



The STT 10G Ethernet Module is a powerful and versatile test module for the Scalable Test Toolkit (STT) for qualifying, installing, maintaining, monitoring, and troubleshooting Ethernet services. The STT 10G Ethernet module can perform simultaneous and independent tests at full line rate over its multiple test ports for 10/100M, Gigabit, and 10 Gigabit Ethernet. The 10 Gigabit Ethernet port features advanced traffic generation up to Layer 4 including stacked VLAN (Q-in-Q) and MPLS. The application based interface optimizes testing time and minimizes test configuration and training time.

The STT 10G Ethernet is part of a family of test modules for the STT Platform

KEY Features

- Full line rate traffic generation for Ethernet up to 10 Gigabits, LAN (10.3 Gbps) & WAN (9.95 Gbps)
- Multi-port and multi-rate capability for network element pre-qualification testing
- RFC 2544: Throughput, latency, frame loss, and back-to-back tests*
- BER testing at Layer 1, Layer 2, and Layer 3 (IP) for Gigabit Ethernet and IP services with received measurement filter
- IP verification with Ping, Trace Route, Echo Response, and IP Throughput across a routed network
- Class of Service (CoS) (via VLAN P-bit) and IP Type of Service (TOS)/DSCP traffic prioritization settings
- Bidirectional monitoring of live Ethernet networks
- Packet capture & decoding up to Layer 7
- Control/Respond Loopback feature to loop-up/down a far end STT or MTT with a MTT-29 or MTT-28 module

* GigE and 10GbE only

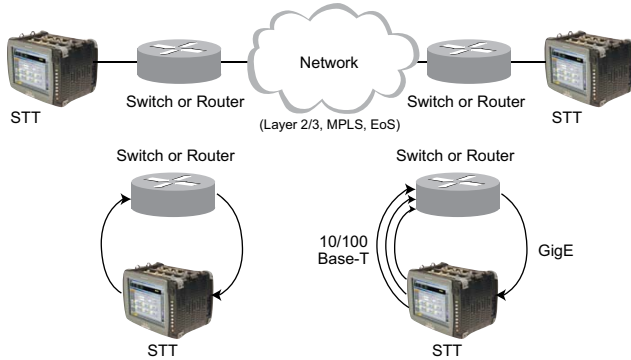
Benefits

- Complete solution for Installation & Maintenance (I&M) of Ethernet, and IP services
- QoS settings for verifying Metro Ethernet services
- SLA verification between service providers and their customers
- Flexible modular design
- Eliminates the need for multiple instruments
- Modular optics for multi-wavelength testing including CWDM and DWDM
- Standardized and customizable RFC 2544 benchmarking
- Test profile storing and loading for fast deployment of packet-based services
- Graphical report generation
- Completely interoperable with the MTT-28 and MTT-29 Ethernet Modules for multi-service deployments and network elements

Test Modes & Applications

BERT

The most common method of turning up and qualifying Ethernet services is to perform a bit error rate or throughput test. The STT 10G Ethernet Module generates test traffic at a specified bandwidth to the far end, where the frames are either looped or analyzed by another test module. By measuring frame loss rate and bit errors, compliance to a SLA (Service Level Agreement) can be confirmed. Stressing the network is achieved by generating traffic with different parameters, such as varying the frame length, sending constant or bursty traffic, and intentionally introducing errors into the system.



RFC 2544

RFC 2544 is a standardized methodology for benchmarking network devices and Ethernet service. To optimize the speed and efficiency of these tests, the STT 10G Ethernet module allows users to modify the test parameters from their standard values. Test results are shown in both tabular and graphical form, following the RFC 2544 specifications. For more details on RFC 2544 testing, see *RFC 2544 Application Note*.

IP Test

The complexity of a routed IP network can make traditional throughput testing cumbersome and time consuming. The STT 10G Ethernet module offers two simple tests, ping and trace route, to verify Layer 3 connectivity without the detailed stream generation found in BERT testing. IP tests also have the advantage that they work to any router or device that responds to ICMP Echo Request and Trace Route packets and does not require a second test set. Unlike similar functions available on a PC, the STT 10G Ethernet module can perform this test directly into an optical Gigabit or 10 Gigabit Ethernet interface.

