Visualize application traffic using Wireshark

SharkFest'23 ASIA
Singapore · Apr 17-19

#sf23asia

Extend your Wireshark expression with the intelligent use of the Graph function.

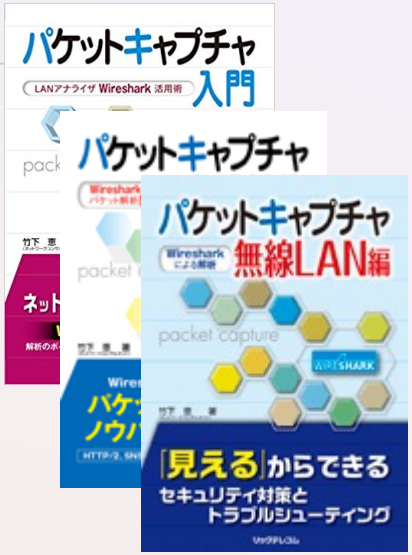
Materials: all trace files and profiles are here
https://www.ikeriri.ne.jp/sharkfest/VisualizeApplicationTraffic.zip

02 12:15-13:30 SGT

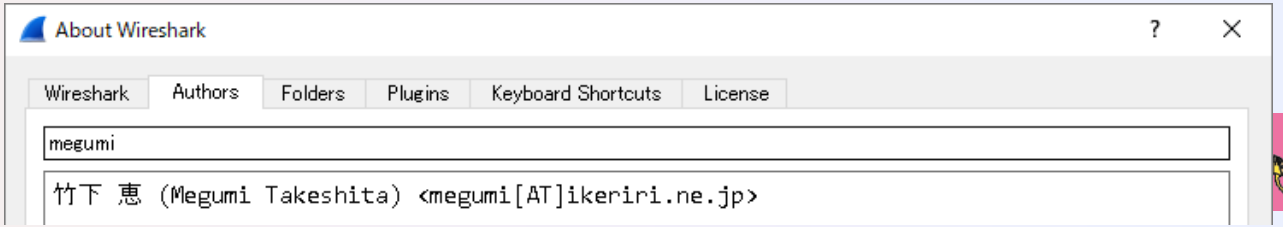
on 17th April 2023

Megumi Takeshita
Ikeriri network service

Megumi Takeshita, packet otaku



- Founder, ikeriri network service co., ltd
- Reseller of CACE technologies in 2008
- Worked SE/IS at BayNetwork, Nortel
- Wrote 10+ books about Wireshark
- Instruct Wireshark to JSDF and other company
- lecturer of CHUO university
- Reseller of packet capture / wireless-tools
- One of the contributors of Wireshark
  Translate Wireshark into Japanese



Session Details

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We know Wireshark is good at trace file investigation with 3000 over protocol dissectors, but it is also an excellent tool for vizualizing traffic with a series of Graph functions. Megumi shows you TIPS and Tricks to use Wireshark as a graphical chart creation tool. Colourful charts tell you the traffic flow situation quickly, and those who are not users of Wireshark will also be satisfied.

Materials

all trace files and Wireshark profiles are here

https://www.ikeriri.ne.jp/sharkfest/VisualizeApplicationTraffic.zip

Visualize Application Traffic

- Wireshark has over 3k protocols that include many applications from HTTP to Gaming.
- We can utilize over 285k fields for visualizing application traffic.
- A most easy and common ways for visualization is the I/O graph with adequate display filter.
- Download materials and copy profile settings https://www.ikeriri.ne.jp/sharkfest/VisualizeApplicationTraffic.zip

Copy Wireshark settings

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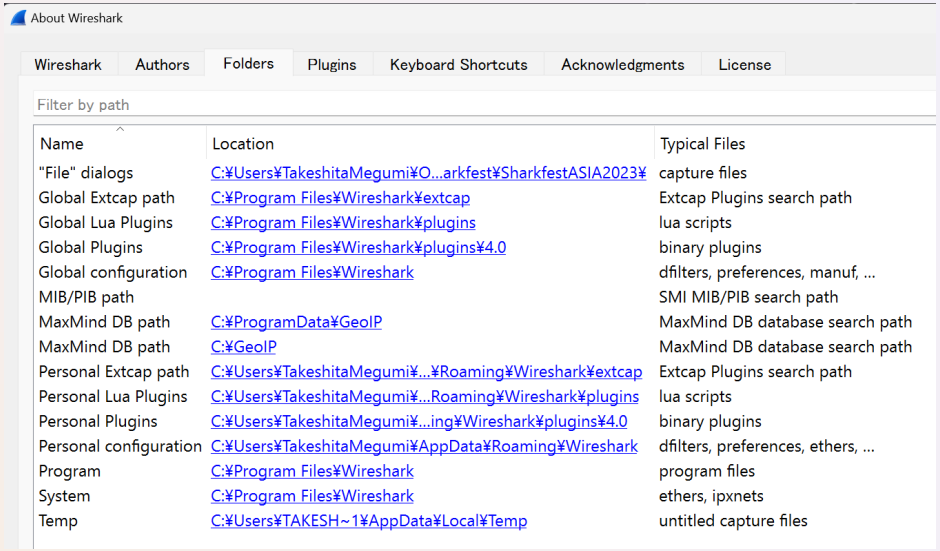
- Open Wireshark, Help>About Wireshark and choose the Folders tab to find personal configuration
- "tshark -G folders" also works in CLI

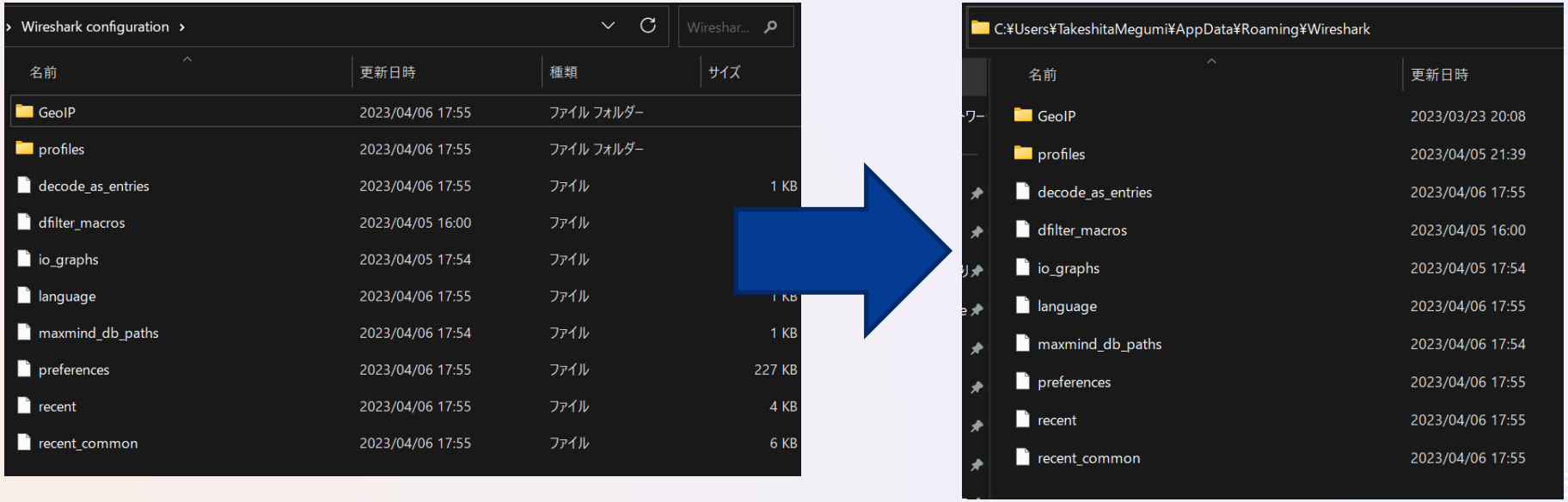


Name	Location	Typical Files
"File" dialogs	C:¥Users¥TakeshitaMegumi¥O...arkfest¥SharkfestASIA2023¥	capture files
Global Extcap path	C:¥Program Files¥Wireshark¥extcap	Extcap Plugins search path
Global Lua Plugins	C:¥Program Files¥Wireshark¥plugins	lua scripts
Global Plugins	C:¥Program Files¥Wireshark¥plugins¥4.0	binary plugins
Global configuration	C:¥Program Files¥Wireshark	dfilters, preferences, manuf, ...
MIB/PIB path		SMI MIB/PIB search path
MaxMind DB path	C:¥ProgramData¥GeoIP	MaxMind DB database search path
MaxMind DB path	C:¥GeoIP	MaxMind DB database search path
Personal Extcap path	C:¥Users¥TakeshitaMegumi¥...¥Roaming¥Wireshark¥extcap	Extcap Plugins search path
Personal Lua Plugins	C:¥Users¥TakeshitaMegumi¥...Roaming¥Wireshark¥plugins	lua scripts
Personal Plugins	C:¥Users¥TakeshitaMegumi¥...ing¥Wireshark¥plugins¥4.0	binary plugins
Personal configuration	C:¥Users¥TakeshitaMegumi¥AppData¥Roaming¥Wireshark	dfilters, preferences, ethers, ...
Program	C:¥Program Files¥Wireshark	program files
System	C:¥Program Files¥Wireshark	ethers, ipxnets
Temp	C:¥Users¥TAKESH~1¥AppData¥Local¥Temp	untitled capture files

```
C:\Users\TakeshitaMegumi>tshark -G folders
Temp:                     C:\Users\TAKESH~1\AppData\Local\Temp
Personal configuration:   C:\Users\TakeshitaMegumi\AppData\Roaming\Wireshark
Global configuration:     C:\Program Files\Wireshark
System:                   C:\Program Files\Wireshark
Program:                  C:\Program Files\Wireshark
Personal Plugins:         C:\Users\TakeshitaMegumi\AppData\Roaming\Wireshark\plugins\4.0
Global Plugins:           C:\Program Files\Wireshark\plugins\4.0
Personal Lua Plugins:     C:\Users\TakeshitaMegumi\AppData\Roaming\Wireshark\plugins
Global Lua Plugins:       C:\Program Files\Wireshark\plugins
Extcap path:              C:\Program Files\Wireshark\extcap
MaxMind database path:    C:\ProgramData\GeoIP
MaxMind database path:    C:\GeoIP
```

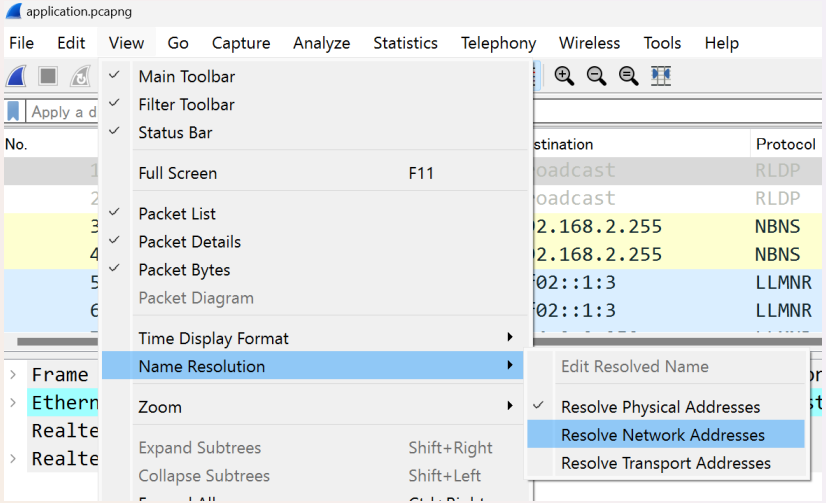
Personal Configuration

- Unzip and copy Wireshark configuration contents to our personal configuration folder
- There are Default and TCP/UDP application profiles



