

Lab Testing Summary Report

June 2012

Report SR120602

Product Category:

**Data Center
TOR Switch**

Vendor Tested:



HUAWEI

Product Tested:

**CloudEngine 6850
Series Switches**



Key findings and conclusions:

- Huawei CloudEngine 6850 TOR switch proved full line rate throughput for all traffic patterns and content type with no loss for 48*10GbE and 4*40GbE ports
- Ultra low latency for traffic forwarding in store-and-forward or cut-through mode switching regardless of frame size
- High availability by design with redundant and hot swappable power supplies and cooling fans
- Efficient Ethernet Certified (802.3az EEE) verified additional power savings up to 24% (17.3% typical)

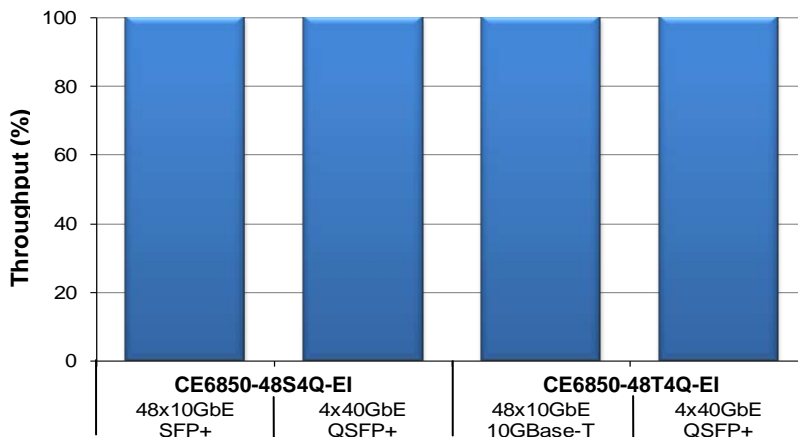
Huawei Technologies requested Miercom evaluate the CloudEngine 6850 Top of Rack (TOR) Data Center Switches. The CE6850 family of fixed configuration switches is available in model CE6850-48S4Q-EI with 48 ports of 10GbE SFP+ interfaces or model CE6850-48T4Q-EI with 48 ports of 10GBaseT interfaces. Both models have four 40GbE QSFP+ uplinks.

The CE6850 Data Center TOR switches are next-generation energy-saving Layer 2/3 Ethernet switches. The CE6850 utilizes state of the art switching technologies and superior throughput and energy efficiency in a compact design perfect for Top of Rack applications in large data centers.

Tests were conducted on the CE6850 TOR switches including RFC 2544 based tests for throughput, forwarding rate, and latency. Power efficiency tests were also conducted using the Miercom Certified Green testing methodology that indexes the industry average power consumption for products in this class and the ATIS TEERs standards.

These tests were the first in a series of tests Miercom is conducting on Data Center TOR Switches for all vendors in the market. This phase of

Figure 1: Huawei CE6850 Throughput Tests



Source: Miercom, June 2012

Throughput for the CE6850-48S4Q-EI and 6850-48T4Q-EI TOR Data Center Switch achieved full line rate all ports for all packet sizes as well as IMIX traffic on all 10GbE and 40GbE uplink ports IAW RFC 2544.

testing of the Huawei Data Center Switches focused on Layer 2 throughput, latency and energy efficiency.

Performance

Throughput Tests The CE6850 was tested for maximum throughput performance, maximum forwarding rate, and packet loss for Layer 2 traffic. Fixed rate tests were conducted using packet sizes of 64, 128, 256, 512, 1024, 1280, 1518, 2176, 9216 bytes. The Ixia XM-12 and Spirent Test Center were used to conduct the RFC 2544 throughput tests.

Throughput tests were conducted both for the 10GbE ports and the 40GbE uplink ports. Line rate throughput was obtained for the 48-port 10GbE SFP+ model CE6850-48S4Q-EI and the 48-port 10GbE 10GBase-T model CE6850-48T4Q-EI. See [Figure 1](#) on [page 1](#). Non blocking throughput to the uplink and traffic through the uplink were also measured at full line rate.

