XTRAMUS

NuDOG-301
DApps-SG Utility
User Manual

USM: V1.0

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REVISION HISTORY

Date	FW Version	FPGA Version	USM Version	History
August, 2009			1.0	First draft version

Table of Contents

1. General Description

NuDOG-301 is a two ports handheld network TAP and streams generating equipment. Innovative design makes it unique from other test equipment. Unlike other network TAP equipment, NuDOG-301 has USB port for both system configuration / management and network TAP. For TAP function, streams flow through NuDOG-301 is tapped and forwarded to PC via USB. Advanced criteria can filter the packet wanted to reduce the traffic to PC dramatically.

In addition to the passive mechanism, NuDOG-301 is also an active stream generator that can generate test streams with variety of Ethernet frames and test protocols. Two ports of NuDOG-301 can work as pair to have Rapid-Matrix stream test for the DUT. BERT pattern loopback test can find the errors due to the DUT.

For network test equipment with such capability and availability, NuDOG-301 indeed reduces the research and development lead-time, do great help to find the faulty product by batch network test and also get the way to find the possible bottleneck of the network for MIS in office. Elegant hairline surface coating outside and excellent feature inside make NuDOG-301 the best choice of handheld network test device.

1.1 Features

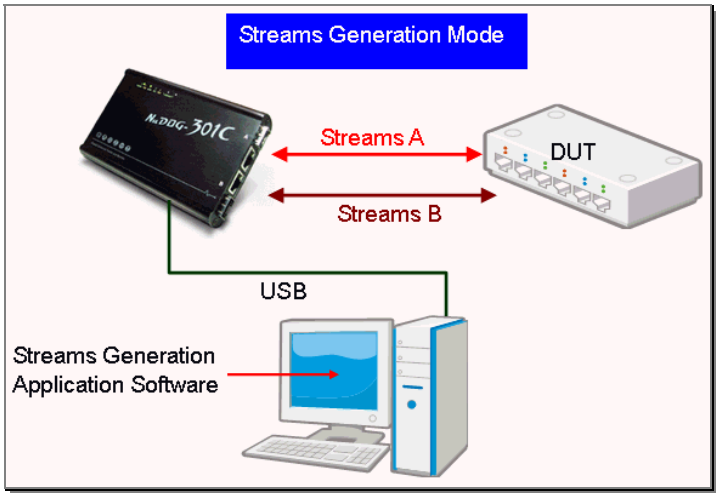
- 10/100/1000 Mbps Wirespeed Stream generation, TAP, capture, and analysis
- Rapid-Matrix multi-streams generation for simultaneous network test
- Proprietary X-TAG frame tagging technique for examination of latency, packet loss, and packet sequence…etc.
- SDFR technique make capture of Ethernet frame easy and convenient
- Stream Counter per port for detailed analysis of test result
- Pre-defined or user-defined patterns as trigger conditions of Multi-stream Counter
- Active TAP feature that analyze and filter all packets flows through without interfering the original traffic
- Uni-directional streams between bi-directional network traffic can be redirected to PC for analysis
- Complete real-time RMON counter for analysis
- Layer 1 and Layer 2 passive loopback mode for incoming traffic
- Supports 2 ports Cross-loopback or one port Local-loopback
- Verify oscillator's speed rate of DUT

- Variety of application software for different test requirement

1.2 Function Mode

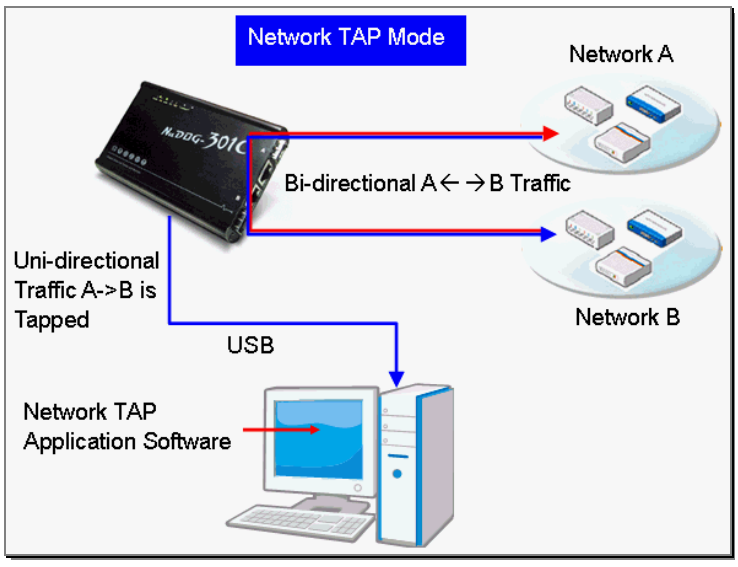
1.2.1 Stream Generation Mode

For Streams Generation mode, the NuDOG-301 generates bi-directional network streams for required test as the illustration below.
Both Port A and Port B of NuDOG-301 can generate and receive test streams. The test streams are sent and return to original NuDOG-301 for analysis of the DUT (device under test).



1.2.2 TAP mode

For TAP mode, NuDOG-301 can monitor any data that flows through this equipment. Network TAP is the way to monitor running network without intruding the network. NuDOG-301 can tap bi-directional or uni-directional traffic from different sides and also provides abundant packet counters



1.3 Support Software

There are several software that can work with NuDOG-301 for different kind of test requirement. Here is the introduction of these software. Please contact with distributor to purchase suitable utility software for your test.

1.3.1 DApps-SG: Control Suite for Multiple Streams Generator

Please read the following chapter to know how to operate this software.
DApps-SG provides a powerful and sophisticated virtual front control panel to manage the NuDOG-301. Two test ports can be independently configured with parameters to define multiple streams, filters, and capture capabilities. Traffic for various network protocols can be customized, transmitted, and received on each port. Comprehensive statistics provide users an in-depth analysis of the performance of the DUT (Device Under Test).

1.3.2 DApps-TAP: Ethernet TAP Suite base on TAP and Loopback

For NuDOG-301, all data streams between two network ports can be duplicated and sent to PC via USB port for monitor and analysis. Operator can specify criteria to filter the packets wanted by DApps-TAP application software. It reduces the network traffic of USB port and also decreases the resource of PC to deal with large quantity of packets.
*In theory, maximum speed of USB 2.0 is 480Mbps and maximum speed of UTP port is 1GMbps. For data transmission over 480Mbps, the packets to USB port are dropped if all packets are tapped by USB port. However, it does not affect the data transmission flows between two network ports.

1.3.3 DApps-NIC: Network Card Simulation Suite

NuDOG-301 has a mini-USB port for connection to PC. In addition to network TAP, system control and system upgrade of NuDOG-301, it also has the function of network interface card. By the software control and hardware conversion of NuDOG-301, network data streams can flow between USB and network port of NuDOG-301.
*In theory, maximum speed of USB 2.0 is 480Mbps and maximum speed of UTP port is 1GMbps. Enable flow control can prevent packet loss if the network transmission is over 480Mbps

1.3.4 DApps-2544: Test Suit Based on RFC-2544

DApps-2544 is a user-friendly and automated test suite based on industry-standard RFC-2544. It generates and analyzes the packets to evaluate the performances of Throughput, Latency, Packet Loss, and Back-to-Back of Ethernet switches or routers via NuDOG-301. The real-time display of test results and customized report provide an effective way to examine the DUT.

1.3.5 DApps-2889: Test Suit Based on RFC-2889

DApps-2889 is a user-friendly and automated test suite based on industry-standard RFC-2889 to test the DUT. RFC 2889 provides methodology for the benchmarking of local area network (LAN)

switching devices, forwarding performance, congestion control, latency, address handling and filtering. It extends the methodology already defined for benchmarking network interconnecting devices in RFC 2544.

1.3.6 DApps-MPT: Automated Batch Tests for Ethernet Device

DApps-MPT is an accurate and efficient software suite for mass production test or batch network test. Various packet generation and reception testing items could be configured to pre-defined testing modes. The utility of DApps-MPT is easy to load testing models. All simple and visualized results and detailed testing logs are available to be accessed based on requirements.
DApps-MPT is a powerful and convenient tool to apply on NuDOG-301.

1.3.7 DApps-QoS: QoS Testing based on VLAN items

Network QoS (quality of service) is a way to classify the transmission priority of packets when the packets that are going to transmit are beyond the throughput that the Ethernet switch or router is able to deal with. Higher priority packets are processed and transmitted first.
For Ethernet frame, each packets can be tagged with a VLAN ID and CoS (class of service). For Ethernet switch or router that supports QoS, packets with higher CoS priority should be transmitted first if traffic is congested. DApps-QoS is able to limit acceptable network traffic at receiving port and analyze the traffic distribution of packets with different priority received from DUT (router or switch).

1.3.8 DApps-QoS3: QoS Testing Based on IP/UDP items of Layer3

The QoS (quality of service) of DApps-QoS3 is similar to DApps-QoS. Layer 3 IP/UDP packets are marked according to the type of service they need. In response to these markings, routers and switches use various queuing strategies to tailor performance to requirements. By the same test mechanism, NuDOG-301 tests the performance of Layer 3 Router, Switch with QoS function.

1.3.9 DApps-RGW: Test for Router Gateway

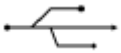
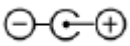
DApps-RGW is an application software to test the router/ gateway. By this application, NuDOG-301 simulates as a DHCP clients that request service or generate streams to test the performance of the router/gateway. The volume of allowable DHCP clients, PPPoE authentication, throughput, latency, QoS, sessions allowed and protocols such as FTP, UDP and TCP can be tested or measured.

2. Appearance

2.1 Left Side

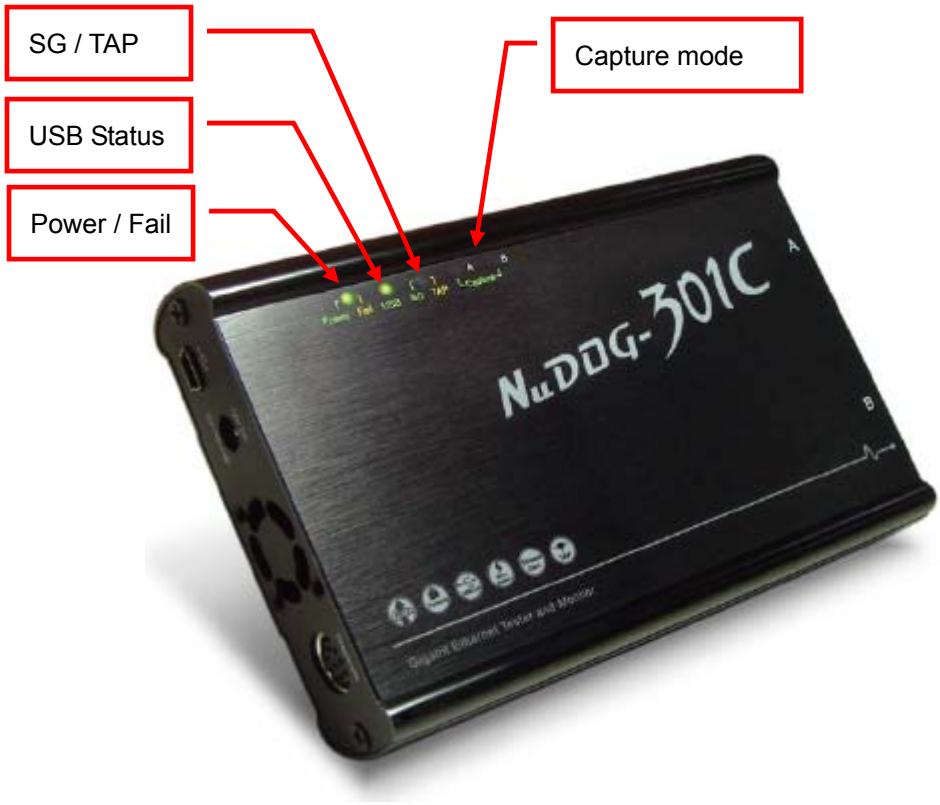
There are holes with fan for ventilation

Connection Ports

Port Type	Label	Description
USB Port		Management, configuration or firmware/FPGA update of this machine. For TAP mode, it also re-directs tapped packets to PC.
Power Jack	12V DC 	Plug power from DC 12V adapter
FAN		Fan hole with internal fan for ventilation.
Diagnostic Port	Diagnostic	Optional diagnostic port (reserved)

2.2 Top side

Indication LEDs are all located here.



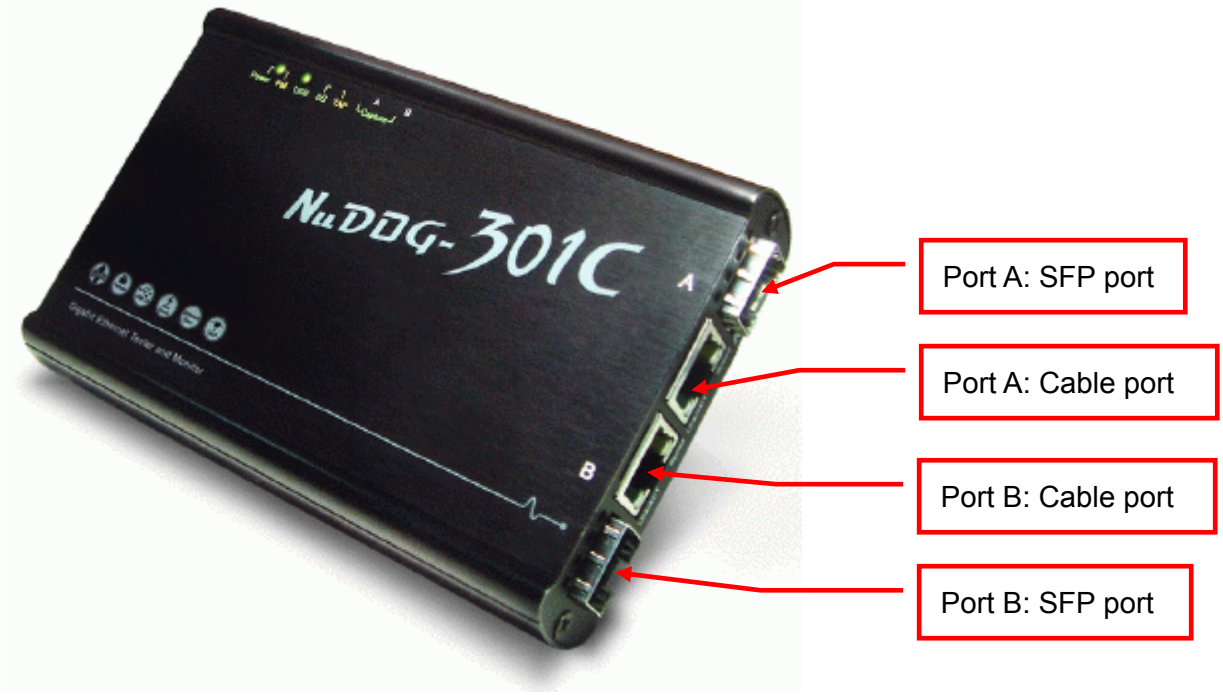
LED Status

Type	Label	LED	Description
Power	Power Fail	Green	Power is ON without problem
		Yellow (Amber)	System is failed
Port Status	USB	Green	USB of this device is linked to PC
		Yellow (Amber)	No USB link
Operation Mode	SG TAP	Green	Stream generation mode is activated. When it works with the utility software below. LED is green. • DApps-SG • DApps-2544 • DApps-2889 • DApps-MTP • DApps-QoS • DApps-QoS3
		Yellow (Amber)	TAP mode is activated. TAP is the method to monitor network traffic that flows through this device. When it works with DApps-TAP utility software, the LED is Yellow
		OFF	When it works DApps-NIC, the LED is off.

Capture Port	Capture A	Green	Capture Mode of A port is activated
	Capture B	Green	Capture Mode of B port is activated

2.3 Right side

Right side has ports that connect with physical transmission media.



Connection Ports

Port Type		Label	Description	
A	SFP port	A	SFP port for 1G speed SFP fiber connector	Only one port can be used simultaneously
	Ethernet port for RJ-45 connector		Ethernet port for 10/100/1000M speed connection of RJ-45 connector	
B	Ethernet port for RJ-45 connector	B	SFP port for 1G speed SFP fiber connector	Only one port can be used simultaneously
	SFP port		Ethernet port for 10/100/1000M speed connection of RJ-45 connector	

LED Status

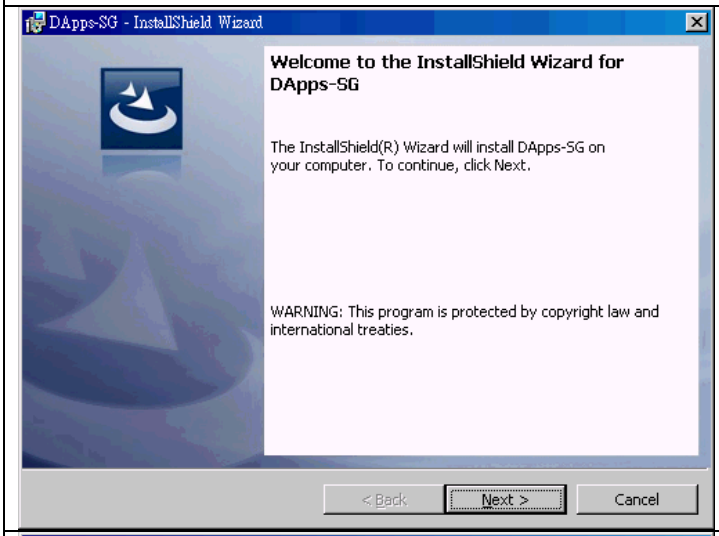
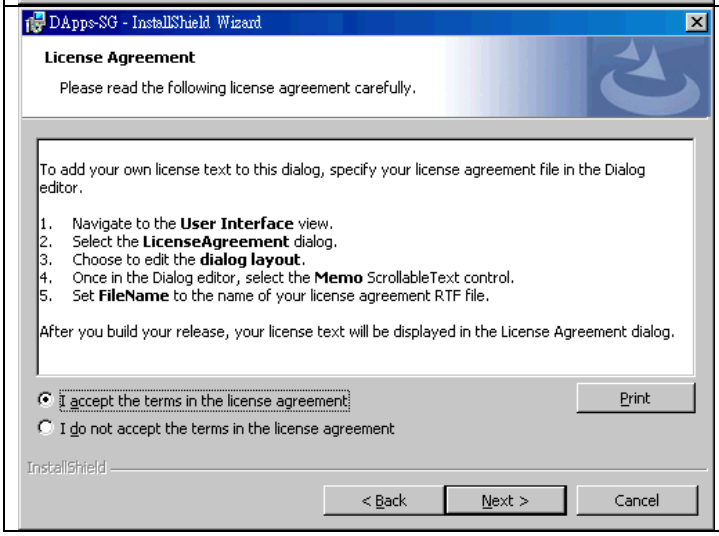
Type	Label	LED	Description
UTP Port status for RJ-45 connector	Link/ACT	ON	Network is linked
		Blinking	Data is transmitting or receiving
	Speed	ON	1000Mbps connection
		Blinking	100Mbps connection
		OFF	10Mbps connection if Link/ACT is ON or blinking

