topology”](#) on page 28.

The **New input stream settings** dialog box opens.

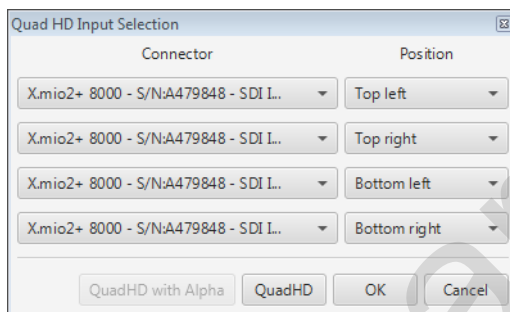


- 2 In the **Input stream name** box, enter a name for the input stream.
- 3 From the **Output node** list, select the card node to receive the input stream if a card node has already been created. Otherwise, select **No output**.

Note Even if a card node has already been created, you are not required to select it as the output node.

- 4 From the **Input connector** list, select the SDI input connector for the input stream.

In the case of Ultra HD (UHD), select **Multiple** from the **Input connector** list. If required, expand the **Input connector** list (...). The **UHD input selection** dialog box opens.



- a From the **Connector** list, select the connector and from the corresponding **Position** list, select in which quadrant the image is to be placed.
- b If the UHD image contains alpha, click **UHD with alpha**. Otherwise, click **UHD**.
- c Click **OK**.

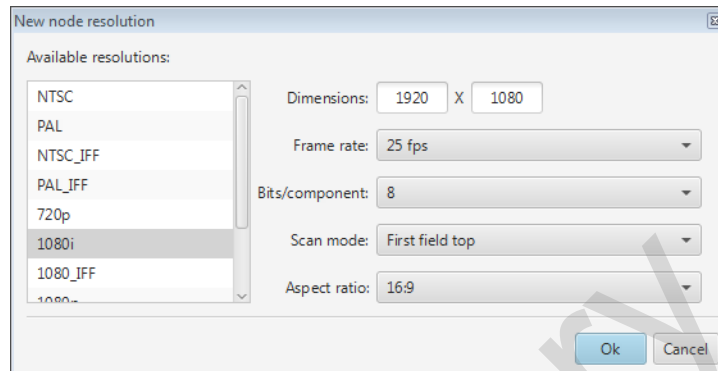
The input connector settings for the UHD image is displayed next to the **Input connector** list.

Note The selected SDI input connector will automatically be added to the topology and connected to the input stream. If you also want to use an AES/EBU input connector, you must add it manually and connect it to the input stream.

- 5 If you would like to use the card node's resolution for the input stream, select **Use node's resolution**. Otherwise, expand the **Video resolution** list (...).

Note If you selected **No output** from the **Output node** list in step 3, clear **Use node's resolution** and expand the **Video resolution** list to select the resolution of the card node that you would like to connect to at a different time. However, you must make sure that the resolutions are the same when you connect the card node to the input stream.

The **New node resolution** dialog box opens.



- a Select the resolution, frame rate, bits per component, scan mode, and aspect ratio.
- b Click **OK**.

The video resolution of the input stream is displayed in the **Video resolution** field of the **New input stream settings** dialog box.

- 6 If required, enter values for:
 - **Brightness** The range is from -92,5 to 92.5.
 - **Luma gain** The range is from 0 to 2.
 - **Hue** The range is from 0 to 360.
 - **Saturation** The range is from 0 to 2.
- 7 If required, select any of the following:
 - **Allow super black** Allows an input video signal that is below 7.5 IRE.
 - **Allow super white** Allows an input video signal that is above 100 IRE.
 - **Enable chroma clipping** Clips over-saturated chroma levels in the active portion of the input video signal.
 - **Upscale** Upscales the luminance range of the input key signal from 16-235 to 0-255. If the video's input stream is connected to a node containing YUV 4:2:2 data, this option is ignored.
 - **Offset** Applies an offset to the luminance values so that the inverted key result falls within the 0-255 range. The offset can only be applied if both **Invert** and **Upscale** are selected. If the video's input stream is connected to a node containing YUV 4:2:2 data, this option is ignored.
 - **Invert** Inverts the luminance part of the key signal and key value. If the input stream is connected to a node containing YUV 4:2:2 data, this option is ignored.

- 8 From the **Input stream mode** list, select the type of time base correction to apply to the input stream. For more information on the input stream's time base correction, see "Applying time base correction and audio resampling" in the *Matrox DSX Topology API User Guide*.
- 9 If required, select the audio pairs that you would like to mute.
- 10 Click **OK**.

A new input stream is added to the Topology view, and is connected to the selected video input connector and to the selected output card node, if an existing card node has been selected.

Note You can connect the input stream to a different audio input connector or node.

Preliminary

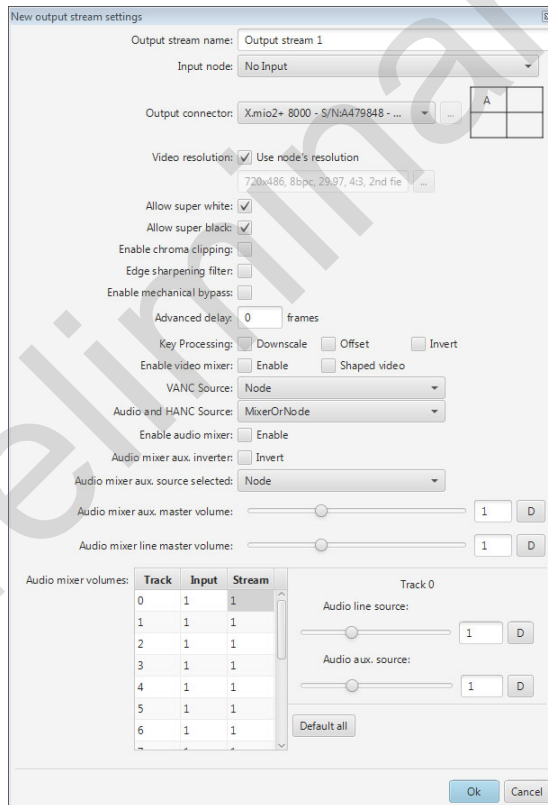
Creating an output stream

Unlike other streams, you are not required to have a card node before creating an output stream. If you already have a card node, you can use it as the input to the output stream. Otherwise, you can create the card node at a different time and connect the output stream to it when required (see “[Creating a node](#)” on page 31). For more information on output streams, see “Output streams” in the *Matrox DSX Topology API User Guide*.

To create an output stream:

- 1 Add an output stream. For information on the different ways to add an output stream, see “[Adding items to a topology](#)” on page 28.

The **New output stream settings** dialog box opens.



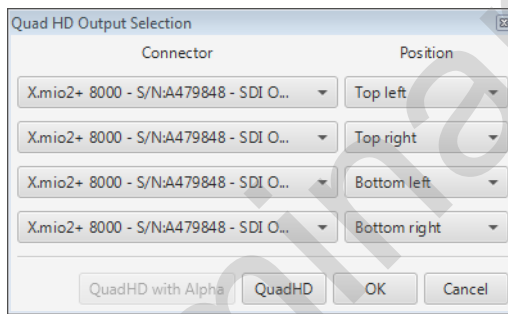
- 2 In the **Output stream name** box, enter a name for the output stream.

- 3 From the **Input node** list, select the card node containing the data to be sent to the output stream if a card node has already been created. Otherwise, select **No input**.

Note Even if a card node has already been created, you are not required to select it as the input node.

- 4 From the **Output connector** list, select the SDI output connector for the output stream.

In the case of Ultra HD (UHD), select **Multiple** from the **Output connector** list. If required, expand the **Output connector** list (...). The **UHD output selection** dialog box opens.



- a From the **Connector** list, select the connector and from the corresponding **Position** list, select in which quadrant the image is to be placed.
- b If the UHD image contains alpha, click **UHD with alpha**. Otherwise, click **UHD**.
- c Click **OK**.

