2 Network Ports and 1 Monitor Port Gigabit Active Network TAP

NuTAP-303 OVERVIEW

NuTAP-303 is portable network TAP equipment that can monitor and redirect any data streams that flow through this equipment. Network TAP is a method for monitoring dynamic situation of network without intruding it.

Non-intrusive to the network segment being monitored; NuTAP-303 provides access to all network traffic with full duplex link from both sides, allowing network monitoring or analysis tools to be dynamically inserted into the network segment without causing any disruption to the link.

NuTAP-303 can work with professional analyzers from Xtramus, or third party LAN and security analyzers. Together, they provide an effective way for probing or analyzing full-duplex traffic on single or multiple network links that cannot be achieved by using traditional methods such as Hub, Port Spanning / Mirroring.

Active TAP is the smart technology that is adapted to this advanced device. Traditionally, to monitor a network such as 1000 Mbps speed connection, it needs to consume lots of resource on the PC to monitor the network; however, most of the traffic is normal without alert. Active TAP can redirect network traffic that is triggered by specified criteria or a range of criteria that are customized by user. Only when the data fits the criteria will it be sent to the monitor port. It greatly reduces the burden of the PC to monitor the network.

NuTAP-303 provides the operating mode of gigabit speed that can forward any data that pass through this machine in wirespeed, including any errors that normally are discarded by general network device, and also redirects them to monitor port for analysis purpose. We can assure you the best network connection and it will be a trustworthy network tap device for your network.

KEY FEATURES

- Active TAP based on store-and-forward architecture, and built-in buffer reduces possibility of forwarding packets loss.
- Filter and redirect TAP streams to monitor port by SDFR technique which can ease the loading of monitor PC.
- Network ports:
  - 1 pair of bi-directional Gigabit Ethernet combo (UTP/SFP) network ports
  - Auto network sensing (UTP or SFP) and auto negotiating of speed and duplex mode
- Monitoring port:
  - One 10/100/1000 Mbps UTP Ethernet port
  - Support 1000 Mbps full duplex and 10/100 Mbps half/full duplex mode
  - Auto negotiation and auto correction of twisted-pair polarity
- On-panel LCD display shows important network status.
- System control and Firmware/FPGA upgrade via USB.
- Statistic Counter: Packet Count, Packet Rate, Bytes, Bytes Rate, Line Rate, Utilization, Collision, Error Packets, Oversize, Undersize, Packet size (64~1518), Broadcast, Multicast, Pause, VLAN, IPv4, Frame Gap and other RMON counters.
- Interframe gap counters to reveal status of real-time wirespeed transmission.
- Supports Jumbo Frame.

KEY BENEFITS

- Supports one pair of Ethernet Gigabit combo (UTP/SFP) network port and one 10/100/1000 Mbps UTP Ethernet monitor port.
- Simultaneously non-blocking forward of all Tx and Rx traffic, including error packets, also can redirect to monitor port.
- Network monitoring and analysis devices that provides an invisible, non-intrusive access to network without disrupting links or causing network degradation.
- Get rid of the needs for redirecting / mirroring port and avoids problems associated with using such methods for traffic monitoring.
- View real-time statistic counter on the LCD that is located at top panel
- Real-time monitoring, redirecting and analyzing of network traffic.
- Converts media connection between fiber and copper automatically.
- Utilization LED on top panel shows the real-time traffic.
- Network traffic to monitor port can be filtered by user-defined criteria.

