Tech Exploration 4 - Wireshark Filters

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About Wireshark

Wireshark is an essential tool in any networking based career, but especially in security. Created in the late 1990's, Wireshark is free and open-source, so that all may use it. By capturing data on the network, and making it human readable, users can easily find, understand, and solve problems on the network. While Wireshark is a very powerful tool in many aspects, filters are arguably the most powerful aspect of the program. This tutorial will cover 4 essential filters, and show the user how to user and/or read them.

Prerequisites

Wireshark can be used on almost any device, and can be used with either a GUI or through the command line. This tutorial will be using the GUI, but can be preformed on any supported OS.

- Supported OS (Windows, Mac, Linux)
- Installation of Wireshark
- Working NIC

Learning Objectives

- Improve on using Wireshark so that the learner can be more effective in future positions after graduation.
- Teach classmates functions that they may not know, so that they may be better suited for future use of the tool.
- Be able to apply and understand filters that are applied to a Wireshark session, being able to customize the filters to fit the user's specific needs.

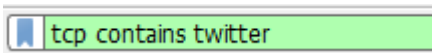
Instructions

TCP/UDP Contains

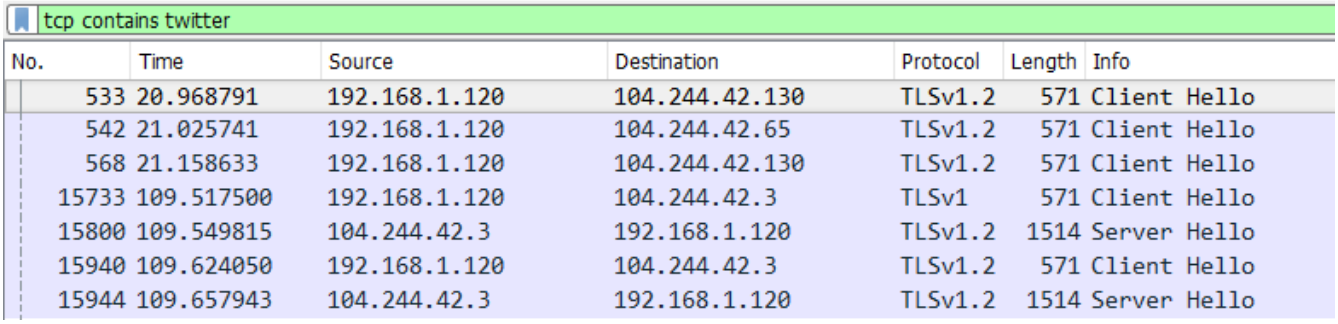
The 'contains' filter is a very simple, yet effective filter, which allows you to search for any plaintext word in a TCP or UDP steam in Wireshark. For example, to search for web traffic related to Twitter, you would do the following:

1. Step 1. In the 'Add a Display Filter' search bar, type in 'tcp contains twitter'. TCP can be replaced with UDP, and twitter can be replaced with anything that you'd like to filter for.

