SmartFlow™ QoS Performance Tester

Product Overview

SmartFlow is a comprehensive SmartBits® software application primarily designed to test QoS and analyze the performance and behavior of policy-based network devices. SmartFlow uses the analysis capabilities of SmartMetrics™ cards to generate traffic that represents different classes of service. It then analyzes the performance of each incoming stream to test a system's ability to forward large numbers of flows. SmartFlow also analyzes the system's ability to correctly handle policies and provisioned bandwidth.

SmartFlow measures the performance of each class of service, characterized by DiffServ, IP precedence, VLAN priority, protocol, port number, and so forth. It transmits and tracks thousands of flows per port and provides results tracking per flow or per group of flows. Results are displayed so that the user can track all flows in each priority bucket and perform priority comparisons.

Because of its flexibility and large range of features, SmartFlow can easily be customized to test:

- Layer 2 switches
- Layer 3 and "3 plus" switches and routers
- Broadband access–based applications that use Dynamic Host Configuration Protocol (DHCP) and cable/DSL modems

Networks containing firewalls and other security devices Through the use of powerful setup wizards, the application lets you very easily create traffic patterns for full mesh, backbone, port pair, waterfall, or user-defined flows.
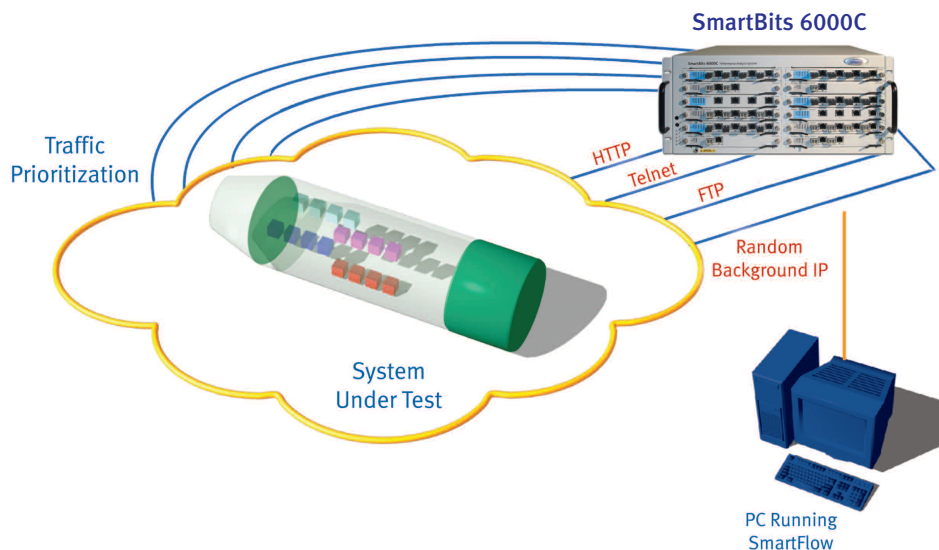
Why SmartFlow?

- SmartFlow is the most trusted and comprehensive Layer 2 and 3 network performance analysis tool among the industry's top professionals
- SmartFlow has historically found network issues that other test tools fail to report
- With SmartFlow, network managers, equipment manufacturer engineers, and testers at ISPs and telcos can answer the following questions:
  - What is the impact of priority-based traffic vs. non-priority based traffic? Am I getting the bandwidth for which I paid a premium?
  - How many priority queues are in the device?
  - Under congestion or port over-subscription, what happens to low-priority traffic? Does the latency increase? Is there traffic loss?
  - What happens to my network over extended periods of time? Do timing issues or memory leaks exist?
  - What happens in case of port failure? Is the traffic re-routed correctly?
  - Are packets received out-of-sequence, possibly requiring upper layer re-transmits?
  - Is IPv6 NAT or tunneling creating packet loss and latency? Is IPv6 throughput better or worse than IPv4?
  - Is my IP multicast traffic slower than the unicast traffic? How does my network scale with additional IP multicast groups and subscribers?
  - Will my network function differently after a firmware upgrade?
  - Can data be handled between different interfaces such as LAN, WAN, ATM, and POS?

