

Technical Note

How to use Packet Size and Packet Delay

Packet Size and Packet Delay for GigE Vision Cameras:

Data transferred from a GigE Vision Camera to the host system is sent in the form of multiple “packets.” Image data captured by the sensor is divided into multiple fixed size packets and sent to the host system. After the host system receives the packets, the packets are re-constructed into an image.

The behavior of this data transfer process depends on the total system environment; such as the host system, NIC (Network Interface Card), hub, and the network configuration. To achieve best performance, the Packet Size and Packet Delay settings can be used to tune up the system.

1. Max fps with Full-Frame Size:

For full-frame size image (without ROI), the following settings are recommended.

1) NIC (Network Interface Card) Settings:

- In “Local Area Connection Properties” window, check “JAI GigE Vision Filter Driver”.

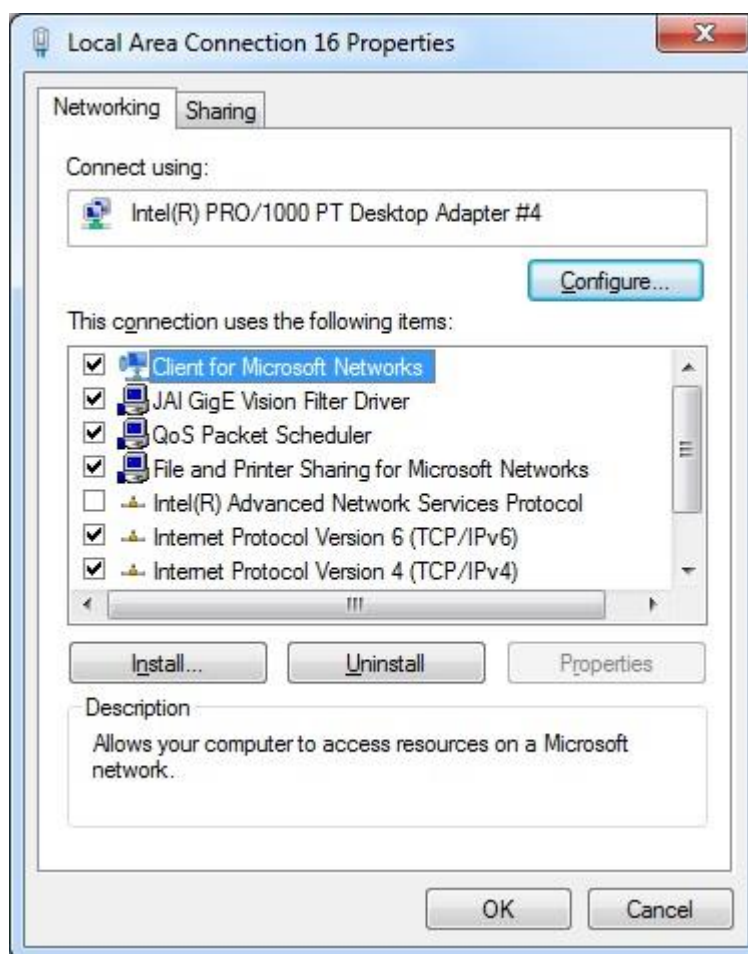


Fig. 1: Filter Driver



Technical Note

How to use Packet Size and Packet Delay

- Click “Configure...” button, select “Advanced” Tab, then set 9014 Bytes for “Jumbo Packet”.

Note: Some drivers display “9K MTF” in the Value field.

