SPIRENT NETWORK IMPAIRMENT EMULATION

CIRCUIT EMULATION SERVICE AND TIMING OVER PACKET

CES AND ToP TEST SOLUTIONS

CES AND ToP TEST APPLICATIONS

Spirent's emulation solutions are ideal for vendors to test a wider range of Circuit Emulation Service and Timing over Packet tests including:

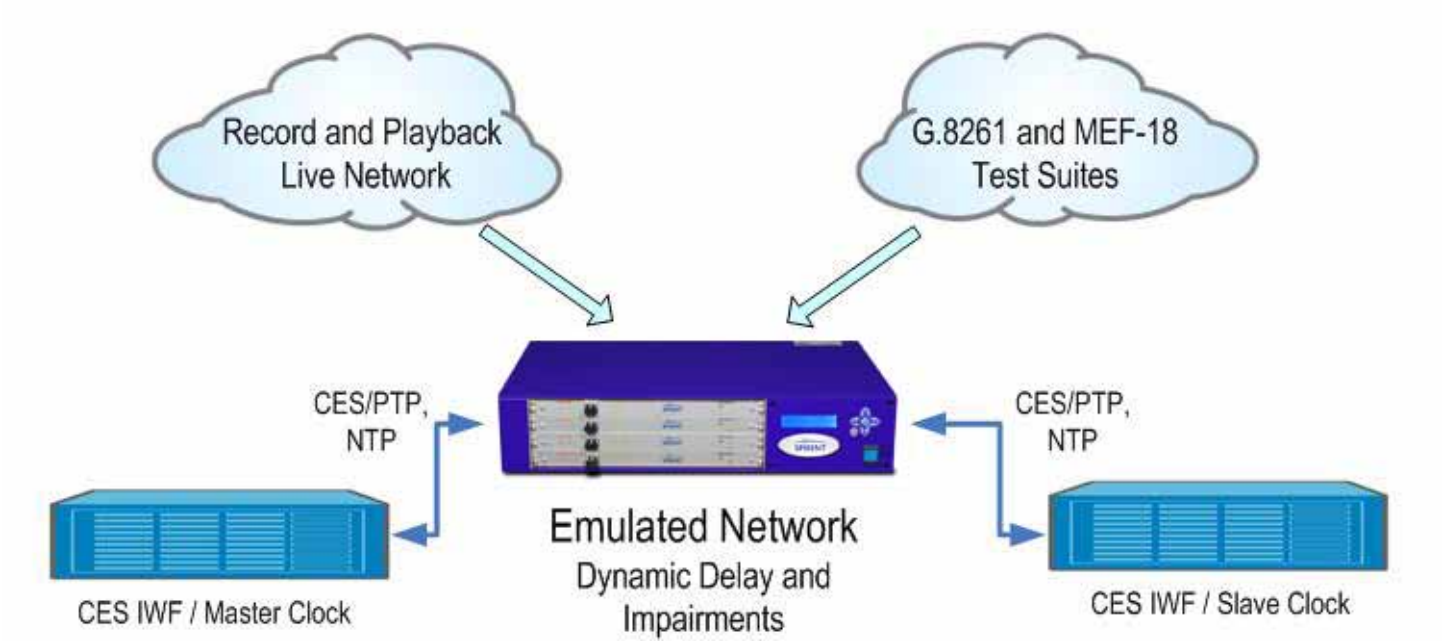
- Verify conformance to ITU-T G.8261, MEF-18 and other emerging standards
- Characterize clock recovery performance across a packet-based network
- Validate TDM services are delivered with the required jitter and wander performance
- Verify packet-loss-concealment algorithms by introducing packet loss and re-order
- Validate the performance of protection fail-over features
- Verify accuracy of performance metrics reporting and status/alarm indicators
- Wireline and wireless operators can use Spirent's CES solutions to easily evaluate competing Circuit Emulation Service and Timing over Packet solutions.

KEY FEATURES

- Test with realistic, repeatable and customizable network conditions in a lab
- Spirent's MEF-18 and ITU-T G.8261 Test Suites allow testing prior to certification submissions
- Save time and money by leveraging emulation with standards-based test suites
- Resides on a hardware-based architecture providing maximum accuracy and repeatability
- 100% line rate (up to 11.3Gbps) capable even with minimum size frames
- Hardware allows users to precisely emulate delays and impairments that occur over Ethernet networks

Live networks and mock-ups have been traditional approaches for testing Circuit Emulation Services (CES) and Timing over Packet (ToP) products, but these methods have significant drawbacks. Using leased lines on a live network is costly, difficult to manage and only represents one customer scenario of the many possible. At the same time, mock-ups are complex to build and maintain, while still only providing limited scenarios. Most importantly, both approaches lack the flexibility and repeatability required to effectively allow a vendor to prepare CES or ToP solutions for real-world deployment.

Spirent's network emulation solution combined with the new MEF-18 Test Suite provides a superior test solution that defines a realistic test network. Vendors and service providers now can significantly reduce the time and cost required to characterize performance and validate the Interworking Functions of their CES (ITU-T Y.1413, IETF CESoPSN or IETF SAToP) and ToP (IEEE 1588 or NTP) solutions.



