![Spirent logo]

SPIRENT TESTCENTER
THE STANDARD FOR TESTING TOMORROW'S NETWORKS
HYPERMETRICS FIBRE CHANNEL TEST MODULE

The efficiency, cost and potential performance benefits of converged data center networks are driving rapid adaptation of 10Gigabit Fibre Channel over Ethernet at the server with bridging to native Fibre Channel moving to the top of rack converged access switch or closer to the storage arrays at the Fibre Channel Director switch. With data center and cloud based applications pushing the need for faster storage access times and higher transfer rates it is vital to test and benchmark the performance of new converged FCoE and native Fibre Channel networks and switches.

Spirent TestCenter's new HyperMetrics Converged Fibre Channel (FC) in conjunction with Spirent TestCenter's HyperMetrics Converged (CV) 10GbE module are the industry's first L2-7 converged data center performance benchmarking test solution. Based on the award winning and industry leading Spirent TestCenter architecture, the new HyperMetrics FC module enables data center network equipment vendors, system integrators, enterprises and data center cloud operators to test every aspect of tomorrows converged networks pre and post deployment.

The Spirent single system solution allows the user to simulate and test the full datacenter environment and understand the complete QoS performance for applications, storage, and datacenter virtualization. Spirent TestCenter offers a consistent end-to-end FC to FCoE solution that provides datacenter benchmarking for all layers of FC and FCoE in one application.

Spirent TestCenter also supports full FCoE functionality including standard compliant FIP, PFC with eight queues, DCBX, NPIV, FDISC, and FCoE benchmarking. Now the test engineer can design end-to-end FC to FCoE tests such as verifying the guaranteed delivery of data from a lossless FC environment to a PFC controlled FCoE environment.

Spirent's automated Fibre Channel Performance Benchmarking Test Package contains a set of proposed IETF standard benchmarking methodologies that enable you to quickly and easily get started and characterize the performance of your Fibre Channel infrastructure with a comprehensive set of tests. The automated tests are easy to configure and produce a full results report.

SPIRENT TESTCENTER
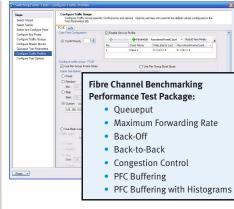## HYPERMETRICS FIBRE CHANNEL TEST MODULE

BENEFITS

- **Reduce TCO:** Complete FC to FCoE testing in a single system with a single unified user interface eliminates complexity of multiple systems and significantly shortens learning curve.

- **Industry expertise:** Spirent has been doing Fibre Channel testing for over a decade and is driving a new set of benchmarking methodologies through the standards bodies. Leverage Spirent's expertise to hit the ground running with a comprehensive set of tests to give you a complete picture of the performance of your implementation.

- **Understand complete end-to-end QoS performance:** Spirent's unparalleled statistics and consistent solution give the engineer a complete picture of the end-to-end performance across the FC to FCoE boundary.

  - Compare FCoE versus native Fibre Channel data center network performance.

  - Understand performance problems before they impact your implementation when it goes live.

  - Measure and validate low latency performance required by data storage applications from FCoE to FC and FC to FCoE at various rates up to the throughput limit.

  - Validate lossless data transfers under congestion between FCoE per Priority Flow Control (PFC) and Fibre Channel buffer and credit mechanisms.

- **Spirent TestCenter architecture:** This new module inherits all of the advantages of the Spirent TestCenter solution including HyperMetricsTM multi-core processing, NoCodeTM Automation, Intelligent ResultsTM and Spirent Topology Emulation.

- **Scalability:** Test fabric scale with hundreds of Fibre Channel and 10GbE Ethernet ports in a single test to understand the performance at true data center scale.

FEATURES

- 4-port 2G/4G/8G Fibre Channel interface
  (up to 48 ports per chassis and 240 ports per rack)
- Port speed can be set independently
- Internal or external clock
- Internal clock supports PPM adjustment
- Frame size: minimum 36 bytes, maximum 2148 bytes
- Supports Class 2 and Class 3 FC traffic
- Real-time TX stream adjustments
- SCSI capability*
- Advanced packet scheduler generates line rate FC and FCoE traffic with realistic bursty SCSI traffic patterns
- Per port user reservation
- Hundreds of frame templates for negative testing
- FC port state machine data frames and responses:
  - Basic link services and extended link services
  - Class 2 and 3 operation
  - Name identifier formats: IEEE 48-bit address, IEEE extended address, locally assigned address, IEEE register address

Fibre Channel Benchmarking Performance Test Package:
- Queueput
- Maximum Forwarding Rate
- Back-Off
- Back-to-Back
- Congestion Control
- PFC Buffering
- PFC Buffering with Histograms

Spirent TestCenter Offers a Comprehensive Set of Data Center Benchmarking Test

Hundreds of Frame Templates for Negative Testing

- Exchange, sequence, sequence count management
- Credit and credit count
- End-to-end flow control
- Buffer-to-buffer flow control
- Connection management
- Error detection and recovery
- Stacked connect requests
- Clock synchronization service
- Link speed negotiation

- FC per port statistics:
  - Total frame count and total byte count received
  - Count of frames with CRC errors
  - Count of oversized and undersized frames
  - Frame count (and byte count) of Class 2 and Class 3 received frames
  - PRBS bit errors
  - Tx credit unavailable over time
  - Tx credit (current value) over time
  - Frame loss, latency, and jitter (real-time and logged)
  - Latency histograms

* Check with your Spirent representative for availability. An upgrade path will be provided when this functionality is released.

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