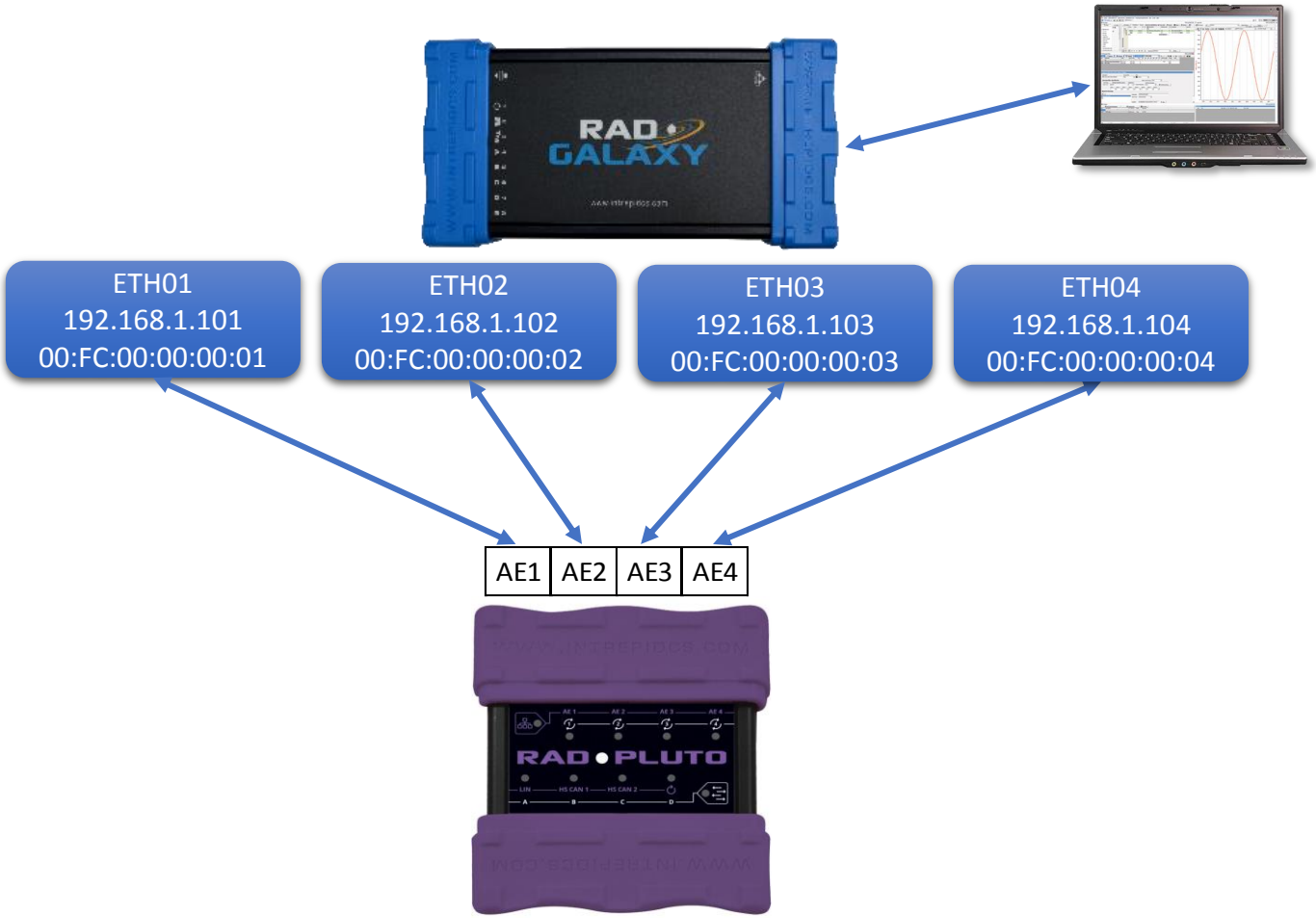
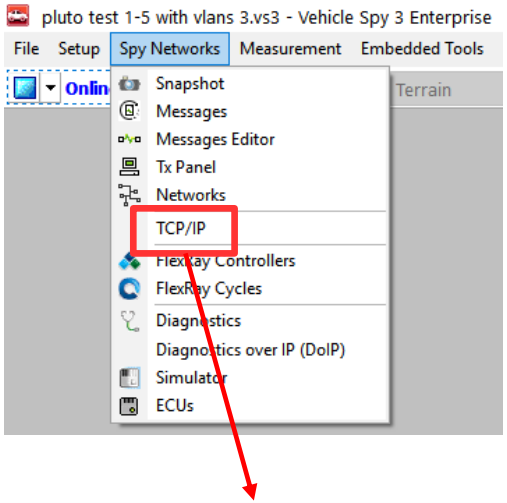
TCP/IP and UDP Support in Vehicle Spy