MAIN APPLICATIONS

Network TAP

Network TAP is a way to monitor the network without causing any interference to the running network. All data streams between point A and B can be duplicated and sent to PC for analysis.
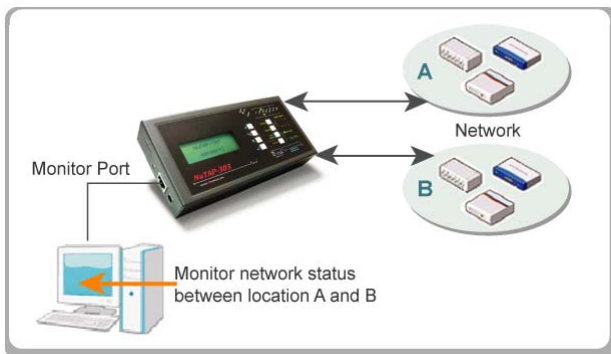
The third party network software such as Ethereal and Utility attached with this equipment can be installed on PC for network analysis.
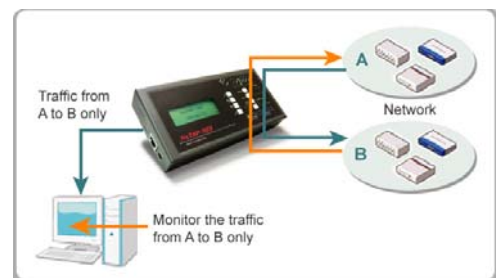
Aggregate is a way to collect network traffic for monitor purpose
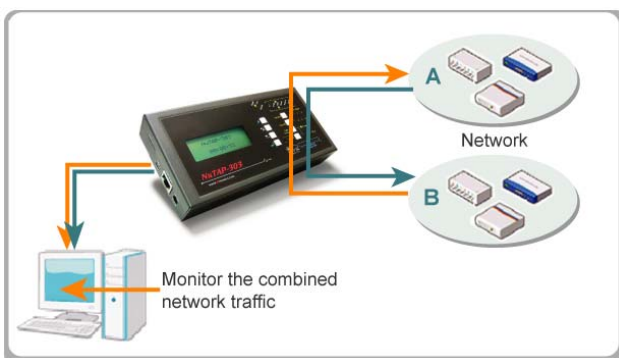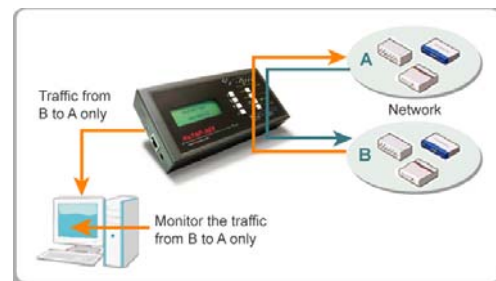

The traffic flow from A to B, and from B to A are combined and send to monitor port for monitor purpose. The result of counter can be analyzed by utility software to evaluate the total traffic flow between A and B

Segregate allow users to monitor traffic in specific direction. (user-selected.)

Segregate network for monitor purpose needs two monitor ports. Although NuTAP-303 has one monitor only, it has the ability to redirect uni-direction traffic flow to monitor port. User can select either A to B or B to A port for monitor purpose.

TAP A to B Traffic

TAP B to A Traffic

SPECIFICATIONS

Supported frame format	Ethernet II frame IEEE 802.3 frame
Interface	• Network Port: One pair of gigabit Ethernet combo (UTP/SFP) port • Monitoring Port: One 10/100/1000 Mbps Ethernet UTP port • Mini USB Port: One mini USB port (for configuration and upgrade) • 12V Power Jack
Speed and Link Mode	Auto Negotiation / Forced Mode • UTP port: 10/100 Mbps Half/Full Duplex, 1000 Mbps Full Duplex Auto Negotiation • SFP port: 1000 Mbps Full Duplex
Redirect Type	The traffic that is re-directed to Monitor Port can be: • Traffic from Port A to Port B • Traffic from Port B to Port A • Traffic between both (Port A to Port B & Port B to Port A)
Active TAP Function	• Real-time RMON counter this is shown on top panel LCD and Utility software. • Real-time VLAN streams counter that is shown on top panel LCD and Utility software. • Filter criteria for NuTAP-303 model. Network traffic to monitor port is filtered by user-defined criteria that can reduce the traffic.
TAP Counters	Rx Packet, Tx Packet, Rx Packet Rate, Tx Packet Rate, Rx Byte, Tx Byte, Rx Byte Rate, Tx Byte Rate, Rx Line Rate, Rx Utilization, Tx Line Rate, Tx Utilization, Broadcast, Multicast, Pause, VLAN, IPv4, IP Checksum Error, Dribble, Alignment, CRC Error, Undersize, Oversize, 64 Bytes, 65-127 Bytes, 128~255 Bytes, 256~511 Bytes, 512~1023 Bytes, 1024~1522, Collision, Frame Error Rate , Frame Gap > 12 Bytes, Frame Gap = 12 Bytes, Frame Gap < 12 Bytes, Preamble + SFD < 8 Bytes, VLAN Stream
VLAN Streams Counter	User-defined VLAN ID from 0~4095
Counters Function	• Compare real-time counter value of port A and port B in top panel LCD • Select or unselect ports and counters items in order to focus the counters that users needs in Utility software • Save statistics counter values to Excel file in Utility software • Start or Pause real-time counter at any time in Utility software
Filter Criteria	• For NuTAP-303 or above model, Filter function redirects only the packets wanted by SDFR (self-discover filtering rules) technique. Criteria Item: • DA: Destination MAC Address • SA: Source MAC Address • VID: VLAN ID • DIP: Destination IP Address • SIP: Source IP Address • DPort: Destination Port for IP Address • SPort: Source Port for IP Address • & sign: Different criteria above can be combined and work together, such as DA & SA Criteria Range: The value that fit the criteria is redirected to monitor port • Single: Single value. • Pair: Pair value. Two unique value • Range: A range of values. Two unique values and values between them.
Jumbo Frame	• Up to 13,000 Bytes under Tap Redirect (from Network Port to Monitor Port). • Up to 13,000 Bytes under Network Forward (Network Port to/from Network Port).

