Wireshark Quick Reference

WS 101 - Features & Functions

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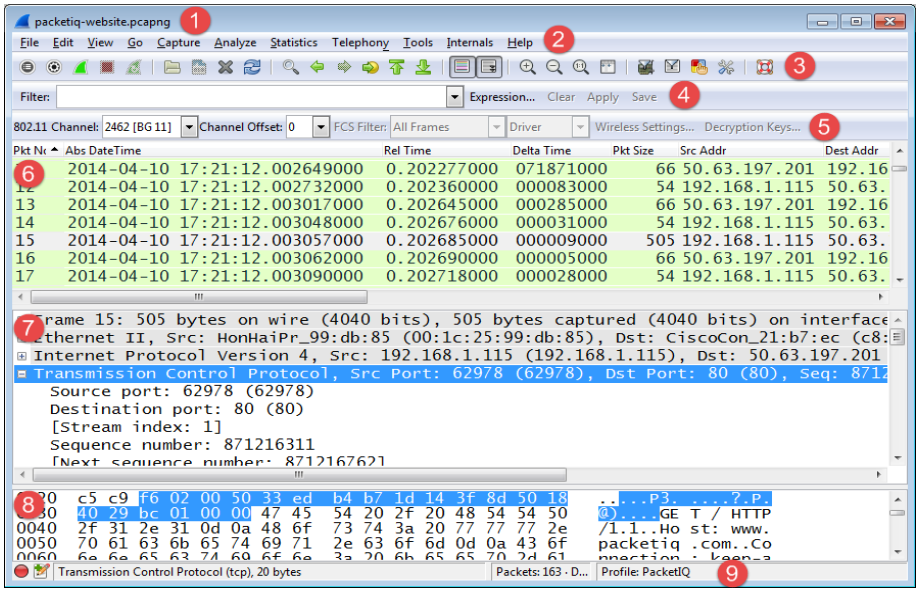
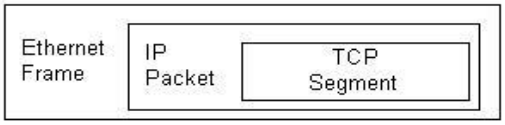
Wireshark User Interface Elements

Wireshark v1.10



1. **Title (trace file name)**
2. **Menu**
3. **Main Toolbar**
4. **Display Filter Toolbar**
5. **Wireless Toolbar**
6. **Packet List Pane**
7. **Packet Details Pane**
8. **Packet Bytes Pane**
9. **Status Bar**

Frame vs Packet vs Segment



A **frame** is the entirety of the data package from the start of the Media Access Control (MAC) layer header (such as in an Ethernet header) to the end of the MAC trailer (Frame Check Sequence)(not always counted)

A **packet** is the payload of the frame minus the MAC header/trailer (Ethernet frame, for example)
To help remember the difference : a router strips off the previous Ethernet frame, internally routes the packet to the proper egress port, and wraps it in a new Ethernet Frame header/trailer (with different MAC layer addressing & FCS) for transmission

A **segment** is the payload contents following the TCP header - the application payload. The max size of this payload is the Maximum Segment Size (MSS)

IP and UDP packets carry *datagrams* vs *segments*

Features & Functions: File & Edit

File Menu > Open (Ctrl O) - browse for capture files

File > Open Recent - quick load of previous files

File > Merge - merge 2 or more capture files

File > Save As

File > File Set > List Files
Select from list of long-capture files

File > Export Specified Packets
Export filtered / displayed packets to a new file

File >Export Packet Dissections
Export to .csv or other formats

File > Export Objects - save
HTTP / DICOM / SMB/2 objects

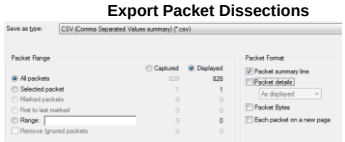
Export Specified / Dissections Options:

Export Specified Packets Captured or Displayed
.pcap or pcap.ng
Packet Range options
Range 4- or 4-63
Range 1,5,6-9

Export Packet Dissections

Marked / Ignored Pkts

Packet summary line:
all columns exported



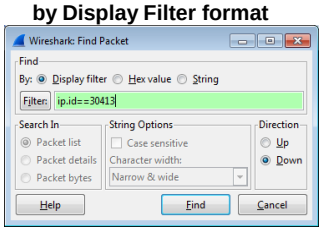
Enable 'Allow subdissector to reassemble TCP streams' in Preferences > Protocols > TCP

Edit Menu

Edit > Copy - copy contents from Packet Details fields (R-Click in Packet List or Details)

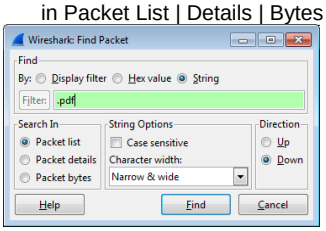
Edit > Find Packet (Ctrl-F)

by Display Filter format



by Hex value
(no '0x' needed)
will find any
occurrence of
the value

by String
in Packet List | Details | Bytes



Ctrl-N: Next
Ctrl-B: Prev

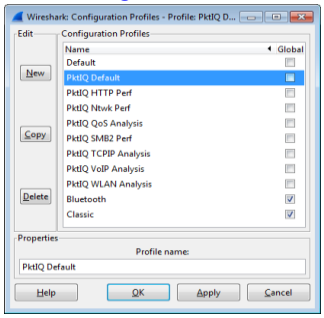
Edit > Mark | Unmark - highlights w/ Black background / White font - easier to find again
Edit > Ignore | Unignore - eliminate extraneous packets hard to eliminate w/ filters
Save trace w/o Ignored pkts - select 'Remove Ignored packets' in Export Specified Packets

Edit > Time Reference (Ctrl-T) - measure time from a specific packet to other pkts
Can be used multiple places - click Reload icon to reset - this is a temporary setting

Edit > Packet Comment (also **R-Click from Packet List**) - annotate packets with notes
Comments appear in Packet Details above the Frame meta data - highlighted in Green
Also listed in Analyze > Expert Info > Packet Comments tab. Must save trace as pcap-ng

Wireshark Configuration Profiles

Edit > Configuration Profiles…



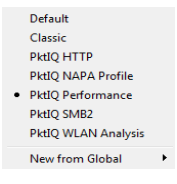
Create, copy, delete, or select custom configuration profiles

Wireshark settings are saved in profiles There are global and custom profiles, and you can create a set of custom profiles for multiple analysis environments

Custom profile files are found quickly by clicking:
Help > About Wireshark > Folders tab
Personal configuration > /profiles

Wireshark profile configuration files:
Capture Filters: *cfilters* (these are all
Coloring Rules: *colorfilters* text-editable)
Decode As settings: *decode_as_entries*
Display Filters: *dfilters*
Preferences: *preferences*
GeoIP data files path: *geoip_db_paths* (if configured)
Recent changes: *recent* (do not modify)

preferences includes Filter Expression Button settings
You can ZIP a custom profile directory and share it
see also: **Global configuration** dir for default files



Click in the Profile section of the Status Bar to select/change profiles

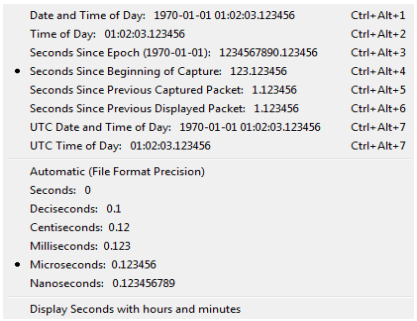
R-Click in Profile section to select Manage Profiles

Features & Functions: Edit & View

Edit > Preferences (Ctrl-Shift-P) - Set/control all the settings for the current profile