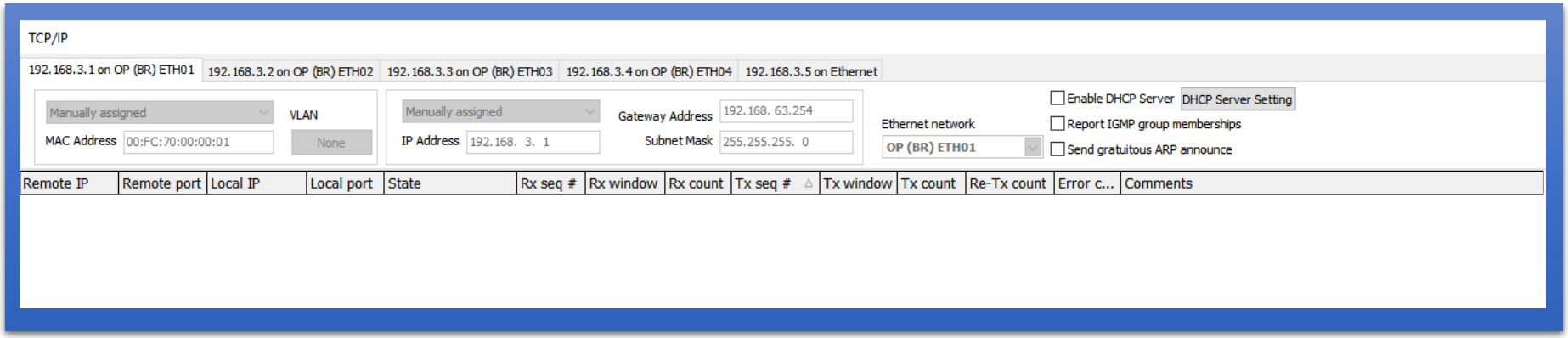
Switch Test Setup on Galaxy



VSPY TCP/IP Support

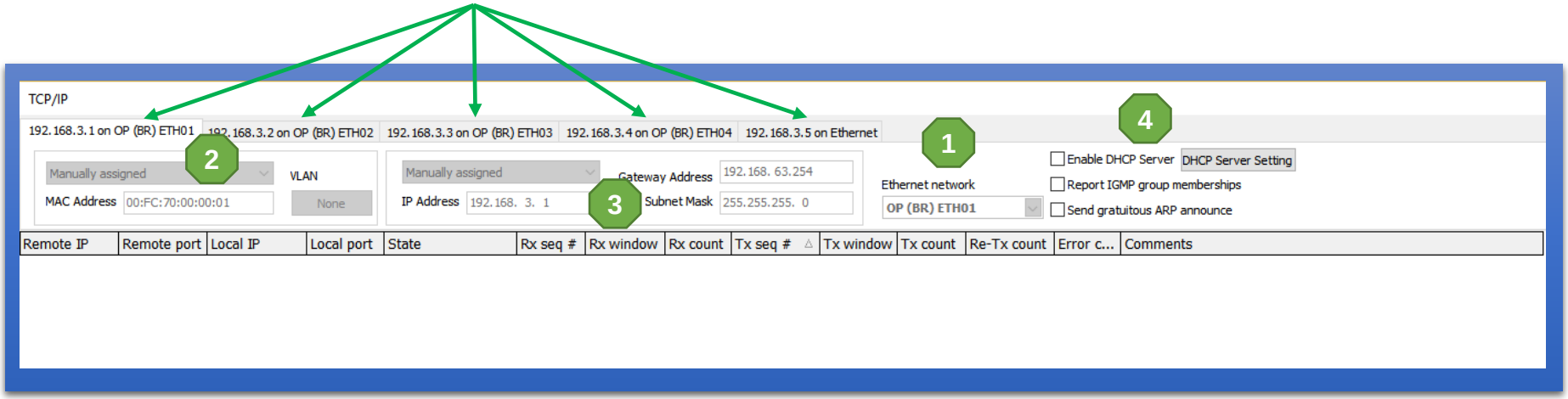


- TCP is managed as a “Virtual Network”
  - Single TCP Message = Multiple MAC Frames
- TCP/IP Tab Found Under “Spy Networks” Menu