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Lab Test to Service Management™

Breadth of Tests

SmartFlow can easily be configured, with or without DHCP, to run a multitude of tests. Most tests can be run with a single one-time configuration. Tests include:

- *Throughput/Forwarding Rate*–Measures the throughput (maximum forwarding rate with zero packet loss) per flow and group. Provides user-defined acceptable loss and control over the search technique used during the test (binary or step)
- *Frame Loss*–Measures the frame loss per flow and group. Reports in- and out-of-sequence frames. What are the load tolerance limits? Do they vary depending on frame size and/or traffic that is randomly sent or randomly sized? Were frames lost evenly or in large blocks at the beginning or end?
- *Latency*–Measures the average, minimum, and maximum latency of each frame per flow/group based on intended or actual load (in case of flow control). Reports both cut-through and store-and-forward measurements
- *Jumbo Test*–Combines many tests into one, allowing you to measure what happens to latency while monitoring frame loss. This test, which uses timesaving histograms, shows latency distribution, latency, packet loss, and sequencing, and correlates the results. The test also shows bandwidth utilization per flow
- *Latency Distribution*–Measures the latency standard deviation (jitter) and latency variation of a histogram per flow/group. Determines how traffic flow latency is distributed for each load, and how the latencies vary from one to another. Defines which groups to analyze and the bit buckets of time to monitor
- *Latency Over Time*–Reports latency over user-defined periods. Allows network changes to be monitored as certain events occur
- *Latency Snapshot*–Captures the latency of each packet for a snapshot in time, allowing the user to see the change in latency between flows
- *SmartTracker*–Determines whether a network is classifying traffic properly, which is especially important when the DUT dynamically changes traffic (through packet re-marking). SmartTracker produces metrics on rate policies, variance of CoS values, and relative CoS percentages. It provides these metrics in tabular and graphic form. It also provides forwarding rates at the same time that proper classification is made, thereby letting the ISP be sure that bandwidth provisioning is not compromised. In addition, SmartTracker eliminates assumptions by correlating received values with the original transmitted values
- *DHCP*—Tests whether tens of thousands of hosts can interact with DHCP servers in a native DHCP environment. Reports per port successes, failures, and DHCP latency. Per stream DHCP response times, lease time, and latency are recorded in a comprehensive log file available for viewing prior to running subsequent data

plane tests. Dynamically and quickly updates the GUI with assigned IP addresses, networks, and gateways in the host traffic

Rate Control

- Flexible transmit rates for provisioned links and disparate downstream and upstream loads. Rates are controllable globally for all ports, per port, or per flow
- Random loads are specified so that the traffic load changes automatically *while the test is running* and with user-defined upper and lower boundaries
- Traffic loads set in meaningful units: Mbps, Kbps, bps, fps, or % utilization. (Corresponding units can be viewed in the results.)
- Easily sweep through all frame sizes expected on a live network. Frame size automation can be applied to each test iteration
- Throttled traffic eliminates testing in a static network environment, so flow rates can be kept steady while others within the same port increase or decrease
- Traffic rates are specified in terms of burst or packet count
- Stagger start options let transmission across ports begin at user-defined intervals

Frame Size Control

- Frame sizes are set globally for all ports, per port, or per flow
- Random loads can be specified so that the traffic load changes automatically *while the test is running* and with user defined upper and lower boundaries
- Jumbo frames can be transmitted and tracked
- Weighted frame sizes for IMIX (or vendor-specific mixes) of frame sizes with intelligent bandwidth calculation
- Random settings within IMIX and weighted frame sizes
- Simultaneously send unique sets of IMIX traffic for tens of thousands of users and at different points on the network
- Providers can set up one test for a host of different IMIX sets, each of which can be run with different traffic loads
- IMIX traffic can be mixed with constant rate background traffic on the same port so that what-if analysis can be easily done while simulating thousands of logical users

VLAN Highlights

- Covers the entire range of possible VLAN IDs on a single port
- Thousands of IEEE 802.1 p/q VLAN ids and priorities
- Multi-subnets/VLANs per port
- Multiple VLANs per subnet (IPv4 and IPv6) within a port for sophisticated broadband testing
- Transmit rates can be set by VLAN and DSCP and automatically distributed for each flow accordingly

- *VLAN stacking (Q-in-Q)*–Flows can be simulated and tracked at different points within the network with one to eight VLAN tags