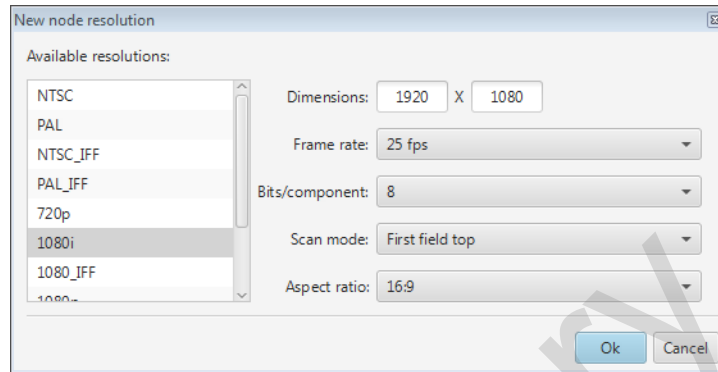
The output connector settings for the UHD image is displayed next to the **Input connector** list.

Note The selected SDI output connector will automatically be added to the topology and connected to the output stream. If you also want to use an AES/EBU output connector, you must add it manually and connect it to the output stream.

- 5 If you would like to use the card node's resolution for the output stream, select **Use node's resolution**. Otherwise, expand the **Video resolution** list (...).

Note If you selected **No output** from the **Input node** list in step 3, clear **Use node's resolution** and expand the **Video resolution** list to select the resolution of the card node that you would like to connect to at a different time. However, you must make sure that the resolutions are the same when you connect the card node to the output stream.

The **New node resolution** dialog box opens.



- a Select the resolution, frame rate, bits per component, scan mode, and aspect ratio.
- b Click **OK**.

The video resolution of the output stream is displayed in the **Video resolution** field of the **New output stream settings** dialog box.

- 6 If required, select any of the following:
 - **Allow super white** Allows an output video signal that is above 100 IRE.
 - **Allow super black** Allows an output video signal that is below 7.5 IRE.
 - **Enable chroma clipping** Clips over-saturated chroma levels in the active portion of the output video signal.
 - **Edge sharpening filter** Applies an edge sharpening filter to the digital output video. The filter reduces ringing artifacts that appear as a result of high amplitude transitions in the digital signal.
 - **Enable mechanical bypass** Enables the mechanical bypass input to output connections depending on the card. For more information, see the *Matrox DSX Topology API User Guide*.
 - **Advanced delay** Indicates the delay (in frames) that will be applied to the output stream's input. The value must be frame aligned. It must be less than the node depth minus the node's write-to-read delay minus three frames. For more information, see the *Matrox DSX Topology API User Guide*.
 - **Downscale** Downscales the luminance range of the output key signal from 0-255 to 16-235. If the video's output stream is connected to a node containing YUV 4:2:2 data, this option is ignored.
 - **Offset** Applies an offset to the luminance values so that the inverted key result falls within the 16-235 range. The offset can only be applied if both

Invert and **Downscale** are selected. If the video's output stream is connected to a node containing YUV 4:2:2 data, this option is ignored.

- **Invert** Inverts the luminance part of the output key signal and key value. If the video's output stream is connected to a node containing YUV 4:2:2 data, this option is ignored.
- **Enable video mixer** Enables the in-line video mixer.
- **Shaped video** Indicates that the video signal to the in-line video mixer from the auxiliary input (video from the output stream's node) is already multiplied by its alpha plane. This option can only be applied if **Enable video mixer** is also selected.
- **VANC source** Indicates the source for the vertical ancillary data. This option can only be applied if **Enable video mixer** is selected.
- **Audio and HANC source** Indicates the source for the audio and horizontal ancillary data. This option can only be applied if **Enable video mixer** is selected.
- **Enable audio mixer** Enables the in-line audio mixer.
- **Audio mixer aux. inverter** Inverts the in-line audio mixer's auxiliary input phase before being mixed.

For more information on the output stream's video and audio mixers, see "Using the output stream video and audio mixers" in the *Matrox DSX Topology API User Guide*.

7 If **Enable audio mixer** is selected:

- a** Select the input stream for the auxiliary input of the audio mixer from the **Audio mixer aux. source selected** list. The audio selected for the auxiliary input is mixed with the audio line input of the in-line audio mixer.
- b** If required, do one of the following to adjust the auxiliary master volume or line master volume:
 - Drag the **Audio mixer aux. master volume** or **Audio mixer line master volume** slider.
 - Enter a value in the text box.
 - Click **D** to use the default value.

The volume is applied to all the auxiliary or line audio input channels. The master volume is changed gradually on all the audio channels at the same time. The volume is changed using a multiplication factor that ranges from 0 to 2.

c If required, select the audio track for which you would like to adjust the volume using the **Audio mixer volumes** scroll bar, and do one of the following:

- Drag the **Audio line source** or **Audio aux. source** slider.
- Enter a value in the text box.
- Click **D** to use the default value.

The volume is applied to specific auxiliary or line audio input channels. The volume is changed using a multiplication factor that ranges from 0 to 2 and is applied at the next zero-crossing.

Note Click **Default all**, to use the default settings for all the audio channel volumes.

8 Click **OK**.

A new output stream is added to the Topology view, and is connected to the selected video output connector and to the selected input card node, if an existing card node has been selected.

Note You can connect the output stream to a different output connector or node.

Creating a transform stream

Before creating a transform stream, you must have a node for the input to the transform stream (see [“Creating a node”](#) on page 31). For more information on transform streams, see “Transform streams” in the *Matrox DSX Topology API User Guide*.

Remarks

- When a transform stream is created between two card nodes, your hardware must have an onboard scaler in order to transform the video.
- When a transform stream is created between two host nodes, the video is transformed using the card’s CPU scaler processing unit, if enabled.

To create a transform stream:

- 1 Add a transform stream. For information on the different ways to add a transform stream, see “[Adding items to a topology](#)” on page 28.

The **New transform stream settings** dialog box opens.

- 2 In the **Transform stream name** box, enter a name for the transform stream.
 - 3 From the **Input node** list, select the node containing the data to be transformed.
 - 4 From the **Output node** list, select the node to receive the transformed data.
- Note** If you would like to connect a node to the transform stream at a different time, select **No output**.
- 5 From the **Content to process** list, select the type of data that you would like the transform stream to process.
 - 6 From the **Transform type** list, select the type of video data scaling to be performed by the transform stream.
 - 7 From the **Video processing** list, select which data field to process.
 - 8 If the vertical filter needs to be controlled manually, select **Vertical filter manual ctrl** and enter the value to use in the **Vertical filter manual value** box.

Note When downscaling, to reduce aliasing without blurring the image, it is recommended to control the vertical filter manually.

- 9 If you would like to apply an advanced delay to the transform stream's input node, enter the value to apply in the **Advanced delay** box.

Remarks

- The value must be frame aligned.
- The advanced delay must be less than the node's depth minus the node's write-to-read delay minus three frames.

For more information on applying an advanced delay to a node, see the *Matrox DSX Topology API User Guide*.

- 10 From the **Src rectangle** list, select the part of the node image to scale.

Note If you select **Custom**, enter the dimensions of the source rectangle in the boxes around the source rectangle or resize the source rectangle using the left, right, top, or bottom sliders.

- 11 From the **Dest rectangle** list, select the aspect ratio of the area to scale.

Note If you select **Custom**, enter the dimensions of the destination rectangle in the boxes around the destination rectangle or resize the destination rectangle using the left, right, top, or bottom sliders.

- 12 If audio processing is required, select **Audio processing**.

- 13 If you would like to clip VANC packets, select **Clip all VANC packets**. Otherwise, specify how to convert the VANC packets, if new bar data needs to be inserted using the destination rectangle, and if a new AFD code needs to be inserted.

Note If a new AFD code needs to be inserted, select the code from the **AFD code** list.

- 14 Click **OK**.

A new transform stream is added to the Topology view, and is connected to the selected input and output nodes.

Note A transform stream cannot be disconnected from its input node. However, you can connect the input to the transform stream to a different node.