Loopback

Loopback mode allows the specified Ethernet port to send incoming Ethernet frames back to the sender for end-to-end testing. Performing loopback tests is a common means of verifying the roundtrip delay of the network. The Ethernet loopback functions have been designed to emulate those used in traditional T-carrier networks. Manual mode immediately sets the port into loopback whereas Responder mode allows the near end unit to send loop up and loop down commands.

Monitor

Bidirectional network probe, packet capture and decode to Layer 7.



About STT Platform

The Scalable Test Toolkit is an advanced, modular, and flexible testing solution that addresses Layer 1 through Layer 7 requirements, from fiber optics to Quality of Service. Designed to meet the challenges of designing, installing, maintaining, and troubleshooting core, metro, and access networks, the STT combines an innovative test platform with revolutionary test features, supporting a complete suite of capabilities and technologies for the converging global communications market.

All STT modules are equipped with a unique standalone feature and can operate at 100% of their capabilities outside of the platform, maximizing test resources.

- **STT ONE.** OTN, EoS (Ethernet over SDH/SONET), NGN (VCAT, LCAS and GFP), legacy SDH/SONET and PDH/T-carrier testing. Transport testing from 1.5/2 Mbit/s up to 10/10.7 Gbit/s. Advanced next generation network testing, GigE frames drop/insert from SDH/SONET via GFP-T port, Packet Capture and export, In-service real time monitoring of SDH/SONET tributaries (Channel Master), APS testing. Legacy networks testing: VF, Pulse Mask.
- **STT Metro.** 10/100/1000M Ethernet testing. Throughput and Bit Error testing across Layers 1, 2, and 3. Stacked VLAN (Q-in-Q) and MPLS. RFC 2544 benchmark testing. GPS antenna port for one-way latency measurements. IP connectivity testing. Bidirectional monitoring of live networks. Packet capture with decoding up to Layer 7.
- **STT 40G 40/43G SDH/SONET and OTN 10/10.7G Drop and Insert.** NRZ or DPSK modulation.



Specifications

Connectivity

Test Interfaces

10 Gigabit Ethernet (10GBASE-R/W, LAN and WAN): 1 or 2 XFP ports
Gigabit Ethernet (1000BASE-T/X): 2 GBIC ports
Ethernet (10/100BASE-T): 8 ports
Automatically detects & adapts to straight or cross-over cables

10 Gigabit Ethernet

XFP: 10-Gigabit Small Form-factor Pluggable
Connectors: LC

STT-3822 (10GBASE-SR/SW, 850 nm)

Transmitter
Wavelength: 850 nm (840 nm to 860 nm) multi-mode
Power: -7.3 dBm to -1 dBm
Receiver
Wavelength: 850 nm (840 nm to 860 nm) multi-mode
Signal: -11.1 dBm to -1 dBm max

STT-3823 (10GBASE-LR/LW, 1310 nm)

Transmitter
Wavelength: 1310 nm (1290 nm to 1330 nm) single-mode
Power: -8.2 dBm to +0.5 dBm
Receiver
Wavelength: 1260 nm to 1565 nm
Signal: -12.6 dBm to +0.5 dBm max

STT-3824 (10GBASE-ER/EW, 1550 nm)

Transmitter
Wavelength: 1550 nm (1530 to 1565 nm) single-mode
Power: -4.7 dBm to +4 dBm
Receiver
Wavelength: 1260 nm to 1565 nm
Signal: -14.1 dBm to -1 dBm

LEDs

10GbE: Link, Activity, Laser On, LOS

Ethernet

BER Test

Test Layer

Layer 1: Unframed (n/a 10/100M)
Layer 1: With FCS/CRC (n/a 10GbE)
Layer 2: MAC
User-defined EtherType/Length field
Optional LLC and SNAP Header (10GbE only)
Layer 3: MAC + IP
User-defined IP Header
TOS, ID, Fragmentation, TTL, Protocol
Layer 4: MAC + IP + TCP/UDP (10GbE only)
User-defined TCP Ports and Header
User-defined UDP Ports
Throughput testing only; no BER testing at Layer 4

VLAN

VLAN ID: 0 to 4095
Priority: 0 to 7
Stacked VLAN (10GbE only)
Up to 3 VLAN tags

MPLS (10GbE only)

Up to 3 MPLS tags
Unicast or Multicast

Frame Length*

10GbE: 60 to 12,000 bytes
Fixed
Gaussian distribution
Multiple gaussians
Uniform distribution

GigE: 38 to 65,535 bytes, Fixed
Fast Ethernet: 38 to 20,480 bytes, Fixed

* Minimum frame lengths apply to Layer 2 traffic. Layer 1, 2, 3, and 4 traffic, or the addition of VLAN or MPLS tags will affect this value.