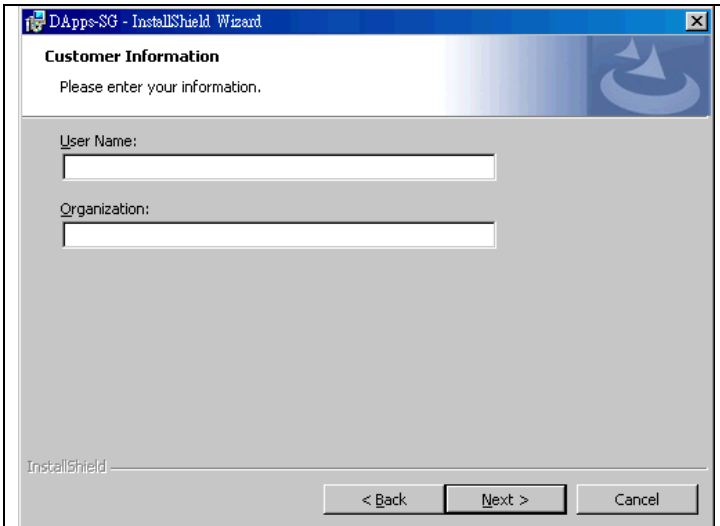
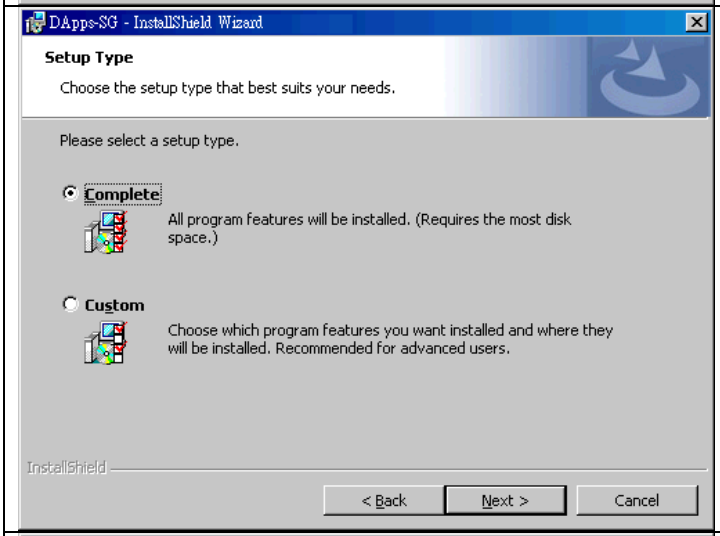
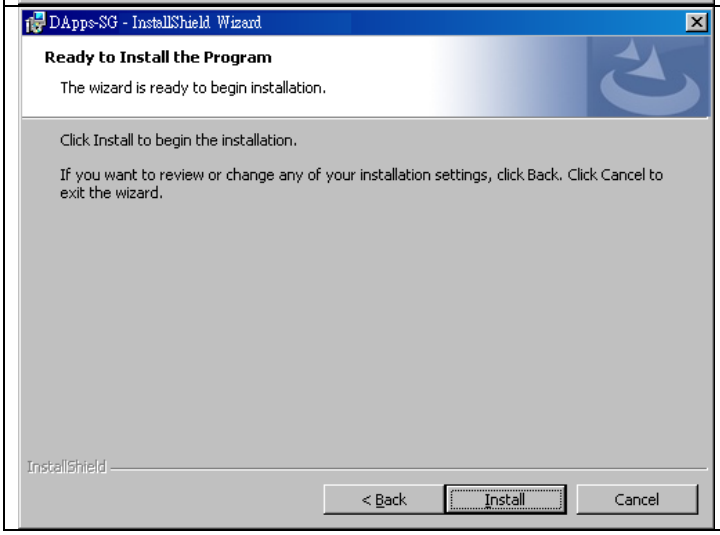
3. DApps-SG Stream Generation Utility

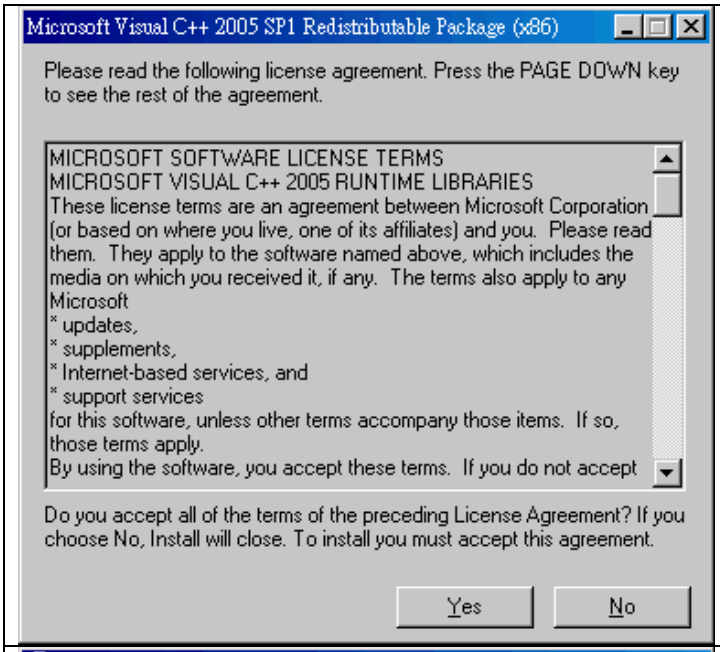
DApps-SG provides a powerful and sophisticated virtual front control panel to manage the NuDOG-301. Two test ports can be independently configured with parameters to define multiple streams, filters, and capture capabilities. Traffic for various network protocols can be customized, transmitted, and received on each port. Comprehensive statistics provide users an in-depth analysis of the performance of the DUT (Device Under Test).

3.1 Installation of Software Utility

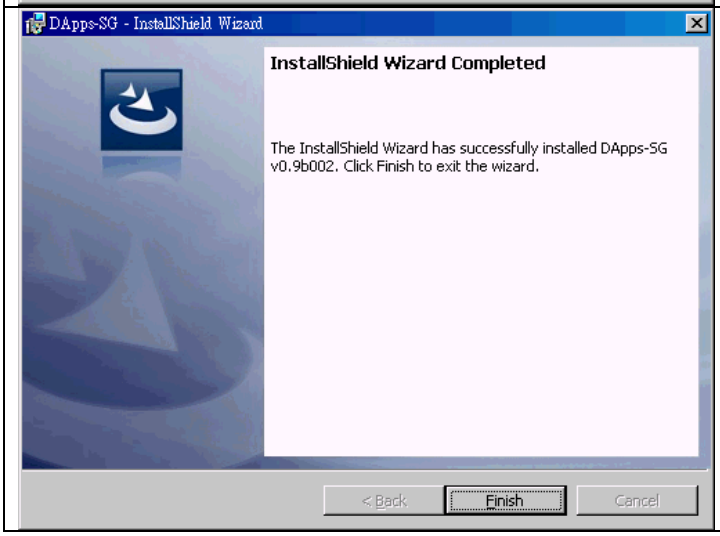
Click to run the .EXE utility execution file provided by Xtramus to install the software. System shows

Windows UI	Description
	Welcome to install NuDOG-301 Utility. Please click **Next** button to continue
	License Agreement for End User. Click **I accept the terms in the license agreement**, and then click **Next**

	Input **User Name** and **Organization** and click **Anyone who uses this computer (all users)** and **Next**
	Select **Complete** setup type, and then click **Next.** If you want to install the utility other then default directory, then select **Custom**.
	The message prompt you that installation is going to start. Click **Next to** continue.



The system prompts you that installation of Microsoft Visual C++ SP1 Redistributable Package is required. Click **Yes** to install it and the installation is started.



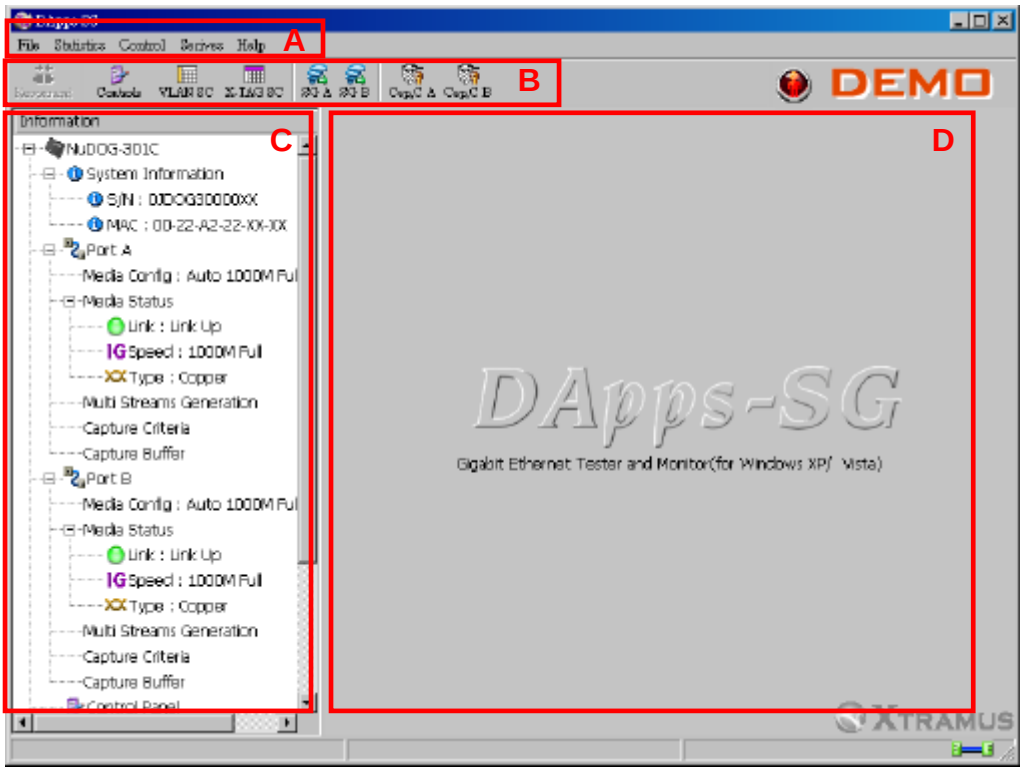
Click **Finish** to close the installation procedure

When Installation is done, start the program by clicking Start → All Programs → Xtramus → DApps-SG vx.xxxxx ("x" is version number) or 

at desktop, then main windows is shown.

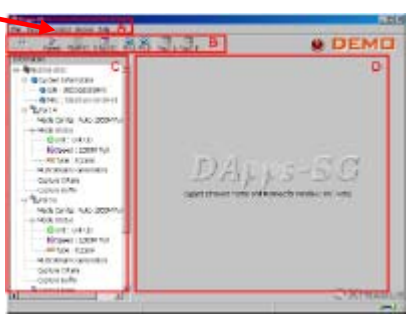
3.2 Operation Menu

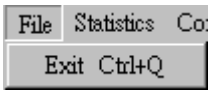
The operation menu is located at top of this utility



3.2.1 File Sub-menu

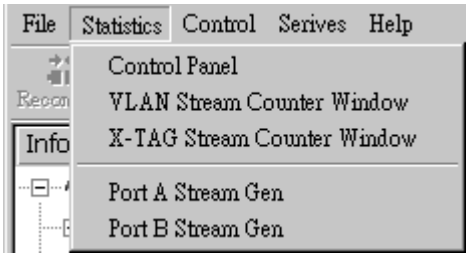
Block in main window: **A**





Menu Choice	Usage
Exit	Exit and close this utility

3.2.2 Statistics Sub-menu

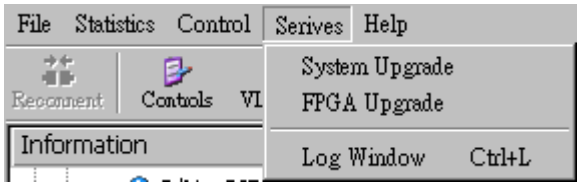


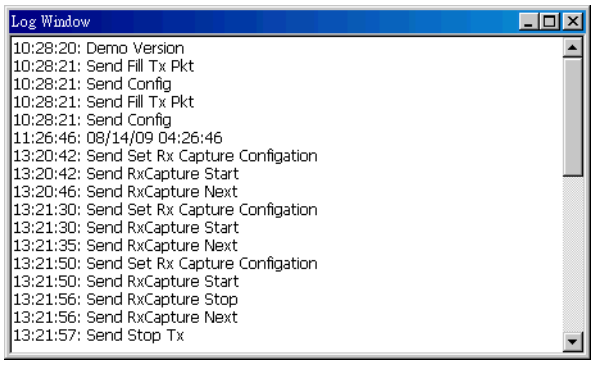
Menu Choice	Usage
Control Panel	Real-time frame counters and control panel of Port A and Port B. The counters contain frame counts generated and received that can examine the DUT.
VLAN Stream Counters Window	Add VID (VLAN ID) in specified range into the Ethernet frames that is generated from port A and/or port B in order to test DUT that supports VLAN tagged frame. Complete VLAN stream counter can analyze the packet sent and received.
X-TAG Stream Counter Window	X-TAG is an Xtramus proprietary 12 bytes embedded tag that is located at 49th~60th bytes of each testing frames that are generated by Rapid-Matrix for multi-streams tests. This counter can analyze many detailed problems of network transmission of Port A, Port B and Port A+B. They contain counters Current Tx Rate, Packets, Bytes, Loss Packets, S/N (serial number) Miss and IPCS (IP Checksum) Error.
Port A Stream Gen	Configure the settings and contents of port A for the generation of packet streams
Port A Stream Gen	Configure the settings and contents of port B for the generation of packet streams

3.2.3 Control Sub-menu

Menu Choice	Usage
Capture Buffer	Standard Mode (2K size): Active capture buffer (built-in memory) mode for maximum 2K size packets
	Jumbo Mode (16K size): Active capture buffer (built-in memory) mode for maximum 16K size packets

3.2.4 Service Sub-menu



Menu Choice	Usage
System Upgrade	Do system upgrade for Firmware: Firmware in this machine
FPGA Upgrade	Do system upgrade for FPGA: (Field Programmable Gate Array) chip in this machine
Log Windows	See instant log of current running command and result 

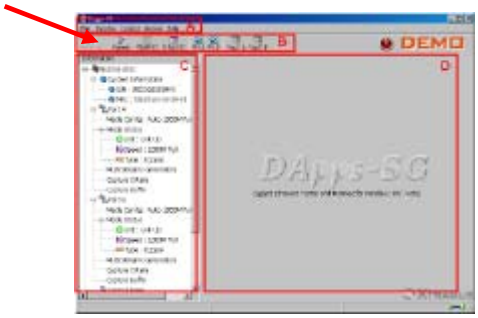
3.2.5 Help Sub-menu

Menu Choice	Usage
About (Model Name)	System information, such as Utility version and Hardware version of this device
Xtramus Web	Connect to Xtramus Web directly.

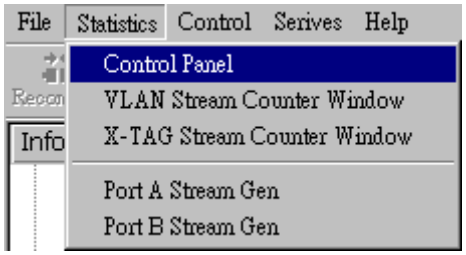
3.3 Toolbar

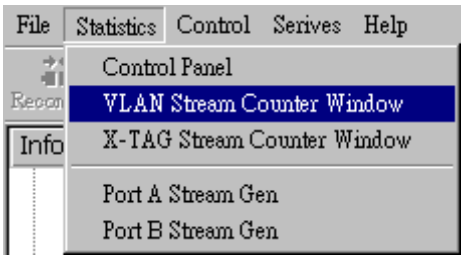
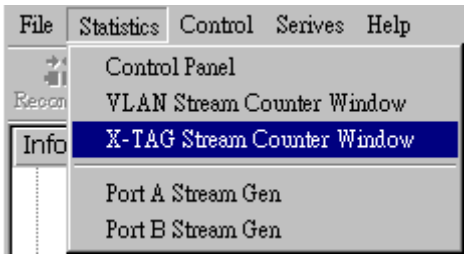
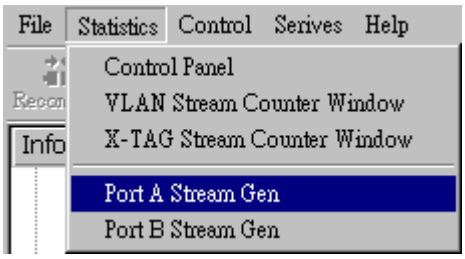
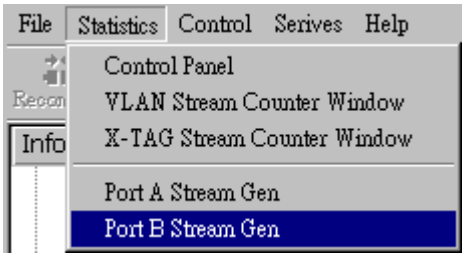
The Toolbar is located below operation menu of this utility

Block in main window: **B**



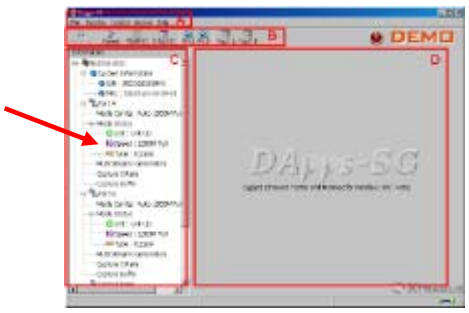
E F G H I J K L

Keys	Usage
Reconnect	For accident case such as power loss, cable disconnected that the network is disconnected, press this button to reconnect the network.
Controls	Real-time frame counters and control panel of Port A and Port B. The counters contain frame counts generated and received that can examine the DUT. This button is the same as main operation menu below 
VLAN SC	VLAN Stream Counters Add VID (VLAN ID) in specified range into Ethernet frame that is generated from port A and/or port B in order to test DUT that support VLAN tagged frame. Complete VLAN stream counter can analyze the packet sent and received. This button is the same as main operation menu below

	
X-TAG SC	X-TAG is an Xtramus proprietary 12 bytes embedded tag that is located at 49th~60th bytes of each testing frames that are generated by Rapid-Matrix for multi-streams tests. This counter can analyze many detailed problems of network transmission of Port A, Port B and Port A+B. This button is the same as main operation menu below 
SG A	Configure the settings and contents of port A for the generation of packet streams This button is the same as main operation menu below 
SG B	Configure the settings and contents of port B for the generation of packet streams 
Cap, C A	Configure the criteria to capture the packets from port A.
Cap, C B	Configure the criteria to capture the packets from port B.

