Wireshark Plugins for Pentesters

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What is it?

What is it?

- **Collection of Wireshark plugins to perform**
  - Macro analysis
  - Providing summary or overview
  - Dissecting unknown protocols
  - Detecting attacks/threats

- Covered protocols
  - WiFi
  - DNS
  - DHCP
  - HTTP, HTTPS

- **GitHub:** http://www.github.com/pentesteracademy/patoolkit

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Introduction to Wireshark Plugins

Motivation

- Macro analysis
- Custom/Proprietary protocols
- Scaling detection logic (i.e. automating detection)
- Wireshark available everywhere, well maintained, free

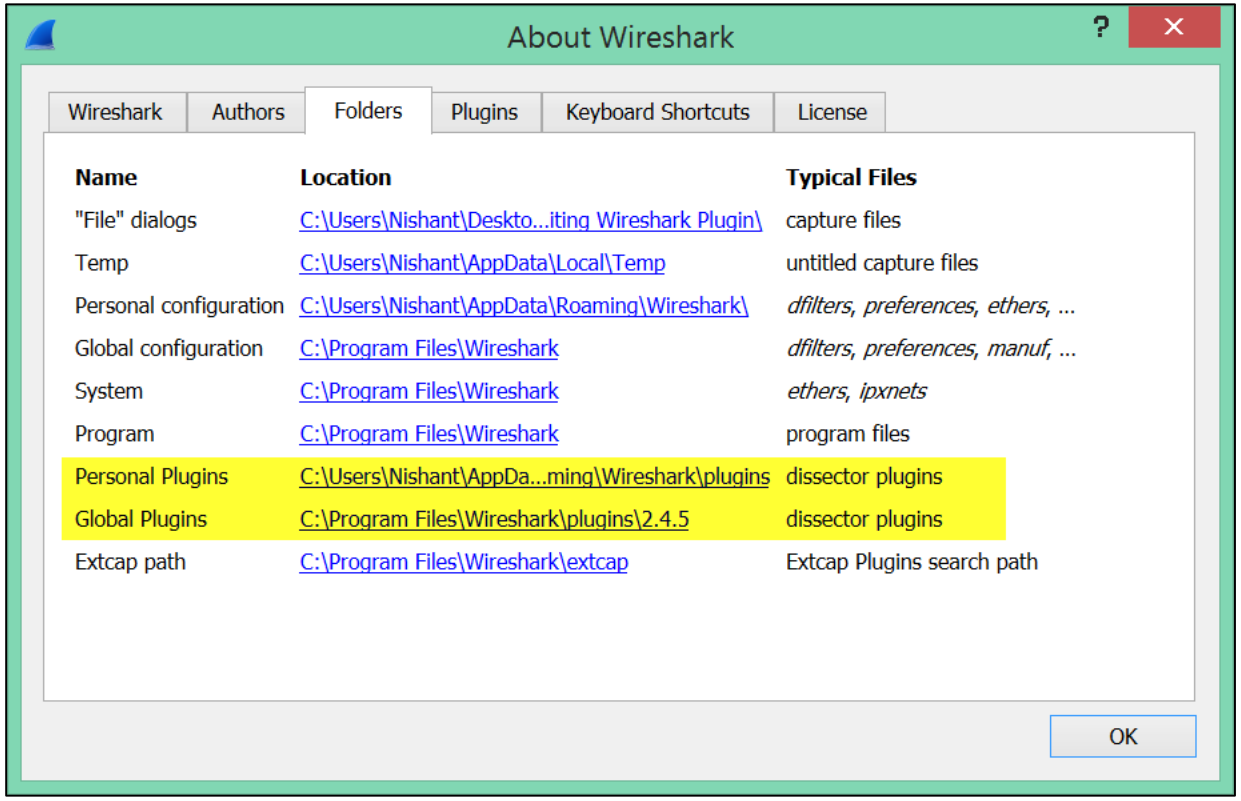
Wireshark Plugins

- plugins for various purposes
- Plugins can be
  - Lua scripts
  - Compiled C/C++ code