Test Patterns

Unframed Pattern

GigE: High-frequency & Mixed-frequency per IEEE 802.3
10GbE: $2^{31}-1$ PRBS

PRBS

Fast Ethernet & GigE: $2^{31}-1$, $2^{23}-1$, $2^{20}-1$, $2^{15}-1$
10GbE: $2^{23}-1$
Pattern inversion

User Patterns

Pre-defined: 1111, 0000, 1010
User-defined: 32-bits, 10 stored patterns per port

Traffic Generation

Fast Ethernet & GigE

Traffic Shapes: Constant, Ramp, Burst, Short Burst
Bandwidth: 0.01% to 100.00%

10GbE

Traffic Groups: 8 (each group is assigned a frame length & traffic shape)
Traffic Shapes: Constant, Ramp, Burst, Short Burst, Manual Burst
Bandwidth: 0.01% to 100.00%

Minimum IPG

10GbE: 9.6 ns
GigE: 96.0 ns
100M: 0.96 μ s
10M: 9.6 μ s

Traffic Streams

10GbE: 128
GigE: 64
Fast Ethernet: 16

BER/Throughput Measurements

Measurement Summary

Gives date and time for all errors and conditions, such as Link status
Tx/Rx Line Status: Frame Bit Rate, Line Rate, Utilization
Signal*: Vendor, Wavelength, Rx Power

* Signal measurements are dependent upon optical plug-in module and may not be supported by modules not purchased through Sunrise Telecom.

Aggregate Defects

Data Errors: FCS/CRC, IP Checksum, TCP/UDP Checksum (10GbE only),
Lost Frames, Out of Sequence (10GbE only), Duplicate (10GbE only),
Bit Errors, Pattern Loss, Symbol Errors (10/100M only)
Service Disruption: Based on maximum packet interval measured during test
Latency: Minimum, Maximum, Average. Assumes loopback at far end; requires 0000 test pattern

Tx/Rx Traffic Statistics

General: Total Frames, Good/Bad Octets (10/100M only), Total Octets (10GbE only), Collisions (Fast Ethernet only)
Frame Rate: Current, Minimum, Maximum, Average
Utilization: Current, Minimum, Maximum, Average
Frame Types: Unicast, Multicast, Broadcast, Non Test Traffic (Rx Only), Flow Control, Bad Frames (Rx Only), VLAN (10GbE only)
Frame Size Counters: Runt/Undersized, 64, 65-127, 128-255, 256-511, 512-1023, 1024-1518, Jumbo/Oversized

Per Stream Statistics (10GbE only)

Data Errors: IP checksum, Lost Frames, Out of Sequence, Duplicate, Bit Errors, Pattern Loss
Tx/Rx Statistics: Total Frames, Total Octets

WAN Measurements (10GbE only)

SONET

Errors: B1, B2, B3, REI-L/P, FASE
Alarms: LOS, LOF, OOF, AIS-L/P, RDI-L/P, LOP-P, NDF-P, PLM-P, UNEQ-P, TIM-S/P

SDH

Errors: B1, B2, B3, MS/HP-REI, FASE
Alarms: LOS, LOF, OOF, MS/AU-AIS, MS/HP-RDI, AU-LOP, AU-NDF, HP-PLM, HP-UNEQ, RS/HP-TIM

Error Injection

10GbE: FCS/CRC, Bit, IP Checksum, TCP/UDP Checksum, Out of Sequence, Lost frame, Duplicate packet, Remote fault
Broadcast Error across all streams or send on selected stream only
GigE/Fast Ethernet: FCS/CRC, Bit, IP Checksum
Modes: Single, Burst, Rate

RFC 2544

Test Parameters



Throughput

Duration: 4 to 60 seconds or 10k to 10,000k frames
Starting Rate: 1 to 100%
Resolution: Down to 0.01%

Latency

Duration: 4 to 3600 seconds
Warm-up Period: 4 to 3600 seconds
Repetitions: 1 to 50
Test Rate: Measured throughput rate or user-defined

Frame Loss Rate

Duration: 4 to 60 seconds or 10k to 10,000k frames
Starting Rate: 1 to 100%
Step Size: 1 to 100%

Back-to-back Frames (GigE & 10GbE only)

Duration: 4 to 100 seconds
Repetitions: 1 to 100
Resolution: Down to 1 frame or 0.01%

Frame Configuration

Preset Frame Lengths: 64*, 128, 256, 512, 1024, 1280, 1518, 4096, 12000

All frame lengths are user-configurable

* 64 bytes is not available for VLAN testing, except as user-defined frame length.