Creating a mixer stream

Unlike other streams, you are not required to have a card node before creating a mixer stream. If you already have a card node, you can use it as the output of the mixer stream. Otherwise, you can create the card node at a different time and connect the mixer stream to it when required (see “[Creating a node](#)” on page 31). For information on mixer streams, see “Mixer streams” in the *Matrox DSX Topology API User Guide*.

Note An onboard compositor is required to create a mixer stream.

To create a mixer stream:

- 1 Add a mixer stream. For information on the different ways to add a mixer stream, see “[Adding items to a topology](#)” on page 28.

The **New mixer stream settings** dialog box opens.

- 2 In the **Mixer stream name** box, enter a name for the mixer stream.
- 3 From the **Output node** list, select the card node that will receive the mixer stream.
- 4 From the **Background node** list, select **No background**, or select the background layer that you would like the mixer stream to apply to the output node.

Note A background layer can only be applied if **Background handling** (see below) is **Wait and copy**.

- 5 From **Content to process** list, select the type of data that you would like the mixer stream to process.
- 6 From the **Composition mode** list, select the type of composition that you would like the mixer stream to apply to the output node.
- 7 From the **Background handling** list, select whether you would like the mixer stream to apply a background color or background image.
 - Select **Color** to apply a background color.
 - Select **Wait and copy** to apply a background image using the selected background node.

Note Can only be applied if **Composition mode** is **Downstream**.

- 8 From the **Background color** list, select the color that you would like the mixer stream to apply to the background.

Note Can only be applied if **Composition mode** is **Downstream** and **Background handling** is **Color**.

- 9 If you would like the mixer stream to generate video that is already multiplied by its alpha, select **Shape output**.

Note Can only be applied if **Composition mode** is **Upstream**.

- 10 If you would like to apply an ARGB filter on the background layer of the mixer stream, select **Background ARGB filter**.

Note Can only be applied if **Background handling** is **Wait and copy** and the **Background node** was created with a **Video surface format** of **ARGB graphic**.

- 11 If you would like to apply an advanced delay to the background node of the mixer stream, enter the value to apply in the **Background advanced delay** box.

Remarks

- The value must be frame aligned both at the input and output.
- The advanced delay must be less than the node's depth minus the node's write-to-read delay minus three frames.

For more information on applying an advanced delay to a node, see the *Matrox DSX Topology API User Guide*.

- 12 If you would like to select audio from one of the input layers, select **Process audio** and enter the audio layer to apply to the mixer stream's output in the **Audio input select** box.

Remarks

- The values range from zero (background) to the number of layers, inclusively.
- If the **Composition mode** is **Upstream**, zero cannot be used.

13 If you would like to select VANC data from one of the input layers, select **Process VANC** and enter the VANC layer to apply to the mixer stream's output in the **VANC input select** box.

Remarks

- The values range from zero (background) to the number of layers, inclusively.
- If the **Composition mode** is **Upstream**, zero cannot be used.

14 Click **OK**.

A new mixer stream is added to the Topology view, and is connected to the selected output card node (if an existing card node has been selected), and if applicable, the selected background layer. The input nodes can then be connected to the mixer stream layers.

Note If you selected a background node, you cannot disconnect it from the mixer stream. However, you can connect it to a different stream.

Preliminary

Creating a reader stream

Before creating a reader stream, you must have a host node for the output of the reader stream (see “[Creating a node](#)” on page 31). For more information on reader streams, see “Reader streams” in the *Matrox DSX Topology API User Guide*.

To create a reader stream:

- 1 Add a reader stream. For information on the different ways to add a reader stream, see “[Adding items to a topology](#)” on page 28.

The **New reader stream settings** dialog box opens.

- 2 In the **Reader name** box, enter a name for the reader stream.
- 3 If you would like the VANC data in the file to be returned when seeking, select **Process VANC on seek**.
For more information on VANC processing, see “VANC data processing” in the *Matrox DSX Topology API User Guide*.
- 4 If you would like the audio data in the file to be returned when seeking, select **Process audio on seek**.
- 5 If you would like to apply a time delay instant replay, select **TDIR**.
- 6 From the **Output host node** list, select the host node that will receive the reader stream data.

7 From the **Content to process** list, select the type of data that you would like the reader stream to process.

8 In the **Video file path** box, select the file name and location of the file to read. If required, click **Browse** to locate the file.

Note After you select a file, information about the file is added to the **Basic information** field of the **New reader stream settings** dialog box. Only available information is added.

9 If you would like the reader stream to play separate audio files, click **+** to select the file name and location of the audio file to stream.

Remarks

- If you would like to remove an audio file from the list, click **-**.
- Click **Move up** and/or **Move down** to rearrange the order in which to play the audio files.

10 If you would like to repeat the last decompressed frame at the output, select **Repeat last frame at end of play**.

11 From the **NTSC closed caption** list, select the format in which to output the NTSC closed captioning.

12 In the **Read ahead** box, enter the maximum number of frames that can be read ahead of time.

Note This value cannot be zero.

13 In the **Read ahead threshold** box, enter the number of frames that will be used to signal the reader stream when to get more frames from the file.

Note If this value is set to zero, the reader stream uses half the value entered in the **Read ahead** box.

14 In the **Cue next element** box, enter the minimum number of frames required before the next element is cued.

Remarks

- The recommended value is four seconds (in frames).
- If this value is too small, frames may be skipped as a result.

15 In the **In point** box, enter the first frame to be read in the file.

16 In the **Out point** box, enter the last frame of the element in the file.

Note This value is exclusive. This means that a trim from 0 to 200 will play frames 0 to 199.

17 In the **Duration** box, enter the number of frames to output.

18 From the **Slow-motion type** list, select which slow-motion algorithm to use.

- 19 If you would like to automatically update the duration, select **Automatically update duration**.
- 20 Click **OK**.

A new reader stream is added to the Topology view, and is connected to the selected host node.

Note A reader stream cannot be disconnected. However, you can connect it to a different host node.

Creating a writer stream

Before creating a writer stream, you must have a host node for the input to the writer stream (see “[Creating a node](#)” on page 31). For more information on writer streams, see “Writer streams” in the *Matrox DSX Topology API User Guide*.

To create a writer stream:

- 1 Add a writer stream. For information on the different ways to add a writer stream, see “[Adding items to a topology](#)” on page 28.

The **New writer stream settings** dialog box opens.

- 2 In the **Writer name** box, enter a name for the writer stream.
- 3 From the **Host node** list, select the host node that will provide data to the writer stream.

- 4 In the **Destination file path** box, specify the location and name for the file to be created. If required, expand the path (...) to specify the location.

To determine which file formats are supported, see “DSX Supported Media File Formats” in the *Matrox DSX File I/O and Codec Information User Guide*.

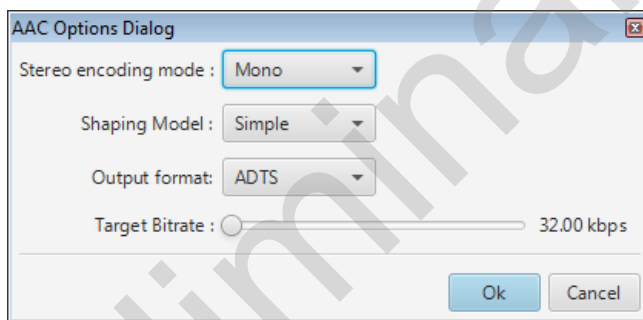
- 5 If you would like to capture video data, select **Video** and from the list, select the video codec to use.

Note If the video codec that you would like to use does not appear in the list, select **Additional CODECs** and click (...) to configure the writer stream codec.

- 6 If you would like to capture audio data, select **Audio**.

From the list, select the audio codec to use and click (...) to configure the audio codec.

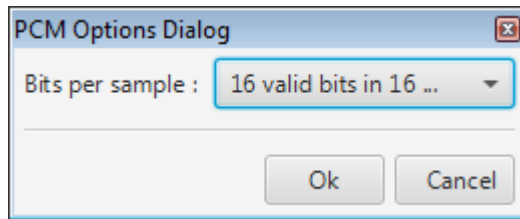
- If AAC audio is selected, the AAC options dialog box opens.



