Product Overview

The SmartBits® SmartMetrics™ and TeraMetrics™ and XD modules offer "Dual Media" Ethernet connections on every test port. The user can select a 10/100/1000 Mbps connection or a Gigabit Ethernet Fiber connection on each port. The SmartBits test system can scale from two ports up to 768 ports, providing the highest density test platform in the industry.

Each XD module is capable of simulating the millions of clients and servers required to fully test network systems. The modules can be used to test high-speed internetworking between Ethernet interfaces, as well as other technologies in the SmartBits system, such as ATM or Packet over SONET interfaces.

Each XD module can generate realistic traffic at different layers and measure specific metrics for each layer. The TeraMetrics XD modules can simultaneously correlate data plane tests with control plane traffic such as routing, to provide the most realistic performance measurements. SmartMetrics XD modules support testing at Layers 2 and 3.

Applications

- Provide custom traffic generation for functional testing of network devices.
- Measure maximum data plane performance (throughput, packet loss, average latency, etc.) of networking devices and systems.
- Measure specific control plane performance of network-embedded applications such as routing, Multicast IP, MPLS, and security.
- Measure Layer 4 to 7 performance of devices like web servers, firewalls, load balancers, streaming media, SSL accelerators, and IPSec VPNs.

Key Features

- Dual Media 10/100/1000 Mbps and Gigabit Ethernet Fiber on each port.
- Wire-rate traffic generation and analysis at Layers 2 and 3.

- Transmit millions of IP flows and analyze CoS and DiffServ information.
- Run multiple protocols per port simultaneously to emulate large routed networks. What is emulated on the control plane can be tested with individual flows on the data plane.
- Realistic higher application traffic and protocol breadth for Layer 4 to 7 testing.

Benefits

- Validate the functionality and performance of networking devices with the industry's most trusted performance test system.
- Run deterministic and repeatable test cases from Layers 2 to 7 to produce the most accurate results.
- One test module will support many types of Ethernet interfaces (10/100/1000 Mbps and Gigabit Fiber) at no extra charge, thereby protecting your investment for future projects.
- Automatically produce test results in graphical or tabular format within the Spirent applications; results can be exported to other applications.

Specifications

Layer 2 Transmit

- Standards: IEEE 802.3.
- 100% wire-rate generation with all traffic types.
- Transmit modes: Single burst, Multiburst, Continuous, Continuous multiburst.
- Transmit byte size: Fixed frames from 40 to 16,384 bytes or random.
- Custom frame generation: All zeros, All ones, Custom, Random, IP, UDP, UDP-RTP, TCP, ARP, RARP, ICMP, IPX, Pause, 555, AAAA, Incrementing byte, Incrementing word, Decrementing byte, Decrementing word, F0F0, 0F0F, FF00, FFFF0000, 0000FFFF, 8-F's 8-0's, 8-0's 8 F's.
- Interpacket Gap: 96 nSec to 1.073 Seconds. Units: Packets/Sec, % Utilization, Random, Databits/Sec, Frame bits/Sec, Total bits/Sec, nSec, uSec, mSec, Seconds.

LAN-3325A TeraMetrics XD module

Analyze | *Assure* | *Accelerate*™

SPIRENT
Communications

- Negative testing: CRC errors, Undersize frames, Oversize frames, IP checksum errors.
- MAC addressing (variable fields 1 and 2): Static, Random, Increment, Decrement, Addressing with cycle count configured for destination and source addresses.
- Custom protocol editor (variable field 3): 2048 byte buffer to build custom protocols across multiple frames.
- Alternate data packet stream (required for RFC 2544): Alternate packets with Layer 2 and 3 headers can be configured and mixed in with the standard data packets for functional and negative testing.
- Programmable Jumbo Frame mode up to 10K bytes.
- Internal Loopback mode.
- Preamble length: 4 –16 bytes.
- VLAN tags: Create/edit VLAN tags.
- VLAN stacking up to 8 tags.
- Autonegotiation on fiber interface: Pause Flow control, Remote Fault control.
- MII interface registers: Read and write to MII registers, Force MII advertisement on interface (10/100/1000 Mbps).
- View output packet in transmit setup window.