View Menu

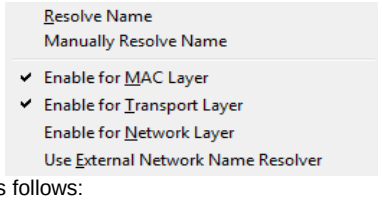
View > Time Display Format
These settings only affect / work with
'Time (format as specified)' field types



The two most useful time columns:
'Rel Time' column: progressive time
Seconds Since Beginning of Capture
Microseconds 0.123456

'Display Time' column: data flow times
Seconds Since Previous Displayed Packet
Microseconds 0.123456

View > Name Resolution



Resolve Name - one-time DNS lookup
Manually Resolve Name - enter hostname (temp)
MAC Layer - NIC manufacturers (enable)
Transport Layer - services by port #'s (enable)
Network Layer - IP addresses to host names
works with *Use External Network Name Resolver* , as follows:
Network Layer + External Resolver: does reverse PTR lookups - **creates DNS traffic**
Network Layer - External Resolver - use hosts file in Wireshark program or profile directory
Network Layer disabled +/- External Resolver - no IP to host name resolution
These are temp settings - use Preferences > Name Resolution to make permanent

Colors **Auto-Scroll**

View > Colorized Packet List - turn coloring rules / colorization on/off
View > Auto Scroll in Live Capture - On/Off (turn Off for busy captures)

View > Zoom In | Out | Normal (Ctrl + | Ctrl - | Ctrl =) - adjust font size

View > Resize All Columns (Ctrl-Shift-R) - auto-size Packet List columns


Resize

View > Displayed Columns - lists all columns & allows turning the display of each On / Off

View > Expand Subtrees (Shift - Right)
View > Expand All (Ctrl - Right)
View > Collapse All (Ctrl - Left)
These controls affect the expansion / collapse of various levels of protocol headers to show / hide data fields in the Packet Details pane

View > Colorize Conversation (Ctrl - 1 thru 9 & 0) - *temporarily* make specific conversations more visible. Click on any packet in a conversation (in Packet List) & apply
View > Reset Coloring 1-10 (Ctrl Space) - removes conversation coloring

View > Coloring Rules - brings up Coloring Rules editor


Edit Coloring Rules

View > Reload - reloads capture file / refreshes display


Reload

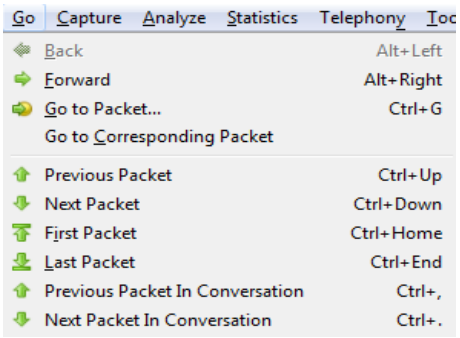
Go Menu

Back - Forward - move to / from packets in a reassembled PDU group

Go to Packet… - go to specific Pkt #

Go to Corresponding Packet - jump to a packet selected from a Reassembled PDU list in the Packet Details pane

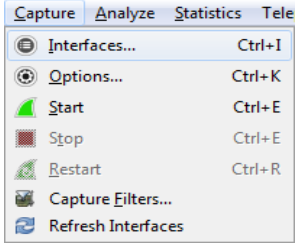
Previous / Next Packet in Conversation move between packets in a conversation



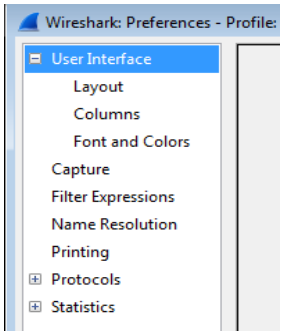
Capture Menu

Capture > Interfaces (Ctrl I)
Capture > Options (Ctrl K) - see next page for details
Capture > Start (Ctrl E)
Capture > Stop (Ctrl E)
Capture > Restart (Ctrl R) - new capture using the same interfaces and options - quick recover from a bad 1st capture
Capture > Filters… - see next page for details
Capture > Refresh Interfaces - refresh interfaces & counters


see next frame



Wireshark Preferences



Edit > Preferences
Ctrl-Shift-P
Preferences Icon

You can set different preferences for each custom profile

Preferences settings are stored in the *preferences* file in each profile dir

Recommended Preference Settings:
User Interface - Maximum recent filters: 10 files: 10
Layout : Pane 1: Packet List Pane 2: Details 3: Bytes
Columns : Add | Remove | drag to move*
Font and Colors : Lucida Console Normal | 8

Capture - set Default interface & Capture as pcap-ng

Filter Expressions - Add | Remove | drag to move*

Name Resolution - disable Resolve network (IP) Addr
GeoIP database directories

Protocols - settings for every protocol
Type sequential letters to quickly select (Ex: 'T' 'C' 'P')

HTTP : Add TCP ports to recognize as HTTP traffic

IEEE 802.11 : Add / edit Wireless Decription keys

IPv4 : Validate IPv4 checksum if possible (disable)
Enable GoIP lookups (enable)(if used)

IPv6 : Enable GeoIP lookups (enable)(if used)

RTP : Allow subdissector to reassemble RTP streams

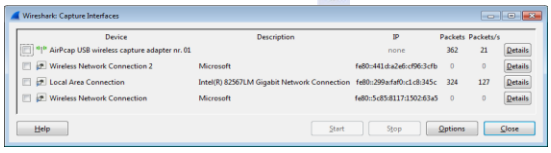
SMB : Reassemble SMB Transaction payload
Disable to measure First Byte response times
Enable to support exporting SMB objects

TCP : Validate TCP checksum if possible (disable)
Allow subdissector to reassemble TCP streams
Disable to measure First Byte response times
Enable to support exporting HTTP objects
Relative sequence numbers (enable)
Track number of bytes in flight (enable
Calculate conversation timestamps (enable)

UDP : Validate the UDP checksum if possible (disable)

* Easier to add / edit / move from the Packet List pane

Capture > Interfaces (Ctrl I) View / select intf(s)

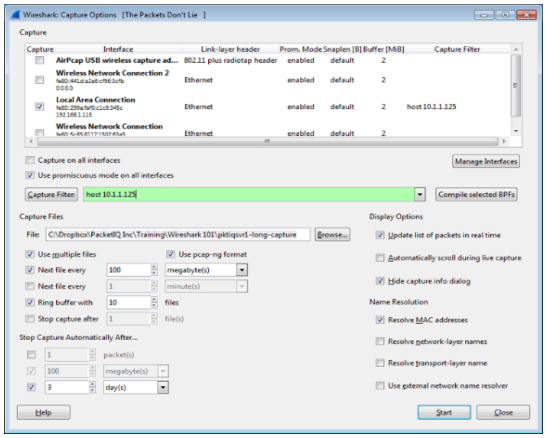


Select interface(s) to capture from (can do multiple)
Click the **IP** header to toggle **IPv4 / IPv6 addresses**
(helpful for identifying a desired / configured interface)
Packets & Packets/s counters identify active intfs

Interface **Details** offer a great deal of information
Options button opens the Capture > Options window

Capture Options

Capture > Options (Ctrl K) - select capture interfaces, filters, and options



Select interface(s) to capture from
IPv6 & IPv4 addresses are displayed

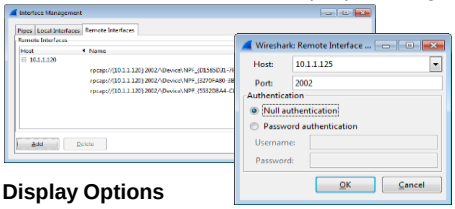
Select or enter/edit **Capture Filters** (sidebar)
This example captures pkts to/from 10.1.1.125
Specify **Capture Files** location (Browse)
Provide a file name and location; if saving multiple files, specify the leading file name - Wireshark will append a date-time stamp to the end of each file. Be sure to add a file extension