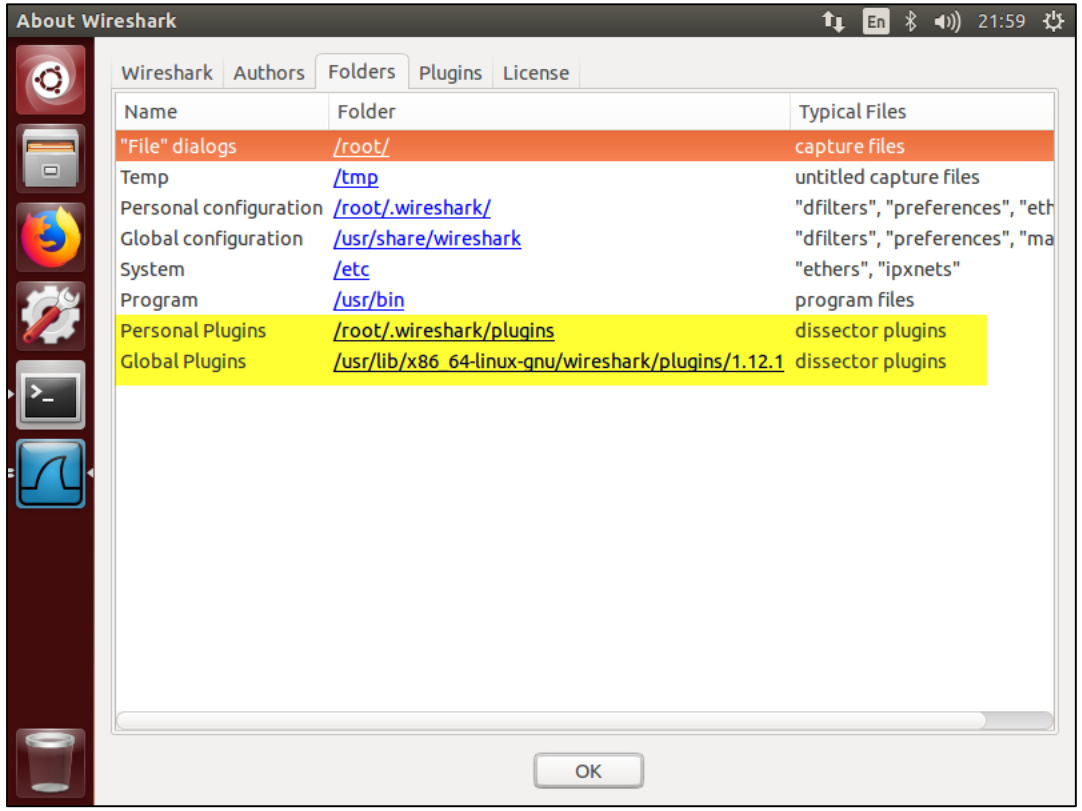
Plugins locations

- Check Help > About Wireshark > Folders

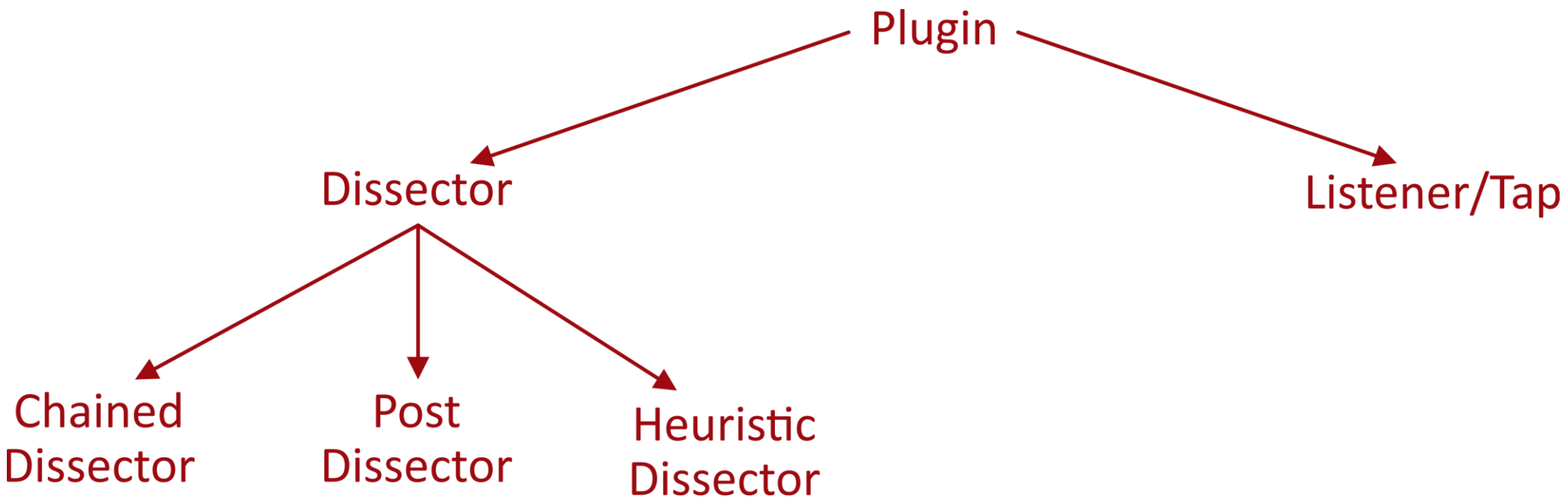
Windows



Ubuntu



Wireshark Plugins Types



Dissector

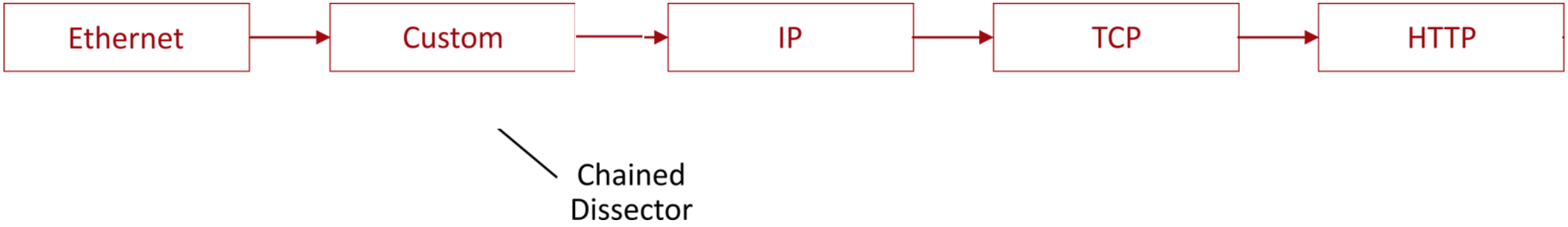
- To interpret the payload data
- Decodes its part of the protocol and passes the payload to next

Example Dissection Flow

Chained Dissector

- Takes data from previous dissector, processes its part and pass the payload to next dissector

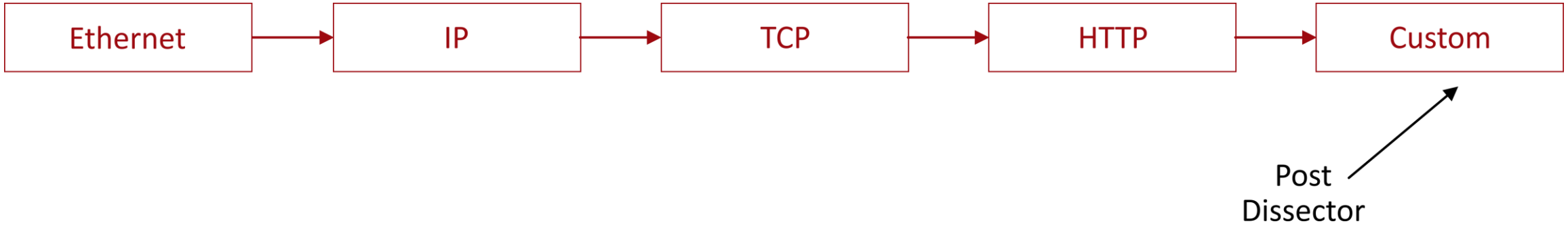
Example Dissection Flow



Post Dissector

- Last dissector in the dissector chain

Example Dissection Flow



Writing Hello World Listener

Writing a Listener: Proposal

- A sample Hello World listener

Why?

- Understanding various aspects
- Getting started with plugin development

Writing a Hello World Listener

- **Lua File:** hello_world_listener.lua
- **Example PCAP:** Complete_normal_call.pcap

Code Walkthrough

- Check if GUI is enabled. Done to make sure, it doesn't run and fail when tshark is used

```
-- If GUI is not enabled exit.
if not gui_enabled() then return end
```

Writing a Hello World Listener

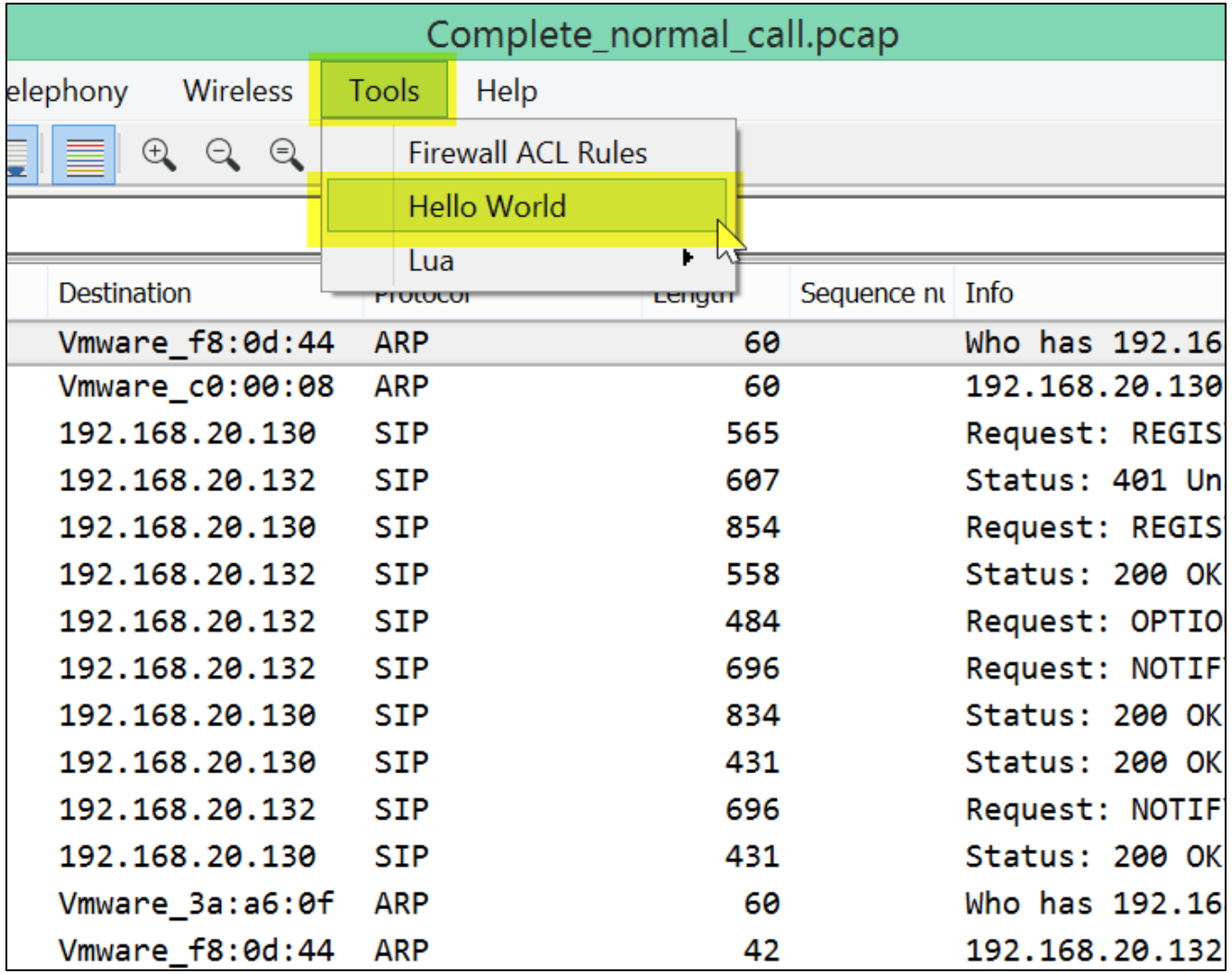
- Main function to create pop up windows and showing content in it

```
-- Function to be called on selecting the option from Tools menu
local function dialog_menu()

  -- Create a new Window with "Hello World Title"
  local win = TextWindow.new("Hello World !");

  -- Printing Hello World!!! in the Window
  win:set(" Hello World!!! ")

end
```