Layer 2 Receive

- Port counters display events and rates: TX frames, RX frames, TX bytes, RX bytes, TX triggers, RX triggers, CRC errors, Oversize frames, Fragments/undersize, TX frames from protocol stack, Received frames from protocol stack, ARP replies sent, ARP requests sent, ARP replies received, ARP requests received, PING replies sent, PING requests sent, PING replies received, PING requests received, Signature frames sent, Signature frames received, Data integrity errors, VLAN frames received, IP checksum errors, Jumbo frames received, and Pause frames received. (All aforementioned are 64 bit counters.)
- Receive triggers: Two 6 bytes triggers can be configured per port. Triggers can be combined with "and/or" statements.
- 32 MB capture per port enables logging and exporting of events. A full protocol decode suite is available separately. Capture event filters include: All frames, CRC errors, Undersize frames, Oversize frames, Data integrity errors, IP checksum errors, Receive triggers. Capture entire frame or the first or last 64 bytes.
- Front Panel LED's: Per port LED's for Link status, TX frames, RX frames, Errors received, Triggers received, Pause frames received, Collisions (for 10 and 100 Mbps half duplex only), Fiber or Copper port selected.

Spirent Software Applications (Layer 2 Testing)

- AST II™ (automated RFC 2889 test suite)
- SmartApplications™ (for automated RFC 1242/2544 testing)
- SmartFlow™ (Layer 2 and 3 QoS test suite)
- SmartLibrary™ and SmartBits Automation™ (for custom test automation)
- SmartWindow™ (for interactive functional testing)

Layer 3 Transmit

- Stream-based 100% wire-rate traffic generation with all frame types and traffic patterns.

- 2048 Layer 3 streams or groups of cyclic flows for IPv4, IPv6, TCP, UDP, IPX, and Custom.
- IPv6 streams or groups of cyclic flows. Includes IPv6-TCP, IPv6-UDP, and extension headers.
- Each stream can be edited to create thousands of flows. These cyclic flows can be programmed to scroll through specific address ranges using subnet masking and stutter counts.
- Transmit modes: Single burst, Multiburst, Continuous, Continuous multiburst.
- Transmit byte size: Fixed frames from 40 to 16,384 bytes or random per stream. Set Random Min and Max values. Set Random seed.
- Transmit rate can be set globally or per stream. Interpacket Gap 96 nSec to 1.073 Sec. Set per stream rate in %Utilization or Frames/Sec units.
- Data payload: Each stream can be programmed with a specific payload pattern or random pattern.
- Each port has an independent dual stack for IPv4 and IPv6.
- IPv4 stack: Support for ARP per stream and per cyclic flow, Gratuitous ARP per stream.
- IPv4 header fields: Identification, Flags, Fragment offset, TTL, Protocol, IP options field, TOS, Precedence, MBZ (unused bit).
- IPv6 stack: Neighbor discovery per stream, Cyclic flows, Next hop address discovery, Router/prefix discovery, Address auto-configuration, IPv6 tunneling over IPv4, Multiple extension headers, Hop-by-hop options, Routing options, Fragment, Authentication, Destination options, Encapsulated security options.
- IPv6 header fields: Flow label, Traffic class, Hop limit.
- IPv6 display formats: Hexadecimal, No leading zero, Compact, Mixed.
- VLAN tags: Create VLAN ID, User priority, Canonical format identifier per stream
- Gateway: Set a Gateway IP address per stream.
- MPLS: Create one or multiple MPLS labels per stream.
- Multicast IP support: IGMP 1, 2, and 3; multicast statistics; membership reports; event logs; and MulticastIP with VLAN tags. Create Multicast groups and assign ports as hosts or receiving clients. Join or leave Multicast actions.
- Set errors on a per stream basis: CRC error, IP check sum error, IP total length error (IPv4 and IPv6).

Layer 3 Receive

- Analyze multiple statistics and histograms at wire rate on up to 64,000 streams per port or 3 million streams for a fully loaded chassis.
- Reduce test time with Multi-pass QoS tests: Each port can measure packet loss, latency, and sequence tracking in one test iteration. Results can be correlated with test traffic load graphically and in tabular formats.
- SmartMetrics (Layer 3) tests: Throughput, Sequence tracking per stream, Latency over time histogram, Latency per stream, Latency variation, Packet loss, and Receive rate.
- Latency tests have 100nSec resolution with +/-100nSec accuracy.
- Multicast statistics, membership reports, and event logs are supported.

