GigE Vision Quick Start Configuration Guide

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.

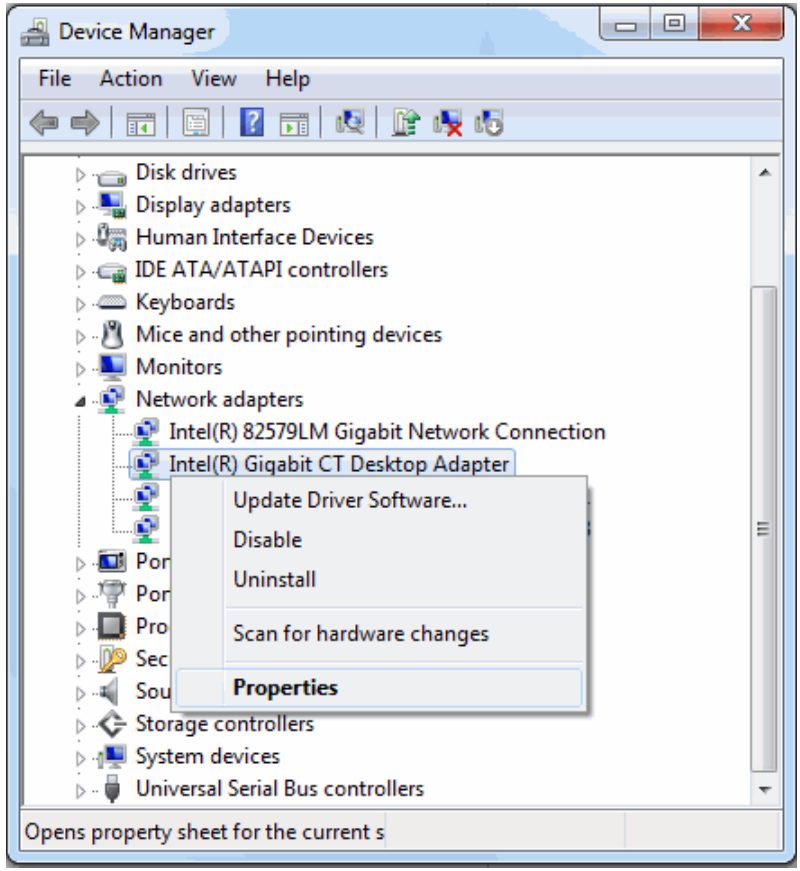
Gigabit Ethernet Network Adapter Configuration

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

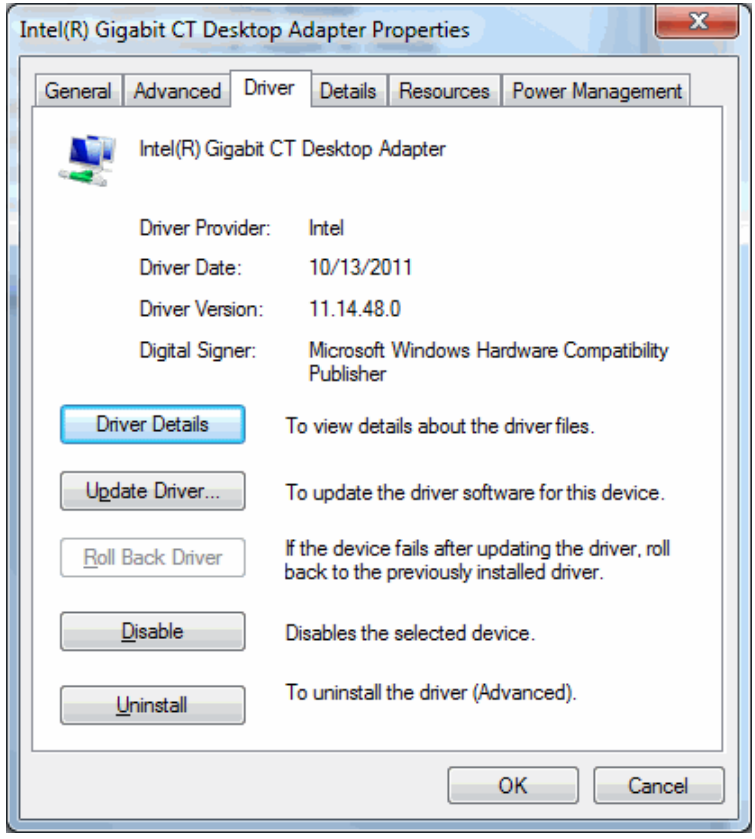
Gigabit Ethernet Adapter Driver

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.