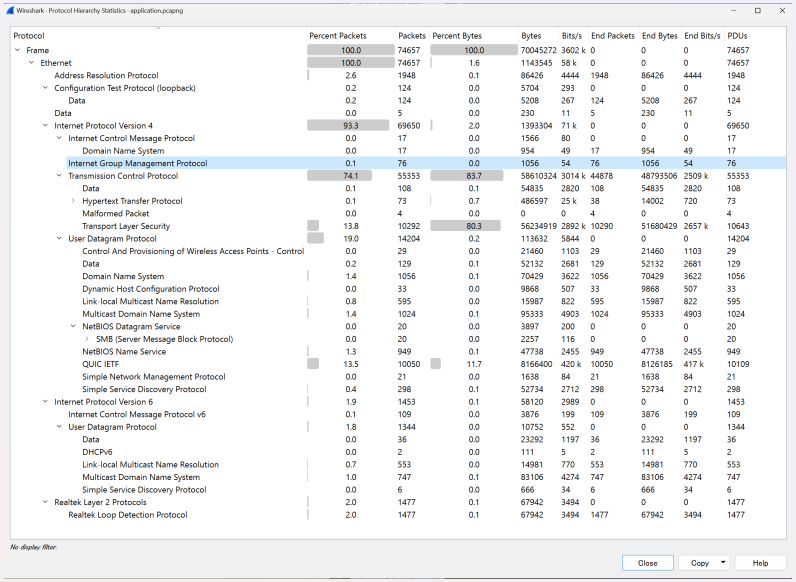
Unzip trace files

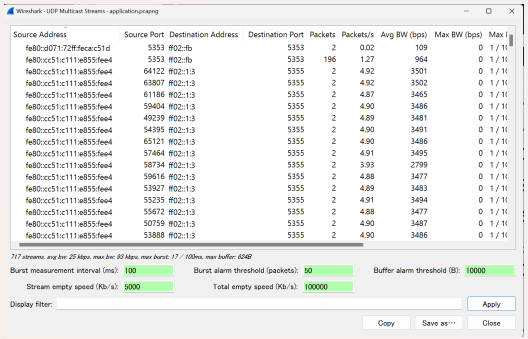
- Unzip tracefile.zip, there are three trace files,
  application.pcapng (TCP/UDP applications)
  application2.pcapng (HTTP/echo test traffic)
  application3.pcapng (Youtube and Zoom traffic)



- open application.pcapng,
  View>Name Resolution
  >Resolve Network Address

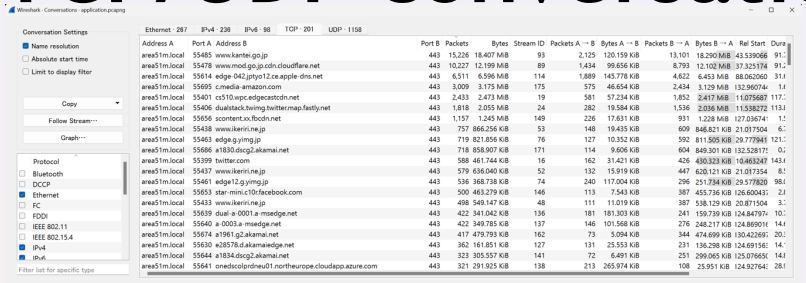
Protocol Hierarchy Statistics and Multicast

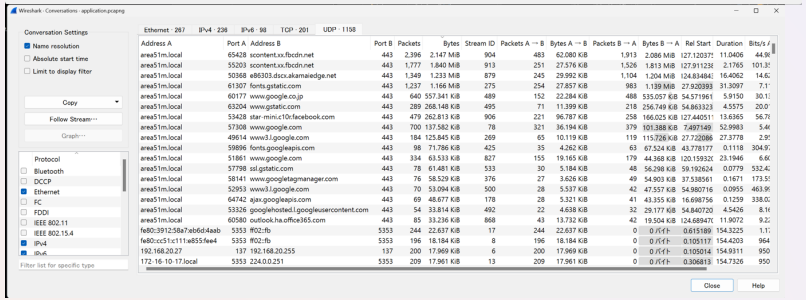




- Statistics>Protocol Hierarchy Statistics and check the application protocols
- 93% is IPv4, IPv6 is few.
- There are TCP protocols, HTTP, TLS and others. Little UDP protocols, DNS, DHCP, SMB, QUIC and others
- Statistics>UDP Multicast Streams to check multicast

TCP/UDP conversation



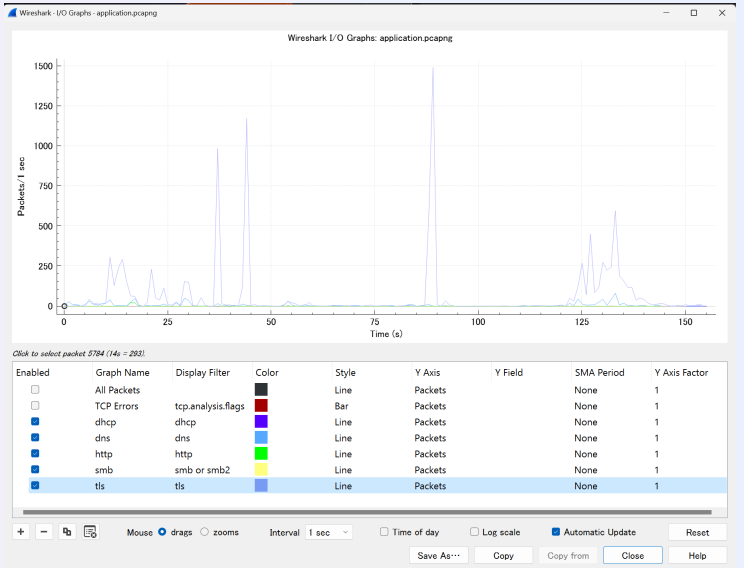


- Statistics>Conversations to find TCP/UDP streams
- Sort by Bytes descending, Check Name resolution, make a Top list of TCP/UDP streams to understand the significant traffic

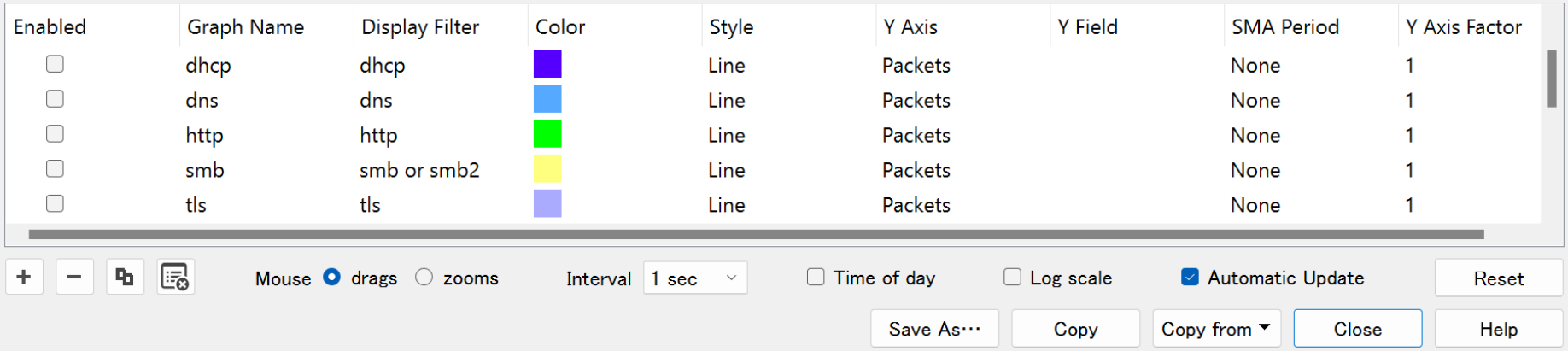
- UDP Traffic Top3
  - 2.1MB of QUIC(fbcdn.net)
  - 1.8MB of QUIC(fbcdn.net)
  - 1.2MB of QUIC(akamai)
- TCP traffic Top3
  - 18MB of tls(kantei.go.jp)
  - 12MB of tls(mod.go.jp)
  - 6.5MB of tls(apple-dns.net)

Basic Graph by application protocols

- The primary way to visualize the application traffic is using I/O Graph by types of application protocols
- Statistics>I/O Graph and check items on dhcp, dns, http, smb, tls
- The graph tells us each packet by application protocols with interval 1 second
- We can change Y axis from Packets to Bits to find bitrates.



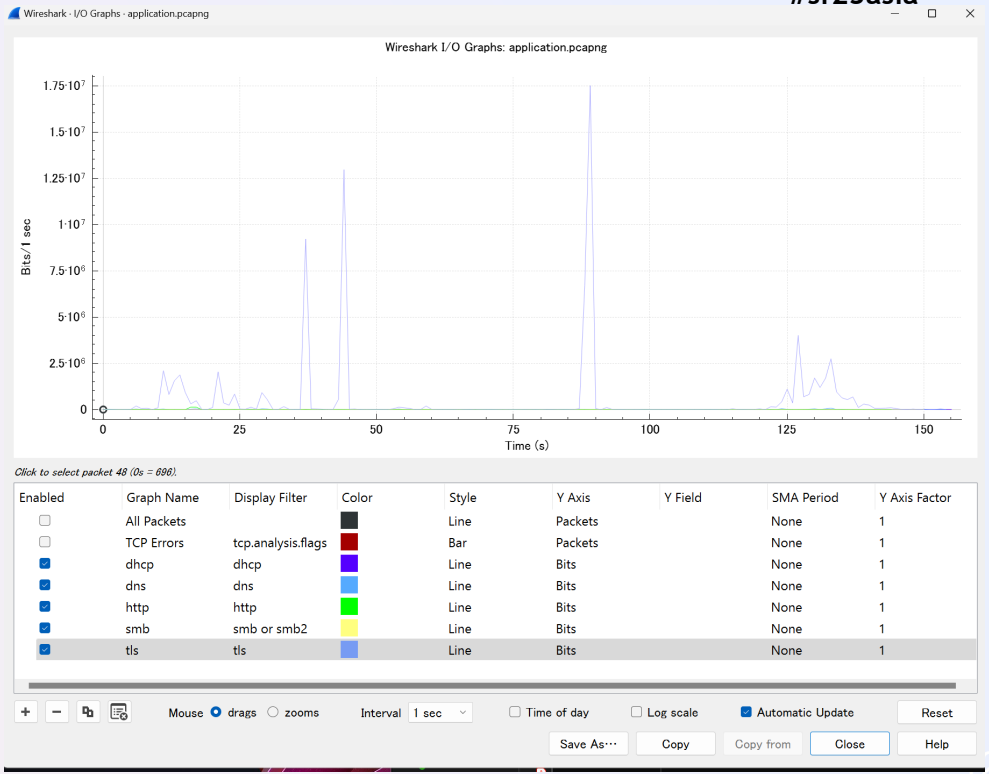
Let’s start with Visualization



- Let’s start Visualization, create an application traffic bandwidth graph. Select Statistics>I/O Graph
- add items those Graph Name as dhcp, dns, http, smb, tls, and each Display filter is the same, set Style as Line, set Y Axis as Bits, set interval as 1 sec

