Installation Manual

AVT GigE Vision Cameras

V2.0.2
70-0062

11 Jan 2012

Allied Vision Technologies Canada Inc.
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///ALLIED
Vision Technologies

Legal notice

For customers in the U.S.A.
This equipment 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 residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However there is no guarantee that interferences will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the distance between the equipment and the receiver.
• Use a different line outlet for the receiver.
• Consult a radio or TV technician for help.

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For customers in Canada
This apparatus complies with the Class A limits for radio noise emissions set out in the Radio Interference Regulations.

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Introduction

This AVT GigE Installation Manual provides instructions for first time use of AVT GigE Vision cameras. Powering up the camera, installing AVT drivers and related software, enabling the user to get up and running are the focus for this document.

For information on camera dimensions, feature overview, I/O definition, trigger timing waveforms, frame rate performance, please refer to the AVT Technical Manuals unique for each camera family.

For detailed information on camera features and controls specific to the Prosilica GX, GE, GS, GB and GC refer to the AVT GigE Camera and Driver Attributes document.

www

AVT literature including camera technical manuals:
http://www.alliedvisiontec.com/us/support/downloads/product-literature.html

Document history

Version	Date	Remarks
V2.0.0	26.07.11	New Manual – RELEASE Status
V2.0.1	09.01.12	Added image of back of GT camera
V2.0.2	01.11.12	Added Multicasting section.

Table 1: Document History

Symbols used in this manual

Note

This symbol highlights important information

Caution

This symbol highlights important instructions. Follow these instructions to avoid malfunctions.

www

This symbol highlights URLs for further information. The URL itself is shown in blue.

Example:
http://www.alliedvisiontec.com

Getting started

The following components are required for your camera system:

Ethernet adapter

GigE Vision cameras can operate on 10/100, or gigabit speed Ethernet adapters. In order to take advantage of maximum camera frame rates a gigabit speed adapter is required.

www

A list of tested Ethernet adapters is available on the AVT website.
http://www.alliedvisiontec.com/fileadmin/content/PDF/Support/Application_Notes/Hardware_Selection_for_AVT_GigE_Cameras.pdf

www

The latest drivers for the Intel Pro 1000 series adapters can be found (at the time of publishing) at:

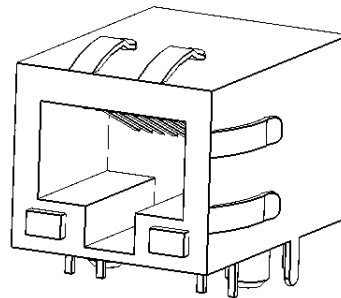http://www.intel.com/support/network/sb/cs-006120.htm

Figure 1: RJ45 3D CAD model

GigE Vision software

AVT provides several software packages that support AVT GigE Vision cameras. The user can target Windows, Linux, QNX or OSX Operating systems and a variety of CPU architectures.

AVT GigE Vision cameras are GigE Vision compliant. This means they are compatible with third party software which offers a GigE Vision driver.

www

AVT PvAPI SDK supports all GigE Vision cameras from AVT and is available free of charge. Visit the link below for more information.
http://www.alliedvisiontec.com/us/products/software/avt-pvapi-sdk.html

Optics

AVT cameras are sold without lenses. The cameras offer C-mount, CS-mount or F-mount mechanical interfaces for installing a lens. Lenses can be purchased directly from the lens manufacturer, from AVT or from an AVT distributor. Users will need to select the desired focal length and appropriate optical format for the target camera model.

www

AVT offers a number of lenses to choose from.
http://www.alliedvisiontec.com/us/products/accessories/lenses.html

GigE Vision camera

AVT offers a number of GigE Vision camera families. This guide can be applied to all of these families. Follow the links below to learn more about GigE Vision cameras from AVT.

www

Follow this link to learn about GigE Vision cameras from AVT.
http://www.alliedvisiontec.com/us/products/cameras.html

Figure 2: AVT GigE Vision cameras, back view, not equal scale

Installing the Ethernet adapter

If your host computer has an available Ethernet port, this can be used with AVT GigE Vision cameras. We recommend that your camera system use a dedicated Ethernet port not shared with internet or local area networks. If more ports are needed, or your existing Ethernet adapter isn't able to operate at gigabit Ethernet speeds, installing additional hardware may be required. For desktop systems, use a PCI or PCI-Express bus Ethernet adapter. On a laptop, expansion slots are available via a PCMCIA or ExpressCard slot. A link to recommended adapters is listed below.

Figure 3: Intel Gigabit CT desktop adapter

Caution

AVT recommends Cat 5E or Cat 6 rated Ethernet cables. A different rating may not sustain peak interface bandwidth; leading to lost connectivity or image data coming from the camera.

Note

Verify that there is an available and compatible interface slot on the host computer before purchasing the desired Ethernet adapter card.

www

A list of tested Ethernet adapters is available on the AVT website.
http://www.alliedvisiontec.com/fileadmin/content/PDF/Support/Application_Notes/Hardware_Selection_for_AVT_GigE_Cameras.pdf

Installing camera software

Instructions for software installation presented below are specific to Windows 7. AVT GigE Vision cameras can be operated under earlier versions of Windows including XP. Suggestions specific to Linux, QNX and OSX are also offered when applicable. The following sequence is presented:

- Download Ethernet adapter driver
- Install Ethernet adapter driver
- Download camera software and filter driver
- Install GigE Sample Viewer

Download the latest Ethernet adapter driver

This is provided by the Ethernet adapter manufacturer. This Manual will reference the Intel Gigabit CT series, an equivalent can be found from other manufacturers.

www   Follow the link below to download the latest drivers for Intel adapters.
http://www.intel.com/p/en_US/support/detect/

Install Ethernet adapter driver

Run installation application provided by driver manufacturer. If no installation application is provided, update the driver manually:

[Windows 7]

➔ *Start*
➔ *Control Panel*
➔ *Hardware and Sound*
➔ *Device Manager*
➔ expand *Network Adapter*
➔ right click *Adapter device name*
➔ *Properties*
➔ *Driver* tab
➔ *Update driver*
➔ *Install from specific location* (identify installation directory)

Figure 4: Adapter properties, driver tab, Windows 7.

Download camera drivers

www

Download the GigE Sample Viewer or PvAPI SDK.
http://www.alliedvisiontec.com/us/products/software/avt-pvapi-sdk.html

www

Alternative to AVT software, AVT GigE cameras will work with any GigE Vision compliant software package. Contact the software provider for installation instructions. A listing of recommended software packages:
http://www.alliedvisiontec.com/us/products/software/3rd-party-solutions.html

Install GigE Sample Viewer

First time users will want to install the GigE Sample Viewer which offers an excellent introduction to using the camera. Advanced users wishing to develop their own software using should download PvAPI SDK. Source code for the GigE Sample Viewer is provided in the examples directory. A filter driver installation executable is also provided with the SDK.

[Windows 7]

→ Go to install directory

→ Click *Allied_Vision_Technologies_GigE_Viewer_Installer.exe*

→ A message will appear indicating the publisher could not be verified, select R*un* to continue

→ Follow the prompts as requested, when asked "Would you like to install the Filter driver?" select *Yes*

Note

The AVT Filter miniport driver works alongside the native Ethernet adapter driver to optimize CPU usage, and minimize dropped packets. It is available only on Windows.

[Linux]

→ Precompiled versions of GigE Sample Viewer are available in the AVT GigE SDK/bin-pc directory.