Use promiscuous mode on all intfs - enable
Use pcap-ng format - enable

Use multiple files - if you want to save a set of files, enable this then select the **Next File every** options by file size and/or time, optionally set a **Stop capture after** (x) files, and/or **Ring buffer with** (x) files. Ring Buffer use will save (x) number of on-going files, discarding the oldest file every time a new one is started

Stop Capture Automatically After… to stop after (x) packets or by file size and/or time

Manage Interfaces
Local Interfaces
Hide unuseable interfaces to avoid confusion
Remote Interfaces
List / Hide remote agent interfaces
Add - IP Addr & Port of remote rpcapd.exe agt



Display Options
Update list of packets in real time - enable
Automatically scroll during live capture - enable
Hide capture info dialog - enable

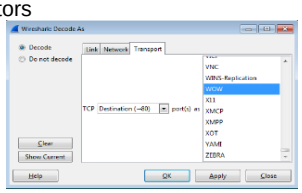
Name Resolution
Resolve MAC addresses - enable
Resolve network-layer names - disable
Resolve transport-layer name - enable
Use external network name resolver - disable

Features & Functions: Analyze

Analyze Menu
Analyze > Display Filters - **see side panel next page**
Analyze > Display Filter Macros - mechanism to create shortcuts for complex filters
These next three features act on a selected field in the Packet Details pane:
Analyze > Apply as Column - create a new column in the Packet List
Analyze > Apply as Filter - create a Display Filter
Analyze > Prepare a Filter - *prepare* (don't apply) a Display Filter

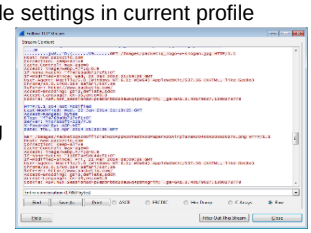
Selected
Not Selected
... and Selected
... or Selected
... and not Selected
... or not Selected

Analyze > Enable Protocols - enable/disable protocol dissectors
Analyze > Decode As… - decode a non-standard port as a specific protcol. Typically, choose the Transport port # to be decoded and the appropriate protocol to decode-as. You can use Edit > Preferences > Protocol | <protocol> to set this
Click 'Clear' to eliminate entries. These are temp settings - they are lost when closing Wireshark or changing profiles



Analyze > User Specified Decodes… - Clear or Save decode settings in current profile

Analyze > Follow TCP / UDP / SSL Stream
VERY useful for inspecting commands and data exchanged between clients and servers during a conversation w/o having to view data payloads across multiple pkts in a stream
Can print or save a conversation to a separate capture file

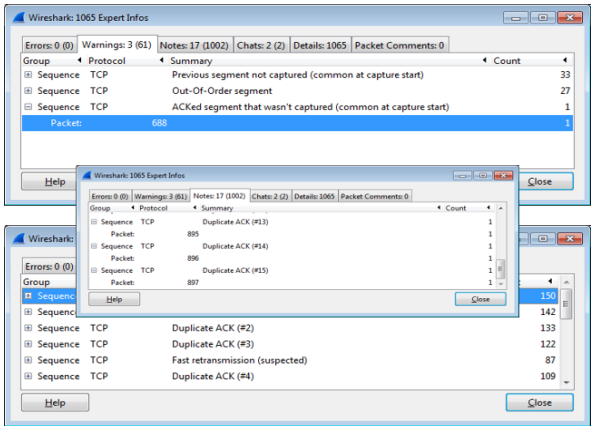


Analyze > Expert Info - one of the most useful features of Wireshark

Errors - packet / dissector errs

Warnings - unusual application and/or transport layer events - Out of Order packets, ACKed segment that wasn't captured (an indication of pkt loss), etc.

Notes - additional application / transport info, incl'd processes for events that were reported in a Warning - Duplicate ACKs, Fast Retransmissions, etc.



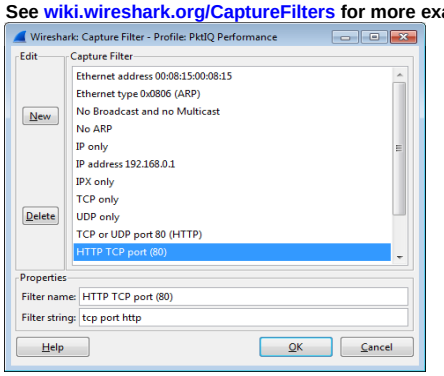
Chats - info about workflows, like TCP session setups / teardowns, GETs, etc.

Details - sequential list of Expert Info events
Packet Comments - listed by Packet #

A high count of Duplicate Acks (#xx) can indicate a high latency network path, but check to see how long the recovery period really was (delta time from 1st to last Dup ACK) - it may not be that long

Capture Filters

See wiki.wireshark.org/CaptureFilters for more examples



Capture Filter Syntax & Examples

Hosts & Networks host *host* , src host, dst host
ether host, ether src, ether dst gateway host *host*
net *net/cidr* , net *net* mask *mask*
host 10.1.1.125 **ether host 00:1c:25:99:db:85**
wlan host ehost **wlan host 00:21:6a:86:0b:c2**
net 10.1.1.0/24 or **net 10.1.1.0 mask 255.255.255.0**
host <hostname> **host www.packetiq.com**
gateway host *host* **(*host* name must be resolvable)**
captures pkts to/from the hardware address of a gw (typically a def router) but not the IP address of that gw

Ports & Protocols port, dst port, tcp port, tcp src, udp port, udp dst arp, icmp, ip, udp, tcp, http
port 80 (TCP or UDP port 80) DNS = port 53
not arp and port not 53 (no ARP & DNS)
DHCP = port 67 & 68
IPv6 ip6, icmp6 (replaces ARP & DNS)
DHCPv6 = port 546 & 547

Operators / Logic
= != > < >= <= ! not && and || or

Other Filters / Examples
len <= *length* , len >= *length* **len <= 128**
vlan [vlan_id] (IEEE 802.1Q VLAN pkts) **vlan 1**
not multicast and not broadcast

Offsets [# bytes from start of header, # bytes to match]
ip[2:2] > 576 (IP pkts > 576 bytes) **ip[1:1] > 0**
tcp[0:2] = 80 (TCP src port = 80) (DiffServ != 0)
Use capture filters sparingly so you don't miss anything!

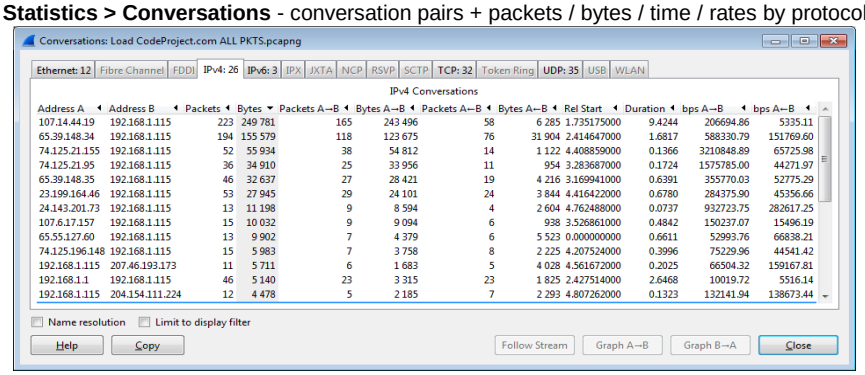
Features & Functions: Statistics

Statistics Menu

Statistics > Summary - capture summary & stats & Display Filter stats (if applicable)
Statistics > Comments Summary - summary + Capture & Pkt Comments - can be copied
Statistics > Show Address Resolution - hosts data for current trace file (if Name Res on)

Statistics > Protocol Hierarchy - packet & byte counts & percentages by protocol. Useful for detecting anomalies / suspect traffic) - look for unusual protocols

Statistics > Conversations - conversation pairs + packets / bytes / time / rates by protocol



Ethernet - station pairs by MAC Addr
IPv4 - host pairs by IP Addr or hostname
TCP - TCP stream conversations by port
UDP - UDP stream conversations by port
WLAN - WLAN conversations by STA Addr
Pay attention to: port #'s / services used, Pkts/Bytes A-B (relative traffic volumes), Rel Start - when did a thread start?, bps A->B, A<-B - impact on the network?