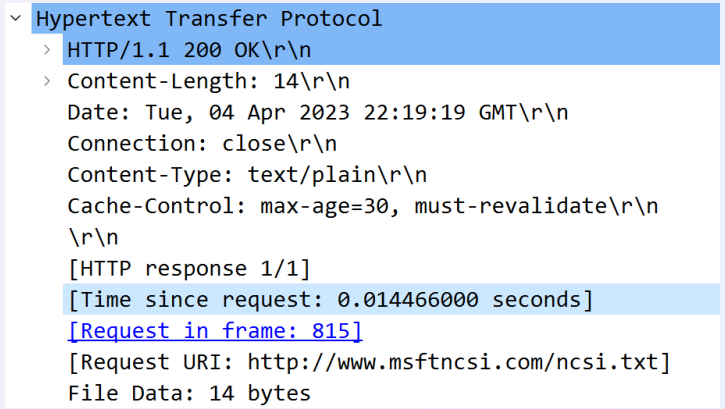
Application traffic bandwidth

- Change Y axis from Packts to Bit, and check Interval is 1 sec
- We can check bitrates by each application
  10^6 says Mbps
  10^9 says Gbps

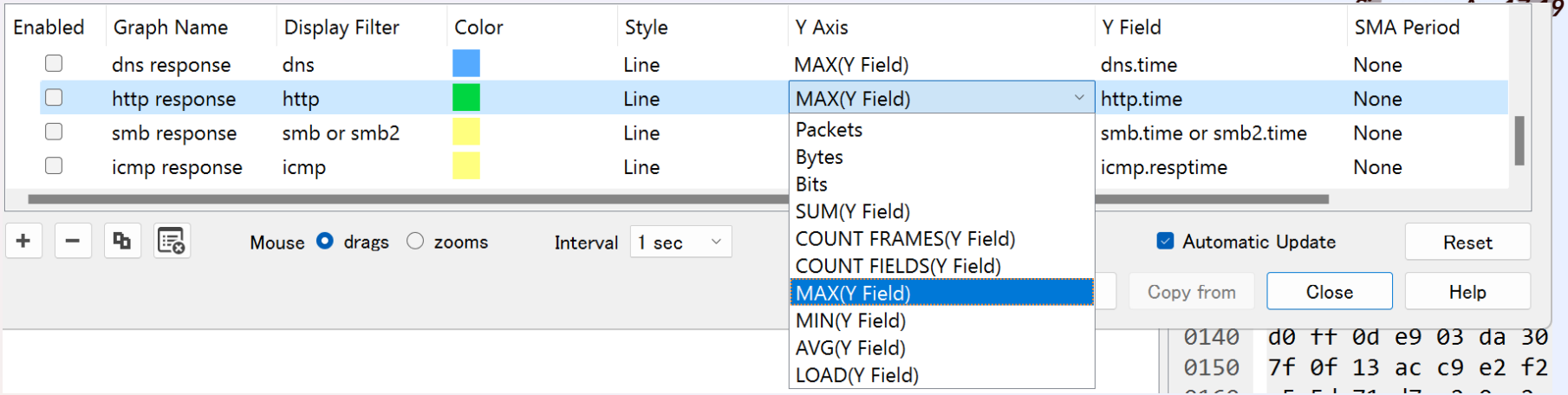


Response time by Application

- Some application dissector has the Wireshark Generated time fields[] that tell us response time.
- http.time field in the http response packet means the time between HTTP request and response.
- dns.time tell us the DNS response time and icmp.resptime and smb.time or smb2.time is also contains response time



Worst time within 1 seconds



- Statistics>I/O Graph and check off all enabled select dns/http/smb/icmp response items enter Y fields as dns.time/http.time/smb.time or smb2.time/icmp.resptime and choose MAX (Y Field) in Y Axis listbox and enable these items.

Application/Service by specified IPv4/IPv6 address range

- Nowadays, most Internet application traffic use TLS and some Google service use QUIC.
- It is difficult to determine each application by protocol filter without keys or proxy server.
  How about IPv4/IPv6 address?
- For example, Microsoft disclose Office 365 URLs and IP address ranges at the support site
  https://learn.microsoft.com/en-us/microsoft-365/enterprise/urls-and-ip-address-ranges?view=o365-worldwide

IPv4/IPv6 address range of Office365 / Exchange endpoints

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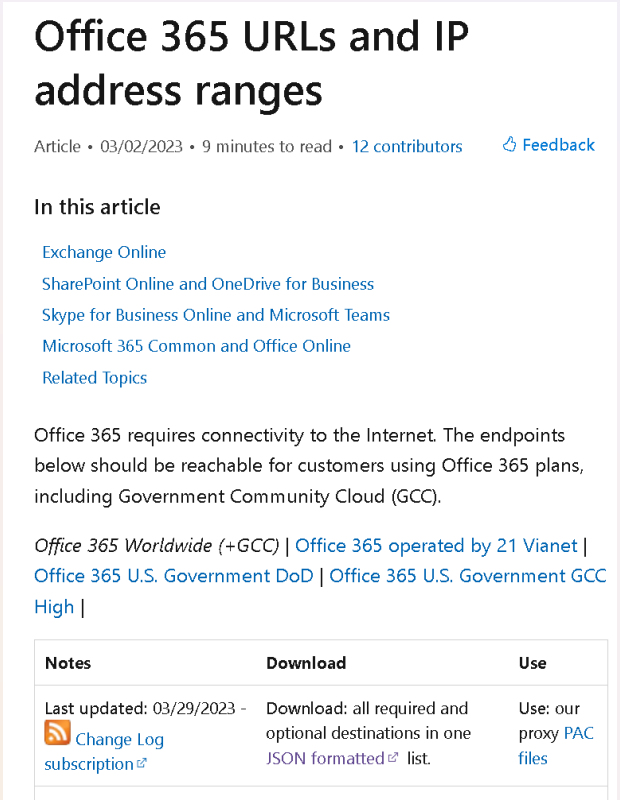


Office 365 URLs and IP address ranges

Article • 03/02/2023 • 9 minutes to read • 12 contributors Feedback

In this article

Exchange Online
SharePoint Online and OneDrive for Business
Skype for Business Online and Microsoft Teams
Microsoft 365 Common and Office Online
Related Topics

Office 365 requires connectivity to the Internet. The endpoints below should be reachable for customers using Office 365 plans, including Government Community Cloud (GCC).

Office 365 Worldwide (+GCC) | Office 365 operated by 21 Vianet | Office 365 U.S. Government DoD | Office 365 U.S. Government GCC High |

Notes	Download	Use
Last updated: 03/29/2023 - Change Log subscription	Download: all required and optional destinations in one JSON formatted list.	Use: our proxy PAC files

- Download JSON formatted list and convert it into Wireshark display filter style
- Wireshark can use network addresses with / mask length like ip.addr==13.107.6.152/31, ipv6.addr==2603:1006::/40

```
[
  {
    "id": 1,
    "serviceArea": "Exchange",
    "serviceAreaDisplayName": "Exchange Online",
    "urls": [
      "outlook.office.com",
      "outlook.office365.com"
    ],
    "ips": [
      "13.107.6.152/31",
      "13.107.18.10/31",
      "13.107.128.0/22",
      "23.103.160.0/20",
      "40.96.0.0/13",
      "40.104.0.0/15",
      "52.96.0.0/14",
      "131.253.33.215/32",
      "132.245.0.0/16",
      "150.171.32.0/22",
      "204.79.197.215/32",
      "2603:1006::/40",
      "2603:1016::/36",
      "2603:1026::/36",
      "2603:1036::/36",
      "2603:1046::/36",
      "2603:1056::/36",
      "2620:1ec:4::152/128",
      "2620:1ec:4::153/128",
      "2620:1ec:c::10/128",
      "2620:1ec:c::11/128",
      "2620:1ec:d::10/128",
      "2620:1ec:d::11/128",
      "2620:1ec:8f0::/46",
      "2620:1ec:900::/46",
      "2620:1ec:a92::152/128",
      "2620:1ec:a92::153/128"
    ],
    "tcpPorts": "80,443",
    "udpPorts": "443",
    "expressRoute": true,
    "category": "Optimize",
    "required": true
  },
```

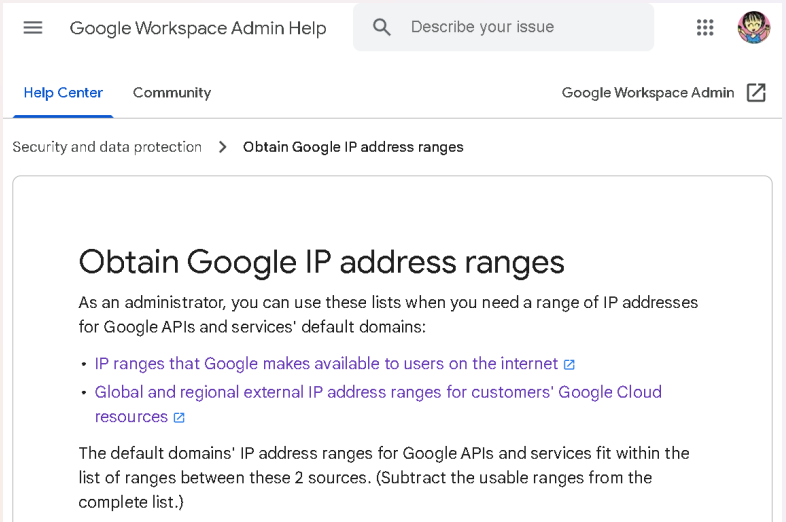

Convert JSON IP range into Display filter strings

- Add ip.addr== or ipv6.addr== strings

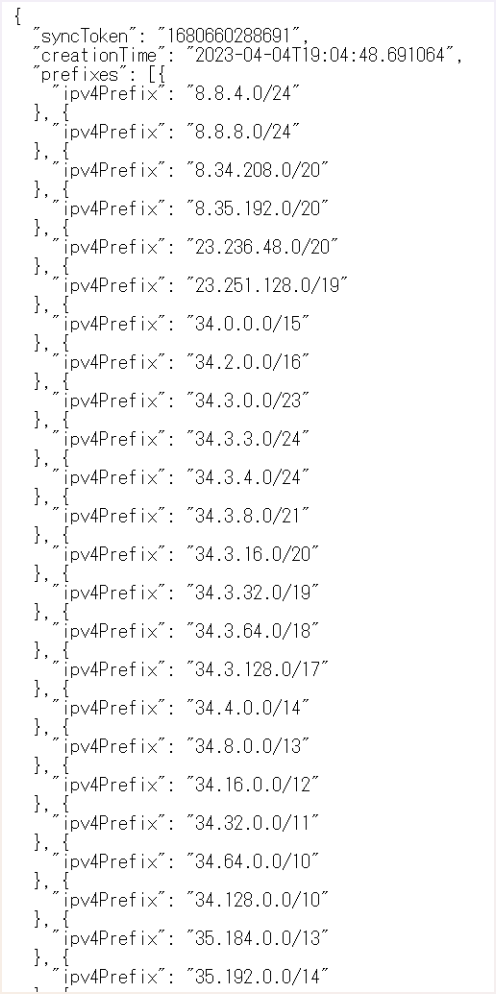
ip.addr==13.107.6.152/31 or ip.addr==13.107.18.10/31 or
ip.addr==13.107.128.0/22 or ip.addr==23.103.160.0/20 or
ip.addr==40.96.0.0/13 or ip.addr==40.104.0.0/15 or
ip.addr==52.96.0.0/14 or ip.addr==131.253.33.215/32 or
ip.addr==132.245.0.0/16 or ip.addr==150.171.32.0/22 or
ip.addr==204.79.197.215/32 or ipv6.addr==2603:1006::/40 or
ipv6.addr==2603:1016::/36 or ipv6.addr==2603:1026::/36 or
ipv6.addr==2603:1036::/36 or ipv6.addr==2603:1046::/36 or
ipv6.addr==2603:1056::/36 or ipv6.addr==2620:1ec:4::152/128 or
ipv6.addr==2620:1ec:4::153/128 or ipv6.addr==2620:1ec:c::10/128 or
ipv6.addr==2620:1ec:c::11/128 or ipv6.addr==2620:1ec:d::10/128 or
ipv6.addr==2620:1ec:d::11/128 or ipv6.addr==2620:1ec:8f0::/46 or
ipv6.addr==2620:1ec:900::/46 or ipv6.addr==2620:1ec:a92::152/128 or
ipv6.addr==2620:1ec:a92::153/128