- From the **Stereo encoding mode** list, select the type of stereo encoding to apply.
- From the **Shaping model** list, select the type of noise shaping model to apply.
- From the **Output format** list, select the format in which to output the AAC audio stream.
- Drag the **Target bit rate** slider to set the target bit rate.
- Click **OK**.

The AAC audio codec is configured.

- If PCM audio is selected, the PCM options dialog box opens.



- From the **Bits per sample** list, select the valid bits per sample to apply.
- Click **OK**.

The PCM audio codec is configured.

- 7 If you would like to capture VANC data, select **VANC** and from the **Location** list, select where the VANC data is located.

Note VANC data can be captured only if **Video** is selected.

- 8 If you would like to capture to other files, select **File switching** and in the **Each** box, enter how many frames to capture to each file.
- 9 If you would like to apply time delay instant replay, select **TDIR** and in the **Update interval** box, enter the flush frequency in seconds.
- 10 In the **Reserved space for end of disk** box, enter the amount of disk space to reserve before the writer stream determines that the end of the disk has been reached.
- 11 Click **OK**.

A new writer stream is added to the Topology view, and is connected to the selected host node.

Note A writer stream cannot be disconnected. However, you can connect it to a different host node.

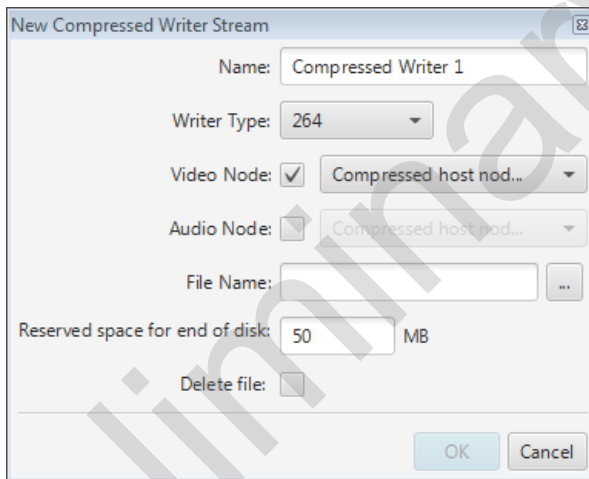
Creating a compressed writer stream

Before creating a compressed writer stream, you must have a compressed host node for the input to the compressed writer stream (see “[Creating a node](#)” on page 31). For more information on compressed writer streams, see “Compressed writer streams” in the *Matrox DSX Topology API User Guide*.

To create a compressed writer stream:

- 1 Add a compressed writer stream. For information on the different ways to add a compressed writer stream, see “[Adding items to a topology](#)” on page 28.

The **New compressed writer stream settings** dialog box opens.



- 2 In the **Name** box, enter a name for the compressed writer stream.
- 3 From the **Compressed writer type** list, select the type of compressed writer stream to create.
- 4 If you would like to capture compressed video and VANC data, select **Compressed video** and from the list, select the compressed host node containing the compressed video and VANC data.
- 5 If you would like to capture compressed audio data, select **Compressed audio** and from the list, select the compressed host node containing the compressed audio data.
- 6 In the **File name** box, specify the location and name for the file to be created. If required, click (...) to specify the location and name.
- 7 In the **Reserved space for end of disk** box, enter the amount of disk space to reserve before the compressed writer stream determines that the end of the disk has been reached.

- 8 If you would like to delete the file when you close the Topology view, select **Delete file**.
- 9 Click **OK**.

A new compressed writer stream is added to the Topology view, and is connected to the selected compressed host node.

Note A compressed writer stream cannot be disconnected. However, you can connect it to a different compressed host node.

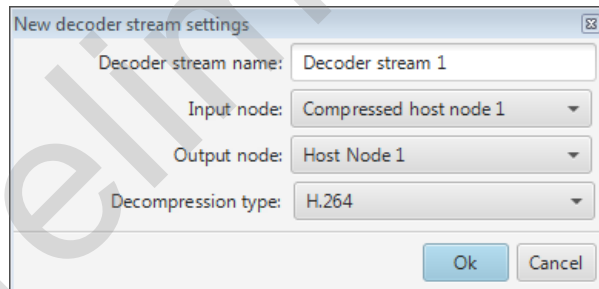
Creating a decoder stream

Before creating a decoder stream, you must have a compressed host node and a host node. The compressed host node is required for the input to the decoder stream and the host node is required for the output of the decoder stream (see “[Creating a node](#)” on page 31). For more information on decoder streams, see “[Decoder streams](#)” in the *Matrox DSX Topology API User Guide*.

To create a decoder stream:

- 1 Add a decoder stream. For information on the different ways to add a decoder stream, see “[Adding items to a topology](#)” on page 28.

The **New decoder stream settings** dialog box opens.



- 2 In the **Decoder stream name** box, enter a name for the decoder stream.
- 3 From the **Input node** list, select the input compressed host node containing the data to be decoded.
- 4 From the **Output node** list, select the output host node to receive the decompressed data from the decoder stream.
- 5 From the **Decompression type** list, select the codec that will be used to decode the stream.

6 Click **OK**.

A new decoder stream is added to the Topology view, and is connected to the selected nodes.

Note A decoder stream cannot be disconnected. However, you can connect it to different nodes.

Creating a de-interlacer stream

Before creating a de-interlacer stream, you must have a card node for the input to the de-interlacer stream (see “[Creating a node](#)” on page 31). For more information on de-interlacer streams, see “De-interlacer streams” in the *Matrox DSX Topology API User Guide*.

Note An onboard de-interlacer is required to create a de-interlacer stream.

To create a de-interlacer stream:

- 1 Add a de-interlacer stream. For information on the different ways to add a de-interlacer stream, see “[Adding items to a topology](#)” on page 28.

The **New de-interlacer stream settings** dialog box opens.

- 2 In the **De-interlacer stream name** box, enter a name for the de-interlacer stream.
- 3 From the **Input node** list, select the card node containing the data from which you would like to remove interlace or motion artifacts.

- 4 From the **Output node** list, select the output card node that will receive the de-interlaced data from the de-interlacer stream.

Remarks

- If you would like to connect a card node to the transform stream at a different time, select **No output**.
 - The output card node’s resolution must be the same as the input card node’s resolution, and the output card node’s frame rate can be the same or twice the input card node’s frame rate. For supported video input and output card node formats, see “De-interlacer streams” in the *Matrox DSX Topology API User Guide*.
- 5 From the **Content to process** list, select the type of data that you would like the reader stream to process.
 - 6 If you would like to show the motion vectors of the de-interlacing process in the output of the de-interlacer stream, select **Show motion vectors**.
 - 7 If you would like for the de-interlacer stream to process the input node’s ancillary data, select **Process VANC**.
 - 8 If you would like the analog line 21 to be converted to Matrox Ancillary Data VANC format, select **Convert analog CEA-608 to digital**.
 - 9 If you would like for the de-interlacer stream to process the input node’s audio, select **Process audio**.
 - 10 If required, in the **Input node advanced delay** box, enter the delay (in nanotime) to apply to the de-interlacer stream’s input.

Remarks

- The value must be frame aligned.
- The advanced delay must be less than the node’s depth minus the node’s write-to-read delay minus three frames.

For more information on applying an advanced delay to a node, see the *Matrox DSX Topology API User Guide*.

A new de-interlacer stream is added to the Topology view, and is connected to the selected card node(s).

Note A de-interlacer stream cannot be disconnected from its input node. However, you can connect the input to the de-interlacer stream to a different node.

Creating an echo stream

Before creating an echo stream, you must have a compressed host node and a host node. One is for the input to the echo stream and the other is for the output of the echo stream (see “[Creating a node](#)” on page 31). For more information on echo streams, see “Echo streams” in the *Matrox DSX Topology API User Guide*.