3.4 Configuration and Information Zone

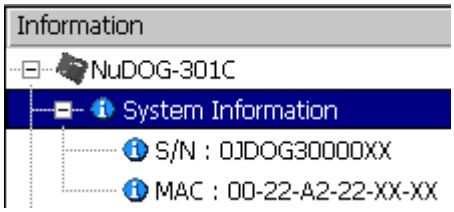
Block in main window: **C**



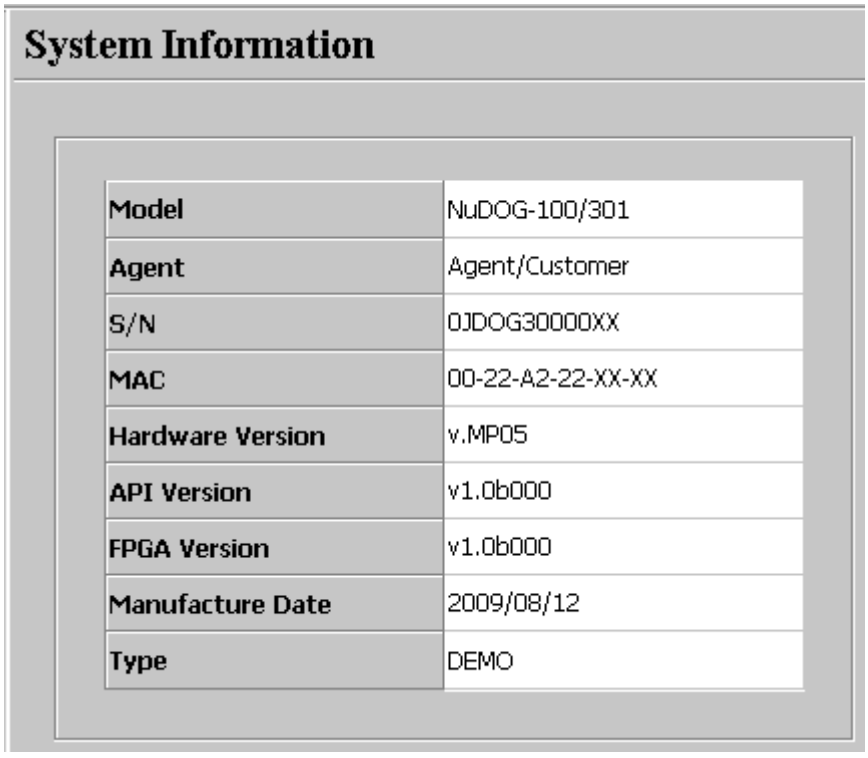
For different selections, there are System Information, Configuration and Status of Port A, Port B, Report and Function Configuration in this block.

3.4.1 System Information

Click the item below to show the system information

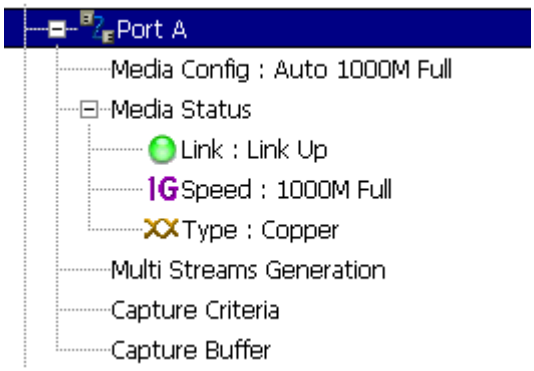


On the right side of the main window, it shows



3.4.2 Port Status and Configuration

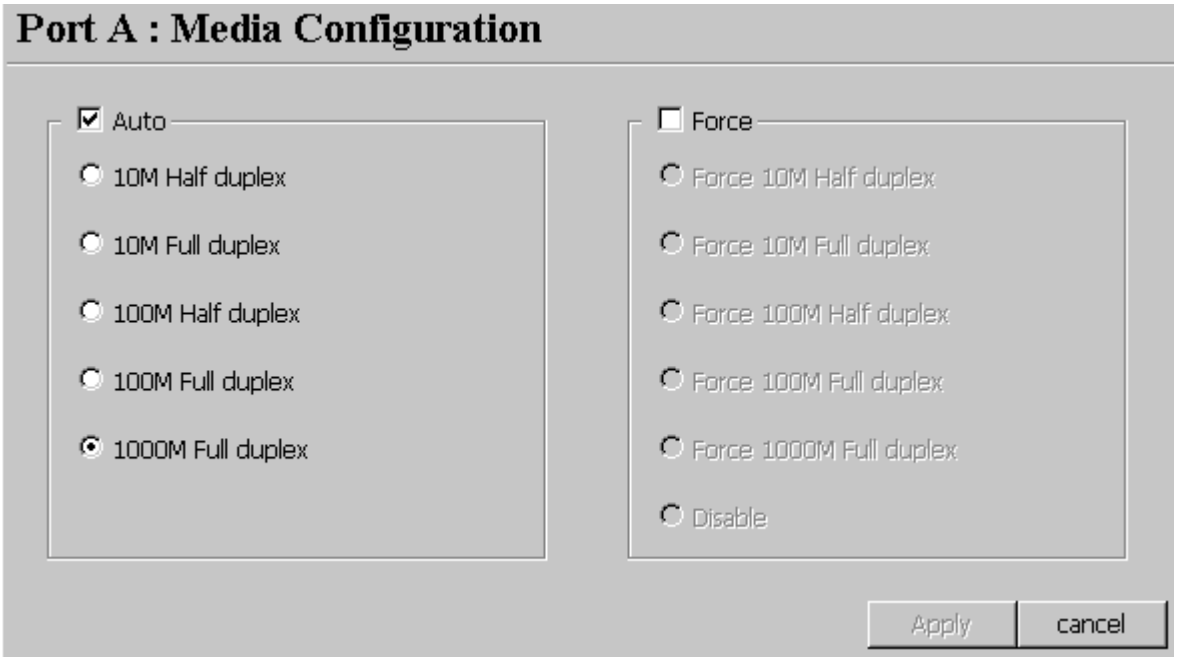
Click the item of ports to show the status or configuration



3.4.2.1 Media Config

Click item below to configure the link mode. Port A and port B has the same configuration items

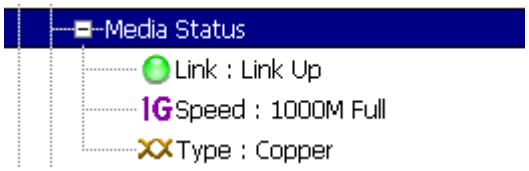
User can view the media link status or force to run specified media link



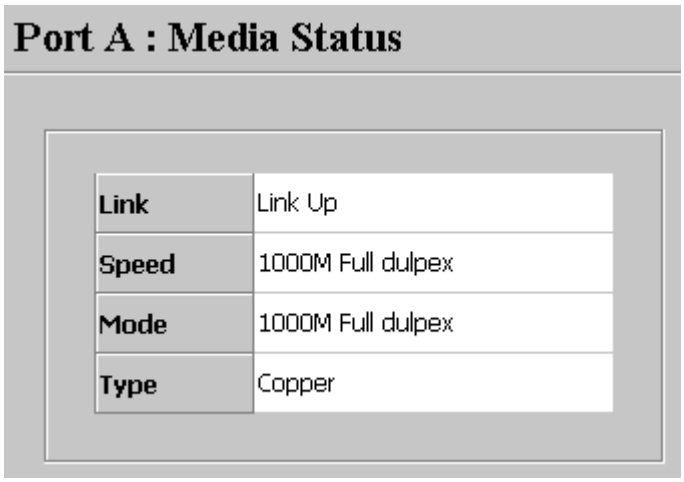
Click  to take effect the configuration on this page or click  to resume the original configuration

3.4.2.2 Media Status

Click items below to view the media status at its sub-tree.

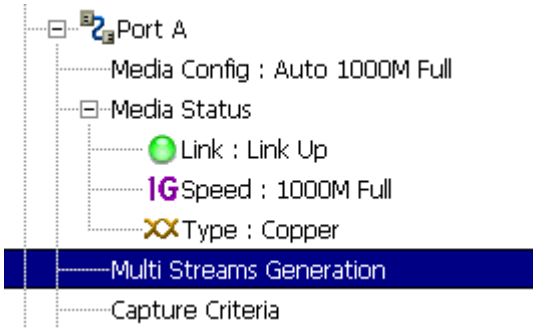


This window shows current link and media status

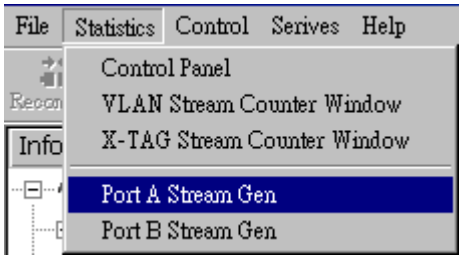


3.4.2.3 Multi Streams Generation

Click item below to view the Multi Streams Generation configuration window.



The configuration is the same as selection in operation menu or toolbar as below

Operation Menu: 

or Toobar: 

System shows the configuration window. User can configure the streams patterns for streams generation. Maximum 64 entries are allowed for this configuration.

Port A : Multi Streams Generation

Save A

Number of Streams 1

B Stream #	C Select Stream	D Length (no CRC)	E Rate	F X-TAG		G Append CRC	H Frame Data Config	I Protocol Type
			PPS	En	X-ID			
1	☑	60	1000	☐	---	☑	Frame Edit	LLC

Continued

J DA		K SA		L VID		M	N Summary	O
Mode	Range	Mode	Range	Mode	Range	IFG	IBG	Frames
Fixed	---	Fixed	---	Fixed	---	96	999327904	1000

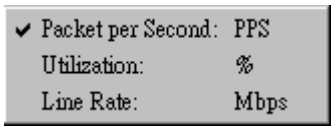
A: Save button: Save the configuration of current settings

B: Number of Streams: Volume of streams that will be generated

C: Select Stream □: User can tick the □ to active the stream generation of this stream.

D: Length (no CRC): Frame length in bytes without CRC

E: Rate: Select the unit and input the value of the parameter that the packets will be generated.



PPS: Packet per second. Volume of packets that will be generated per second.

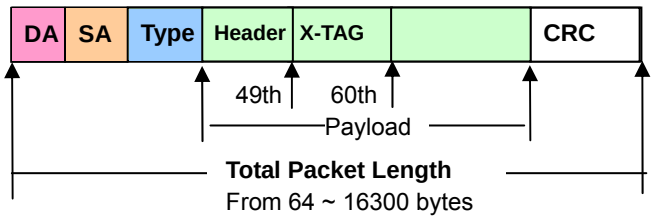
Utilization: Percentage of Wirespeed transmission

Line Rate: Mbytes per second in transmission

F: X-TAG En □: User can tick the □ to active tag generation of X-TAG. When it is ticked, user can select X-ID. Each X-TAG has an unique ID. If there are more than one product of Xtramus is generating the data stream on the same network, their X-ID should be different

X-TAG that is used as stream tags for providing fundamental information for collecting statistics of multi-stream traffic. Advanced tests like latency, packet loss, and packet sequence miss can be realized by X-TAG.

X-TAG is an Xtramus proprietary 12 bytes embedded tag that is located at 49th~60th bytes of each testing frames that are generated by Rapid-Matrix for multi-stream tests.



G: Append CRC: Add CRC checksum to the end of each frame. CRC checksum is the way to

verify the correctness after data transmission. 4 bytes will be added at the end of the frame when CRC checksum is added.

H: Frame Data Config: Configure the payload contents in frame. Click the **Frame Editor**

to edit the detailed contents in frame. For the detail of how to use Frame Editor, please refer to 3.5 Frame Editor

I: Protocol Type: System shows the Protocol Type when frame content is configured in

J: DA: Mode: Show or configure current Destination Address Mode. It can be Fixed, Increase, Decrease or Random. If increse or decrese mode is selected, configure range (0~255) is required. The DA will increase or decrease according to the range and repeat again. For the detail of this function, please refer to 3.5 Frame Editor

K: SA: Mode: Show or configure Source Address Mode. It can be Fixed, Increase, Decrease or Random. If increse or decrese mode is selected, configure range (0~255) is required. The SA will increase or decrease according to the range and repeat again. For the detail of this function, please refer to 3.5 Frame Editor

L: VID: Mode: Show or configure VID Mode. It can be Fixed, Increase, Decrease or Random. If increse or decrese mode is selected, configure range (0~4095) is required. The SA will increase or decrease according to the range and repeat again. For the detail of this function, please refer to 3.5 Frame Editor

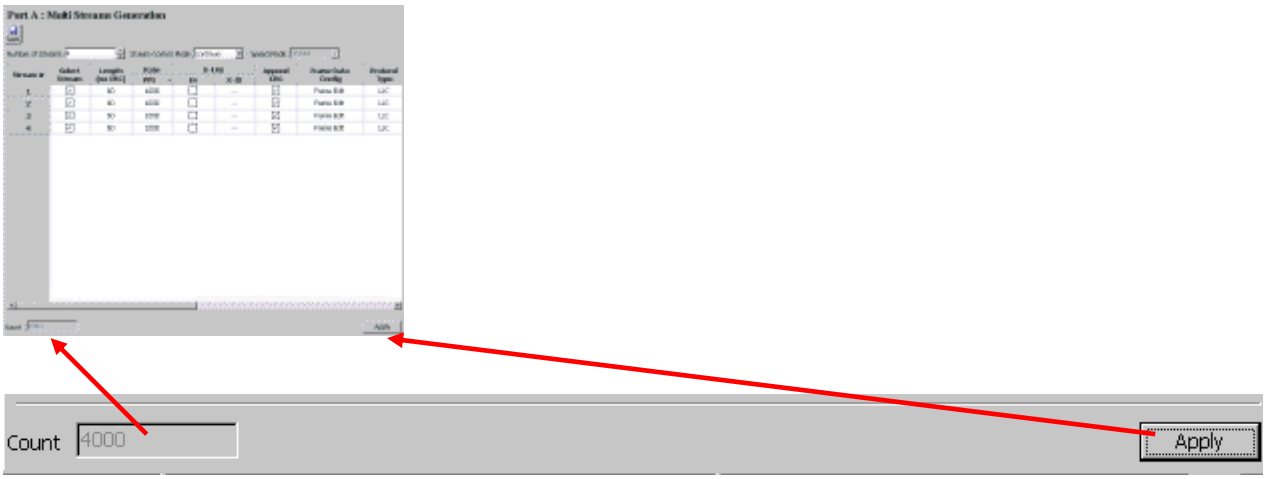
Summary: The summary of the stream that user create

M: IFG: Interframe Gap. Ethernet devices must allow a minimum idle period between transmissions of Ethernet frames. It is called interframe gap (IFG) as the illustration below

The minimum interframe gap is 96 bits time or 12 byte time. It is the time taken for transmission of 96 bits raw data on the media.

N: IBG: Inter Burst Gap. Gap between each burst streams.

O: Frames: Total frames that will be sent

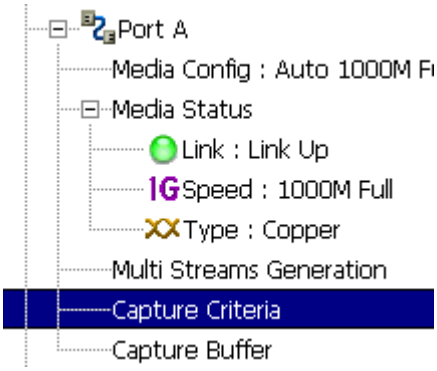


Count: Create the number counts of streams generation

Apply: Apply to take effect.

3.4.2.4 Capture Criteria

Click item below to view the Capture Criteria configuration window.



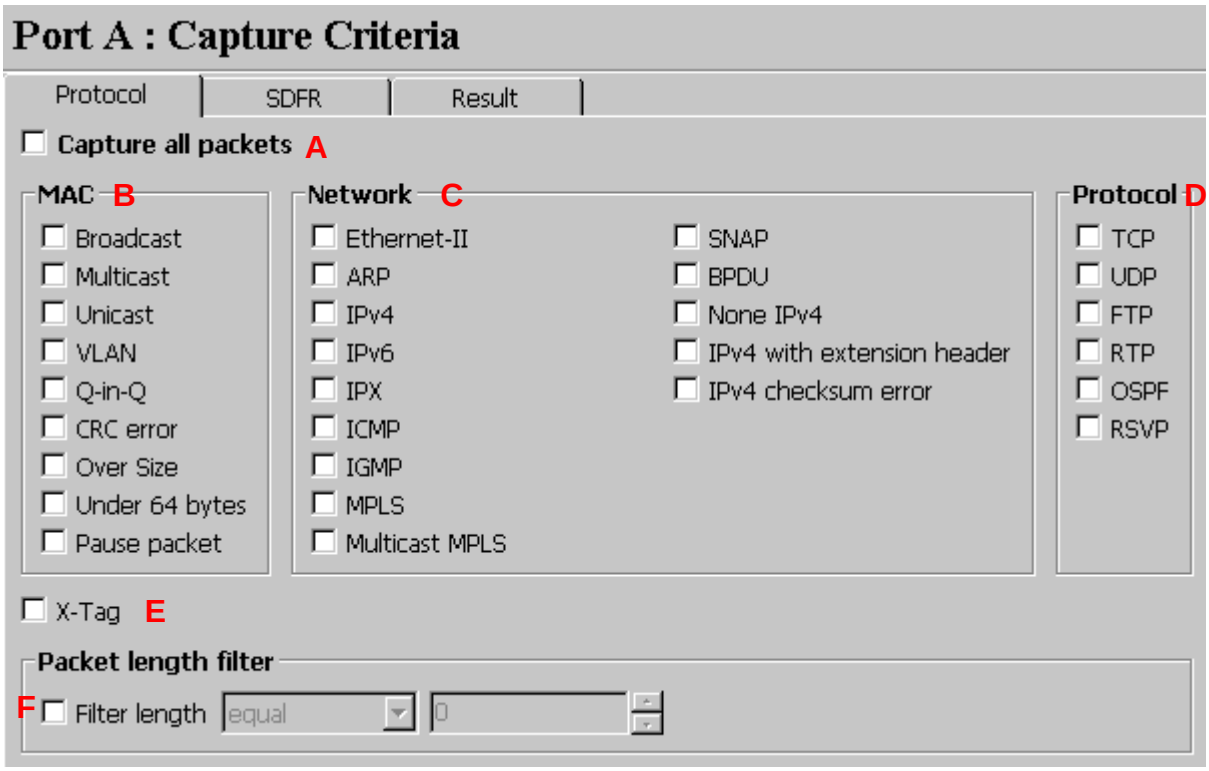
The configuration is the same as selection in operation menu or toolbar as below

Toolbar: 

System shows the configuration window. Users can configure the criteria that they want to capture, from protocol or SDFR aspects

◆ **Protocol**

Different protocols can be combined as unique criteria



A: Capture all packets: All packets are captured and sent to PC by USB port. Be attention that packet loss is possible if the captured traffic is higher than traffic allowed for USB port.