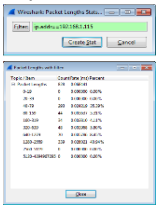
A VERY useful tool for identifying & filtering on conversations of interest from a capture:
1. Select IPv4 - Click the Bytes column twice - Top Talkers by IP Addr will top the list
2. ID the conversation of interest by name / IP
3. R-Click, select 'Apply as a Filter', 'Selected', 'A<->B' to apply a display filter for this conv
4. Inspect - if this is the desired conversation, save to a new file: **File > Export Specified Packets**

Name resolution - turn on/off to ID host pairs by IP or hostname (if resolution info available)
Limit to display filter - inspect TCP/UDP conversations related to a filtered IP host pair

Statistics > Endpoints - displays stats like Conversations, but for single hosts
IPv4/v6 tabs support GeoIP mapping - Click 'Map' **->** Country, City, & AS #'s for each host based on IP Addr

Setup GeoIP
1. Create a 'MaxMindGeoIP' directory on your hard drive
2. Open http://dev.maxmind.com/geoip/legacy/geolite/
3. Click / save the binary / gzip files for Country, City, & ASN (IPv4 & v6); unzip to .dat files
4. Edit > Preferences > Name Resolution | GeoIP database directories
5. Click New - navigate to MaxMind dir - choose 'Other…' - click 'Open'

(its easier to enter the path in the 'Location' field or edit geo_db_paths)



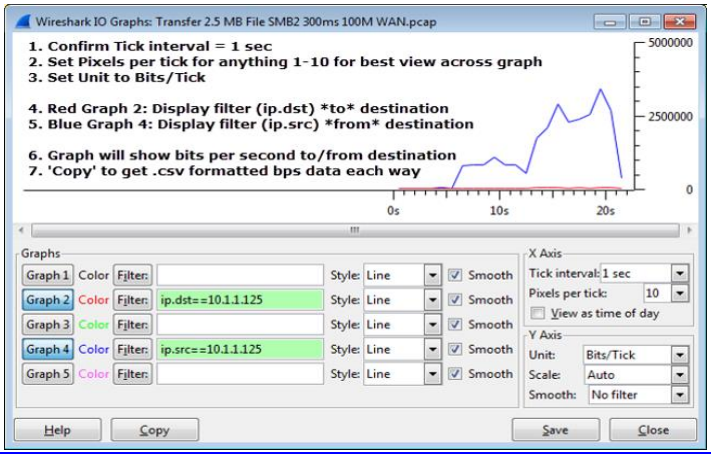
Statistics > Packet Lengths - useful for determining nominal pkt sizes
Can be used with a Display Filter setting. There shouldn't be any pkts < 40-79 bytes. 9000 byte Jumbo Packets may be enabled on 10GE intfs

Statistics > IO Graph - this is another of the MOST useful Wireshark features
This Filter IO Graph example reveals bi-directional peak application demands in bits-per-sec
You can click on a point in the IO Graph to go to that packet in the Packet List

Set **Tick interval** to smaller units to provide increased per-pkt resolution

Set **Y Axis Unit** to **Advanced** for add'l functionality - see panel on right for more options

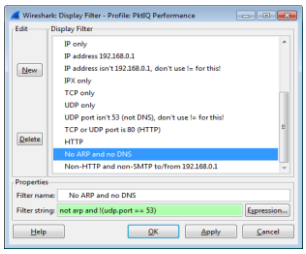
Copy the IO graph data points to save in .csv format or **Save** an image



Display Filters

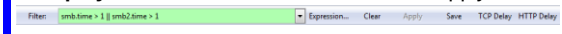
Analyze > Display Filters - select, create, delete filters

To create a new filter enter the display filter name and filter string and then click 'New'



Display filters are saved in the *dfilters* profile file

Display Filter Toolbar - enter/edit - Clear/Apply/Save



Filter opens the Display Filters window shown above
Expression... opens a window that walks you through creating a display filter - you can see all the possible filters and their extensions w/ descriptions
Save a display filter as a **Filter Expression Button** for quick and easy us of filters - very handy!! Configs for Filter Expression Buttons are saved in *preferences* files

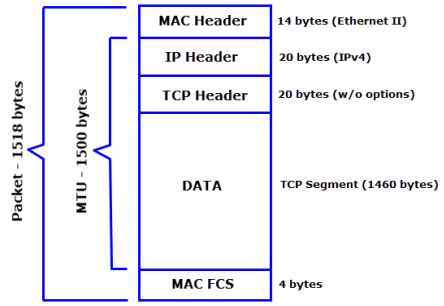
Useful Display Filters

arp	bootp	dns	dhcp6	snmp	smb
smb2	icmp	rtp	ip	ipv6	udp
tcp	http	sip			

ip.addr==10.1.1.125 && ip.addr==192.168.1.115
tcp.port==80 tcp.stream==1
Extended filter options are available for each protocol
Use Wireshark's auto-complete feature to list filters; type a protocol abbreviation and then a period to view and select a filter: Example: **tcp.analysis.xxxxxx**
There are **ip.geoip display filters** - for example:
ip and not ip.geoip.country == "United States"
Show nodes North of New York: ip.geoip.lat > 41
See http://www.wireshark.org/docs/dfref/ for more info

Packet Lengths

Most common data transfer methods use TCP/IP on Ethernet 802.3 networks supporting 1518-byte max frame sizes and a 1500-byte MTU (default in routers)



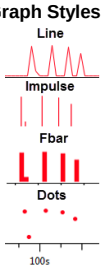
Ethernet (MAC) header + IP header + TCP header + Frame Check Sequence (FCS) = 58 bytes
1518 - 58 = 1460 byte Maximum Segment Size (MSS)

IO Graph Options

X axis intervals:
.001, .01, .1, 1, 10 sec, 1 min, 10 min
Y axis settings:
Packets - Bytes - Bits /Tick & Advanced
Scale - Auto, 10 to 2 Billion, logarithmic
Smoothing - plots a moving avg of data
Advanced Options:

SUM(*)	Adds values of a field for a tick
MIN(*)	Min value during a tick interval
AVG(*)	Avg value during a tick interval
MAX(*)	Max value during a tick interval
COUNT FRAMES(*)	# of frames containing a field or characteristic seen during the tick interval
COUNT FIELDS(*)	# of occurences of a field or characteristic seen during the tick interval
LOAD(*)	Measures response time fields only

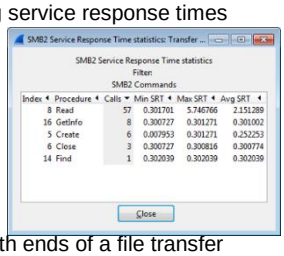
IO Graph Styles



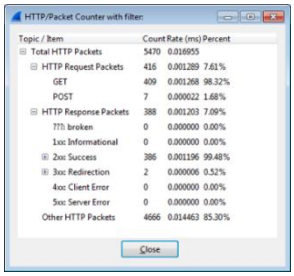
Features & Functions: Statistics & Telephony

Statistics Menu - Cont'd

Statistics > Conversation List - another way to open a Conversations window
Statistics > Endpoing List - another way to open an Endpoints window (w/ IPv4/v6 GeoIP)
Statistics > Service Response Time - tables of min, max, avg service response times for services such as SMB2. R-Click & build procedure filters **->**



