**CSCI 367 - Computer Networks I**

TCP/IP Sockets – TCP – Window Size Field

**Overview**

During the TCP connection establishment, three packets are sent and received:

1. The initial SYN packet sent from the client to the server.
2. The SYN/ACK packet sent from the server to the client.
3. The ACK packet sent from the client to the server.

During the connection establishment, a receive buffer size is advertised by both the client and server. The TCP Window field represents the receive buffer size. The receive buffer on the client and the server can be different sizes.

TCP stream data is partitioned into segments to allow the segments to fit into the Ethernet frame payload, which is based on the Ethernet MTU. As these TCP data segments are received by either the client or the server, an ACK packet is sent back to signify receipt of the data packet. The window size is included in the ACK packet. As the receiving host’s buffer is being filled, the ACK packet sent back by the receiving host may contain a window size that is less than the original window size. This notifies the sender that it may have to throttle back the rate of packet transmissions. The decrease in the receiver’s window size usually due to the application layer not being able to process the incoming data fast enough.

**Window Scaling**

To use window scaling, both sides of the connection must advertise this capability in the handshake process. If one side or the other cannot support scaling, then neither will use this function. The scale factor, or multiplier, will only be sent in the SYN packets during the handshake and will be used for the life of the connection. This is one reason why it is so important to capture the handshake process when performing TCP analysis.

**References**

https://accedian.com/blog/tcp-receive-window-everything-need-know/

https://networklessons.com/cisco/ccie-routing-switching-written/tcp-window-size-scaling

https://www.networkcomputing.com/data-centers/network-analysis-tcp-window-size

<https://learn.microsoft.com/en-us/troubleshoot/windows-server/networking/description-tcp-features>

https://en.wikipedia.org/wiki/TCP\_window\_scale\_option

**Packet Captures**: TCP\_Window\_Size\_01.pcapng, TCP\_Window\_Size\_02.pcapng

**Source Code Listing:** 10\_TCP\_Window\_Size

**Compilation:** gcc -g -I../../Libraries -o Program \*.c ../../Libraries/Utilities.c

Client TCP Connection Establishment ACK

Client Windows Size: 65536 = Windows Size Value X Window Size Scaling Factor = 512 X 128

Graphical user interface, text, application, email

Description automatically generated

TCP Zero Window Packet

Client Windows Size: 0

Client ACK NUMBER: 1698817

Graphical user interface, text, application, email

Description automatically generated

TCP Window Update Packet

Client Windows Size: 0

Client Windows Size: 48512 = Windows Size Value X Window Size Scaling Factor = 379 X 128

Client ACK NUMBER: 1698817 (Same ACK NUMBER value as in the previous packet)

Graphical user interface, text, application, email

Description automatically generated