Google services and customer's Google Cloud IPv4/IPv6 range

- Google also disclose the IP address range of Google service and end-user's Google Cloud https://support.google.com/a/answer/10026322?hl=en



- Download the latest JSON lists and convert them into Wireshark Display Filter string styles https://www.gstatic.com/ipranges/goog.json

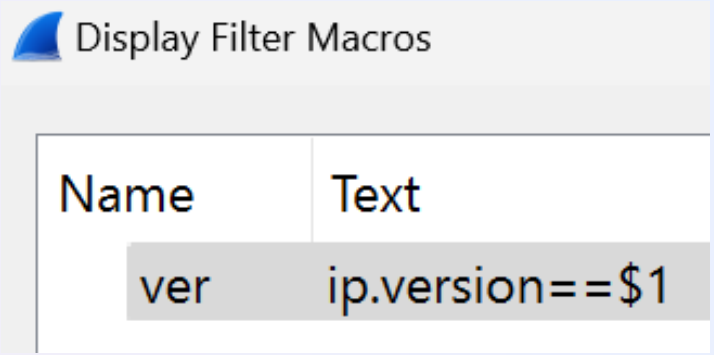


- Add ip.addr== or ipv6.addr== strings

ip.addr==108.170.192.0/18 or ip.addr==108.177.0.0/17 or
ip.addr==130.211.0.0/16 or ip.addr==136.112.0.0/12 or
ip.addr==142.250.0.0/15 or ip.addr==146.148.0.0/17 or
ip.addr==162.216.148.0/22 or ip.addr==162.222.176.0/21 or
ip.addr==172.110.32.0/21 or ip.addr==172.217.0.0/16 or
ip.addr==172.253.0.0/16 or ip.addr==173.194.0.0/16 or
ip.addr==173.255.112.0/20 or ip.addr==192.158.28.0/22 or
ip.addr==192.178.0.0/15 or ip.addr==193.186.4.0/24 or
ip.addr==199.36.154.0/23 or ip.addr==199.36.156.0/24 or
ip.addr==199.192.112.0/22 or ip.addr==199.223.232.0/21 or
ip.addr==207.223.160.0/20 or ip.addr==208.65.152.0/22 or
ip.addr==208.68.108.0/22 or ip.addr==208.81.188.0/22 or
ip.addr==208.117.224.0/19 or ip.addr==209.85.128.0/17 or
ip.addr==216.58.192.0/19 or ip.addr==216.73.80.0/20 or
ip.addr==216.239.32.0/19 or ipv6.addr==2001:4860::/32 or
ipv6.addr==2404:6800::/32 or ipv6.addr==2404:f340::/32 or
ipv6.addr==2600:1900::/28 or ipv6.addr==2606:73c0::/32 or
ipv6.addr==2607:f8b0::/32 or ipv6.addr==2620:11a:a000::/40 or
ipv6.addr==2620:120:e000::/40 or ipv6.addr==2800:3f0::/32 or
ipv6.addr==2a00:1450::/32 or ipv6.addr==2c0f:fb50::/32

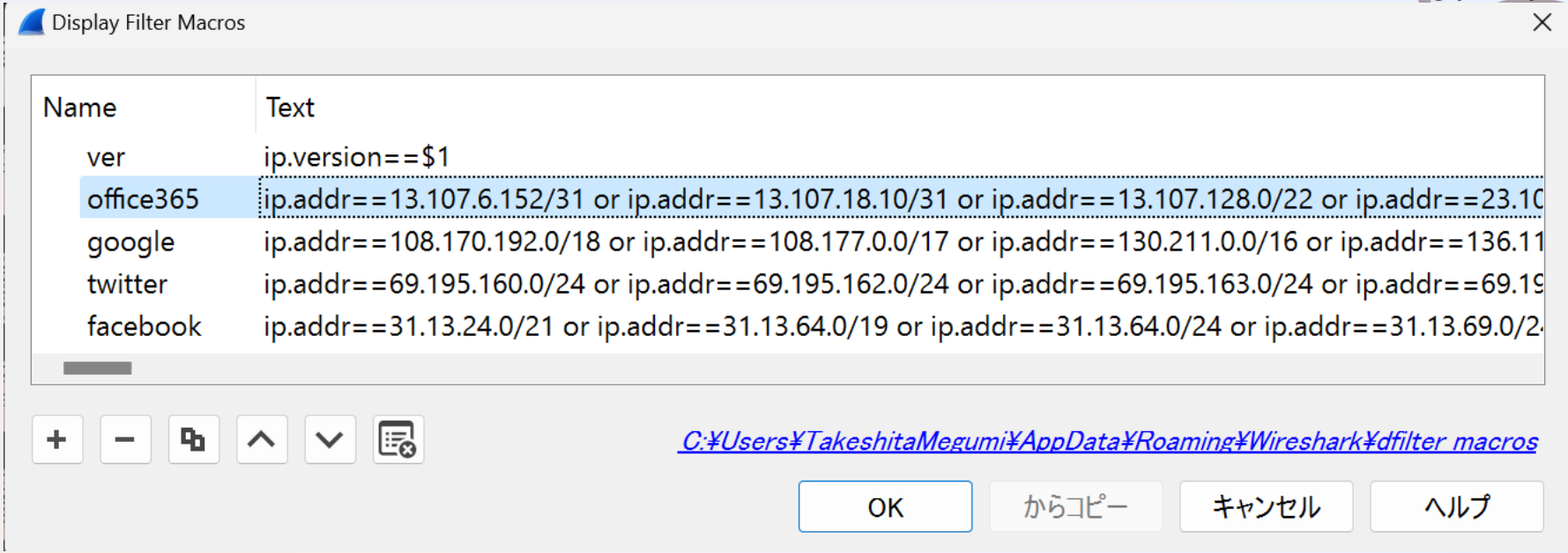
Create a Display Filter macro. without any parameters

- As usual, we declare Display Filter macro with some parameters using $1, $2, …
  For example, the Name is "ver'
  The text is "ip.version==$1"
  type ${ver:4} in Display filter



- We can also make a Display filter macro without any parameters, define long display filter strings for the use of some alias

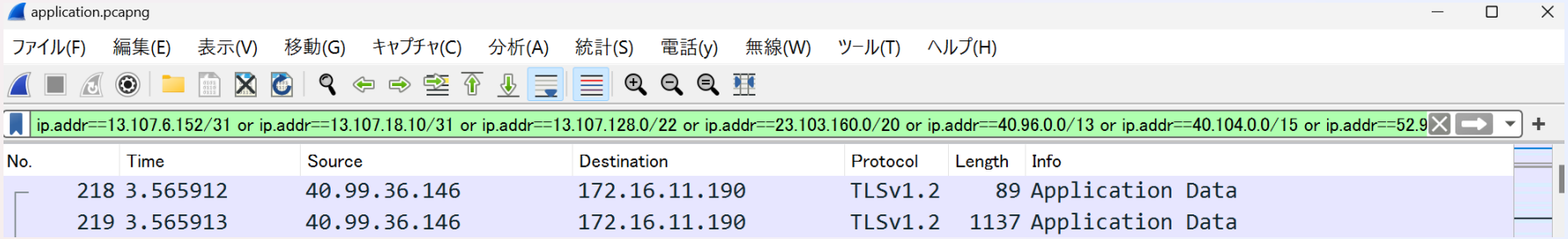
Create each Display filter macro



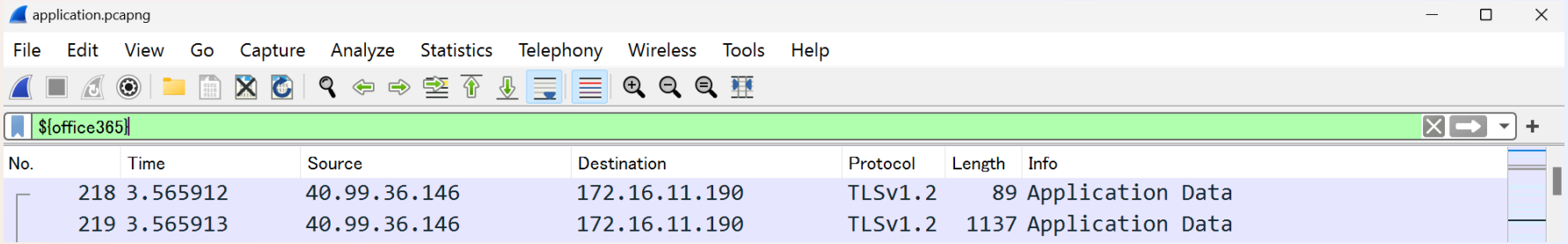
- Create new Display filter macros without parameters
- Set IP address range for each application/service
- We set office365, google, facebook, and twitter

Use display filter macro in Wireshark

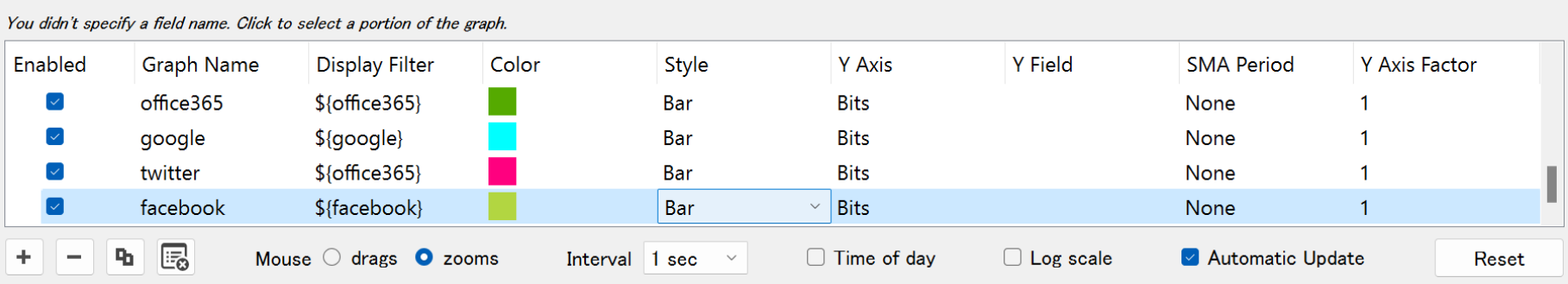
- Back to Wireshark, we use a long display filter to pick up office365 ip address range, like below



- Just type ${office365} in the display filter, it works!!