→ Run as root, e.g. "sudo ./SampleViewer", allowing the OS to boost the priority of the AVT driver thread, the driver to bind directly to the NIC adapter, and minimize dropped packets. Users who feel running as root compromises their system security may find the following implementation satisfactory:

- set the executable owner as root.
- set the "setuid" permission bit on the executable
- in code, when application starts, use capset() to release all but these privileges: CAP_SYS_NICE, CAP_NET_ADMIN, CAP_NET_BROADCAST, CAP_NET_RAW

The application will start with all root privileges, but it will drop them immediately after startup.
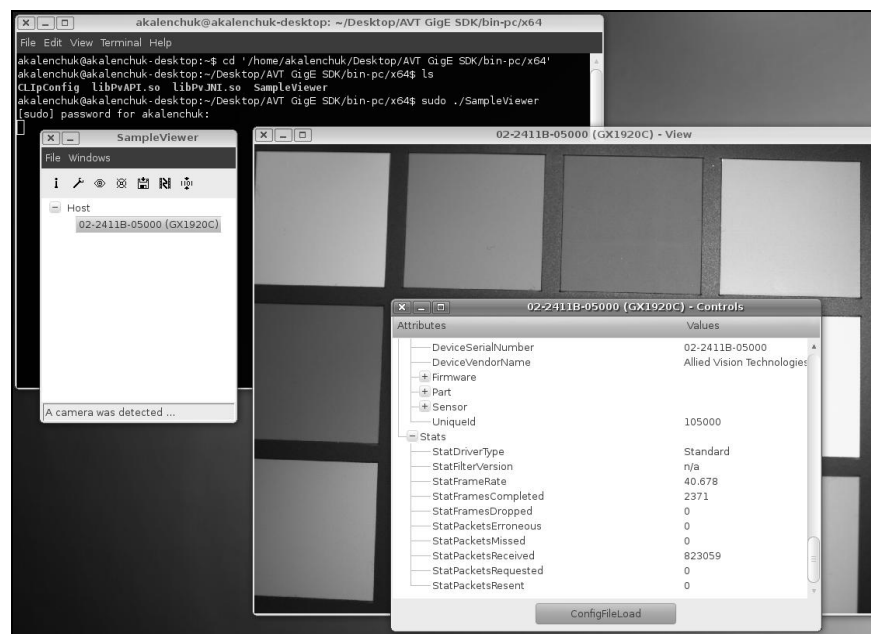

Figure 5: GigE Sample Viewer, Linux Ubuntu 10.04

Ethernet adapter configuration

After initial Ethernet adapter hardware installation connect the Ethernet adapter directly to the camera. The default configuration will assign an IP address automatically using the Link-Local Address range of 169.254.xxx.xxx or an address defined the by the DHCP server, if present.

Users can fix the adapter address to minimize the time required for a camera to be recognized by the host application. Systems that employ multiple Ethernet adapters connected to multiple cameras will also be required to fix the address of the Ethernet adapter. Refer to Chapter **Modify Ethernet adapter IP address** on page 23.

Ethernet adapter optimization

 The Ethernet adapter should be adjusted to improve system performance when using a GigE Vision camera. This performance is related to minimizing CPU usage and dropped or resent packets.

Edit the Ethernet adapter driver properties according to the values in the table below. The names and availability of the properties listed may vary depending on adapter manufacturer and model.

Properties	Value
Packet size (MTU)	8228 or larger
Interrupt Moderate Rate	Extreme
Transmit buffers	256 bytes
Receive buffers	Max setting available

Table 2: Ethernet Adapter Performance Settings

Default AVT GigE Vision camera factory settings configure the camera packet size to 8228. The host adapter needs to support a packet size of equal or larger size to stream from the camera.

Note

If adapter packet size support is limited to 1500 bytes, as on 10/100 speed NICs, the camera packet size can be reduced using GigE Sample Viewer and saved to an on board camera power up config file. See ConfigFile in the **AVT GigE Camera and Driver Attributes** document.

Adjust camera packet size

[Windows 7, Intel Gigabit CT]

→ *Start , Control Panel*
→ *Hardware and Sound*
→ *Device Manager*
→ *Network Adapter*
→ right click *Adapter device name*
→ *Properties*
→ *Advanced* tab
→ Settings: *Jumbo Packet*
    Value: *9014 Bytes*

[Linux]

→ Terminal: *sudo gedit /etc/network/interfaces*
→ Add: *mtu 8228* to appropriate interface.
→ Or, to temporarily increase packet size – Terminal: *sudo ifconfig eth0 mtu 8228* where eth0 is the camera NIC.

[OSX]

→ *System Preferences*
→ *Network*
→ Select *Ethernet,* click *Advanced*
→ *Ethernet* tab:
    Configure: Manually
    Speed: 1000baseT
    Duplex: full-duplex
    MTU: Jumbo (9000)
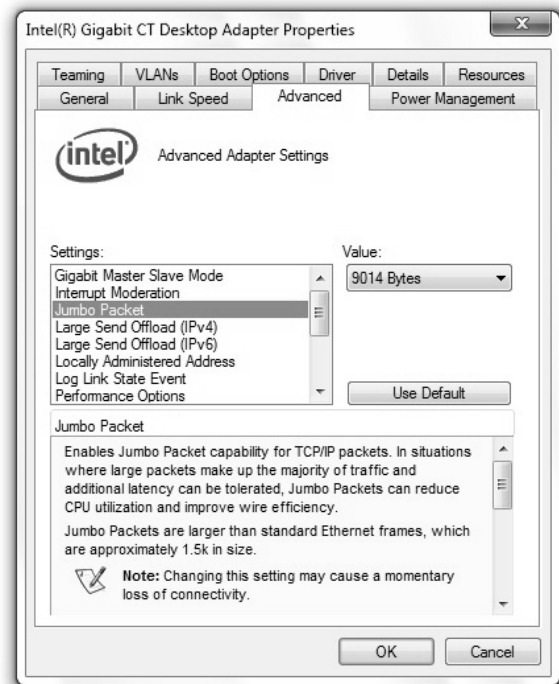
Figure 6: Intel adapter properties, Windows 7, Intel Gigabit CT

Figure 7: Ethernet settings OSX Snow Leopard

Adjust buffers and moderation rate

[Windows 7, Intel Gigabit CT]

→ *Start ,Control Panel*
→ *Hardware and Sound*
→ *Device Manager*
→ *Network Adapter*
→ right click *Adapter device name*
→ *Properties*
→ *Advanced* tab
→ *Performance Options*
→ Settings: *Interrupt Moderation Rate*
Value: Extreme
→ Settings: *Transmit Buffers*
Value: 256 bytes

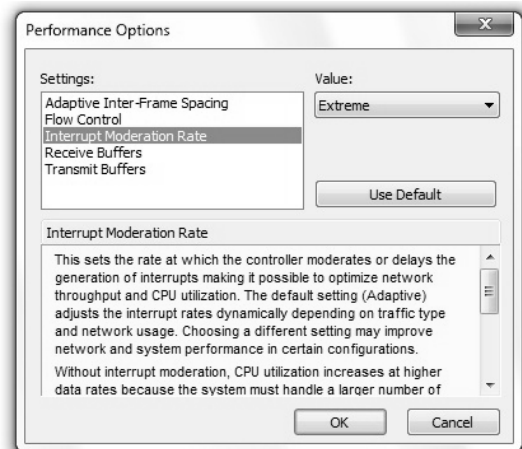Settings: *Receive Buffers*
Value: Max allowable

Figure 8: Intel adapter performance options.
Windows 7, Intel Gigabit CT

[Linux, QNX, OSX]

Support for buffer size control and moderation rate settings varies greatly between network card driver providers.

www

Follow the link below for a detailed guide to using the e1000 linux base driver for the Intel PRO/1000 family of adapters

http://www.intel.com/support/network/sb/CS-09209.htm#parameters

Starting the camera

Power up

A camera power adapter is available from AVT. Please consult the camera technical manual for connector definition, voltage specifications and related part number information.

www   AVT Product literature
http://www.alliedvisiontec.com/us/support/downloads/product-literature.html

Connect to host application

Use a Cat 5E or Cat 6 rated Ethernet cable to connect the camera to the host adapter. Cross over cable is not required, but will work – the camera has circuitry to determine if a cross over cable is being used.