- Full CoS/DiffServ counters per port. Tracks all received traffic per port or a specific IP flow.
- Data Integrity test on frame payload.

Spirent Software Applications (Layer 3 Testing)

- SmartApplications™ (for automated RFC 1242/2544 testing)
- SmartFlow™ (Layer 3 QOS IPv4 and IPv6, MulticastIP test suite)
- SmartLibrary™ and SmartBits Automation™ (for custom test automation)
- SmartMulticastIP™ (Multicast IP performance analysis)
- SmartWindow™ (for interactive functional and performance testing)
- TeraRouting Tester™ (routing test suite)

Routing

- Router testing is available on all TeraMetrics XD modules using the TeraRouting Tester (TRT) application.
- The modules provide for integrated control and data plane routing tests.
- The modules support data plane tests with static or dynamic routing.
- Run multiple routing protocols per port simultaneously. Run hundreds of sessions of BGP per port, run hundreds of OSPF LSAs.
- OSPF Graphical Topology Editor: This allows the user to quickly drag, drop (many times), and modify any OSPF topology created by the application wizard or the user.
- Protocols available in TRT: RIP V1/V2, RIPng, BGP4, BGP4+, ISIS, ISISv6, OSPF, OSPFv3, LDP, RSVP-TE, Martini, VPLS RFC 2547.
- Set up large BGP, OSPF, IS-IS, or RIP networks on all ports with data plane traffic going to each advertised network from all transmitting ports.
- Test results appear in real time; Can display final test results.
- Track data plane traffic based on: Prefix length (1-128), Flap status ("Will Flap" or "Will not Flap"), Route duplication, or User-defined tracking groups.
- Real-time test results include:
  - Receive frame rate graph: Per tracking group, QoS group, protocol, and port.
  - Percentage of expected frame rate graph: per tracking group, QoS group, protocol, and port.
  - Average latency graph: per tracking group, QoS group, protocol, and port.
  - All graphs have flap events integrated.
  - Port counters with totals and rates.
  - Routing protocol counters per session, adjacency, or emulated router.
  - Event log with filtering for specific routing sessions.
- Final test results include:
  - Final receive frame rate graph from the beginning of an iteration to the end.
  - Final average latency graph from the beginning of an iteration to the end.
  - Final routing protocol counters per session, adjacency, or emulated router; final port counters.
  - Per-stream frame analysis including frames sent, received, and lost, as well as stray frames and latency.
  - Two-way control plane capture and decode.

Layer 4-7

Websites, Applications, and Services

- Layer 4 to 7 testing is available on all TeraMetrics XD modules using Spirent's Avalanche SmartBits™ application.
- Avalanche SmartBits easily scales to allow users to simulate large application and network infrastructures and to test content-aware devices that use upper layer protocols such as HTTP, SSL, FTP, Microsoft Media Server (MMS), SMTP, POP3, and Real Time Streaming Protocol (RTSP).
- Each SmartBits module can act as a client (using the Avalanche™ portion of Avalanche SmartBits) or a server (using the Reflector™ portion of Avalanche SmartBits).
- When used individually, Avalanche can be used with real web, FTP streaming servers, mail servers, and SSL acceleration devices. Together, Avalanche and Reflector can be used to test web switches, caches, load balancers, application proxies, firewalls, switches, routers, and intrusion detection systems.
- Performance of Avalanche SmartBits:
  - Simulates more than 1 million simultaneously connected users.
  - Generates more than 30,000 requests per second (HTTP 1.0 with no keep alive) and over 50,000 requests per second (HTTP 1.1 with persistence).
  - Sustains over 2,000 HTTPS requests per second with no SSL session id re-use.
  - Generates over 10,000 streaming requests.

Security

Firewall testing is available on all TeraMetrics XD modules using Spirent's WebSuite™ Firewall application or Avalanche SmartBits application. For high-performance testing of firewalls, WebSuite Firewall can test connection rates and effective throughput, as well as the ability to deal with DoS attacks. For advanced firewall testing, Avalanche SmartBits can generate extremely high loads of protocol-accurate traffic over TCP, validating firewall features such as stateful inspection, application proxying, and protocol fix-ups.

