PLEORA TECHNOLOGIES INC.

vDisplay HDI-Pro IP Engine

User Guide

Pleora Technologies

Document Number

EX001-014-0002 Version 5.0, 9/18/18

Table of Contents

Chapter 1

About this Guide

This chapter describes the purpose and scope of this guide and provides a list of complimentary guides.

The following topics are covered in this chapter:

What this Guide Provides

This guide provides you with the information you need to efficiently set up and start using the Pleora vDisplay HDI-Pro IP engine. In this guide you can find product overviews, examples of video network configurations, and the steps you need to take to fine-tune the vDisplay HDI-Pro IP engine to suit your requirements.

The last section of this guide provides technical support contact information for Pleora Technologies.

Related Documents

The *vDisplay HDI-Pro IP Engine User Guide* is complemented by the following guides:

- *GEVPlayer Quick Start Guide*
- *GEVPlayer User Guide*

We recommend that you become familiar with these guides before installing and using the vDisplay IP engine.

The vDisplay HDI-Pro IP engine will be referred to as the “vDisplay IP engine” for the remainder of this guide.

Chapter 2

About vDisplay IP Engines

This chapter describes the vDisplay IP engine, including key features, video interfaces, resolutions, and pixel formats.

The following topics are covered in this chapter:

About the vDisplay IP Engine

vDisplay IP engines are compact receivers that efficiently receive and convert IP video directly from GigE Vision compliant network links to standard, high definition, or custom video monitors or appliances for display and/or processing in real time. This process eliminates the need for bulky, costly, unreliable PC workstations at each viewing node. vDisplay IP engines shrink the size, cost, and power consumption of real-time viewing stations on high-performance video networks.

To ensure clear, high-definition viewing, vDisplay IP engines deliver video to monitors with low, consistent latency. vDisplay IP engines accept a variety of video sources that comply with GigE Vision, the global standard for image transfer and device control, including analog, LVDS, Camera Link, or custom cameras, as long as the camera interface to GigE uses a GigE Vision compliant converter, such as a Pleora iPORT IP engine.

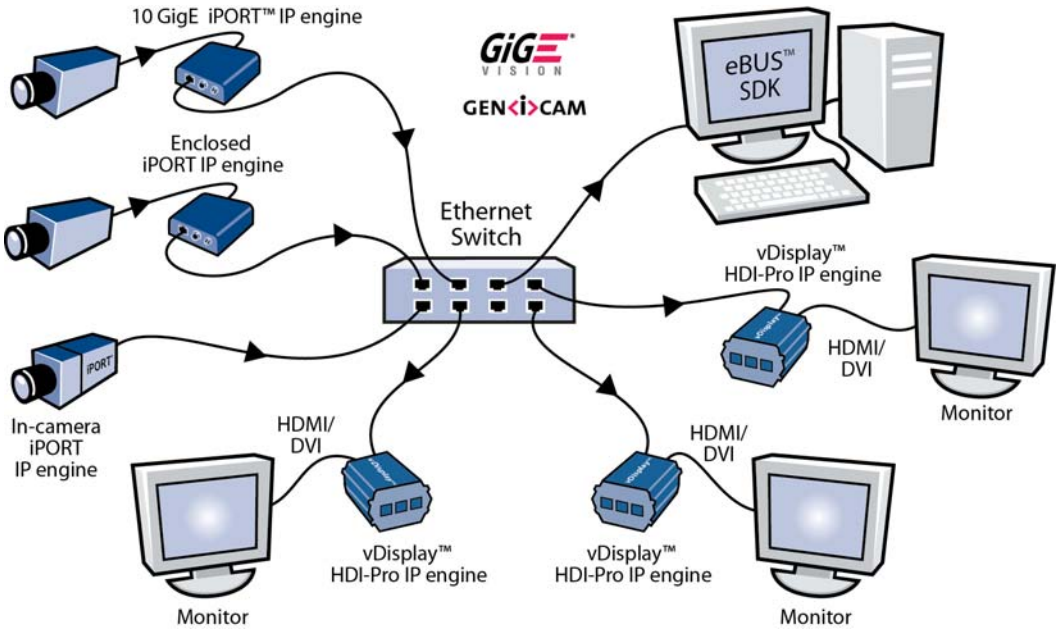
vDisplay IP engines can connect to video sources over direct point-to-point GigE links, or can be part of a packet-switched GigE local area network, and require minimal configuration for first-time use. You can configure vDisplay IP engines by using the GEVPlayer application, part of Pleora's eBUS™ SDK, or any other GenICam-compliant application that supports GigE Vision receiver devices. The vDisplay IP engine provides a GenICam v2.0.1 compliant XML file, which allows access to the IP engine features that are controlled with the GenICam API, and a GenICam node map.

The GigE Vision Control Protocol (GVCP) allows an application to configure vDisplay IP engines; this protocol is implemented over the UDP transport layer protocol. The GVCP defines mechanisms that guarantee the reliability of packet transmission and ensure minimal flow control.

Combined with other elements of Pleora's end-to-end iPORT Video Connectivity Solution, the vDisplay IP-to-HDMI converter can create complete solutions that are unmatched in flexibility, performance, and ease-of-use.

The following figure provides you with an example of how vDisplay IP engines interact seamlessly with other elements in a GigE networked video system.

Figure 1: Overview of a vDisplay IP Engine Network



Summary of vDisplay IP Engine Features

The vDisplay IP engine provides the features and functions listed in the following table.

Table 1: vDisplay HDI-Pro IP Engine Feature Summary

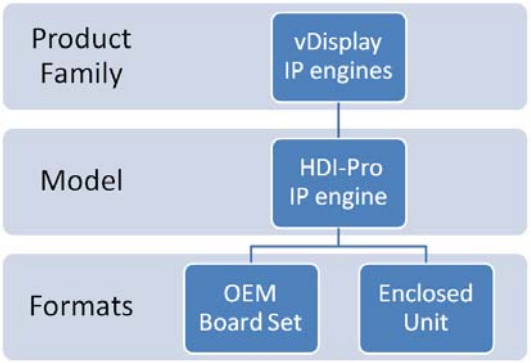
Key features
Ethernet interface
• 10/100/1000 Mbps • IPv4
GigE Vision receiver device*
• Persistent IP address • DHCP • LLA • FORCEIP command of the GigE Vision Control Protocol (GVCP) • ICMP • GigE Vision stream receiver • GigE Vision Streaming Control Protocol (GVSCP) • Unicast • Multicast (IGMPv2) • Jumbo packets support • 32 stream channels • Configurable image buffering
Display interface
• HDMI connector (Type A) • Single link video capabilities • Display Capabilities Detection for VESA-compliant monitor • Programmable video resolutions and timing • Predefined DVI and CEA video format support
Autonomous control of GigE Vision compliant cameras
• Controls up to eight cameras
Imaging processing
• White balance: manual, once, and continuous • 8 bits for monochrome rendering • Option to display MSB or LSB of mono pixel • Up to 10 bits for Bayer to RGB rendering • 16 bits for YUV 4:2:2 to RGB rendering • 24 bits for RGB pixel formats
Display channel tuner
User Set (for device configuration persistence)
Field upgradable

* Can be controlled and configured by any GigE Vision and GenICam compliant software supporting GigE Vision receiver devices.

vDisplay IP Engine Product Structure

The vDisplay HDI-Pro IP engine is available in two separate formats, the OEM board set and the enclosed unit, as shown in the following figure.

Figure 2: vDisplay HDI-Pro Product Structure



vDisplay HDI-Pro IP Engine (Enclosed Unit)

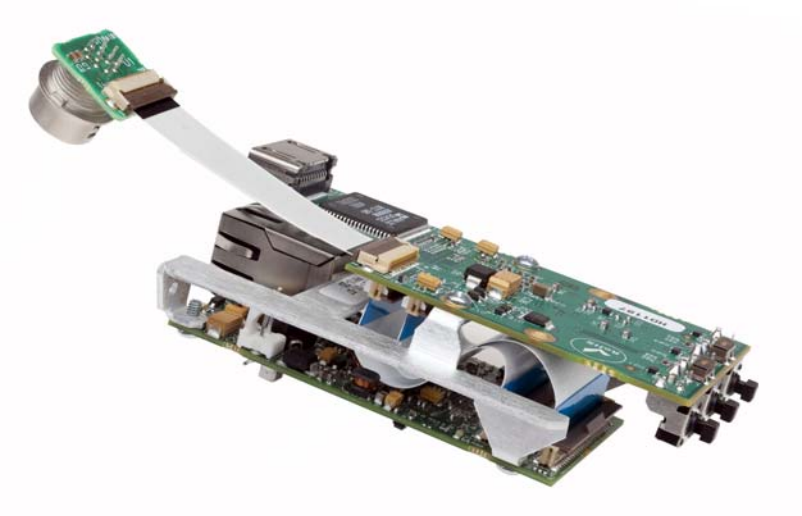
The vDisplay IP engine is comprised of a motherboard that receives streaming IP video and converts it to RGB, and a daughter card that converts RGB video to HDMI/DVI signals. These components are enclosed in a compact and rugged case, and can be used in a variety of applications as a stand-alone component within a simple point-to-point GigE network, or as part of a larger switched GigE network.

vDisplay IP engines can be installed as part of an industrial inspection system, where they feed video to viewing stations. The viewing stations can be used by operators of industrial inspection equipment to ensure that cameras are properly aligned and focused. Because the vDisplay IP engine measures only 81 mm x 59mm x 40mm, it can be located close to the inspection area, where the use of a bulky PC may not be practical.

The following images show the enclosed vDisplay IP engine with and without mounting brackets.

vDisplay HDI-Pro IP Engine OEM Board Set

The vDisplay HDI-Pro OEM board set provides the same functionality as the enclosed unit, described in the previous section, but without the enclosure, it can be embedded in a variety of devices offering further deployment flexibility. For example, the vDisplay HDI-Pro OEM board set can be installed in a workstation in a military vehicle. The vDisplay HDI-Pro OEM board set can also be installed directly within a monitor, and allow you to prototype a monitor with embedded GigE Vision capabilities.



Supported Video Display Interfaces

The vDisplay IP engine can be connected to video display devices (monitors) using the standard HDMI Type “A” receptacle, and is compatible with HDMI version 1.3a. The HDMI hardware interface is fully backward compatible with DVI-compliant devices. For DVI-based monitors, you need an HDMI-to-DVI cable to connect to the vDisplay IP engine.

The HDMI standard allows any video format timing to be transmitted and displayed. Common DTV formats have been defined to maximize interoperability between products. The inherent video format timings define the pixel line counts and timing, and synchronization pulse position and duration. In addition, the HDMI standard allows for the use of vendor-specific formats.

Video stream content protection (HDCP) is not supported in the vDisplay IP engine.

Supported Single Link DVI Video Resolutions

The vDisplay IP engine supports most single link DVI interface resolutions, as shown in Table 2.

Supported HDMI Video Resolutions

HDMI supports a wider range of video formats than DVI, but HDMI has a similar variety of pixel clock frequencies that are between 25 and 150 megahertz (MHz). These pixel frequencies support the common consumer formats of 480p, 720p, and 1080p.

The following table shows the common industry resolutions supported by the vDisplay IP engine.

Table 2: Supported Industry Resolutions

Type	X (width)	Y (height)	Pixels (106)	Aspect ratio
DVI				
VGA	640	480	0.31	4:3
SVGA	800	600	0.48	4:3
XGA	1024	768	0.79	4:3
SXGA	1280	1024	1.31	5:4
UXGA/Reduced Blanking	1600	1200	1.92	4:3
HDTV/60	1920	1080	2.1	16:9
HDMI (“A”)				
480p	720	480	0.34	3:2
720p	1024	768	0.79	4:3
1080p	1920	1080	2.1	16:9

The vDisplay IP Engine Ethernet Interface

The Ethernet interface of the vDisplay IP engine can operate at 10, 100, or 1000 Mbps.

Detailed information about how to configure the Transport Layer is provided in “Controlling the vDisplay IP Engine Transport Layer” on page 48.

Supported Pixel Formats and Image Resolutions

The following table shows the pixel formats supported by the vDisplay IP engine. The maximum image size the vDisplay IP engine can support for the Bayer format is 2048 pixels wide. The height is a function of the Bayer pixel format. For non-Bayer formats, the maximum width and height are each 64000 pixels. For Bayer and non-Bayer formats, the total image size (H x W x Pixel Depth) must be less than 10 MB.

Table 3: Supported Pixel Formats

Format	Number of bits per pixel in GVSP streams	Number of bits per pixel used for RGB rendering
BayerBG8	8	8
BayerGB8	8	8
BayerGR8	8	8
BayerRG8	8	8
Mono8	8	8
Mono8Signed	8	8
BayerBG10Packed	12	8 (Mono) 10 (Color)
BayerBG12Packed	12	8 (Mono) 10 (Color)
BayerGB10Packed	12	8 (Mono) 10 (Color)
BayerGB12Packed	12	8 (Mono) 10 (Color)
BayerGR10Packed	12	8 (Mono) 10 (Color)
BayerGR12Packed	12	8 (Mono) 10 (Color)
BayerRG10Packed	12	8 (Mono) 10 (Color)
BayerRG12Packed	12	8 (Mono) 10 (Color)
Mono10Packed	12	8
Mono12Packed	12	8
BayerBG10	16	8 (Mono) 10 (Color)

Table 3: Supported Pixel Formats (Continued)

Format	Number of bits per pixel in GVSP streams	Number of bits per pixel used for RGB rendering
BayerBG12	16	8 (Mono) 10 (Color)
BayerBG16	16	8 (Mono) 10 (Color)
BayerGB10	16	8 (Mono) 10 (Color)
BayerGB12	16	8 (Mono) 10 (Color)
BayerGB16	16	8 (Mono) 10 (Color)
BayerGR10	16	8 (Mono) 10 (Color)
BayerGR12	16	8 (Mono) 10 (Color)
BayerGR16	16	8 (Mono) 10 (Color)
BayerRG10	16	8 (Mono) 10 (Color)
BayerRG12	16	8 (Mono) 10 (Color)
BayerRG16	16	8 (Mono) 10 (Color)
Mono10	16	8
Mono12	16	8
Mono14	16	8
Mono16	16	8
YUV422Packed	16	16
YUYVPacked	16	16
BGR8Packed	24	24
RGB8Packed	24	24
BGRA8Packed	32	24
RGBA8Packed	32	24

Power Supply Considerations

The Pleora power supply encorporates the Broadband Split, Snap-On Ferrite Cylinder, which meets FCC/EMC requirements. If you choose to purchase the vDisplay IP engine without the optionally provided power supply, you must use a power supply that is outfitted with a ferrite bead with similar specifications to the Broadband Split, Snap-On Ferrite Cylinder for the vDisplay IP engine to meet FCC/EMC requirements.

The Broadband Split, Snap-On Ferrite Cylinder, part number 28A0592-0A2, is manufactured by Laird Technologies. For more information, you can visit their Web site at www.lairdtech.com.

FCC Conformity

The vDisplay IP engine has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. The vDisplay IP engine generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this user guide, can cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his, or her, own expense.

EMC Conformity

This product complies with the requirements of the EMC Directive 2004/108/EC and carries the CE mark accordingly.

Chapter 3

Accessing the IP Engine

This chapter describes how to access the vDisplay IP engine, includes instructions for using GEVPlayer to configure GigE Vision compliant devices, and provides an overview of the GEVPlayer dialog boxes. It also describes the stream destination options.

The following topics are covered in this chapter:

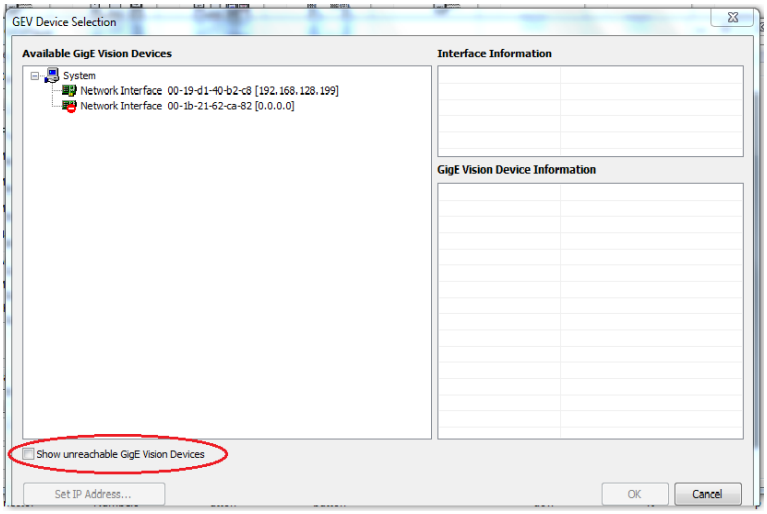
Using GEVPlayer to Configure GigE Vision Compliant Devices

After you have assembled and powered up the hardware components, you can adjust the settings of the vDisplay IP engine and the GigE Vision compliant video sources using the GEVPlayer application. We recommend starting two sessions of GEVPlayer: one session to configure the video sources and one session to configure the vDisplay IP engine.

