GigE Vision Quick Start Configuration Guide

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Configure GigE Vision Image Acquisition on Windows

Acquiring images from a GigE Vision camera in Image Acquisition Toolbox[™] using the GigE Vision Hardware support package functionality (either the videoinput object using the gige adaptor or the gigecam object) requires specific configuration and setup for the Ethernet network adapter and network connection outside of MATLAB[®]. This guide describes the configuration steps to help you get started using a GigE Vision camera with the Image Acquisition Toolbox on a Windows[®] computer.

The configuration instructions and screen shots included are for Windows 7, but similar configuration steps are applicable for Windows 8 or Windows 10.

Recommended Hardware Setup

The recommended getting-started configuration when using the Image Acquisition Toolbox to acquire images from a single GigE Vision camera consists of a system with:

- GigE Vision compliant camera.
- Computer with a camera-dedicated Gigabit Ethernet network adapter (for example a PCI Express Gigabit Ethernet network interface card), which supports jumbo frames (4k or 9k bytes are common jumbo frame sizes).
- Direct connection between the camera and dedicated Gigabit Ethernet adapter.
- For any additional computer network connection (such as an Internet connection or your organization's local area network) it is recommended to use a separate network adapter.

Although other hardware setups are possible, the above configuration ensures that:

- · Maximum bandwidth is available for streaming images from the camera.
- The camera-dedicated private network connection can have network/firewall settings different than the Internet or domain network connection.

Gigabit Ethernet Network Adapter Configuration

- "Gigabit Ethernet Adapter Driver" on page 1-4
- "Network Settings for the Camera's Network Connection" on page 1-9

The following Ethernet adapter configuration settings are recommended for proper operation and optimum performance when acquiring images from a GigE Vision camera.

Gigabit Ethernet Adapter Driver

Verify that an appropriate Ethernet network adapter driver (provided by the network adapter manufacturer) is installed and working properly. Custom high-performance drivers installed for use with a third-party imaging application will not work with the Image Acquisition Toolbox videoinput and gigecam interfaces.

- 1 Open Windows Device Manager, and click on Network adapters.
- 2 Right-click on the Gigabit Ethernet adapter entry dedicated to the camera's network connection under **Network adapters**, and click **Properties** in the context menu.



3 In the Adapter Properties, click the **Driver** tab to verify the driver.

Intel(R) Gigabit CT Desktop	o Adapter Properties
General Advanced Driv	rer Details Resources Power Management
Intel(R) Gigabit (CT Desktop Adapter
Driver Provider:	Intel
Driver Date:	10/13/2011
Driver Version:	11.14.48.0
Digital Signer:	Microsoft Windows Hardware Compatibility Publisher
Driver Details	To view details about the driver files.
Update Driver	To update the driver software for this device.
Roll Back Driver	If the device fails after updating the driver, roll back to the previously installed driver.
<u>D</u> isable	Disables the selected device.
<u>U</u> ninstall	To uninstall the driver (Advanced).
	OK Cancel

For optimum GigE Vision streaming performance, i.e. reduced CPU load and smaller likelihood of dropped frames, the following settings for the Gigabit Ethernet adapter jumbo packet and receive buffers are recommended:

- **1** In the network Adapter Properties (described in the previous section), click the **Advanced** tab.
- 2 Set Jumbo Frame (or Jumbo Packet) to the maximum supported value (for example 9014 bytes). Gigabit Ethernet controllers that support jumbo frames can transfer packet sizes larger than the standard Ethernet frame size (1500 bytes).

Intel(R) Gigabit CT D	esktop Ad	dapter Pi	roperties		x
General Advance	d Driver	Details	Resources	Power Management	
The following prop the property you w on the right.	erties are a ant to char	vailable fo nge on the	or this network e left, and the	k adapter. Click n select its value	
Property:			<u>V</u> alue:		
Interrupt Moderati IPv4 Checksum C	on Rate)ffload	^	9014	Bytes	
Large Send Offloz Large Send Offloz Link Speed & Du Locally Administer Log Link State Ev Priority & VLAN Receive Buffers Receive Side Sca Receive Side Sca Reduce Speed O TCP Checksum O	ad (IPv4) ad (IPv6) olex red Address vent aling Queue n Power Do Yffload (IPv)	s E			
				OK Cancel	

3 Set **Receive Buffers** (or **Receive Descriptors**) to the maximum supported value (for example 2048). For some Ethernet controller drivers this setting is grouped under **Performance Options**.

4 Confirm that Link Speed & Duplex is set to Auto Negotiation (or Auto Detect).

Intel(R) Gigabit CT Desk	top Adapte	r Properties		x
General Advanced [Driver Deta	ils Resources	Power Manager	ment
The following propertie the property you want t on the right.	s are availabl o change on	e for this networ the left, and the	k adapter. Click In select its value	
Property:		<u>V</u> alue	:	
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			ок Са	ancel

Network Settings for the Camera's Network Connection

The following settings for the camera's dedicated network connection are recommended for proper operation and optimum performance when acquiring images from a GigE Vision camera.

