G3-AN0008 Genie Nano Multicasting

How to Multicast with Genie Nano & Sapera LT

All Genie Nano GigE models support multicasting.

Overview
Multicasting allows a camera to send an image to multiple computers at the same time. Any device on the same network as the camera can receive multicast image data. This allows for distributed monitoring and processing capabilities.

Prerequisites
The following table lists the recommended Genie Nano firmware and software for this camera model.

<table>
<thead>
<tr>
<th>Genie Nano Firmware Design</th>
<th>Software SDK</th>
</tr>
</thead>
<tbody>
<tr>
<td>All firmware</td>
<td>Sapera LT 8.40 or higher</td>
</tr>
</tbody>
</table>

Software

Sapera LT SDK (full version), the image acquisition and control software development kit (SDK) for Teledyne DALSA cameras is available for download from the Teledyne DALSA website:

http://teledynedalsa.com/imaging/support/downloads/sdks/

If the required version is not available, contact your Teledyne DALSA representative.

Sapera LT includes the CamExpert application, which provides a graphical user interface to access camera features for configuration and setup.

For third-party software SDKs, refer to its documentation for multicast support.

Ethernet Switch

A Gigabit Ethernet switch supporting Internet Group Management Protocol (IGMP) v2 is recommended for optimal network performance.
Multicasting Overview

A GigE Vision camera can use multicasting if the image data stream must be sent to multiple locations. When multicasting, a camera sends image data to a multicast IP address, rather than to a specific host computer IP address. Multiple host computers can subscribe to the camera’s multicast and receive image data.

Only one “Master” application can control camera features (read/write access), while any other “Receiver” applications can only receive image data (read-only access).

When a multicast transmission initiates, the Teledyne DALSA GigE Vision driver creates a multicast group. A valid multicast group IP address is within the range of locally administered addresses (239.0.0.0 to 239.255.255.255). The multicast group address is the destination address for the camera image data stream.

When multicasting with a camera connected to a non-IGMP Ethernet switch (or a switch with IGMP functionality disabled); the switch forwards the image data to the NICs of all connected devices.
When using an IGMP-capable Ethernet switch, to optimize network traffic enable IGMP snooping on the switch so that it forwards images only to devices that request the multicast rather than to all connected devices.

![Diagram of IGMP Switch and connections](image.png)

**Note:** The camera does not send the same image multiple times to each computer; the switch duplicates image data as required.

Refer to the switch documentation for information on how to verify IGMP settings (typically IGMP snooping is enabled by default).
Requirements for Multicasting

To use multicast at least two Sapera LT applications are required running on different host computers; a “Master” application and at least one “Receiver” application:

- **Master** application: connects to the camera with *read/write access* to enable multicast and start image acquisition. This is required since the `multicastStreamingEnable` feature is part of the GigE Vision Host Controls category and is not saved with the camera. In addition, the multicast port is assigned only when multicast is enabled.

- **Receiver** application: connects to the camera with *read-only access* to retrieve the multicast information, such as the multicast group IP address and port assignment, as well as the image format, to create the transfer object to acquire images from the camera.

At the application level, the Sapera LT API sets the access level to a camera when constructing a `SapAcqDevice` object using its `readOnly` parameter.

```
SapAcqDevice(SapLocation location = SapLocation::ServerSystem, BOOL readOnly = FALSE);
```

When the `readOnly` parameter is set to FALSE, the application operates as a master for multicast; TRUE is required for receiver applications.

In addition:

- **Sapera LT Version**: All Sapera LT applications connecting to a camera should use the same version of Sapera LT to avoid possible incompatibility errors between versions.

- **Control (Multicast)**: For host systems running multicast applications, verify that the Camera Default Write Mode is set to Control (Multicast); refer to the Set the Camera Default Write Mode section.

- **Packet Size**: All devices on the network must use the same packet size. It is recommended to use the maximum packet size supported by all network devices to reduce packet overhead; refer to the Important System Configuration Information section.

- **Image Format and Size**: Any buffers used by receiver applications should correspond to the camera settings. If the master application changes acquisition image-related features, the receiver application must be updated accordingly.
Set the Camera Default Write Mode

The default connection mode in Sapera LT is “Exclusive” mode. Exclusive mode only allows one application to connect to the camera; any requests to access the camera from other applications will be denied.

For multicast, the Camera Default Write Mode must be set to **Control (Multicast)**. When the host system is in this mode, applications running on the system can connect to cameras in read-only mode, provided no application is connected to the camera in “Exclusive” mode. However, only one application can connect to the device with read/write access.

Use the Teledyne DALSA Network Configuration Tool (available through the Start Menu under Teledyne DALSA) to specify the Camera Default Write Mode. This parameter is set at the system level in the System Configuration tab.