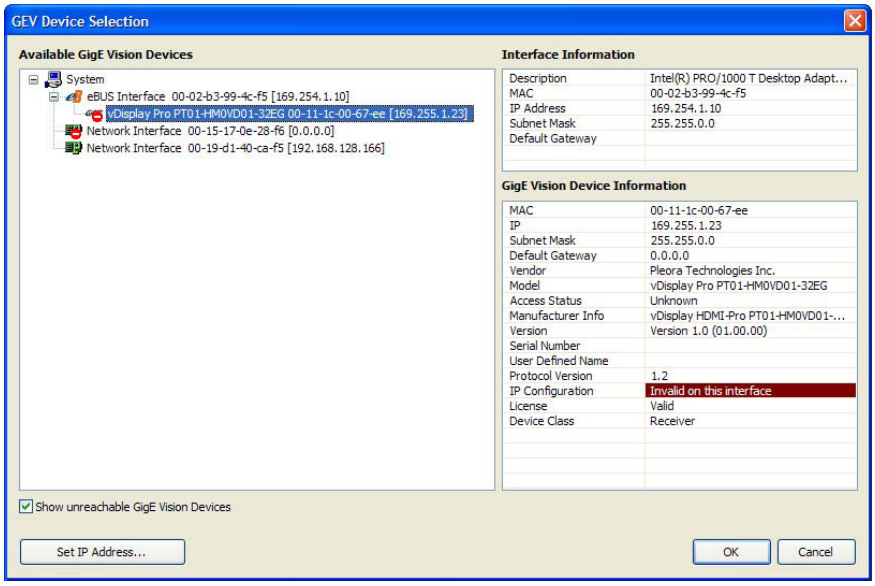
Ensure that you have installed version 1.3.3 (or later) of the eBUS SDK with GEVPlayer (formerly called the eBUS PureGEV SDK suite) on the PC or laptop.

It is possible for you to configure the vDisplay IP engine and GigE Vision compliant video sources using other GenICam-compliant software, however, this guide provides you with the instructions you need to use the Pleora GEVPlayer application.

It is important to connect the vDisplay IP engine to the same subnet as the network card of the PC used to configure the vDisplay IP engine. If it is not on the same subnet, the vDisplay IP engine might not appear within the GEVPlayer application. You can locate the vDisplay IP engine by clicking **Show unreachable GigE Vision Devices**, as shown in the following image.



If the vDisplay IP engine does not have a valid IP address, an error message appears, as shown in the following image.



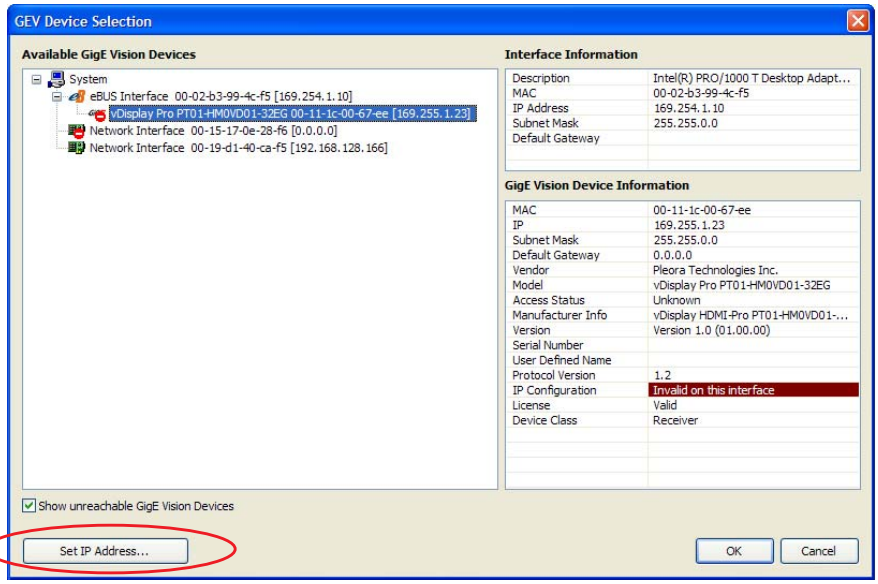
Configuring a Valid IP Address

You can provide the vDisplay IP engine with a valid IP address using the following procedure.

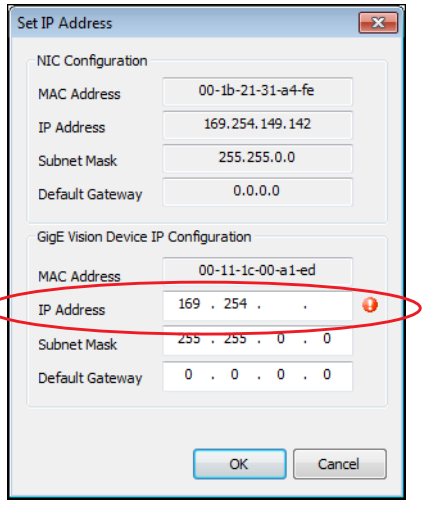
To configure a valid IP address

1. Start GEVPlayer and click **Select / Connect**.

2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **Set IP Address**.



4. In the **Set IP Address** dialog box, enter a valid IP address, subnet mask, and default gateway.



The red exclamation mark disappears if the IP address is valid.

5. Click **OK**.

The GEVPlayer application is documented in the *GEVPlayer Quick Start Guide* and the *GEVPlayer User Guide*. The *vDisplay HDI-Pro User Guide* provides you with the GEVPlayer instructions and overviews required to set up and configure the vDisplay IP engine.

Understanding GEVPlayer Control Dialog Boxes

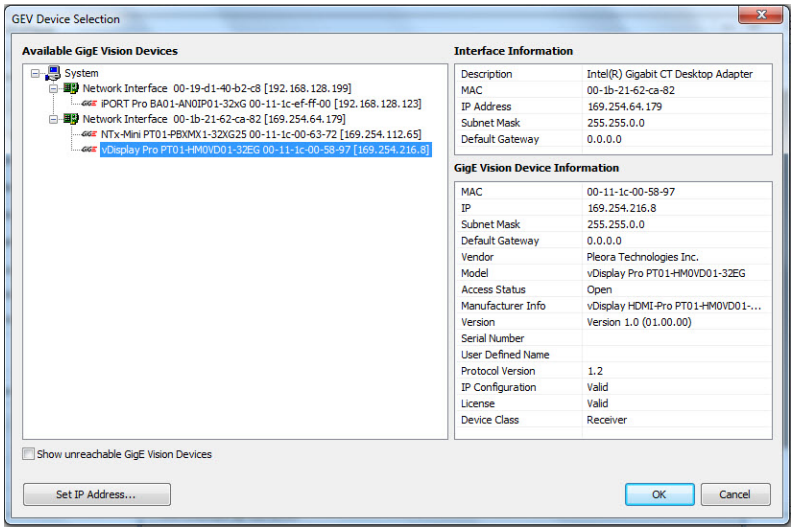
GEVPlayer breaks control of your vDisplay IP engine into the following two main categories, and provides a set of controls for each category in a separate dialog box:

- **Communication Control dialog box.** Controls connection and communication settings for the vDisplay IP engine.
- **GEV Device Control dialog box.** Controls vDisplay IP engine transport layer settings, image processing settings, image mode and formatting settings, display timing settings, channel settings, autonomous control settings, and messaging settings.

For the vDisplay IP engine, the **Image Stream Control** dialog box is not available.

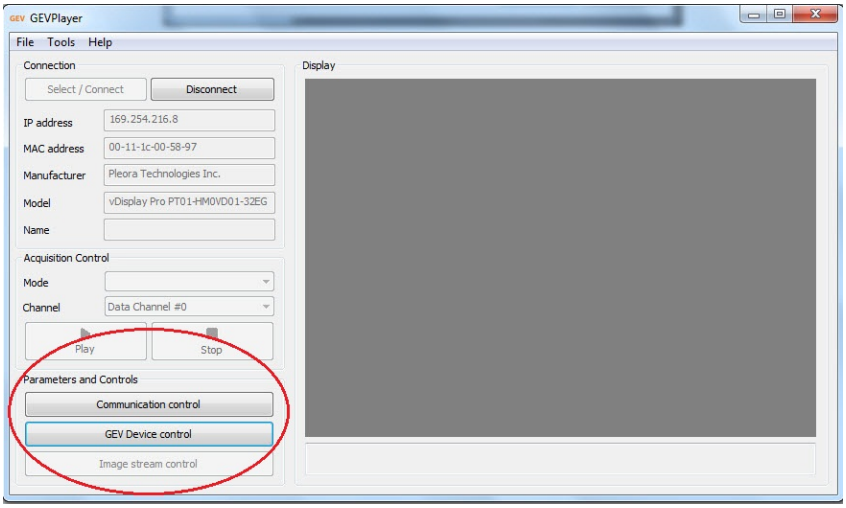
To access the Communication Control and GEV Device Control dialog boxes

1. Start GEVPlayer and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.



3. Click **OK** in the bottom right corner.

4. Click either **Communication control** or **GEV Device control** in the **Parameters and Controls** section.

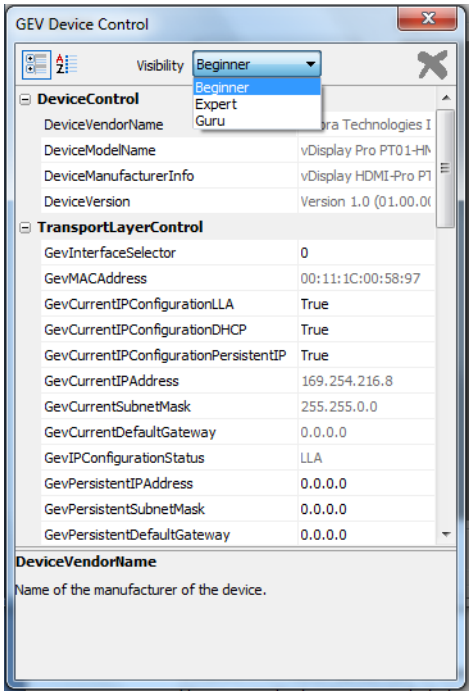


Adjusting the Visibility of GEVPlayer Controls

You can adjust the number of controls available to you to suit your level of video network responsibility and understanding. There are more controls available for the **Guru** level than for the **Beginner** level; some controls are not available in the **Beginner** level.

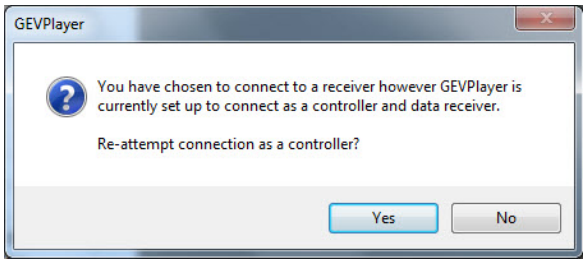
To adjust the visibility of controls

1. Start **GEVPlayer** and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click either **GEV Device control** or **Communication Control** in the **Parameters and Controls** section.
5. Using the **GEV Device Control** dialog box as an example, click the arrow in the **Visibility** drop-down box and select the appropriate user level.



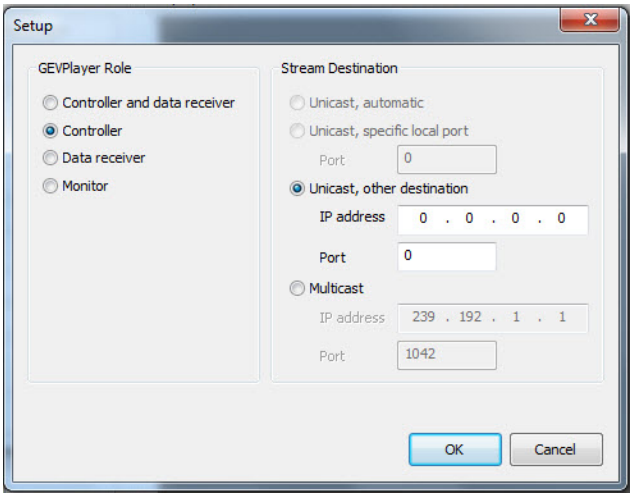
Configuring the vDisplay IP Engine Role

The first time you start GEVPlayer and connect to a vDisplay IP engine, the following GEVPlayer role error message may appear.



By default, GEVPlayer acts as a controller *and* data receiver. However, when connecting to a vDisplay IP engine, GEVPlayer must be configured as a controller only and not as a data receiver. The vDisplay engine transmits video data to a display monitor only and not to the GigE Vision network.

The GEVPlayer roles are configured in the **Setup** dialog box, shown in the following image.



To access the Setup dialog box

- Start **GEVPlayer** and select **Tools / Setup**.

  The following table describes the various GEVPlayer roles.

Table 4: GEVPlayer Roles

Role	Description
Controller and data receiver	Select this role if you are using GEVPlayer to connect to and control a GigE Vision compliant transmitter device AND if you want GEVPlayer to receive streaming data from the device.
Controller	Select this role if you are using GEVPlayer to connect to and control a GigE Vision compliant device. GEVPlayer does not receive streaming data from the device if this option is selected.
Data Receiver	Select this role if you are using GEVPlayer to connect to and receive streaming data from a GigE Vision compliant device. You cannot control the device if this option is selected.
Monitor	Select this role if you are using GEVPlayer to view the parameters and settings of a GigE Vision compliant device. You cannot make any changes to the device parameters or view video if this option is selected.

Configuring the Stream Destination, Unicast or Multicast

The **Stream Destination** panel is located beside the **GEVPlayer Role** panel, and provides options that allow you to configure GigE Vision compliant video sources to operate in either a unicast or multicast video network configuration.

The following table describes the **Stream Destination** options.

Table 5: Stream Destination Options

Option	Description
Unicast, automatic	Select this option to configure the camera to stream directly to the GEVPlayer PC using an automatically-selected port.
Unicast, specific local port	Select this option to configure the camera to stream directly to a user-defined port on the GEVPlayer PC.
Unicast, other destination	Select this option to configure the camera to stream directly to a PC or a vDisplay IP engine (a destination other than the GEVPlayer PC).
Multicast	Select this option to configure the camera to join a multicast group (specified by the IP address and port), and to begin streaming to that group. The vDisplay IP engine must be configured to receive streaming data at the same multicast address.

Instructions on how to use the GEVPlayer roles and **Stream Destination** options are included in “Setting up and Configuring vDisplay IP Engines” on page 27.

Chapter 4

Setting up and Configuring vDisplay IP Engines

This chapter provides you with information to help you efficiently set up and configure the vDisplay IP engine.

The following topics are covered in this chapter:

Initial Setup

You need a PC or laptop, with version 1.3.3 (or later) of the Pleora eBUS SDK (with the included GEVPlayer sample application) to configure the vDisplay IP engine and other GigE Vision devices during initial setup. After the initial setup, the vDisplay IP engine settings can be stored in persistent memory and the devices can then operate in the system without further configuration. It is important to ensure that the vDisplay IP engine is connected to the same subnet as the network card of the PC used to configure the vDisplay IP engine.

By default, the vDisplay IP engine is configured to automatically acquire an IP address using the Dynamic Host Configuration Protocol (DHCP) and Link Local Addresses (LLA), provided that no persistent IP address has been previously assigned to the vDisplay IP engine. This allows you to immediately connect to the vDisplay IP engine at first-time deployment, and provide the vDisplay IP engine with a persistent IP address (if required).

For information about how to provide the vDisplay IP engine with a persistent IP address, see “Configuring a Persistent IP Address” on page 48.

For information about how to store new settings in persistent memory, see “Saving Your Configuration Settings” on page 69.

The vDisplay IP engine can connect to video sources over direct point-to-point GigE links, or the vDisplay IP engine can be part of a packet-switched GigE local area network, supporting both unicast and mulitcast configurations.