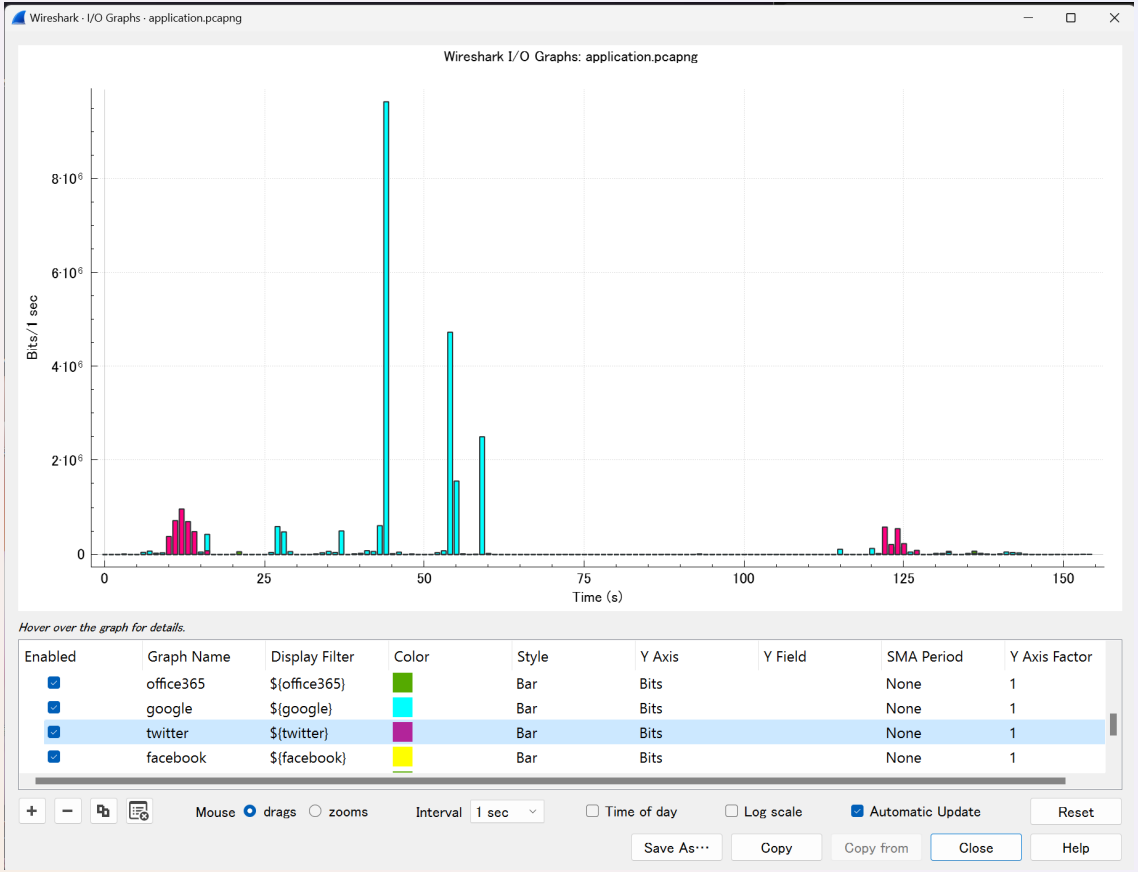


Create application bandwidth graph



- Statistics>I/O Graph and check off all enabled
- Create items office365, google, twitter, facebook these filter is ${office365}, ${google}, ${twitter}, ${facebook} and sets Style as Bar, Y axis as Bit and set interval as 1 sec. Then enable these items

Visualize application by colour

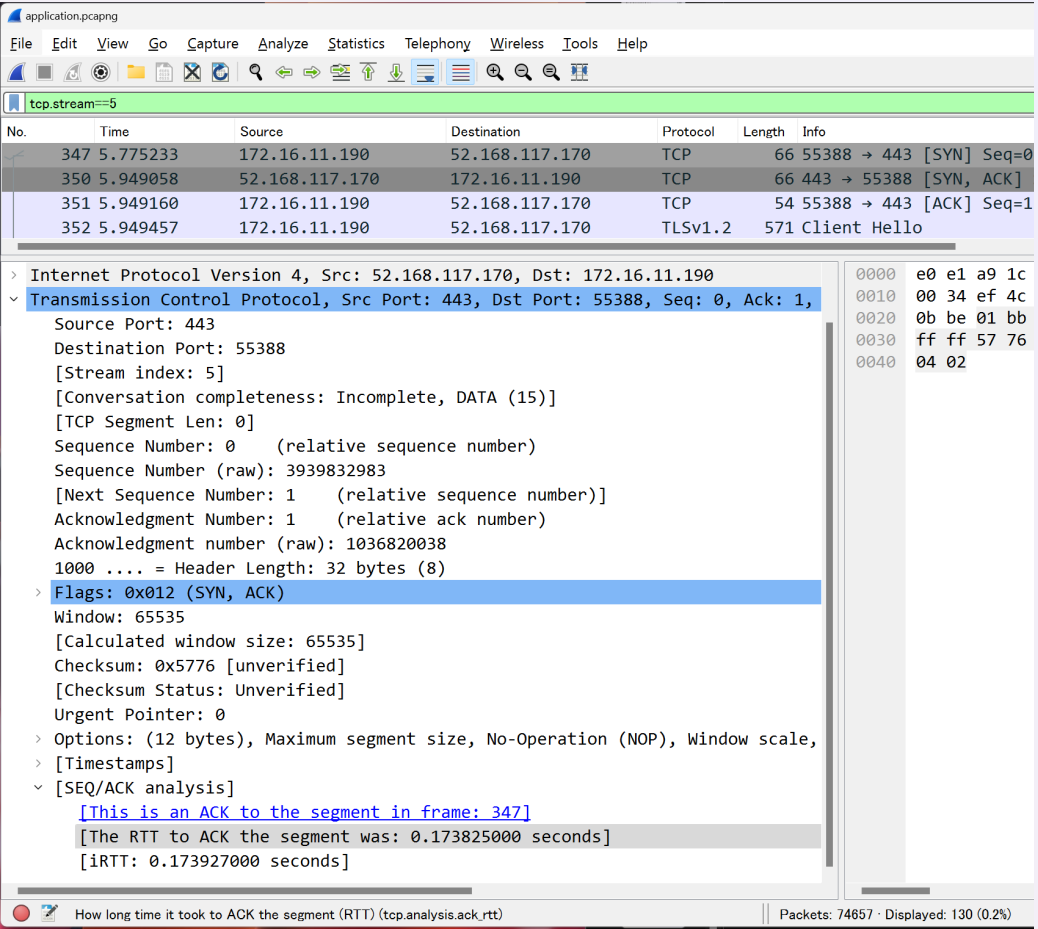


- We can Visualize each application traffic by colour
- Google is the most used in this trace, and the max bandwidth is about 10Mbps

Response time of each application

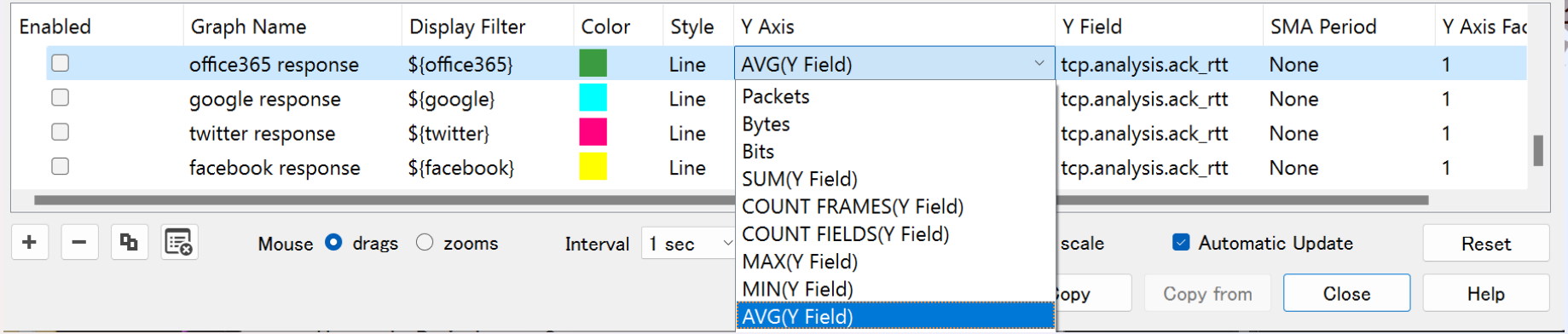
- How about the response time of each service?
  It is impossible to decrypt each TLS connection,
  (except you have a proxy server or server's key)
- So we try to use lower layer header information,
  TCP fields of each connection instead of upper layer.
- Let's check TCP connection, back to Wireshark,
  tcp.stream==5 to filter some TCP connections,
  then look for a syn-ack packet of #350 frame.

How long time it took to ACK the segment



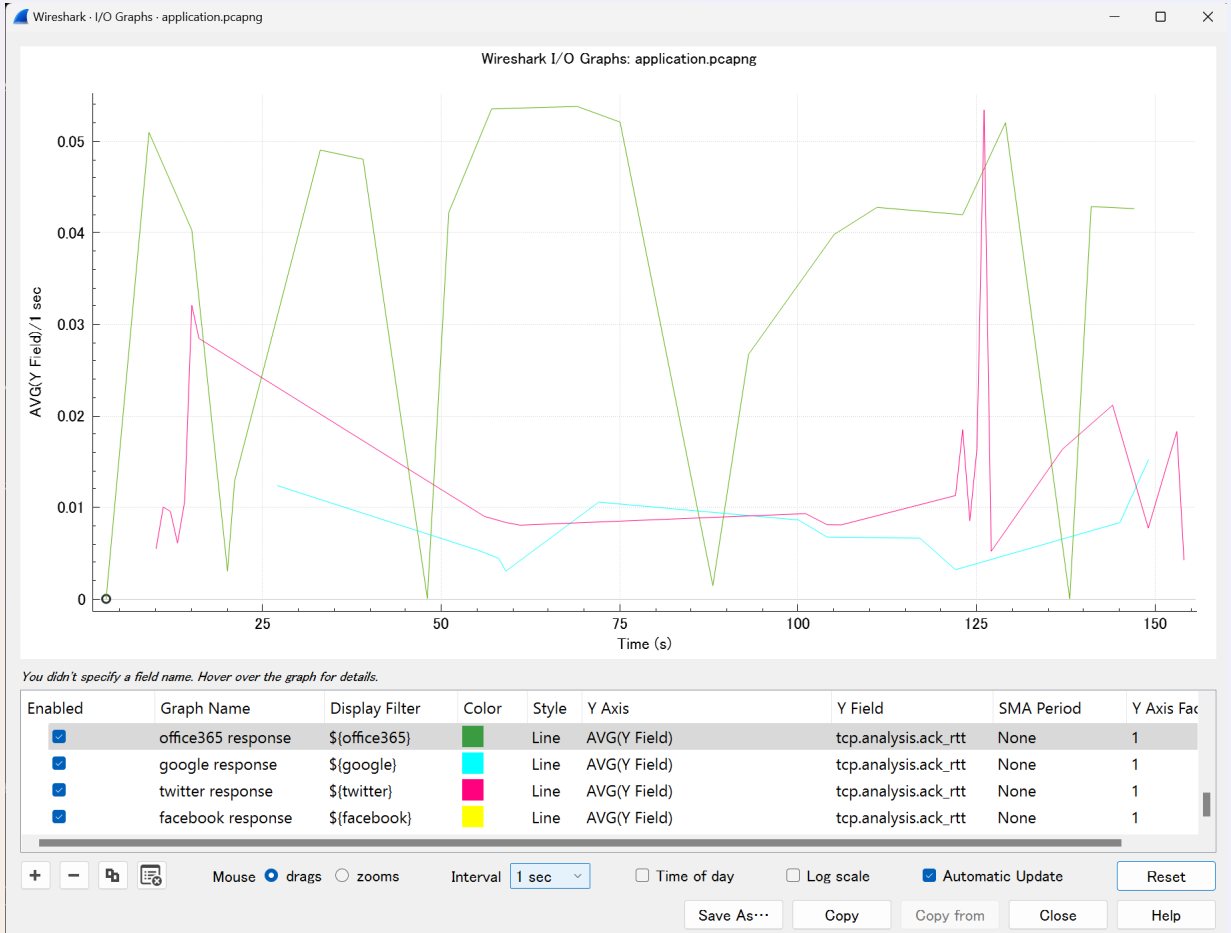
- Wireshark collects each TCP round trip time to measure how long time it took to ACK the segment tcp.analysis.ack_rtt
- We can use an average time of 1 second to Visualize the application response.