SPECIFICATIONS (Continued)

Alarm Notice	Alarm notice for traffic with CRC, Alignment, Dribble and IP checksum errors.
Loopback function	Support passive layer 1 loopback

LED indicator	• System Status
	    ♦ Power: Power ON status
	    ♦ SYS: Ready status of this machine
	    ♦ Remote: Remote control from USB cable
	• Port Status (for both A and B)
	    ♦ SFP: SFP fiber connector is connected
	    ♦ 10/100M: Speed of 10/100 Mbps connection
	    ♦ 1000M: Speed of 1000 Mbps connection
	    ♦ Receive: Data is received
	    ♦ Broadcast: Broadcast frame is received
	    ♦ CRC Err: Frame with CRC Error is received
	    ♦ Trigger: Reserve function
	• Monitor Port
	    ♦ Link: Monitor port is connected
	    ♦ Tx: Data flow to A and/or B that is redirect to monitor port
	    ♦ Buffer: Capacity status of buffer memory (reserved function)
	• Utilization (%) Network Ports
	    ♦ 6 LEDs to indicate Utilization of traffic flow from 0% to 100%
	• Display Page #
	    ♦ 1, 2, 3, 4, 5, 6: Indicates the page No. currently shown on LCD
	• Traffic Direction: Forward direction of TAP ports, A itself / B itself, or both ways
	    ♦ A <-> B: Both way forwarding
	    ♦ A ⊃ B ⊃: Loopback mode
	• Capture: Capture procedure is going on. (Reserve function)

Power	External Power Adapter • Input: AC 100 V ~ 240 V, 50 Hz ~ 60 Hz • Output: DC 12 V
Temperature	Operating: $0^{o}C \sim 40^{o}C$ Storage: $0^{o}C \sim 50^{o}C$
Humidity (non-condensing	Operating: 0% ~ 85% Storage: 0% ~ 85%
Dimension	175 mm x 85.9 mm x 32.6 mm

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TECHNICAL TERM and APPLICATION

Active TAP

Normal TAP only redirects all traffic flow between two locations into the PC that analyze the traffic.

Active TAP deals with all packets flow through the TAP machine. NuTAP-303 is an Active TAP machine that has

- Comprehensive real-time statistics: Frame with varied size and packets with certain errors are all registered in the real-time statistics counter.
- Contrast port counter: List the value of the same statistics counter from both directions simultaneously for analysis.
- Selectable packet redirect modes: Besides Aggregate, this device also can redirect uni-directional packets to single monitor port on the device. For example
- Network traffic to monitor port can be filtered by user-defined criteria. By this method, it reduces the traffic and loading of PC significantly.

SDFR

SDFR (Self-Discover Filtering Rules) is a technique that makes 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 redirect criteria includes Layer 2 DA, SA, VLAN ID and Layer 3 DIP, SIP, Destination Port, Source Port. Each filter is independent that they can be activated in any combinations.
- Value of SDFR can be a unique value or a range of value 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.

Frame (Packet) Size

A frame is a digital data transmission unit on the Layer 2 of the OSI model. It is used for data exchange between two points via a direct physical or logical link. Depends on the data a frame carries, the standard length (bytes) of Ethernet II frame is varied from 64 to 1518 bytes as the figure.

802.3 MAC Frame							
Preamble	SFD	DA	SA	Ethertype	Payload	CRC	I FG
7 bytes	1	6	6	2	46-1500	4	12
		64-1518 bytes					
72-1526 bytes							

SFD: Start Frame Delimiter
DA: Destination MAC address
SA: Source MAC address;
IFG: Interframe gap

- *Undersize*

From the frame structure of Ethernet, a standard Ethernet frame size should be from 64 to 1518 bytes. If the frame received is less then 64 bytes, it is called undersize frame. Usually, under size frame is a kind of error. NuTAP-303 provides this counter.

- *Jumbo Size*

While most Ethernet switches and Ethernet network interface cards support only standard-sized frames, NuTAP-303 supports Jumbo Frame (up to 1,000 Bytes). NuTAP-303's counter function can count frames with length from undersize frame to Jumbo Frame or frame size between 64 bytes and 1522 byte (4 bytes is added for VLAN tagged frame).