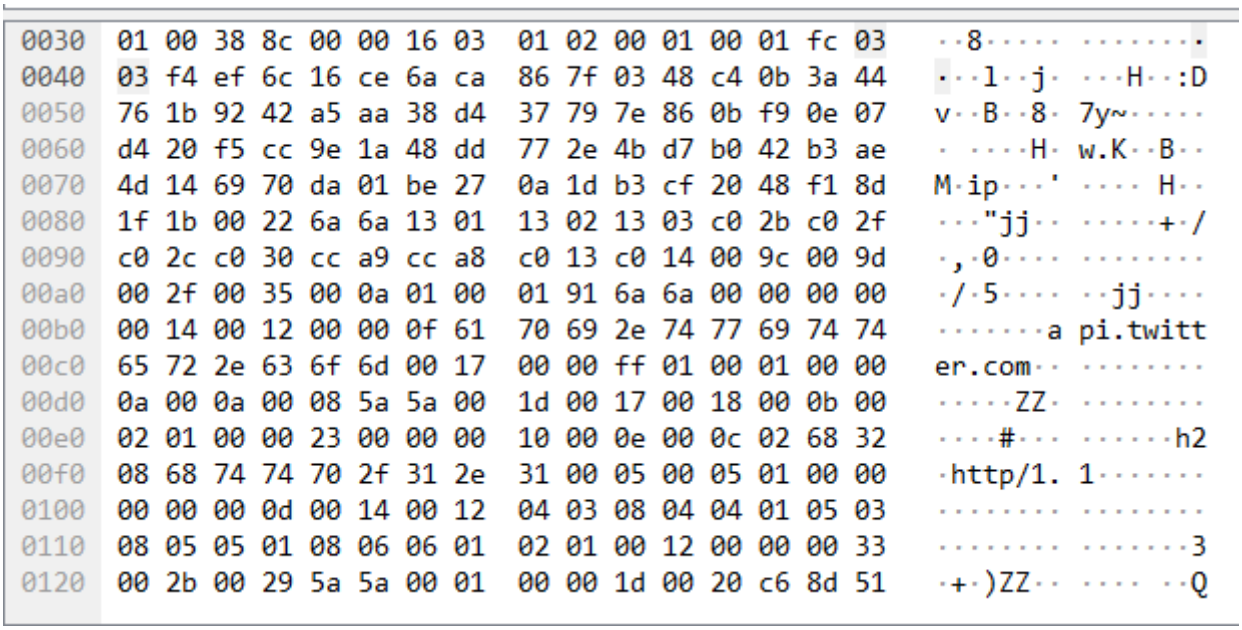
1. Step 2. Hit 'Enter' or the arrow button to the right of the search bar to apply the filter.



1. Step 3. View the results of the filter. If nothing shows up, navigate to the website, and browse for a small amount of time.



In the results at the bottom of Wireshark, you will be able to see some of the data within the captured traffic. You can see here that this filter worked, as the data shows 'twitter' in the results.

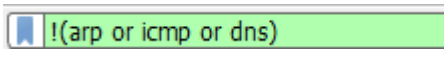


!(arp or icmp or dns)

This filter will discard arp, icmp, and dns requests sent on the network. These results are usually the bulk of your results, but are not always helpful, and can just take up space. By applying this filter you will be able to view more important traffic, without having to dig through all of these requests.

1. Step 1. In the 'Add a Display Filter' search bar, type in '!(arp or icmp or dns)'.

1. Step 2. Hit 'Enter' or the arrow button to the right of the search bar to apply the filter.



1. Step 3. View the results of the filter. You will likely still have quite a few results, but will not see any of the specified protocols in the Protocols column in the results pane. You can also add more exclusions by adding more to the protocols in the parenthesis.

!(arp or icmp or dns)

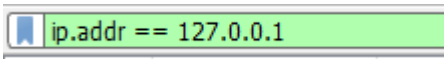
No.	Time	Source	Destination	Protocol	Length	Info
68659	586.696161	104.16.59.37	192.168.1.120	TLSv1.2	131	Application Data
68660	586.737052	192.168.1.120	104.16.59.37	TCP	54	49826 → 443 [ACK] Seq=796 Ack=15855 Win=251 Len=0
68661	587.137120	192.168.1.1	239.255.255.250	IGMPv2	42	Membership Query, specific for group 239.255.255.250
68662	587.232547	104.16.59.37	192.168.1.120	TLSv1.2	151	Application Data
68663	587.273286	192.168.1.120	104.16.59.37	TCP	54	49826 → 443 [ACK] Seq=796 Ack=15952 Win=251 Len=0
68664	587.590789	192.168.1.120	162.254.193.47	UDP	126	58484 → 27018 Len=84

ip.addr ==

This filter allows you to view traffic for a specific IP address, which can help immensely when trying to view specific traffic on the network.

1. Step 1. In the 'Add a Display Filter' search bar, type in 'ip.addr == x.x.x.x', replacing the x's with the desired IP address.