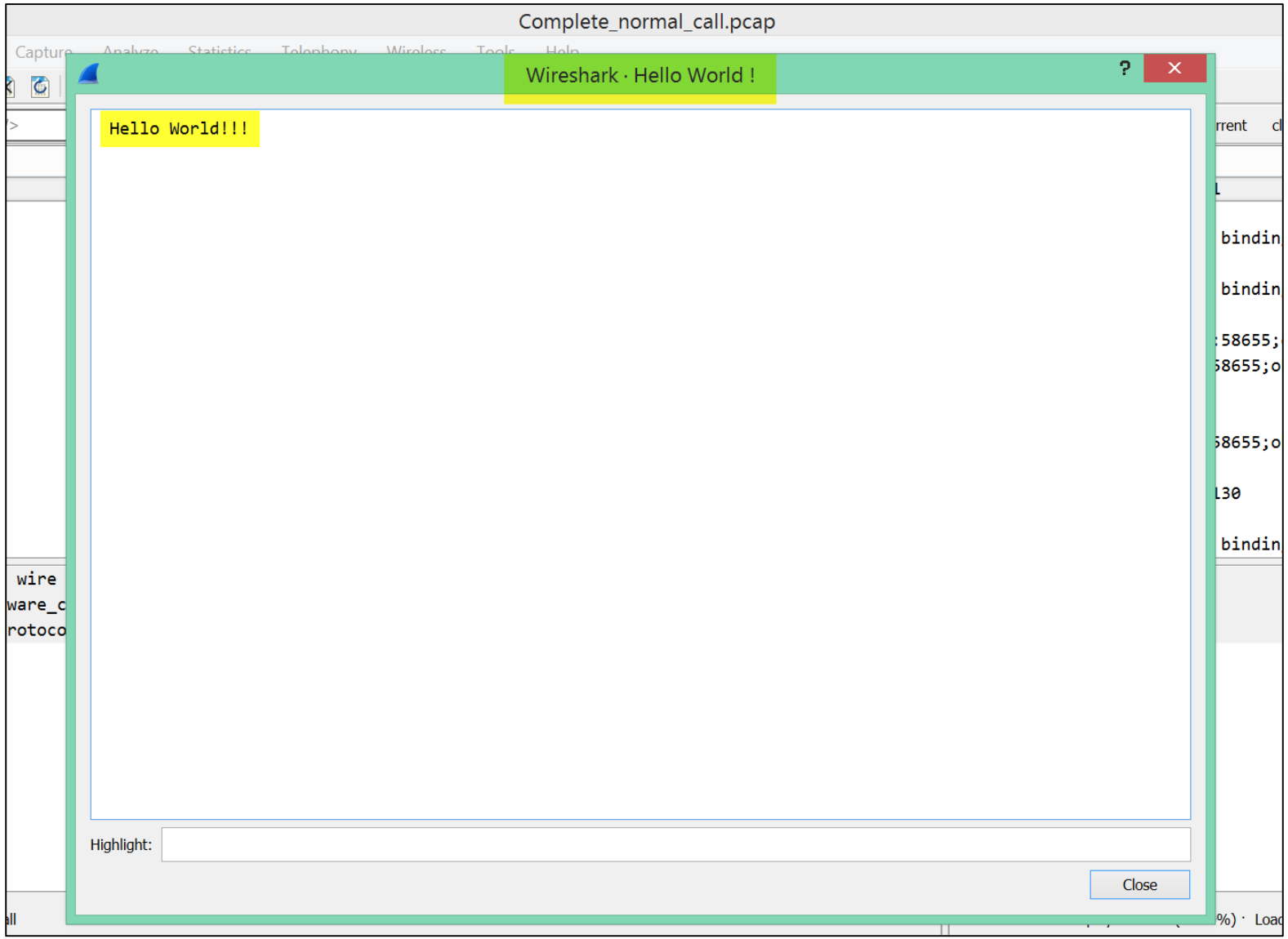
- Registering function with Tool menu

```
-- Register the function to Tools menu
register_menu("Hello World",dialog_menu, MENU_TOOLS_UNSORTED)
```

Hello World Listener: Tools Menu Entry



Hello World Listener: Output



Writing Hello World Dissector

Writing a Dissector: Proposal

- A Hello World dissector to add new protocol to protocol tree
- Dissector will add “Hello World” to all packets
- **Lua file:** hello_world_dissector.lua
- **Example PCAP:** Complete_normal_call.pcap

Writing a Hello World Dissector

- Defining global variables and fields

```
-- Defining Proto Object
local world= Proto("hello_world","Hello World")

-- Defining fields for our protocol
local hello_world=ProtoField.string("hello_world.hello_world","Hello World")

-- Registering fields to our protocol
world.fields={
hello_world
}
```

Writing a Hello World Dissector

- Dissector function, to add protocol tree and elements

```
function world.dissector(tvbuf,pktinfo,root)

 -- Packet legth
 local pktlen=tvbuf:reported_length_remaining()

 -- Creating a tree for our protocol
 local tree=root:add(world,tvbuf:range(0,pktlen))

 -- Adding fields and corresponding value to the tree
 tree:add(hello_world,"Hello")

end
```

Writing a Hello World Dissector

- Registering the dissector

```
-- Registering our protocol as post dissector
register_postdissector(world)
```

Hello World Dissector: Before

Complete_normal_call.pcap

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression... + torrent cleanup_own_ssid cleanup_probe