Launch the GigE Sample Viewer application. Wait until the camera is listed. This may take up to one minute in network card "Obtain an IP address automatically" mode.

If a camera does not appear after some time, try the following:

1. Confirm the camera is powered.

2. Confirm the Ethernet cable is connected to the host PC.

3. Modify the Ethernet adapter and/or Camera IP such that they are on the same subnet. More info in Chapter **Modify Camera IP address** on page 23.

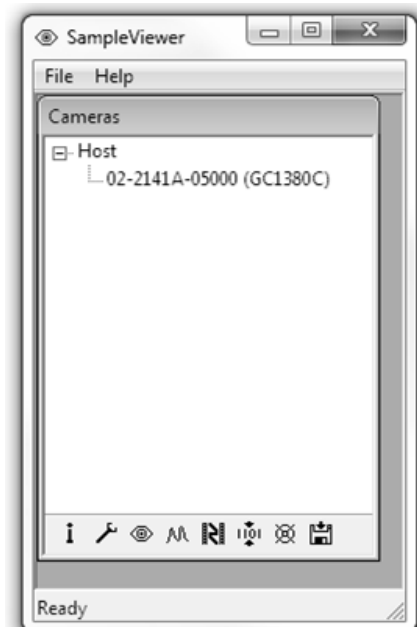If the camera still does not appear, proceed to Chapter **Troubleshooting** on page 36.

Figure 9: GigE Sample Viewer window

Using the GigE Sample Viewer

This application is used to stream live view images from the camera, adjust the camera parameters and test functionality.

www

The GigE Sample Viewer can be downloaded from the AVT website without registration.

http://www.alliedvisiontec.com/us/products/software/avt-pvapi-sdk.html

Launch the application

Start the GigE Sample Viewer application. Wait for the camera to appear listed under Host. If the camera does not appear, return to Chapter **Connect to host application** on page 17.

Open live view

Select the desired camera from the cameras window of the GigE Sample Viewer. Click the eyeball icon.

A new View window will appear. Using default camera settings this will start continuous acquisition from the camera using freerun trigger mode, 15 ms exposure time and 0 dB gain.

If the images are too dark, point the camera directly at a light source to ensure images are not being dropped. If no images appear proceed to Chapter **Troubleshooting** on page 36.

Figure 10: GigE Sample Viewer Live View**.**

Adjust camera controls

Select the desired camera from the cameras window of the GigE Sample Viewer. Click the wrench icon.

The controls window is used to configure the camera frame rate, exposure time, color balance, imaging mode, strobe functionality, pixel format, and much more.

A detailed explanation of camera controls can be found in the AVT GigE Camera and Driver Attributes Document.

www

AVT GigE Camera and Driver Attributes download link:
http://www.alliedvisiontec.com/fileadmin/content/PDF/Software/Prosilica_software/Prosilica_firmware/AVT_Camera_and_Driver_Attributes.pdf
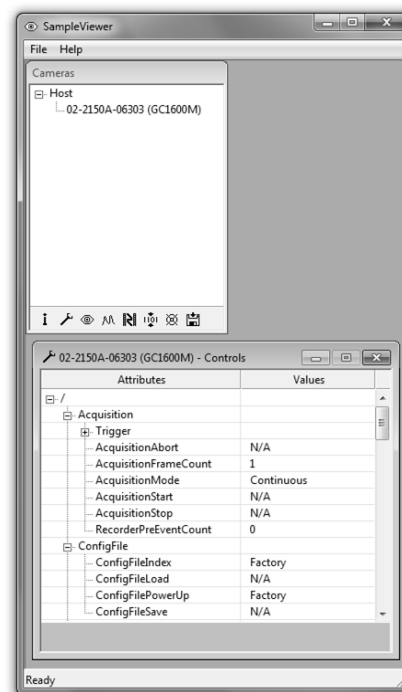
Figure 11: GigE Sample Viewer Controls.

Live histogram

Start Live View from the camera by selecting the eyeball icon. Click the histogram icon, shown left.

This will launch an 8 bit live histogram. A histogram graphs number of pixels on the vertical axis and digital number value on the horizontal axis.

Camera information

Select the desired camera from the cameras window of the GigE Sample Viewer. Click the information icon, shown left.

The information window provides camera identify information including the serial number and part number.
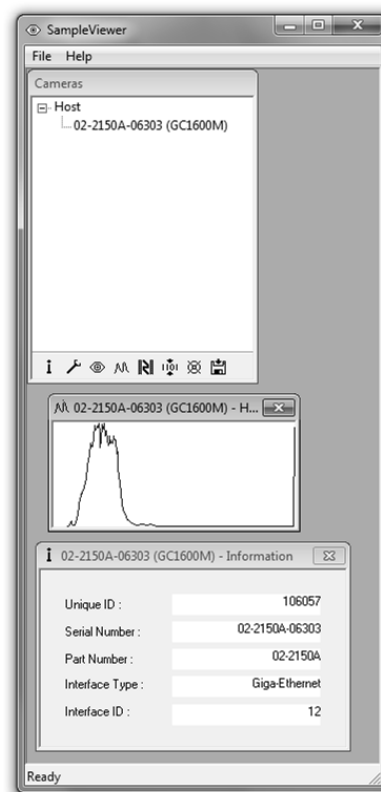
Figure 12: GigE Sample Viewer information and histogram.

Event channel

 Select the desired camera from the cameras window of the GigE Sample Viewer. Click the film icon, shown left.

The Events window will open. This is a tool used to monitor in-camera events such as AcquisitionEnd, ExposureStart, ExposureEnd, etc. The factory default settings disable all event notifications.

Use the camera controls to select which events to monitor. View the EventID to understand the display format in the Events window.
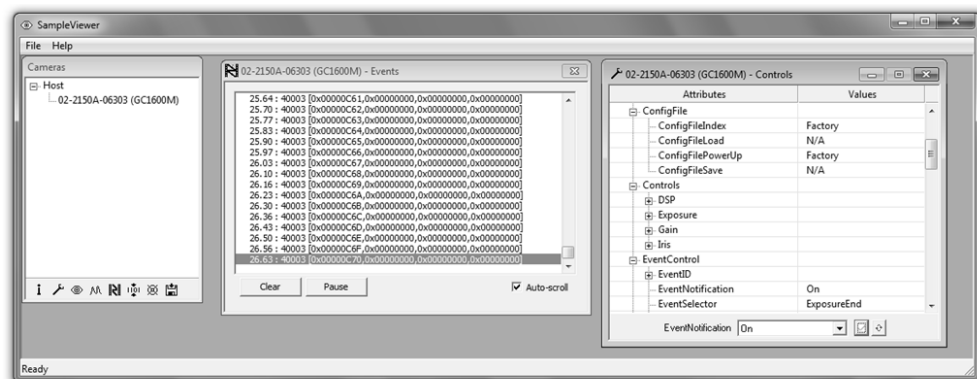

Figure 13: GigE Sample Viewer events and controls.

RS232 serial interface

 Select the desired camera from the cameras window of the GigE Sample Viewer. Click the serial icon, shown left.

The SerialIO window will open. This tool controls the camera's RS232 port which communicates across the RXD and TXD pins on the camera IO port. All AVT GigE Vision cameras offer an RS232 port.