B: MAC: MAC based criteria. Packets with MAC events in the list is captured and sent to PC by USB port

C: Network: Network events criteria. Packets with network events in the list is captured and sent to PC by USB port.

D: Protocol: Protocol Type criteria. Packets with protocol type in the list is captured and sent to PC by USB port.

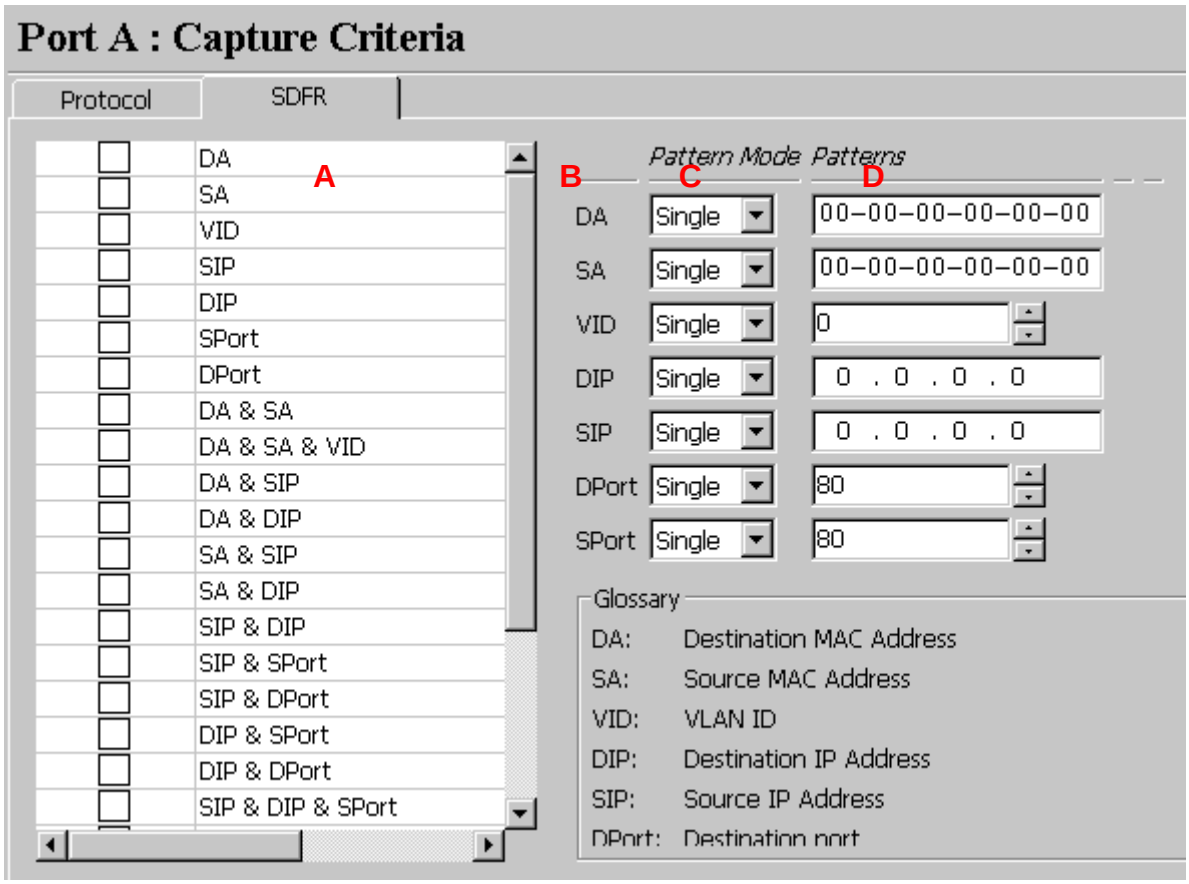
E: X-TAG: X-TAG is an Xtramus proprietary 12 bytes embedded tag. User can capture this kind of packets from product of Xtramus

F: Packet length filter: Capture packet (frame) length in specified range of length

◆ **SDFR:**

- SDFR (Self-Discover Filtering Rules) is a technique that make capture of Ethernet easy and convenient

- User-friendly interface that the value such as source IP, destination IP and other criteria for capture and filter can be input directly without calculating mask.
- SDFR value for capture or filter includes several network event (such as DA, SA, DIP…), varied length of frame (oversized, undersized) and varied of frame/packet type (CRC error, IP checksum error…).
- Value of SDFR can be a unique value or a range of values between specified values. All packets that fit the value are captured
- Multiple filter condition can be activated easily by just clicking different options
- Displays captured packet in real-time while network is still running.
- Value of SDFR and filter criteria can be changed dynamically during capture procedure.



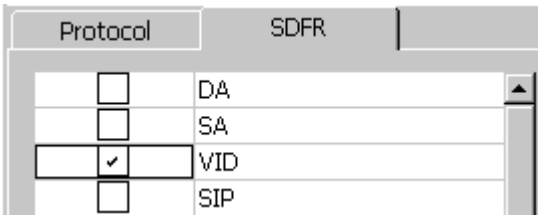
A: SDFR items: User can tick the items that act as criteria. When user ticks one option, some other options will be gray. It means the option what user tick has covered the range of those options in gray.

B:Pattern

- DA: Destination MAC address
- SA: Source MAC address
- VID: VLAN ID that follows 802.11Q standard
- DIP: Destination IP address

- SIP: Source IP address
- DPort: Destination port of IP address
- SPort: Source port of IP address

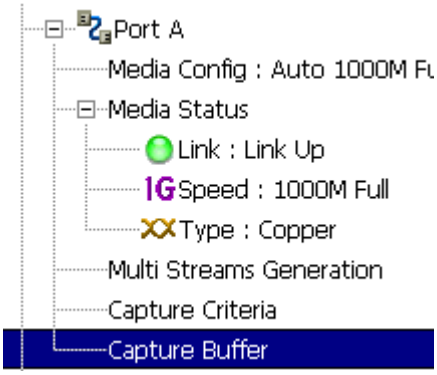
C: Pattern Mode: Select a pattern (Single, Pair, Range) to cover the value of criteria items.
D: Patterns: The unique value or range of values specified as the capture criteria of criteria items.
For example, user wants to capture packets with VLAN ID 1 to 10.



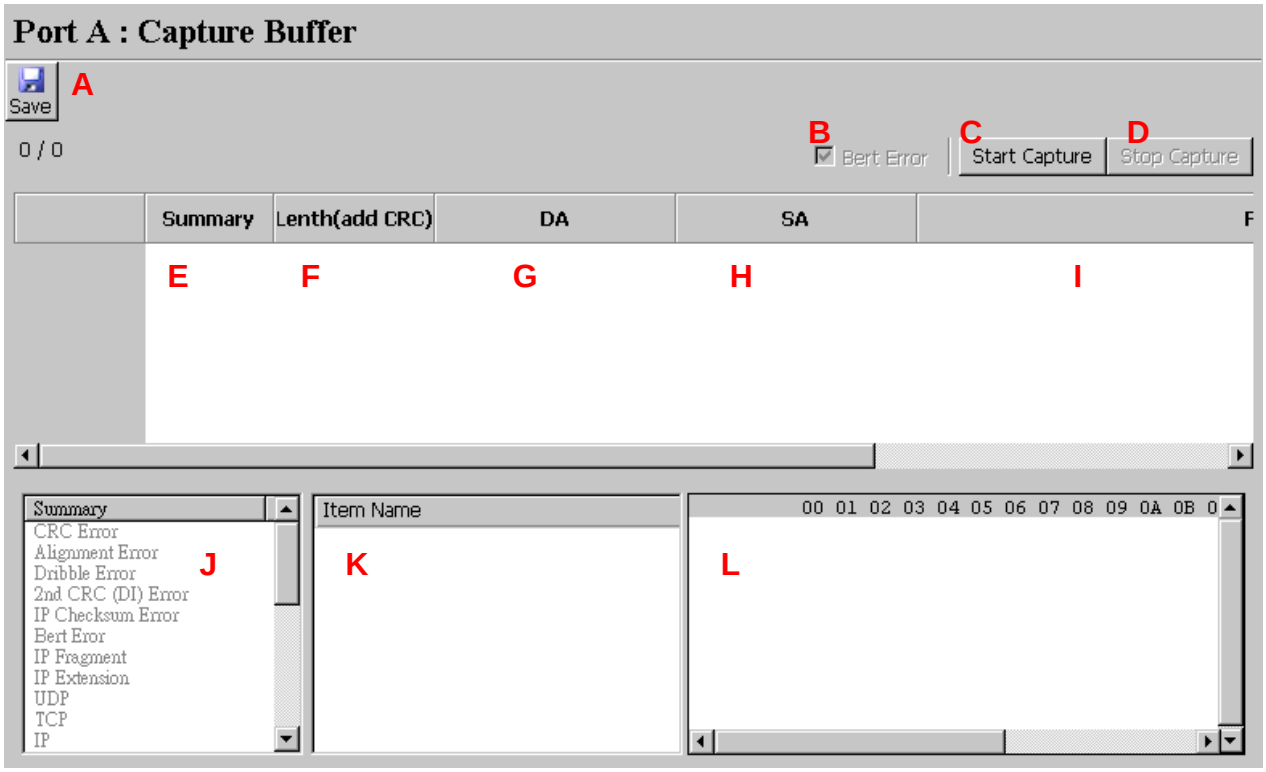
Plus

3.4.2.5 Capture Buffer

Click item below to view the Capture Buffer configuration window.



To view the contents of captured packets, user can select the captured packets from Capture Buffer window



A: Save: Save the captured packets to file

B: Tick this option to capture Bert Error packets

C: Start Capture: Starts the capture process.

D: Stop Capture: Stop the capture process

This block lists all captured packets

E: Summary: Summary of network items

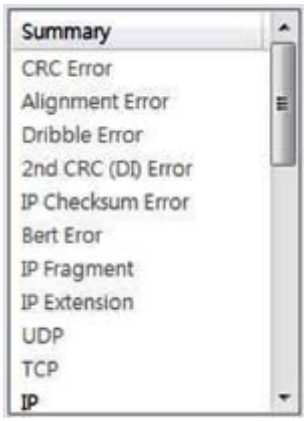
F: Length (add CRC): Packet length that includes CRC

G: DA: Destination MAC Address

H: SA: Source MAC Address

I: Frame Data: Contents of captured frame (packet).

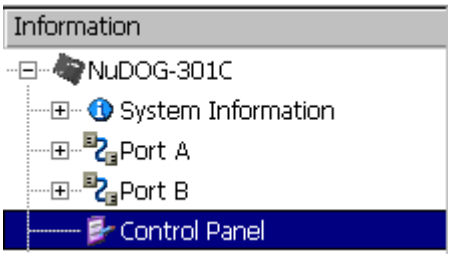
J: Summary: List all summry items of network. When user select a packet, the summary items that fit the packet is labels as black word, otherwise, labels as gray word that it does not fit the packet. For the example below, the selected packet is **IP** packet and it does not has the other property such as CRC Error, Alignment Error.



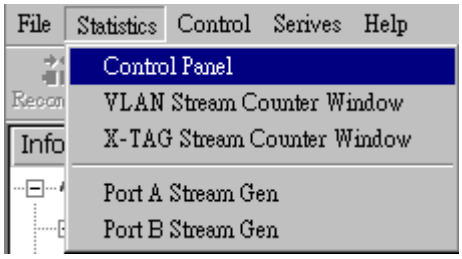
K: Item Name: Frame view of capture packets, such as Ethernet II

3.4.3 Control Panel

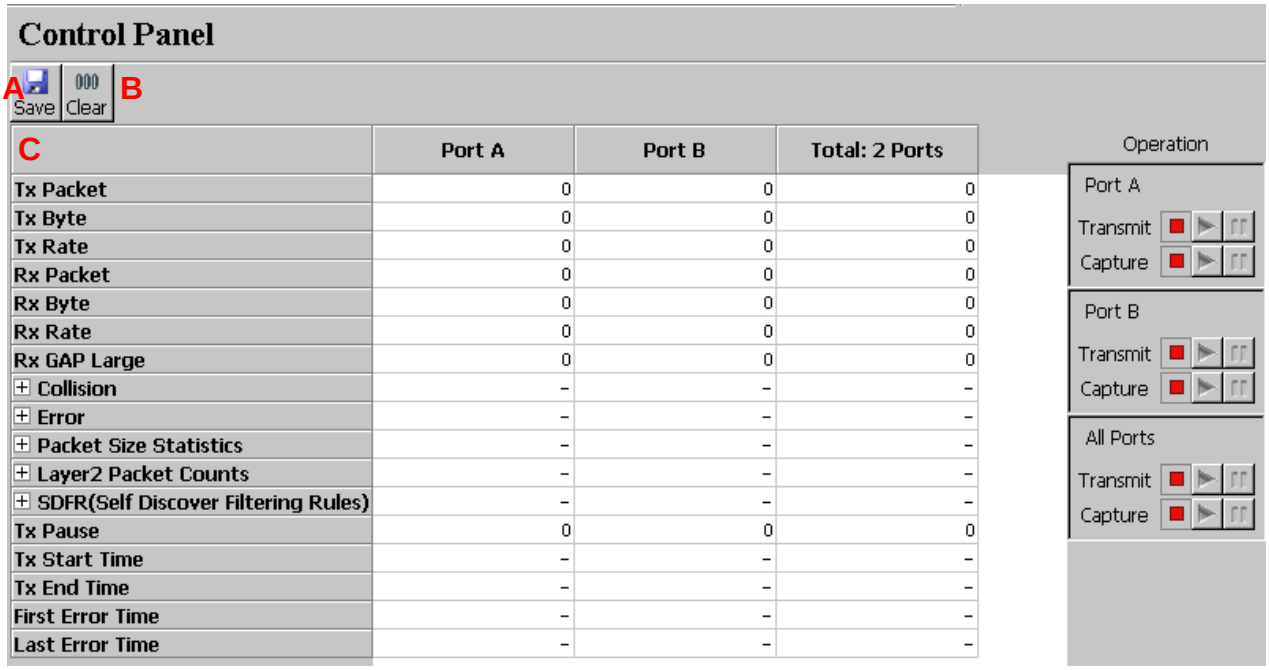
Click item below to view the Control Panel window.



The configuration is the same as selection in operation menu or toolbar as below

Operation menu:  or Toolbar 

Control button of this window can control packet generation and receiving, and also view the result counter



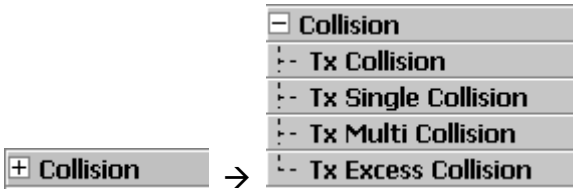
◆ Control buttons

A: Save: Save current result of counters to Excel file

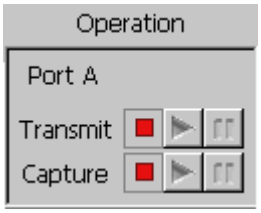
B: Clear: Clear all counters to zero and it is ready for next packet generation

C: Counter: Counters for streams generation

Counter with ⊞ mark is expansible. Please click the ⊞ mark



◆ Operation



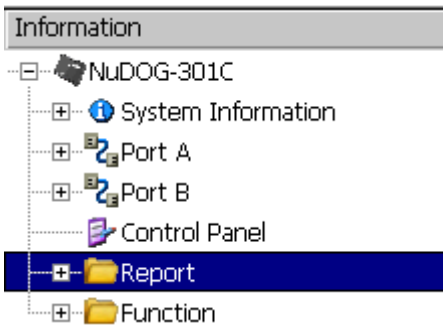
This option can activate Transmit or Capture of port A, port B or port A + B individually.

Button	Description
■	Stop complete procedure of transmitting or capturing.
▶	Start to transmit or capture procedure
⏸	Pause transmitting or capturing procedure. System still measure the

	statistics couter, however, the counter value is static for user to watch the status when user click the  button. When user click  again, the counter status resume to real status instantly. Click this button does not affect the real counters values

3.4.4 Report

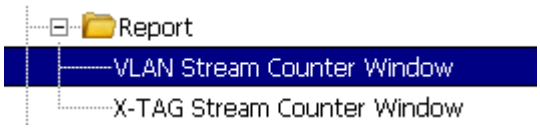
Click item below to view the Report window.



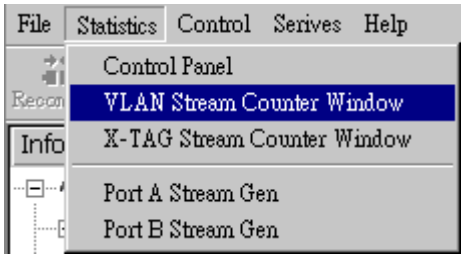
3.4.4.1 VLAN Stream Counter Window

User can specify the range of VLAN ID for each port in order to view the stream counter

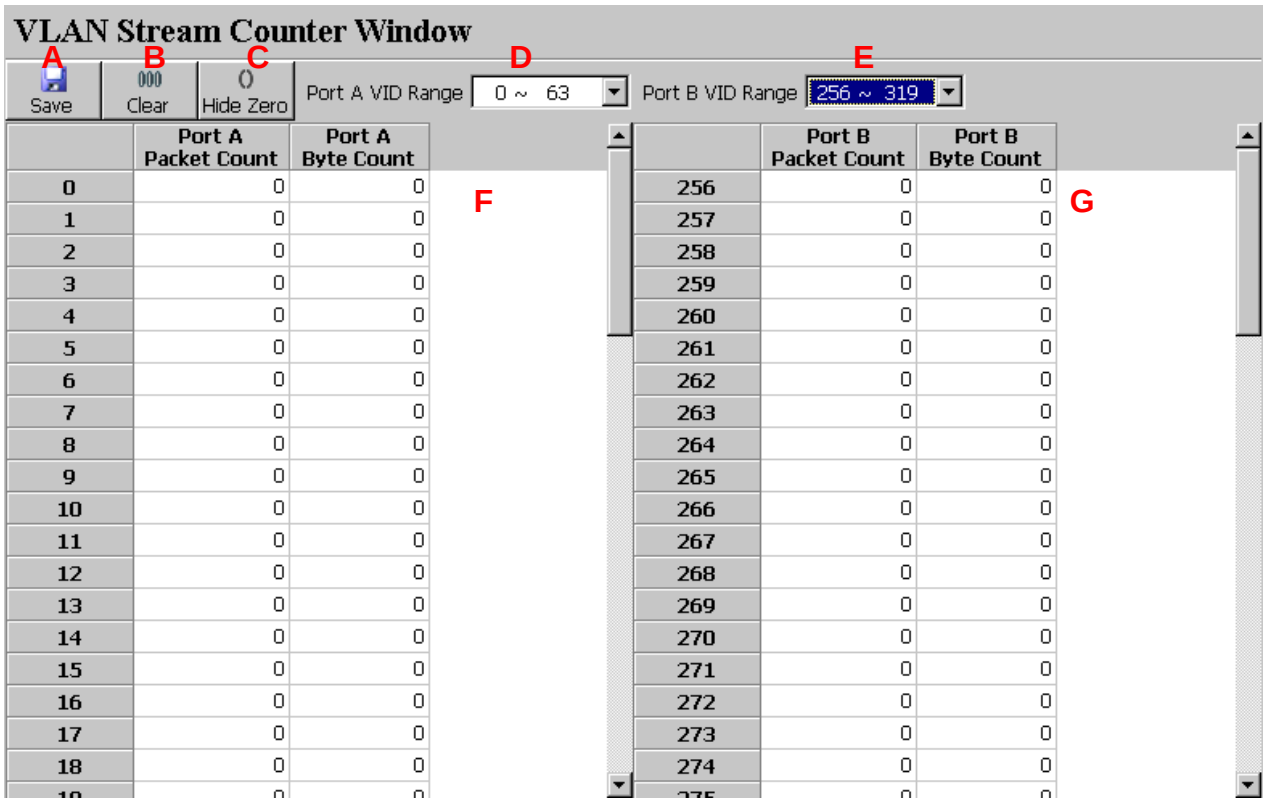
Click item below to view the VLAN Stream Counter window.