- 1 In Windows Control Panel, open the Network and Sharing Center.
- 2 Click on Change adapter settings.

🕥 🗸 🖳 « Network and I	 Network and Sharing Center 	Search Control Panel			
Control Panel Home	View your basic network informat	tion and set up connections			
Change adapter settings	📃 — 💐 – 🖊 -	See full map			
settings	MYCOMPUTER Multiple netwo (This computer)	rks Internet			
	View your active networks	Connect or disconnect			
	ad.mathworks.com Domain network	Access type: Internet Connections: 🚆 Local Area Connection			
	Unidentified network Work network	Access type: No Internet access Connections: Q GigE			
	Change your networking settings				
	Set up a new connection or netwo	ork			
	Set up a wireless, broadband, dial- router or access point.	-up, ad hoc, or VPN connection; or set up a			
	Connect to a network				
	Connect or reconnect to a wireless, wired, dial-up, or VPN network connection. Choose homegroup and sharing options Access files and printers located on other network computers, or change sharing settings.				
See also HomeGroup					
Internet Options	Troubleshoot problems				
Vector Hardware	Diagnose and repair network problems, or get troubleshooting information				
Windows Firewall					

3 Right-click on the camera's network connection and click **Properties**.



4 In the **Networking** tab, confirm that **Internet Protocol Version 4 (TCP/IPv4)** is enabled/checked, and uncheck all other options.

When a dedicated camera network connection is used, other protocols, clients, or services can be disabled/unchecked, as they are not necessary for GigE Vision control and streaming.

GigE Properties
Networking Sharing
Connect using:
Intel(R) Gigabit CT Desktop Adapter
Configure This connection uses the following items:
VMware Bridge Protocol QoS Packet Scheduler File and Printer Sharing for Microsoft Networks Intermet Protocol Version 6 (TCP/IPv6) Intermet Protocol Version 4 (TCP/IPv4)
Description Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
OK Cancel

5 To configure the IP address, select **Internet Protocol Version 4 (TCP/IPv4)** and right-click **Properties**.

To configure automatic IP address assignment for the camera network connection, on the **General** tab, select **Obtain an IP address automatically** and **Obtain DNS server address automatically**, and click **OK**.

Internet P	rotocol Version 4 (TCP/IPv4)	Prope	erties	7		2	×
You ca this cap for the	n get IP settings assigned autor pability. Otherwise, you need to appropriate IP settings.	natica) ask y	lly if y our n	our ne	etwork : k admin	suppor istrato	ts r
0 0	btain an IP address automatical	ly					
-© U	se the following IP address: —						
<u>I</u> P a	ddress:						
Subi	net mask:						
Defa	ault gateway:						
00	btain DNS server address autor	natical	ly				
-©U	- s <u>e</u> the following DNS server add	resses	s:				
Pref	erred DNS server:						
Alte	rnate DNS server:						
	'alįdate settings upon exit				Adv	anced.	
				ОК		Car	ncel

Firewalls and the GigE Vision Camera Network Connection

Firewalls can block UDP packets used for image data transfer by the GigE Vision Streaming Protocol. The ports used for image data transfer by the camera and Gigabit network adapter are dynamic, and setting up the required firewall rules is an advanced operation. Firewall processing of the image data stream can also reduce performance.

A convenient getting-started configuration is to turn off the firewall for the camera's dedicated network connection, while keeping the firewall enabled for the other network connections (such as the Internet connection or your organization's local area network connection).

Windows uses network location profiles to group firewall settings for different types of connections, and turning off Windows firewall selectively for an individual network connection is not directly possible. Refer to the following online article for possible network and firewall configurations: http://www.mathworks.com/matlabcentral/answers/232356.

Configure Camera GigE Vision Streaming Parameters in MATLAB

Each image acquired by the camera is transferred to the computer as a data block of UDP packets, which are processed by MATLAB. For a lower CPU load during image acquisition and to prevent dropped frames, you can configure the camera GigE Vision streaming parameters (packet size and packet delay) in MATLAB.

Packet Size

- The toolbox configures the packet size automatically once the connection between MATLAB and the camera is established.
- The packet size value can also be configured manually by setting the PacketSize property of the videoinput source or gigecam objects.
- The packet size value should be set to the largest size that the network adapter and camera can handle (not larger than the Ethernet adapter jumbo packet size configured in step 1).

Packet Delay

- To prevent dropped frames, you can configure the camera to introduce a time delay between the image data packets by setting the PacketDelay property of the videoinput source or gigecam objects.
- Optimum values for the packet delay depend on the packet size, acquired frame size (image height and width), specified pixel format (for example 'Mono8'), camera frame rate, and other camera-specific settings.

The following online article provides details about determining the recommended packet delay value, and setting the packet size and packet delay values in MATLAB: http://www.mathworks.com/matlabcentral/answers/91834.