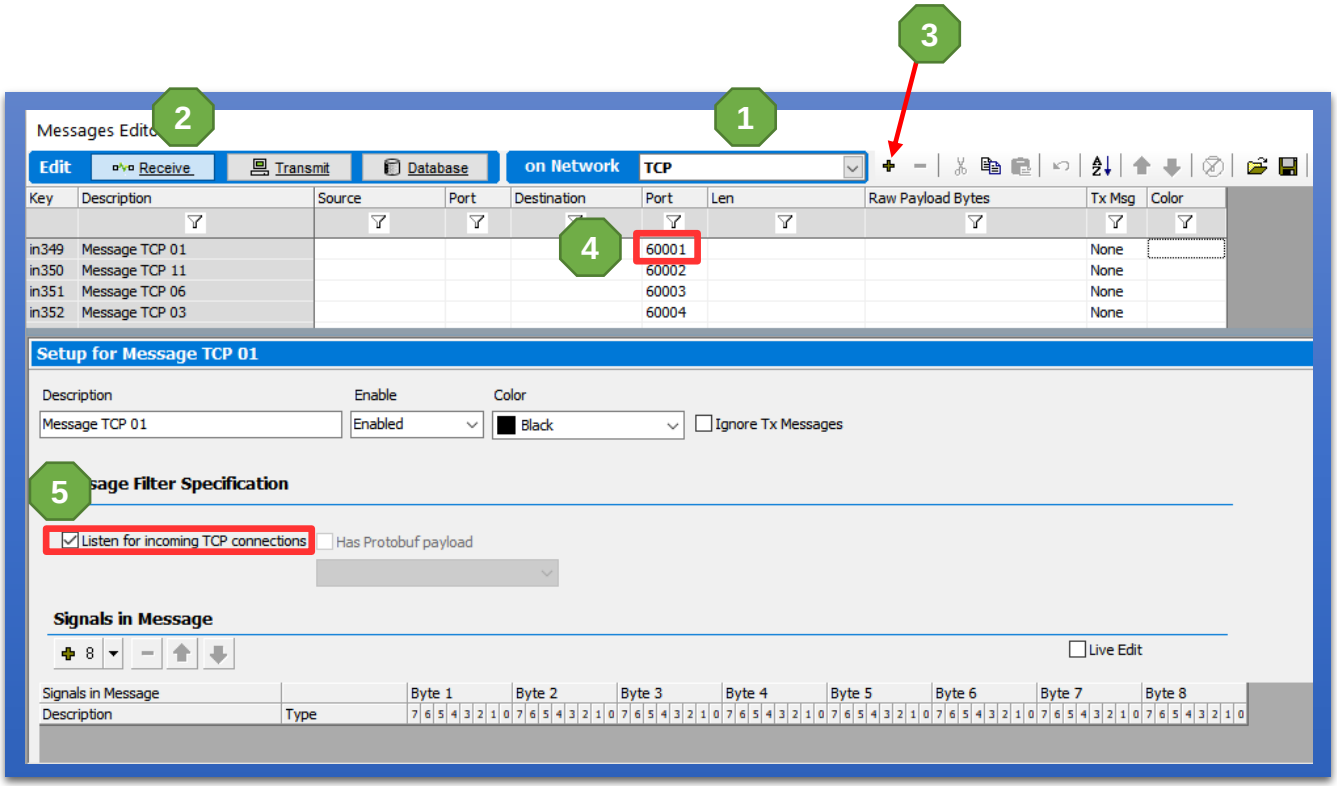
TCP Server Setup

Each tab represents an independent server



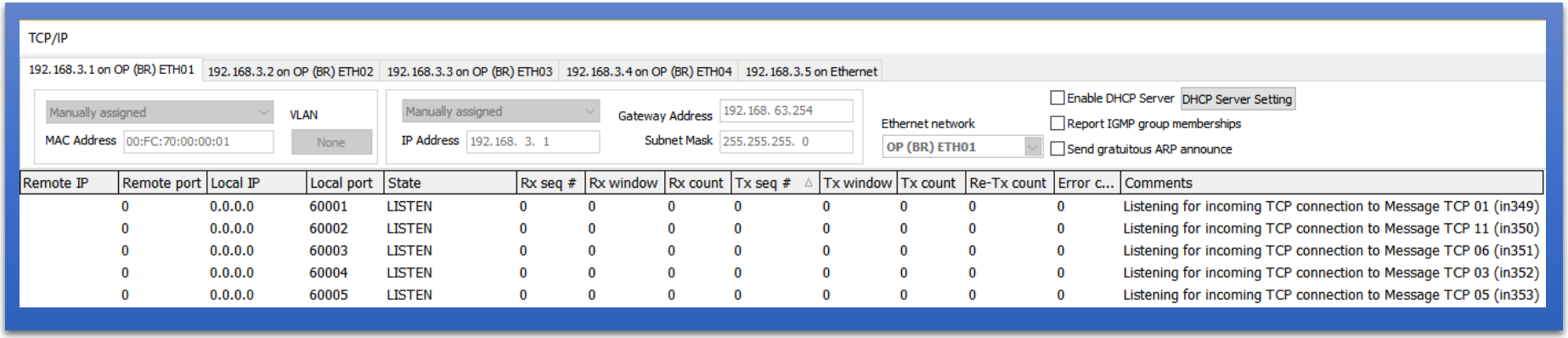
1. Physical Port (on Galaxy, RS2, PC NIC, etc.)
2. MAC/VLAN: Inherit or assign
3. IP Address/Gateway/Subnet: Inherit or assign
4. Configurations
   - DHCP Server
   - Report IGMP Group Memberships
   - Gratuitous ARP