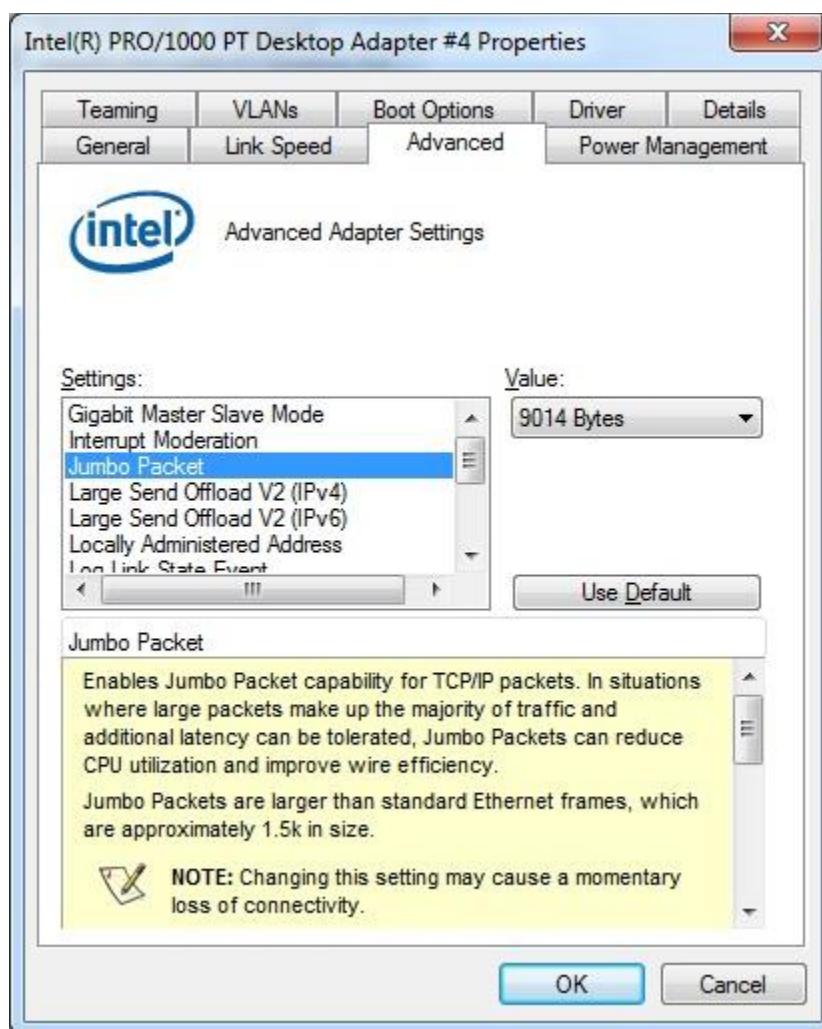


Fig. 2: Jumbo Packet

Technical Note

How to use Packet Size and Packet Delay

- Select “Performance Options” and click “Properties”.