1. Step 2. Hit 'Enter' or the arrow button to the right of the search bar to apply the filter.

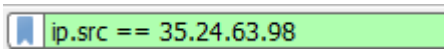


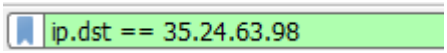
1. Step 3. View the results of the filter.

ip.addr == 35.24.63.98

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	35.24.63.98	104.244.42.67	TCP	55	51893 → 443 [ACK] Seq=1 Ack=1 Win=252 Len=1 [TCP segment of a reassembled PDU]
2	0.090248	104.244.42.67	35.24.63.98	TCP	66	443 → 51893 [ACK] Seq=1 Ack=2 Win=132 Len=0 SLE=1 SRE=2
3	1.425244	35.24.63.98	162.254.193.6	UDP	126	52280 → 27019 Len=84
4	4.146509	35.24.63.98	172.217.8.14	GQUIC	1392	Client Hello, PKN: 1, CID: 15370318909630539734
5	4.183209	172.217.8.14	35.24.63.98	GQUIC	1392	Payload (Encrypted), PKN: 1
6	4.183210	172.217.8.14	35.24.63.98	GQUIC	73	Payload (Encrypted), PKN: 2
7	4.184297	35.24.63.98	172.217.8.14	GQUIC	81	Payload (Encrypted), PKN: 2, CID: 15370318909630539734
8	4.184582	35.24.63.98	172.217.8.14	GQUIC	70	Payload (Encrypted), PKN: 3, CID: 15370318909630539734
9	4.185083	35.24.63.98	172.217.8.14	GQUIC	1392	Payload (Encrypted), PKN: 4, CID: 15370318909630539734
10	4.185210	35.24.63.98	172.217.8.14	GQUIC	749	Payload (Encrypted), PKN: 5, CID: 15370318909630539734
11	4.212468	172.217.8.14	35.24.63.98	GQUIC	62	Payload (Encrypted), PKN: 3
12	4.237011	172.217.8.14	35.24.63.98	GQUIC	62	Payload (Encrypted), PKN: 4
13	4.285330	172.217.8.14	35.24.63.98	GQUIC	374	Payload (Encrypted), PKN: 5
14	4.285331	172.217.8.14	35.24.63.98	GQUIC	446	Payload (Encrypted), PKN: 6
15	4.285332	172.217.8.14	35.24.63.98	GQUIC	70	Payload (Encrypted), PKN: 7

This filter can be further specified into source and destination IP addresses. You can do this by using the filters 'ip.src == ', and 'ip.dst == ', as shown below.