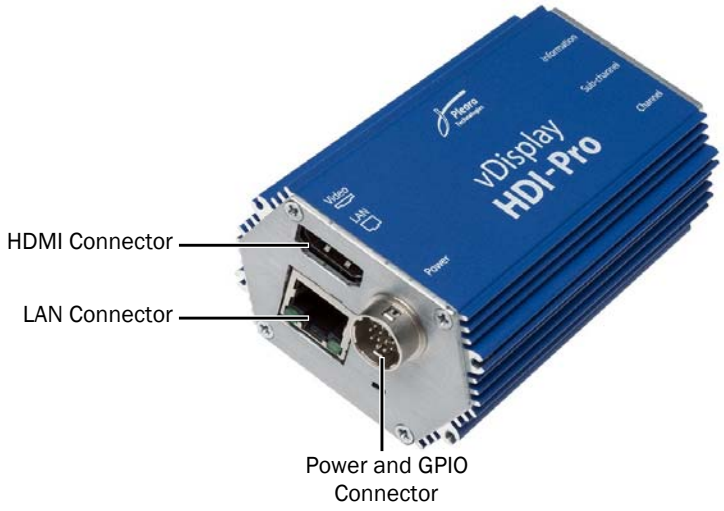
Connecting the Hardware and Power Supply

To connect the hardware and power supply for the vDisplay IP engine, ensure you have the following items available:

- GigE Vision compliant camera or other GigE Vision compliant video source

If the camera is not GigE Vision compliant, you must connect a GigE Vision compliant converter, such as one of Pleora's iPORT IP engines, between the camera and the vDisplay IP engine.

- Cat5/Cat6 cable
- HDMI-to-HDMI cable or HDMI-to-DVI cable
- Display device (monitor)
- PC with eBUS SDK (with GEVPlayer), version 1.3.3 or later (formerly called the eBUS PureGEV SDK suite)
- Pleora Technologies vDisplay IP engine power supply cable (optionally provided with the vDisplay IP engine)

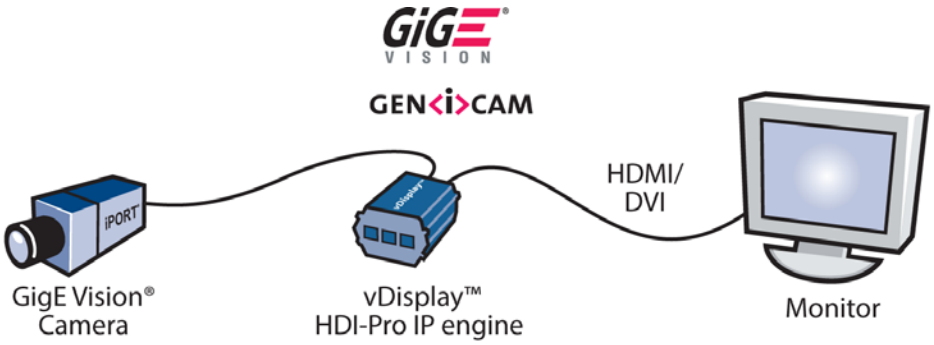


Setting up a Point-to-Point Video Network Configuration

In a point-to-point network configuration, the vDisplay IP engine is connected between a GigE Vision compliant camera and a video monitor. In the following figure, the vDisplay IP engine has been previously configured using GEVPlayer to automatically find the camera on the network and command it to send video, which is why the PC with GEVPlayer installed does not appear in the illustration.

For information about how to configure the vDisplay IP engine to automatically find GigE Vision compliant video sources without further configuration, see “Configuring Autonomous Control of Cameras” on page 38.

Figure 3: Point-to-Point Video Network Configuration



Connecting the Hardware and Power Supply for Point-To-Point Configurations

The following section provides you with detailed steps to achieve a point-to-point configuration.

To connect the hardware and power supply for point-to-point configurations

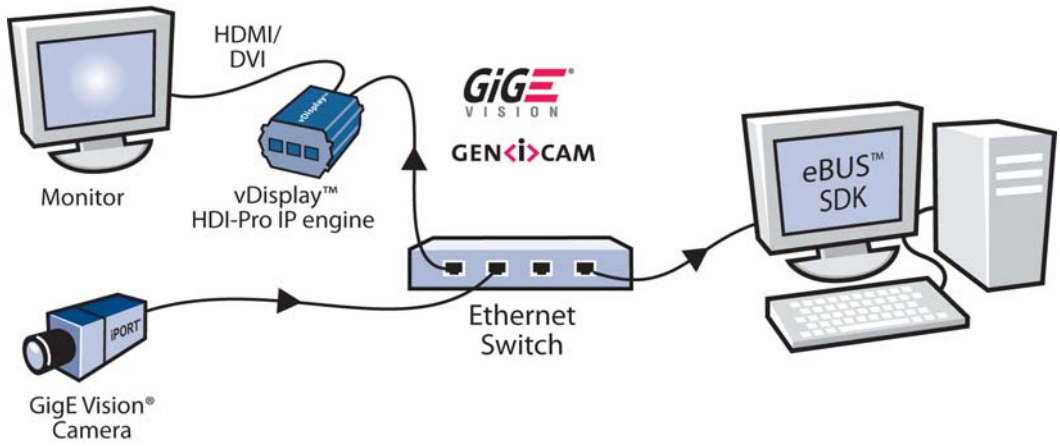
1. Connect one end of a Cat5/Cat6 cable into the RJ-45 jack of the vDisplay IP engine. Then, connect the other end to the RJ-45 jack of the GigE Vision compliant camera.

   If the camera is not GigE Vision compliant, you must connect a GigE Vision compliant converter, such as a Pleora iPORT IP engine, between the camera and the vDisplay IP engine.
2. Attach one end of an HDMI-to-HDMI cable or an HDMI-to-DVI cable to the display monitor. Then, connect the other end to the HDMI receptacle of the vDisplay IP engine.
3. Apply power to the camera, the monitor, and then to the vDisplay IP engine.

Setting up a Unicast Video Network Configuration

In a unicast network configuration, a GigE Vision compliant camera, connected to a network switch and configured to send unicast packets, is the video source. A vDisplay IP engine is fed video through the network switch and passes the video directly to a monitor. A PC with GEVPlayer installed is implemented as a management entity. The PC configures the system and starts the GigE Vision camera acquisition, and is responsible for sending heartbeat packets to the camera to maintain an active connection. The following figure illustrates the vDisplay IP engine in a unicast network configuration.

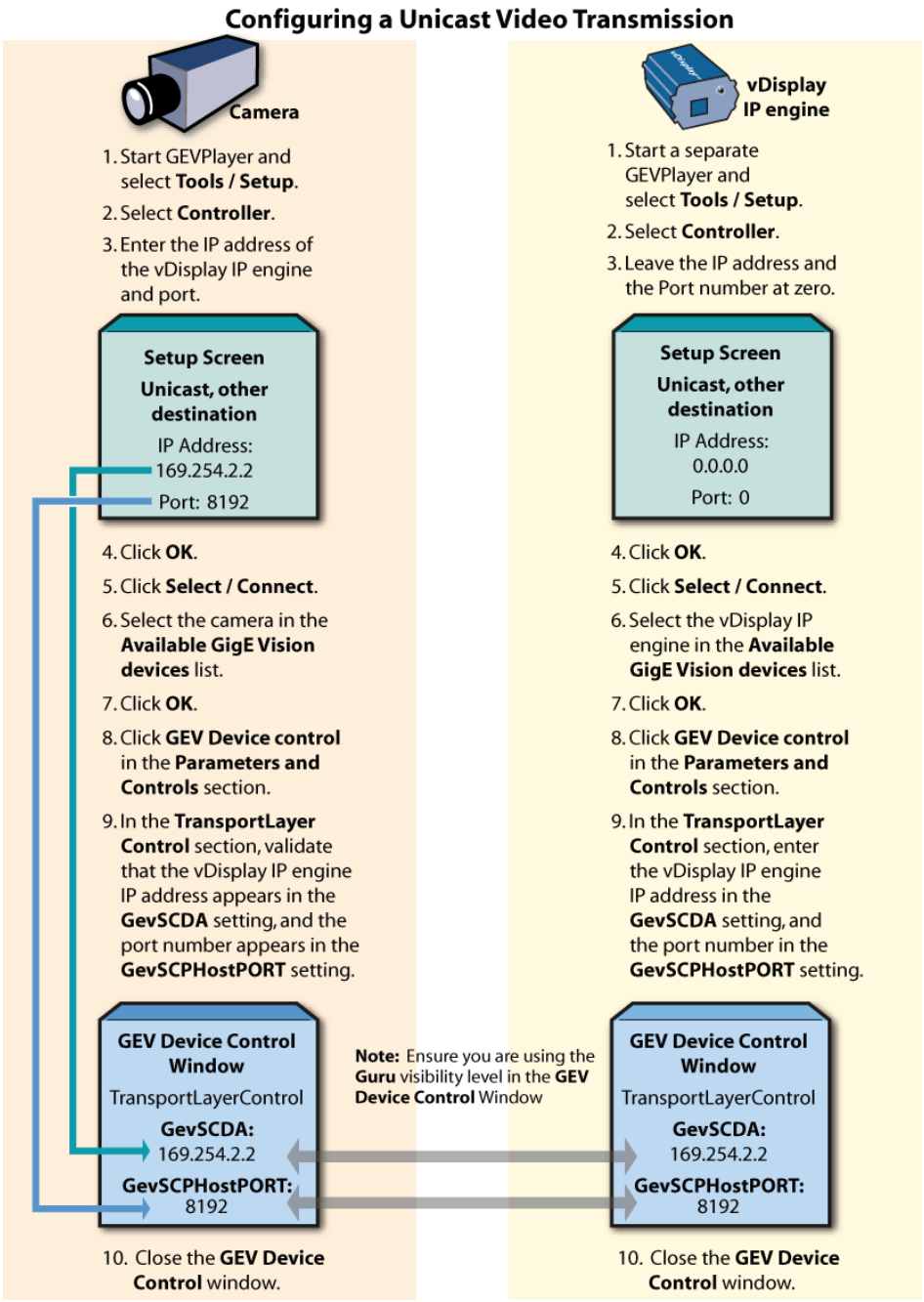
Figure 4: Setting up a Unicast Video Network Configuration



Configuring the Unicast Video Transmission

The following figure provides you with detailed steps to configure the vDisplay IP engine and GigE Vision compliant camera in a unicast video network.

Figure 5: Configuring a Unicast Video Transmission



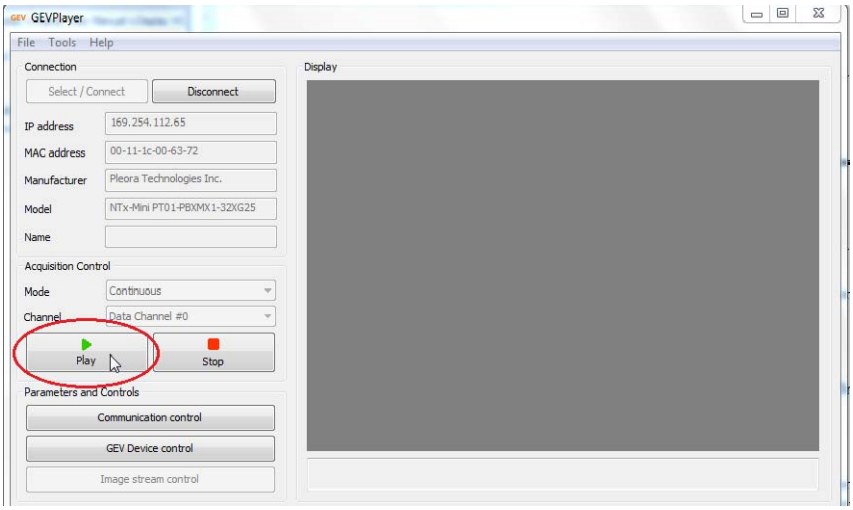
Viewing Video

After you have configured the unicast video transmission, you can view the streaming video on the connected display device.

Video does not appear in the GEVPlayer window, shown in the image below, because the unicast video transmission is being sent through the vDisplay IP engine to the display device.

To view video on the connected display device

1. Follow steps 1-10 in Figure 5 on page 32, to configure the camera.
2. In GEVPlayer, click **Play**.



After configuring the vDisplay IP engine, you no longer need to maintain its connection to GEVPlayer. However, the connection between the camera and GEVPlayer must be maintained.

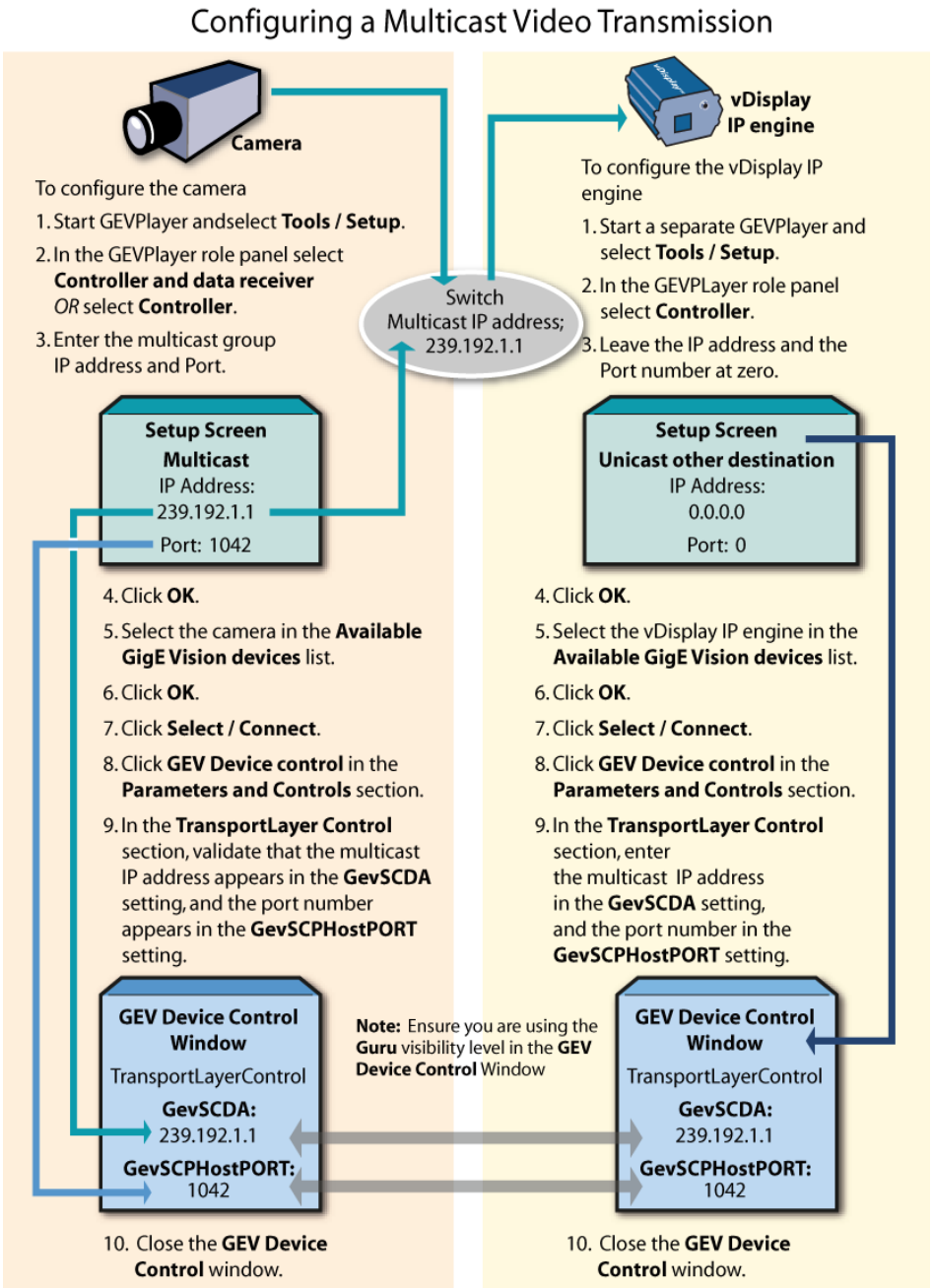
Setting up a Multicast Video Network Configuration

In a multicast network configuration, a GigE Vision compliant camera, connected to a network switch and configured to send multicast packets, is the video source. A vDisplay IP engine is fed video through the network switch and passes the video directly to a monitor and to the GEVPlayer application. A PC with GEVPlayer installed is implemented as a management entity. The PC configures the system and starts the GigE Vision camera acquisition, and is responsible for sending heartbeat packets to the camera to maintain an active connection.

Configuring the Multicast Video Transmission

The following figure provides you with detailed steps to configure vDisplay IP engines and GigE Vision compliant cameras in a multicast video network.