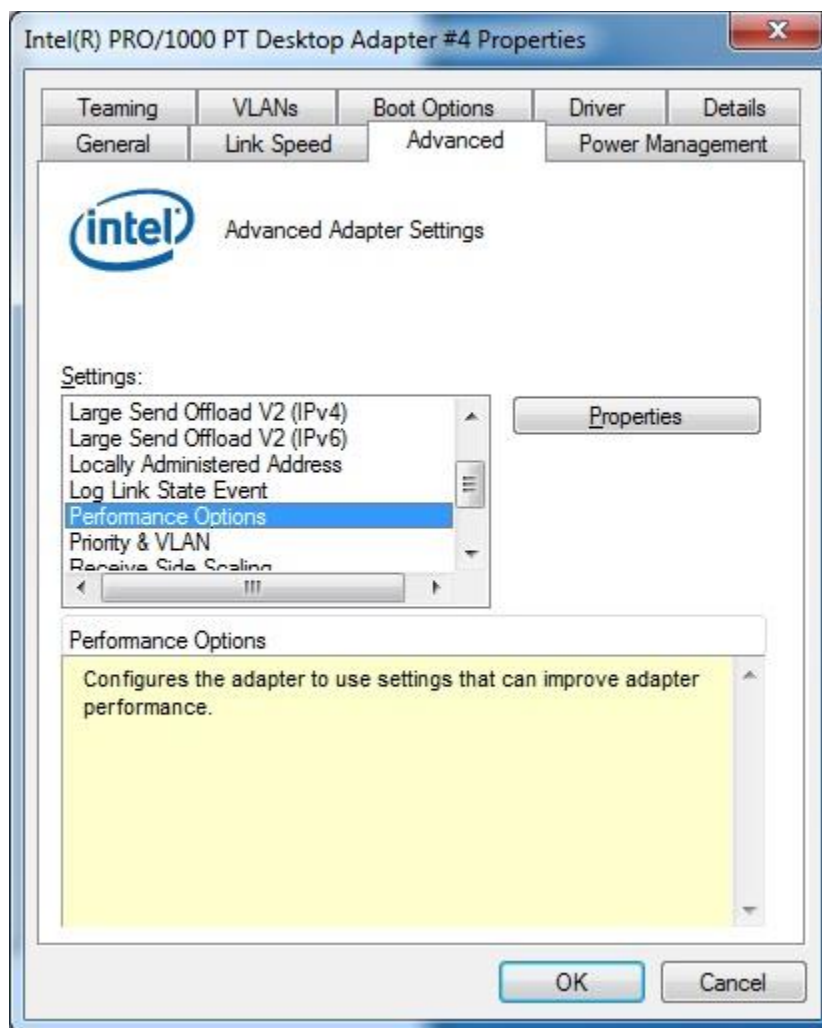


Fig. 3: Performance Options

Technical Note

How to use Packet Size and Packet Delay

- For “Interrupt Moderation Rate”, select “Extreme”.

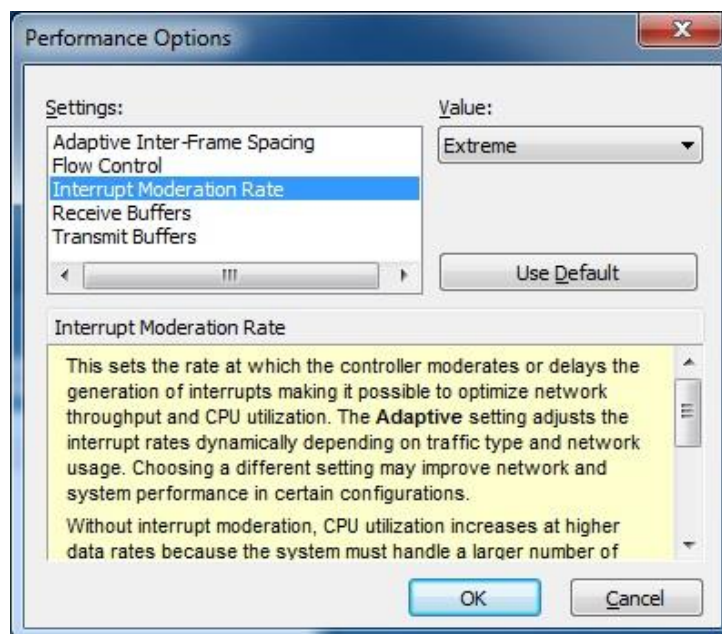


Fig. 4: Interrupt Moderation Rate

- For “Receive Buffers”, set to 2048.

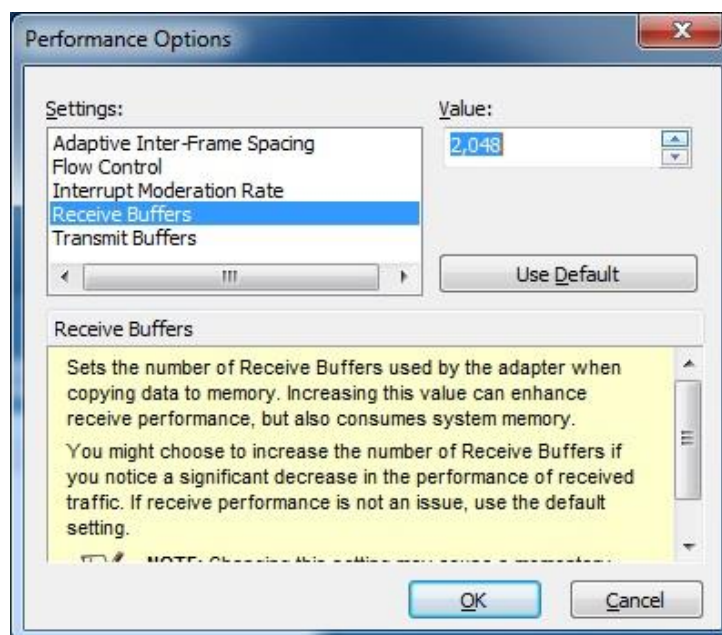


Fig. 5: Receive Buffers



Technical Note

How to use Packet Size and Packet Delay

2) Camera settings:

In the JAI Control Tool, select the category “Transport Layer Control” -> “Stream Channel Selector” -> “PacketSize” and set it to 8192 Bytes.

Note: this is smaller than the Jumbo Packet size selected in the network adapter. Setting a packet size larger than the network adapter’s jumbo packet size will cause the output to be blocked.

Stream Channel Selector	0
Stream Channel Port	0
Do Not Fragment	True
Packet Size	8192
Packet Delay*	0
Stream Channel Destination Address	0.0.0.0
Stream Channel Source Port	0

Fig 6: PacketSize of Camera Settings

2. NIC which does not support Jumbo Frames:

In the case of using a NIC which does not support Jumbo Frames, even though the camera is recognized, captured images are sometimes corrupted. In this case, a smaller Packet Size is recommended.

1) Camera settings:

In the JAI Control Tool select Category “Transport Layer Control” -> “Stream Channel Selector” -> “PacketSize” and set 1476 Bytes.

Stream Channel Selector	0
Stream Channel Port	0
Do Not Fragment	True
Packet Size	1476
Packet Delay*	0
Stream Channel Destination Address	0.0.0.0
Stream Channel Source Port	0

Fig. 7: Small PacketSize



Technical Note

How to use Packet Size and Packet Delay

3. Image Capturing at High Frame Rate using ROI:

In the case of capturing images at a high frame rate with a small image size (ROI), low Interrupt Moderation Rate is recommended.

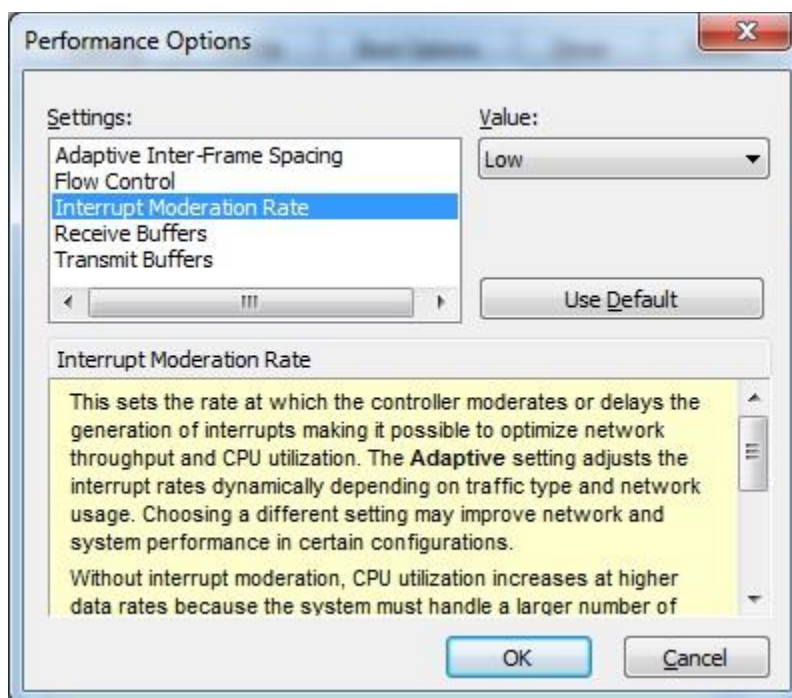


Fig. 8: Low Interrupt Moderation Rate

4. Reducing the NIC load when using a hub:

When connecting multiple cameras to one NIC port through the use of a hub, the load on the NIC will increase significantly. One method to reduce the load on the NIC is to decrease the frame rate or image size. However, even after decreasing the frame rate or image size, a large number of packets from multiple cameras may still be transferred to the hub simultaneously. If the amount of data momentarily exceeds the buffer size of the hub, data will be lost.