Remarks

- An echo stream is used to propagate VANC data without altering it.
- When defining the compressed host node settings, select **VANC** from the **Node content** list.

To create an echo stream:

- 1 Add an echo stream. For information on the different ways to add an echo stream, see “[Adding items to a topology](#)” on page 28.

The **New echo stream settings** dialog box opens.

- 2 In the **Echo stream name** box, enter a name for the echo stream.
- 3 From the **Echo direction** list, select the direction you would like the echo stream to propagate the VANC data. The direction can be from a host node to a compressed host node, or vice-versa.
- 4 From the **Input node** list, select the node containing the VANC data that you would like to propagate.

Note If you select a host node as the input node, then you must select a compressed host node as the output node, and vice-versa.

- 5 From the **Output node** list, select the node to which you would like to propagate the VANC data.

Note If you select a host node as the output node, then you must select a compressed host node as the input node, and vice-versa.

- 6 Click **OK**.

A new echo stream is added to the Topology view, and is connected to the selected nodes.

Note An echo stream cannot be disconnected. However, you can connect it to different nodes.

Creating an encoder stream

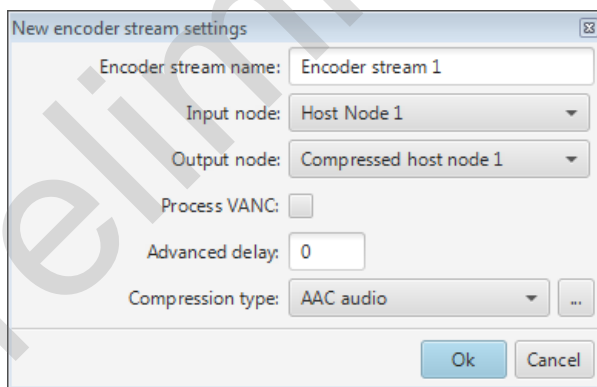
Before creating an encoder stream, you must have a host node and a compressed host node. The host node is required for the input to the encoder stream and the compressed host node is required for the output of the encoder stream (see “[Creating a node](#)” on page 31). For more information on echo streams, see “Encoder streams” in the *Matrox DSX Topology API User Guide*.

Note When defining the compressed host node settings, select the type of content required by the encoder stream from the **Node content** list. For example, if you are using the encoder stream to encode video, select **Video** from the **Node content** list.

To create an encoder stream:

- 1 Add an encoder stream. For information on the different ways to add an encoder stream, see “[Adding items to a topology](#)” on page 28.

The **New encoder stream settings** dialog box opens.



- 2 In the **Encoder stream name** box, enter a name for the encoder stream.
- 3 From the **Input node** list, select the input host node containing the data that you would like to compress.
- 4 From the **Output node** list, select the output compressed host node that will receive the compressed data from the encoder stream.
- 5 If you would like the encoder stream to process data, select **Process data**.
- 6 If you would like to apply an advanced delay to the encoder stream’s input node, enter the value to apply in the **Advanced delay** box.

Remarks

- The value must be frame aligned.
- The advanced delay must be less than the node's depth minus the node's write-to-read delay minus three frames.

For more information on applying an advanced delay to a node, see the *Matrox DSX Topology API User Guide*.

- 7 From the **Compression type** list, select the codec that will be used to compress the stream.
- 8 Click **OK**.

A new encoder stream is added to the Topology view, and is connected to the selected nodes.

Note An encoder stream cannot be disconnected. However, you can connect it to different nodes.

Creating a muxer stream

Before creating a muxer stream, you must have three compressed host nodes. Two of which are for the input to the muxer stream and the other is for the output of the muxer stream (see “[Creating a node](#)” on page 31). For more information on muxer streams, see “Muxer streams” in the *Matrox DSX Topology API User Guide*.

Remarks

- One of the compressed host nodes to be used to connect to the input of the muxer stream must contain compressed video, while the other must contain compressed audio.
- The compressed host node to be used to connect to the output of the muxer stream must contain a compressed MPEG-2 transport stream (TS).

To create a muxer stream:

- 1 Add a muxer stream. For information on the different ways to add a muxer stream, see [“Adding items to a topology”](#) on page 28.

The **New muxer stream settings** dialog box opens.

The screenshot shows the 'New muxer stream settings' dialog box with the following values:

- Muxer stream name: Muxer stream 1
- Video input node: Compressed host node 1
- Audio input node: Compressed host node 2
- Output node: Compressed host node 3
- Program ID: 256
- Video PID: 4113
- Audio PID: 4352
- PCR PID: 4097
- Bitrate Option: VBR
- Process VANC:
- Input node: Compressed hos...
- PID: 4560
- Type: None

- 2 In the **Muxer stream name** box, enter a name for the muxer stream.
- 3 From the **Video input node** list, select the compressed host node containing the compressed video data that you would like to include in the compressed MPEG-2 TS muxed buffer.
- 4 From the **Audio input node** list, select the compressed host node containing the compressed audio data that you would like to include in the compressed MPEG-2 TS muxed buffer.
- 5 From the **Output node** list, select the compressed host node that will receive the compressed MPEG-2 TS muxed buffer.
- 6 In the **Program ID** box, enter the program packet ID contained in the stream.
- 7 In the **Video PID** box, enter the packet ID of the video elementary stream.
- 8 In the **Audio PID** box, enter the packet ID of the audio elementary stream.
- 9 In the **PCR PID** box, enter the packet ID of the Program Clock Reference (PCR) elementary stream.

10 From the **Bit rate option** list, select the bit rate encoding option of the stream.

Note The recommended option for streaming is variable bit rate (VBR).

11 If you would like the muxer stream to multiplex compressed VANC data into the compressed MPEG-2 TS muxed buffer, select **Process VANC** and:

- From the **Input node** list, select the compressed host node containing the compressed VANC data.
- In the **PID** box, enter the packet ID of the VANC elementary stream.
- From the **Type** list, select the type of elements to process in the VANC.

Note Currently only SCTE 35 streams are supported.

12 Click **OK**.

A new muxer stream is added to the Topology view, and is connected to the selected compressed host nodes.

Note An muxer stream cannot be disconnected. However, you can connect it to different compressed host nodes.

Preliminary

Creating an RTP sender stream

Before creating an RTP sender stream, you must have a compressed host node for the input to the RTP sender stream (see “[Creating a node](#)” on page 31) containing compressed MPEG-2 transport stream (TS) muxed buffers. For more information on RTP sender streams, see “RTP sender streams” in the *Matrox DSX Topology API User Guide*.

To create an RTP sender stream:

- 1 Add an RTP sender stream. For information on the different ways to add an RTP sender stream, see “[Adding items to a topology](#)” on page 28.

The **New RTP sender stream settings** dialog box opens.

The screenshot shows a dialog box titled "New RTP Sender Stream". It contains several input fields and dropdown menus. The fields are: "RTP Sender stream name" (text box with "RTP Sender 1"), "Surface format" (dropdown menu with "MPEG2-TS"), "Network interface IP address" (text box with "0.0.0.0"), "Remote IP address" (text box with "0.0.0.0"), "Source port" (text box with "5004"), "Destination port" (text box with "5004"), "IP protocol" (dropdown menu with "UDP"), "MTU" (text box with "1500"), "TTL" (text box with "64"), and "Input compressed host node" (dropdown menu with "Compressed host node 1"). At the bottom right, there are "Ok" and "Cancel" buttons.

- 2 In the **RTP sender stream name** box, enter a name for the RTP sender stream.
- 3 From the **Surface format** list, select the format of the data to send.

Note Currently only compressed MPEG-2 TS muxed buffers are supported.

- 4 In the **Network interface IP address** box, enter the IP address (IPv4) of the network card to be used for Real-time Transport Protocol (RTP) transmission.

Note An RTP sender stream can only be created if the IP address entered is the same as the system’s IP address.