Figure 6: Configuring a Multicast Video Transmission



When configuring the vDisplay IP engine for a multicast video transmission where there is one camera and one vDisplay IP engine, the **GevStreamChannelSelector** setting should be **0**.

Viewing Video

After you have configured the multicast video transmission, you can view the streaming video on the connected display device and in GEVPlayer.

To view video on the connected display device and in GEVPlayer

1. Follow steps 1-9 in Figure 6 on page 34 to configure the camera.

Do not select **Controller** as the GEVPlayer role; if you select **Controller**, you cannot view video in GEVPlayer, as shown below.

2. In the GEVPlayer, click **Play**.

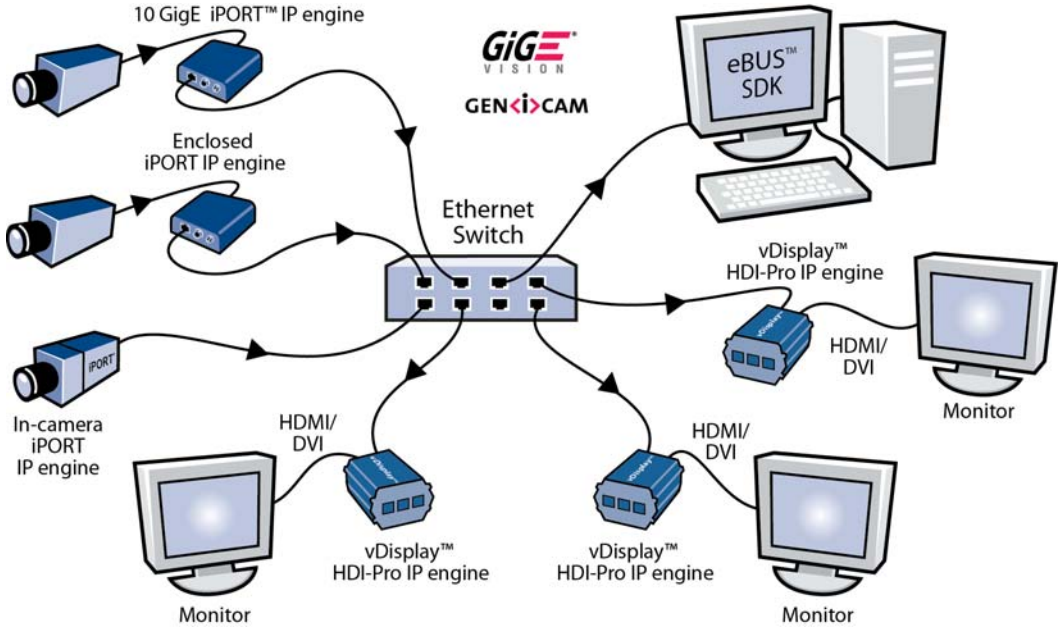
After configuring the vDisplay IP engine, you no longer need to maintain its connection to GEVPlayer. However, the connection between the camera and GEVPlayer must be maintained.

Mixed Video Network Configuration Overview

The following figure provides you with an overview of vDisplay IP engines and GigE Vision compliant cameras in a more complex video network consisting of multicast and unicast video transmissions.

Use the steps provided in Figure 5 on page 32 and Figure 6 on page 34 when setting up a mixed video network.

Figure 7: Mixed Video Configuration Overview

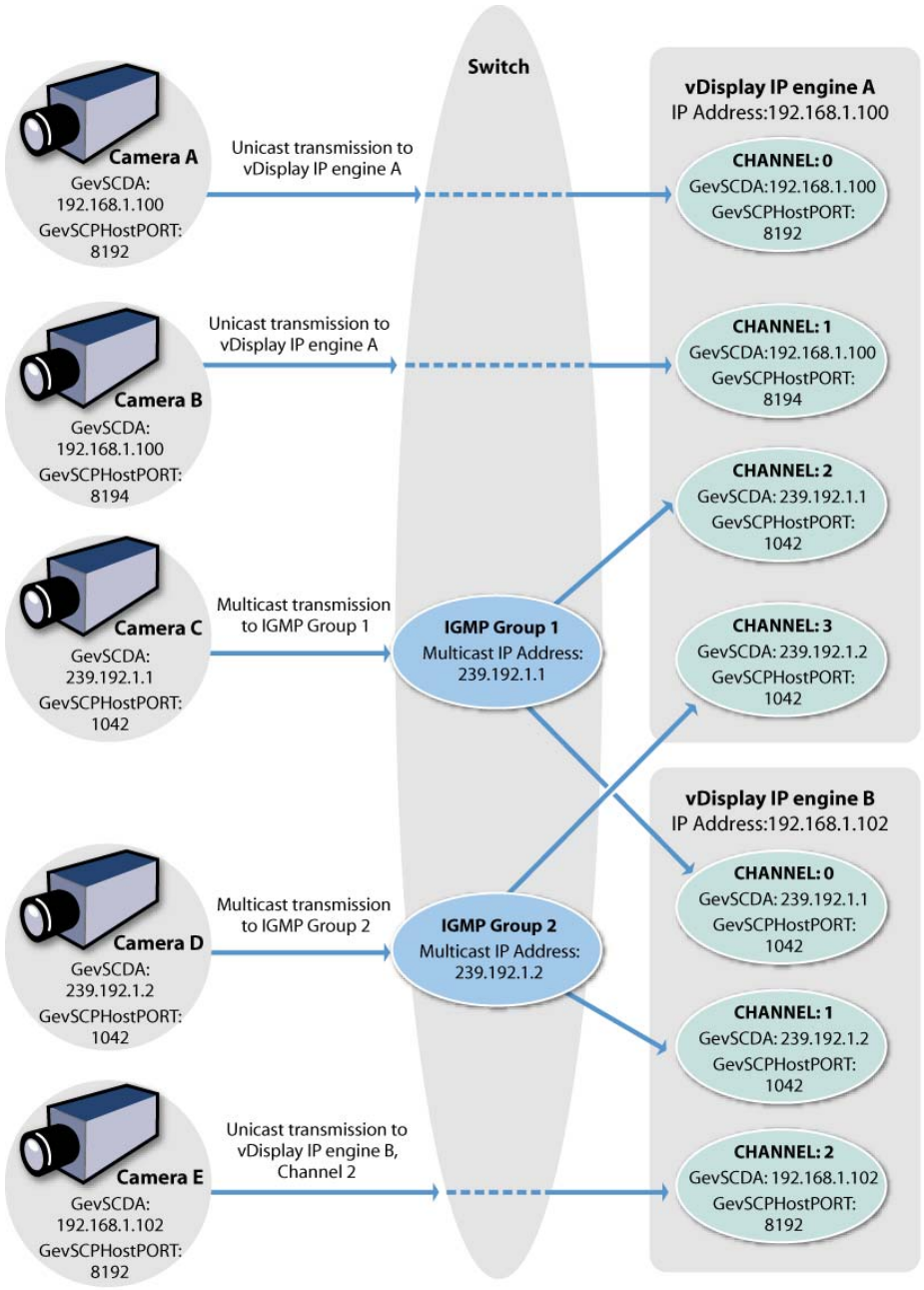


When configuring a multi-camera and multi-vDisplay IP engine video network, you must open one GEVPlayer application for each camera, and one GEVPlayer application for each vDisplay IP engine.

Configuring a Mixed Video Network

The following figure provides the configuration settings for vDisplay IP engines and GigE Vision compliant cameras in a video network consisting of unicast and multicast video transmissions.

Figure 8: Configuration Settings for a Mixed Video Network

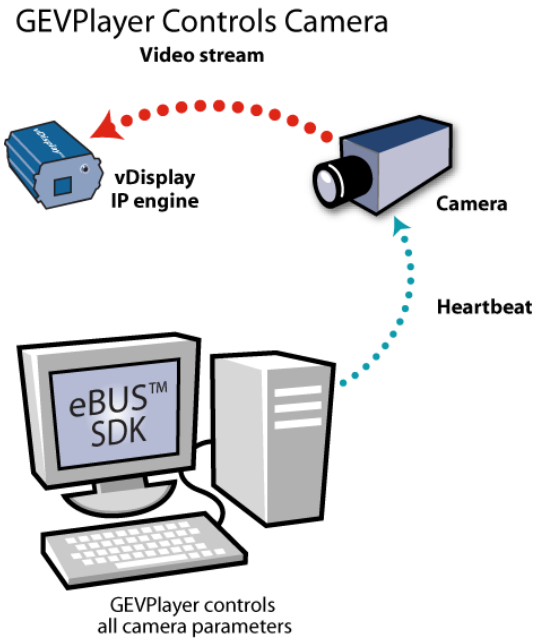


Note: The GevSCPHostPort on the camera side must match the GevSCPHostPort on the vDisplay IP engine.
Note: The vDisplay IP engine can receive multiple unicast video transmissions from multiple cameras as long as each transmission is received on a unique port.
Note: Two multicasting cameras can use the same multicasting IP address, but must send to different multicast ports.

Configuring Autonomous Control of Cameras

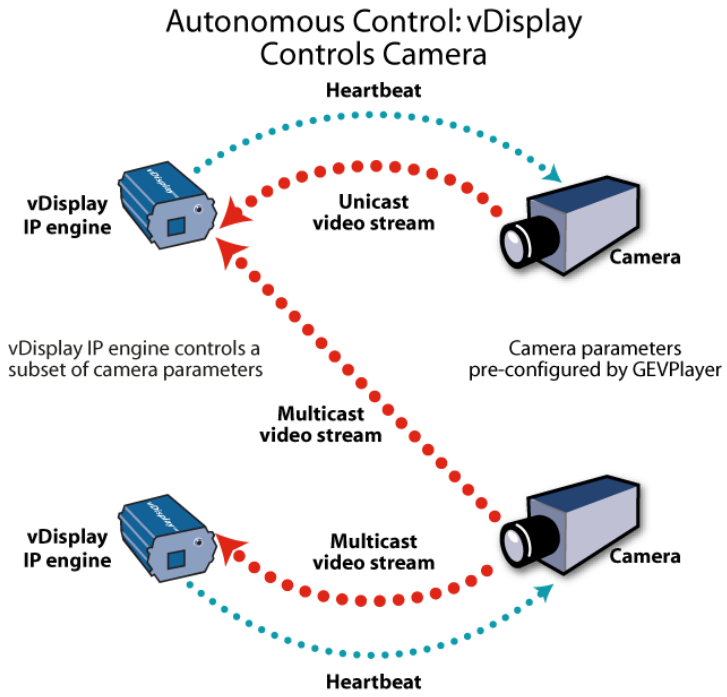
You can configure the vDisplay IP engine to efficiently control up to eight GigE Vision compliant video sources (cameras) without the need for further user intervention through GEVPlayer. This is referred to as Autonomous Source Control.

Previous sections of this guide describe how GEVPlayer can be used to control vDisplay IP engines and cameras. GEVPlayer controls these devices and sends heartbeats to the cameras to maintain the flow of video from the camera to the vDisplay IP engines, as shown in the following figure.



When configured for Autonomous Control, the vDisplay IP engine automatically finds the camera on the network by either looking for a specified IP address, or by using the Discovery mode, and commands the camera to stop or start streaming video in either a unicast or multicast video network configuration. The vDisplay IP engine sends heartbeats to the cameras to maintain video transmissions.

The following figure provides a simple overview of vDisplay IP engines autonomously controlling cameras.



Cameras used in an autonomously controlled video network must be preconfigured before they are connected; the vDisplay IP engine controls only a subset of the camera's network parameters.

In Discovery mode, only **Source 0** is allocated for the discovered camera, as there is a one-to-one relationship between a discovered camera and the vDisplay IP engine. Discovery mode is used when there is only one camera in the video network.

In IP Address mode, channels **0**-7 are used and correspond to the **0**-7 cameras being autonomously controlled by the vDisplay IP engine.

Communication status between the vDisplay IP engine and the connected cameras is displayed beside **SourceControlStatus** in the **AutonomousSourceControl** section in the **GEV Device Control** dialog box. When a camera is discovered by, and connected to, the vDisplay IP engine, the **SourceControlStatus** changes to **SessionConnected**.

Configuring Autonomous Control Using Discovery Mode

In Discovery mode, the vDisplay IP engine sends discovery packets across the network to find and connect to the first GigE Vision compliant video source that responds. We recommend using Discovery mode when only one camera exists on the video network.

When the vDisplay IP engine is configured for Discovery mode, the **SourceSCDA** value can be **0.0.0.0**. If the **SourceSCDA** value is **0.0.0.0,** the vDisplay IP engine connects to the first camera it finds and commands it to send a unicast video stream to the vDisplay IP engine (IP address and port 8192). At the same time, the vDisplay IP engine prepares channel **0** to receive the unicast stream.

If there are two vDisplay IP engines on the network, and you want both of them to receive video from the same camera, you should enter a multicast group IP address as the **SourceSCDA** value and enter a multicast port number as the **SourceSCPHostPort** value. You should also configure a channel on both vDisplay IP engines to receive the multicast stream.

After you have configured the vDisplay IP engine to control the camera autonomously using Discovery mode, you must save the configurations to **UserSet1**. Once the settings are saved, you can power off the vDisplay IP engine and remove the PC with GEVPlayer from the network.

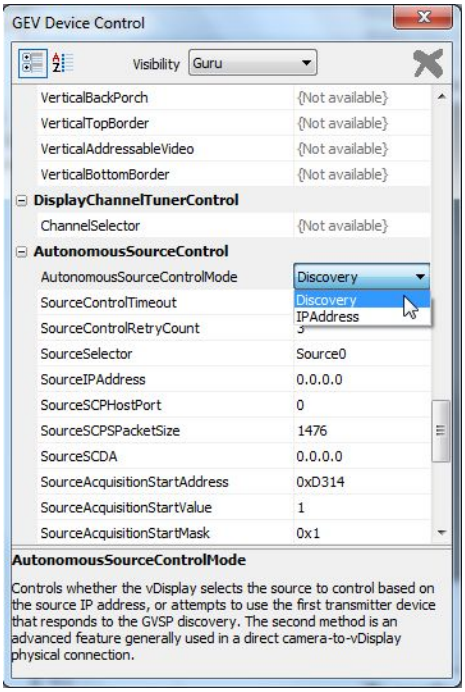
When you power on and reconnect the vDisplay IP engine to the camera, the vDisplay IP engine starts to autonomously control the camera.

You can disconnect and reconnect the camera to the vDisplay IP engine (either the same camera or a different camera) without power cycling the vDisplayIP engine; it automatically detects and controls the camera. The IP address of the camera and the vDisplay IP engine must be on the same subnet.

For information about how to save your configuration settings, see “Saving Your Configuration Settings” on page 69.

To configure the vDisplay IP engine to automatically discover video sources using Discovery mode

1. Start **GEVPlayer** and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click **GEV Device control** in the **Parameters and Controls** section.
5. In the **AutonomousSourceControl** section, select **Discovery** in the **AutonomousSourceControlMode** box.

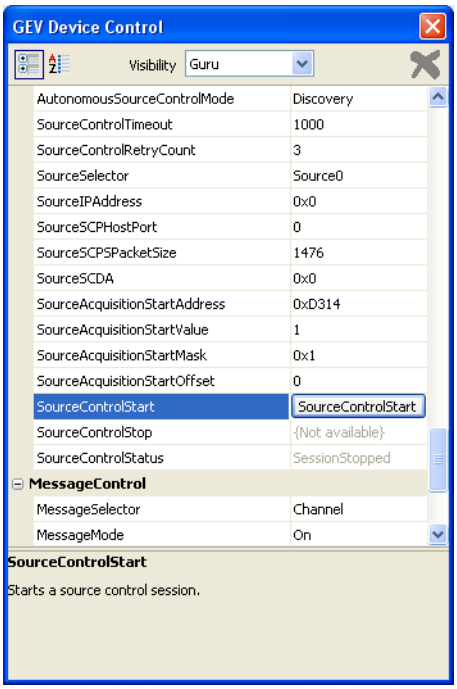


6. Leave the **SourceSelector** value at **0** and the **SourceIPAddress** value at **0.0.0.0**.
7. For a unicast video transmission, leave the **SourceSCDA** at **0.0.0.0** and **SourceSCPHostPort** at **0**.

   - Or -

   For a multicast video transmission, enter the multicast group IP address in the **SourceSCDA** box and the source port number in the **SourceSCPHostPort** box.

8. To enable autonomous source control, scroll down and click **SourceControlStart**; the box changes to **SourceControlStart** to indicate that the vDisplay IP engine will now automatically find video sources on the network.