Create Listening Ports



1. Select TCP Network
2. Select Receive Message Table
3. Add Message
4. Define Destination Port
5. Enable Listening Port

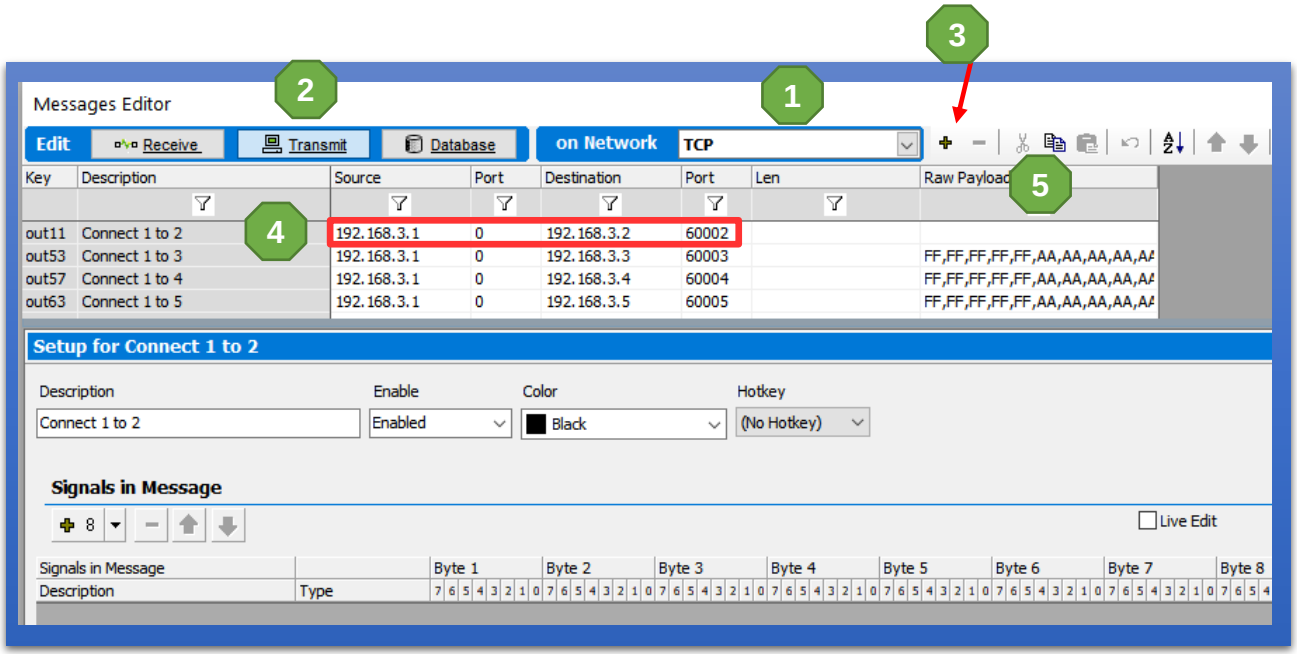
Listening Port Status



Remote IP	Remote port	Local IP	Local port	State	Rx seq #	Rx window	Rx count	Tx seq #	Tx window	Tx count	Re-Tx count	Error c...	Comments
	0	0.0.0.0	60001	LISTEN	0	0	0	0	0	0	0	0	Listening for incoming TCP connection to Message TCP 01 (in349)
	0	0.0.0.0	60002	LISTEN	0	0	0	0	0	0	0	0	Listening for incoming TCP connection to Message TCP 11 (in350)
	0	0.0.0.0	60003	LISTEN	0	0	0	0	0	0	0	0	Listening for incoming TCP connection to Message TCP 06 (in351)