Statistics > ANCP - Access Node Control Prot (DSL access)
Statistics > BACnet - Building Automation & Control Network
Statistics > BOOTP-DHCP - list of packets by type
Statistics > Collectd - info on Collectd daemon stats traffic (collector for an open source system performance project)
Statistics > Compare - supports comparing trace files from both ends of a file transfer based on IP IDs. Merge files w/ Mergecap then open & Compare (*not reliable this version*)
Statistics > Flow Graph - similar to a 'Bounce Diagram' - displays SMB2 or HTTP flows between nodes with elapsed time, Req/Resp and data flow info. Can be exported to txt file
Statistics > HART-IP - Highway Addressable Remote Transducer over IP stats



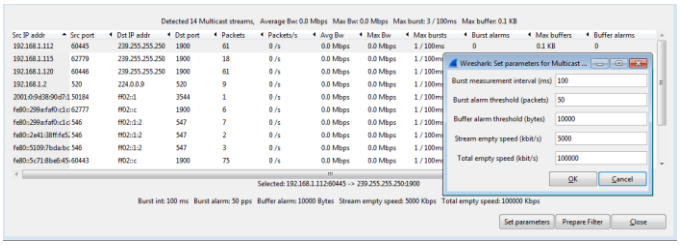
Statistics > HTTP - Packet Counter - packet distribution
Statistics > Requests - by HTTP host & list of requests
Statistics > Load Distribution - Reqs/Resps by Server

Statistics > ONC-RPC - Min/Max/Avg service response times for the ONC variation of Remote Procedure Call
Statistics > Sametime - stats for Lotus Notes Sametime

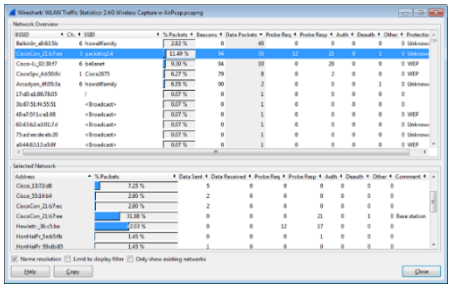
Statistics > TCP StreamGraph - **see panel on right**

Statistics > UDP Multicast Streams - multicast source, destination, port, BW, & burst info

Stream analysis / burst parameters can be set. Multicast stream sources include OSPF, IGMP, & video streams



Statistics > WLAN Traffic
Provides WLAN traffic statistics incl'd BSSID, Channel, SSID, % Packets, and summary stats of frame types
Selecting a BSSID / Ch / SSID network provides statistics for that network: address, % Packets, data sent/rcvd, and management frame counts



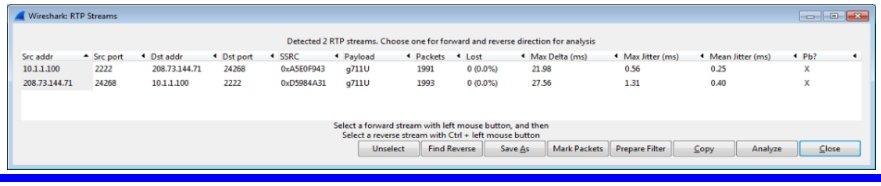
The 'rate' in stats below is packets / ms
Statistics > IP Destinations - IP **dest** addresses & pkt counts, rate, & % by protocol & port
Statistics > IP Addresses - IP addresses w/ total (src + dest) packets, rate, & % counts
Statistics > Protocol Types - total packet counts, rate (ms), & percents by protocol

Telephony Menu

Protocols for cellular radio & VoIP ntwks, SS7, etc.

Telephony > ANSI - BSMAP, DTAP, & MAP Operation A-Interface message stats
Telephony > GSM - Global System for Mobile Communications A-Interface msg stats
Telephony > H.225 - H.225 Message & Message Reason counters
Telephony > IAX2 - Inter-Asterisk stream analysis
Telephony > ISUP - ISDN User Part message Count Rate (ms) & percentages
Telephony > LTE - Long Term Evolution protocol MAC & Radio Link Control stats & graphs
Telephony > MTP3 - Message Transfer Part3 Message Signal Unit stats

Telephony > RTP > Show All Streams - lists & displays stats for RTP steams



TCP Stream Graphs

Statistics > Stream Graphs - one of the more impressive but least understood / utilized features

For ALL of the TCP Stream Graphs:

1. Click a packet in the Packet List for the direction the data is flowing (a server pkt for a server->client transfer

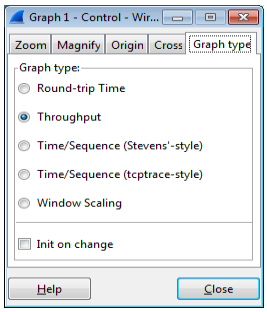
2. Statistics > TCP Stream Graph > <any graph>
If a graph is blank, select a packet in the other direction
!! Each graph is only for the selected packet's flow
Or open two graphs - one for each direction

3. Click on an area of interest and use keyboard '+' & '-' keys to zoom In/Out (Click/drag w/ mouse to zoom in)

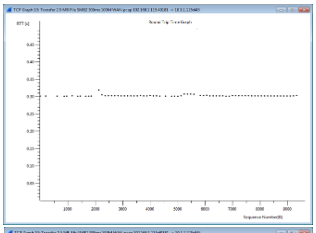
4. Use keyboard arrow keys to go Left/Right / Up/Down

5. Clicking a point in the graph takes you to that pkt

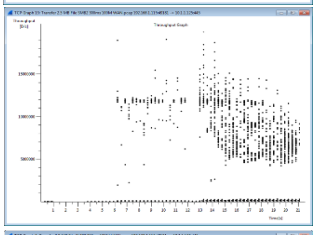
6. Along with any graph a Control window will appear - select a desired graph from the Graph Type tab



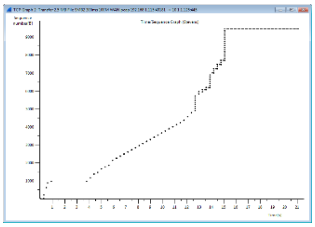
Round Trip Time
latency time between a TCP data packet and a related ACK packet. Investigate spikes or other anomalies



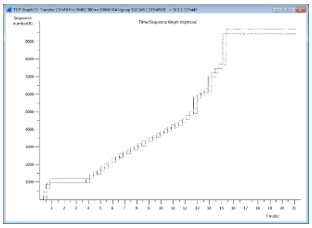
Throughput
Like an IO Graph but with dots (vs lines) and graphed in **Bytes** / sec
This graph reflects a high latency path w/ SMB2 transfer effects



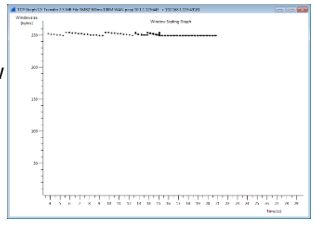
Time/Sequence (Steven's style)
Plots sequence #'s as they increase during a data transfer. Ideal plot is lower left to upper right in a smooth line.



Time/Sequence (tcptrace style)
Also plots SEQ #'s but with more info. TCP segments are plotted in an I - bar format - taller bars contain more data. Horizontal is time, vertical is Byte-based Seq #s
Grey line is the window size - when I bars reach this line you have a Zero Window (no data flow) condition.



Window Scaling
Plots calculated window size in each pkt sent.
To use select an ACK pkt from the host that is receiving data.



Features & Functions: Telephony & Tools & Internals

Telephony Menu - Cont'd

Telephony > RTP > Show All Streams - Cont'd RTP = Real-Time Transport Protocol

SSRC is the Synchronization Source Identifier that ID's a RTP stream timestamping source

Pb? indicates a problem in the RTP stream - pkt loss & errors, out of order seq #'s, etc.