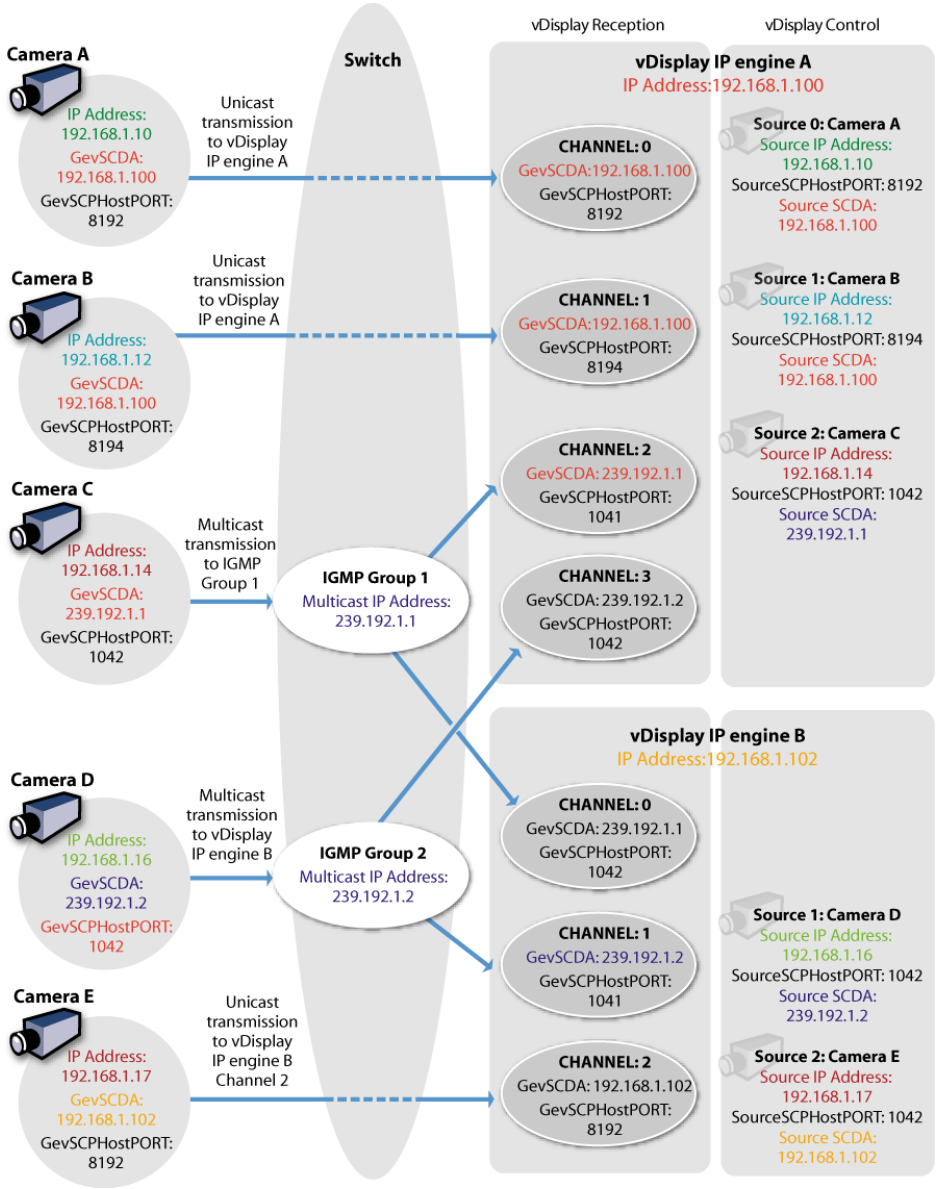
9. Save the configuration settings to **UserSet1** and then close the **Gev Device Control** dialog box.

Configuring Autonomous Control using IP Addresses

The following figure provides an overview of vDisplay IP engines autonomously controlling GigE Vision compliant cameras in a complex video network consisting of multicast and unicast video transmissions. In this scenario, the vDisplay IP engines discover the cameras using configured IP addresses.

This illustration is most informative when viewed in color.

Figure 9: Configuring Autonomous Control of Cameras Using IP Addresses



For instructions on channel configuration, see “Configuring Channels” on page 63.

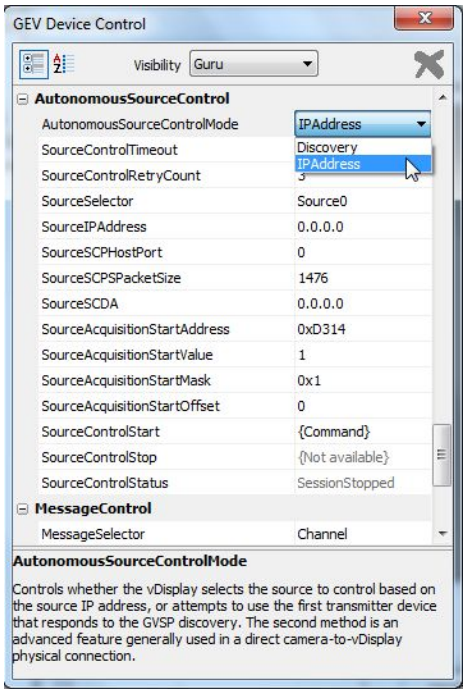
After you have configured the vDisplay IP engines, you must save the configurations to **UserSet1**. Once the settings are saved, you can power off the vDisplay IP engines and remove the PC with GEVPlayer from the network. When you power on and reconnect a vDisplay IP engine to a camera, the vDisplay IP engine continues to autonomously control the camera.

When using IP addresses, if you disconnect and reconnect the camera, you must power cycle the vDisplay IP engine for it to automatically detect and control the camera.

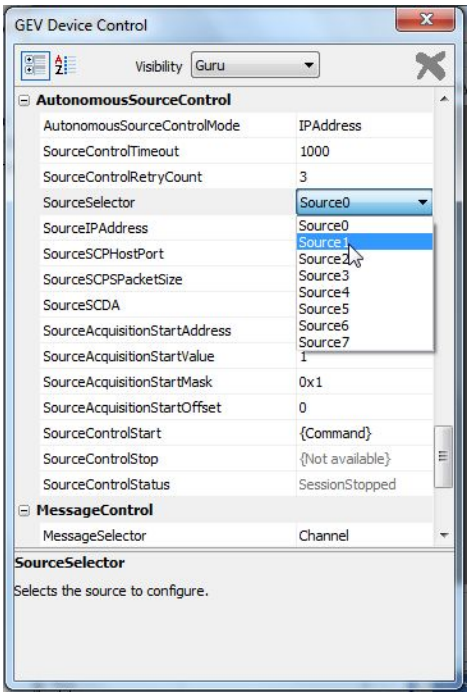
To configure the vDisplay IP engine to automatically control video sources using IP addresses

1. Start **GEVPlayer** and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click **GEV Device control** in the **Parameters and Controls** section.

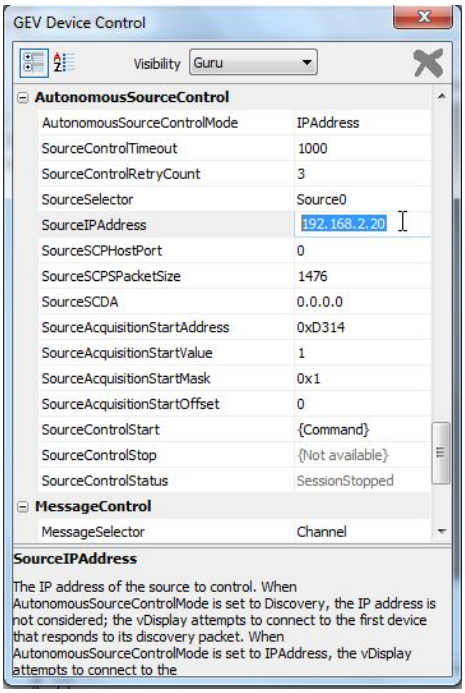
   In the **AutonomousSourceControl** section, click in the box to the right of **AutonomousSourceControlMode** and select **IP Address**.



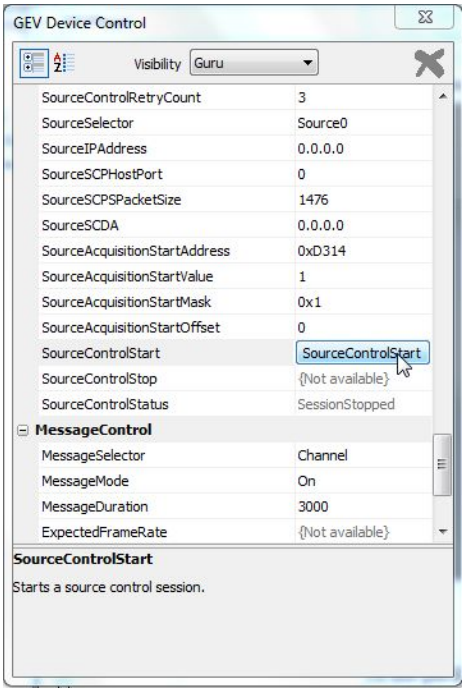
5. Assign a source ID number to the video source by clicking in the **SourceSelector** box and selecting a number from **0**-7.



6. Enter the video source IP address in the **SourceIPAddress** box.



7. Enter the source port in the **SourceSCPHostPort** box, for example, **8192**.
8. For a unicast transmission, enter the vDisplay IP engine IP address in the **SourceSCDA** box; for a multicast video transmission, enter the multicast group address as the **SourceSCDA** box.
9. To enable autonomous source control using IP addresses, scroll down and click **SourceControlStart**. The field changes to **SourceControlStart** to indicate that the vDisplay IP engine will now automatically find video sources on the network.



10. Repeat steps 6-9 until all of the video source IP addresses have been entered.

    Save the configuration settings to **UserSet1** and close the **Gev Device Control** dialog box.

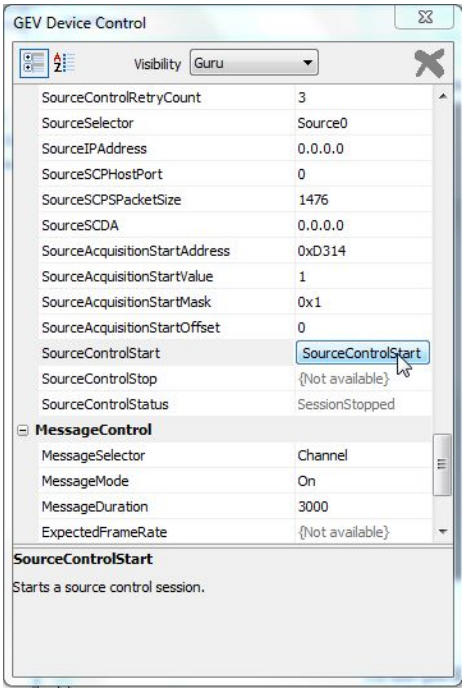
For further clarification, see “Configuring Autonomous Control of Cameras Using IP Addresses” on page 43.

For instructions on channel configuration, see “Configuring Channels” on page 63.

The vDisplay IP engine locates the **SourceAcquisitionStartAddress** for all Pleora IP engine products. If you are using non-Pleora products, you may have to enter the **SourceAcquisitionStartAddress** along with the **SourceAcquisitionStartValue** and **SourceAcquisitionStartMask**. You can usually find this information in the XML file belonging to the product.

To disable the autonomous control of a camera

- In the **AutonomousSourceControl** section, click to select **SourceControlStop**. The box changes to **SourceControlStop** to indicate that the vDisplay IP engine will no longer command cameras to start streaming video.



To permanently stop controlling a specific camera, enter **0** in the **SourceIPAddress**, **SourceSCPHostPort**, and **SourceSCDA** fields for that camera.

Controlling the vDisplay IP Engine Transport Layer

The **GEV Device Control** dialog box provides you with the tools you need to configure persistent IP addresses for your vDisplay IP engines, and control how data is streamed from your video sources to your display devices.

Configuring a Persistent IP Address

The vDisplay IP engine requires an IP address to function on a video network and supports IPv4. By default, the vDisplay IP engine is configured to automatically acquire an IP address using DHCP and LLA, provided no persistent IP address has been assigned. This allows you to immediately connect to the vDisplay IP engine at first-time deployment, and then, if you choose to, provide it with a persistent IP address. If you provide the vDisplay IP engine with a persistent IP address, it will use this persistent IP address each time it is powered up and connected to the network.

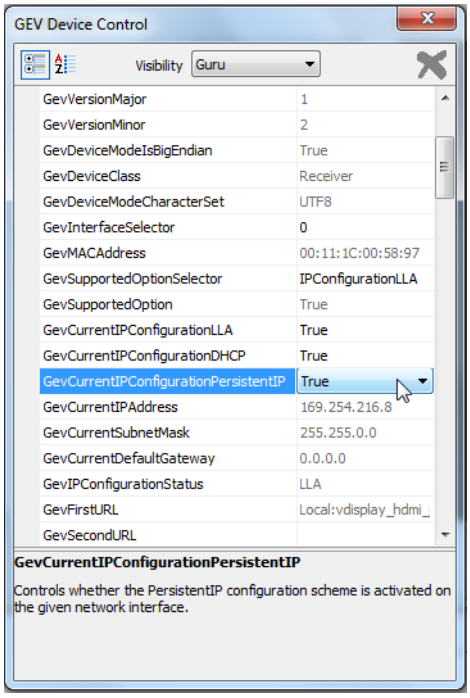
The vDisplay IP engine can use the persistent IP address each time it is powered up, as long as the IP address is valid and there were no IP address conflicts at the time the IP address was configured.

To configure a persistent IP address

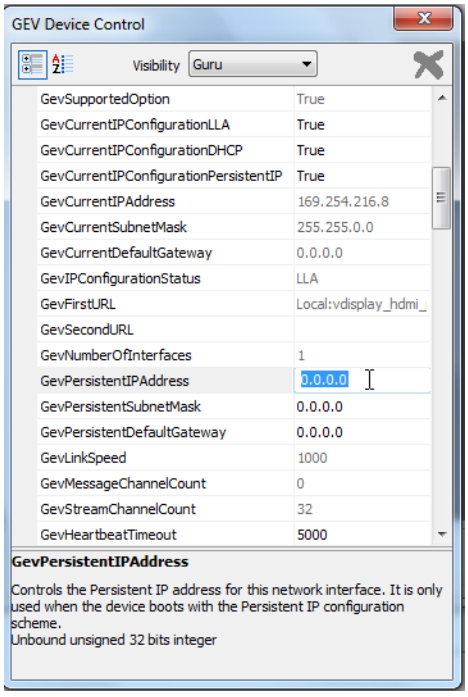
1. Start **GEVPlayer** and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click **GEV Device control** in the **Parameters and Controls** section.
5. In the **TransportLayerControl** section of the **GEV Device Control** dialog box, enter a subnet mask in the **GevPersistentSubnetMask** box.
6. Enter a default gateway in the **GevPersistentDefaultGateway** box.

The subnet gateway value can remain at **0**.

7. Click in the **GEVCurrentIPConfigurationPersistentIP** box and select **True**.



8. Enter the persistent IP address in the **GEVPersistentIPAddress** box.



9. Close the **GEV Device Control** dialog box.

The vDisplay IP engine uses the persistent IP address first, but if this option if set to **False**, it uses the IP address provided by DHCP next, and if this fails, uses LLA to find an available IP address. LLA cannot be disabled and is **True** by default.

Controlling the Video Stream

Using the **GEVPlayer** options in the **GEV Device Control** dialog box, you can configure how the vDisplay IP engine streams video to your display devices. The video streaming options can affect the performance and display of images through buffering, provide you with the ability to display partial images under packet-loss scenarios, and allow you to define a partial image.

Ensure you have selected the **Guru** level of visibility to access all of the controls discussed in the following sections.

Configuring the Buffer Count

You can use either one or three buffers for reassembling images. If you select one buffer, the vDisplay IP engine immediately displays the image packets as they are received, without first attempting to reassemble an entire image. If you choose three buffers, the vDisplay IP engine uses the buffers to attempt to reassemble an entire image before displaying it.