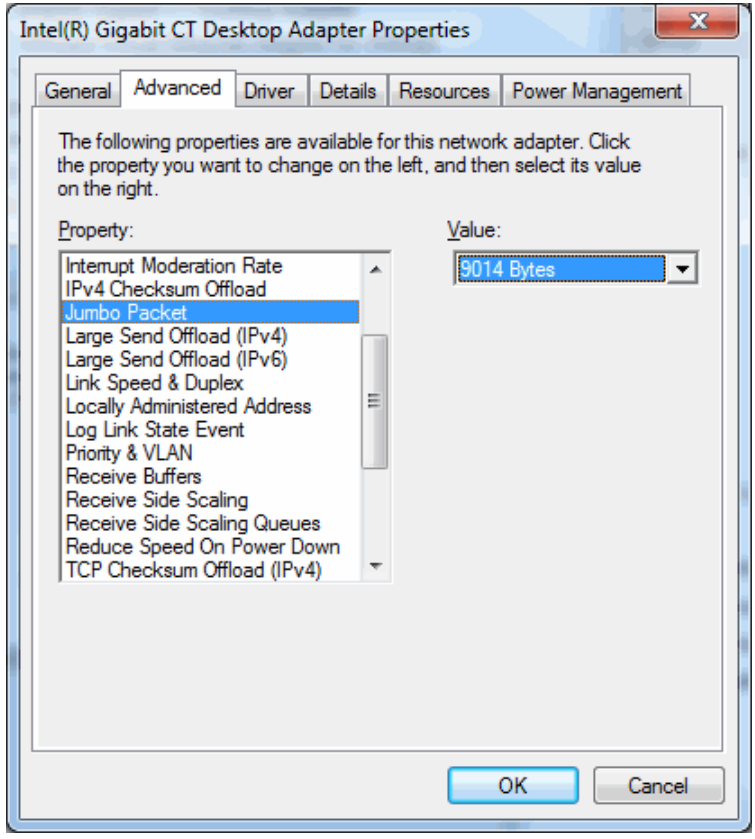


3 In the Adapter Properties, click the **Driver** tab to verify the driver.

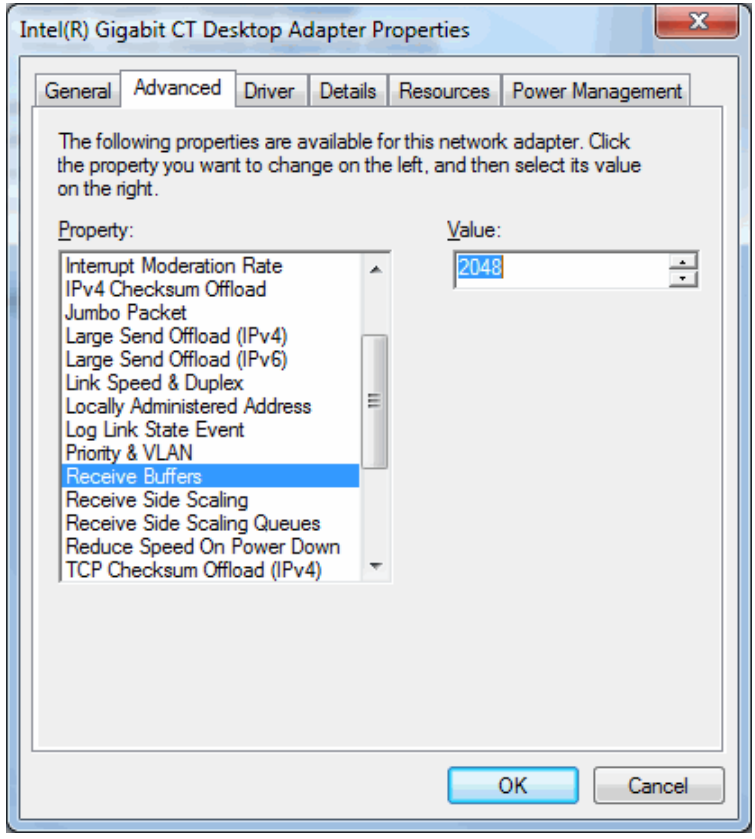


For optimum GigE Vision streaming performance, i.e. reduced CPU load and smaller likelihood of dropped frames, the following settings for the Gigabit Ethernet adapter jumbo packet and receive buffers are recommended:

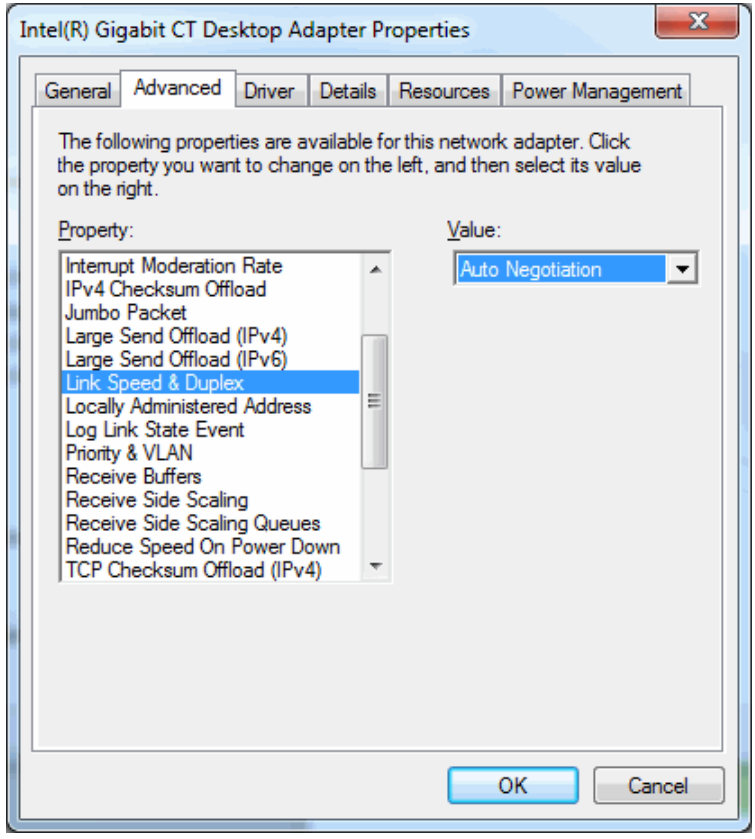
1. In the network Adapter Properties (described in the previous section), click the **Advanced** tab.
2. Set **Jumbo Frame** (or **Jumbo Packet**) to the maximum supported value (for example 9014 bytes). Gigabit Ethernet controllers that support jumbo frames can transfer packet sizes larger than the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



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**).