	0	0.0.0.0	60004	LISTEN	0	0	0	0	0	0	0	0	Listening for incoming TCP connection to Message TCP 03 (in352)
	0	0.0.0.0	60005	LISTEN	0	0	0	0	0	0	0	0	Listening for incoming TCP connection to Message TCP 05 (in353)

TCP/IP Tab will now show ports listening for connections

Create TX Messages for Socket Connection



1. Select TCP Network
2. Select TX Message Table
3. Add Message
4. Define Message
   - Source IP
   - Source Port = 0**
   - Dest IP/Port
   - Payload

***Stack will use Ephemeral Port*

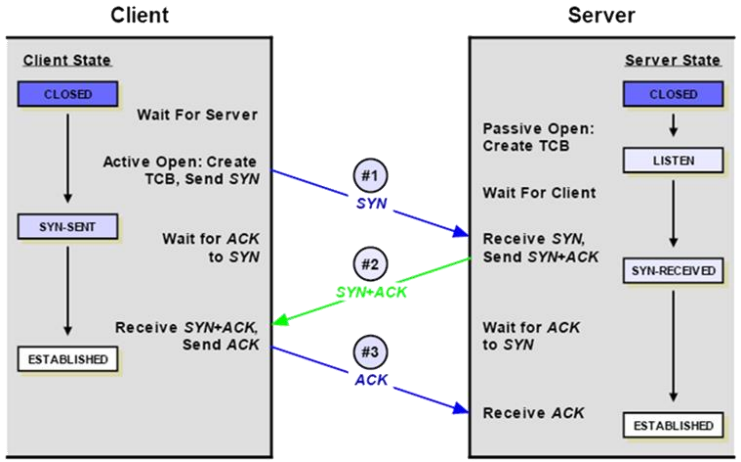
Opening a Socket

Tx Panel

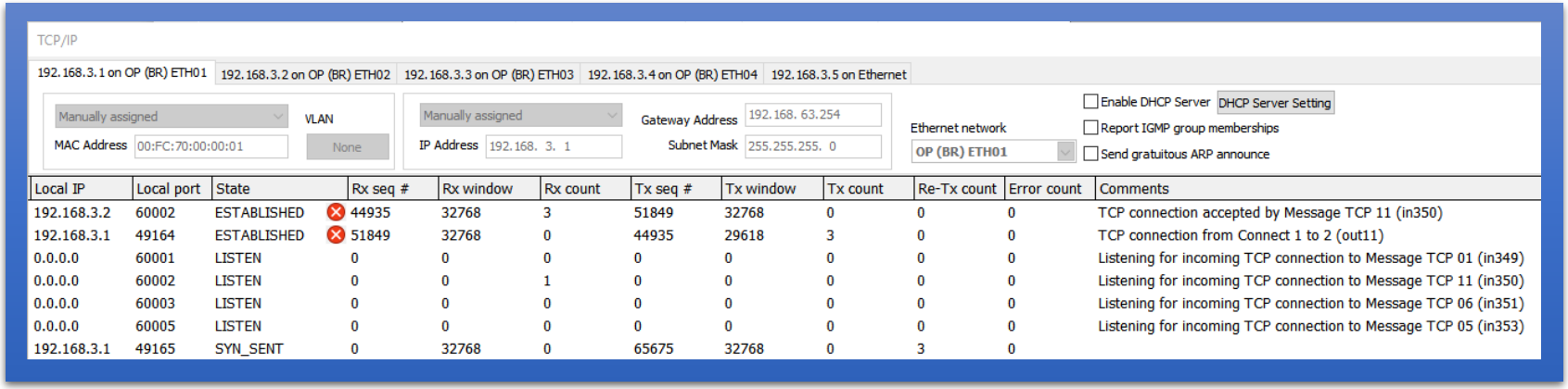
Edit Transmit Messages | Disable All Tx | Protocol: All