Extended Features

The following features go beyond the RFC 2544 standards, but they improve the ease, speed, and interpretation of the tests.

Paired Port Testing

The transmit and receive ports can be configured independently, allowing RFC 2544 testing between two ports even if they are at different interface rates.

Loopback

The module can automatically send a loop-up command to another STT 10G Ethernet module or SSMTT -28/-29 module at the far end. At the conclusion of the test, a loop-down command is sent.

Quick Latency

The Quick Latency test is an alternative to the time-consuming RFC

2544 standard. When enabled, the Quick Latency test measures the latency of the frames during the Throughput test and requires no additional testing time.

Thresholds

The thresholds for Throughput and Latency provide a pass/fail indication for service compliance so that the RFC 2544 test results can be quickly and easily interpreted.

Network Element Test

The tests are performed as a ramp test, incrementally stepping through rates rather than finding optimum throughput rate. The user defines the step size and duration, as well as the starting & stopping rates. This is designed for burn-in testing and avoids problems associated with testing at maximum throughput rates.

IP Test

Ping Test Configuration

Ping Rate: 1 to 20 pings per second

Number of Pings: 1 to 9999 or Continuous

Frame Length: 64 to 1518 bytes

TTL: 1 to 255

Timeout: 1 to 5 seconds

Ping Destination: IP Address or URL

Ping Results

Sent: Number of pings sent to the network

Received: Number of correct Echo Response packets received

Unreached: Number of Echo Response packets w/unreached label received

Lost: Number of Echo Response packets missing

Time Exceeded: Number of pings that timed out per user configuration

Roundtrip: Measure of roundtrip delay, current, average, max., min.

Ping Response

Automatically responds to incoming Echo requests running continuously in background while an IP connection is in place.

Trace Route Test Configuration

TTL: 1 to 255

Timeout: 1 to 5 seconds

Ping Destination: IP Address or URL

Loopback

Loopback Layers

Layer 1 (with FCS/CRC): Frames are looped without any modification

Layer 2: Frames are looped with their MAC Source and Destination addresses swapped

Layer 3: Frames are looped with their MAC and IP Source and Destination addresses swapped

Loopback Modes

Manual: Fully compatible with all other Ethernet devices

Responder: Loops up or down based on commands received from another STT 10G Ethernet port or SunSet MTT -28 or -29 module

Loopback Commands: Loop Up, Loop Down

Monitoring

The STT 10G Ethernet provides in-service monitoring of live traffic. All throughput measurements including signal status, Rx statistics, and defects (excluding bit errors) are available.

Monitoring ports

Fast Ethernet: Up to 4 bi-directional links

GigE: 1 bidirectional link. In this mode, the STT Ethernet module can function as a gigabit extender, translating 850 nm signal into 1310 nm, and visa-versa (for example).

10GbE: 1 uni-directional link per port

Packet Capture and Decode

The STT 10G Ethernet module can capture thousands of Ethernet frames in real time. Captured packets can be analyzed immediately or saved and opened with another application. This feature is compatible with the most popular packet analysis software suites. Packet Capture is available in all Ethernet test modes.