In this case, the "Packet Delay" function can be used. It adds a delay between each of the packets being sent from the camera. The spaces between packets can be used by other data being transferred from other cameras. The idea is to find a spacing that avoids collisions at the hub while still allowing the packets from each frame to be transmitted within the allotted frame period.

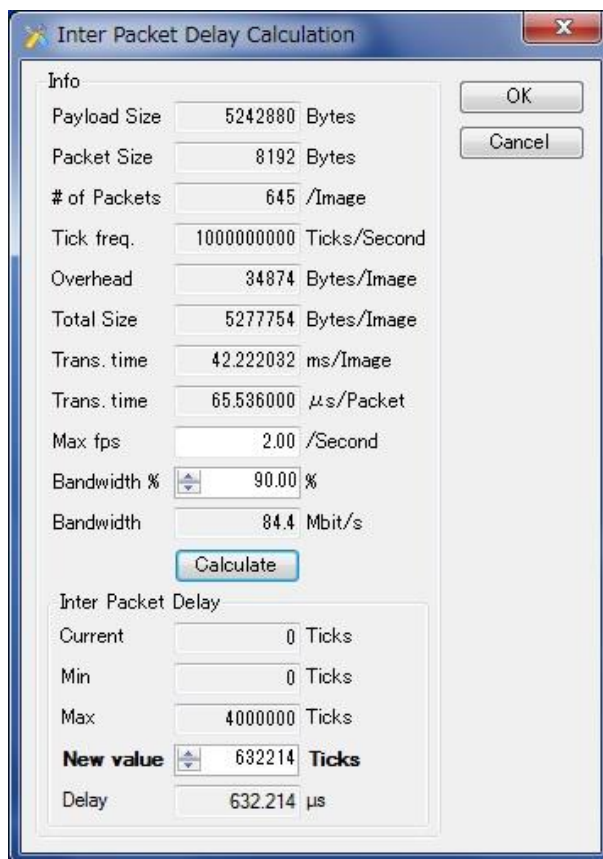
Technical Note

How to use Packet Size and Packet Delay

Stream Channel Selector	0	
Stream Channel Port	0	
Do Not Fragment	True	
Packet Size	8192	
Packet Delay*	0	
Stream Channel Destination Address	0.0.0.0	
Stream Channel Source Port	0	

Fig 9: Packet Delay

To calculate a proper Packet Delay value, the JAI SDK Control Tool supports a calculator. Click the “...” button next to “Packet Delay” (see above). The following calculator window appears.



The "Inter Packet Delay Calculation" window contains the following fields and buttons:

- Info section:**
 - Payload Size: 5242880 Bytes
 - Packet Size: 8192 Bytes
 - # of Packets: 645 /Image
 - Tick freq.: 1000000000 Ticks/Second
 - Overhead: 34874 Bytes/Image
 - Total Size: 5277754 Bytes/Image
 - Trans. time: 42.222032 ms/Image
 - Trans. time: 65.536000 μ s/Packet
 - Max fps: 2.00 /Second
 - Bandwidth %: 90.00 %
 - Bandwidth: 84.4 Mbit/s
 - Calculate** button
- Inter Packet Delay section:**
 - Current: 0 Ticks
 - Min: 0 Ticks
 - Max: 4000000 Ticks
 - New value:** 632214 Ticks
 - Delay: 632.214 μ s
- Buttons:** OK, Cancel

Fig. 10: Inter Packet Delay Calculation Tool

Input the frame rate of the camera in the “Max fps” box. In the “Bandwidth %” box, indicate the percentage of each frame period to use for sending packets (it is best to leave at least 10% available for packet resends). Click the “Calculate” button and a “Packet Delay” value is automatically calculated and shown in the “New value” field. Click the “OK” button to automatically apply the “Packet Delay” to the camera.

End.