SSL Accelerator testing is available on all TeraMetrics XD modules using Spirent's Avalanche SmartBits application. The testing supports SSL versions v2, v3 and tls v1, Session id, Dynamic HTML, and Business Logic.

IP VPN testing is available on all TeraMetrics XD modules using Spirent's TeraVPN Tester™ application. Spirent also offers an optional XD Security module that can be plugged into the 1- and 2-port test modules to provide hardware acceleration for IP Sec tunnel setup. The IPSec protocol stack is from SSH and supports:

- Generation of hundreds to thousands of tunnels.
- Generation of data (TCP or HTTP) over tunnels.
- Measurement of forwarding rate, packet loss, and response time.

- Bounce diagrams for troubleshooting tunnel creation.
- Stack log to investigate tunnel failures.
- SPI entries for both incoming and outgoing tunnels.
- Easy-to-use GUI with straightforward tab-approach configuration.
- Graphical single-tunnel setup wizard reduces learning curve.
- Scalable to thousands of tunnels using wizards.
- Control over IKE Phase 1 setup parameters like # retries and expire timer.

802.1x testing is available on 10/100/1000 Mbps TeraMetrics XD modules. Spirent's 802.1x solution allows users to:

- Test the session setup rate up to 100 sessions per second.
- Test the maximum capacity of a device for 802.1x authentication.
- Simulate up to 256 supplicants per port.
- Measure session setup rate per supplicant.

The available 802.1x protocols are:

- Extensible Authentication Protocol (MD5-EAP)
- Protect Extensible Authentication Protocol (PEAP)
- Transport Layer Security (TLS)

Physical Connectors

Each XD module except the LAN-3306A contains two connectors per test port. One connector is for 10/100/1000 Mbps operation and the other is a Gigabit Fiber connector, which can be populated with a SFP transceiver (multimode or single mode). The system software enables the test port to be either Fiber or Copper. The Copper port can be set for 10 or 100 or 1000 Mbps operation and for half duplex or full duplex (for 1000 Mbps, only full duplex operation is supported).

Hardware Requirements

- SmartBits 6000C chassis–The SmartBits 6000C supports up to twelve XD modules. Each XD module requires one slot in the chassis.
- SmartBits 6000B chassis–The SmartBits 6000B supports up to six XD modules. Each module must have an empty slot and a blank panel above it.
- SmartBits 600B chassis–The SmartBits 600B supports up to two XD modules in any combination.
- SmartBits 600 chassis–The SmartBits 600 supports one 4-port XD module or two 1- or 2-port XD modules.

Ordering Information

Part Number	Description
LAN-3306A	10/100Base-TX Ethernet, Copper, 4-port, TeraMetrics XD module
LAN-3320A	10/100/1000 Mbps and Gigabit Ethernet Fiber, 2-port, SmartMetrics XD module
LAN-3321A	10/100/1000 Mbps and Gigabit Ethernet Fiber, 2-port, TeraMetrics XD module
LAN-3324A	10/100/1000 Mbps and Gigabit Ethernet Fiber, 4-port, SmartMetrics XD module
LAN-3325A	10/100/1000 Mbps and Gigabit Ethernet Fiber, 4-port, TeraMetrics XD module
LAN-3327A	10/100/1000 Mbps and Gigabit Ethernet Fiber, 1-port, TeraMetrics XD module
ACC-6025A	1000Base-SX Gigabit Ethernet, SFP Transceiver, multi-mode, 850nm, LC Connector
ACC-6026A	1000Base-LX Gigabit Ethernet, SFP Transceiver, single mode, 1310nm, LC Connector
Contact Spirent Sales	1000Base Gigabit Ethernet, SFP Transceiver, single mode, 1550nm, LC Connector

NOTES:
- SmartMetrics XD modules support testing of Layers 2 and 3.
- TeraMetrics XD modules support testing of Layers 2 to 7.
- Gigabit Ethernet SFP Transceivers must be ordered separately from the test modules.

Spirent Communications offers a variety of ServiceEdge™ maintenance and support packages. For more information, visit the Spirent website at www.spirentcom.com or contact your Spirent sales representative.

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