- 5 In the **Remote IP address** box, enter the IP address to which data will be streamed.
Note A multicast address can be used. However, it will only stream content to the systems within the same subnet as the source system.
- 6 In the **Source port** box, enter the IP port to use on the source side.
Note The value entered must be an even number.
- 7 In the **Destination port** box, enter the IP port to use on the destination side.
Note The value entered must be an even number.
- 8 From the **IP protocol** list, select the IP protocol for streaming.
Note Currently only User Datagram Protocol (UDP) is supported.
- 9 In the **MTU** box, enter the Maximum Transmission Unit (MTU) to use for connection.
Note The maximum value is 1500.
- 10 In the **TTL** box, enter the time in which RTP packets can be used.
Note The maximum value is 255.
- 11 From the **Input compressed host node** list, select the compressed host node containing the compressed MPEG-2 TS muxed buffers that you would like to use for streaming over the Internet.
- 12 Click **OK**.

A new RTP sender stream is added to the Topology view, and is connected to the selected compressed host node.

Note An RTP sender stream cannot be disconnected. However, you can connect it to a different compressed host node.

Creating an RTP receiver stream

Before creating an RTP receiver stream, you must have a compressed host node for the output of the RTP receiver stream (see “[Creating a node](#)” on page 31). For more information on RTP receiver streams, see “RTP receiver streams” in the *Matrox DSX Topology API User Guide*.

To create an RTP receiver stream:

- 1 Add an RTP receiver stream. For information on the different ways to add an RTP receiver stream, see “[Adding items to a topology](#)” on page 28.

The **New RTP receiver stream settings** dialog box opens.

The screenshot shows the 'New RTP Receiver Stream' dialog box with the following settings:

- RTP Receiver stream name: RTP Receiver 1
- Output compressed host node: Compressed host node 1
- Surface format: MPEG2-TS
- Buffering mode: Low Latency
- IP protocol: UDP
- Source: Network Interface
- Network interface IP address: 0.0.0.0
- Remote IP address: 0.0.0.0
- Destination port: 5004
- Source port: 5004
- MTU: 1500
- TTL: 64

- 2 In the **RTP receiver stream name** box, enter a name for the RTP receiver stream.
- 3 From the **Output compressed host node** list, select the compressed host node to which you would like to send the compressed MPEG-2 transport stream (TS) data.
- 4 From the **Surface format** list, select the format of the multiplexed TS data which can be received.

Note Currently only compressed MPEG-2 TS muxed buffers can be received.
- 5 From the **Buffering mode** list, select the latency required for the buffering mode of the RTP receiver stream.

6 From the **IP protocol** list, select the IP protocol the RTP receiver stream uses to receive the multiplexed TS data.

Note Currently only User Datagram Protocol (UDP) is supported.

7 From the **Source** list, select the type of connection the RTP receiver stream uses.

– If **Network interface** is selected, enter values for:

- **Network interface IP address** Indicates the IP address (IPV4 or IPV6) of the network card to be used for Real-time Transport Protocol (RTP) transmission.

- **Remote IP address** Indicates the IP address from which data will be received.

A multicast address can be used. However, it will only stream content to the systems within the same subnet as the source system.

- **Destination port** Indicates the IP port to use on the destination side. The value entered must be an even number.

- **Source port** Indicates the IP port to use on the source side. The value entered must be an even number.

- **MTU** Indicates the Maximum Transmission Unit (MTU) to use for connection. The maximum value is 1500.

- **TTL** Indicates the time in which RTP packets can be used. The maximum value is 255.

– If **SAP** is selected, enter the following:

- **Session name** Indicates the name of the Session Announcement Protocol (SAP) data that will be used to connect to the remote host.

- **Timeout** Indicates the maximum time (in milliseconds) to wait for the RTP receiver stream to connect to the remote host.

– If **SDP** is selected, do one of the following:

- In the **SDP data** box, enter a name for the Session Description Protocol (SDP) that will be used to establish connection and click **Save**.

- To use a previously saved SDP data file, click **Load**.

8 Click **OK**.

A new RTP receiver stream is added to the Topology view, and is connected to the selected compressed host node.

Note An RTP receiver stream cannot be disconnected. However, you can connect it to a different compressed host node.

Creating a transfer stream

Before creating a transfer stream, you must have a card node and a host node. One is for the input to the transfer stream and the other is for the output of the transfer stream (see “[Creating a node](#)” on page 31). For more information on transfer streams, see “Transfer streams” in the *Matrox DSX Topology API User Guide*.

Remarks

- A transfer stream is used to transfer data between onboard memory and host memory without any modification.
- In the case where the resolution of the card node is PsF, the VANC data is converted to progressive when transferred to a host node (or vice-versa).

To create a transfer stream:

- 1 Add a transfer stream. For information on the different ways to add a transfer stream, see “[Adding items to a topology](#)” on page 28.

The **New transfer stream settings** dialog box opens.

- 2 In the **Transfer stream name** box, enter a name for the transfer stream.
- 3 From the **Transfer direction** list, select the direction you would like the transfer stream to propagate the data. The direction can be from a card node to a host node, or vice-versa.
- 4 From the **Input node** list, select the node containing the data that you would like to propagate.

Note If you select a host node as the input node, then you must select a card node as the output node, and vice-versa.

5 From the **Output node** list, select the node to which you would like to propagate the data.

Note If you select a host node as the output node, then you must select a card node as the input node, and vice-versa.

6 From the **Content to process** list, select the type of data in the stream to process.

7 If required, in the **Advanced delay** box, enter the delay (in nanotime) to apply to the transfer stream's input.

Remarks

- The value must be frame aligned both at the input and output.
- The advanced delay must be less than the node's depth minus the node's write-to-read delay minus three frames.

For more information on applying an advanced delay to a node, see the *Matrox DSX Topology API User Guide*.

8 Click **OK**.

A new transfer stream is added to the Topology view, and is connected to the selected nodes.

Note A transfer stream cannot be disconnected. However, you can connect it to different nodes.

Creating a CG stream

A CG stream is a software item that can be used to generate video and audio. For more information on software items, see [“Application items”](#) on page 9.

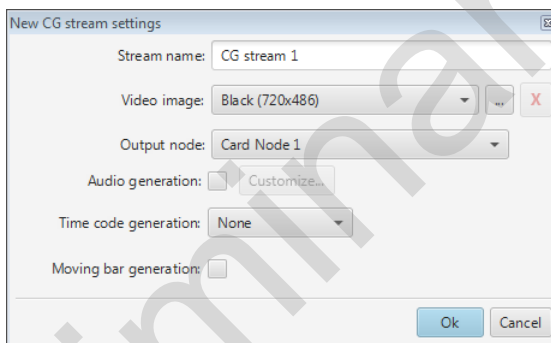
Before creating a CG stream, you must have a node for the output of the CG stream (see [“Creating a node”](#) on page 31).

Note You can use a host or card node as the output node.

To create a CG stream:

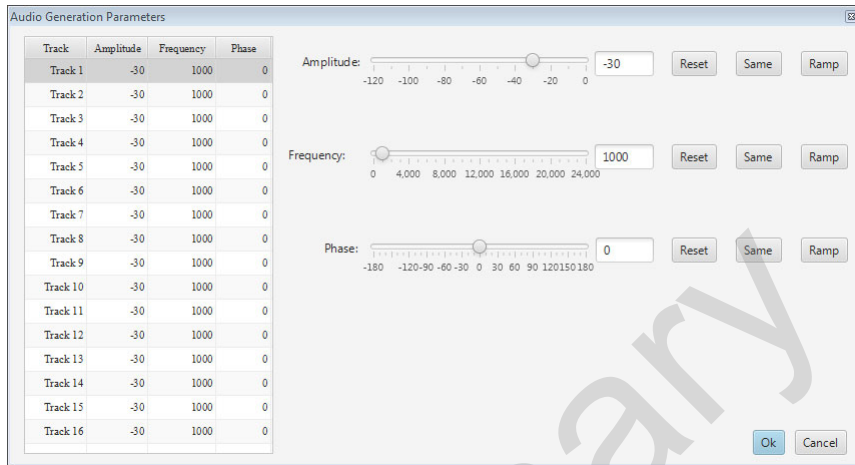
- 1 Add a CG stream. For information on the different ways to add a CG stream, see [“Adding items to a topology”](#) on page 28.