The alternative of application response time



- Statistics>I/O Graph and check off all enabled
- Create items office365 response, google response, twitter response, facebook response these filter is ${office365}, ${google}, ${twitter}, ${facebook} and sets Style as Line, Y axis as AVG(Y Field) and set Y Field as tcp.analysis.ack_rtt

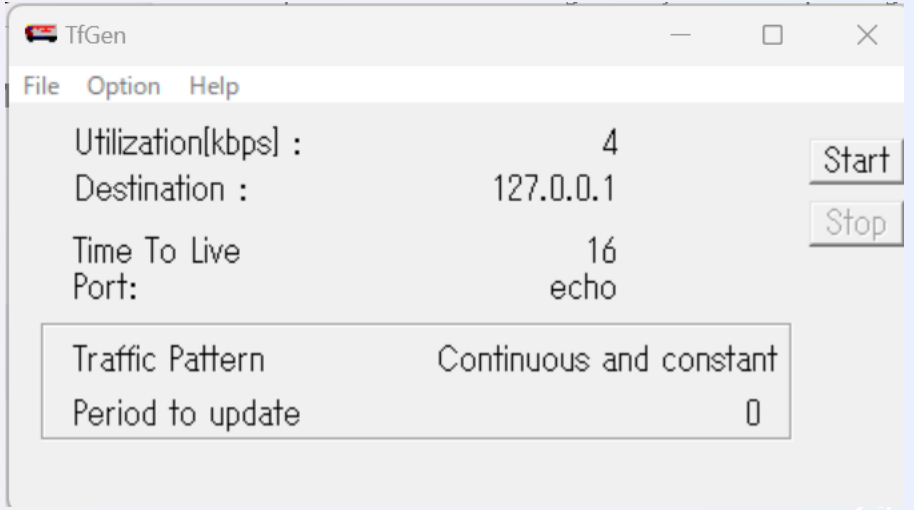
Check App's Response by TCP RTT



- Check each service response
- 1st Google
  2nd Twitter
  3rd Office365

Characteristics of UDP Application

- Open another trace file, application2.pcapng
- This trace contains TfGen, traffic generator packets, UDP echo (port 7) protocol as well as HTTP traffic.
- Change configuration profiles from default to UDP application
- Check the characteristics of UDP application.



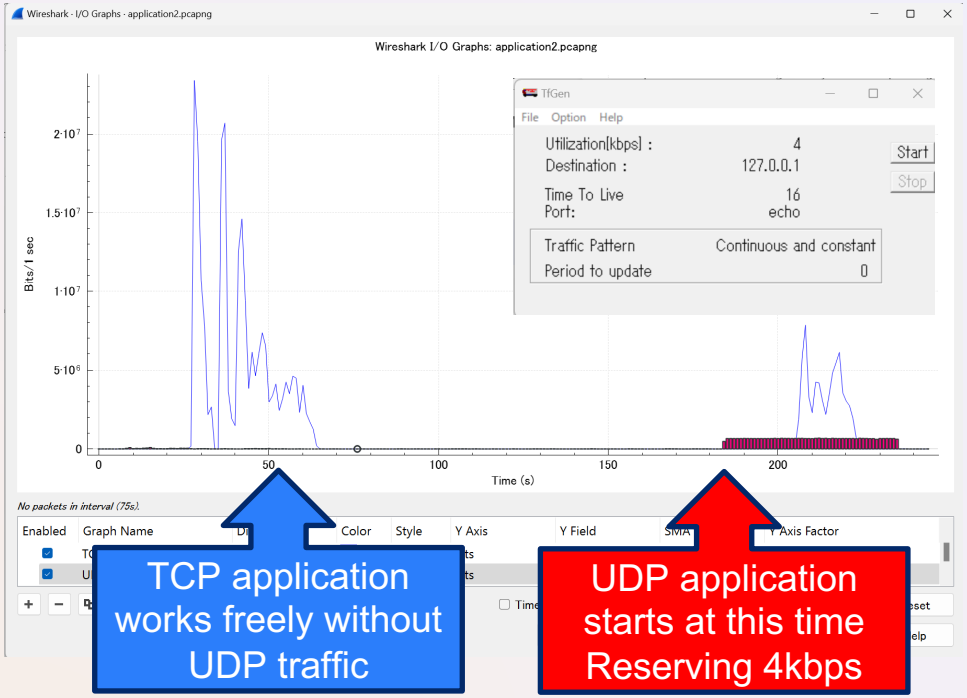
UDP Application bandwidth graph

- Select Statistics>I/O graph and add an item as TCP application that display filter is “tcp”, set Style as Line, set Y Axis as Bits and add an item as UDP application that display filter is “udp”, set Style as Bar, Y Axis as Bits, then check enabled

Enabled	Graph Name	Display Filter	Color	Style	Y Axis	Y Field	SMA Period	Y Axis Factor
☑	TCP application	tcp		Line	Bits		None	1
☑	UDP application	udp		Bar	Bits		None	1

- This easy graph shows us the characteristics between TCP and UDP

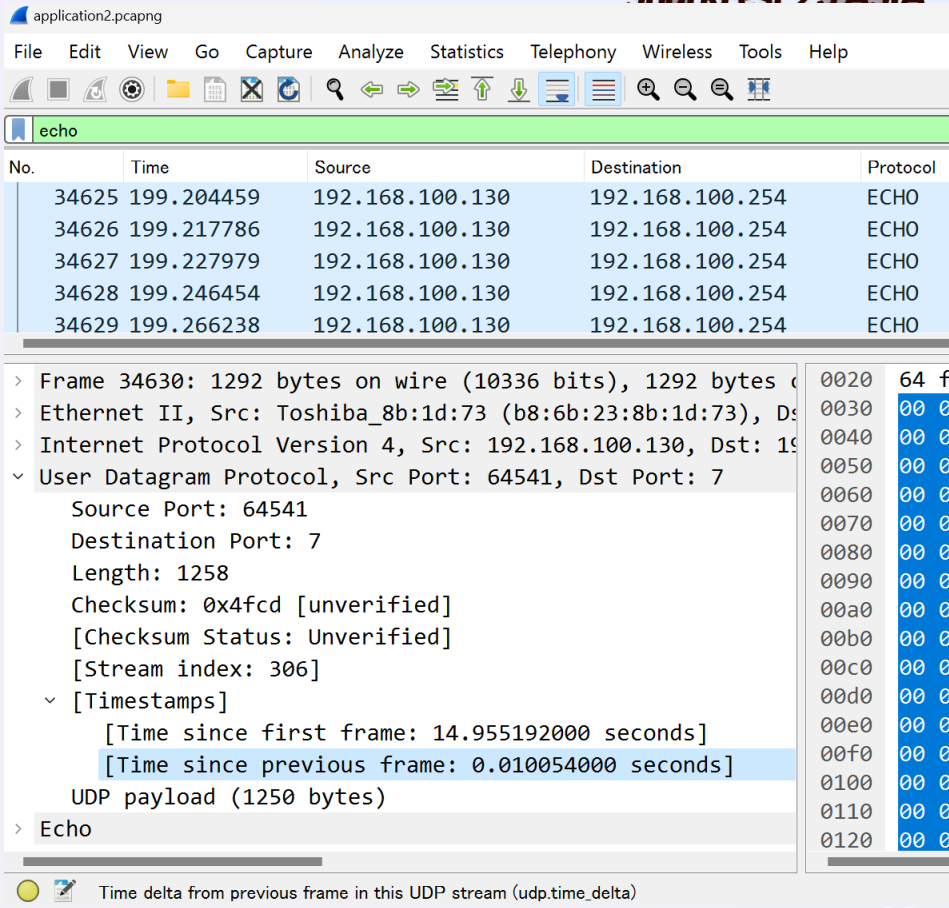
UDP uses fixed bandwidth prior to TCP at first then TCP bandwidth changes dynamically



- TCP application (http) works freely without UDP traffic at first (change output segment size, receive window size by round trip time)
- UDP application (echo) reserve fixed bandwidth 4kbps prior to TCP app.

Check UDP application (echo) frame rate

- Set the display filter as echo and check each packet.
- Check UDP application frame rate by Time delta from previous fame in this UDP stream (udp.time_delta)
- Also compare TCP RTT with UDP frame timing



TCP RTT vs UDP frame timing

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Enabled	Graph Name	Display Filter	Color	Style	Y Axis	Y Field	SMA Period	Y Axis Factor
☑	TCP RTT (http)	tcp.port==80		Line	AVG(Y Field)	tcp.analysis.ack_rtt	None	1
☑	UDP frame timing (echo)	udp.port==7		Bar	AVG(Y Field)	udp.time_delta	None	1

- Select Statistics>I/O graph and add an item as TCP RTT (http), set Display Filter as “tcp.port==80”, set Style as Line, set Y Axis as AVG(Y Field), set Y Field as “tcp.analysis.ack_rtt” and add an item as UDP frame timing (echo), set Display Filter as “udp.port==7”, set Style as Bar, set Y Axis as AVG(Y Field), set Y Field as “udp.time_delta”
- Enabled both items and reset the Graph

UDP sends packets on constant

- UDP application is prior and faster than TCP

- Blue line (TCP RTT) changes dynamically by the traffic status
- Red Bars (UDP frame timing) are almost the same height and lower than the blue line

Compare each UDP applications

- In this case, we compare Youtube with Zoom, both services are based on UDP protocols (another trace file: application3.pcapng)
- Youtube uses Google's QUIC, and Zoom uses a customised RTP protocol.
- UDP has no retransmission, no flow control, no mechanism of control bandwidth (application protocol does everything)
  So first UDP application takes the bandwidth, the later TCP application suffers.

IPv4/IPv6 address range of Zoom

- Zoom network address blocks are below
  https://support.zoom.us/hc/en-us/articles/201362683-Zoom-network-firewall-or-proxy-server-settings

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Zoom network firewall or proxy server settings

Last Updated: March 31, 2023

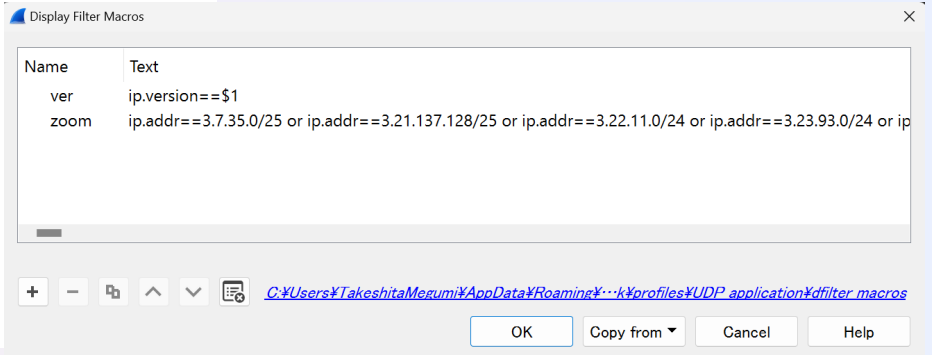
If your app stays in a "connecting" mode or has timed out due to **Network error, please try again** or **Can't connect to our service, please check your network connection and try again** issues, it could be related to your network connection, network firewall settings, or web security gateway settings.