Full line rate performance for all ports and all interfaces was obtained in testing. For all fixed frame sizes and jumbo frames of 9216 bytes, the switch forwards all ports of traffic at full line rate speed without a single frame lost. See [Figure 2](#). Tests confirmed an aggregate throughput capacity of 640 Gbps and a forwarding rate of 1,904.8 Mpps, both measurements are the

theoretical maximum for the 52 ports tested. The CE6850 switch family is designed for Next Generation networks with an aggregate throughput capacity and forwarding rate in excess of what the physical port speeds and capacity allow at this time.

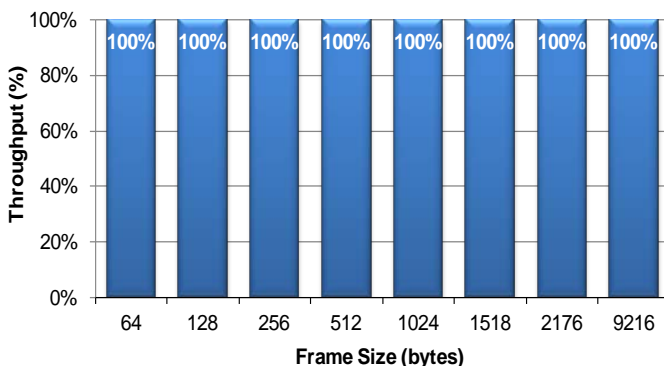
Throughput, forwarding rate and latency tests were conducted using traffic flows between the 10GbE interfaces, and then the tests were repeated with traffic utilizing the 40GbE uplinks. The tests conducted confirmed latency; throughput and forwarding rate were consistent regardless of the traffic switching between the 10GbE ports or through the 40GbE uplinks.

Latency Tests The CE6850 switches were tested for latency performance, at maximum forwarding rate for Layer 2 traffic. Fixed rate tests were conducted using packet sizes of 64, 128, 256, 512, 1024, 1280, 1518, 2176, 9216 bytes. The Ixia XM12 and Spirent TestCenter were used to conduct the RFC 1242 and 2544 for measuring latency. See [Figure 3](#) on [page 3](#).

The test and measurement equipment calculates latency by transmitting frames for 30 seconds. Frames are tagged once a second and during half of the transmission duration, then tagged frames are transmitted. The receiving and transmitting timestamp on the tagged frames are compared. The difference between the two timestamps is the latency. The test uses a one-to-one traffic mapping. For store and forward DUT switches latency is defined in RFC 1242 as the time interval starting when the last bit of the input frame reaches the input port and ending when the first bit of the output frame is seen on the output port. Thus latency is not dependent only on link speed, but processing time too.

The average latency for the CE6850-48T4Q-EI was 3.73 μ sec with very little variation or low jitter. The latency varied in range from 3.32 to 3.98 μ sec. The average latency for the CE6850-48S4Q-EI was only 1.80 μ sec and also had a very tight range of variation between 1.35 and 2.05 μ sec.

Figure 2: CE6850 Throughput by Frame Size Compared to Theoretical Maximum



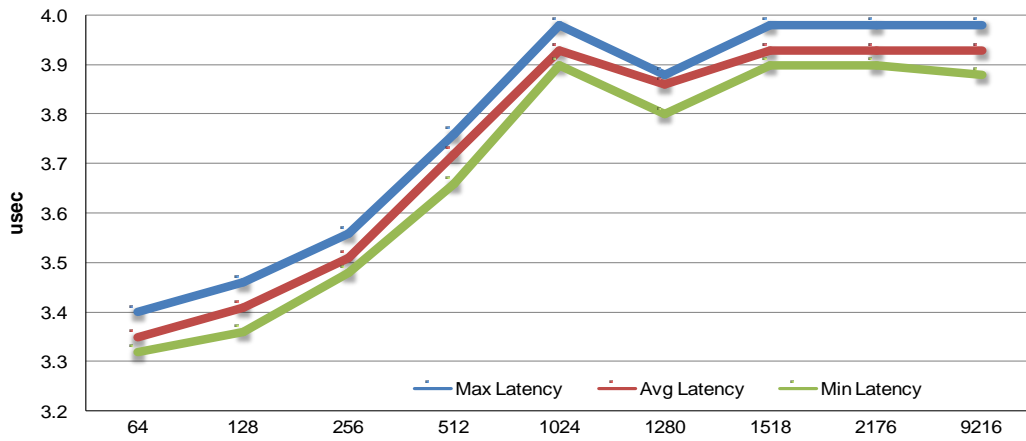
Source: Miercom, June 2012

No packet loss was observed in test run with full line rate mixed traffic mix patterns ingress applied to the CE6850 Switches. RFC 2544 and models CE6850-48S4Q-EI and CE6850-48T4Q-EI were tested.