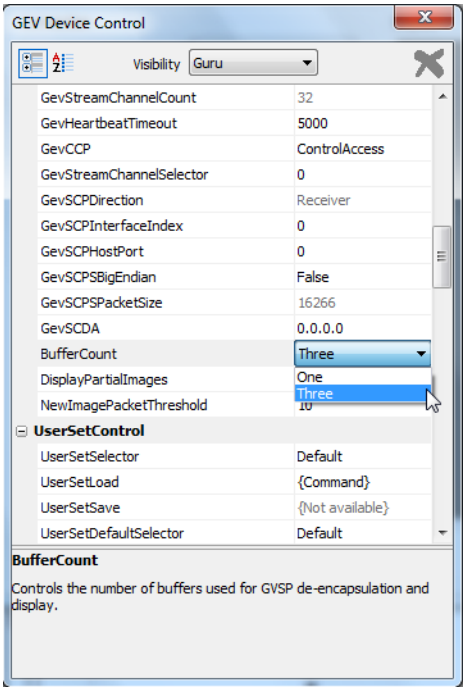
Using the single buffer means that images are displayed as packets are received. This mode provides the lowest latency, but pixels from different video frames can appear on the same screen as the image is updated. Therefore, using a single buffer is only recommended where the absolute lowest latency is required.

When using three buffers, one buffer is used to completely receive an image. After the image is completely received, it is placed in another buffer and queued for display. This mode of operation is recommended because the vDisplay attempts to reassemble packets to form a complete image before displaying it.

To configure the buffer count

1. Start **GEVPlayer** and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click **GEV Device control** in the **Parameters and Controls** section.

5. In the **TransportLayerControl** section of the **GEV Device Control** dialog box, click in the **BufferCount** box and choose either **One** or **Three**.



6. Close the **GEV Device Control** dialog box.

Defining Partial Images

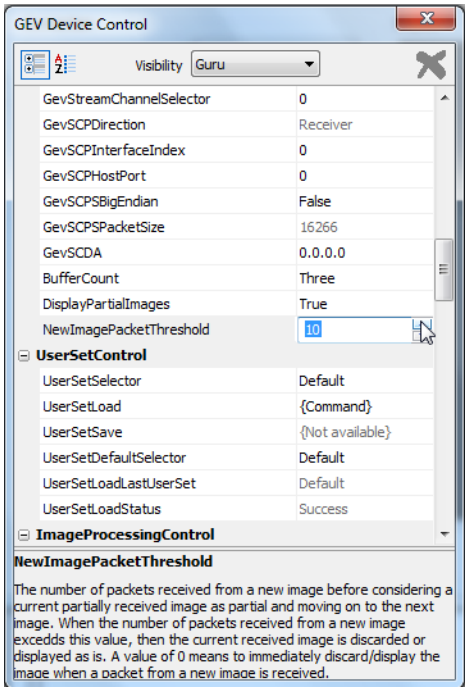
When using three buffers, one buffer (the Receiving Buffer) is used to re-assemble an image before it is displayed on screen. When a new packet arrives, if it belongs to an image other than the one currently being re-assembled, it is discarded. You can use the **NewImagePacketThreshold** control to determine when the image in the Receiving Buffer is defined as a partial image. When the number of packets received from images (other than the one in the Receiving Buffer) exceeds the value entered, the image in the Receiving Buffer is either discarded or displayed as-is.

If you enter a value of **0**, the vDisplay IP engine immediately discards or displays the image in the Receiving Buffer when a packet from a different image is received.

The **NewImagePacketThreshold** setting is closely linked to the **DisplayPartialImages** setting. Once you have defined the number of packets that define a partial image, you can choose whether to display or discard the partial image using the **DisplayPartialImages** setting, described in the next section.

To define a partial image

1. Start **GEVPlayer** and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click **GEV Device control** in the **Parameters and Controls** section.
5. In the **TransportLayerControl** section of the **GEV Device Control** dialog box, enter a value in the **NewImagePacketThreshold** box.



If you enter a value of **0**, the vDisplay IP engine immediately discards or displays the image when a packet from a new image is received.

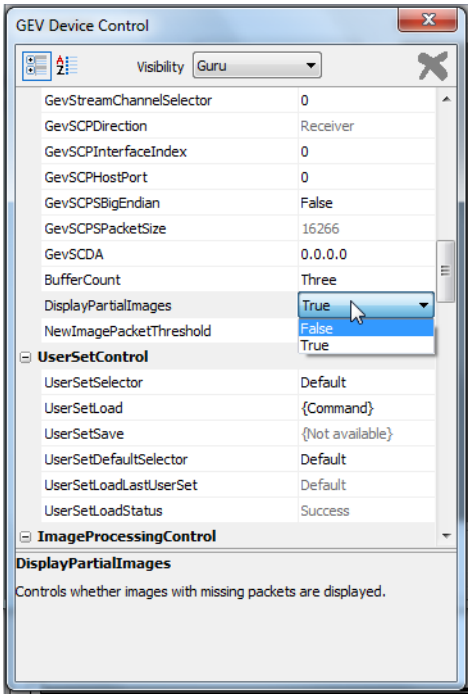
6. Close the **GEV Device Control** dialog box.

Displaying Partial Images

If a packet arrives for a different image before the re-assembly of the current image is complete, the vDisplay IP engine can pass the partially re-assembled image to the display device in its incomplete state, and start assembling a new image. However, the vDisplay IP engine only sends the partial image to the display if the **DisplayPartialImages** control is set to **True**. If the **DisplayPartialImages** setting is set to **False**, the partial image is discarded.

To display partial images

1. Open **GEVPlayer** and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click **GEV Device control** in the **Parameters and Controls** section.
5. In the **TransportLayerControl** section of the **GEV Device Control** dialog box, click in the **DisplayPartialImages** box and select **True**.

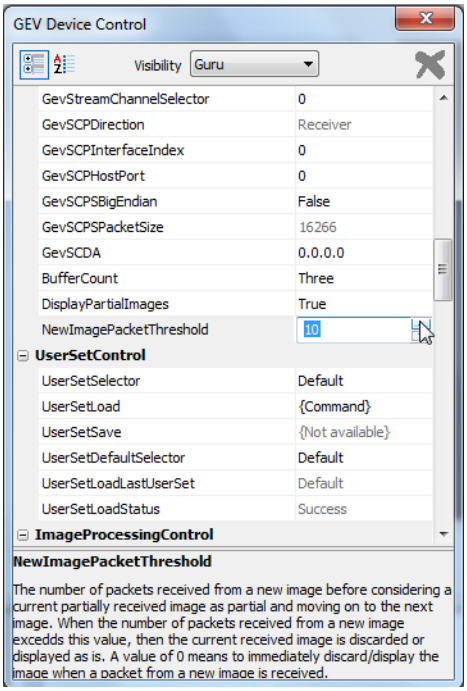


6. Close the **GEV Device Control** dialog box.

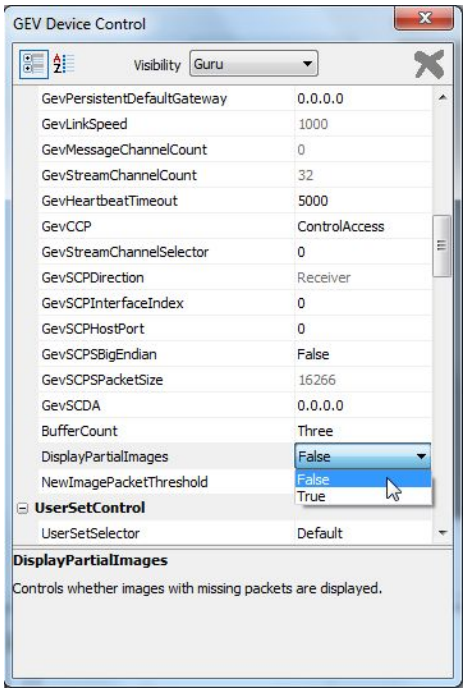
To discard partial images

1. Start GEVPlayer and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click **GEV Device control** in the **Parameters and Controls** section.
5. In the **TransportLayerControl** section of the **GEV Device Control** dialog box, enter a value in the **NewImagePacketThreshold** box.

   The value entered as the **NewImagePacketThreshold** is the number of packets received from the new image at which point the current image is discarded.

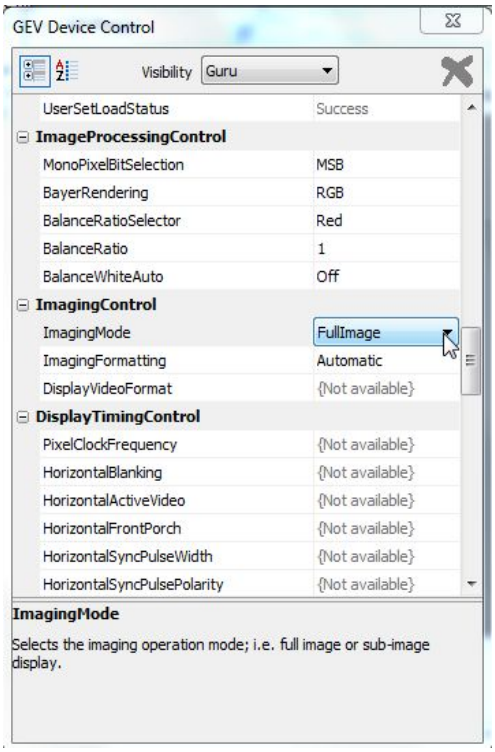


6. In the **TransportLayerControl** section of the **GEV Device Control** dialog box, click in the **DisplayPartialImages** box and select **False**.



Controlling the Image Display

You can use the options available in the **ImagingControl** section of the **GEV Device Control** dialog box to achieve the best possible image on your display device.



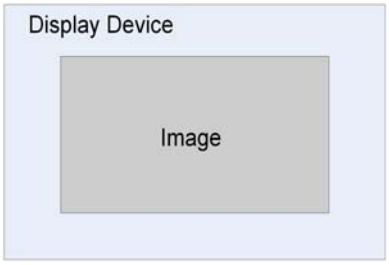
Controlling the Image Mode

You can use the **ImagingMode** option in the **ImagingControl** section of the **GEV Device Control** dialog box to select the imaging mode of the vDisplay IP engine.

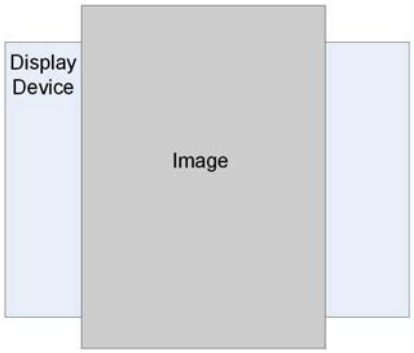
Currently, there is only one option (**FullImage**), which allows the attached display device to display as much of the image as possible, depending on the image and display resolutions selected.

Controlling the Image Display Format

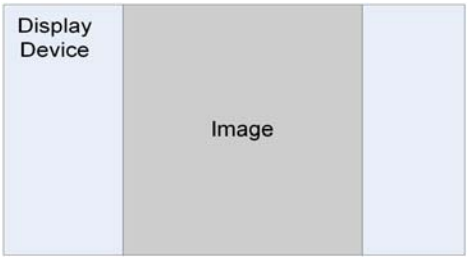
The vDisplay IP engine automatically centers and crops the images for optimal viewing on your display device. If the image has a smaller resolution than your monitor, the vDisplay IP engine centers the image, as shown below.



In some cases, the image can be taller than your monitor, as shown below.



The vDisplay IP engine automatically crops and centers the image, as shown below.



If the image is larger than the monitor, the vDisplay IP engine centers the image; it does not make the image smaller.

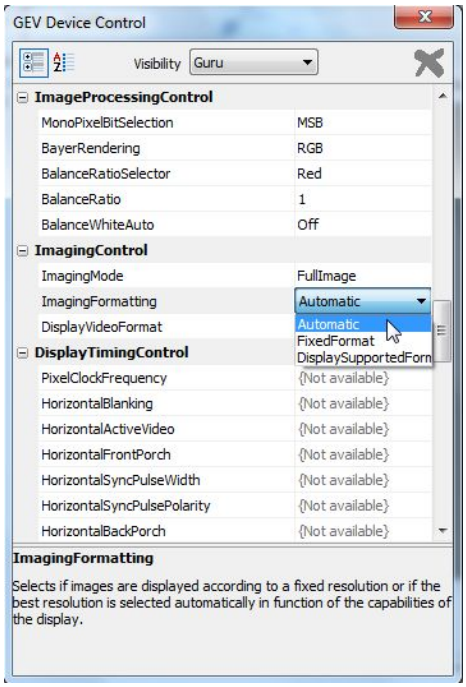
Choosing the Optimal Display Format

You can take steps to further optimize the display format. In the **ImagingControl** section of the **GEV Device Control** dialog box, you can choose one of the following options:

- Automatic
- DisplaySupportedFormats
- FixedFormat

Using Automatic Display Formats

By choosing **Automatic**, you allow the vDisplay IP engine to automatically select the optimal resolution from the options provided by the connected monitor. The vDisplay IP engine selects the display format with a resolution equal to, or larger than, the image resolution, and selects the highest available frame rate of that resolution.



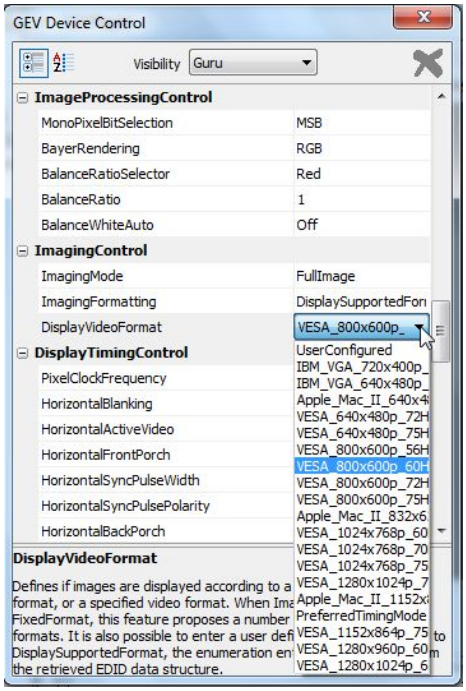
We recommend that you use the **Automatic** display formats when possible. The vDisplay IP engine searches for the best display resolution for each and every frame, especially when you change video channels. If different channels have different resolutions, the **Automatic** display setting adjusts the image format.

The **Automatic** display format list is only available on display devices that support EDID display information. If the vDisplay IP engine fails to retrieve the EDID information, the vDisplay IP engine uses a resolution of 640 x 480 (at least one format is usually available from the monitor).

Displaying Supported Formats

If you are not satisfied with the display format selected by the vDisplay IP engine, you can review the EDID list from the monitor and select a display format better suited to your needs.

When you select **DisplaySupportedFormat,** you are allowing the vDisplay IP engine to retrieve the EDID table of supported resolutions from the attached display device. Once this information is retrieved, the vDisplay IP engine updates the **DisplayVideoFormat** list with the supported resolutions from which you can choose.



This feature is only available on display devices that support EDID display information.

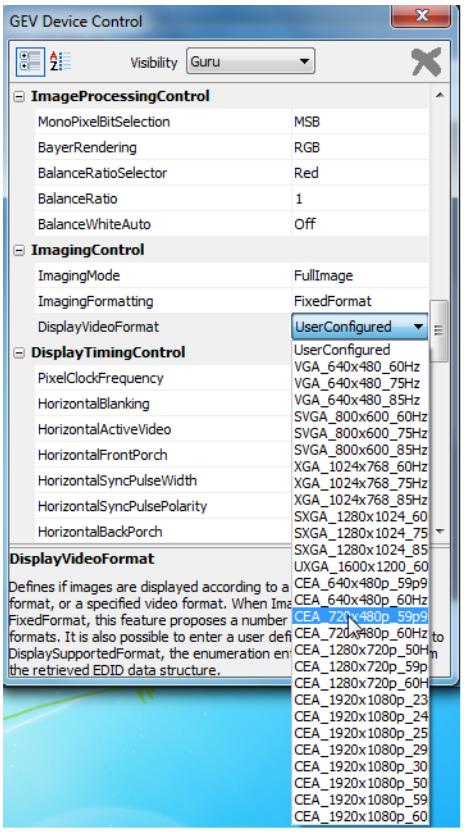
Using Fixed Display Formats

By setting **ImageFormatting** to **Fixed Format,** you have the ability to select from a set of predefined industry standard display timings. The fixed formats shown in the **DisplayVideoFormat** list are formats used in the video display industry, but might not be supported by your specific display device. If you select one of the standard display formats, you can customize the display timings to better suit your environment.

Before selecting and attempting to apply a fixed format, ensure that your display device supports the selected fixed format by reviewing the accompanying documentation for the display device. If the supported display information is available from the display device, we recommend using the supported display formats instead of the fixed formats.

To apply a fixed format to your display device

1. Start **GEVPlayer** and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click **GEV Device control** in the **Parameters and Controls** section and scroll to the **ImagingControl** section.
5. In the **ImagingFormatting** box, select **FixedFormat**.
6. In the **DisplayVideoFormat** box, select from one of the industry standards listed.