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 and it add 4 bytes for Ethernet II frame.
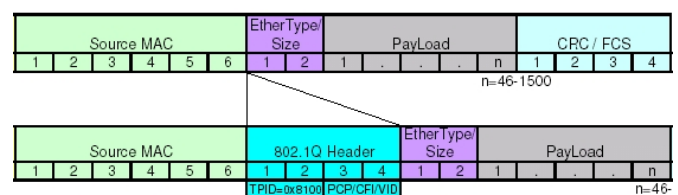
Interframe Gap

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

Frame	IFG	Next Frame

A brief recovery time between frames allows devices to prepare for reception of the next frame. For the standard of Ethernet, 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. For different connection speed, there are

- 9.6 µs for 10 Mbps Ethernet
- 960 ns for 100 Mbps Fast Ethernet
- 96 ns for 1000 Mbps Gigabit Ethernet
- 9.6 ns for 10 Gbps (10 Gigabit) Ethernet

Interframe Gap Counters

From the characteristic of IFG, if the gap between two frames is the same as the minimum bits time when data transmission is going on, the transmission speed can be defined as wirespeed transmission.

Interframe Gap Counters are several unique counters of this device that calculates the frame counts beyond, equal or below minimum bits time.

- Above Min. bits time: Normal transmission utilization.
- Equal to Min. bits time: Wirespeed transmission. It should be for test purpose only, otherwise, the network is fully loaded that might have problem.

Below Min. bits time: Special device of the network that can send more frames than Ethernet standard. However, these kinds of device may cause more collision.

Alignment Error vs. Dribble Error

A kind of error happens on Ethernet frame. All frames should end on an 8-bit boundary to present a full byte, but problems on the network could cause the number of bits to deviate from the multiple of 8. A full byte (octet) is represented by two hexadecimal digits; therefore, it is common to display a byte of information as two nibbles.

- If the frame sent or received is lack of a nibble of a full byte, it is call **Alignment Error**.
- If the frame sent or received has more one nibble of a full byte, it is called **Dribble Error**.

The problem could happen, owing to collision (CRC error together with packet short). NuTAP-303 provides counter of these errors

IDS

An Intrusion detection system (IDS) is software and/or hardware designed to detect unwanted attempts at accessing, manipulating, and/or disabling of computer systems, mainly through a network, such as the Internet. These attempts may take the form of attacks, as examples, by crackers, malware and/or disgruntled employees. NuTAP-303 is effective for the application without direct attack from Internet to IDS.

Loopback

NuTAP-303 has loopback function for the trouble shooting of network. Loopback test is the method to send out signal and quickly back to the same source entity to test the transmission and route problem of network. Passive loopback equipment with this troubleshooting technique resends incoming data streams back to the source network.

From the operation button or utility software at PC, user can active loopback mode. When it is enabled, data streams from packet generator to NuTAP-303 will be resent back to their source entity. Here it illustrates how loopback works.
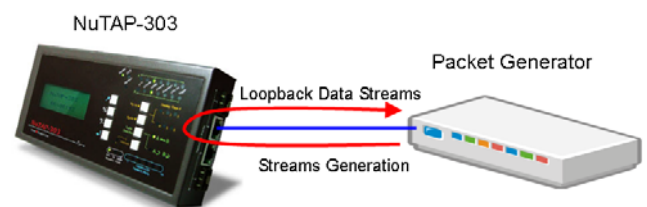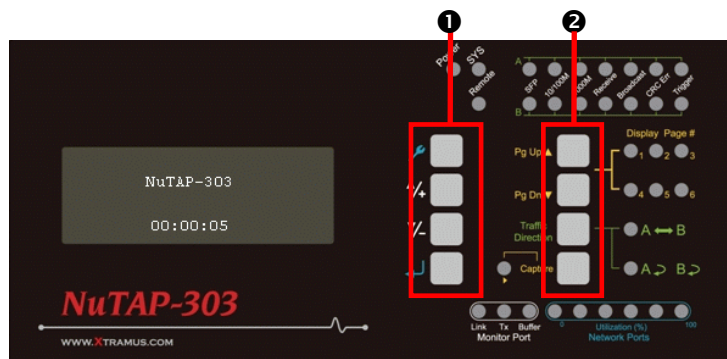
GENERAL DESCRIPTION

The figure of NuTAP-303 is illustrated below. The control panel, LCD and LED indicator make it convenient for operation.