Description	Tx	Auto Tx	Rate (s)	Arb ID	Len	B1	B2	B3	B4	B5	B6	B7	B8	Network	Color
Connect 1 to 2		Periodic	None					3.3.1	0	3.3.2	0002	A,AA		TCP	
Connect 1 to 3		Periodic	None					3.3.1	0	3.3.3	0003	A,AA		TCP	
Connect 1 to 4		Periodic	None					3.3.1	0	3.3.4	0004	A,AA		TCP	
Connect 1 to 5		Periodic	None					3.3.1	0	3.3.5	0005	A,AA		TCP	
Connect 2 to 1		Periodic	None					3.3.2	0	3.3.1	0001	A,AA		TCP	
Connect 2 to 3		Periodic	None					3.3.2	0	3.3.3	0003	A,AA		TCP	
Connect 2 to 4		Periodic	None					3.3.2	0	3.3.4	0004	A,AA		TCP	

- Sending a message on the TCP network will automatically initiate the TCP 3-way handshake
- Listening TCP ports will respond to TCP 3-way handshake. Port remains open until terminated.



TCP Socket Status



Local IP	Local port	State	Rx seq #	Rx window	Rx count	Tx seq #	Tx window	Tx count	Re-Tx count	Error count	Comments
192.168.3.2	60002	ESTABLISHED	44935	32768	3	51849	32768	0	0	0	TCP connection accepted by Message TCP 11 (in350)
192.168.3.1	49164	ESTABLISHED	51849	32768	0	44935	29618	3	0	0	TCP connection from Connect 1 to 2 (out11)
0.0.0.0	60001	LISTEN	0	0	0	0	0	0	0	0	Listening for incoming TCP connection to Message TCP 01 (in349)
0.0.0.0	60002	LISTEN	0	0	1	0	0	0	0	0	Listening for incoming TCP connection to Message TCP 11 (in350)
0.0.0.0	60003	LISTEN	0	0	0	0	0	0	0	0	Listening for incoming TCP connection to Message TCP 06 (in351)
0.0.0.0	60005	LISTEN	0	0	0	0	0	0	0	0	Listening for incoming TCP connection to Message TCP 05 (in353)
192.168.3.1	49165	SYN_SENT	0	32768	0	65675	32768	0	3	0	

- Displays socket status and statistics
- Socket can be closed using the “Red X” button next to socket state

TCP “Three-Way Handshake”

Line	Time	Tx	Er	Description	Source	Src Port	Destination	Dst Port	EtherType	Protocol	VLAN	Len	Seq#	Ack#	Window	Flags
				54.225.225.147						tcp						
1				Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		66	84287138	0	65535	SYN
2	72.401 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		66	205960898	84287139	29200	ACK,SYN
3	83 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		54	84287139	205960899	1024	ACK
4	120 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		485	84287139	205960899	1024	ACK,PSH
5	75.992 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		60	205960899	84287570	237	ACK
6	5.953 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		204	205960899	84287570	237	ACK,PSH
7	0 µs			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		60	205961049	84287570	237	ACK,FIN
8	55 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		54	84287570	205961050	1023	ACK
9	151 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		54	84287570	205961050	1023	ACK,FIN
10	73.652 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		60	205961050	84287571	237	ACK

- SYN – Initial request to initiate TCP connection (also synchronize requestor's seq #)
- ACK + SYN – Acknowledgement of request (also synchronize other party's seq #)
- ACK – Requestor acknowledges other party's seq #

TCP – HTTP Exchange Example

Line	Time	Tx	Er	Description	Source	Src Port	Destination	Dst Port	EtherType	Protocol	VLAN	Len	Seq#	Ack#	Window	Flags
				54.225.225.147						tcp						
1				Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		66	84287138	0	65535	SYN
2	72.401 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		66	205960898	84287139	29200	ACK,SYN
3	83 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		54	84287139	205960899	1024	ACK
4	120 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		485	84287139	205960899	1024	ACK,PSH
5	75.992 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		60	205960899	84287570	237	ACK
6	5.953 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		204	205960899	84287570	237	ACK,PSH
7	0 µs			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		60	205961049	84287570	237	ACK,FIN
8	55 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		54	84287570	205961050	1023	ACK
9	151 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		54	84287570	205961050	1023	ACK,FIN
10	73.652 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		60	205961050	84287571	237	ACK