Customizing Display Formats

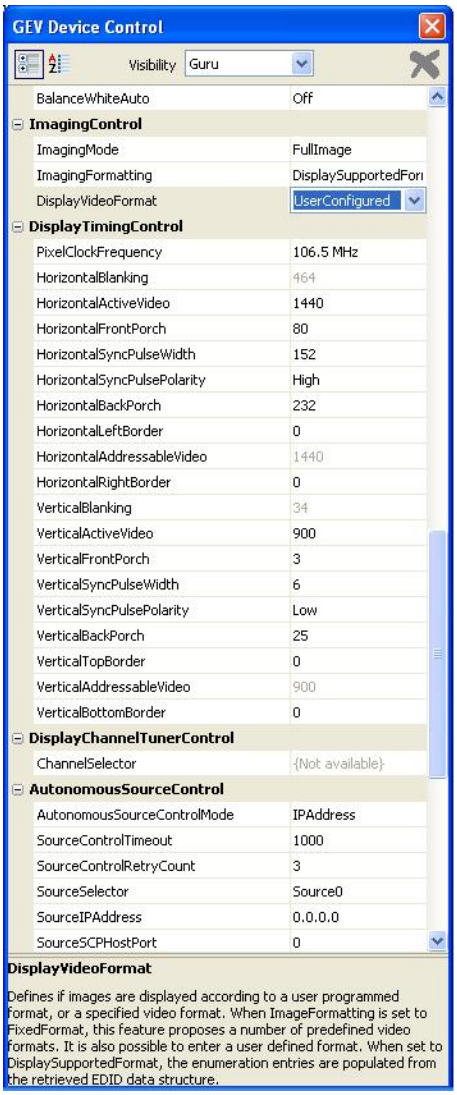
When you select a display from the supported format list, you are provided with the settings associated with the format, which you can then customize to suit your individual display requirements.

You can also customize the fixed display formats, but we recommend starting with the supported display formats when possible, as these will be best suited to your display device.

To customize the supported display format

1. Start **GEVPlayer** and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click **GEV Device control** in the **Parameters and Controls** section.
5. In the **ImageFormatting** section of the **GEV Device Control** dialog box, select **FixedFormat** or **DisplaySupportedFormats**.
6. In the **DisplayVideoFormat** section, select from one of the formats listed.

   The settings in the **DisplayTimingControl** section fill in with the settings associated with the industry standard you have selected.
7. In the **DisplayVideoFormat** section, select **UserConfigured**.



8. In the **DisplayTimingControl** section, enter values for the settings listed in the following table.

Table 6: Timing Control Settings

Setting	Value	Description
PixelClockFrequency	Min: 0.63 Max: 165	Pixel clock frequency, in MHz.
HorizontalActiveVideo	Min: 0 Max: 64000	The sum of the horizontal left border time, horizontal addressable video time, and the horizontal right border time.
HorizontalFrontPorch	Min: 1 Max: 1024	The amount of time that passes between the end of the right border and the beginning of the horizontal synch pulse.
HorizontalSynchPulseWidth	Min: 1 Max: 256	The amount of time that passes between the end of the horizontal front porch and the beginning of the horizontal back porch.
HorizontalSynchPulsePolarity	Low High	The level of polarity of the horizontal synch pulse.
HorizontalBackPorch	Min: 1 Max: 512	The amount of time that passes between the end of the horizontal synch pulse and the beginning of the left border.
HorizontalLeftBorder	Min: 0 Max: 0	The amount of time that passes between the end of the horizontal blanking period and the beginning of the horizontal addressable video region.
HorizontalAddressableVideo		The amount of time that passes between the end of the left border and the beginning of the right border.
HorizontalRightBorder	Min: 0 Max: 0	The amount of time that passes between the end of the horizontal addressable video region and the beginning of the horizontal blanking period.

Configuring Channels

When configuring your vDisplay IP engine unicast or multicast video network, you can create up to 32 streaming channels to display images from multiple video sources on *one* display device. A streaming channel is defined as a UDP destination port and a destination IP address and is created to allow you to view streaming video from a specific video source.

The options for creating channels are available only in the **Guru** and **Expert** visibility level.

The video stream for a selected channel can be displayed if you have previously configured the camera, or other video source, to stream the video to a specific port and IP address; you must also have configured the vDisplay IP engine to receive the video stream at that specific port and IP address.

Bandwidth Considerations

The vDisplay IP engine has a single Gigabit link. When you configure and use multiple vDisplay IP engine channels, you should consider the impact these channels have when they share the Ethernet bandwidth.

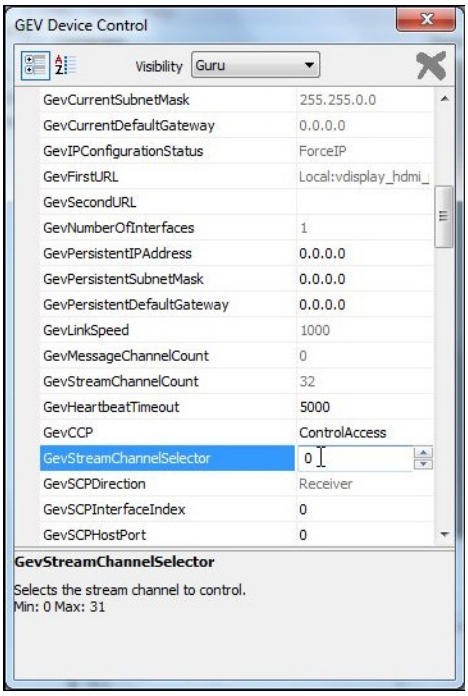
Channels receiving unicast streams from cameras always receive data, even when the channels are not selected and displayed.

Channels receiving multicast video transmissions use the Ethernet bandwidth more efficiently. Only the selected multicast channel receives streaming video from the multicast group. When you switch from a channel that is currently receiving a multicast video transmission, the vDisplay IP engine sends an **IGMP Leave** message to the switch, indicating that this channel is leaving the multicast group. When the network switch receives the **IGMP Leave** message, it removes the current vDisplay IP engine channel from this multicasting group. If the new channel is receiving a multicast video transmission, the vDisplay IP engine sends an **IGMP Join** message to the network switch. When the network switch receives the **IGMP Join** message, it adds the vDisplay IP engine to the multicasting group, and the video streams from the multicasting group flows to the new vDisplay IP engine channel.

In some cases, some smaller switches do not handle IGMP messages properly and, after switching one multicast channel to another, the previous multicasting stream is still sent to the to the vDisplay IP engine. When unselected channels receive video streams, the vDisplay IP engine ignores these packets but they still share the bandwidth of the single Gigabit link. This could impact the latency or performance of the selected channel.

To create a vDisplay IP engine channel

1. In the **TransportLayerControl** section of the **GEV Device Control** dialog box, enter a channel number from **0** to **31** in the **GEVStreamChannelSelector** box.

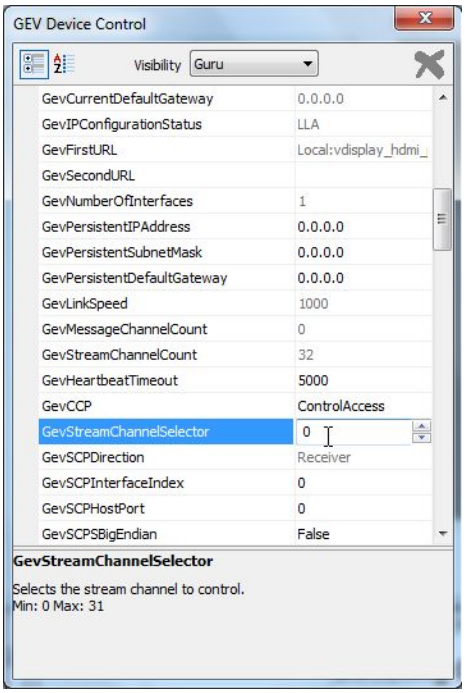


2. Enter a port in the **GevSCPHostPort** box.
3. Enter a streaming destination address in the **GevSCDA** box.

You must assign each channel its own unique combination of port and **GevSCDA** address.

To configure the vDisplay IP engine to receive video for a selected stream (channel)

1. Start **GEVPlayer** and click **Select / Connect.**
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. In the **TransportLayerControl** section, select a channel in the **GEVStreamChannelSelector** box.



5. In the **GevSCPHostPort** box, enter the port to which the camera has been configured to send the video stream.
6. In the **GevSCDA** box, enter the IP address to which the camera has been configured to send the video stream.

A streaming channel is valid and can be selected if the **GevSCPHostPort** (Streaming Channel Port) and **GevSCDA** values are not set at **0**.

If previously configured, a message appears on your display device when no live video is received for a selected channel, or if the live video is not received at the expected frame rate (in Hz). When you select a new channel, a message appears, if configured, on the display device to indicate the channel you are now viewing.

For information about configuring messages, see “Controlling Messages” on page 70.

Switching Channels

After the channels have been configured, you can select and then change the channel (streaming video) you want to view on your display device. There are two methods for selecting the channel: you can select the channel in the **GEV Device Control** dialog box or you can select the channel by pressing the channel button on the vDisplay IP engine.

To switch channels using the GEV Device Control dialog box

- In the **DisplayChannelTunerControl** section of the **GEV Device Control** dialog box, select a channel number from the **ChannelSelector** list.

Only the channels that have been created appear in the **ChannelSelector** list; if channel 2 is not created, it does not appear in the list. Also, you can switch channels from 2 up to 3, but you cannot switch channels in the other direction from 32 down to 31. You have to cycle through the channels in one direction until you get to the desired channel.

If you use the physical channel button to change a channel, the new channel number is updated in the **ChannelSelector** list.

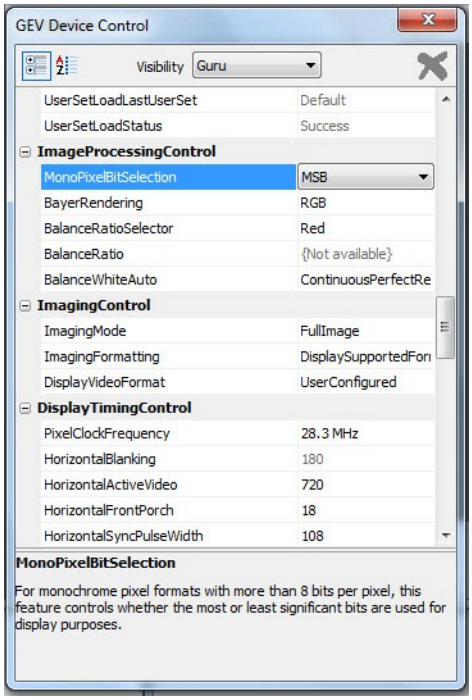
To switch channels using the buttons on the vDisplay IP engine

- Press the channel buttons on the side of the vDisplay IP engine.

Currently, only the main **Channel** button is in use.

Controlling Image Processing

You can use the options available in the **ImageProcessingControl** section of the **GEV Device Control** dialog box to control how mono pixel images and Bayer Filter images are displayed on your display device. You can also choose how to adjust the white balance of images that originated as Bayer color formats.



Mono Pixel Bit Selection

In some display scenarios, the vDisplay IP engine can receive mono-pixel images with more than 8 bits per pixel. Using the options available in the Image Processing Control, you can choose between displaying the Most Significant Bit (MSB) or the Least Significant Bit (LSB).

Bayer Rendering and White Balance

As Bayer images, which are comprised of a mosaic of Green, Red, and Blue color filters, are transferred, they can become biased towards one of the color filters, making your image appear green, red, or blue. You can correct the image using the Image Processing options in GEVPlayer.

Table 7: Bayer Rendering Options

Option	Description
RGB	Select this option to convert the Bayer pixel format to RGB24. When you select **RGB**, the white balance options are available.
Monochrome	Select this option to convert the Bayer pixel format to the monochrome pixel format. The R and B pixels are replaced with the G pixels of their horizontal neighbor.
RAW	Select this option to view the Bayer pixel format as the monochrome format.

Adjusting White Balance for Bayer to RGB Rendering

You can use the **BalanceWhiteAuto** options in the **ImagingControl** section of the **GEV Device Control** dialog box to ensure that the colors appearing on your display device are rendered as accurately as possible.

Table 8: White Balance Options

Option	Description
Off	This option allows you to manually adjust color balance for each color component using the options available in **BalanceRatioSelector** and **BalanceRatio**.
Once	Select this option to allow the vDisplay IP engine to automatically adjust the image white balance once. You must place a white source in front of the video input source, and then select this option. The adjustments are made and then this option automatically returns to **Off**. The balance ratio applies to all subsequent images.
ContinuousGreyWorld	This option allows the vDisplay IP engine to continuously adjust the image white balance using the Grey World algorithm. **Note:** This feature is only available when the **BayerRendering** option is set to **RGB**.
ContinuousPerfectReflector	This option allows the vDisplay IP engine to continuously adjust the image white balance using the **ContinuousPerfectReflector** algorithm. **Note:** This feature is only available when the **BayerRendering** option is set to **RGB**.

Saving Your Configuration Settings

You can use the options available in the **UserSetControl section** of the **GEV Device Control** dialog box to save the changes you make to the vDisplay IP engine default settings. Once saved, the changes (saved as user sets) can persist across power cycles. Currently, the vDisplay IP engine supports two user sets: **UserSet1**, which consists of the user configured settings, and **Default**, which consists of the pre-configured settings. Settings identified as **Default** in the **GEV Device Control** dialog box cannot be changed.

The following table describes the options available in **UserSetControl**.

Table 9: Saving Configuration Options

Setting	Description
UserSetSelector	Selects the feature user set to load, save, or configure.
UserSetLoad	Loads the user set specified by **UserSetSelector** to the device and makes it active.
UserSetSave	Saves configuration data to the user set specified by **UserSetSelector**, which is part of the non-volatile memory of the device.
UserSetDefaultSelector	Selects the feature user set to load and make active when the device is reset.
UserSetLoadLastUserSet	Shows the last user set executed by the IP engine from a **UserSetLoad** command, or as a result of a reset of the IP engine.
UserSetLoadStatus	This option indicates the success or failure of the last user set applied. The user set can be applied through a power cycle or through user selection.

To save a configuration change to UserSet1

1. In the **GEV Device Control** dialog box, make appropriate configuration changes.
2. Scroll to the **UserSetControl** section and change the **UserSetSelector** setting to **UserSet1**.
3. Click **UserSetSave**.

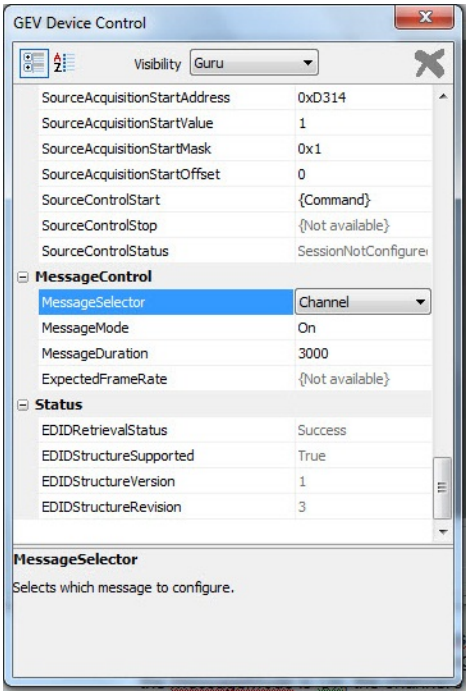
To load the default configuration settings

1. In the **UserSetControl** section of the **GEV Device Control** dialog box, select **Default** in the **UserSetSelector** box.
2. Click the **UserSetLoad** setting and then click the **UserSetLoad** button that appears to the right.

   The default settings are applied to the vDisplay IP engine.

Controlling Messages

You can use the options available in the **MessageControl** section of the **GEV Device Control** dialog box to manage the messages that appear on your connected display device. Some of the messages can be enabled or disabled. For all messages, you can choose the duration of display time.



The following table provides a list of all of the vDisplay IP engine messages that can appear.

Table 10: vDisplay IP Engine Messages

Message	Description
Fragmented packets received	This message is displayed when fragmented image packets are received. Fragmentation should not be received if your system is properly configured. This message cannot be disabled.
Channel *N*" (when in full display mode, where *N* is a value between 0 and 31)	This message is displayed to indicate the selected channel when you select a new streaming channel, either by writing to the streaming channel selection register or by using the display channel tuner.