- Identify active VLANs
- Inspect non-test traffic
- Measure delay between packets
- Troubleshoot higher-layer protocols

Pre-Filter

MAC Source

MAC Destination

MAC Type/Length

VLAN ID

IP Source

IP Destination

Buffer Size

10GbE: 256 MB

GigE: 64 MB

Fast Ethernet: 32 MB



Protocols Decoded

MAC/LLC: 802.1q (VLAN), 802.2 (LLC), 802.3 (ETH), 802.5 (TR), Ethernet II, Novell Raw, IEEE Vendor Code, MAC Control (TR), SNAP, Source Routing

Cisco: Cisco ISL

Bridge Protocol: BPDU, GARP, GMRP, GVRP

IP/SPX: IPX, SPX, SAP, RIP, NCP

TCP/IP: ARP, BGP, BOOTP, DHCP, DNS, FTP, GRE, HTTP, ICMP, IGMP, IP, NNTP, OSPF, POP3, RARP, RIP, RSVP, SMTP, SNMP, TELNET, TFTP, UDP

IpSec/Security: AH, ESP, Radius

NETBIOS: NetBIOS, NetBIOS Datagram, NetBIOS Name, NetBIOS Session, SMB

APPLETALK: AARP, ADRP, ADSP, AEP, ATP, DDP, NBP, RTMP, ZIP

PPP: PPP LCP protocol, PPPoE

VoIP: H.225, H.245, H.323, MGCP, PPTP, Q.931, RAS, RTCP, RTP, SIP, T.120 protocols

10GbE WAN Features

10GbE WAN-PHY encapsulates the Ethernet traffic into an OC-192c/STM-64c frame. In this mode, the STT 10G Ethernet Module provides access to SONET/SDH overhead alarms and measurements. The STT 10G Ethernet Module can be configured to use SONET or SDH terminology.

Alarm Generation

SONET: TIM-S, AIS-L, RDI-L, LOP-P, AIS-P, UNEQ-P, PLM-P, TIM-P, RDI-P

SDH: RS-TIM, MS-AIS, MS-RDI, AU-LOP, AU-AIS, HP-UNEQ, HP-PLM, HP-TIM, HP-RDI

Overhead Control

Hex display and decode: J0, K1/K2, S1, J1, C2

Hex/binary encode: K1/K2, S1, C2

J0 Section Trace: 16 bytes E.164 ASCII sequence + CRC-7 or 64 bytes E.164 ASCII sequence

J1 Path Trace: 16 bytes E.164 ASCII sequence + CRC-7 or 64 bytes E.164 ASCII Sequence

Product description

Upgrades: SW upgradable via CD-ROM or USB memory device

Operating temperature: 0 to 40°C (32 to 104°F)

Storage temperature: -20 to 70°C (-4 to 158°F)

Humidity: 5% to 90% noncondensing

Stand-Alone Operation

Power Input: Stand-alone AC operation with 100 to 240 VAC, 50/60 Hz universal charger

Communication: 10/100BASE-T and RS-232 Serial Port

65 mm Chassis

Weight: 2.3 kg (5.1 lb)

Size: 320 × 220 × 65 mm (12.6 × 8.7 × 2.6 in)

150 mm Chassis

Weight: 4.6 kg (10.2 lb)

Size: 320 × 220 × 150 mm (12.6 × 8.7 × 5.9 in)

Ordering Information

65 mm Chassis

STT-3301 Single 10GbE Only

150 mm Chassis

STT-3302 Dual 10GbE Ports

Accessories

XFP (10GbE) Modules

STT-3822 10GBase-SW/SR: 850 nm optics, single-mode

STT-3823 10GBase-LW/LR: 1310 nm optics, single-mode

STT-3824 10GBase-EW/ER: 1550 nm optics, single-mode

Recommended Cables

SA265 Cable; 100Ω, CAT5, RJ-45 (M) to RJ-45 (M), cross-over, 6'

SA266 Cable; 100Ω, CAT5, RJ-45 (M) to RJ-45 (M), 6'

SA511 Optical Cable; SC to SC, 6'

SA515 Optical Cable; SCUPC to SCUPC, multi-mode, 6'

SA561 Optical Patch Cord: LC-SC Duplex, MMF, 6'

SA562 Optical Patch Cord: LC-SC Duplex, SMF, 6'

Other Accessories

SA420 STT Standalone Accessory Package - required for test module in stand-alone configuration. [Serial Cable; DB9 to DB9, 6' (SA221), Cable; 100 Ohm, CAT 5, RJ45 (m) to RJ45 (m), Straight 6' (SA266), AC Power Adapter (SA140), Null Modem Adapter (SS122B), Carrying Strap (SA421), and STT Bus Case (SA144), (4) screw-on feet, (4) rubber pads for mounting screws.]

SA427 Standalone Accessory Package for the STT Modules, 130 Watt

SA620 Soft Carrying Case, STT

SA622 Hard Carrying Case with Wheels, STT



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