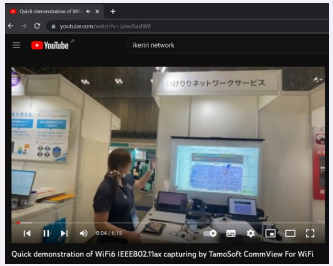
Note: Check your network connection by opening a browser and ensure that you can access https://zoom.us

This article covers:

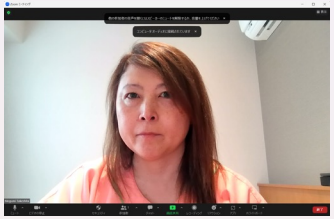
- Zoom firewall rules
  - Firewall rules for Zoom Phone
  - Firewall rules for Zoom Contact Center
  - Firewall rules for Zoom website
  - Firewall rules for certificate validation
  - Zoom CDN
  - Zoom Device Management (ZDM)
  - IP ranges txt files
- Proxy server
- Firewall rules for other Zoom services

- Create Display Filter Macros of Zoom ip range

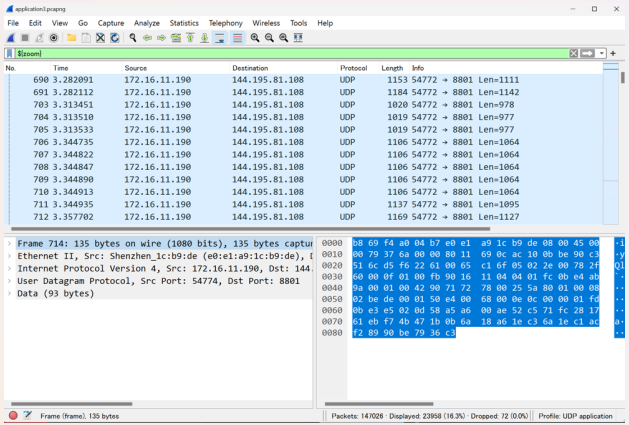




Let's Test the Application bandwidth and response



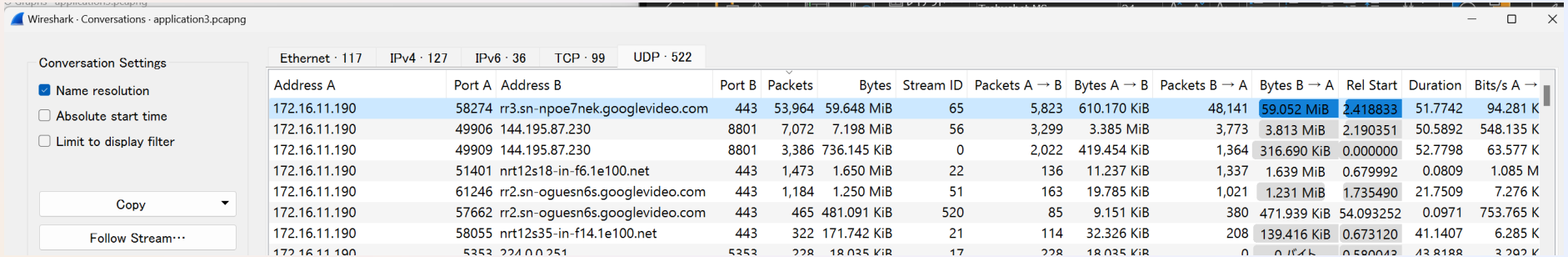
- First, Open Chrome and Play Youtube video 4k Full HD streaming using Google QUIC
- Second, Start video conference using Zoom Zoom uses its customized RTP/RTCP.



- Capture and save trace file as application3.pcapng
- Open the file and create a bandwidth graph and UDP frame timing graph between Google and Zoom

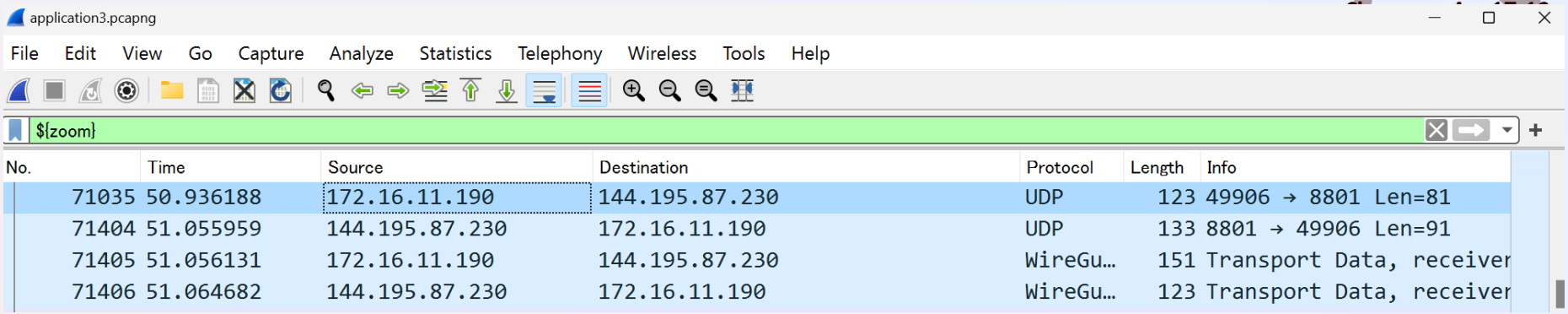
Check Google QUIC traffic

- Statistics>Conversation and choose UDP with Name the resolution, sort traffic by the number of packets
- Select the 1st UDP conversation of 59.648MBytes
  Address A Port A is 172.16.11.190:58274 (Client Chrome)
  Address B Port B is rr3.sn-npoe7nek.googlevideo.com:443
  (UDP port 443 means Google QUIC protocol by Youtube)
  this traffic starts soon after starting the capture, duration is 51. 7742, so this conversation (udp.stream==65) is Youtube



Address A	Port A	Address B	Port B	Packets	Bytes	Stream ID	Packets A → B	Bytes A → B	Packets B → A	Bytes B → A	Rel Start	Duration	Bits/s A →
172.16.11.190	58274	rr3.sn-npoe7nek.googlevideo.com	443	53,964	59.648 MiB	65	5,823	610.170 KiB	48,141	59.052 MiB	2.418833	51.7742	94.281 K
172.16.11.190	49906	144.195.87.230	8801	7,072	7.198 MiB	56	3,299	3.385 MiB	3,773	3.813 MiB	2.190351	50.5892	548.135 K
172.16.11.190	49909	144.195.87.230	8801	3,386	736.145 KiB	0	2,022	419.454 KiB	1,364	316.690 KiB	0.000000	52.7798	63.577 K
172.16.11.190	51401	nrt12s18-in-f6.1e100.net	443	1,473	1.650 MiB	22	136	11.237 KiB	1,337	1.639 MiB	0.679992	0.0809	1.085 M
172.16.11.190	61246	rr2.sn-oguesn6s.googlevideo.com	443	1,184	1.250 MiB	51	163	19.785 KiB	1,021	1.231 MiB	1.735490	21.7509	7.276 K
172.16.11.190	57662	rr2.sn-oguesn6s.googlevideo.com	443	465	481.091 KiB	520	85	9.151 KiB	380	471.939 KiB	54.093252	0.0971	753.765 K
172.16.11.190	58055	nrt12s35-in-f14.1e100.net	443	322	171.742 KiB	21	114	32.326 KiB	208	139.416 KiB	0.673120	41.1407	6.285 K
172.16.11.190	5353	224.0.0.251	5353	228	18.035 KiB	17	228	18.035 KiB	0	0 KiB	0.580043	43.8188	3.292 K

Check Zoom video traffic



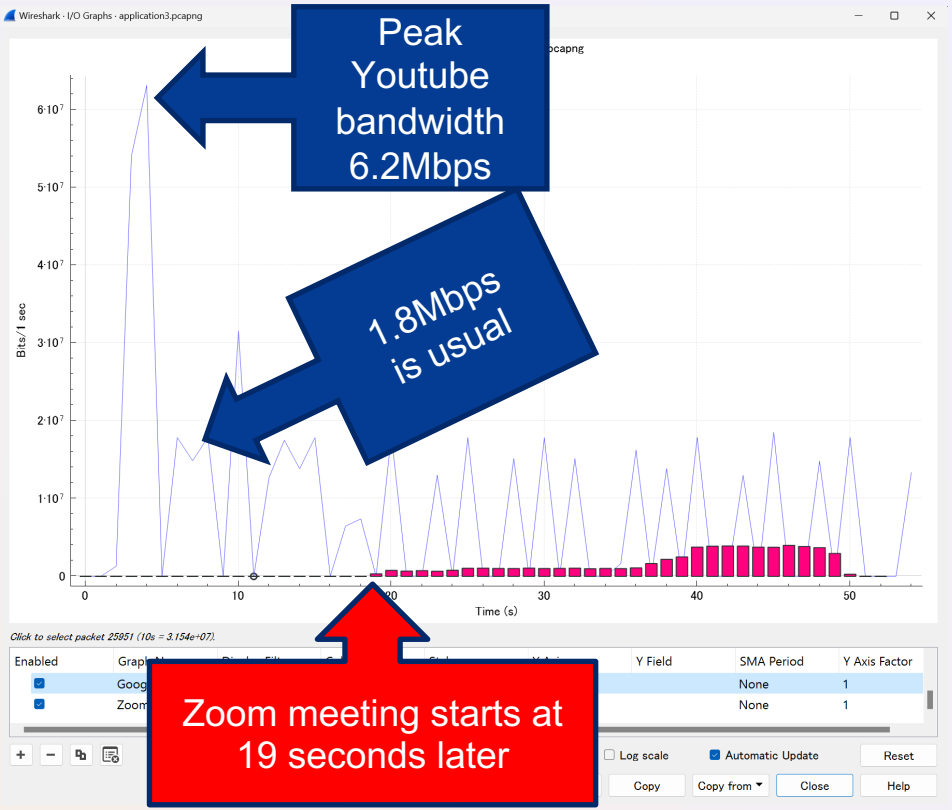
- Look for Zoom traffic, set Display filter as ${zoom}
  we can find UDP packets between Zoom Client (172.16.11.190:49909) and Server(144.195.87.230:8801)
- Statistics>Conversation and choose UDP with Name resolution
- We can find 2nd UDP traffic of 7072 packets, 7.198MBytes, this UDP stream (udp.stream==56) is Zoom video traffic.

Bandwidth graph between Youtube and Zoom

Enabled	Graph Name	Display Filter	Color	Style	Y Axis	Y Field	SMA Period	Y Axis Factor
☑	Google bandwi...	udp.stream==65		Line	Bits		None	1
☑	Zoom bandwidth	udp.stream==56		Bar	Bits		None	1

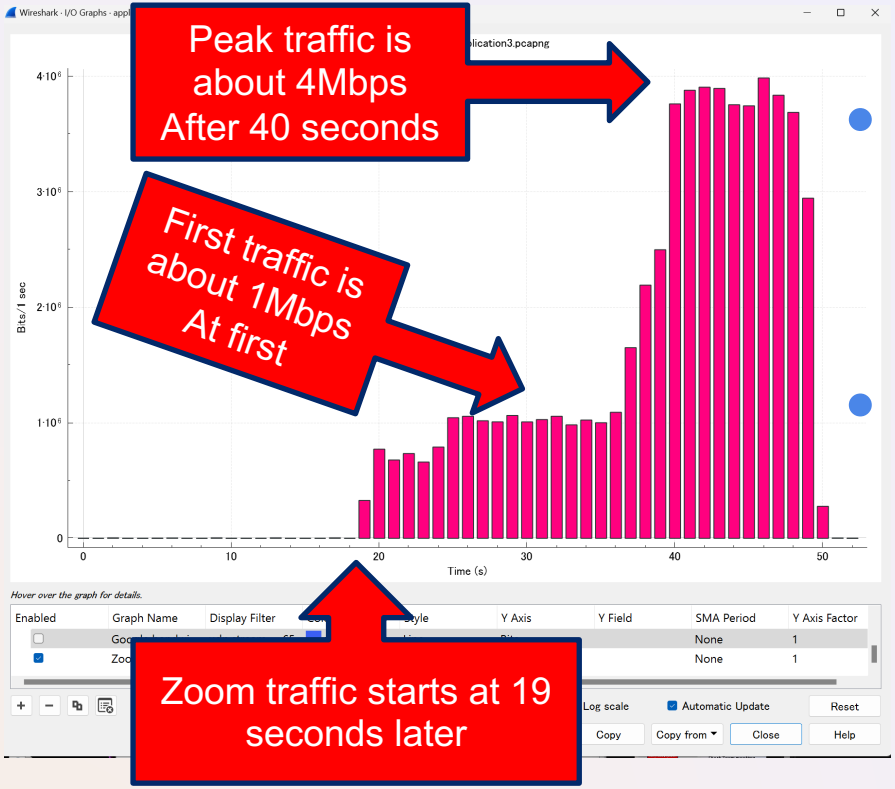
- Select Statistics>I/O graph and add an item as Google bandwidth, set Display Filter as udp.stream==65, set Style as Line, set Y Axis as Bits, and add an item as Zoom bandwidth, set Display Filter as udp.stream==56, set Style as Bar, set Y Axis as Bits, then check both items
- Make a bandwidth graph between Youtube and Zoom