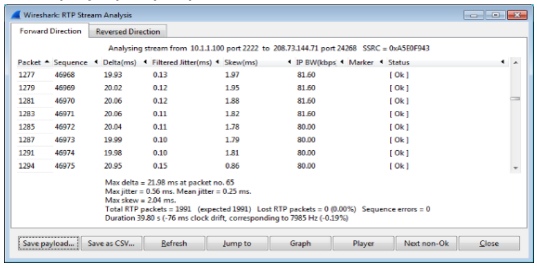
Select Fwd & Revs streams, click Analyze to open Stream Analysis window for those streams

Telephony > RTP > Stream Analysis - displays per-pkt performance stats for RTP flows

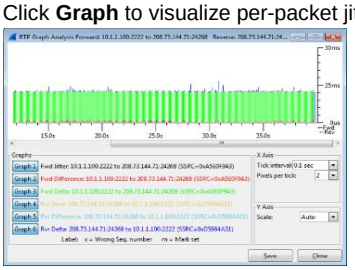
Pkt #, Seq #, time delta, jitter, skew, IP bw (kbps), end of silence marker, status, & summary stats at bottom for Fwd & Reverse directions.

Click **Save payload** & save both channels in .au format for playback.

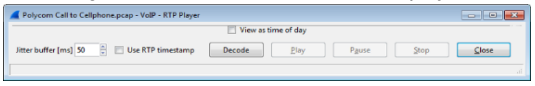
Click **Save as CSV** to save stats in csv format for analysis in Excel®.

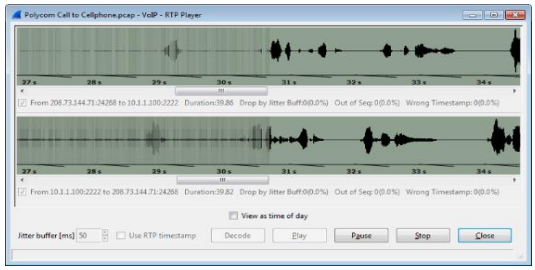


Click **Graph** to visualize per-packet jitter - adjust Tick interval & Pixels / tick for best display



Click **Player** then **Decode** to launch audio player





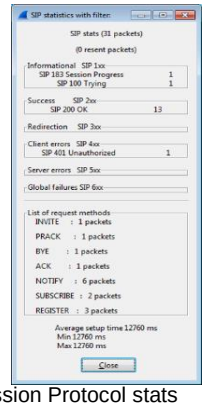
Click to **select Fwd & Rev streams** then **Play** to listen to call audio **->**

Telephony > RTSP > Packet Counter - displays Real Time Streaming Protocol request & response pkt Count Rate in pkts/ms & Percent. Resp pkts listed by resp code categories

SCTP = Stream Control Transport Protocol - transport layer protocol w/ elements of both UDP & TCP

Telephony > SCTP - Analyze & Show Associations (connections), (data) Chunk Counter

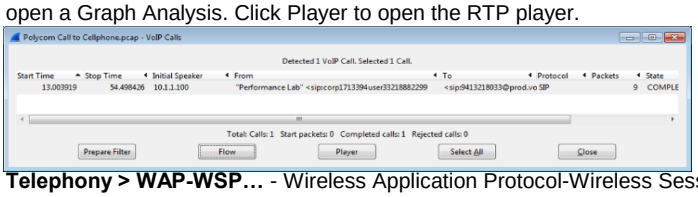
Telephony > SIP - Session Initiation Protocol stats & request methods



Telephony > SMPPOperations - Short Message Peer Protocol stats

Telephony > UCP Messages - Universal Computer Protocol stats

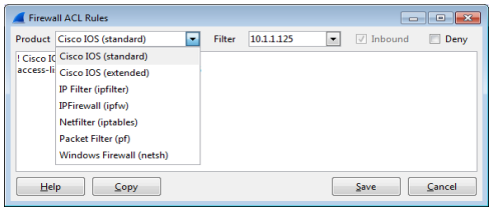
Telephony > VoIP Calls - lists VoIP calls in a capture. Click Flow to open a Graph Analysis. Click Player to open the RTP player.



Telephony > WAP-WSP... - Wireless Application Protocol-Wireless Session Protocol stats

Tools Menu

Tools > Firewall ACL Rules - creates ACL rules used by firewall products to block or allow traffic based on various characteristics found within packet traces. Click on a packet or field and launch, then Select **Product** and **Filter** options



Tools > Lua - Lua is "a powerful, fast, lightweight, embeddable scripting language" added to Wireshark for prototyping and scripting, writing dissectors, post-dissectors, and 'taps'

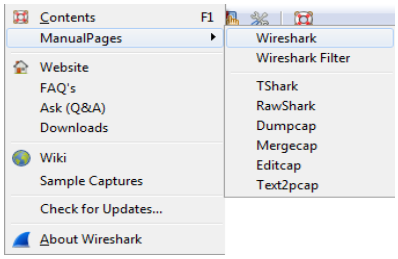
Internals Menu

Internals > Dissector tables - variables/parameters that reflect defined standards for a protocol in each dissector. See TCP & UDP port integer tables, Heuristic svcs/abbreviations

Internals > Supported Protocols - exhaustive list of all protocols supported in Wireshark.

Display Filters Fields tab lists ALL of >100,000 protocol and packet type fields recognized by Wireshark & can be used to create Display Filters - scroll right to see add'l type fields

Wireshark Help



Help > Contents (F1) - Wireshark User's Guide

Help > ManualPages - man-style html help pages

Help > Website http://www.wireshark.org

Help > FAQ's http://www.wireshark.org/faq.html

Help > Ask (Q&A) http://ask.wireshark.org

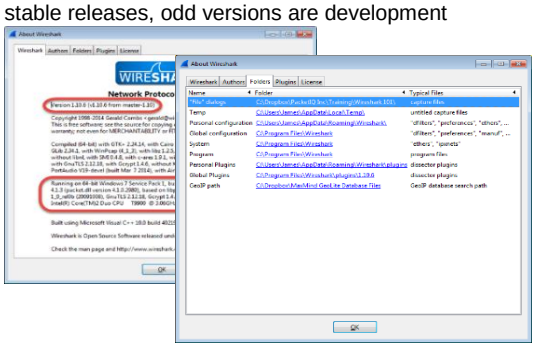
Help > Downloads http://www.wireshark.org/download.html

Help > Wiki http://wiki.wireshark.org

> Sample Captures http://wiki.wireshark.org/SampleCaptures

Help > Check for Updates... - online version check

Help > About Wireshark... > Wireshark - current version & info on your workstation! Even versions are stable releases, odd versions are development



Help > About Wireshark... > Authors - all of the developers who have made this fine tool possible

Help > About Wireshark... > Folders - very handy! Personal profile files are in Personal configuration folder Command-line utilities in Program folder - GeoIP path Double-click a link to open that folder

Main Toolbar

GET IN THE HABIT OF USING THESE - Saves Time!