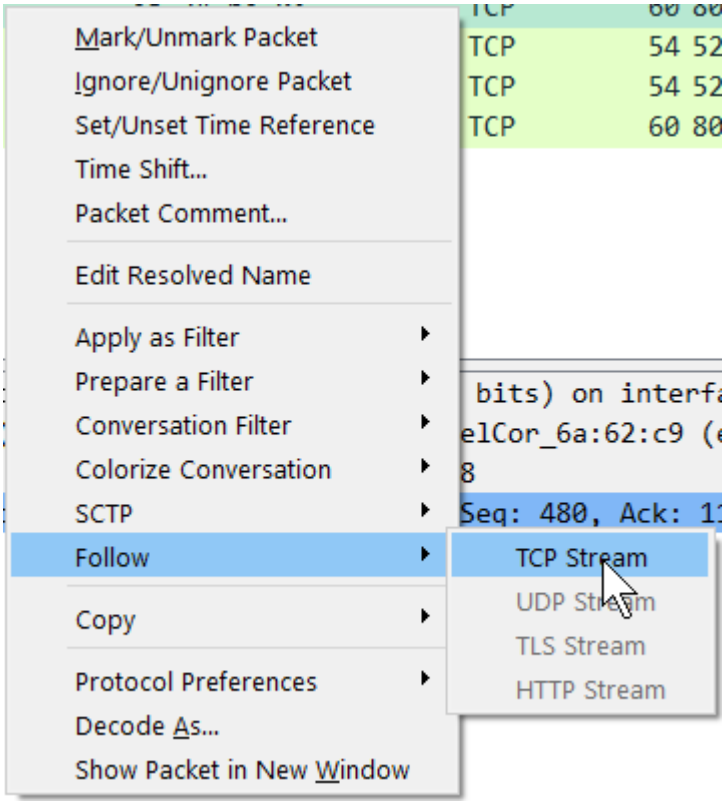


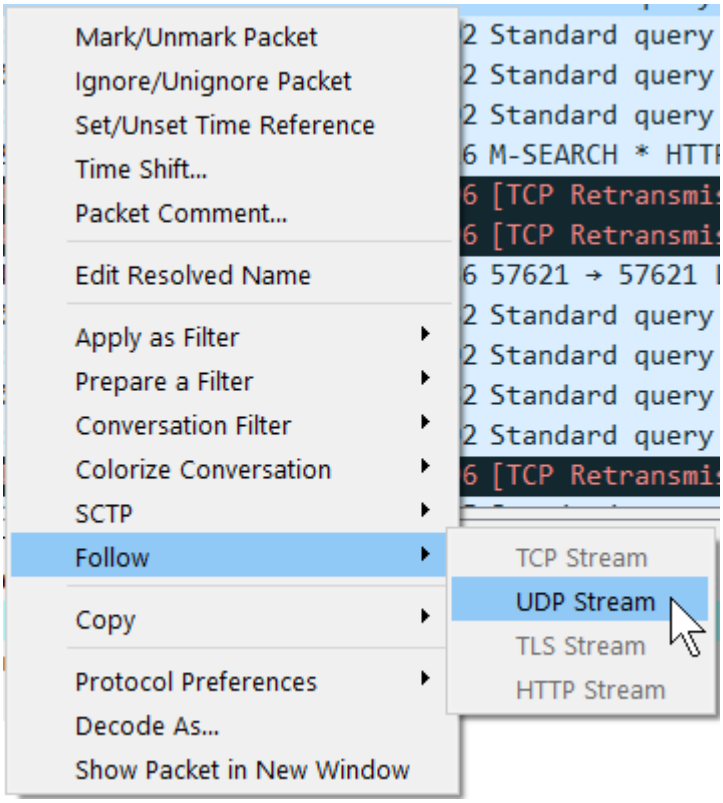


tcp.stream

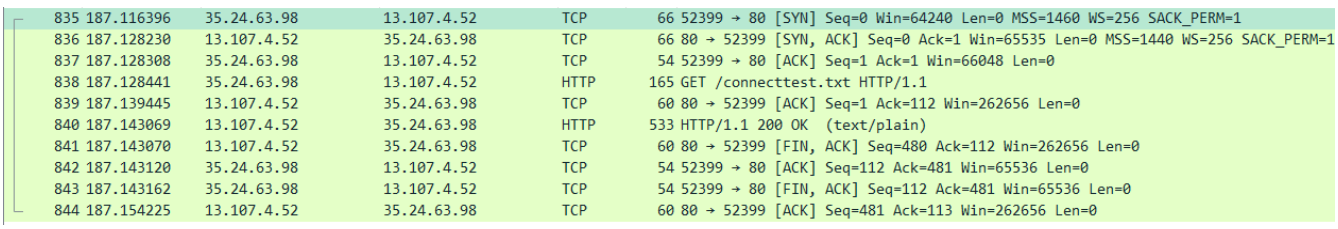
This filter allows you to piece together a string of packets to view the data that they contain. This will work better with HTTP traffic, as opposed to HTTPS, as the encryption makes the data unreadable.

1. Step 1. This filter can be used with manual filter entry, however, this is much more complicated than just right clicking a packet and selecting 'Follow TCP/UDP Stream'. Note: There are also options for HTTP and TLS streams, but the majority of the packets captured are going to be TCP or UDP.