No.	Time	Source	Destination	Protocol	Length	Sequence nu	Info
366	23.539017	192.168.20.1	192.168.20.130	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0x294823, Seq=5229, Time=11200
367	23.540170	192.168.20.130	192.168.20.132	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0xAFD8AB5, Seq=20595, Time=11200
368	23.540675	192.168.20.132	192.168.20.130	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0x43572C47, Seq=29428, Time=11200
369	23.540996	192.168.20.130	192.168.20.1	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0x3C988166, Seq=25721, Time=11200
370	23.558827	192.168.20.1	192.168.20.130	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0x294823, Seq=5230, Time=11360
371	23.559261	192.168.20.130	192.168.20.132	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0xAFD8AB5, Seq=20596, Time=11360
372	23.560761	192.168.20.132	192.168.20.130	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0x43572C47, Seq=29429, Time=11360
373	23.561106	192.168.20.130	192.168.20.1	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0x3C988166, Seq=25722, Time=11360
374	23.578996	192.168.20.1	192.168.20.130	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0x294823, Seq=5231, Time=11520
375	23.579711	192.168.20.130	192.168.20.132	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0xAFD8AB5, Seq=20597, Time=11520
376	23.581088	192.168.20.132	192.168.20.130	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0x43572C47, Seq=29430, Time=11520
377	23.581450	192.168.20.130	192.168.20.1	RTP	214		PT=ITU-T G.711 PCMU, SSRC=0x3C988166, Seq=25723, Time=11520

```
▷ Frame 370: 214 bytes on wire (1712 bits), 214 bytes captured (1712 bits)
▷ Ethernet II, Src: Vmware_c0:00:08 (00:50:56:c0:00:08), Dst: Vmware_f8:0d:44 (00:0c:29:f8:0d:44)
▷ Internet Protocol Version 4, Src: 192.168.20.1, Dst: 192.168.20.130
▷ User Datagram Protocol, Src Port: 4000, Dst Port: 15674
▷ Real-Time Transport Protocol
```

Hello World Dissector: After

Complete_normal_call.pcap

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression... + torrent cleanup_own_ssid cleanup_probe

No.	Time	Source	Destination	Protocol	Length	Sequence nu	Hello World	Info
365	23.520490	192.168.20.130	192.168.20.1	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0x3C988166, Seq=25720, Time=1
366	23.539017	192.168.20.1	192.168.20.130	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0x294823, Seq=5229, Time=1120
367	23.540170	192.168.20.130	192.168.20.132	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0xAFD8AB5, Seq=20595, Time=11
368	23.540675	192.168.20.132	192.168.20.130	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0x43572C47, Seq=29428, Time=1
369	23.540996	192.168.20.130	192.168.20.1	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0x3C988166, Seq=25721, Time=1
370	23.558827	192.168.20.1	192.168.20.130	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0x294823, Seq=5230, Time=1136
371	23.559261	192.168.20.130	192.168.20.132	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0xAFD8AB5, Seq=20596, Time=11
372	23.560761	192.168.20.132	192.168.20.130	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0x43572C47, Seq=29429, Time=1
373	23.561106	192.168.20.130	192.168.20.1	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0x3C988166, Seq=25722, Time=1
374	23.578996	192.168.20.1	192.168.20.130	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0x294823, Seq=5231, Time=1152
375	23.579711	192.168.20.130	192.168.20.132	RTP	214		✓	PT=ITU-T G.711 PCMU, SSRC=0xAFD8AB5, Seq=20597, Time=11

```
▷ Frame 372: 214 bytes on wire (1712 bits), 214 bytes captured (1712 bits)
▷ Ethernet II, Src: Vmware_3a:a6:0f (00:0c:29:3a:a6:0f), Dst: Vmware_f8:0d:44 (00:0c:29:f8:0d:44)
▷ Internet Protocol Version 4, Src: 192.168.20.132, Dst: 192.168.20.130
▷ User Datagram Protocol, Src Port: 4000, Dst Port: 16912
▷ Real-Time Transport Protocol
◢ Hello World
    Hello World: Hello
```

This one

Hello World Dissector: After

- Applying Hello World tree element as Column

Complete_normal_call.pcap

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/> Expression... + torrent cleanup_own_ssid cleanup_probe

No.	Time	Source	Destination	Protocol	Length	Sequence nu	Hello World	Info
365	23.520490	192.168.20.130	192.168.20.1	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0x3C988166, Seq=25720, Time=1
366	23.539017	192.168.20.1	192.168.20.130	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0x294823, Seq=5229, Time=1120
367	23.540170	192.168.20.130	192.168.20.132	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0xAFD8AB5, Seq=20595, Time=11
368	23.540675	192.168.20.132	192.168.20.130	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0x43572C47, Seq=29428, Time=1
369	23.540996	192.168.20.130	192.168.20.1	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0x3C988166, Seq=25721, Time=1
370	23.558827	192.168.20.1	192.168.20.130	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0x294823, Seq=5230, Time=1136
371	23.559261	192.168.20.130	192.168.20.132	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0xAFD8AB5, Seq=20596, Time=11
372	23.560761	192.168.20.132	192.168.20.130	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0x43572C47, Seq=29429, Time=1
373	23.561106	192.168.20.130	192.168.20.1	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0x3C988166, Seq=25722, Time=1
374	23.578996	192.168.20.1	192.168.20.130	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0x294823, Seq=5231, Time=1152
375	23.579711	192.168.20.130	192.168.20.132	RTP	214		Hello	PT=ITU-T G.711 PCMU, SSRC=0xAFD8AB5, Seq=20597, Time=11

```
▷ Frame 370: 214 bytes on wire (1712 bits), 214 bytes captured (1712 bits)
▷ Ethernet II, Src: Vmware_c0:00:08 (00:50:56:c0:00:08), Dst: Vmware_f8:0d:44 (00:0c:29:f8:0d:44)
▷ Internet Protocol Version 4, Src: 192.168.20.1, Dst: 192.168.20.130
▷ User Datagram Protocol, Src Port: 4000, Dst Port: 15674
▷ Real-Time Transport Protocol
◢ Hello World
    Hello World: Hello
```

This one

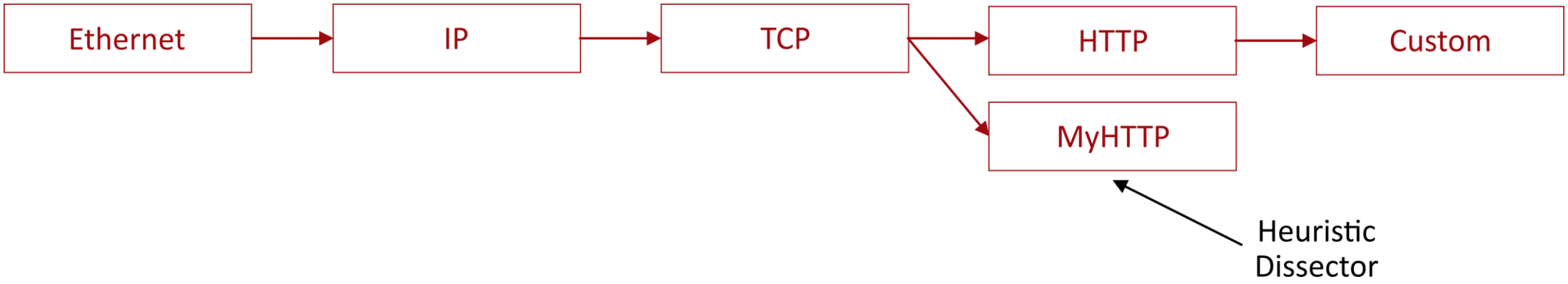
Heuristic Dissector

Heuristic Dissector

- Identifies the protocol on the basis of heuristics
- Heuristics can be
  - Average size or size range of the packets
  - Specific codes or strings in the header or the payload
- Useful when port based detection fails i.e. protocols operating on non standard ports (e.g. DNS server running on port 8089)

Heuristic Dissector

Example Dissection Flow



Note: The heuristic dissector will only give result if no existing dissector is able to identify the packet