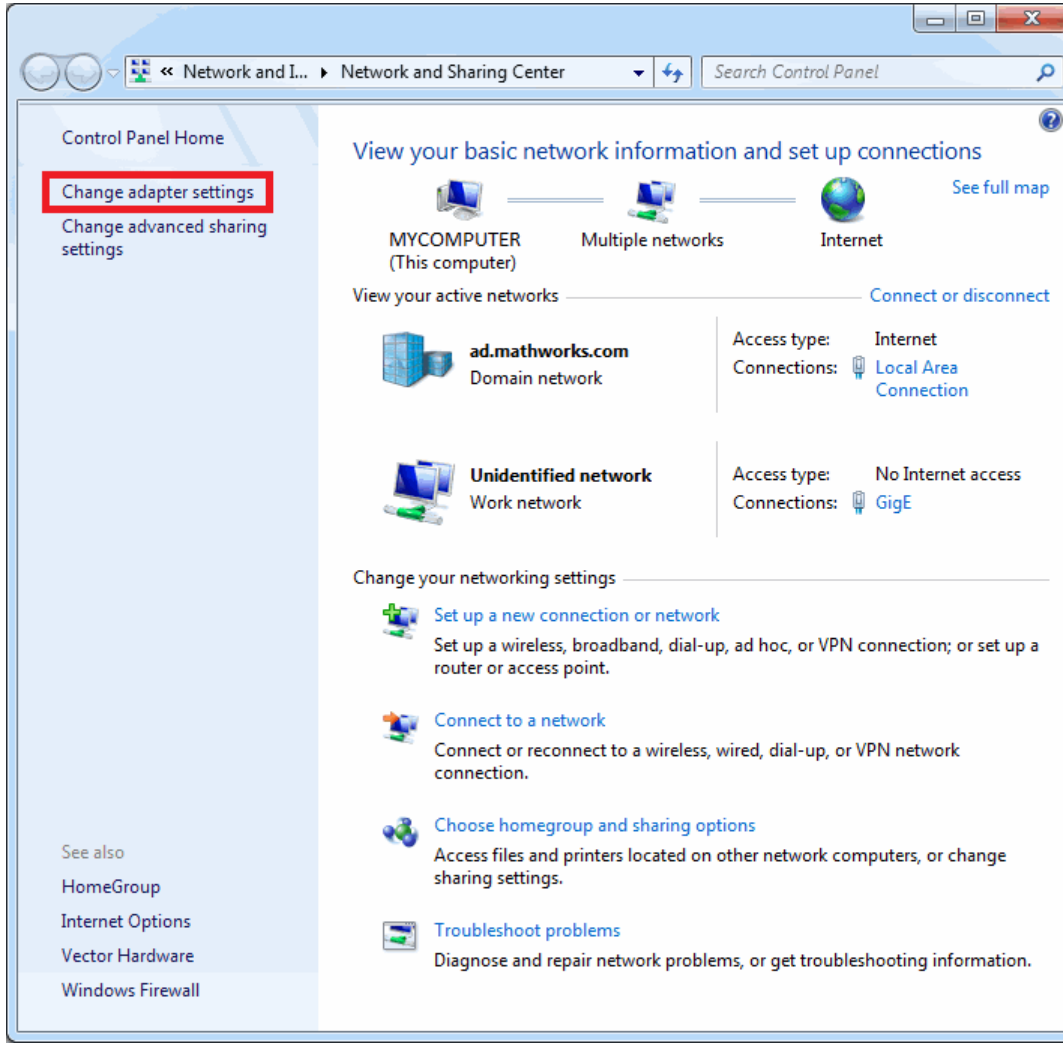


Network Settings for the Camera's Network Connection

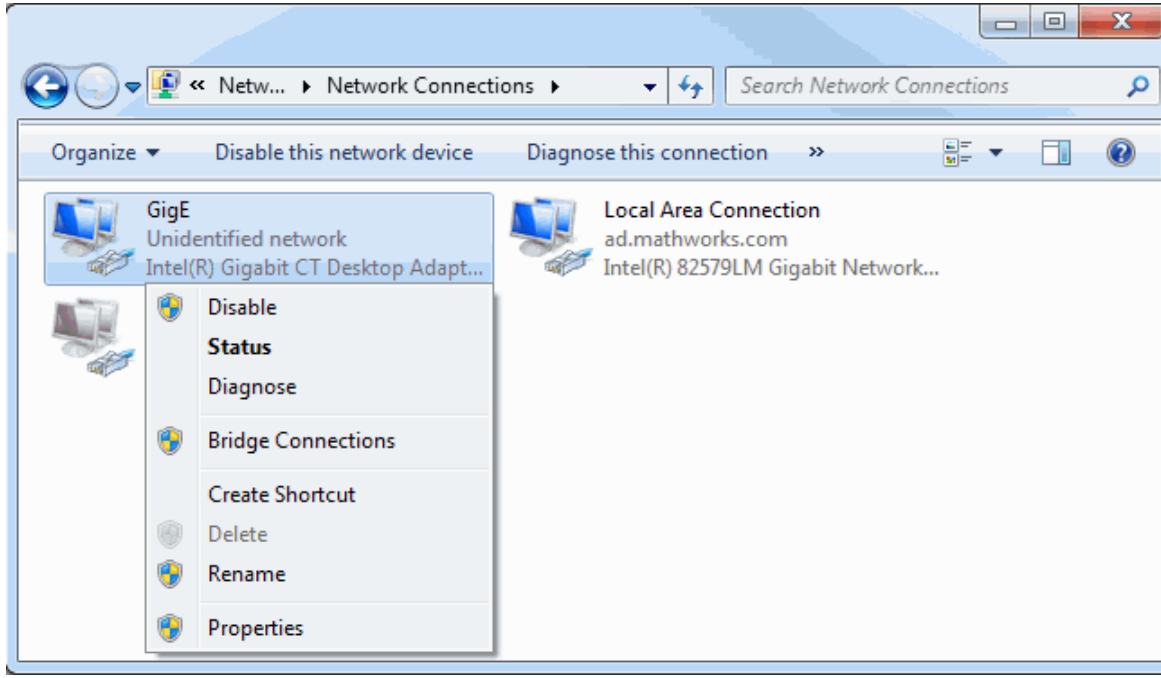
The following settings for the camera's dedicated network connection are recommended for proper operation and optimum performance when acquiring images from a GigE Vision camera.