High Availability Testing

The CE6850 is designed with resilient hot swappable components including redundant power

Figure 3: CE6850-48T4Q-EI Latency vs. Frame Size



Source: Miercom, June 2012

Legend

	64	128	256	512	1024	1280	1518	2176	9216
Max Latency	3.40	3.46	3.56	3.76	3.98	3.88	3.98	3.98	3.98
Min Latency	3.32	3.36	3.48	3.66	3.90	3.80	3.90	3.90	3.88
Avg Latency	3.35	3.41	3.51	3.72	3.93	3.86	3.93	3.93	3.93

Latency for the CE6850-48T4Q-EI TOR Data Center Switch for a range of packet sizes from 64 thru 9216 bytes. RFC 2544 was used for the latency measurements and the switch was configured in cut through mode.

supplies and fans. During throughput tests, we removed and switched power supplies and fan modules. The action was detected by the management console and was reported accurately. Performance was not impacted by the replacement of the redundant modules of the switches in any way. No interruption of service or other anomaly was detected during these tests.

Energy Efficiency Testing

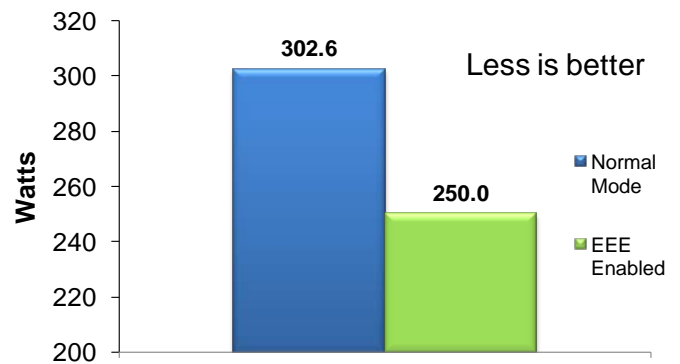
The CE6850 was tested for power consumption and energy efficiency using the Miercom proprietary standard for calculating Industry Average trends for data center equipment and by conducting tests in accordance with ATIS-0600015.03.2009 Methodology for Energy Efficiency for Telecommunications Equipment.

The CE6850-48T4Q-EI demonstrated exceptional power savings by employing Energy Efficient Ethernet Standard (EEE) 802.3az. We verified the EEE power savings to be up to 24% with 17.3% savings typical. See *Figure 4*. At lower utilization levels including idle periods energy savings of up to 24% were observed. Under heavy load conditions of 70% utilization or more the energy savings was reduced to 8%.

Bottom Line

The Huawei CloudEngine 6850 TOR Data Center Switch is designed for demanding Data Center Environments where high performance and high availability are essential. The superior performance and energy efficiency of the CE6850 Switches will allow Huawei to meet the demand for providing TOR solutions for future deployments. With the increasing demand for port density, line speed and throughput this TOR switch will continue to provide a scalable solution for Cloud Networking applications.