RS232 communication can be used for interfacing the camera to motorized lenses, temperature and pressure sensors, camera position motors, and other applications.
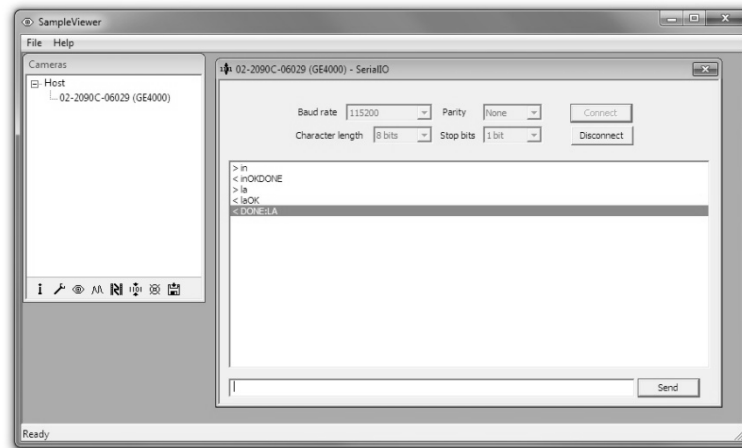

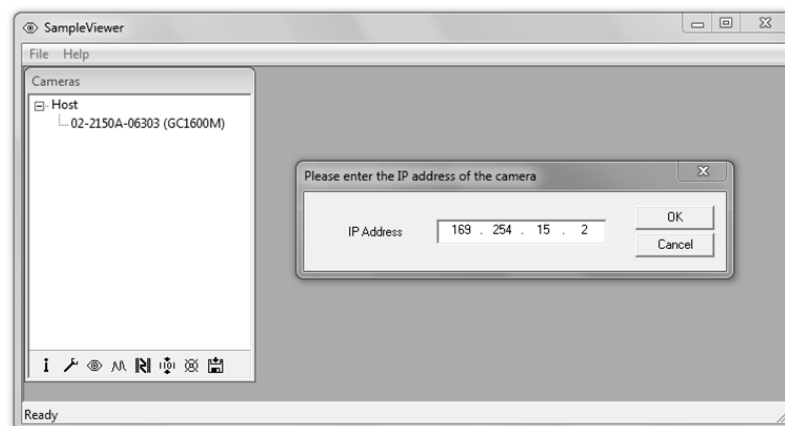Figure 14: GigE Sample Viewer SerialIO.

Seek camera

Select the desired camera from the cameras window of the GigE Sample Viewer. Click the seek icon, shown left.

The seek camera window will appear. This is used when camera UDP discover broadcast packets are either disabled, or blocked by hardware or network administrator preventing the camera from being recognized by the GigE Sample Viewer. Enter the camera's IP address into the window shown below.

Figure 15: GigE Sample Viewer seek camera.

Export camera settings

Select the desired camera from the cameras window of the GigE Sample Viewer. Click the floppy disk icon, shown left.

A file explorer window will appear requesting a download location for the camera setup file. This file captures the current camera settings and creates a simple text file. This file can be uploaded to other cameras allowing both units to utilize the same camera settings.

Note

Load camera settings to other cameras using the CamSetup example code found in PvAPI SDK from AVT.
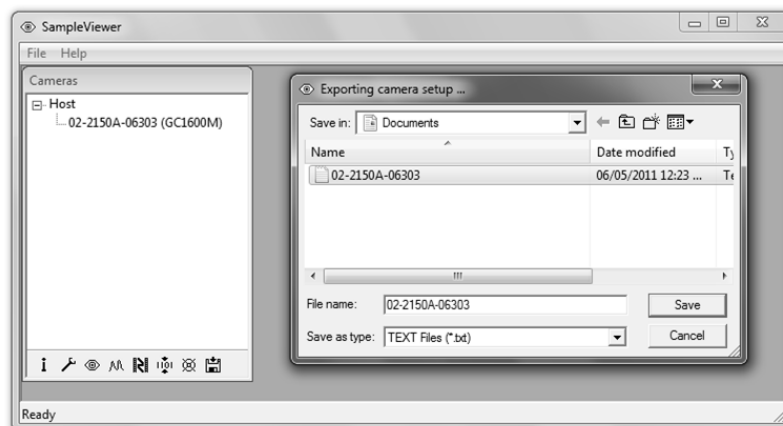
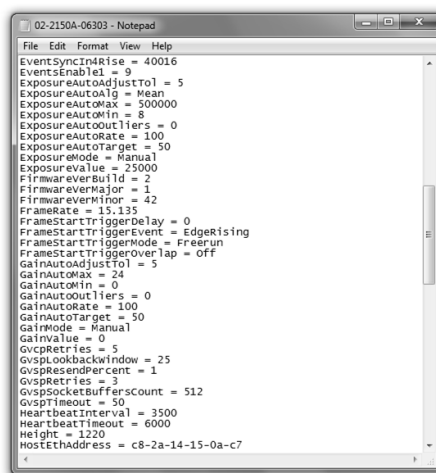Figure 16: GigE Sample Viewer exporting camera setup.

Figure 17: Camera settings text file exported from the camera.

Modify Ethernet adapter IP address

The "Obtain an IP address automatically" process can take up to one minute for the appropriate IP address to resolve and for a camera to be recognized on the adapter.

It is possible to speed up this recognition process by fixing the IP address of the adapter to the link-local address range of 169.254.x.x.

[Windows 7]

→ *Start, Control Panel*
→ *Network and Internet*
→ *View network status and tasks*
→ *Change adapter settings*
→ Right click *Network Connection*
→ *Properties*
→ Select *Internet Protocol Version 4*
   click *Properties*
→ Select *Use the following IP address*:

   IP Address: *169.254.100.1*
   Subnet mask: *255.255.0.0*
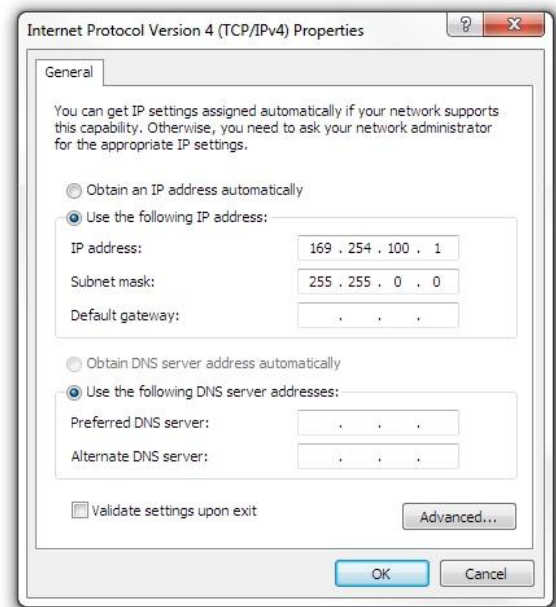   Default gateway: blank

Figure 18: Fixed IP address, Auto-IP range. Windows.

[Linux]

→ Terminal: *ifconfig*
→ Note *eth#* of NIC connected to camera
→ Terminal: *sudo gedit /etc/network/interfaces*
→ Add/edit:
   auto eth6
   iface eth6 inet static
   address 169.254.100.1
   netmask 255.255.0.0

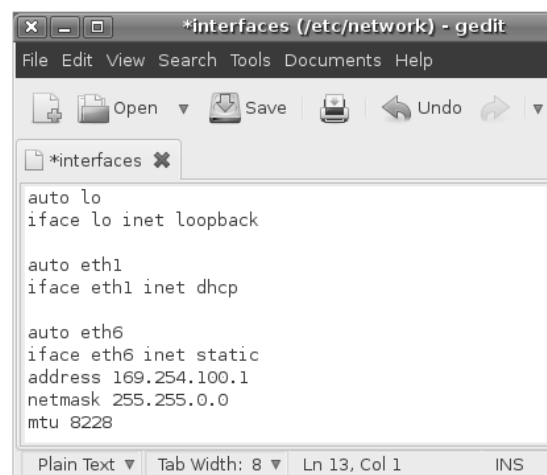   where *eth6* is name of NIC connected to camera.