The configuration is the same as selection in operation menu as below

Operation Menu: 

or Toolbar: 



A: Save: Save the current counters value to Excel file

B: Clear: Clear the current counters value to zero

C: Hide Zero: Hide counter items that its counter value is zero

D: Port A VID Range: Specify the range of VLAN ID of Port A

The range is based on 64 entries once a time, so the entries are 0~63, 64~127…4032~4095.

E: Port B VID Range: Specify the range of VLAN ID of Port B

The range is based on 64 entries once a time, so the entries are 0~63, 64~127…4032~4095.

F: Packet Counts and Bytes Counts of Port A

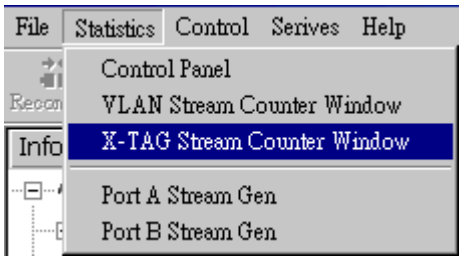
G: Packet Counts and Bytes Counts of Port B

3.4.4.2 X-TAG Stream Counter Windows

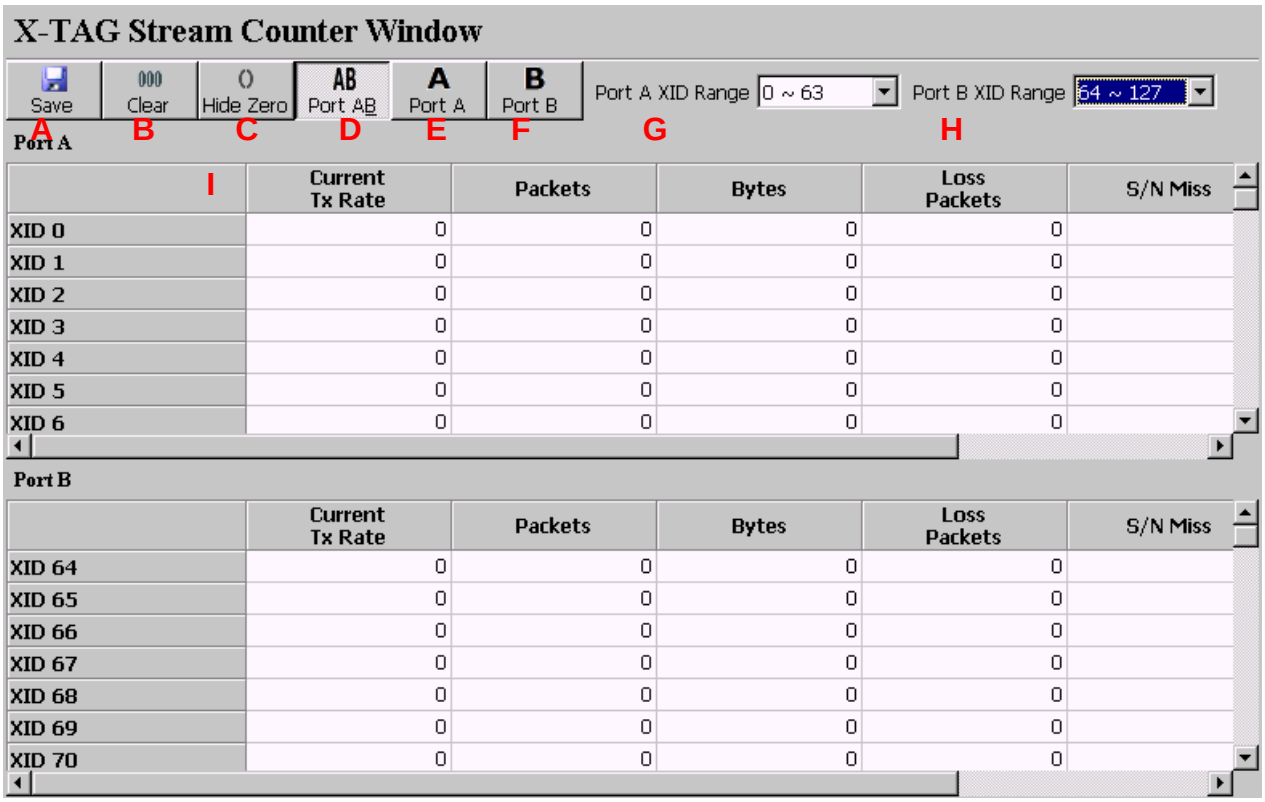
User can specify the range of X-TAG ID for each port in order to view the received stream counter

Click items below to view the X-TAG Stream Counter window.

The configuration is the same as selection in operation menu as below

Operation Menu: 

or Toolbar: 



A: Save: Save the current counters value to Excel file.

B: Clear: Clear the current counters value to zero.

C: Hide Zero: Hide counter items that its counter value is zero.

D: Port AB: Lists counters value of port A and port B simultaneously.

E: Port A: Lists counters value of port A only.

F: Port B: Lists counters value of port B only.

G: Port A XID Range: XID (X-TAG ID) is the ID of Xtramus proprietary embedded tag in Ethernet frame. The range cover from 0~255 that is divided by 4 groups. If more then one port of this machine joins the test or more users use this device to join the test in the same network, different XID can be identify as different packet generator

H: Port B XID Range: The same function above that is applied to Port B

I: XID counter

	Current Tx Rate	Packets	Bytes	Loss Packets	S/N Miss	IPCS Error
XID 0	0	0	0	0	0	0
XID 1	0	0	0	0	0	0

Current Tx Rate: Current transmission rate (packets / sec)

Packets: Packets received

Bytes: Bytes received

Loss Packets: Packet loss found

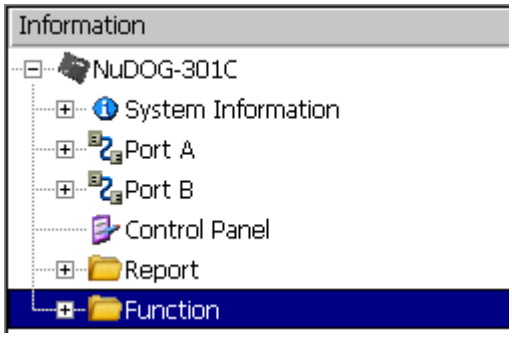
S/N Miss: Sequence misses. X-TAG is able to detect the mis-ordered sequence.

IPCS Error: IP checksum error received

CRC Error: CRC error received

3.4.5 Function

Click item below to view the Function window.

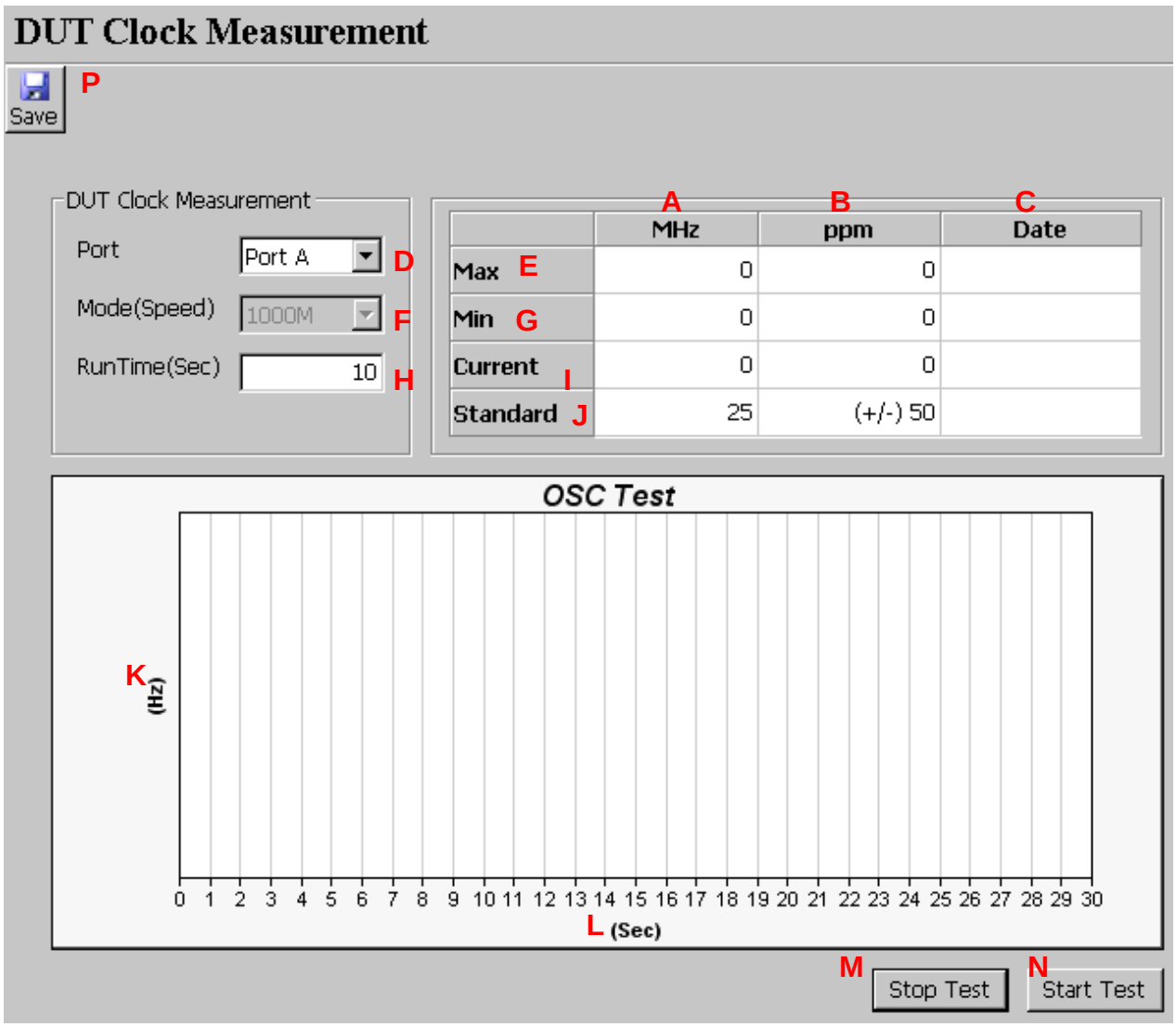


3.4.5.1 DUT-Clock

In the sub-tree of Function

This device is equipped with high precision 1 ppm temperature-compensated oscillator that can generate precise speed network streams to DUT, or measures the speed rate of DUT's oscillator for speed control of network streams.

By using this application software, operator is able to measure oscillator's speed of DUT that is either faster or slower than standard speed in ppm scale, or use it as criteria to judge the result of test.



D: Select Port: Select port that connect to DUT for test.

F: Mode (Speed): Select network speed that user wants to test the DUT.

H: RunTime(Sec): Configure the duration of the test.

A: MHz: The frequency of Quartz Oscillator.

B: ppm: ppm: faster (+) or slower (-) then standard speed. For example, +20 means 20ppm faster then standard speed

C: Date: Date of this test.

E: Max: Maximum value of MHz or ppm during the test.

G: Min: Minimum value of MHz or ppm during the test.

I: Current: Current detected value.

J: Standard: Standard value for reference.

K: MHz: MHz scale in this curve graph.

L: Sec: Time (second) scale in this curve graph.

M: Stop Test: Click this button to stop the test.

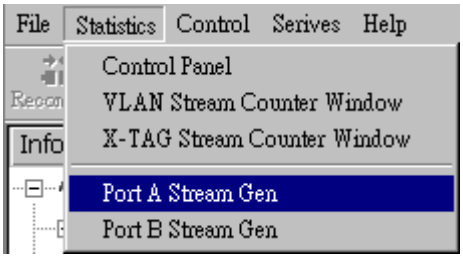
N: Start Test: Click this button to start the test.

P: Save: Save the test result.

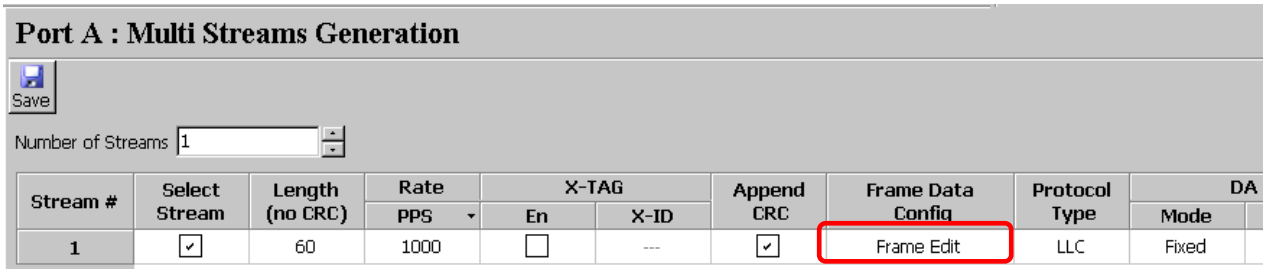
3.5 Frame Editor

To create the pattern and contents of the streams what user want to generate, the utility has Frame Editor function to create what user want.

Click 

button on toolbar or 

on operation menu, system shows

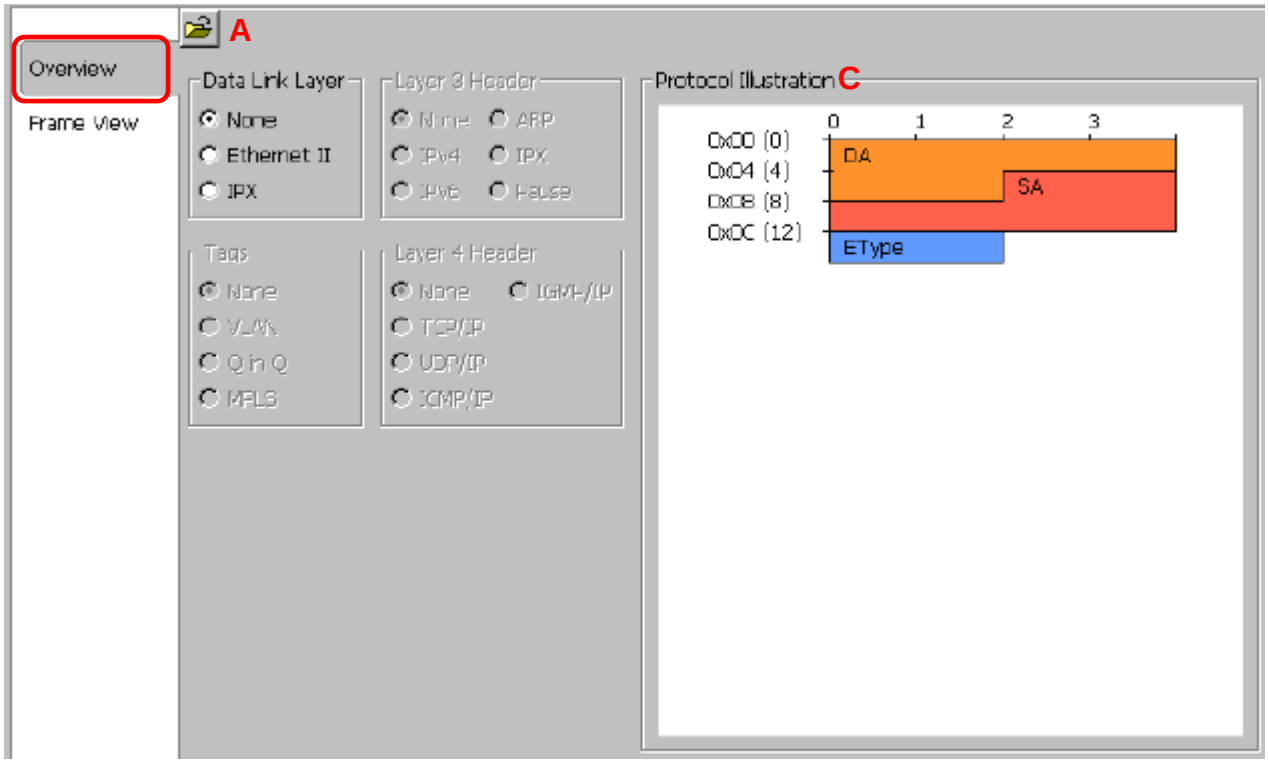


Configure related parameters, then user can click 

to edit the detailed contents in frame.

3.5.1 Overview

This window shows all frame type that is configurable. User can also import user-defined file (*.pcap of Ethereal or Wireshark) for test directly.