Bandwidth usage between Google and Zoom



- This trace includes 4k 30fps Youtube video traffic at first
- Peak Google QUIC bandwidth is 62Mbps and 18Mbps usual
- Start Zoom meeting after 19 seconds later

Check off Google bandwidth and focus on Zoom



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Check off Google bandwidth item and focus on Zoom bandwidth

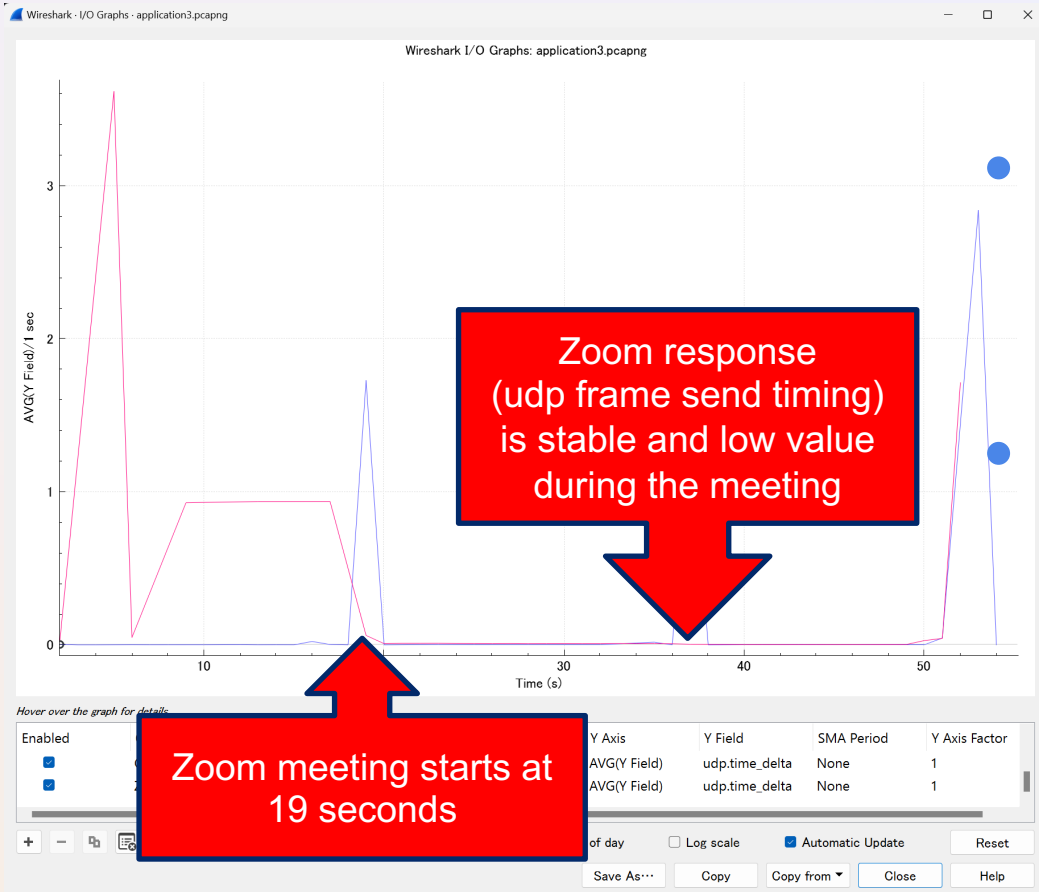
Actual Zoom meeting traffic starts at 19 seconds later, and actual traffic is about 1Mbps at first, then speed up at 4Mbps after 40 seconds

Create application response time

- Select Statistics>I/O graph and add an item as Google response, set Display Filter as udp.stream==65, set Style as Line, set Y Axis as AVG(Y Fields), set Y Field as udp.time_delta and add an item as Zoom response, set Display Filter as udp.stream==56, set Style as Line, set Y Axis as AVG(Y Fields), set Y Field as udp.time_delta , then check both items

Enabled	Graph Name	Display Filter	Color	Style	Y Axis	Y Field	SMA Period	Y Axis Factor
☐	Google response	udp.stream==65		Line	AVG(Y Field)	udp.time_delta	None	1
☐	Zoom response	udp.stream==56		Bar	AVG(Y Field)	udp.time_delta	None	1

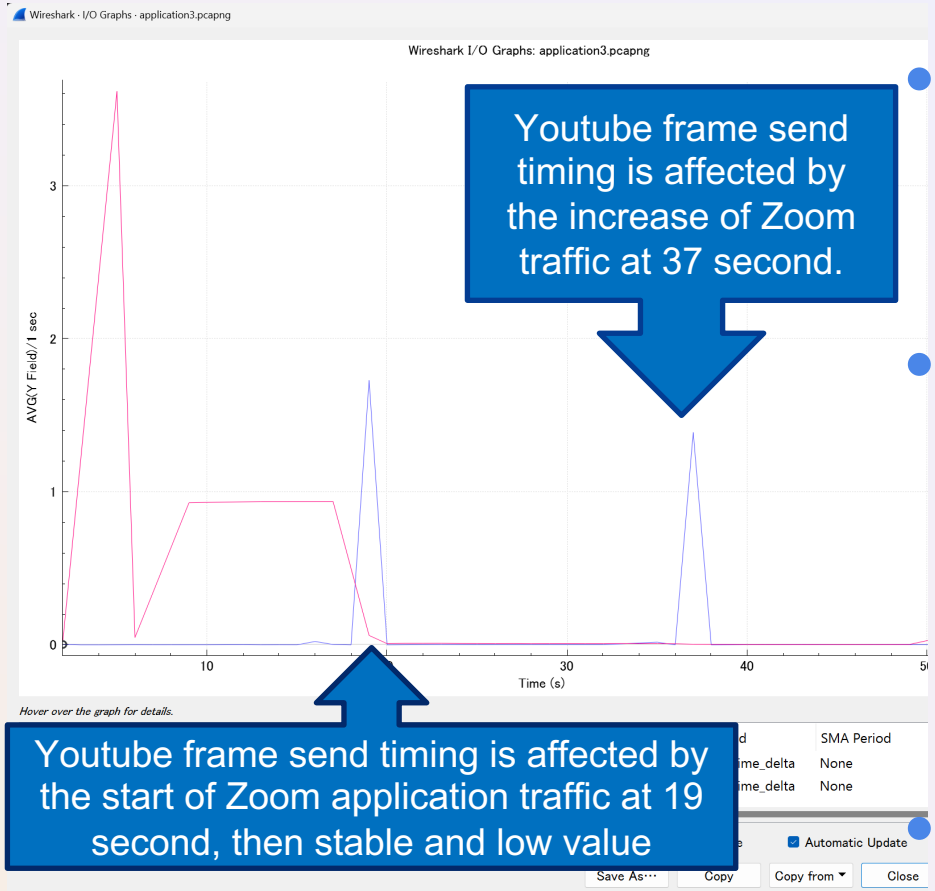
UDP frame send timing of Zoom application



Check the red line,
it means Zoom response
(udp frame send timing)

Zoom meeting starts at 19 seconds, then Zoom response is low until 50 seconds at the end

UDP frame send timing of Youtube Video

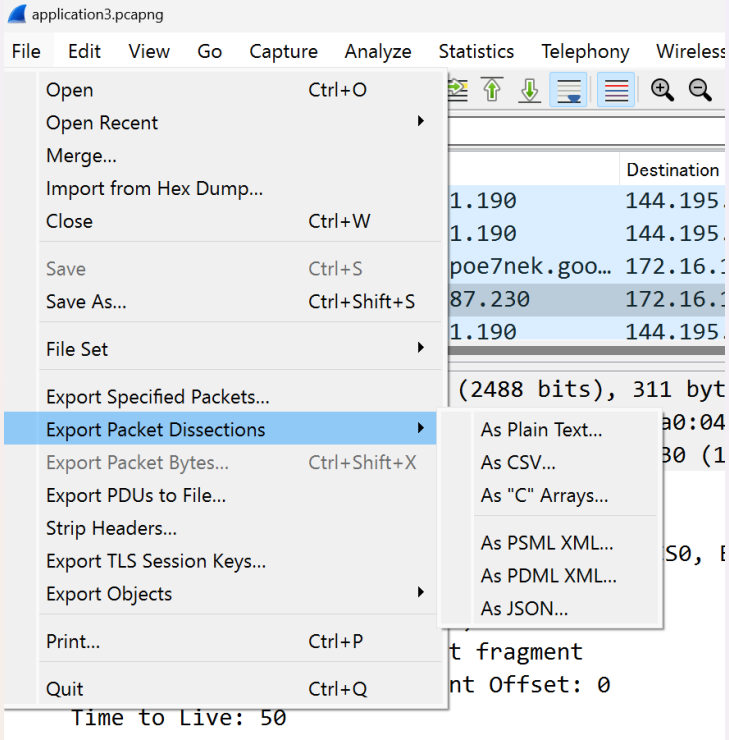


Check the blue line, it means Youtube response (udp frame send timing)

Youtube frame send timing is affected by the start of Zoom application traffic at 19 sec and the increase of Zoom traffic at 37 sec.

But soon go back to normal

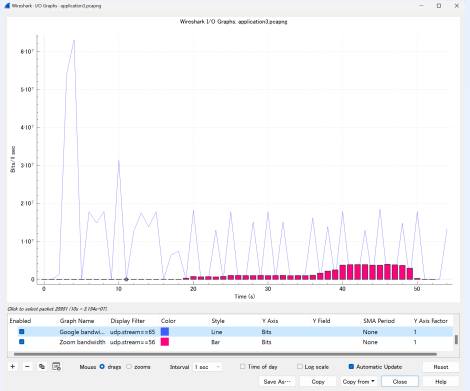
We can extend Wireshark Visualization by exporting the trace as JSON, CSV



- File>Export Packet Dissections As CSV… or As JSON…
- We can use Excel to create Pie charts, Splunk or Erastic Search Kibana Grafana to create Data Analysis (or ChatGPT?)
- tshark is useful to create output data (-T and -e options)

Wireshark I/O Graph is also one of good tools for visualizing application traffic

- Excel, Splunk and other data analysis tools are good options for Visualization, but Wireshark I/O Graph is easy to use, no need for a complicated configuration
- We can try and get Visualization results within the Wireshark I/O graph easily.
- Use Wireshark I/O graph and Visualize, troubleshoot your application problems.



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Thank you for watching.

Please complete the Google form survey

trace files and Wireshark profiles are here:
https://www.ikeriri.ne.jp/sharkfest/VisualizeApplicationTraffic.zip

ikeriri network service
http://www.ikeriri.ne.jp