1. Step 2. Left click on the TCP/UDP stream option.
2. Step 3. View the results of the TCP/UDP conversation.



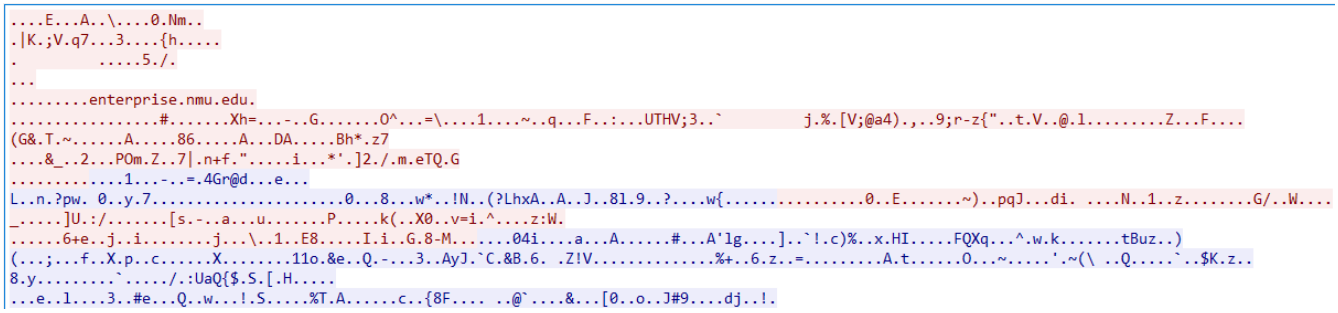
```
GET /connecttest.txt HTTP/1.1
Connection: Close
User-Agent: Microsoft NCSI
Host: www.msftconnecttest.com

HTTP/1.1 200 OK
Cache-Control: no-store
Content-Length: 22
Content-Type: text/plain; charset=utf-8
Last-Modified: Sun, 07 Apr 2019 17:45:22 GMT
Accept-Ranges: bytes
ETag: 0x8D343F9E96C9DAC
Access-Control-Allow-Origin: *
Access-Control-Expose-Headers: X-MSEdge-Ref
Timing-Allow-Origin: *
X-MSEdge-Ref: Ref A: DB23420AFAB44ECCA775B5CBEF6E4A40 Ref B: CHGEDGE0809 Ref C: 2019-04-09T19:36:56Z
Date: Tue, 09 Apr 2019 19:36:56 GMT
Connection: close

Microsoft Connect Test
```

You can see above that the individual packet data gets put into a more human readable form, and is much easier to understand. This TCP conversation was unencrpyted, so it is plain text readable.

This *can* be done with HTTPS (encrypted) traffic, but it will almost definitely be unreadable, as shown below.



Challenge

Go out and try these filters on your own! Use these specific filters, find other ways to use them, or find filters not shown here.

Try this on your home network, see what data you capture, and what you can make of it. You might be sending data you didn't know about.

Go out and try other packet sniffing programs, and compare them to Wireshark:

- Are they better/worse?
- Any features that you can't find in Wireshark?
- Do the same filters for Wireshark work in the other program(s)?

Disclaimer

Sniffing packets on a network you do not have permission to sniff is illegal, and can get you in serious trouble. This tutorial did not go over promiscuous mode, due to NMU laptop NICs not

supporting it. However, turning on promiscuous mode will allow you to see *all* available traffic on the network. Keep promiscuous mode off, and stay on a home network to ensure you are in compliance with best network practices.

Reflection

Now that you have learned some useful filters for Wireshark, and have a better understanding of the program, consider the following:

- In what situations could you use Wireshark to find/solve issues on the network?
- What should you do if you find someone using Wireshark (or another packet sniffer) on your network?
- In what situation(s) is turning on promiscuous mode okay?
- What other programs could you use in conjunction with Wireshark to utilize the captured data?