The **New CG stream settings** dialog box opens.



- 2 In the **Stream name** box, enter a name for the CG stream.
- 3 From the **Video image** list, select the type of video for the CG stream. To select a different video image, expand the **Video image** list (...) to specify the location and name of the video image that you would like to use.
- 4 From the **Output node** list, select the node that you would like to use for the CG stream.
- 5 If you would like to generate audio tones for the CG stream, select **Audio generation** and click **Customize** to customize the audio.

The **Audio generation parameters** dialog box opens.



- a Do one of the following to set the amplitude, frequency, and phase:
 - Drag the appropriate slider accordingly for the selected audio track.
 - Enter a value in the appropriate box for the selected audio track.
 - Click **Reset** to reset the value to the default value for the selected audio track.
 - Click **Same** to apply the current values to all the audio tracks.
 - Click **Ramp** to use the hard-coded values for all the audio tracks.
- b Click **OK**.

The audio generation parameters will be used when creating the CG stream.

- 6 From the **Time code generation** list, select the type of time code to generate.
- 7 If you would like to generate a moving bar for the CG stream, select **Moving bar generation**.
- 8 Click **OK**.

A new CG stream is added to the Topology view, and is connected to the selected node.

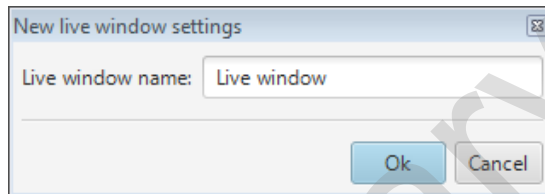
Creating a Live window

A Live window is a software item that is used to display the contents of a card or host node. For more information on the Live window, see “[Live window item](#)” on page 10.

To create a Live window item:

- 1 Add a Live window. For information on the different ways to add a Live window, see “[Adding items to a topology](#)” on page 28.

The **New Live window settings** dialog box opens.



- 2 In the **Live window name** box, enter a name for the Live window.
- 3 Click **OK**.


A new Live window is added to the Topology view. It can then be connected to any card or host node.

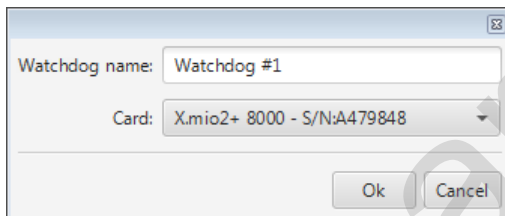
Note If a Live window is closed, choose **View > Live window** to open it again.

Creating a watchdog

A watchdog is a monitoring feature that can alter the state of the card and the way that the card processes data. For more information on watchdogs, see “Using the watchdog feature” in the *Matrox DSX Topology API User Guide*.

To create a watchdog:

- 1 In the Card pane toolbar, select **New** from the **Watchdog** menu (). The **New watchdog** dialog box opens.



- 2 In the **Watchdog name** box, enter a name for the watchdog.
- 3 From the **Card** list, select the card for which you would like to create a watchdog.
- 4 Click **OK**.

A new watchdog is added to the tree structure of the selected card.

- 5 Select the newly created watchdog and edit the Watchdog properties pane as follows:
 - If you would like to pulse the watchdog, select **Pulse event**.
 - If you would like to enable a timeout after which the watchdog will be triggered, select **Enable timeout**. To use this feature, clear **Force topology**.
 - In the **Watchdog timeout** box, enter the amount of time (in seconds) that needs to elapse before the watchdog is triggered. To use this feature, select **Enable timeout**.
 - If you would like to force the watchdog to trigger immediately, select **Force topology**.
 - From the **GPI input pin** list, select the General Purpose Interface (GPI) input pin that you would like to use to trigger the watchdog. To use this feature, clear **Force topology**. If you do not want to use a GPI input pin, select **Invalid**.
 - From the **GPI input trigger type** list, select the type of GPI signal that will activate the selected GPI input pin.
 - From the **GPI output pin** list, select the GPI output pin that you would like to activate when the watchdog is triggered. If you do not want to use a GPI output pin, select **Invalid**.

- From the **GPI output trigger type** list, select the type of GPI signal that the selected GPI output pin will generate.
- In the **Output pin pulse** box, enter the duration of the pulse (in nanoseconds) on the specified GPI output pin. To use this feature, select **Falling edge** or **Rising edge** from the **GPI output trigger type** list.
- From the **Topology to load** list, select a previously created system topology that you would like to load when the watchdog is triggered. For more information on creating a system topology, see [“Creating a new system topology”](#) on page 27.

▼ Watchdog Properties	
Watchdog name	Watchdog #1
Object existence	Exists
Pulse event	<input type="checkbox"/>
Enable timeout	<input type="checkbox"/>
Watchdog timeout	5.0
Force topology	<input checked="" type="checkbox"/>
GPI input pin	Invalid ▼
GPI input trigger type	High level ▼
GPI output pin	Invalid ▼
GPI output trigger type	High level ▼
Output pin pulse	0
Topology to load	None ▼

The watchdog properties are edited if any changes are made in the Watchdog properties pane.

Note If you would like to add or remove a watchdog to or from the default state of a card, see [“Using the Permanent memory manager”](#) on page 20.

Your notes

Preliminary

3

Working with System Topologies

This chapter provides examples on how to work with system topologies. The examples are simple, but can be extended to more complex uses.

Creating playback topologies

This section explains how to create a simple playback topology, as well as a simultaneous HD/SD playback topology with a Live window using examples.

Creating a simple playback topology

To create a simple playback topology:

- 1 Create a new system topology (see [“Creating a new system topology”](#) on page 27).
- 2 Create a card node with the following settings:
 - Node name: Card node 1.
 - Content: Video and audio.
 - Write-to-read delay: 1 frame.
 - Depth: 8 frames.
 - Video resolution: 1080i.
 - Video surface format: YUYV 422.
 - Video colorimetry: ITUR BT 709.
 - Audio channel type: Stereo.
 - Audio data type: PCM.
 - Audio bits per sample: 24 bits in 32 bits.
 - Any VANC format.

For information on creating a card node, see [“Creating a node”](#) on page 31.

- 3 Create an output stream with the following settings:
 - Input node: Card node 1.
 - Output connector: SDI OUT A.

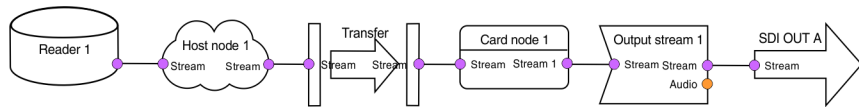
For information on creating an output stream, see [“Creating an output stream”](#) on page 41.

- 4 Create a host node (Node name: Host node 1) with the same settings as the card node in step 2.
- 5 Create a reader stream with the following setting:
 - Output host node: Host node 1.
 - File path: Any 1080i file containing stereo audio.

For information on creating a reader stream, see [“Creating a reader stream”](#) on page 51.

- 6 Create a transfer stream between the host node and the card node in which the transfer direction is from host node to card node. For more information on creating a transfer stream, see [“Creating a transfer stream”](#) on page 69.

A simple playback topology is created as shown in the following figure.



- 7 Click the reader stream and click **Play** (▶) in the Transport pane to start the simple playback.

Creating a simultaneous HD/SD playback topology with a Live window

To create a simultaneous HD/SD playback topology with a Live window:

- 1 Create a simple HD playback topology as explained in steps 1 to 6 of “[Creating a simple playback topology](#)” on page 78, with an advanced delay of one frame applied to the output stream in the Properties pane.
- 2 Create an SD card node with the following settings:
 - Node name: Card node 2.
 - Content: Video and audio.
 - Write-to-read delay: 1 frame.
 - Depth: 8 frames.
 - Video resolution: NTSC.
 - Video surface format: YUYV 422.
 - Video colorimetry: ITUR BT 601.
 - Audio channel type: Stereo.
 - Audio data type: PCM.
 - Audio bits per sample: 24 bits in 32 bits.
 - Any VANC format.
- 3 Create a transform stream to downscale from HD to SD with the following settings:
 - Transform stream name: Transform 1.
 - Input node: Card node 1.
 - Output node: Card node 2.
 - Transform type: Region.
 - Source rectangle: Full screen.
 - Destination rectangle: Keep aspect ratio.
 - Select **Audio processing**.