Example: DNS heuristic dissector

Lua File: dns_dissector.lua

File Source:
https://wiki.wireshark.org/Lua/Examples?action=AttachFile&do=get&target=dissector.lua

Heuristic Dissector: DNS Server on Port 8089

DNS_traffic_server port_8089.pcapng

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Protocol	Destination	Length	Info
11	4.555392055	192.168.1.16	SSDP	239.255.255.250	216	M-SEARCH * HTTP/1.1
12	5.114518734	192.168.1.115	DB-LS…	192.168.1.255	188	Dropbox LAN sync Discovery Protocol
13	5.462842742	192.168.1.33	UDP	192.168.1.104	74	46191 → 8089 Len=32
14	5.463360963	192.168.1.104	UDP	192.168.1.33	90	8089 → 46191 Len=48

```
▷ Frame 13: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0
▷ Ethernet II, Src: HewlettP_4b:06:c9 (48:0f:cf:4b:06:c9), Dst: CompalIn_4b:c4:4d (f8:a9:63:4b:c4:4d)
▷ Internet Protocol Version 4, Src: 192.168.1.33, Dst: 192.168.1.104
◢ User Datagram Protocol, Src Port: 46191, Dst Port: 8089
    Source Port: 46191
    Destination Port: 8089
    Length: 40
    Checksum: 0xf239 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 7]
◢ Data (32 bytes)
    Data: 26da0100000100000000000003777777706676f6f676c6503...
    [Length: 32]
```

```
0000  f8 a9 63 4b c4 4d 48 0f  cf 4b 06 c9 08 00 45 00   ..cK.MH. .K....E.
0010  00 3c cb 4f 00 00 40 11  2b 88 c0 a8 01 21 c0 a8   .<.O..@. +....!..
0020  01 68 b4 6f 1f 99 00 28  f2 39 26 da 01 00 00 01   .h.o...( .9&.....
0030  00 00 00 00 00 00 03 77  77 77 06 67 6f 6f 67 6c   .......w ww.googl
0040  65 03 63 6f 6d 00 00 01  00 01                     e.com... ..
```

Heuristic Dissector: Identifying DNS Traffic

DNS_traffic_server port_8089.pcapng

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

mydns

No.	Time	Source	Protocol	Destination	Length	Info
13	5.462842742	192.168.1.33	MYDNS	192.168.1.104	74	Query (9946) www.google.com
14	5.463360963	192.168.1.104	MYDNS	192.168.1.33	90	Response (9946) www.google.com
15	5.463688094	192.168.1.33	MYDNS	192.168.1.104	74	Query (40285) www.google.com
16	5.565232771	192.168.1.104	MYDNS	192.168.1.33	102	Response (40285) www.google.com

```
▷ Frame 13: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0
▷ Ethernet II, Src: HewlettP_4b:06:c9 (48:0f:cf:4b:06:c9), Dst: CompalIn_4b:c4:4d (f8:a9:63:4b:c4:4d)
▷ Internet Protocol Version 4, Src: 192.168.1.33, Dst: 192.168.1.104
◢ User Datagram Protocol, Src Port: 46191, Dst Port: 8089
    Source Port: 46191
    Destination Port: 8089
    Length: 40
    Checksum: 0xf239 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 7]
  [Heuristic dissector used]
◢ MyDNS Protocol
    Transaction ID: 9946
  ▷ Flags: 0x0100
    Number of Questions: 1
    Number of Answer RRs: 0
    Number of Authority RRs: 0
    Number of Additional RRs: 0
  ▷ Queries
```

Heuristic Dissector for DNS

- Defining heuristic function

```
-- Note: this heuristic stuff is new in 1.11.3
local function heur_dissect_dns(tvbuf,pktinfo,root)
    dprint2("heur_dissect_dns called")
```

- Factor 1: Length should be greater than DNS header length

```
-- the length should be greater then DNS header length
if tvbuf:len() < DNS_HDR_LEN then
    dprint("heur_dissect_dns: tvb shorter than DNS_HDR_LEN of:",DNS_HDR_LEN)
    return false
end
```

Heuristic Dissector for DNS

- Factor 2: Opcode has to be one of 0, 1 , 2, 4, 5

```
-- the opcode has to be 0, 1, 2, 4 or 5
-- the opcode field starts at bit offset 17 (in C-indexing), for 4 bits in length
local check = tvbr:bitfield(17,4)
if check == 3 or check > 5 then
    dprint("heur_dissect_dns: invalid opcode:",check)
    return false
end
```

- Factor 3: Rcode has to be 0-10, 16-22

```
-- the rcode has to be 0-10, 16-22 (we're ignoring private use rcodes here)
-- the rcode field starts at bit offset 28 (in C-indexing), for 4 bits in length
check = tvbr:bitfield(28,4)
if check > 22 or (check > 10 and check < 16) then
    dprint("heur_dissect_dns: invalid rcode:",check)
    return false
end
```

Heuristic Dissector for DNS

- Factor 4: Number of queries and answers should be reasonable

```
-- now let's verify the number of questions/answers are reasonable
check = tvbr:range(4,2):uint()  -- num questions
if check > 100 then return false end
check = tvbr:range(6,2):uint()  -- num answers
if check > 100 then return false end
check = tvbr:range(8,2):uint()  -- num authority
if check > 100 then return false end
check = tvbr:range(10,2):uint() -- num additional
if check > 100 then return false end
```

- Register the function

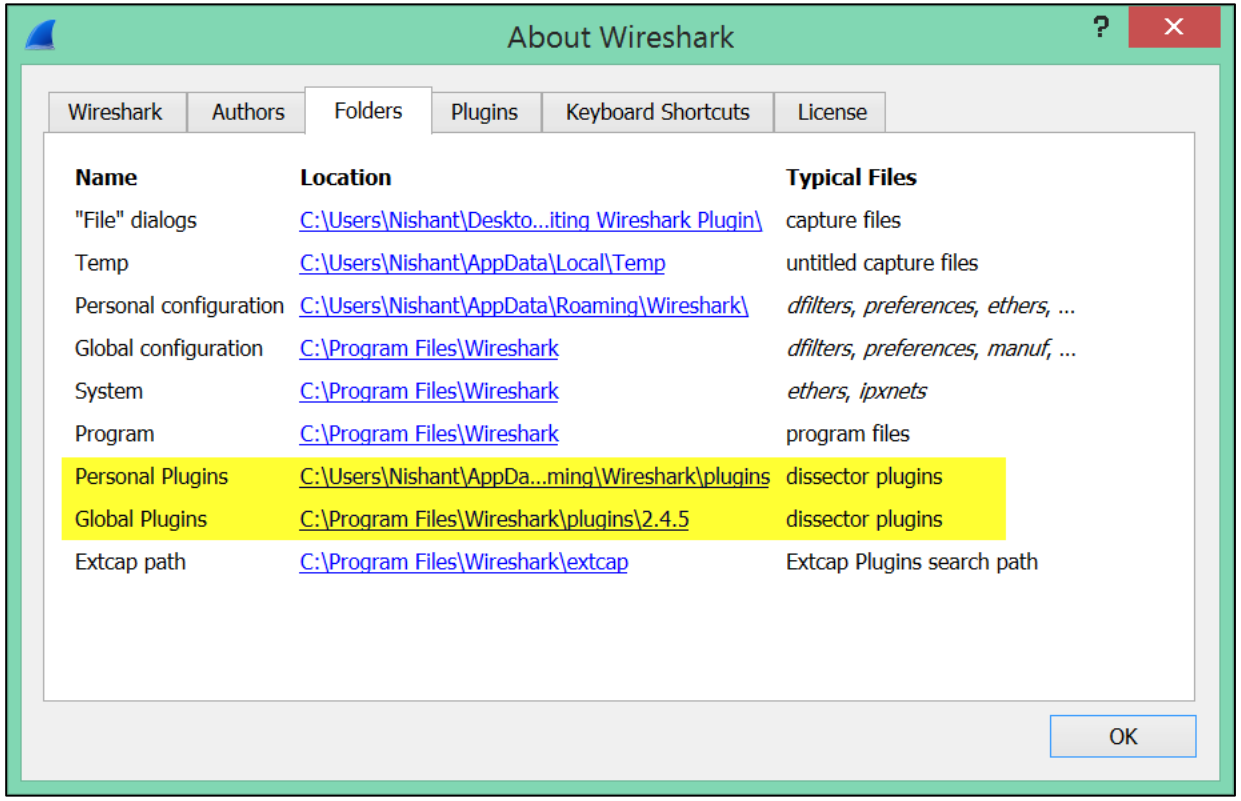
```
-- now register that heuristic dissector into the udp heuristic list
dns:register_heuristic("udp",heur_dissect_dns)
```