Figure 19: Interfaces file for static IP, Linux Ubuntu 10.04

[OSX]

→ *System Preferences*
→ *Network*
→ Select *Ethernet,* click *Advanced*
→ *TCP/IP* tab, *Configure IPv4: Manually*
　IPv4 Address: 169.254.100.1
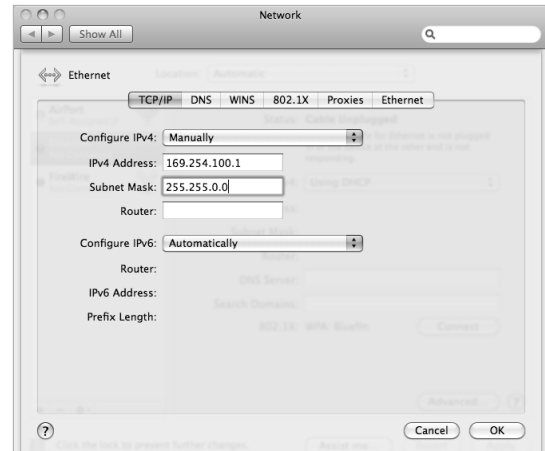　Subnet Mask: 255.255.0.0
　Router: Blank

Figure 20: Network property window, OSX Snow Leopard

Modifying camera IP address

AVT GigE Vision cameras support a number of IP addressing modes. Cameras shipped from the factory are configured to DHCP. If a DHCP server is not present, the camera uses the AutoIP configuration mode.

Configuration Mode	Description
DHCP	Obtain an IP address automatically using DHCP (Fallback to Auto-IP)
AutoIP	Obtain an IP address automatically using Auto-IP (169.254.xxx.xxx)
Fixed	IP address is assigned by the user

Table 3: Camera IP configuration modes

The camera IP address can be fixed by changing the configuration mode and defining the desired address.

[Windows 7]

With the camera(s) connected to the host, run the **IPConfig** program. This application is packaged with the GigE Sample Viewer download.
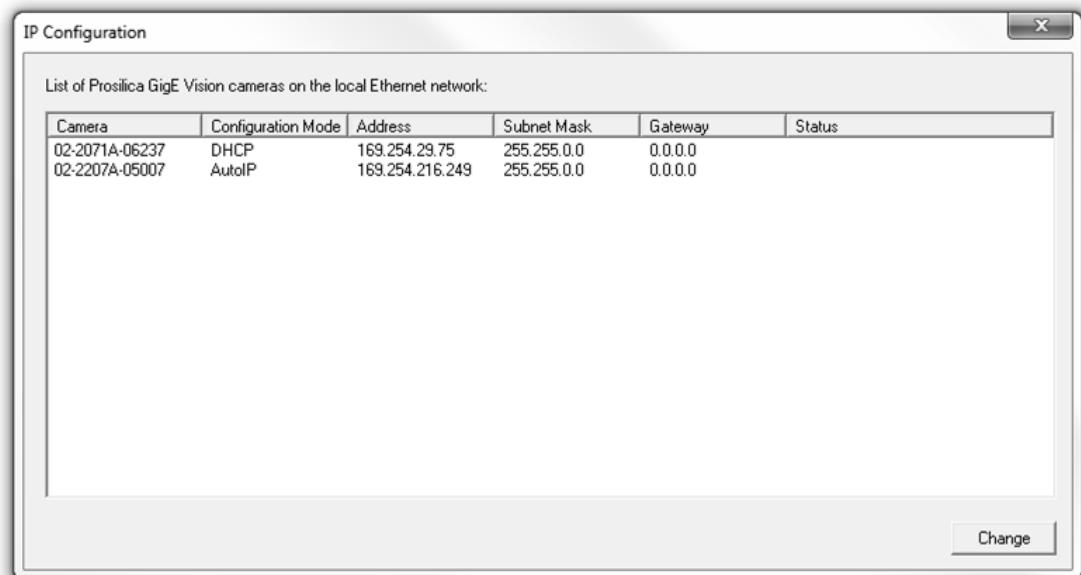

Figure 21: AVT IPConfig application.

→ Select the camera(s) you wish to alter, select *Change*

→ You are presented with three different addressing modes. To manually assign an IP address, select *use the following IP address:*

→ Select camera, click C*hange*

→ Select *Use the following IP address.*
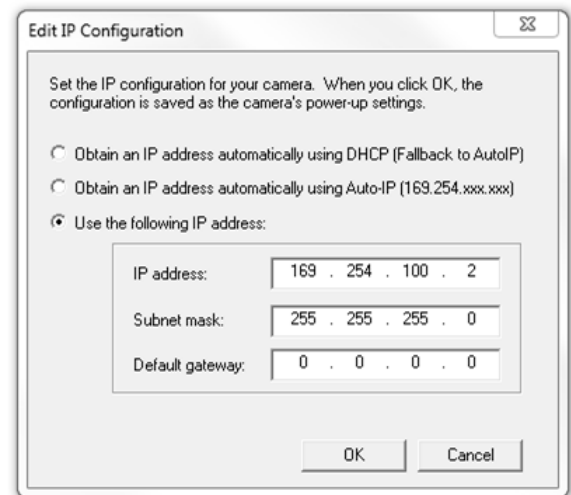
→ Enter desired IP, subnet mask, and gateway.

Figure 22: Setting fixed camera IP address. Non Auto-IP range.

[Linux, OSX, QNX]

With the camera(s) connect to the host, run the CLipConfig program included in the AVT GigE SDK/bin-pc directory. Source code is included in the examples.

Figure 23: AVT CLipConfig application command line options.

Using multiple cameras

There are a number of different methods for configuring a multiple camera system. Most of these can be differentiated into two architectures: Single Ethernet port and Multiple Ethernet port. In order to determine which architecture is needed, start by calculating the amount of bandwidth required from the cameras based on the desired resolution, pixel format, frame rate and number of cameras.

$$\text{Bandwidth} = \text{Width x Height x Bytes Per Pixel x Frame Rate x Num Cameras}$$
$$= \text{Value in MBps (Megabytes per second)}$$

Example 1:

Three GC1020 cameras, full resolution, mono8 pixel format (1 byte per pixel), at 30 fps.
Bandwidth usage = 1024 x 768 x 1 x 30 x 3 = 70.8 MBps

Percentage of single port GigE bandwidth = 57 %. Single port architecture is sufficient.

Example 2:

Three GC650 cameras, full resolution, mono16 pixel format (2 bytes per pixel), at 90 fps.
Bandwidth usage = 659 x 493 x 2 x 90 x 3= 175.4 MBps

Percentage of single port GigE bandwidth =140 %. Multiple port architecture is needed.

Example 3:

Three GC1380C camera, full resolution, bayer16 pixel format (2 bytes per pixel), 20 fps.
Bandwidth usage = 1360 x 1024 x 2 x 20 x 3 = 167.1 MBps

Percentage of single port GigE bandwidth = 134 %. Multiple port architecture is needed.

Gigabit Ethernet bandwidth is 1 Gbps (Giga bit per second) ~ 125 MBps (Mega bytes per second). Example 1 can be accommodated using a single Ethernet port whereas example 2 and 3 requires multiple Ethernet ports in order to increase the available bandwidth.

www

For more information on StreamBytesPerSecond and camera pixel format refer to the **AVT Prosilica GigE Camera and Driver Attributes** document:

http://www.alliedvisiontec.com/fileadmin/content/PDF/Software/Prosilica_software/Prosilica_firmware/AVT_Camera_and_Driver_Attributes.pdf

Single Ethernet port

Multiple cameras are connected to a switch. The switch is connected to a single Ethernet port. This is the simplest multiple camera installation. The cameras can be managed using Auto-IP, no additional configuration on the switch is necessary.

Figure 24: Multi camera network configuration using a switch and single Ethernet port

This architecture combines bandwidth coming from each camera onto a single cable connected to the host. To prevent packet collision, resulting in dropped packets, the user is required the reduce StreamBytesPerSecond attribute on each camera, such that the sum doesn't exceed 125,000,000 Bps.