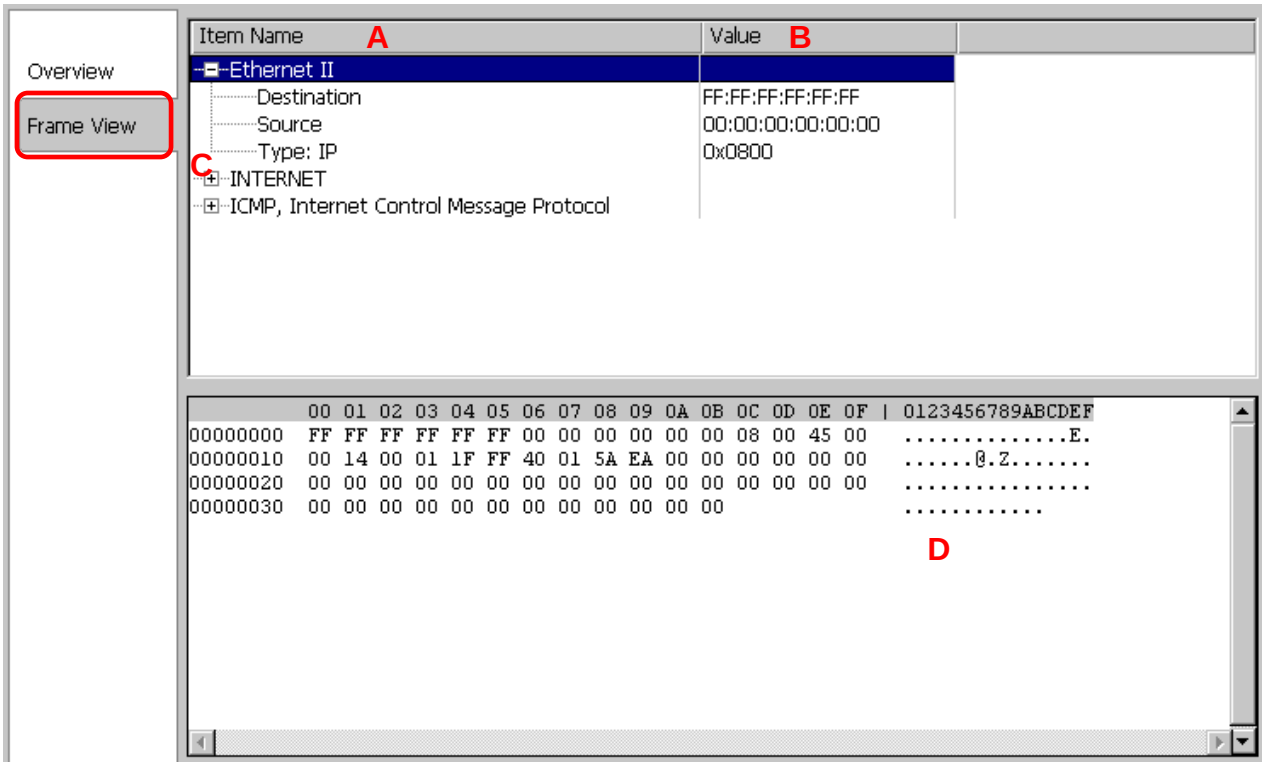
3.5.1.1 Import

Click the **A**:  button and import the file from PC

C: Protocal Illustration: The figure shows the structure of packet/frame that will be generated. The figure is changeable, depending on the configuration of the packet/frame.

3.5.2 Frame View

This Frame View window shows the frame structure of the frame that user want to edit.



A: Item Name: Network protocal type

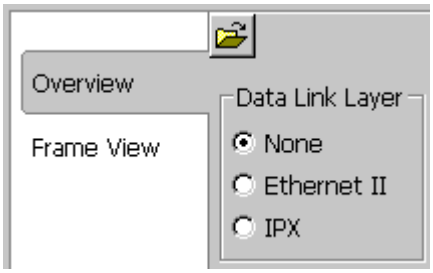
B: Value: the value in the protocal type

C: Click ⊞ can expend the items in protocal type

D: Contents of the edited frame/packet.

3.5.3 Data Link layer

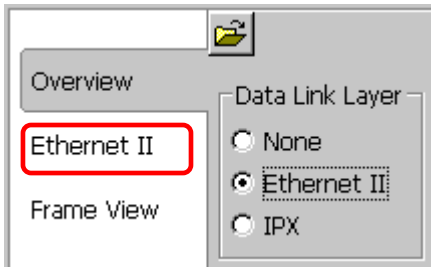
Data Link Layer type of streams generation

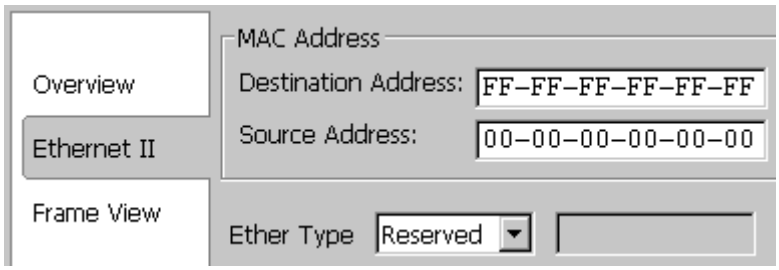


Data Link layer: The Data Link Layer is Layer 2 of the seven-layer OSI model of computer networking. The Data Link Layer protocols respond to service requests from the Network Layer and they perform their function by issuing service requests to the Physical Layer.
Several protocols options can be chosen for the test.

3.5.3.1 Ethernet II

Ethernet II: The most common Ethernet protocol currently used on LAN





User can configure the MAC address of DUT.

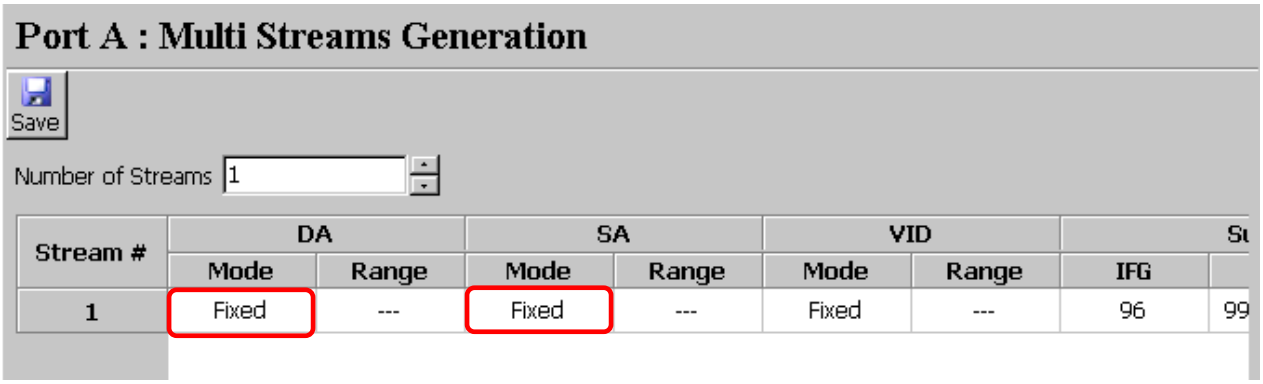
Destination Address (DA): Default: FF:FF:FF:FF:FF:FF, means broadcast frame. To use variation of DA function, this MAC address is the start MAC address

Source Address (SA): Default: 00:00:00:00:00:00, means the MAC address of this device itself. To use variation of SA function, this MAC address is the start MAC address

3.5.3.2 Variation of DA, SA and VID

The DA and SA is variable if increase or decrease selection is selected

DA, SA of Default Multi Streams generation is fixed



User can click the selection and change it to increase or decrease and also specify a range of variation as the example below

DA		SA	
Mode	Range	Mode	Range
Increase	100	Decrease	150

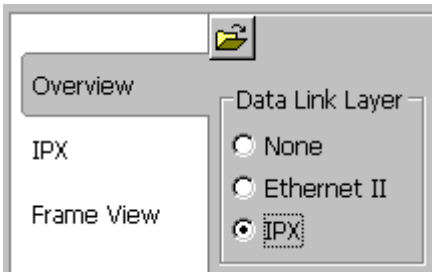
Assume that the DA is 00-00-21-5C-0A-22, Assume that the DA is 00-00-21-5C-0B-22

- When increase mode is selected, the last 2 hexdecimal digits will be 22, 23, 24…till the counts of the range, for example, 100.
- When decrease mode is selected, the last 2 hexdecimal digits will be 22, 21, 20…till the

counts of the range, for example, 150.

3.5.3.3 IPX

IPX: Internetwork Packet Exchange (IPX) is the OSI-model Network layer protocol in the IPX/SPX protocol stack. The IPX/SPX protocol stack is supported by Novell's NetWare network operating system.



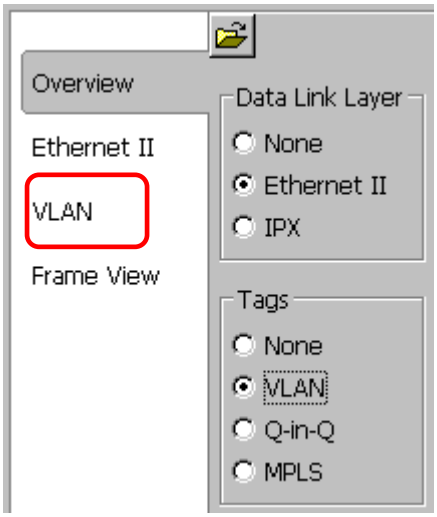
This editor of IPX will added if required.

3.5.4 Tags

When Ethernet II of Data Link Layer is selected, extra tag options is available.

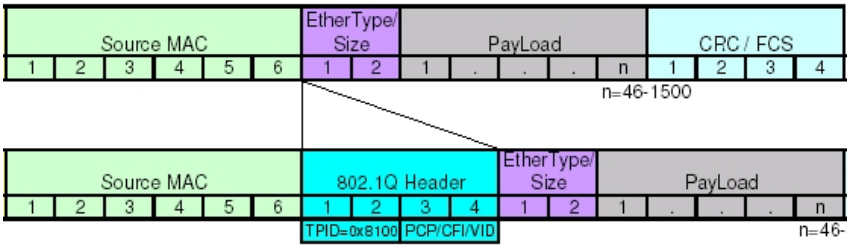
When Ethernet II is selected. Tags option is opened

3.5.4.1 VLAN



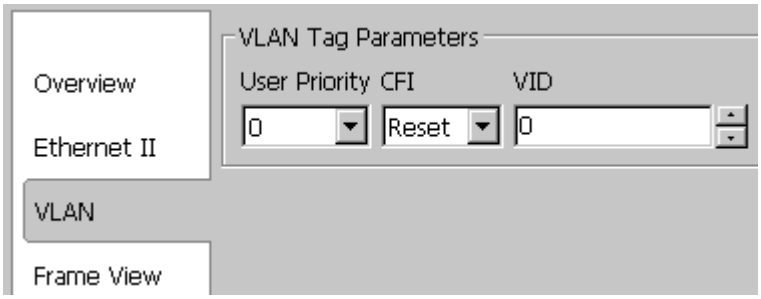
A virtual LAN, commonly known as a VLAN, is a group of hosts with a common set of requirements that communicate as if they were attached to the Broadcast domain, regardless of their physical location.
The protocol most commonly used today in configuring virtual LANs is IEEE 802.1Q.

IEEE 802.1Q adds a 32-bit field between the source MAC address and the EtherType/Length fields of the original frame. The VLAN tag field has the following format:



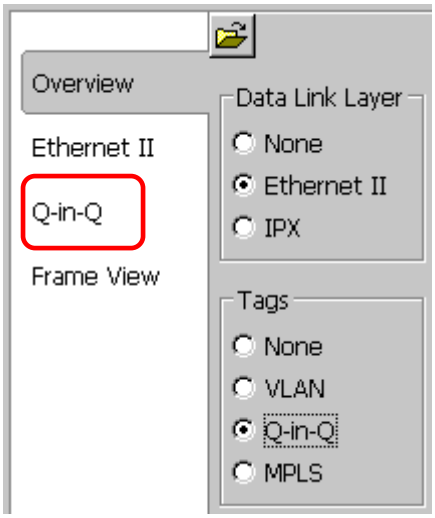
VLAN Tag in Ethernet Frame

To configure the VLAN for streams generation, click the VLAN Tab

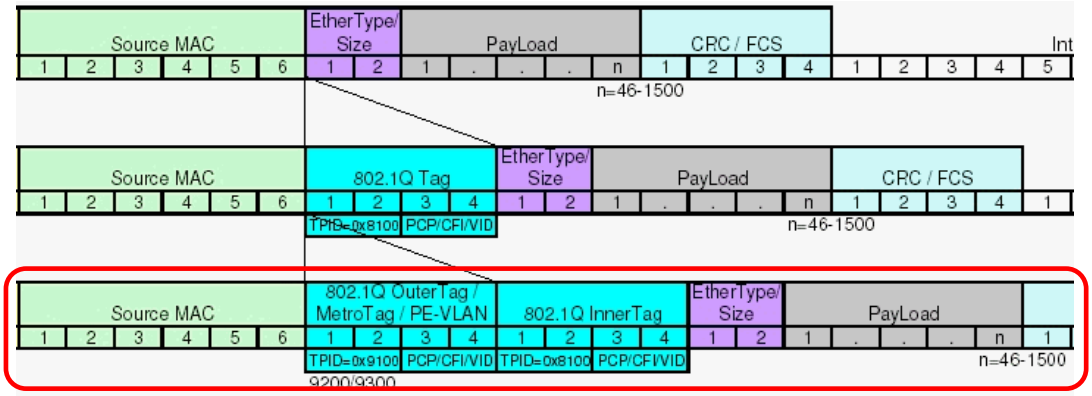


User priority (also called COS, class of service) and VID are most common parameter for the test

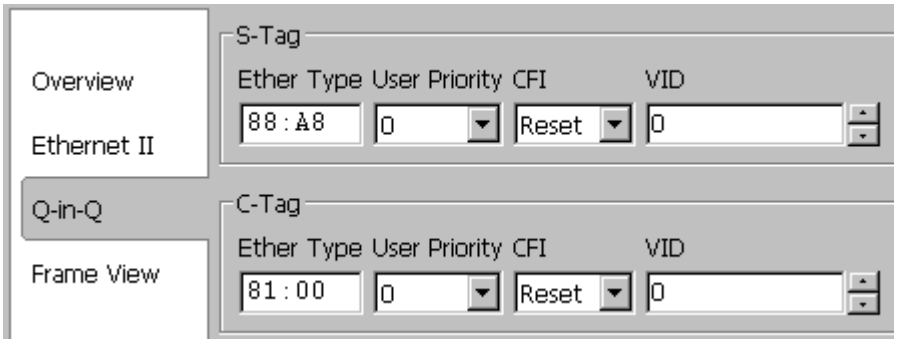
3.5.4.2 Q-in-Q



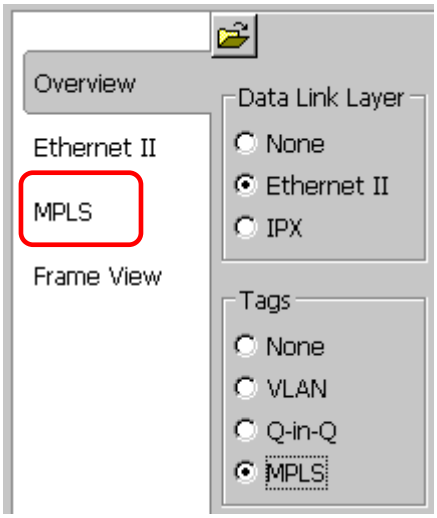
IEEE 802.1ad (Provider Bridges) is an amendment to IEEE standard IEEE 802.1Q-1998 and it is called Q-in-Q or Stacked VLANs



To configure the Q-in-Q for streams generation, click the Q-in-Q Tab



3.5.4.3 MPLS

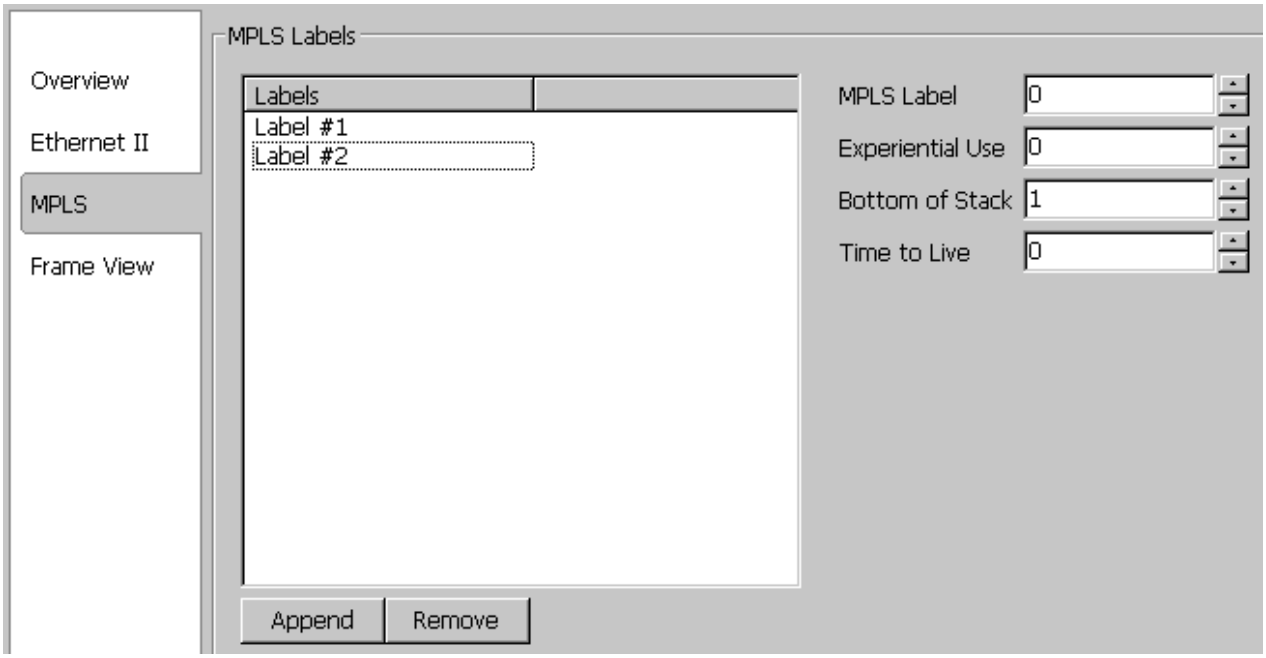


In computer networking and telecommunications, Multiprotocol Label Switching (MPLS) refers to a mechanism that directs and transfers data between Wide Area Networks (WANs) nodes with high performance, regardless of the content of the data. MPLS makes it easy to create "virtual links" between nodes on the network, regardless of the protocol of their encapsulated data.

MPLS works by prefixing packets with an MPLS header, containing one or more 'labels'. This is called a label stack. Each label stack entry contains four fields:

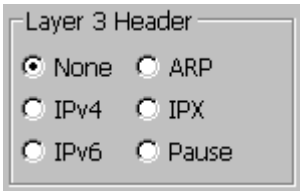
- A 20-bit label value.
- A 3-bit Traffic Class field for QoS (Quality of Service) priority (experimental) and ECN (Explicit Congestion Notification).
- A 1-bit bottom of stack flag. If this is set, it signifies that the current label is the last in the stack.
- An 8-bit TTL (time to live) field.