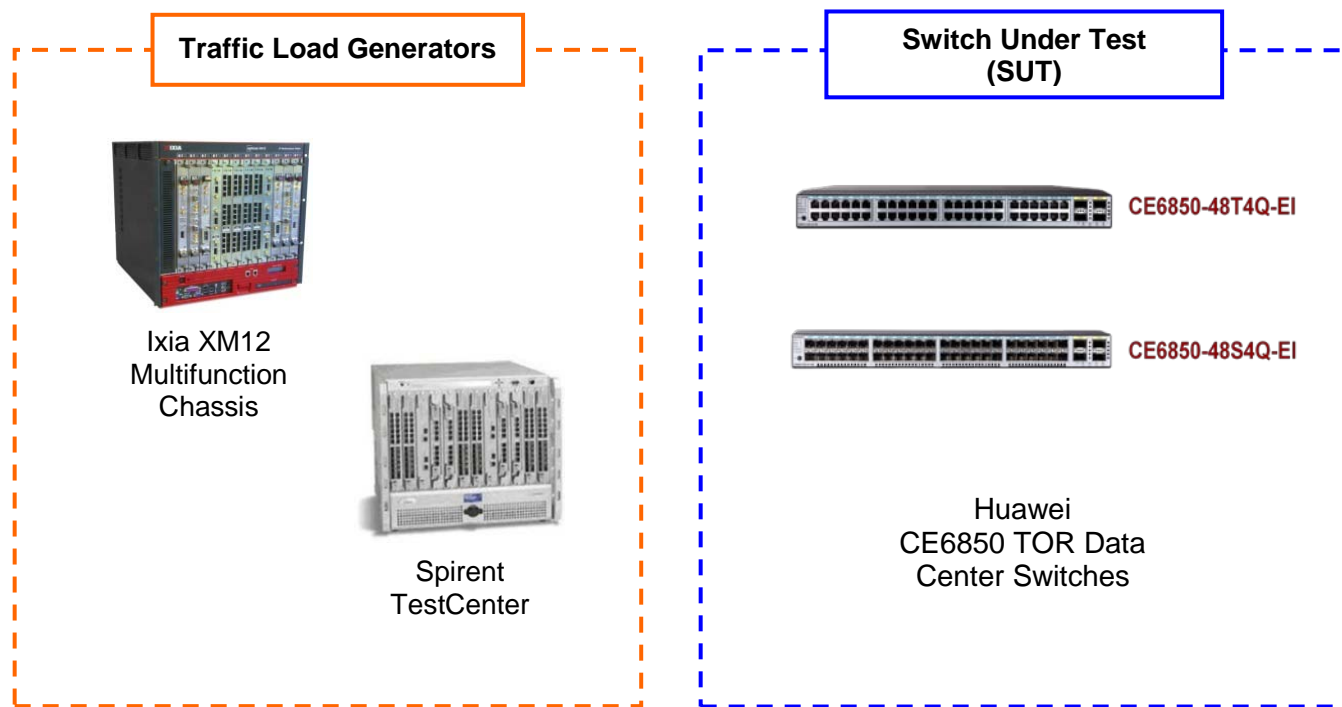
Figure 4: CE6850-48T4Q-EI Energy Savings Employing 802.3az EEE



Source: Miercom, June 2012

A 17% savings on average power consumption with EEE mode enabled on the CE6850-48T4Q-EI TOR. Power usage based on all ports loaded with IMIX traffic at 30%.

Test Bed Diagram



Source: Miercom, June 2012

How We Did It

The Huawei CE6850 series of switches were evaluated for performance throughput and energy efficiency. Testing was conducted to verify that the features in this report operated as advertised. The Huawei CE6850 was running the latest firmware, version 8.5 OS. Two different traffic generators were used, Ixia XM12 running IxNetwork version 5.50.121.48 and Spirent TestCenter running version 3.95.0236. Energy testing was implemented with Ixia and a Chroma ACSorce power controller / conditioner.

Miercom recognizes Ixia as an industry leader in energy efficiency testing of networking equipment. Ixia's unique approach utilizes coordination of energy measurements with network traffic load – allowing energy consumption to be graphed against network traffic volume. Real-world traffic is generated by Ixia's test platform and test applications, principally IxNetwork for Layer 2-3 routing and switching traffic and IxLoad for Layer 4-7 application traffic.

The tests in this report are intended to be reproducible for customers who wish to recreate them with the appropriate test and measurement equipment. Current or prospective customers interested in repeating these results may contact reviews@miercom.com for details on the configurations applied to the Device Under Test and test tools used in this evaluation. Miercom recommends customers conduct their own needs analysis study and test specifically for the expected environment for product deployment before making a product selection.

Miercom Performance Verified

The performance of Huawei CE6850 TOR Data Center Switch was verified by Miercom. In hands-on testing, Huawei demonstrated advanced performance capabilities including:

- Huawei CloudEngine 6850 TOR switch proved full line rate throughput for all traffic patterns and content type with no loss for 48*10GbE and 4*40GbE ports
- Ultra low latency for traffic forwarding in store-and-forward or cut-through mode switching regardless of frame size
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CE6850-48T4Q-EI

Huawei
CE6850 TOR Data
Center Switches



CE6850-48S4Q-EI



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