Example:

Camera 1: GE1900, full resolution, Mono8 pixel format, at 15 fps
Bandwidth usage = 1920 x 1080 x 1 x 15 = 31,104,000 Bps.
Set StreamBytesPerSecond = 31,104,000 Bps.

Camera 2: GE1650C, full resolution, Bayer 8 pixel format, at 5 fps
Bandwidth usage = 1600 x 1200 x 1 x 5 = 9,600,000 Bps
Set StreamBytesPerSecond = 9,600,000 Bps.

Camera 3: GC2450, full resolution, Mono8 pixel format, at 5 fps
Bandwidth usage = 2448 x 2050 x 1 x 5 = 25,092,000 Bps
Set StreamBytesPerSecond = 25,092,000 Bps.

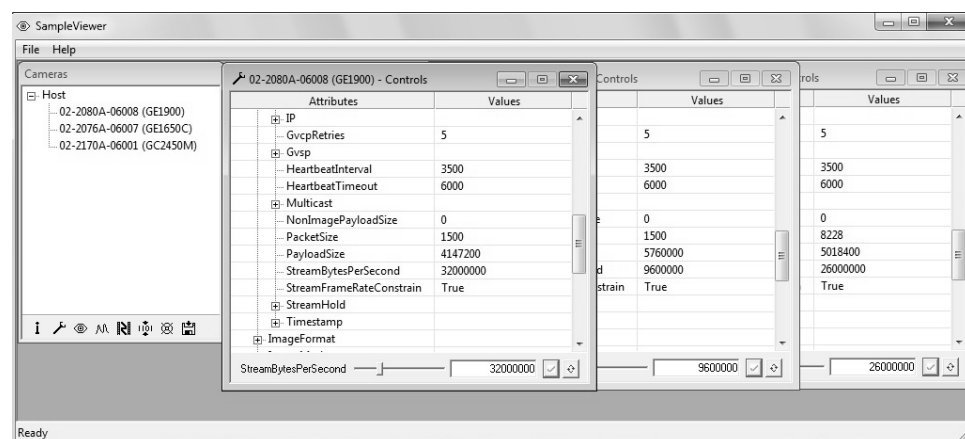Total bandwidth consumed = 31,104,000 + 9,600,000 + 25,092,000 = 65,796,000 Bps

Figure 25: GigE Sample Viewer window, controls window StreamBytesPerSecond

Multiple Ethernet ports

Each camera is connected directly to an Ethernet port. No switch is used. This configuration is more complex and requires the user to manage host and camera IP addressing however it allows each camera to use the entire gigabit interface bandwidth.
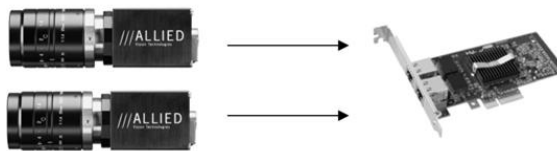

Figure 26: Multi camera network configuration using multiple Ethernet ports

Camera and adapter IP addresses are managed with fixed IP addressing, as the IP address of each adapter needs to be on a unique subnet.   A subnet is that part of the IP address which overlaps with the binary 1's (decimal 255 in following example) of the Subnet mask.
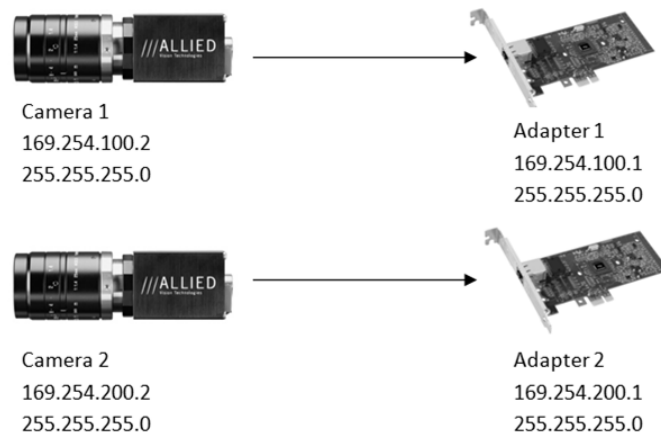

Figure 27: Camera and adapter IP address example

The following steps are required to configure a multiple Ethernet port camera system:

- Fix host adapter IP address
- Fix camera IP address

Note

The host can be configured using multiple single port adapter cards, multiple dual port, quad port and so on. The same IP addressing model can be scaled to larger network configurations.

Fix host adapter IP address

→ Refer to Chapter **Modify Ethernet adapter IP address** on page 23.

→ Select *Use the following IP address*:

Adapter 1

IP Address: 169.254.100.1
Subnet mask: 255.255.255.0

Adapter 2

IP Address: 169.254.200.1
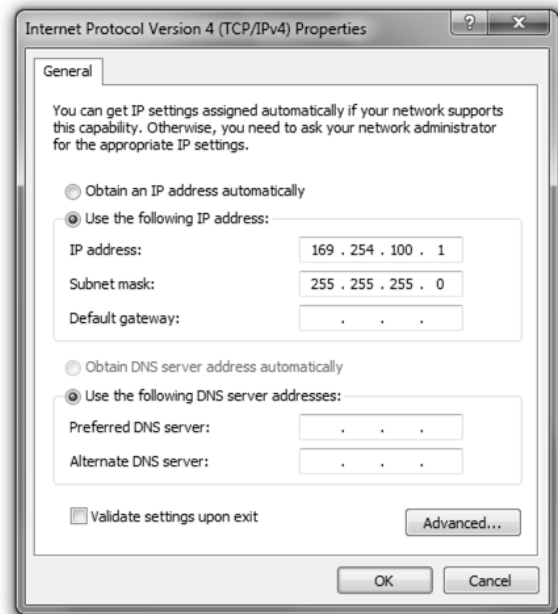Subnet mask: 255.255.255.0

Figure 28: IP configuration window for Adapter 1

Fix camera IP address

→ Refer to Chapter **Modify camera IP address** on page 25.

→ Select *Use the following IP address*:

Camera1

IP Address: 169.254.100.2
Subnet mask: 255.255.255.0

Camera2

IP Address: 169.254.200.2
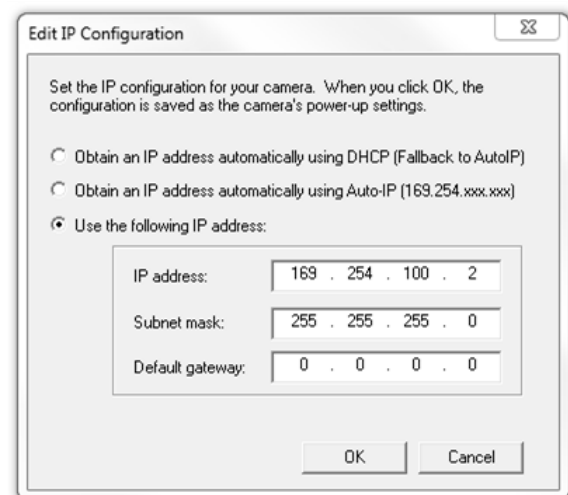Subnet mask: 255.255.255.0

Figure 29: AVT IPConfig camera IP address configuration window

Implementing link aggregation

The GX series cameras offer two Gigabit Ethernet ports for image data transfer and control. Users can connect one or both ports on the GX to Ethernet adapter ports on a host computer. The dual port approach requires the host computer to configure a Link Aggregate Group (LAG). A LAG configuration combines multiple Ethernet ports into a single data channel.
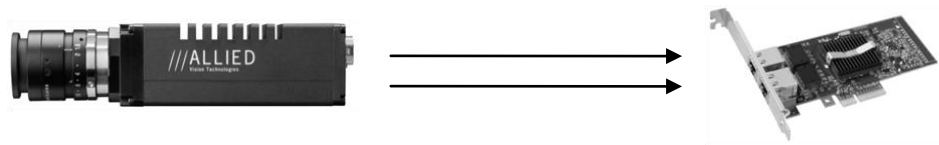

Figure 30: Prosilica GX camera network configuration using multiple Ethernet ports

When is LAG needed?