Capture Toolbar Icons

Restart Capture - quick recover from bad 1st capture

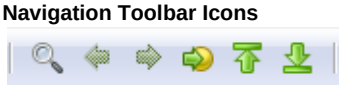
List Interfaces – Capture Options – Start – Stop – Restart Capture

Trace File Toolbar Icons

Many temp settings can be cleared by Reload File

Open File - Save File - Close File - Reload File

Navigation Toolbar Icons



Back returns to last pkt located

Find - Go Back - Fwd – Jump To – Go to First | Last Pkt

Color - Scroll - View Toolbar Icons

Pkt Coloring - Auto-Scroll **Zoom In | Out | 100% | Resize**

Filter Editors - Color Rules - Configuration - Help

View/edit filters & colors

Set Preferences

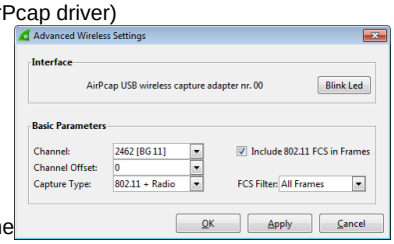
Capture Filter Editor - Display Filter Editor

Coloring Rules Editor - Preferences - Help

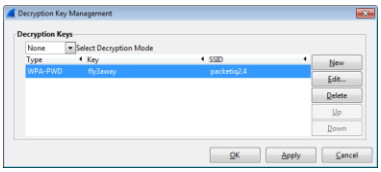
Wireless Analysis

View > Wireless Toolbar to enable / view the toolbar

Controls: **Note**: 802.11 adapters must be set to *monitor mode* (*rfmon mode*) - not all can be
802.11 Channel to capture - **Channel Offset** w/AirPcap N/NX Adapters for a "wide channel"
FCS Filter: All Frames - Valid Frames - Invalid Frames only
Decryption Method - None, Wireshark, Driver (AirPcap driver)
Advanced Wireless Settings - offers the same options you can set from the toolbar, plus:
A button to '**Blink LED**' on the AirPcap adapter
Set the **Capture Type** to:

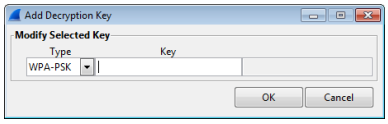


802.11 Only
802.11 + Radio (default) - prepend a 'Radiotap' pseudoheader to each frame in Packet Details pane
802.11 + PPI = prepend Per-Packet Information pseudoheader in Packet Details Pane
Include 802.11 FCS in Frames (on by default)



Decryption Keys… - Add / Edit / Delete keys
Decryption Mode - Driver, Wireshark, None
(select Wireshark to avoid saving keys in registry)

Add Decryption Key - Type, Key, SSID (not labeled)



Type: WEP - parsed as WEP key
(wep:a1:b2:c3:d4:e5)
SPA-PWD - pswd + SSID
(wpa-pwd:MyPassword:MySSID)
WPA-PSK - raw pre-shared key (wpa-psk:01020304050607…5647392)

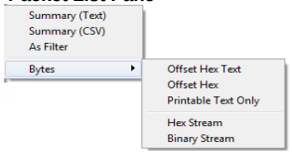
Right-Click Menus

Many Wireshark tasks can be completed **much more** quickly using Right-Click menus
Different R-Clk options are available in Packet List, Packet Details, & Packet Bytes panes, depending on where (which field) you R-Click from. All of the options in R-Clk menus are covered in previous sections, but a few specifics apply:
The Display Filter string prepared when you Right-Click and select **Apply as Filter** or **Prepare a Filter** depends on the specific packet and field you clicked from

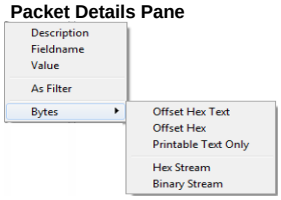
You can R-Clk > **Colorize Conversations** or create a **New Coloring Rule** - but you have to select View > Reset Coloring 1-10 (or Ctrl-Space) to remove the coloring

Right-Click > **Copy** options vary depending on the pane:

Packet List Pane



Packet Details Pane



R-Clk > **Protocol Preferences** offers a selection of the preferences options for the highest layer protocol in that pkt

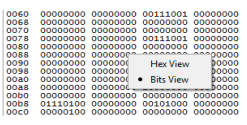
R-Clk on a protocol layer header & select **Expand Subtrees** to expand all of the headers UNDER that protocol layer, or **Expand All** / **Collapse All** to affect all the protocol layers

R-Clk > **Apply as Column** in Packet Details is a quick way to add a Pkt List pane column of the selected field values

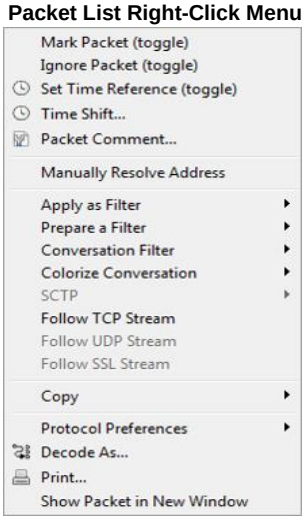
R-Clk > **Wiki Protocol Page**, **Filter Field Reference**, & **Protocol Help** offers info based on the protocol/field selected

Packet Bytes R-Clk Menu

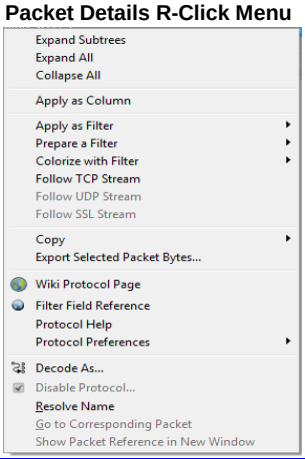
R-Clk > **Hex View** displays Packet Bytes contents as Hex octets & their ascii derivative (if possible)
R-Clk > **Bits View** displays each packet byte in 1's & 0's



Packet List Right-Click Menu



Packet Details R-Click Menu

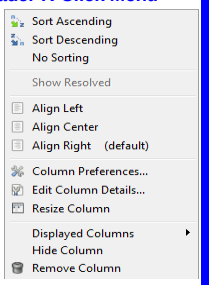


Wireless Adapters

Wireless capture on on ANY channel w/o association requires AirPcap adapters like AirPCap NX USB 802.11a/b/g/n (capture + injection)
Catalog: http://www.cacetech.com/products/catalog/
AirPcap Driver: *Can use up to 3 adapters for Ch 1+6+11*
https://support.riverbed.com/content/support/software/cascade/airpcap.html
Bug Fix: if the Wireless Toolbar stays greyed out with an AirPcap adapter installed - open Capture Options, Dbl-Click on the AirPcap entry, click OK, then Start

Packet List Columns

Column Header R-Click Menu



R-Clk > **Sort** options are quicker to do by just clicking a column header multiple times

R-Clk a column header and select **Align Left** - **Center** - **Right** or **Resize Column**

You can **click & drag** a column to another location in the Packet List

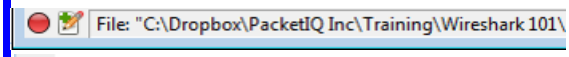
R-Clk > **Column Preferences** brings up Preferences window for selecting / customizing columns

R-Clk > **Edit Column Details** allows modification of the Title, Field type, Field name, and occurrence (for filters that match more than one field in a packet)

R-Clk > **Displayed Columns** list all available columns, which are currently displayed, and the ability to select

R-Clk > **Hide Column** hides (but does not delete) the selected column from being displayed in Packet List
RC > **Remove Column** deletes a column permanently

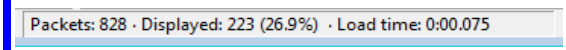
Status Bar



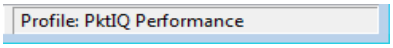
Expert Info Button - click to bring up Expert Infos
Button color indicates highest analysis level:
Red Errors Yellow Warnings
Cyan Notes Blue Chats
Green Packet comments, but no Errors / Warnings / Notes
Grey No Expert Info items

Trace File Annotation Button - Add / Edit / Cancel comments about the entire trace file

File Information Column - path/directory & file name, file size, & packet capture duration

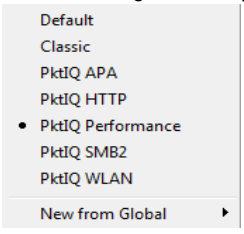


Packet Information Column - displays Packet counts: Total - Displayed - Marked - Dropped (during capture)

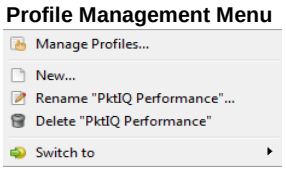


Profile Column - Click to select profiles / Right-Click to select Manage Profile options