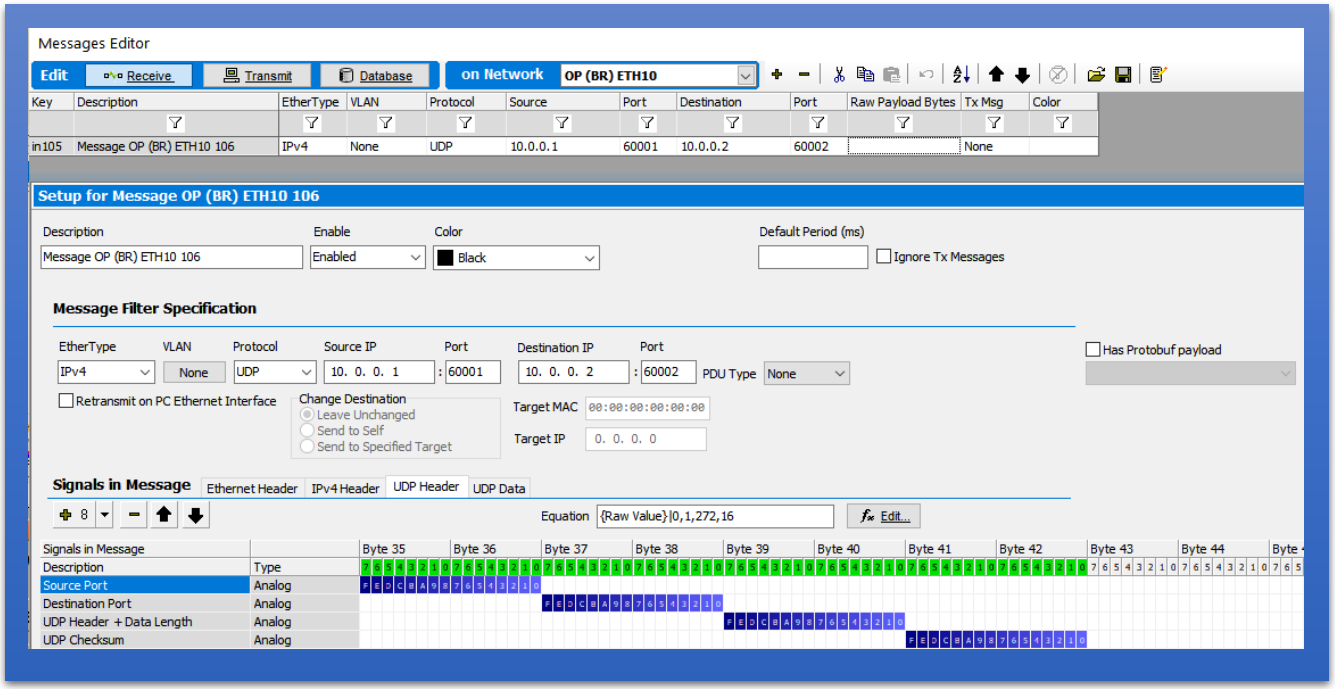
- PSH – Push data (HTTP request)
- ACK – Acknowledgement of request
- PSH – Push data (HTTP response back to requestor)

TCP – Terminate Connection

Line	Time	Tx	Er	Description	Source	Src Port	Destination	Dst Port	EtherType	Protocol	VLAN	Len	Seq#	Ack#	Window	Flags
				54.225.225.147						tcp						
1				Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		66	84287138	0	65535	SYN
2	72.401 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		66	205960898	84287139	29200	ACK,SYN
3	83 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		54	84287139	205960899	1024	ACK
4	120 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		485	84287139	205960899	1024	ACK,PSH
5	75.992 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		60	205960899	84287570	237	ACK
6	5.953 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		204	205960899	84287570	237	ACK,PSH
7	0 µs			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		60	205961049	84287570	237	ACK,FIN
8	55 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		54	84287570	205961050	1023	ACK
9	151 µs			Ethernet 10.5.1.245 to 54.2...	10.5.1.245	57967	54.225.225.147	80	IPv4	TCP		54	84287570	205961050	1023	ACK,FIN
10	73.652 ms			Ethernet 54.225.225.147 to ...	54.225.225.147	80	10.5.1.245	57967	IPv4	TCP		60	205961050	84287571	237	ACK

- ACK+FIN – Acknowledge data received from other party, plus Finish (terminate connection)
- ACK – Acknowledgement of termination (requestor → other party)
- ACK+FIN – Acknowledge data received from requestor, plus Finish (terminate connection)
- ACK – Acknowledgement of termination (other party → requestor)