This can be defined by the configuration of this utility.

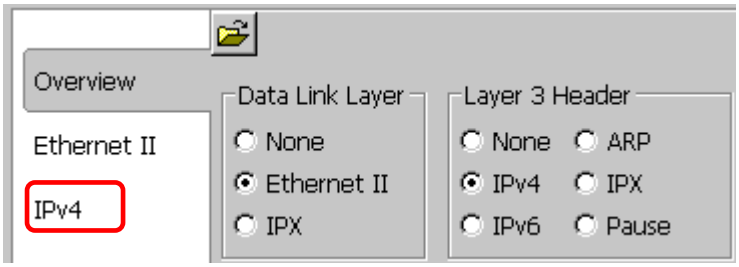


3.5.5 Layer 3 Header

In the payload of frame, layer 3 header as the items below is configurable



3.5.5.1 IPv4

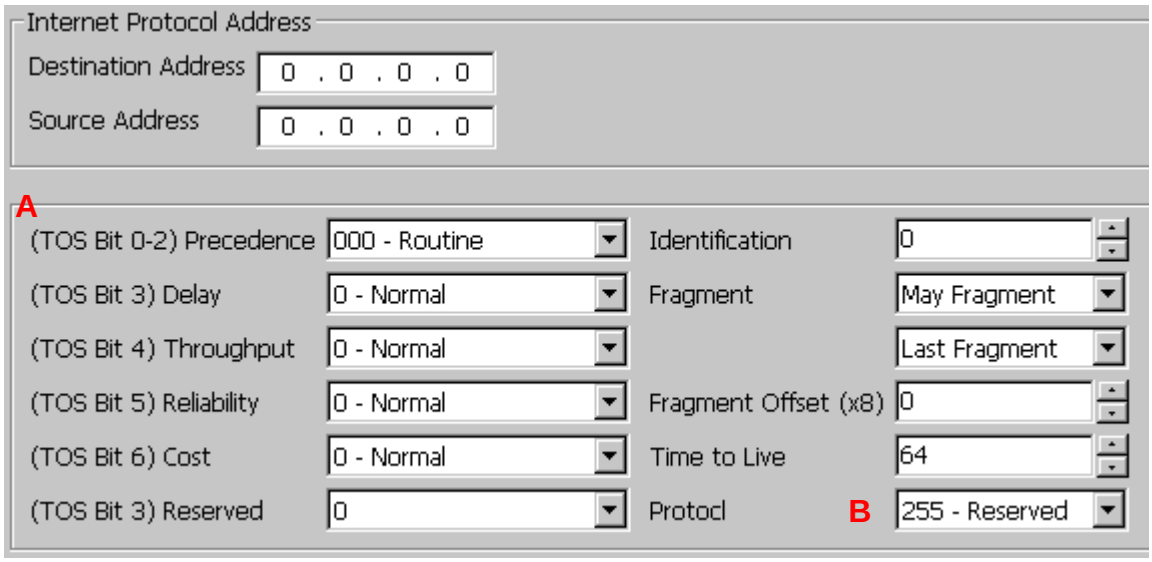


IPv4: Internet Protocol version 4 (IPv4) is the fourth revision in the development of the Internet Protocol (IP) and it is the first version of the protocol to be widely deployed.

The structure of IP header is illustrated below

bit offset	0–3	4–7	8–15	16–18	19–31
0	Version	Header length	Differentiated Services	Total Length	
32	Identification			Flags	Fragment Offset
64	Time to Live		Protocol	Header Checksum	
96	Source Address				
128	Destination Address				
160	Options				
160 or 192+	Data				

The utility has user configurable interface to match the structure of IPv4 header



A: Differentiated Services (DS) was originally defined as the TOS (**Type of Services**) field; this field is now defined by RFC 2474 for Differentiated services (DiffServ) and by RFC 3168 for Explicit Congestion Notification (ECN), matching IPv6.

B: Most common protocols numbers are listed below and the utility has detail configuration of these protocol.

1: Internet Control Message Protocol (ICMP)

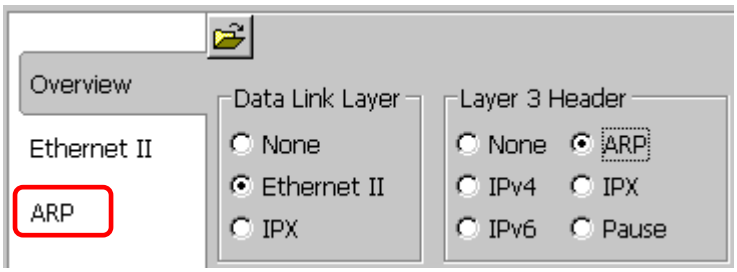
2: Internet Group Management Protocol (IGMP)

6: Transmission Control Protocol (TCP)

17: User Datagram Protocol (UDP)

IPv6: This protocol will be supported later.

3.5.5.2 ARP

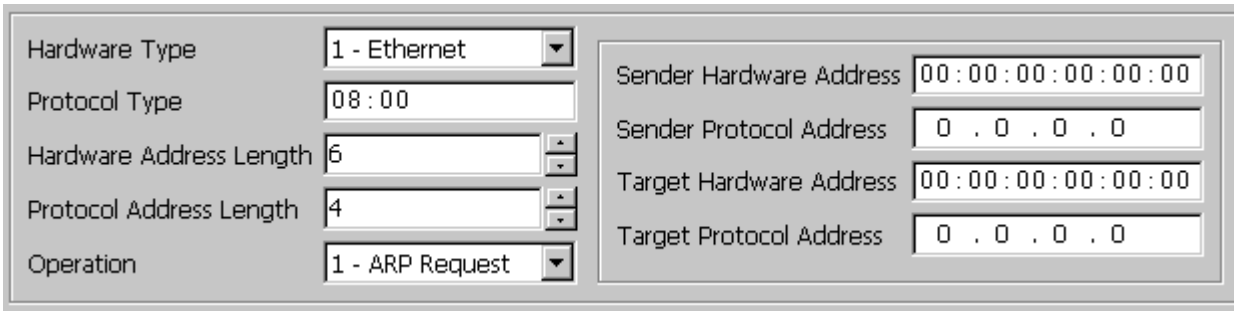


ARP: Address Resolution Protocol (ARP) is the method for finding a host's link layer (hardware) address when only its Internet Layer (IP) or some other Network Layer address is known. ARP is primarily used to translate IP addresses to Ethernet MAC addresses.

The structure of ARP header is illustrated below

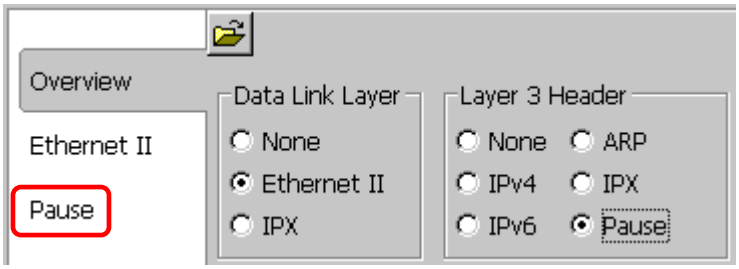
bit offset	0 - 7	8 - 15	16 - 31
0	Hardware type (HTYPE)		Protocol type (PTYPE)
32	Hardware length (HLEN)	Protocol length (PLEN)	Operation (OPER)
64	Sender hardware address (SHA) (first 32 bits)		
96	Sender hardware address (SHA) (last 16 bits)		Sender protocol address (SPA) (first 16 bits)
128	Sender protocol address (SPA) (last 16 bits)		Target hardware address (THA) (first 16 bits)
160	Target hardware address (THA) (last 32 bits)		
192	Target protocol address (TPA)		

The utility has user configurable interface to match the structure of ARP header

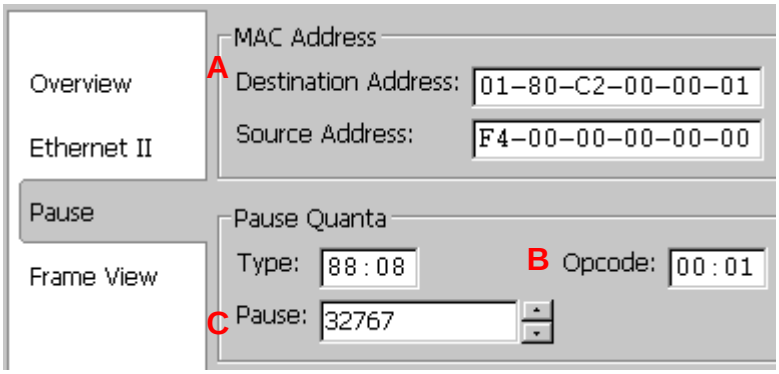


◆ D: IPX: Reserve function for next version

3.5.5.3 Pause



Pause: PAUSE is a flow control mechanism on full duplex Ethernet link segments defined by IEEE 802.3x and uses MAC Control frames to carry the PAUSE commands.



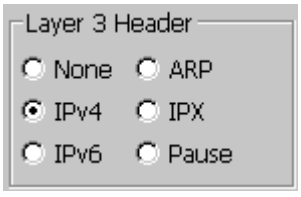
A: Destination Address: 01:80:C2:00:00:01. This particular address has been reserved for use in PAUSE frames.

B: Opcode: The MAC Control opcode for PAUSE is 00:01 (0X0001 in hexadecimal)

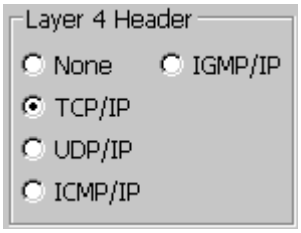
C: A PAUSE frame includes the period of pause time being requested, in the form of two byte unsigned integer (0 through 65535). This number is the requested duration of the pause.

3.5.6 Layer 4 Header

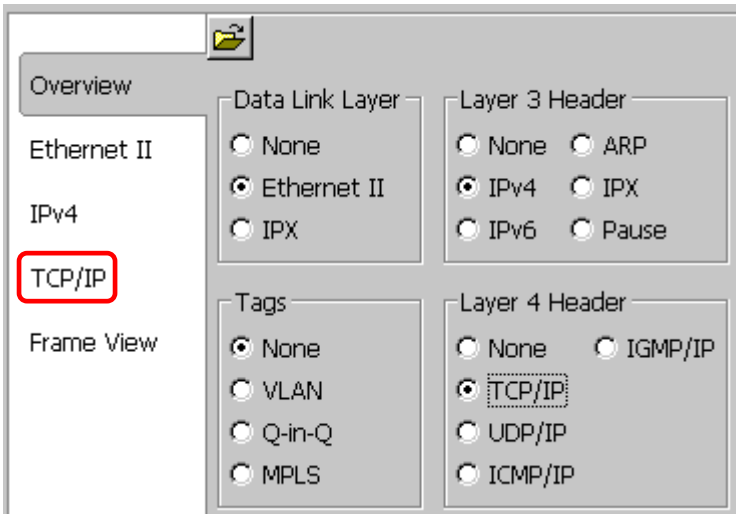
In the payload of frame, if IPv4 is selected



Then Layer 4 header as below is configurable



3.5.6.1 TCP/IP



The Transmission Control Protocol (TCP) is one of the core protocols of the Internet Protocol Suite.

The structure of TCP segment is illustrated below. The TCP header starts after bit 160 of the IP header.

TCP Header

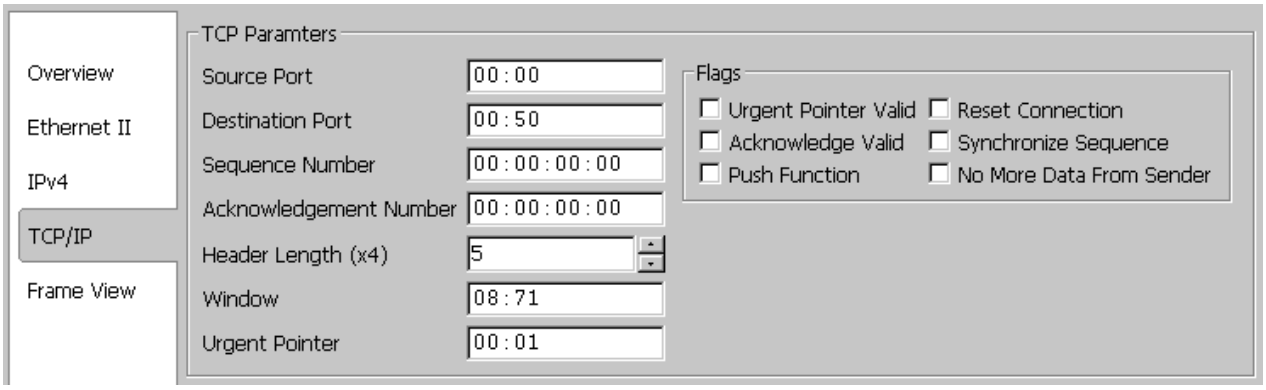
Bit offset	0–3	4–7	8–15	16–31
0	Source port			Destination port
32	Sequence number			
64	Acknowledgment number			
96	Data offset	Reserved	CWR ECE URG ACK PSH RST SYN FIN	Window Size
128	Checksum			Urgent pointer
160	Options (optional)			
160/192+	Data			

Flags (8 bits) (called Control bits) – contains 8 1-bit flags

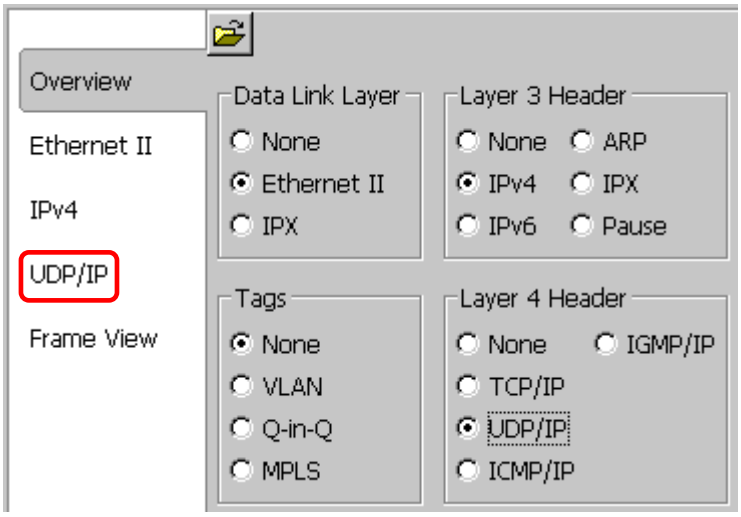
- CWR (1 bit) – Congestion Window Reduced (CWR) flag is set by the sending host to indicate that it received a TCP segment with the ECE flag set (added to header by RFC 3168).
- ECE (ECN-Echo) (1 bit) – indicate that the TCP peer is ECN capable during 3-way handshake (added to header by RFC 3168).
- URG (1 bit) – indicates that the URGent pointer field is significant
- ACK (1 bit) – indicates that the ACKnowledgment field is significant
- PSH (1 bit) – Push function

- RST (1 bit) – Reset the connection
- SYN (1 bit) – Synchronize sequence numbers
- FIN (1 bit) – No more data from sender

The utility has user configurable interface to match the structure of TCP segment



3.5.6.2 UDP/IP



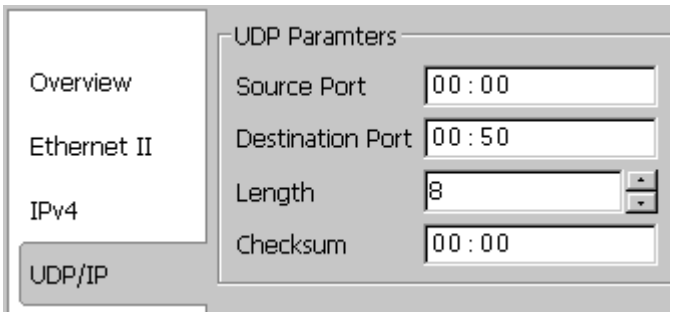
UDP/IP

The User Datagram Protocol (UDP) is one of the core members of the Internet Protocol Suite, the set of network protocols used for the Internet.

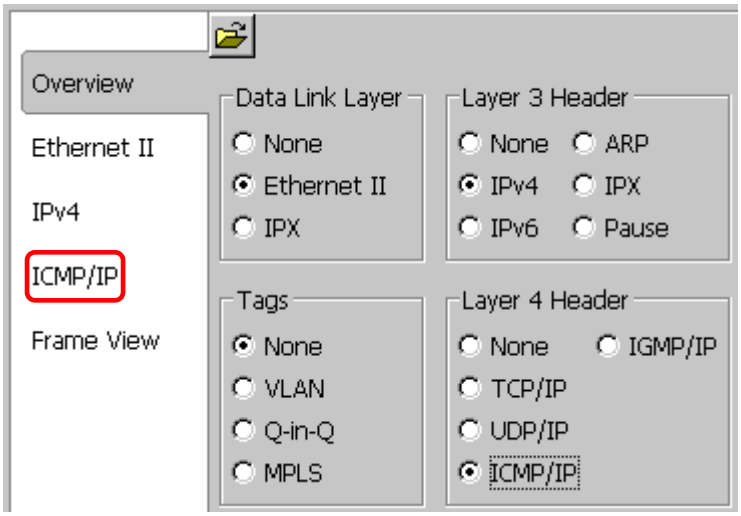
The structure of UDP segment is illustrated below. The UDP segment starts after bit 160 of the IP header

bits	0 - 15	16 - 31
0	Source Port	Destination Port
32	Length	Checksum
64	Data	

The utility has user configurable interface to match the structure of UDP segment



3.5.6.3 ICMP/IP



ICMP/IP

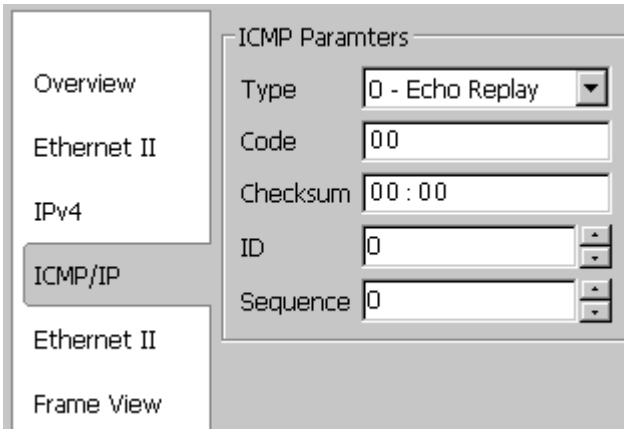
The Internet Control Message Protocol (ICMP) is one of the core protocols of the Internet Protocol Suite.