REALISTIC NETWORK CONDITIONS IN THE LAB

Spirent's unique hardware-based emulator design provides nano-second precision and line-rate performance. Spirent's Network Playback™ feature provides users the flexibility to control delay and impairments on a per-packet basis. Users can now create virtually any network scenarios required including the following:

- Pathological timing scenarios
- Custom statistical impairment distributions such as long tail
- Extremely high or low (sub-Hertz) frequency delay changes and impairments
- Dynamic delay and impairment conditions (packet-to-packet or time-based control)

Network Playback's open file format enables configuration input from actual live network measurements or software-based network models. These network scenarios can be customized with user-defined impairment tables. Extremely large tables are supported for multi-day scenarios for low frequency content (e.g., diurnal variation).

MEF-18 TEST SUITE FOR FAST AND COST EFFECTIVE TESTING

The Metro Ethernet Forum (MEF) has developed a set of test cases based on ITU-T G.8261 for certification of CES products. Spirent now offers the MEF-18 test suite providing customers the ability to test their solution against industry-based test plans prior to certification testing. The MEF-18 test suite is integrated with Spirent's network emulator product so tests can be set up quickly and easily:

- Repeatable testing against models based on ITU-T G.8261
- Complete set of section six (synchronization) network emulation scenarios

RECORD PDV CHARACTERISTICS DIRECTLY FROM ANY LIVE NETWORK FOR PLAYBACK IN THE LAB

With one step the Spirent GEM can directly record Packet Delay Variation (PDV) characteristics from any live or test network into a format which can be precisely played back in the lab for testing devices against the same exact conditions found on your network. With this capability it is also possible to view the actual packets for protocol analysis or perform timing analysis of the PDV data.

SPECIFICATIONS

Physical Interfaces:

- Copper 10/100M/1000 BaseT
- 1/10Gig Ethernet optical

Optional support: SONET/SDH, CPRI, OTN, Fibre Channel

Reference Clock Input:

- Line timed
- 10MHz, E1 MTS, T1 BITS

Control Interface:

- Any web browser (Windows or Linux) – HTML based interface

Supported Protocols:

- CES – Any, standard T1/T3, E1/E3 and support forproprietary formats, structure-aware or agnostic SAToP, TDMoIP, CESoP, CESoPSN
- Suppport with or without (stacked) VLAN or MPLS ToP – Any, PTPv1, PTPv2, RTP, NTP (all header formats)
- Others – Any L2+ protocol including Ethernet OAM, SSM and VoIP or IPTV protocols
- Jumbo packet support to over 12k byte size

Multiple Simultaneously Stream Support (CES and ToP)

- Up to 16 Network Profiles per direction
  - Enables QoS testing, recreate multipath networks, targeted impairment control
  - Each Network Profile has unique bandwidth and impairment conditions
  - Each defined by powerful classifier (filter): standard or customized L2–L7 protocol filters
- Individual PDV and impairment conditions per Network Profile
- Capture and analyze packets for multiple Network Profiles simultaneously
- Symetrical and Assymetrical scenario control (uni or
- bidirectional testing)
  - Synchronized bidirectional impairment control

Automation API

- Tcl based API allows for automation of testing

Individual Network Profile Control

PACKET FILTERS

- Extensive L2 – L7 protocol filters: MAC, VLAN, MPLS, IP, TCP/UDP, CES, PTP, more
- Customizable GUI filters provides virtually unlimited protocol support

PACKET CAPTURE

- 693 MBytes in each direction for synchronized bidirectional protocol analysis
- Standard PCAP compatible stream capture
- Export directly to Symmetricom or other 3rd party analysis software tool for extensive timing analysis including phase, TIE, MTIE, minTDEV, PDV and more
- Precise capture; up to true line rate (›5nsec accuracy)
- Triggered capture based on impairment event
- Filtered capture
- Capture entire packet or first n-bytes

PACKET REPLAY

- Inject packets via playback
- 693 Mbytes buffer of saved network traffic
- Control data rate

IMPAIRMENTS:

- Delay, Packet Delay Variation
- Drop, Reorder, Duplicate, Corrupt
- Bandwidth control (policing/shaping)
- CRC corruption, Accumulate and Burst

MODIFY PACKET COMPONENTS

- Redirect traffic (change MAC, IP, VLAN, MPLS)
- Change protocol messages (PTP, CES, EthOAM)
- Inject alarms (ex: CES L, R, M)
- Replace up to 48 bytes within packet (multiple noncontiguouslocations)
- Bit level control
- Ethernet CRC, IP, TCP/UDP, RSVP, FCoE checksum correction based on new content

PDV RECORD

- Capture PDV characteristics from a live or mock network for playback and timing analysis
- Capture and analyze multiple CES and/or ToP streams at the same time
- Record during emulation playback is supported

PLAYBACK PDV AND PACKET DROP CONDITIONS

- Industry Standard Test Suites: Complete set of ITU-T G.8261-2008 and MEF-18 scenarios
- Recorded scenarios
- Custom built scenarios (sawtooth, step functions or any custom statistical distribution)
- Apply to multiple CES and/or ToP streams simultaneously

OTHER CAPABILITIES

- Complete TIA-921 and ITU-T G.1050 test suite
- Complete MEF-18 and ITU-T G.8261 test suite
- IPTV Impairments of H.232 and H.234

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