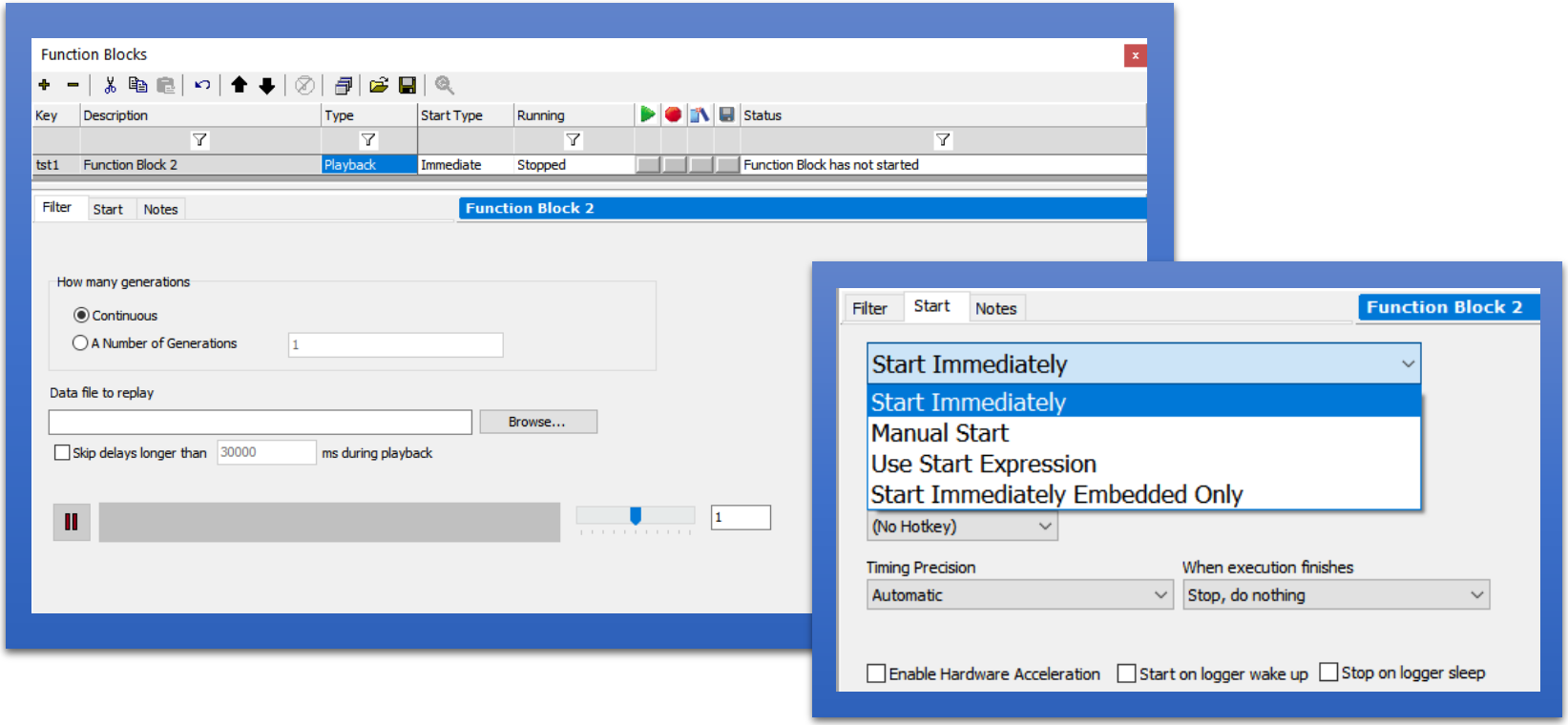
UDP Support



- Unlike TCP, UDP frames do not have their own virtual network.
- Frames built in Message Editor

Sending UDP Stream

Simplest means of sending UDP Stream is to playback a logged stream.



BACKUP Slides

TCP Header

- TCP has IP protocol number 0x06

Offsets	Octet	0								1								2								3							
Octet	Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	Source port																Destination port															
4	32	Sequence number																															
8	64	Acknowledgment number (if ACK set)																															
12	96	Data offset				Reserved 0 0 0				NS	CWR	ECE	URG	ACK	PSH	RST	SYN	FIN	Window Size														
16	128	Checksum																	Urgent pointer (if URG set)														
20 ...	160 ...	Options (if *data offset* > 5. Padded at the end with "0" bytes if necessary.) ...																															

Sequence number, used to guarantee in-order delivery on other end

- The next sequence number the sender can receive
- All previous sequence numbers are acknowledged as received

TCP Sliding Window System

- Used to keep track of bytes sent and received
- Special pointer maintained for each connection
- ISO 15765-2 has a “sliding window”, but it only acknowledges one group of frames at a time