PA Toolkit: WiFi

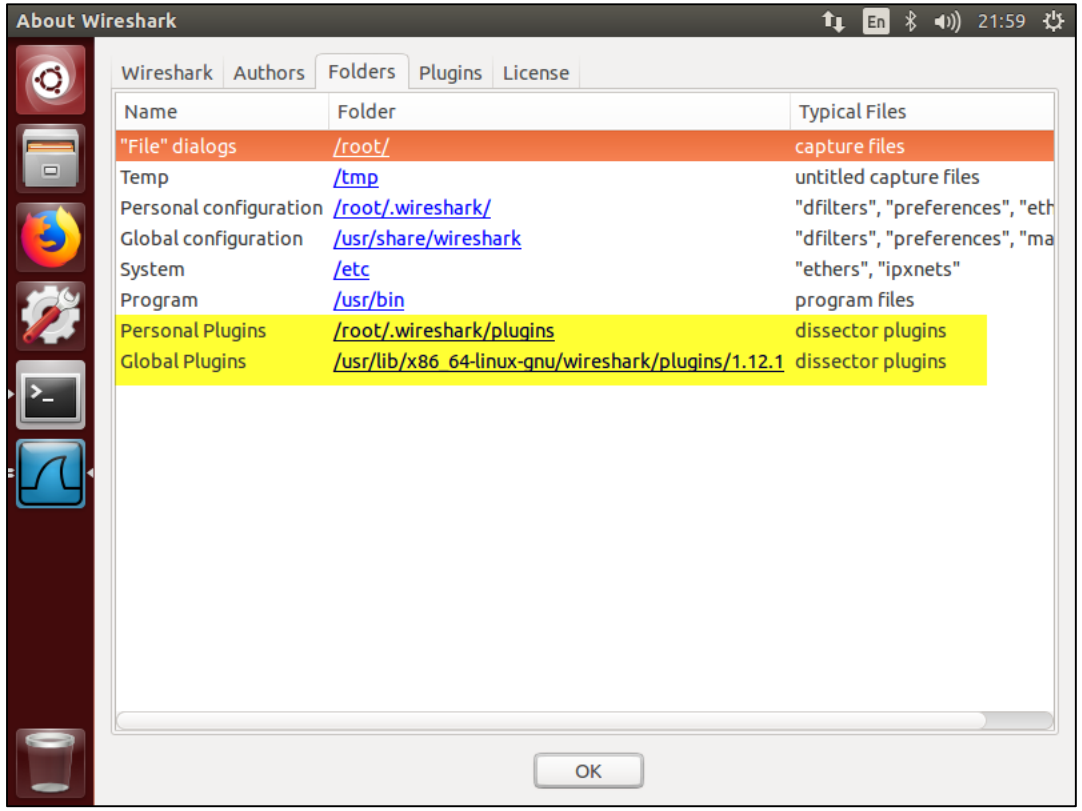
Where to place plugins?

- Check Help > About Wireshark > Folders

Windows



Ubuntu



WiFi Plugins

- Overview (Shows all present SSIDs with their details)
- Beacon Flood Detection (Show possible beacon flood attempts)
- Deauth Disassoc Detection (Shows stats related to deauth and disassoc packet)
- WPA Cracking Possibility (Shows AP-client pairs for which WPA handshake packets are available)

Overview

- **PCAP File:** Airbase_detection/Open_Airbase_Network.pcap

Open_Airbase_Network.pcap

Wireshark · Overview

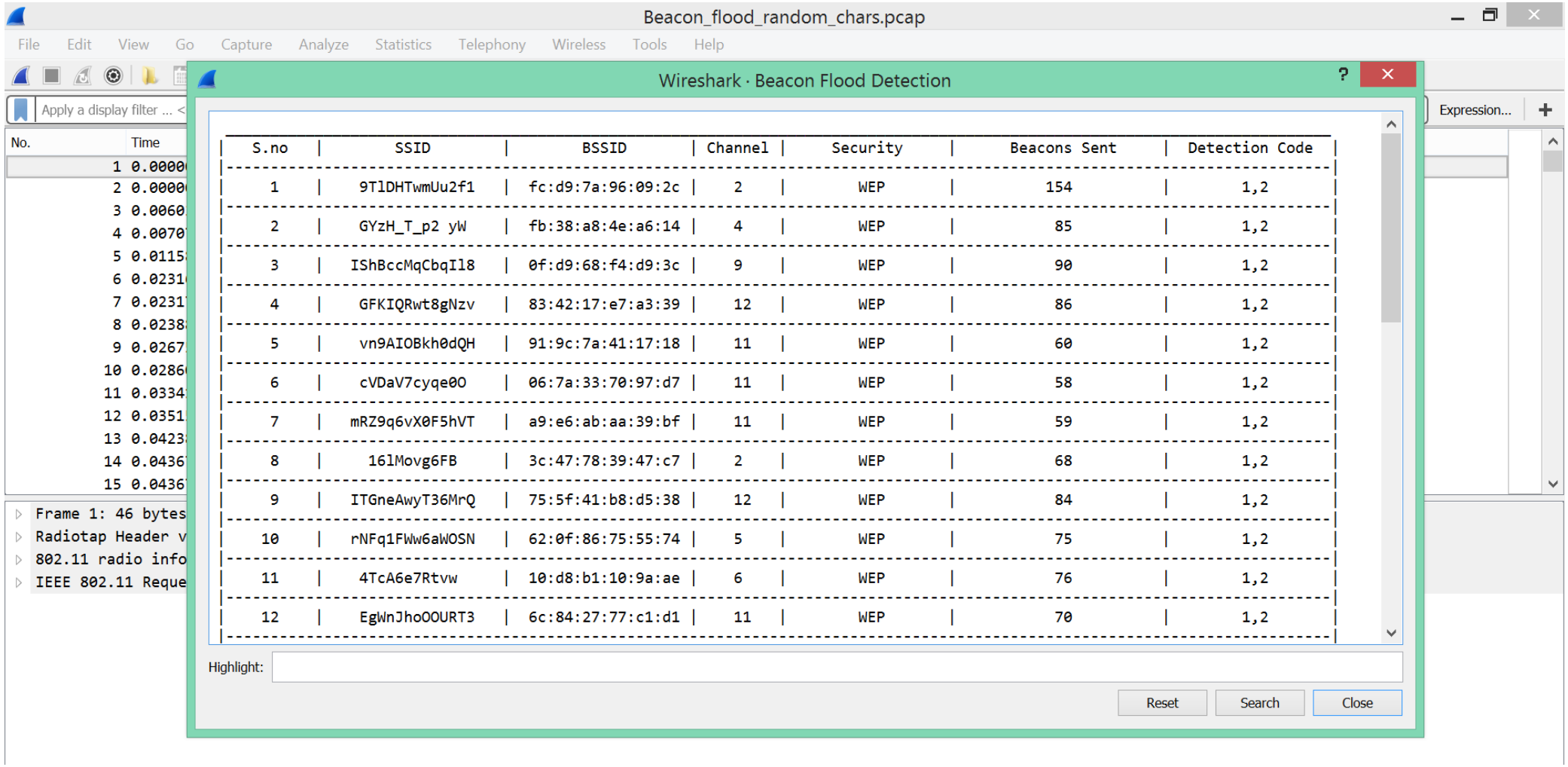
S.no	SSID	BSSID	Channel	Data Count	Managment Count	% Packets	Security	Key Managment	WPS
1	eFinserve	74:da:da:17:da:ef	3	0	29	0.00	WPA/WPA2 Personal	PSK	
2	Board room	f4:f2:6d:47:1c:a6	2	211	83	44.90	WPA2 Personal	PSK	Enabled
3	Unit24	60:e3:27:56:2b:18	2	0	4	0.00	WPA2 Personal	PSK	Enabled
4	Unit 16	1c:5f:2b:9f:85:e2	1	3	47	8.00	WPA2 Personal	PSK	
5	Corporate	d6:50:cc:ab:f8:e5	10	3887	893	75.82	No-Encryption		
6	VIKRAM-LAPTOP 3485	74:29:af:42:2b:7d	1	41	59	37.00	WPA2 Personal	PSK	Enabled
7	HP-Print-96-LaserJet Pro MFP	40:49:0f:b9:9d:96	6	0	141	0.00	No-Encryption		
8	HIDER-2	f4:f2:6d:46:dd:6a	8	17	20	0.00	WPA2 Personal	PSK	Enabled
9	Mancer	f4:f2:6d:46:d9:dc	7	8	142	3.33	WPA2 Personal	PSK	Enabled
10	HP-Print-CB-LaserJet Pro MFP	90:cd:b6:14:47:cb	6	0	39	0.00	No-Encryption		
11	HP-Print-52-Deskjet 3540 series	f0:92:1c:fc:de:52	6	0	151	0.00	WPA2 Personal	PSK	
12	Conference Room2	f4:f2:6d:4e:b6:24	6	0	32	0.00	WPA2 Personal	PSK	Enabled