1 In Windows Control Panel, open the **Network and Sharing Center**.

2 Click on **Change adapter settings**.

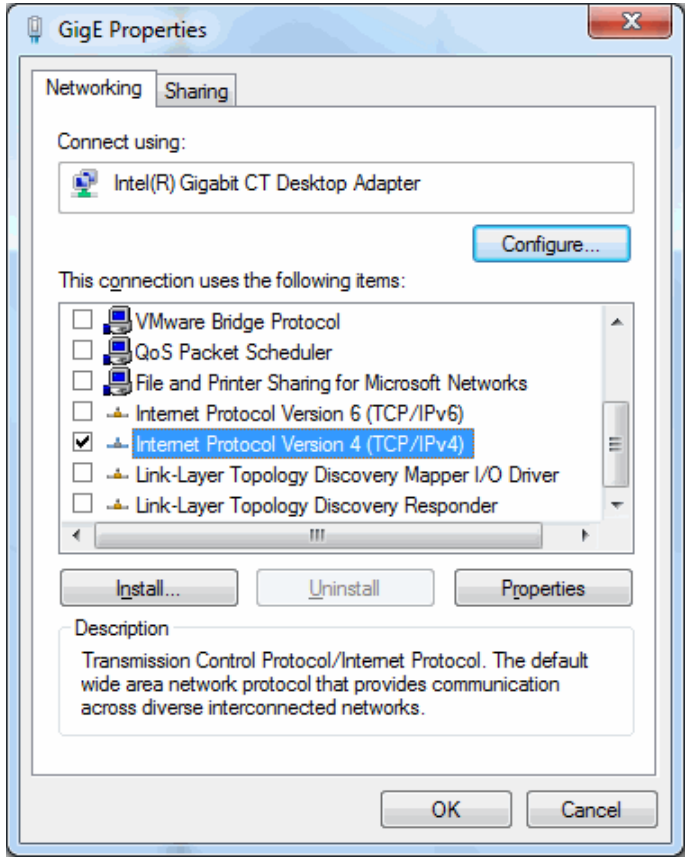


3 Right-click on the camera's network connection and click **Properties**.



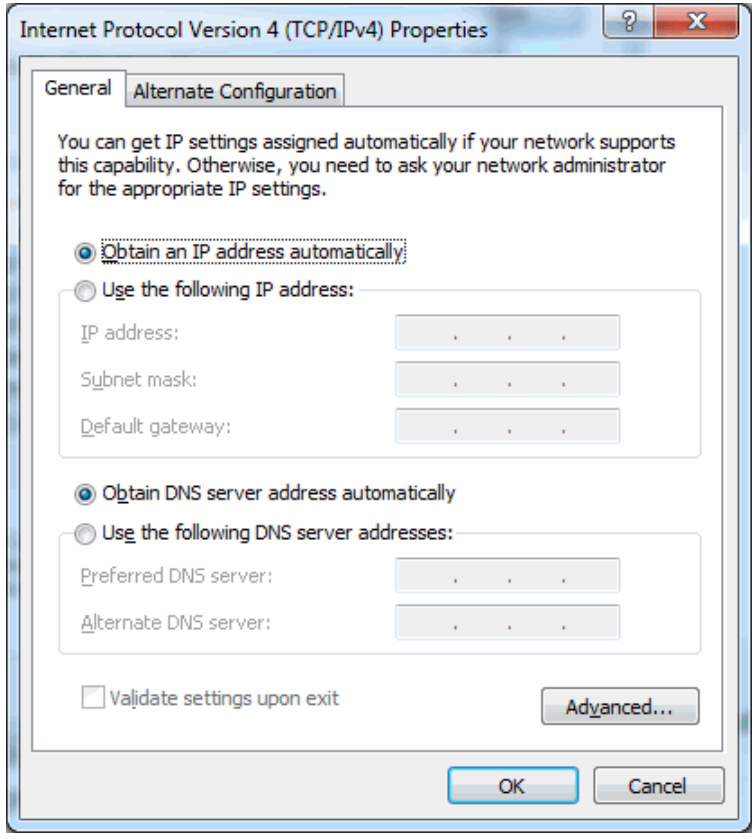
4 In the **Networking** tab, confirm that **Internet Protocol Version 4 (TCP/IPv4)** is enabled/checked, and uncheck all other options.

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.



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 Protocol Version 4 (TCP/IPv4) Properties
General
Alternate Configuration
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
Subnet mask:
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Validate settings upon exit
Advanced...
OK
Cancel

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.