Profile Selection Menu



Profile Management Menu



Working with Time

There are several Wireshark time fields available

Absolute (actual capture date/times)
Absolute date & time - actual capture date and time based on the time zone of analysis host
Absolute time - actual capture time (no date) based on time zone of analysis host

Relative (to start of capture)
Relative time - time from the first packet in a trace file
Relative time (conversation) - time from the first packet in the trace file for the conversation
Time (format as specified) - this setting displays a value set using View > Time Display Format

Delta (from previous frames)
Delta time (frame.time_delta) - end of the current frame from the end of the prevoius frame
Delta time (conversation) - end of one packet to the end of the next packet *in a conversation*
Delta time displayed - end of one packet to the end of next packet *of displayed packets only*

Wireshark saves a GMT/UTC offset value of the capture machine in the packet trace file, and converts the timestamps to the number of seconds since the UNIX 'epoch' - # of seconds since Jan 1, 1970 @ 00:00:00 GMT. When the trace file is opened the GMT/UTC offset is again applied to display the timestamps. **If a capture from one time zone is viewed in another time zone, the absolute date/time stamps will be off by the difference in the time zones.**

Selecting Wireshark Time Displays

You need to know when an event occurred in a capture
Absolute Time: locating events related to user reports / logs
Relative Time: how far into a capture an event occurred

You need the delay between pkts in a conversation, especially responses to requests
Delta time: time between packets *in a conversation*

This example shows the differences between Abs, Rel, Frame Delta, and Displayed Delta times:

Frame #	Abs Time	Rel Time	Frame Delta Time	Delta Time Displ	Info
1	2014-06-29 18:16:08.057411	0.000000	0.000000000	0.000000	54581 > http [SYN] Seq=0 Win=8
2	2014-06-29 18:16:08.076586	0.019175	0.019175000	0.019175	http > 54581 [SYN, ACK] Seq=0
3	2014-06-29 18:16:08.076634	0.019223	0.000048000	0.000048	54581 > http [ACK] Seq=1 Ack=1
4	2014-06-29 18:16:08.076860	0.019449	0.000226000	0.000226	GET / HTTP/1.1
5	2014-06-29 18:16:08.102400	0.044989	0.025540000	0.025540	http > 54581 [ACK] Seq=1 Ack=6
6	2014-06-29 18:16:08.239464	0.182053	0.137064000	0.137064	HTTP/1.1 200 OK (text/html)

Abs Time steadily increases… as does **Relative time**
Frame Delta Time varies - is the difference between frames
Delta Time Displayed is diff between displayed frames
Also see: tcp.time_relative & tcp.time_delta times for TCP
Create multiple time columns and Show / Hide as needed

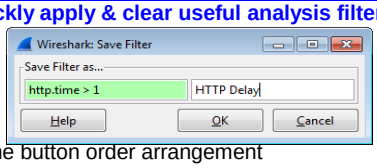
GET / is request for a homepage
ACK comes 25.5 ms later
First Byte resp 137 ms after that
Total First Byte RT is 163 ms
(with a network RTT of 19 ms)

Enable 'calculate conversation timestamps' in TCP Preferences to support delta times

Filter Expression Buttons

One of the best new features in Wireshark - quickly apply & clear useful analysis filters

1. Prepare & test a Display Filter
2. Click 'Save' on Display Filter Toolbar
3. Enter a button name - OK



These are saved in your Personal Configuration *preferences* file. Edit this file manually to change the button order arrangement

Command Line Utilities

Tshark or **Dumpcap** for packet captures
tshark -h or dumpcap -h for options
-D to get list of interfaces - use intf # in cmd
-f <capture filter> in BPF format
-i <interface name or #>
-w <outfile> (pcap format)
Ex: tshark -i 2 -w tcapture.pcap
dumpcap -i 2 -f "host 192.168.1.116"
-b filesize:100000 -b files:3 -w capture.pcap
Ctrl-C to stop capture

Mergecap to merge packet trace files
mergecap -h for options
mergecap -w <outfile> <infile> <infile> [<inf…
-s <snaplen> - truncate to <snaplen> bytes
Ex: mergecap -w outfile.pcap infile1.pcap infile2.pcap infile3.pcap -s 128

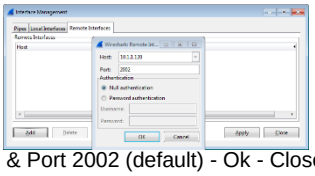
Editcap to edit trace files -h for options
editcap [options] <infile> <outfile>
[<pkt #> [-<pkt #>] … (start @ Pkt # or range)
-A <start time> -B <stop> (YYYY-MM-DD hh:mm:ss)
-d remove duplicate packets (def window = 5)
-D <dup window> (0 to 1000000 pkts)
-w <dup time window> (rel sec e.g. 0.000001)
-t <time adjustment> - in rel sec e.g. -0.5 | 60
-c <pkts per file> -i <sec per file>
Ex: split a large trace file into multiple smaller files of 600 seconds: (outfiles will be #'d)
editcap -i 600 infile.pcap outfile_.pcap

Capinfos to get trace info -h for options
capinfos [options] <infile>
-c # of pkts -d data size -u capture dur (s)
Ex: capinfos -cdu MyCapture.pcap

Remote Captures (Windows only)

Install WinPcap & start rpcapd.exe on remote machine
CMD window - navigate to WinPcap install directory
rpcapd -n (C:\Program Files (x86)\WinPcap\ )
You can use a -l (lower case 'L') with rpcapd to specify which hosts can connect. **rpcapd -h** for help

Wireshark:
Capture Options > Manage Interfaces > Remote Interfaces > Add - enter remote machine's IP address & Port 2002 (default) - Ok - Close

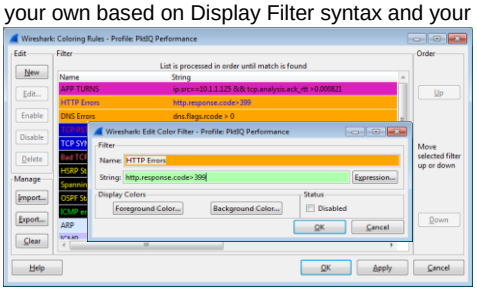


Capture Options:
Un-select unwanted interfaces - the desired intf will have the correct IP address listed under the Interface ID
Click **Start** - Click OK and ignore the capture buffer msg

Be aware that captured packets are sent from the remote machine to the controlling Wireshark machine

Coloring Rules

Colorization can be an effective tool for identifying and highlighting packets of interest. Wireshark has predefined coloring rules in a default file (colorfilters). But… sometimes too many colors can be distracting. Turn off most default rules, leave useful ones on or add your own based on Display Filter syntax and your colors



New / **Edit** / **Delete** - create, edit, or delete a rule
New/Edit: name, display filter string, fg and bg color
Enable / **Disable** - turn a rule on/off w/o deleting it
Up / **Down** - change the rule order. Wireshark evalutes coloring rules from top to bottom - first match is used, so you should **put more specific rules near the top**
Import / **Export** - import or share coloring rule files
Clear - remove all personal rules & revert to default rules
Import / **Export** - import or share coloring rule files
Clear - remove all personal rules & revert to default rules

Analysis Tips

1. Turn off TCP releative sequence numbers to match captures from 2 or more locations by SEQ/ACK #'s
2. Turn off 'Allow subdissector to reassemble TCP streams' with HTTP to get 1st Byte response times
3. http.response.code > 399 to see HTTP err msgs
4. Disable Checksum Validations to eliminate false errs
5. Clear Win DNS cache: ipconfig / flushdns
   Linux: restart nscd (name service cache daemon)
6. Clear Win arp cache (elevated CMD): arp -d -a
7. WS frame dissector calcs / adds frame meta-data:
   frame # & timestamp - frame length & captured len
   coloring rules applied & coloring rule string