IPv6 Mixes Easily with IPv4

- Stateful IPv6 with neighbor discovery to automate testing
- Easy-to-compare differences between IPv4 and IPv6 flows
- Tracking between IPv4 and IPv6 flows for devices that support NAT
- Dual stack for IPv4 and IPv6 flows concurrently per SmartBits port
- End-to-end testing over networks with 6to4 and 6over4 tunneling
- QoS by flow label or traffic class
- Flexible address formats
- IPv6 cyclic flows to simulate tens of thousands of users

IP Multicast Mixes Easily with Unicast

- Performance metrics on multicast flows using VLANs on joins/leaves and flow data
- Run all SmartFlow tests using a flexible combination of unicast and multicast traffic
- Test with IGMP versions 1 and 2
- Configuration wizard makes the setup of complex configurations fast and easy
- Join verification and timers for controlled testing
- Report on a multicast group basis or on a per flow/group basis
- Transmit from multiple sources to single or multiple groups
- Subscribers may belong to more than one group; transmitter may also be a subscriber in another group
- Thousands of multicast groups per transmitter

MPLS and BGP Included

- User flow data is automatically generated based on MPLS signaling
- Supports ingress, transit, and egress LSR testing, individually or combined
- Supports over 5,000 Label-Switch Paths (LSPs) per MPLS test using dynamic and/or static labels
- Supports the RSVP-TE protocol and dynamic timer options
- Explicit routing and controlled load with configurable label contents such as EXP bits
- Advertises 100K routes per port using optional BGP4 with route flapping

Setup Wizards

- Group wizard for configuring thousands of tailored flows in seconds
- Network wizard for configuring networks and VLANs
- CoS wizard for setting rates per VLAN and CoS
- IP multicast wizard
- ATM VC wizard
- IMIX wizard incorporated into group wizard

Easily Move From GUI to Script

- Export SmartFlow GUI configurations using a simple menu option that creates Script Automation Interface (SAI) files. Use SAI to:
- Control tests with simple text files that can be wizard-generated
- Provide scalable support for configurations larger than those supported by the GUI
- Decrease test setup and execution time; support quick tests that are repeatable
- Combine tests with web-based L4-L7 test suites and router tests, including OSPF
- Provide platform and language independence

General Highlights

- Supports IPv4 and IPv6 unicast flows, and IPv4 multicast flows
- Simulates hundreds of thousands of cable or DSL modem users (hosts) that interact with DHCP servers on broadband-based networks
- Individually analyzes up to 64,000 totally unique streams per port
- Transmits up to 8,000 classes of service per port
- Supports IP, TCP, UDP, ICMP, and user-definable custom flows
- Set source and destination MAC/IP addresses and TCP/UDP ports
- Set IP/DiffServ fields or IP/ToS precedence bits
- Continuous looping traffic blaster mode, with the ability to view results and frame rates while a test is running; allows extended duration testing
- Performs both Layer 2 and Layer 3 packet learning, including ARPs before and during the test, and for transmit and/or receive ports
- Supports fast-path learning with a sample iteration of test traffic
- Supports multiple chassis operation (co-located or remotely located)
- Supports GPS, CDMA, and NTP for one-way latency measurements

Interface Support

- 10/100 Mbps Ethernet, plus USB, Gigabit with copper/fiber interfaces, including dual media, and 10 Gigabit XENPAK/XFP LAN and WAN mode
- OC-3c/OC-12c ATM, using over 8,000 PVCs and streams per port
- OC-3c/OC-12c/OC-48c/OC-192c POS with full PPP sessions, Cisco HDLC, and 16/32-bit CRC
- Frame relay, PPP, and Cisco HDLC headers using channelized DS3 WAN or clear channel

Report Highlights

- Summary, detail, and graphic charts are automatically produced for each test
- Bandwidth utilization chart provides an immediate visual for determining if an SLA is working

SPIRENT
Communications

- SmartTracker shows relative percentages of each tracked value, plus the receive rate of flows containing tracked values
- Save results in delimited text, JPEG, or HTML format
- A stray frame report on all tests indicates stray frames that were received on the incorrect port
- Reports receive port errors, including data integrity and CRC errors
- Uses Microsoft® Access database, allowing for additional analysis and reporting of data

Requirements

A SmartBits 200/2000 or SmartBits 600/600B/6000C chassis with the appropriate modules.