– Any VANC format.

For information on creating a transform stream see [“Creating a transform stream”](#) on page 45.

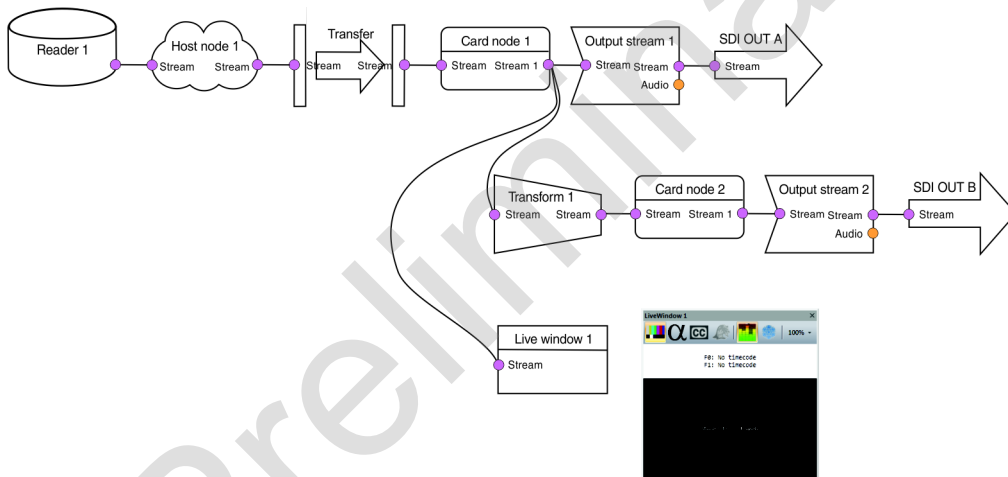
4 Create an output stream with the following settings:

- Input node: Card node 2.
- Output connector: SDI OUT B.

For information on creating an output stream, see [“Creating an output stream”](#) on page 41.

5 Create a Live window and connect it to the output of Card node 1. For information on creating a Live window, see [“Creating a Live window”](#) on page 73.

A simultaneous HD/SD playback topology with a Live window is created as shown in the following figure.



6 Click **Play/Record all** in the Main toolbar to start the playback.

Creating capture topologies

This section explains how to create a simple capture topology, as well as a simultaneous HD/SD capture topology with a Live window using examples.

Creating a simple capture topology

To create a simple capture topology:

- 1 Set the **Genlock source** to **Internal** or **SDI input A**.

Note When using time base correction, if repeated frames are not desirable, select **SDI input A**. For more information on time base correction, see “Applying time base correction and audio resampling” in the *Matrox DSX Topology API User Guide*.

- 2 Create a new system topology (see “[Creating a new system topology](#)” on page 27).

- 3 Create a card node with the following settings:

- Node name: Card node 1.
- Content: Video and audio.
- Write-to-read delay: 1 frame.
- Depth: 8 frames.
- Video resolution: 1080i.
- Video surface format: YUYV 422.
- Video colorimetry: ITUR BT 709.
- Audio channel type: Stereo.
- Audio data type: PCM.
- Audio bits per sample: 24 bits in 32 bits.
- Any VANC format.

For information on creating a node, see “[Creating a node](#)” on page 31.

- 4 Create an input stream with the following settings:

- Output node: Node 1.
- Input connector: SDI IN A.

For information on creating an input stream, see “[Creating an input stream](#)” on page 37.

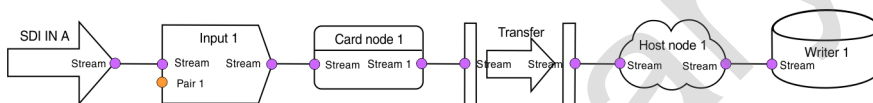
- 5 Create a host node (Node name: Host node 1) with the same settings as the card node in step 3.

- 6 Create a writer stream connected to Host node 1 with the following settings:
 - File path: Location and .avi file name of your choice.
 - Select **Audio**.
 - Clear **VANC**.

For more information on creating a writer stream, see [“Creating a writer stream”](#) on page 53.

- 7 Create a transfer stream between the card node and the host node in which the transfer direction is from card node to host node. For more information on creating a transfer stream, see [“Creating a transfer stream”](#) on page 69.

A simple capture topology is created as shown in the following figure.



- 8 Click **Play/Record all** in the Main toolbar to start recording.

Creating a simultaneous HD/SD capture topology with a Live window

To create a simultaneous HD/SD capture topology with a Live window:

- 1 Create a simple HD capture topology as explained in steps 1 to 7 of [“Creating a simple capture topology”](#) on page 81.
- 2 Create an SD host node with the following settings:
 - Node name: Host node 2.
 - Content: Video and audio.
 - Write-to-read delay: 1 frame.
 - Depth: 8 frames.
 - Video resolution: NTSC.
 - Video surface format: YUYV 422.
 - Video colorimetry: ITUR BT 601.
 - Audio channel type: Stereo.
 - Audio data type: PCM.
 - Audio bits per sample: 24 bits in 32 bits.
 - Any VANC format.

3 Create a transform stream to downscale from HD to SD with the following settings:

- Transform stream name: Transform 1.
- Input node: Host node 1.
- Output node: Host node 2.
- Transform type: Region.
- Source rectangle: Full screen.
- Destination rectangle: Keep aspect ratio.
- Select **Audio processing**.
- Any VANC format.

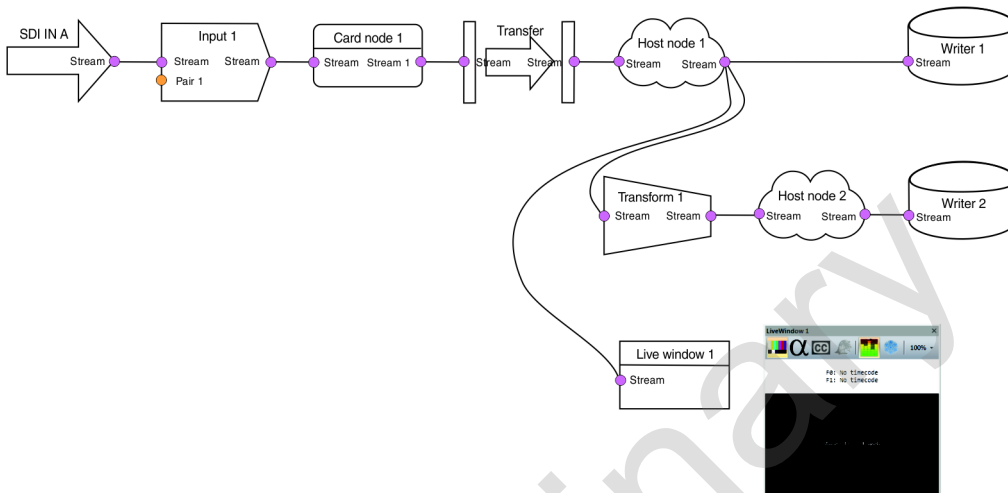
For information on creating a transform stream, see [“Creating a transform stream”](#) on page 45.

4 Create another writer stream connected to Host node 2 with the following settings:

- File path: Location and *.avi* file name of your choice.
- Select **Audio**.
- Clear **VANC**.

5 Create a Live window stream and connect it to the output of Host node 1. For more information on creating a Live window, see [“Creating a Live window”](#) on page 73.

An HD/SD capture topology with a Live window topology is created as shown in the following figure.



Note The content of the writers will not be synchronized because the transform stream's output node produces a write-to-read delay of one frame.

- 6 Click **Play/Record all** in the Main toolbar to start recording.

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