❶ LCD Display	❺ Operation Buttons & Hotkey
❷ USB Port	❻ SFP Port A
❸ Monitor Port	❼ UTP Port A
❹ Power Jack	❽ UTP Port B
	❾ SFP Port B

OPERATION OF NuTAP-303

Top panel of NuTAP-303

Control via Button

Almost all function can be operated via buttons at top panel.

❶ Operation Buttons: Buttons for common operation and configuration

Label	Action	Description
🔧	Push once	Enter main menu or Return to previous menu.
	Push once	Return for next test
▲/+	Push once	Move up one selection
▼/-	Push once	Move down one selection
↵	Push once	Execute the selected selection

❷ Hotkeys: Switch to common used function immediately.

| Label	Action	Description
Pg Up	Push once	Move page up for frequently used sub-menu **Contrast All Port** at LCD. It shows statistic from A to B, B to A, and A+B to Monitor port.
Pg Dn	Push once	Move page down as above
Traffic Direction	Push once	Select the direction of traffic flow for monitor. A <-> B: All traffic flow between A and B are forwarded. A ⊃ B ⊃ : Loopback mode of Port A and Port B
Capture	Push once	Reserved function

Control via Utility Software

NuTAP-303 comes with a GUI (graphic user interface) utility for the configuration of this machine. Operator can configure test parameter, collects statistic counter, also does system upgrade for this machine via USB. All configurations that are operated from buttons at top panel of the device can be done here.

USB cable with mini-USB connector comes with the package of NuTAP-303. It is an industrial standard cable with standard male USB connector and standard male mini-USB connector at each side.
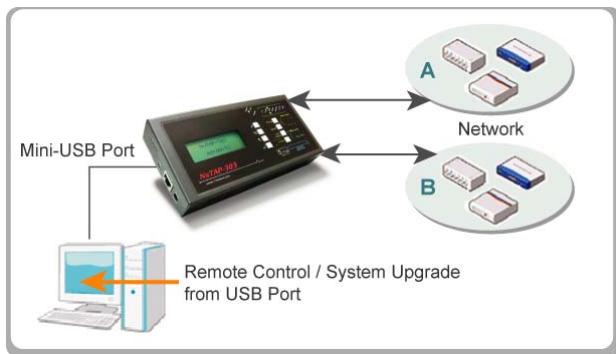
NuTAP-300 Utility Software is a Windows based software as illustrated below. It is user-friendly and easy to operate.

Main functions of the Utility consists of real-time counter report that include full RMON counters, connection status and configuration of port A, B and Monitor port.
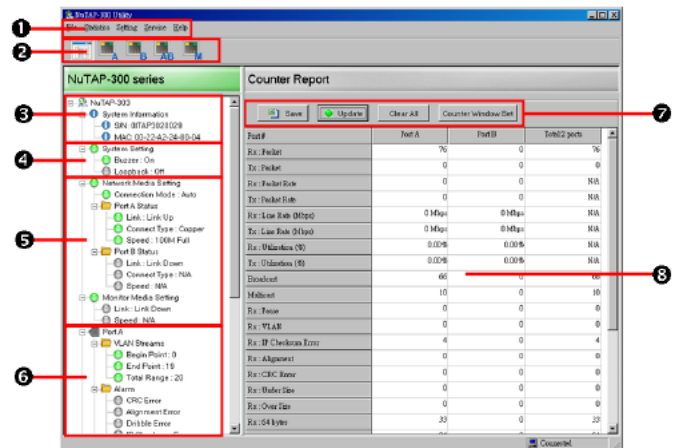
❶ Operation Menu	❺ Link Status of Port A and Port B
❷ Toolbar	❻ VLAN, Alarm, Filter Status and Configuration
❸ System Information	❼ Counter Control Buttons
❹ System Setting	❽ Real-time Counter

RELATED PRODUCTS

NuTAP:

Wirespeed Active network TAP with 4 pairs of Ethernet 10/100 Mbps UTP Port.

NuTAP-302

2 Network Ports and 1 Monitor Port Gigabit Active Network TAP

Comparison Table of NuTAP-300 Series

NuTAP-302	TAP model that provide real-time RMON counters and redirect data streams from port A to B, B to A, or A+B to monitor port.
NuTAP-303	In addition to the function of NuTAP-302, it provides user-defined filter and redirect criteria to monitor port by SDFR technique.

NuTAP Rackmount:

Rackmount Management Network TAP

- **NuTAP-L Series:**
  - ➤ 10/100/1000 Mbps UTP Interface
- **NuTAP-R Series:**
  - ➤ 10/100/1000 Mbps UTP and 1000 Mbps SFP Combo Interface
- **NuTAP-A Series:**
  - ➤ 10/100/1000 Mbps UTP and 1000 Mbps SFP Combo Interface

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