Highlight:

Reset Search Close

Beacon Flood Detection

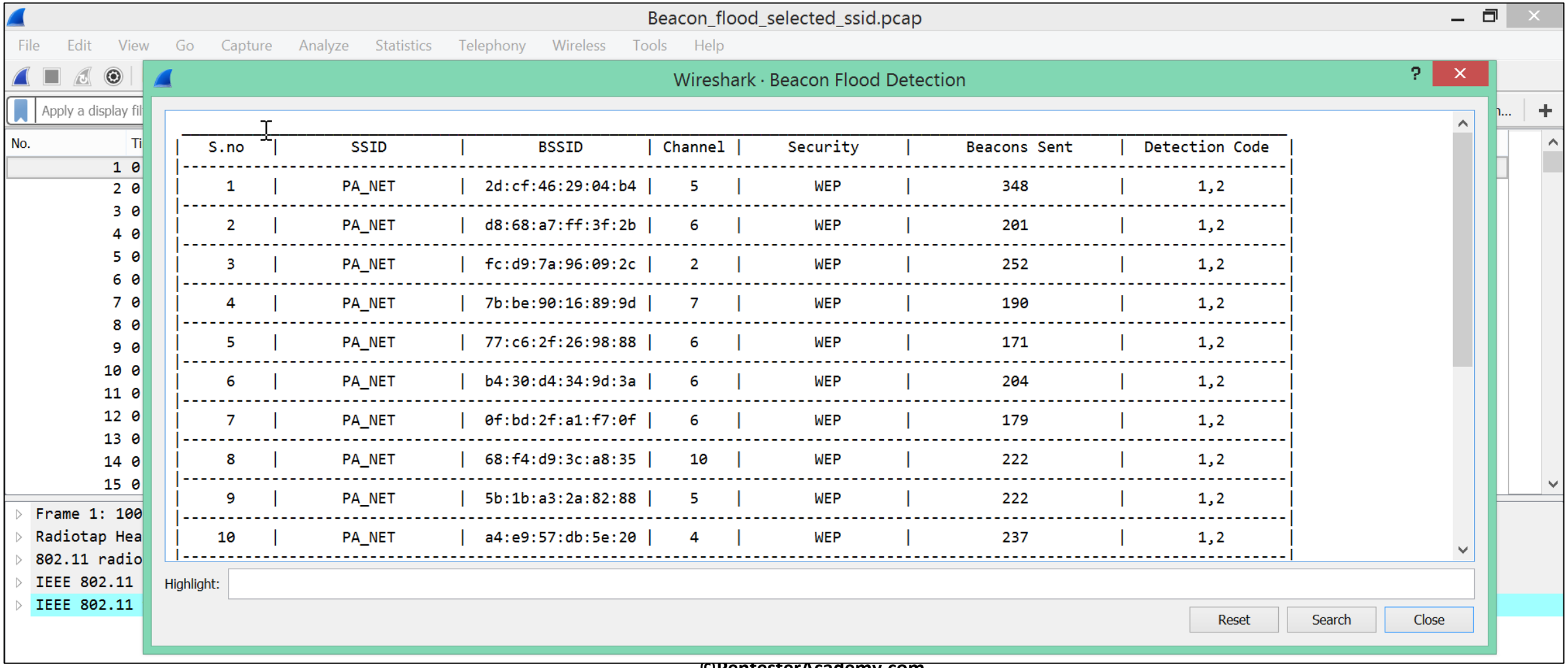
- **PCAP File:** Beacon_flood_random.pcap



S.no	SSID	BSSID	Channel	Security	Beacons Sent	Detection Code
1	9TlDHTwmUu2f1	fc:d9:7a:96:09:2c	2	WEP	154	1,2
2	GYzH_T_p2 yW	fb:38:a8:4e:a6:14	4	WEP	85	1,2
3	IShBccMqCbqIl8	0f:d9:68:f4:d9:3c	9	WEP	90	1,2
4	GFKIQRwt8gNzv	83:42:17:e7:a3:39	12	WEP	86	1,2
5	vn9AIOBkh0dQH	91:9c:7a:41:17:18	11	WEP	60	1,2
6	cVDaV7cyqe0O	06:7a:33:70:97:d7	11	WEP	58	1,2
7	mRZ9q6vX0F5hVT	a9:e6:ab:aa:39:bf	11	WEP	59	1,2
8	16lMovg6FB	3c:47:78:39:47:c7	2	WEP	68	1,2
9	ITGneAwyT36MrQ	75:5f:41:b8:d5:38	12	WEP	84	1,2
10	rNFq1FWw6aWOSN	62:0f:86:75:55:74	5	WEP	75	1,2
11	4TcA6e7Rtvw	10:d8:b1:10:9a:ae	6	WEP	76	1,2
12	EgWnJhoOOURT3	6c:84:27:77:c1:d1	11	WEP	70	1,2