Connecting both ports will increase the available bandwidth to 240 MB/sec. This is beneficial for the following cases.

- Need to use Mono16, Bayer16, RBG24 and other high bit depth pixel formats.
- Highest frame rate is needed

www

Reference **AVT Prosilica GX Technical Manual** for resolution and ROI frame rate performance.
http://www.alliedvisiontec.com/us/support/downloads/product-literature/prosilica-gx.html

Reference the **AVT Prosilica GigE Camera and Driver Attributes** document for information regarding camera pixel format
http://www.alliedvisiontec.com/fileadmin/content/PDF/Software/Prosilica_software/Prosilica_firmware/AVT_Camera_and_Driver_Attributes.pdf

The following examples show how to determine bandwidth consumption. If the value is greater than 125 MB, LAG is required.

Example 1:

GX1050 camera using Mono8 pixel format and outputting 100 fps
Bandwidth usage = Resolution x Pixel format x Frame rate
= 1024 x 1024 x 1 (1 byte for mono8) x 100
~ 105 MBps
Percentage of single port GigE bandwidth ~ 84 %

LAG is not required to operate the GX1050 camera at 100 fps in Mono8

Example 2:

GX1050C using YUV422 pixel format and outputting 100 fps
Bandwidth usage = 1024 x 1024 x 2 (2 byte for YUV422) x 100
              ~ 210 MBps
              Percentage of single port GigE bandwidth ~ 168 %,

LAG is required to operate the GX1050C at 100 fps using YUV422

Configuring Link Aggregation

The GX camera connected to host using LAG will required two host Ethernet adapter ports. Configure and optimize each Ethernet adapter port using steps outlined in Chapter **Ethernet adapter configuration** on page 14.   Follows the steps below to setup a link aggregate group.

[Windows 7, Intel PT]

→ *Start ,Control Panel*
→ *Hardware and Sound*
→ *Device Manager*
→ *Network Adapter*
→ right click *Adapter device name*
→ *Properties*
→ *Teaming* tab
→ Select *Team the adapter with other adapters*
→ click *New Team*
→ The New Team Wizard window will open, choose a team name
click *Next*

Figure 31: Intel adapter properties teaming tab.

➔ Select the desired adapters corresponding to the ports to be used by the Prosilica GX camera, click *Next*
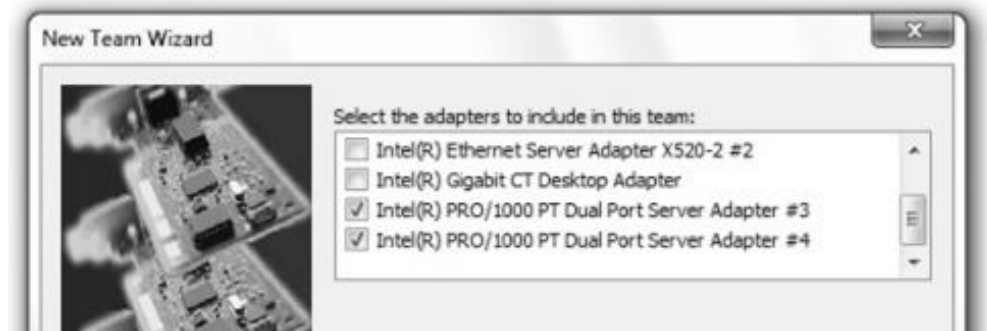
Figure 32: Team wizard adapter selection.
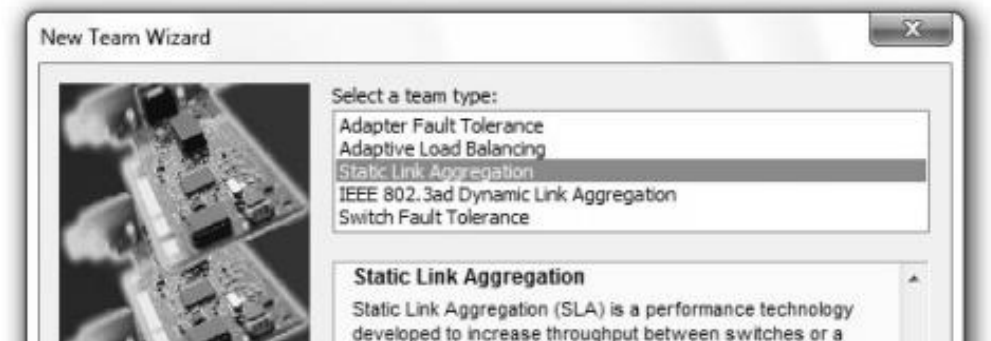
➔ Select team type: *Static Link Aggregation*
click *Next*

Figure 33: Team wizard team type selection.

The team will now configure and a new adapter will appear in the Network Connections window.

Note

ⓘ The newly formed team adapter can be managed using automatic IP configuration or fixed IP using instructions provided in Chapter **Modify Ethernet adapter IP address** on page 23.

[Linux]

Link Aggregation is referred to as bonding in Linux. The following instructions are for Ubuntu Linux 10.04 or newer.

www

For full installation instructions on Ubuntu, see:
https://help.ubuntu.com/community/UbuntuBonding
https://help.ubuntu.com/community/LinkAggregation

→ Download *ifenslave* module.
Terminal: *sudo apt-get install ifenslave*

→ Terminal: *ifconfig*

→ Note *eth#'s* of NICs to be bonded

→ *Terminal: sudo gedit /etc/network/interfaces*

→ Add/edit:

auto bond0
iface bond0 inet static
address 169.254.100.101
netmask 255.255.0.0
bond-slaves eth6 eth7
bond_mode 0
mtu 8228

where *eth6 and eth7* are the NICs to be bonded.

interfaces (/etc/network) - gedit

File   Edit   View   Search   Tools   Documents   Help

Open ▼   Save   Undo ▼

interfaces ✖

```
#Settings for Ubuntu 10.04 and newer

#local loopback
auto lo
iface lo inet loopback

#LAN/Internet
auto eth1
iface eth1 inet dhcp

#Intel Pro 1000 PT Dual. Bonded.
auto bond0
iface bond0 inet static
address 169.254.100.101
netmask 255.255.0.0
bond-slaves eth6 eth7
bond_mode 0
mtu 8228
```

Plain Text ▼   Tab Width: 8 ▼   Ln 1, Col 1   INS

Figure 34: Interfaces file for bonding. Linux.

[OSX]

www

For full installation instructions on OSX, see:
http://docs.info.apple.com/article.html?path=ServerAdmin/10.6/en/asa7873dc0.html

Note these instructions are for OSX server, but apply to OSX also.

→ *System Preferences*

→ *Network*

→ Select *Ethernet,* click gear icon, *Manage Virtual Interfaces…*

→ Click the Add (+) button, and select *New Link Aggregate*.

→ Select the ports to bond from the list, click *Create*, *Done*.

Figure 35: Manage Virtual Interfaces. OSX.

Multicasting Configuration

Multicasting allows multiple hosts on the same network to receive camera image data. One host acts as master/controller, and the others act as monitor. Most network hardware only supports multicasting at maximum packet size 1500.

See **AVT GigE Camera and Driver Attributes** document for enabling/disabling multicasting.

[Windows]

Ensure camera PacketSize = 1500. No additional setup is required.

[Linux]

Multicasting will only work if the application is run as root. Additionally, you may have to add manually a route:

> sudo route –n add –net 224.0.0.0 netmask 240.0.0.0 dev eth0

where eth0 is the adapter used for camera.