Table 10: vDisplay IP Engine Messages (Continued)

Message	Description
Image width is too large Image height is too large Image payload size is too large	These messages are displayed when the width, height, or the payload size of images of an incoming video feed exceeds the limits supported by the vDisplay IP engine. The maximum width, height, and payload size (width x height x number of bytes per pixel) of incoming images is limited. The maximum width and maximum height are limited to 65535 pixels. The maximum payload size is limited to 10 MB (10,485,760 bytes). These messages correspond to the following statuses: **image width is too large**, **image height is too large**, and **image payload size is too large**.
No video	This message is displayed when no live video is received on a selected streaming channel. A configuration register is used to control the minimum expected frame rate in Hz. Valid range for the expected frame rate is from 0.001 Hz to 100 kHz. The message is displayed as soon as the expected frame rate is not achieved. This message corresponds to the **no video** status.
Incoming data rate is too high	This message is displayed when the total incoming and display stream bandwidth requirements exceed the vDisplay IP engine frame buffer available bandwidth. Feeding the display (monitor) has priority over the reception of the video feed from the network in the case of frame buffer contention. This message corresponds to the **data rate is too high** status.
Cannot retrieve EDID data structure	This message is displayed when the retrieval of the display EDID data structure doesn't succeed. This message corresponds to the **display EDID structure retrieval status**.
Display does not support single link resolution	This message is displayed if the display only supports dual link resolutions. This message corresponds to the **display doesn't support single link video resolutions** status.
Unsupported pixel format	This message is displayed if the pixel format of the selected streaming channel is not supported. This message corresponds to the **unsupported pixel format for the selected streaming channel** status.

Some display devices take time to refresh when display preferences are updated. This refresh time may reduce the time duration that a message is displayed. If the refresh time is longer than the specified message duration, the message may not appear.

Configuring the NoVideo Message

You can configure the **NoVideo** message to appear on your connected display device when the vDisplay IP engine is not receiving video.

To configure the NoVideo message

1. In the **MessageControl** section of the **GEV Device Control** dialog box, click the list to the right of **MessageSelector** and select **NoVideo**.
2. Enter the duration for the message to display on your connected display device (in milliseconds) in the **MessageDuration** box.
3. Click in the list to the right of **MessageMode** and select **On** or **Off**.

The **NoVideo** message appears on your display device when the expected frame rate drops below the value entered in the **ExpectedFrameRate** box. A valid range for the expected frame rate is 0.001 Hz to 100 kHz.

Configuring the Channel Message

You can configure the vDisplay IP engine to show channel information on your connected display device for a specified number of milliseconds. After the channel information is configured, you can use the channel selector buttons on the vDisplay IP engine to cycle through the video channels.

To configure the channel message

1. In the **MessageControl** section of the **GEV Device Control** dialog box, click the list to the right of **MessageSelector** and select **Channel**.
2. Enter the duration for the message to display on your connected display device (in milliseconds) in the **MessageDuration** box.
3. Click in the list to the right of **MessageMode** and select **On** or **Off**.

To configure the channel message to appear for 5.5 seconds, enter **5500** in the **MessageDuration** box.

Updating the vDisplay IP Engine Firmware

You can update the vDisplay firmware as new versions become available. You will need the following items to complete the update:

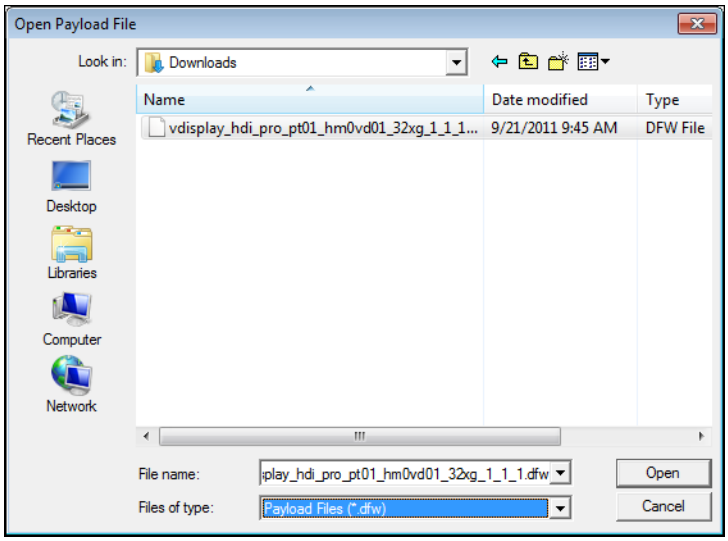
- The latest vDisplay Firmware Updater application, available at the Pleora Technologies Support Center, located at supportcenter.pleora.com.
- The latest firmware (dfw file), also located at the Pleora Technologies Support Center.

To update the vDisplay firmware

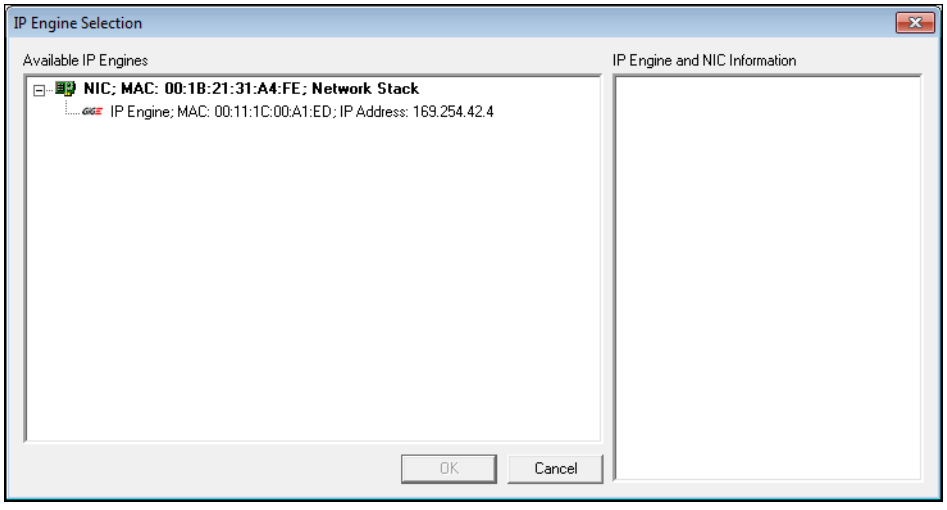
1. Connect the vDisplay IP engine directly to the management PC.

Do not connect the vDisplay IP engine to the management PC through a switch.

2. Start the **Firmware Updater** application.
3. Browse to and open the latest firmware (dfw file).



4. In the **IP Engine Selection** window, select the vDisplay IP engine and click **OK**.



Accessing System Statistics

The vDisplay IP engine provides several statistics (such as **oMacEntity**, **oMACControlFunctionEntity**, **IFMIB**, and **RMONMIB**), which are used to debug the system. Your Pleora Technologies representative may request these statistics from you when providing technical support.

To access system statistics

1. Start **GEVPlayer** and click **Select / Connect**.
2. Click the vDisplay IP engine in the **Available GigE Vision Devices** list.
3. Click **OK** in the bottom right corner.
4. Click **GEV Device control** in the **Parameters and Controls** section.
   The statistics appear under the **Statistics** category.

Chapter 5

Troubleshooting Tips and Best Practices

Video Does Not Appear on Display Device

The following situations might cause the display device to remain blank (black) or display something other than the video you expect to view; this section does NOT describe situations where the "No Video" message appears on the display device.

Power Not Supplied to vDisplay IP Engine

Your display device might appear blank or black if power is not supplied to the vDisplay IP engine. Check to see that the small LED light, located just below the power connector on the vDisplay IP engine, is lit in either green or orange. If it is not lit, verify that the power cable is connected properly and that at least 12 volts of power are being provided. When the LED is lit, the power cable is functioning properly and providing power to the vDisplay IP engine; in this case, you should try to connect to the vDisplay IP engine using GEVPlayer.

vDisplay Unable to Retrieve EDID Information From Display Device

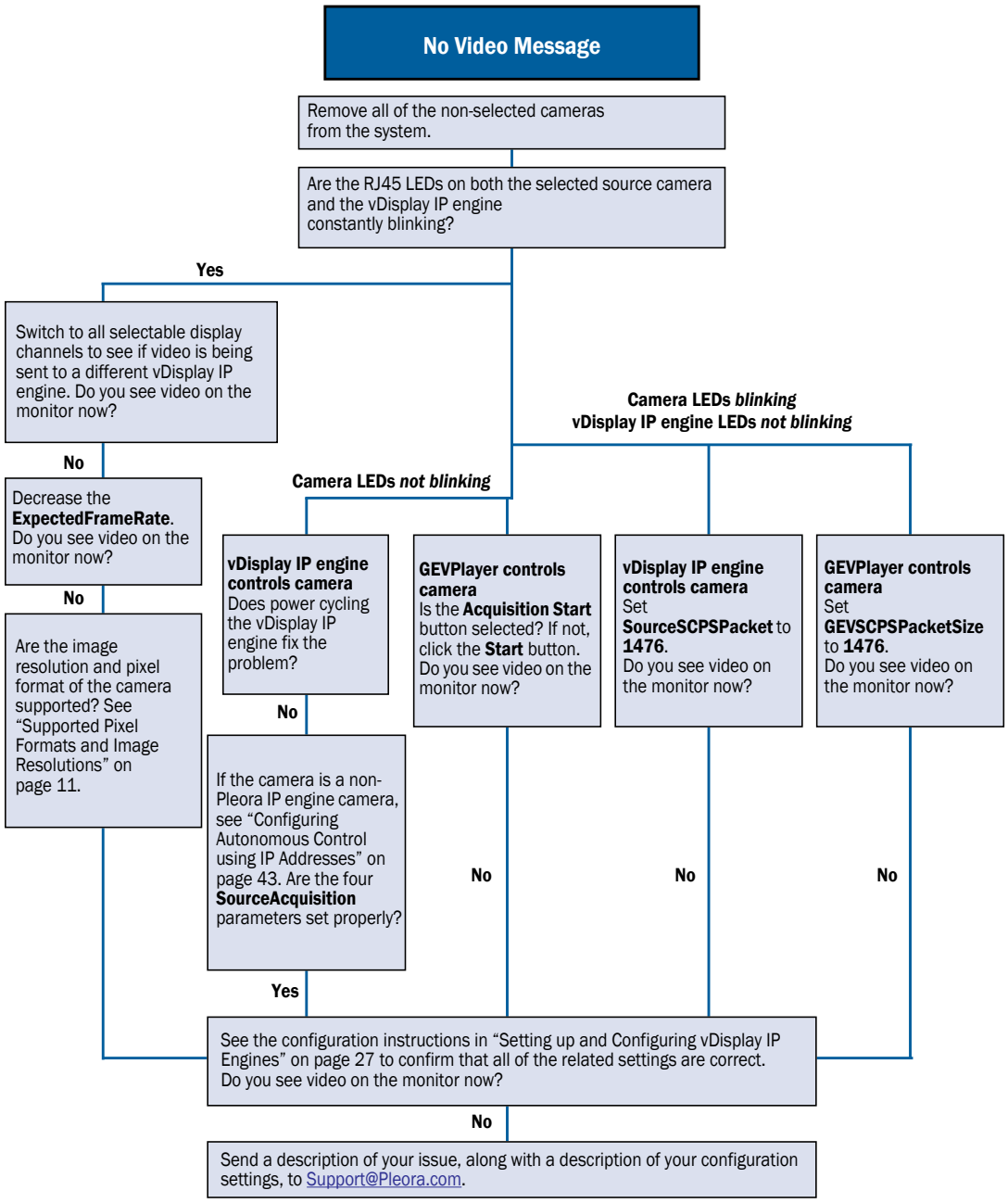
Your display device might appear blank or black if the vDisplay IP engine is unable to retrieve the EDID information from the display device. If you are able to use GEVPlayer to connect to the vDisplay IP engine, connect to the vDisplay IP engine and in the **Status** section of the **GEV Device Control** dialog box, check to see that the vDisplay IP engine successfully retrieved the EDID information from the display device. If the EDID information has been successfully retrieved, **EDIDStructureSupported** is **True**. If this status is **False**, you can enter the display device parameters in the **DisplayTimingControl** section of the **GEV Device Control** dialog box. For more information about display formats, see "Controlling the Image Display Format" on page 57.

“No Video” Message Appears on Display Device/Video Does Not Display

The following figure provides you with some troubleshooting steps you can use to determine why the “NoVideo” message appears on your display device.

If the “No Video” message appears on your display device, the vDisplay IP engine is receiving power and has successfully retrieved the EDID information from the display device.

Figure 10: NoVideo Message Troubleshooting Steps



The following situations may cause the "No Video" message to appear on the display device or cause video to not display.

vDisplay, Camera, and Management PC Not on Same Subnet

Video might not appear on your display device if the camera, vDisplay IP engine, and management PC (with GEVPlayer installed) are on different subnets. You should ensure that the vDisplay IP engine is on the same subnet as the cameras and management PC, or that these devices are connected using valid gateway/subnet mask information. You can view the camera and vDisplay IP engine IP address information in the **Available GigE Vision Devices** list in GEVPlayer. A red icon appears beside the GigE Vision device if there is a problem with the IP configuration.

Camera Not Configured to Support Multicast Configuration

Video might not appear on your display device if you are using a multicast video network configuration, but the video source (camera) does not support multicast video transmission. Ensure that you are using video sources that do support multicast networks and that the video sources are configured to operate in a multicast network.

Devices in Video Network Not GigE Vision Compliant

Video might not appear on your display device if you are using other devices in your video network that were not provided by Pleora Technologies, and that may not be GigE Vision compliant. Ensure that all devices used in your video network are GigE Vision compliant. You can test your network by replacing non-Pleora devices with Pleora devices, and then connecting to the vDisplay IP engine using GEVPlayer.

If you can connect to the vDisplay IP engine using GEVPlayer, but video is still not appearing on the display device, you should refer to the *vDisplay IP Engine Quick Start Guide* and follow the steps provided in the guide. This guide is available online at the Pleora Technologies Support Center.

vDisplay IP Engine is Displaying the Wrong Camera Image When Using Autonomous Control

The wrong camera image might appear on the display device if multiple cameras are on the same subnet as the vDisplay IP engine, and a persistent IP address for the camera (the video source for the image you want to view) has not been provided to the vDisplay IP engine when it is in Autonomous Control mode. To ensure that the correct camera image is displayed on the display device, you should provide the vDisplay IP engine (in Autonomous Control mode) with a persistent IP address for the video sources (cameras) to which it is connected.

Chapter 6

List of Terms

The following table provides a list of terms used in this guide.

Table 11: Glossary

Term	Definition
DHCP	Dynamic Host Configuration Protocol
DVI	Digital Visual Interface
GenICam	Generic Interface for Cameras. A generic programming interface for vision system cameras.
GigE	Gigabit Ethernet
GVCP	GigE Vision Control Protocol. Allows an application to configure vDisplay IP engines. This protocol is implemented over the UDP transport layer protocol. The GVCP defines mechanisms that guarantee the reliability of packet transmission and ensure minimal flow control.
GVSP	GigE Vision Stream Protocol. Allows an application to transfer images using GigE. This protocol is implemented over the UDP transport layer protocol.
HDCP	High-Bandwidth Digital Content Protection is a form of digital copy protection developed by Intel Corporation to prevent copying of digital audio and video content as it travels across DisplayPort, Digital Visual Interface (DVI), High-Definition Multimedia Interface (HDMI), Gigabit Video Interface (GVIF), or Unified Display Interface (UDI) connections. HDCP does not address whether copying would be permitted by fair use laws. The specification is proprietary, and implementing HDCP requires a license.
HDMI	High Definition Multimedia Interface
ICMP	The Internet Control Message Protocol
IGMPv2	Internet Group Management Protocol version 2
IP	Internet Protocol
IPv4	IP version 4

Table 11: Glossary (Continued)

Term	Definition
LLA	Link-Local Address
LVDS	Low-Voltage Differential Signaling
RGB	Red Green Blue color model
SDK	Software Development Kit
UDP	User Datagram Protocol
VESA	Video Electronics Standards Association

Chapter 7

Technical Support

At the Pleora Support Center, you can:

- Download the latest software.
- Log a support issue.
- View documentation for current and past releases.
- Browse for solutions to problems other customers have encountered.
- Get presentations and application notes.
- Get the latest news and information about our products.
- Decide which of Pleora's products work best for you.

To visit the Pleora Support Center

- Go to www.pleora.com and click **Support Center**.

  If you have not registered yet, you are prompted to register.

  Accounts are usually validated within one business day.

If you have difficulty finding an existing solution in the knowledge base, post a question by clicking **Log a Case**. Provide as many specific details about your system and the nature of the issue as possible.

Index

S

T

U

V

W