An advantage of setting this parameter using the Network Configuration Tool is that it only has to be set one time for all applications, and remains in this mode at subsequent system startups.
Alternatively, it can be set at the application level using the Device Access Privilege Control (deviceCCP) feature, available in the GigE Vision Transport Layer category. In CamExpert, the possible parameter values are “Exclusive Access” or “Control Access”.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Link Selector</td>
<td>0</td>
</tr>
<tr>
<td>Device Link Throughput Limit</td>
<td>On</td>
</tr>
<tr>
<td>Device Link Throughput Limit (in Bps)</td>
<td>1150000000</td>
</tr>
<tr>
<td>Stream Channel Selector</td>
<td>0</td>
</tr>
<tr>
<td>Device Link Speed (in Mbps)</td>
<td>1000</td>
</tr>
<tr>
<td>Packet Size</td>
<td>1500</td>
</tr>
<tr>
<td>Interpacket Delay</td>
<td>2</td>
</tr>
<tr>
<td>Packet Resend Buffer Size (in MB)</td>
<td>6.0</td>
</tr>
<tr>
<td>IP Configuration Status</td>
<td>DHCP</td>
</tr>
<tr>
<td>Current IP Address</td>
<td>169.254.8.78</td>
</tr>
<tr>
<td>Current Subnet Mask</td>
<td>255.255.0.0</td>
</tr>
<tr>
<td>Current Default Gateway</td>
<td>0.0.0.0</td>
</tr>
<tr>
<td>Current IP set in LLA</td>
<td>True</td>
</tr>
<tr>
<td>Current IP set in DHCP</td>
<td>True</td>
</tr>
<tr>
<td>Current IP set in PersistentIP</td>
<td>False</td>
</tr>
<tr>
<td>Primary Application IP Address</td>
<td>169.254.0.120</td>
</tr>
</tbody>
</table>

**Device Access Privilege Control**

- **Control Access**
- **Exclusive Access**

**Communication Timeout (in msec)**

- 0

**Communication Retransmissions Count**

- 0
Sequence of Application Operations

To ensure proper operation of multicast, application operations should be executed in the following order:

1. Start the master application, verify the required acquisition parameters such as the image format and size, and set the **Multicast enable streaming** (multicastStreamingEnable) feature to True. If necessary, change the Multicast IP Address from the default setting.

   In CamExpert, these features are available in the GigE Vision Host Controls category:

   ![Multicast Configuration](image)

   2. Start the receiver application, connect to the camera and start the acquisition. The Sapera LT SapAcqDevice and SapTransfer objects are created using the settings provided by the currently active master application.

   3. In the master application, start the acquisition; images will be received by any currently connected receiver application with an active acquisition.

   Starting the acquisition after the receiver application has connected avoids possible network issues that can occur since the camera may delay read requests if it is grabbing images.

   In addition, the multicast port is only assigned when multicast is enabled by the master application; a receiver application that attempts to create a transfer object and acquire images when multicast is not enabled will not be able to acquire images. Receiver application transfer objects must only be created if the multicast enable state is true; if the multicast enable state changes, new transfer objects must be created since a new multicast port is assigned.
Sapera LT Multicast Example

Sapera LT includes an example program and source code that demonstrates how to connect to a camera as a receiver or master and initiate a multicast broadcast.

The console program allows you to select an available camera, connect as master or receiver, and display the acquisition.

Example programs are available in the <install directory>\Teledyne DALSA\Sapera\Examples folder, as compiled binaries or .NET/C++ solutions.
Important System Configuration Information

Verify the Packet Size of Network Devices

For the Genie Nano camera, the PacketSize (GevSCPSPacketSize) feature is available in the GigE Vision Transport Layer category, as shown here in CamExpert.

For the network interface card (NIC), use the Windows Control Panel to open the Network and Sharing Center to access the required Ethernet connection properties dialog. Click **Configure** to open the associated NIC properties dialog; the actual parameter setting name and location can vary depending on the device.

For all other network devices connected to a subnet for multicasting, such as switches or other equipment, refer to the device documentation.
**Using a Camera with Persistent IP**

When multicasting with a camera that uses a persistent IP address, set the default gateway to any NIC it is connected to.

The IP address of the NIC is available in the GigE Vision Device Status window or in the Teledyne DALSA Network Configuration Tool.

The GigE Vision Device Status can be opened using its Windows tray icon.

To specify the default gateway in the camera, use the Teledyne DALSA Network Configuration Tool, select the device and specify the required default gateway address in the Device IP Configuration tab. Click **Apply** to execute the change.