The proper cabling for the test (for example, category 5, straight-through or crossover, depending on the DUT) A Pentium™–equipped PC running Windows® 2000/NT/XP, with mouse and color monitor.
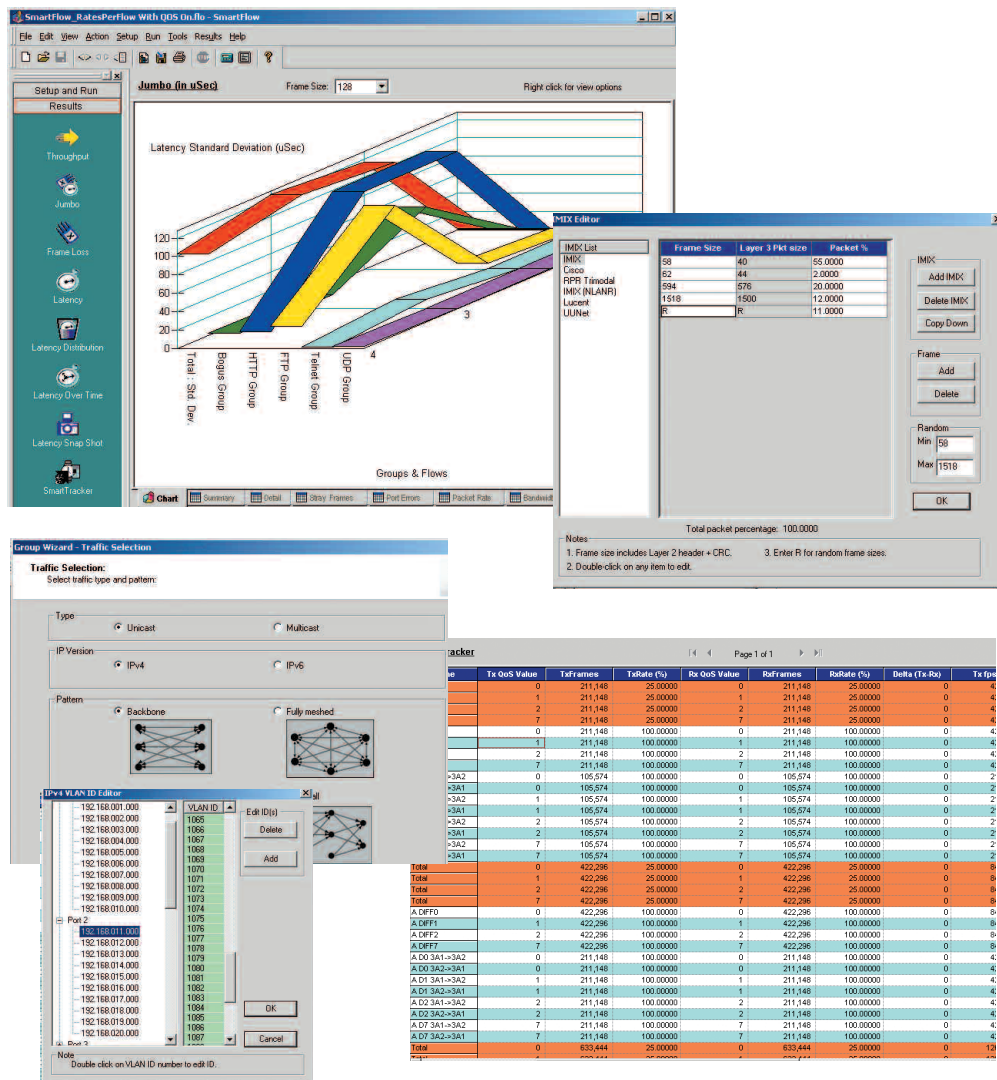
Ordering Information

SWF-1201A–SmartFlow Layer 2, 3+ QoS Performance Tester for IPv4, IPv6, and multicast.

About Spirent Global Services

The services described here are only part of the offerings from Spirent Global Services. In addition to Education Services, we also offer:

- Professional Services supplementing your internal resources for engineering, implementation, integration, and testing.
- Support Services providing customized access to the level of software updates and technical support that meets your needs. These services maximize uptime, protect the value of your investment and make maintenance expenditures more predictable.

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