Beacon Flood Detection

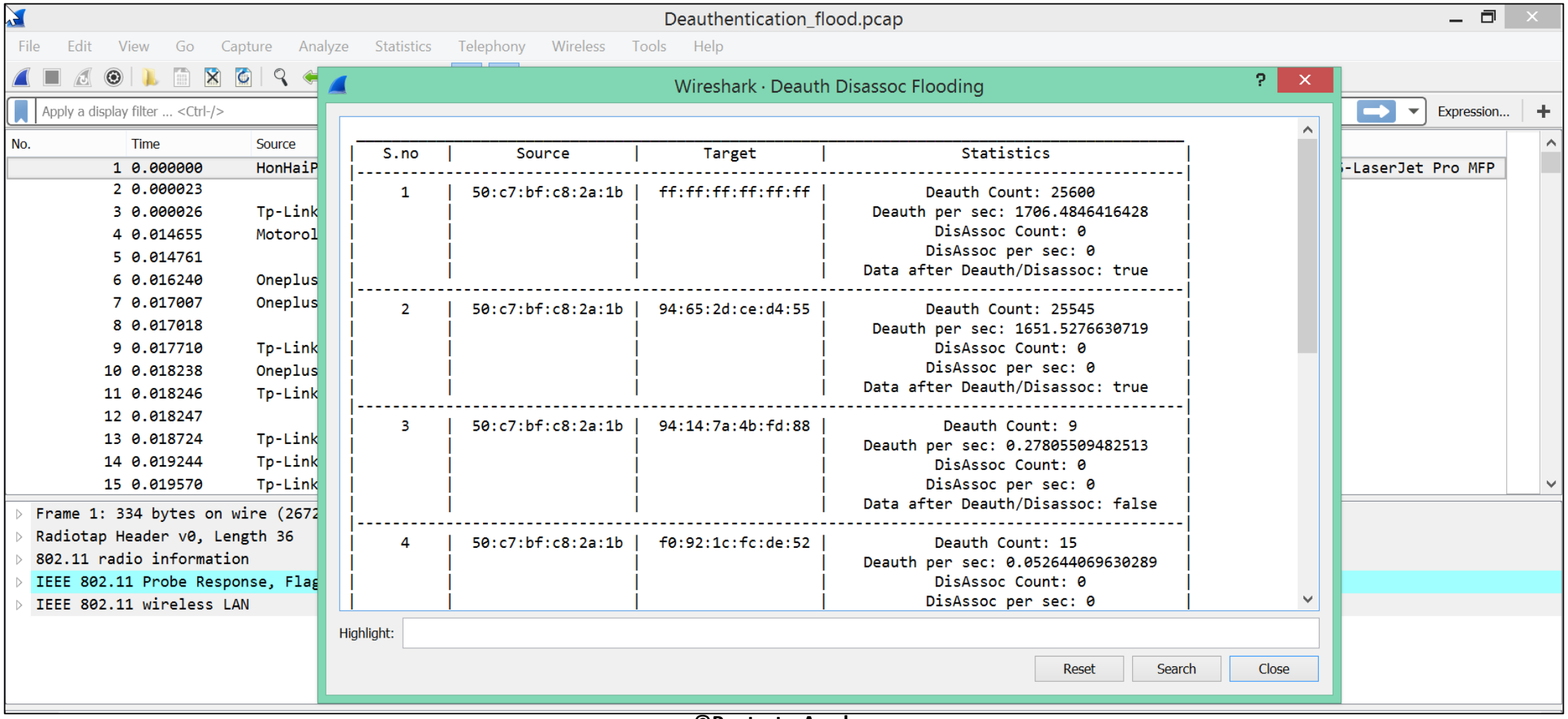
- **PCAP File:** Beacon_flood_selected_ssid.pcap



S.no	SSID	BSSID	Channel	Security	Beacons Sent	Detection Code
1	PA_NET	2d:cf:46:29:04:b4	5	WEP	348	1,2
2	PA_NET	d8:68:a7:ff:3f:2b	6	WEP	201	1,2
3	PA_NET	fc:d9:7a:96:09:2c	2	WEP	252	1,2
4	PA_NET	7b:be:90:16:89:9d	7	WEP	190	1,2
5	PA_NET	77:c6:2f:26:98:88	6	WEP	171	1,2
6	PA_NET	b4:30:d4:34:9d:3a	6	WEP	204	1,2
7	PA_NET	0f:bd:2f:a1:f7:0f	6	WEP	179	1,2
8	PA_NET	68:f4:d9:3c:a8:35	10	WEP	222	1,2
9	PA_NET	5b:1b:a3:2a:82:88	5	WEP	222	1,2
10	PA_NET	a4:e9:57:db:5e:20	4	WEP	237	1,2

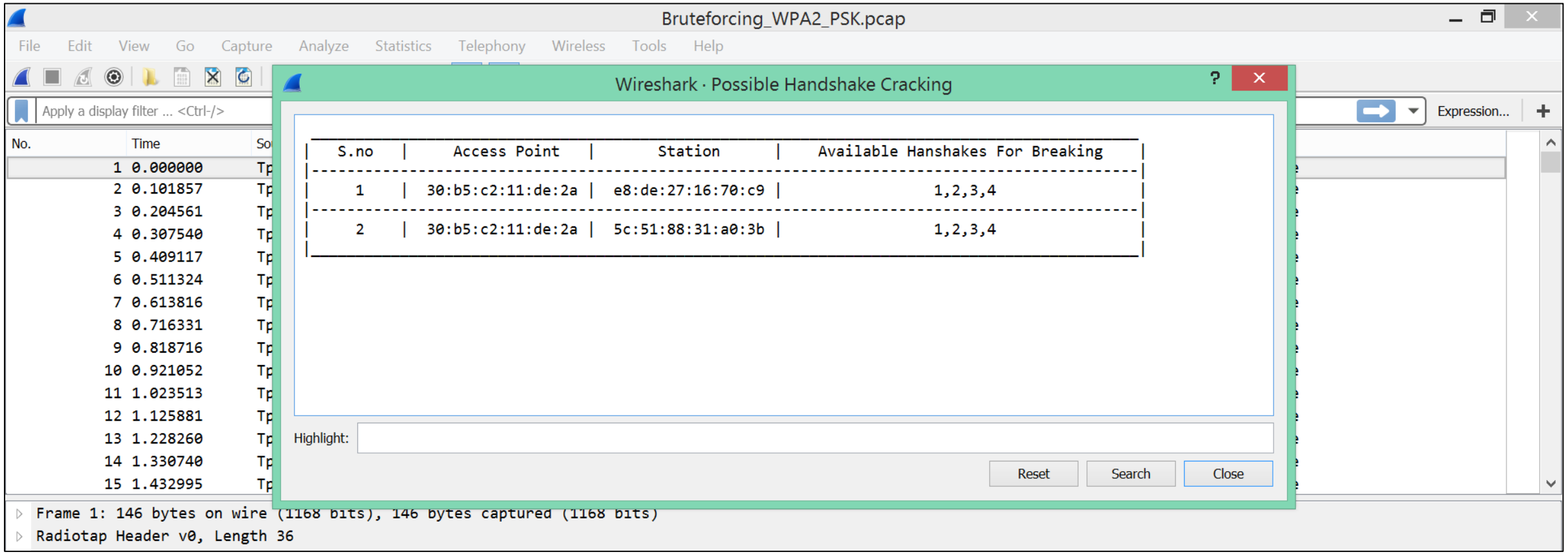
Deauth Disassoc Flooding

- **PCAP File:** Deauthentication_flood.pcap



WPA Cracking Possibility

- **PCAP File:** Bruteforcing_WPA2_PSK.pcap



Live Demo: PA Toolkit

Q & A

Thanks!