[OSX]

Multicasting is not supported on Mac OS X.

Troubleshooting

Is the camera getting power?

The RJ45 Ethernet connector on the back for the camera contains LEDs, one of which will illuminate when the camera is powered. If unlit, check the power adapter. If possible, test the adapter with a working camera to verify its operation. If using a custom power adapter, be sure the adapter and wire gauge is rated to 200 – 500 mA.

Is the camera powered, but not detected in GigE Sample Viewer?

Damaged or poor quality Ethernet cabling can result in no cameras found, dropped packets, decreased bandwidth, and other problems. Use Cat5e, 6 or better rated Ethernet cabling.

Return to Chapter **Modify Ethernet adapter IP address** on page 23, which describes how to adjust the IP address of the host adapter. There should be no gateway on your NIC. Connect a single camera directly to your NIC, no hub/switch.

[Windows 7]

Run the **IpConfig** application installed with the **GigE Sample Viewer**. You may need to wait up to one minute for the camera to appear.
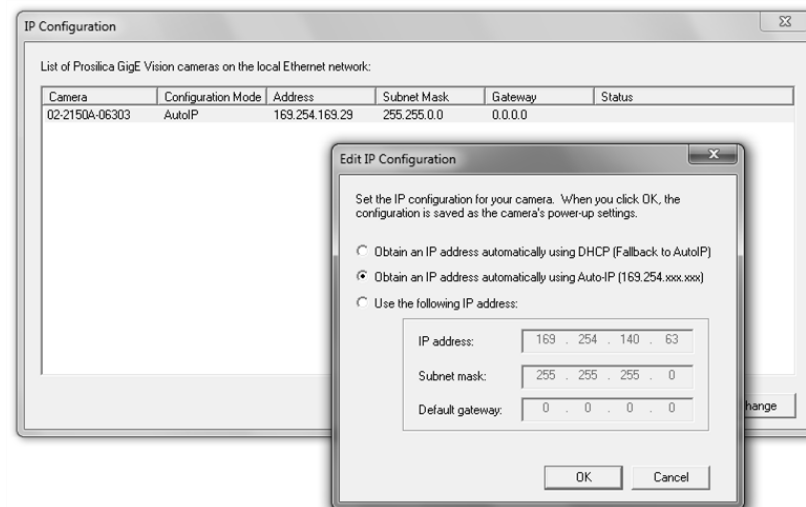

Figure 36: GigEIpConfig.

[Linux, OSX, QNX]

In AVT GigE SDK/bin-pc/<correct architecture>/ directory:

Terminal: *sudo ./CLiPConfig –l*

Possible results:

Camera is listed

Your camera and NIC must be on the same subnet. A sample IP configuration for the camera and adapter is shown below.

	Adapter	Camera
IP address:	169.254.23.2	169.254.43.3
Subnet Mask:	255.255.0.0	255.255.0.0

Camera is not listed

This can happen if the IP address of the adapter is not on the same subnet as the camera. To repair the issue, return the adapter address to the **Auto-IP configuration**.

If you are still having problems, type: *ipconfig /all* in a command prompt [windows]; *ifconfig –a* in terminal [Linux, OS X, QNX]. Send resulting screenshot to support@alliedvisiontec.com.
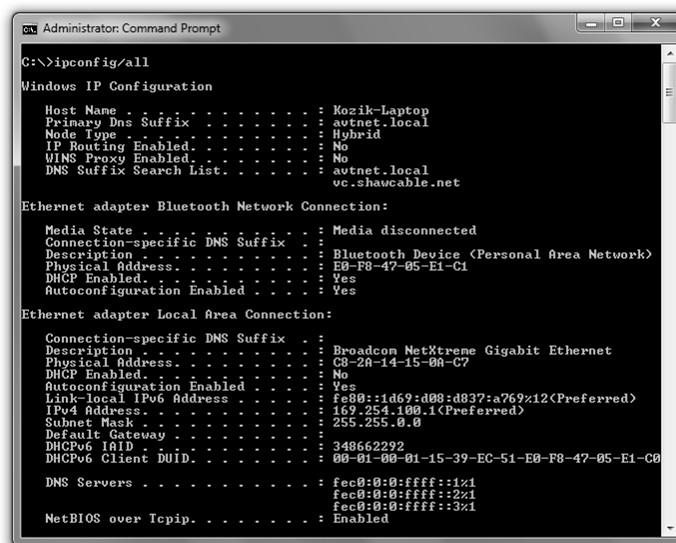

Figure 37: ipconfig /all. Windows.

Is the camera listed in GigE Sample Viewer but can't acquire images?

Reset your camera settings to factory default: with ConfigFileIndex = Factory, click the ConfigFileLoad button. While streaming, check your Stats.
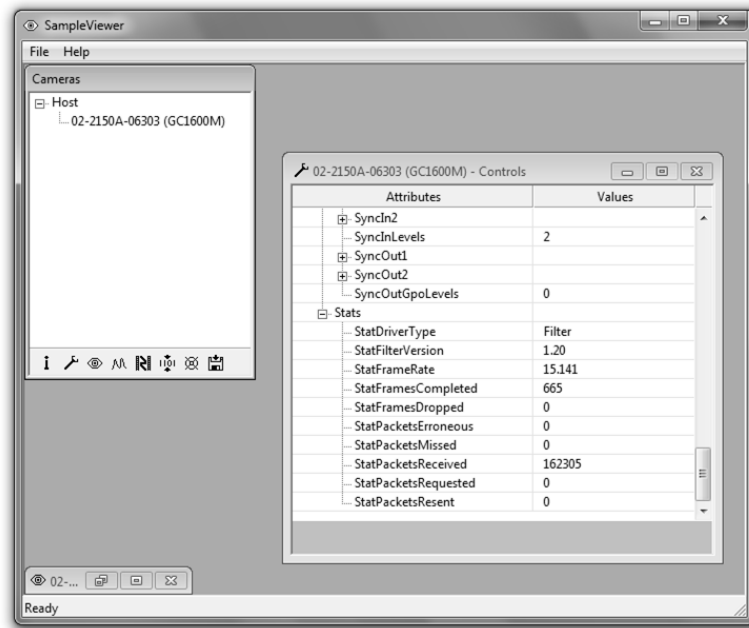

Figure 38: GigE Sample Viewer. Stats reporting.

StatFramesCompleted/StatPacketsReceived = 0.

- Likely a firewall is blocking incoming traffic. Disable your firewall on Ethernet adapter connected to camera.
- Be sure FrameStartTriggerMode = Freerun or FixedRate. Other trigger modes require a trigger event to capture frames.

StatFramesDropped ≠ zero

- Packets are incoming, but all dropping. Be sure you have Jumbo Frames enabled on your Adapter, see **Ethernet adapter configuration** section. Alternatively, reduce camera PacketSize value to 1500.

StatFramesCompleted is increasing but black image

- Increase Exposure Value,
- Ensure the camera lens is properly installed and the lens cap has been removed.
- Be sure your scene is suitably lit

Note

If you are still having problems, capture the cameras settings file explained in Chapter **Export camera settings** on page 22 and send this to support@alliedvisiontec.com.

Additional references

Product webpage

http://www.alliedvisiontec.com/us/products/cameras/gigabit-ethernet/prosilica-gc.html

Product manuals and CAD models

http://www.alliedvisiontec.com/us/support/downloads/product-literature.html

AVT GigE PvAPI SDK

http://www.alliedvisiontec.com/us/products/software/avt-pvapi-sdk.html

Knowledge base

http://www.alliedvisiontec.com/us/support/knowledge-base.html

Case studies

http://www.alliedvisiontec.com/us/products/applications.html

Firmware

http://www.alliedvisiontec.com/us/support/downloads/firmware.html