The structure of ICMP segment is illustrated below

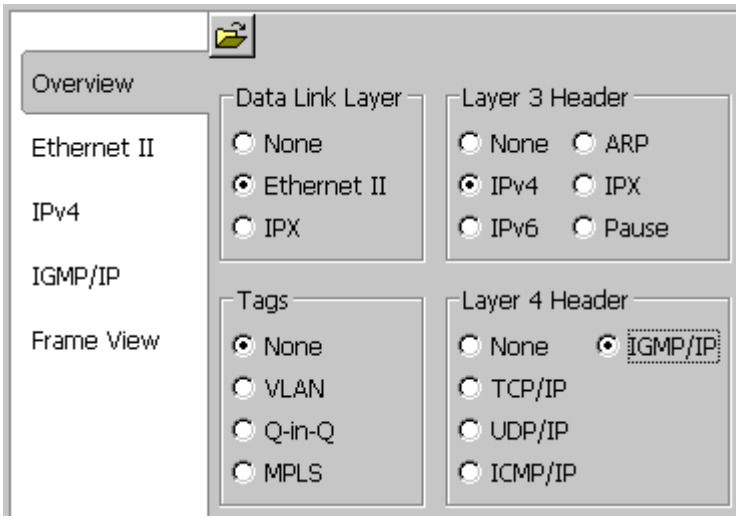
The ICMP header starts after bit 160 of the IP header

Bits	160-167	168-175	176-183	184-191
160	Type	Code	Checksum	
192	ID		Sequence	

The utility has user configurable interface to match the structure of ICMP segment



3.5.6.4 IGMP/IP



IGMP/IP

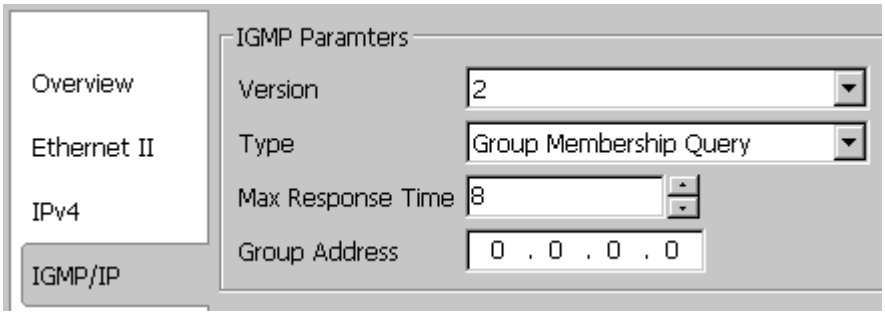
The Internet Group Management Protocol (IGMP) is a communications protocol used to manage the membership of Internet Protocol multicast groups.

The structure of IGMP segment is illustrated below. The IGMP header starts after bit 160 of the IP header

+	Bits 0 - 7	8 - 15	16 - 23	24 - 31
0	Type	Max Resp Time	Checksum	
32	Group Address			

The utility has user configurable interface to match the structure of IGMP segment

There are three versions of IGMP


Overview
Ethernet II
IPv4
IGMP/IP
IGMP Paramters
Version
2
Type
Group Membership Query
Max Response Time
8
Group Address
0 . 0 . 0 . 0

4. Operation of NuDOG-301 with DApps-SG

To chapter tell you how to use this device to test the DUT

4.1 Control from USB Port

NuDOG-301 comes with a GUI utility software for controlling of this machine. Operator can operate this machine via USB port by Windows user interface, and also collect statistic counter and do system upgrade.

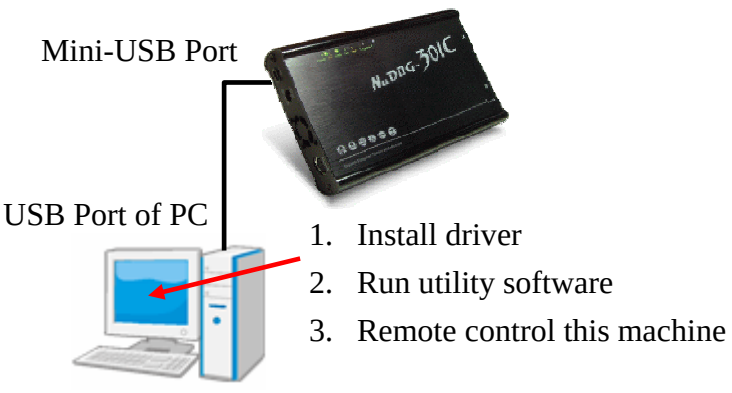
	Basic System Requirement for NuDOG-301 application software	
	Windows XP	**Windows Vista**
CPU	800MHz CPU	1.6 GHz, 32 bits (x86) CPU
RAM	256MB RAM	1GB RAM
HDD	20MB available space (available space means the space for installation and operation)	20MB available space (available space means the space for installation and operation)

USB cable with mini-USB connector comes with the package of this machine. If operator does not have this cable, it is possible to purchase it from local electronic store. It is an industrial standard cable with standard male USB connector and standard male mini-USB connector at each side.

4.1.1 Installation of Driver

To active the USB connection, install driver for NuDOG-301 series is required
The procedure below shows the installation of driver

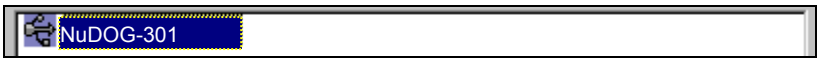
1. Power On the machine
2. Connect USB cable to both PC and mini-USB port of NuDOG-301



3. Windows will prompt you that new USB device is found and it needs driver. Manual select the

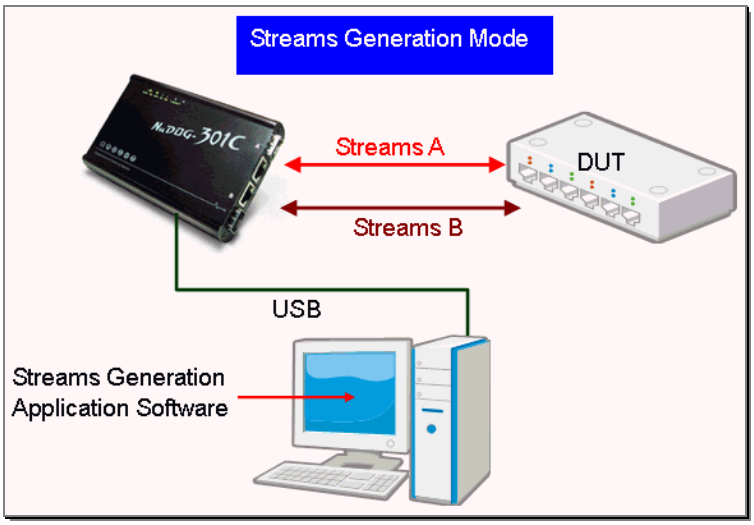
driver location at the folder ..**\NuDOG-301 driver** which operator gets it from Xtramus. Follow the instruction of Windows to finish the installation.

4. If driver is installed correctly, when you click icon  at right-bottom corner of Windows task bar, it shows NuDOG-301 or NuDOG-101 device



4.2 Hardware connection

To use this device, user can connect it to DUT as the illustration below



Then NuDOG-301 can generate test stream to DUT and also receive data stream from DUT for analysis

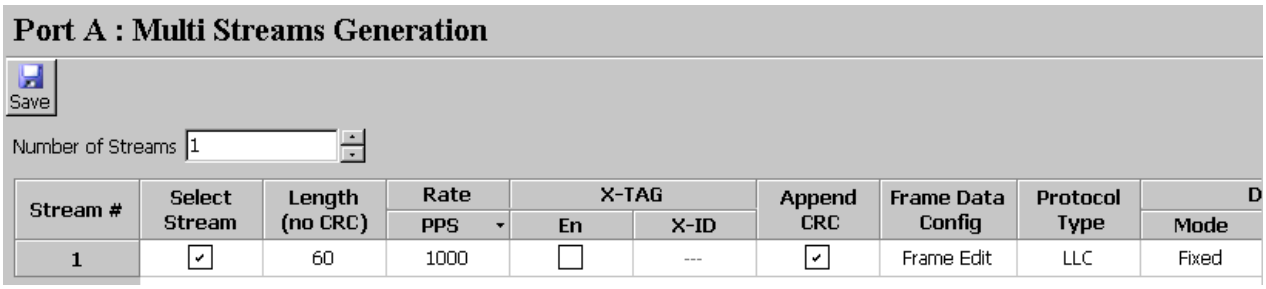
4.3 Operation of DApps-SG

4.3.1 Generate Test Streams to DUT

To generate the test streams, user should configure the pattern and contents of the test streams

Click 

, System shows

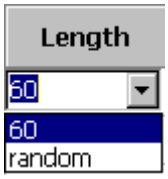


Select the streams volume user want to generate. It can be 1~64

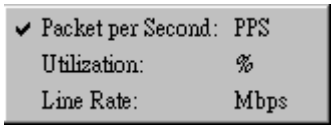
User can create many streams; however, only tick streams that user want to send

Stream #	Select Stream	Length
1	☐	60
2	☑	60

Double click value in the grid of length, then user can change the value. Select random or input the length directly.



Select the unit and input the value of the parameter that the packets will be generated.



PPS: Packet per Second. Volume of packets that will be generated per second.

Utilization: Percentage of Wirespeed transmission

Line Rate: Mbytes per second in transmission

Tick to activate X-TAG if user needs

X-TAG En
☑
☐

Click Frame Editor to edit the pattern and contents of stream packets. Please refer to 3.5 Frame Editor about how to use frame editor

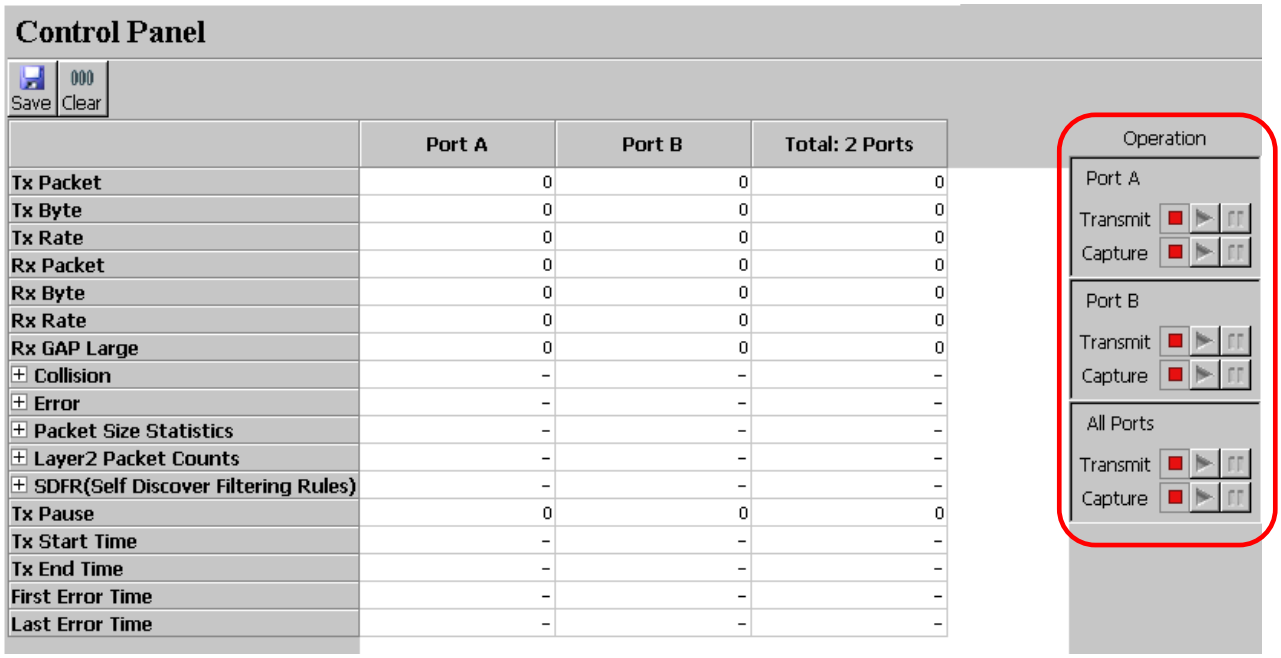
When all procedures are done, the read-only basic information at last few items if shown automatically

Protocol Type	Summary		
	IFG	IBG	Frames
LLC	96	96	1000
LLC	96	96	1000

Then input count and click Apply to take effect.

4.3.1.1 Start to generate test streams

When all configurations is done, click Control Panel on Toolbar



Click control button on operation button to control the packet generation

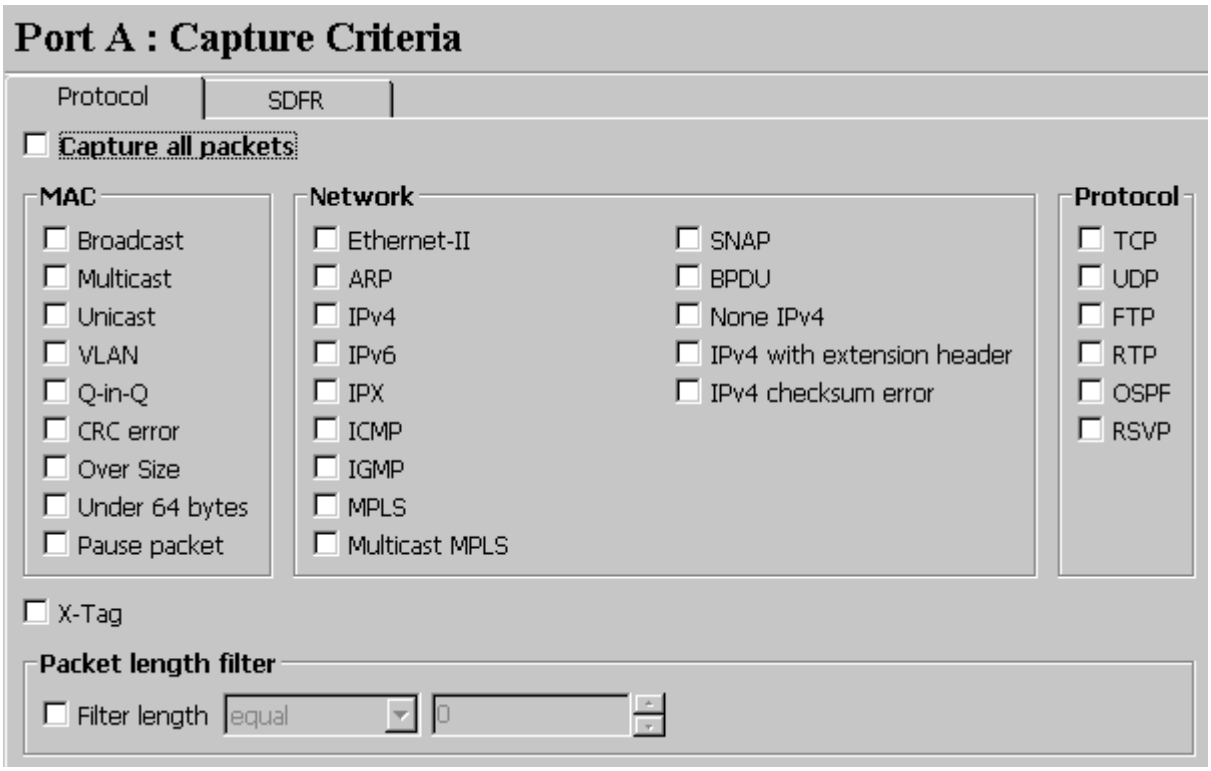
Expend sub-item counter to see more details of counters.

4.3.2 Capture Specified Packets

To capture packets/frames of incoming streams to PC via USB port, configure capture criteria is required.

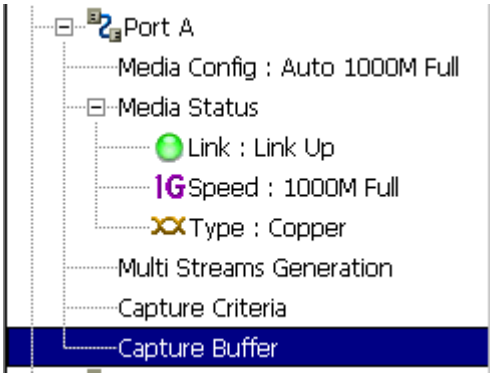
Click 

button on toolbar. The system shows the capture criteria settings

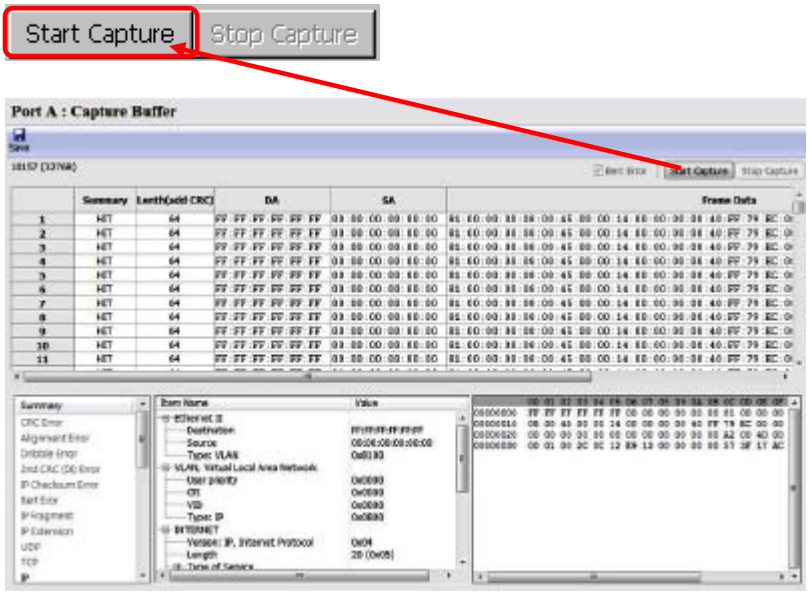


User can configure criteria of Protocol, SDFR according to section 3.4.2.4 Capture Criteria

Then Click Capture Buffer of selected port



Start capture from the Capture Buffer window



The result of captured frame is shown on Capture Buffer window.

4.3.3 View counter of captured packet and others

User can view the counters of captured packet by SDFR criteria

Click Control Panel on Toolbar

Expand SDFR sub-counter item by clicking "+" of 

, user the see the packet counts that is captured by SDFR criteria

User also can see conters of other events.

SDFR(Self Discover Filtering Rules)	-	-	-
SDFR DA	3,900	1,950	5,850
SDFR SA	0	0	0
SDFR VID	1,950	3,900	5,850
SDFR Q-in-Q	0	0	0
SDFR MPLS	0	0	0
SDFR Source IP Addr.	0	0	0
SDFR Destination IP Addr.	0	0	0
SDFR Destination Port	0	0	0
SDFR Source Port	0	0	0