Lab Testing Summary Report

June 2012
Report SR120601

Product Category:
Data Center Core Switch

Vendor Tested:

Product Tested:
CloudEngine 12800 Series Switches

Summary

Key findings and conclusions:

- Huawei CloudEngine 12812 proved full line rate throughput at 2 Tbps per line card without loss using traffic pairs on the same line card as well as traversing cards.
- CE12800 is a high performance, scalable core switch supporting up to 1152*10GbE or 288*40GbE port connections, up to 47.52 Tbps of line rate traffic and 28,800 Mpps forwarding rate.
- Ultra low latency of 2-5 usec and low jitter even during high volume traffic tests and regardless of frame size.
- Highly reliable Core Data Center Switch with hot swappable components including line cards, power supplies, cooling fans and redundant processing modules.
- CE12800 is highly energy efficient with power consumption 50% better than the industry average for core switches.

Huawei Technologies requested Miercom evaluate the CloudEngine 12800 Core Data Center Switch. It is a chassis switch with 12 available line card slots. We tested CE12800 with the CE-L24LQ-EA (24*40GbE QSFP+) Line Cards and the CE-L48XS-EA (48*10GbE SFP+) Line Cards during this testing.

The CE12800 series of Data Center Core switches are next-generation energy-saving Layer 2/3 Ethernet switches. The CE12800 utilizes state of the art switching technologies and superior scalability in design to meet the demand for large Data Center applicability driven by the ever increasing demand for cloud networking traffic loads. It also meets the requirements for core layer deployment in large campus networks. The CE12800 series includes chassis models CE12812, CE12808 and CE12804 that accommodate 12, 8 or 4 line cards.

Tests were conducted on the CE12800 using RFC 2544 for throughput (Tbps), forwarding rate (pps), and latency. Power efficiency tests were also conducted using the Miercom Certified Green testing methodology.

Figure 1: Huawei CE12800 Throughput Tests

Throughput for the CE12800 Core Data Center Switch achieved line rate all ports for RFC2544 medium and large packet size tests and full line rate for IMIX traffic with local (same line card) as well as across multiple line cards.
which 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 Core Switches for all vendors in the market. This phase of testing of the Huawei Data Center Switches focused on Layer 2 throughput, latency and energy efficiency.

**Performance**

**Throughput Tests** - The CE12800 was tested for maximum throughput performance, maximum forwarding rate, and packet loss for Layer 2 traffic. Mixed traffic patterns as well as fixed rate tests were conducted using packet sizes of 64, 128, 256, 512, 1024, 1280, 1518, 2176, and 9216 bytes. The Ixia XM12 and Spirent TestCenter were used to conduct the RFC 2544 throughput.

Throughput tests were conducted both local (same line card) and across the switching backplane/fabric traversing multiple cards. Line rate throughput was obtained for the 48-port 10GbE CE-L48XS-EA modules and the 24-port 40GbE CE-L24LQ-EA modules for both local traffic tests, and traffic traversing the backplane. An aggregate load test with two CE-L24LQ-EA and four CE-L48XS-EA modules fully loaded also handled full line rate traffic all ports loaded. See Figure 1 on page 1. Our testing was limited only by the port density and test equipment available, not the capacity of the switch.

Throughput tests were conducted using packet sizes of 64, 128, 256, 512, 1024, 1280, 1518, 2176, and 9216 bytes. The Ixia XM12 and Spirent TestCenter were used to conduct the RFC 2544 throughput.

Full line rate performance for all ports and all line module cards was obtained in testing when the mixed traffic streams were applied. Tests confirmed an aggregate 24 Tbps projected throughput of the available 47.52 Tbps available capacity for the CE12800 switch. The CE12800 switch is designed for Next Generation networks with an aggregate throughput capacity and forwarding rate exceeding what the physical line cards and port capacity allow at this time.

Maximum throughput with no packet loss was observed in tests for the CE12800 Core Data Center Switch. Various packet sizes were applied across all ports using RFC 2544 on CE128-L48XS-EA line card. See Figure 2 on this page.

The forwarding rate for 64-byte traffic handling was confirmed 600 Mpps for the 10GbE line cards and 2400 Mpps for the 40GbE line cards.

Throughput, forwarding rate and latency tests were conducted using traffic flows between ports on the same line card, and then the test was repeated on different line cards. The test conducted confirmed latency; throughput and forwarding rate were consistent regardless of the traffic switching locally or across different line cards traversing the switching fabric of the switch.

**Latency Tests** - The CE12800 was tested for latency performance, at maximum forwarding rate for Layer 2 traffic. Mixed traffic patterns as well as fixed rate tests were conducted using packet sizes of 64, 128, 256, 512, 1024, 1280, 1518, 2176, and 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. The measured latency is dependent on the link speed, as well as the processing time for the system under test.

The store and forward latency is 2.45µs for the 40GbE interfaces and 3.09µs for the 10GbE interfaces. The CE12800 rivals the latency of many
core switches in cut-through mode. The industry average latency for switches in this class for 9216 byte traffic is approximately 10µs, but the CE12800 switch achieved much better store and forward latency under 3µs.

High Availability Testing

The CE12800 is designed with resilient hot swappable components and fully redundant hardware. The hot swappable power supplies and fans were pulled, detected and reported accurately by the switch’s management processing while throughput tests were conducted. No interruption of service was detected during these tests.

Energy Efficiency Testing

The CE12800 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 Industry Average for energy efficiency shown in the Miercom reports includes data we maintain for energy efficiency on vendors’ products that we test. This includes data from Alcatel, Arista, Brocade, Cisco, H3C, HP, IBM, and Juniper Core Data Center Switches.

The CE12800 proved in testing 50% more energy efficient (Watts per 10GbE port) than competitive products in this class. See Figure 4 below.

Bottom Line

The Huawei CloudEngine 12800 Core Data Center Switch is designed for the most demanding Data Center Environments where high performance and high availability are essential. The scalability in the design of the CE12800 Family Switches will allow Huawei to meet the demand of increasing port count, line speed and aggregate throughput driven by the increasing demand from Cloud Networking.
How We Did It

The Huawei CE12800 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 CE12800 was running the latest firmware, version 8.5 OS. Sections of testing required using a traffic generator to evaluate the features of the product. 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 ACSource 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 CE12800 Core Data Center Switch was verified by Miercom. In hands-on testing, Huawei demonstrated advanced performance capabilities including:

- Full line rate throughput at 2 Tbps per line card without loss
- Scalability up to 576 port connections, and up to 47.52 Tbps of line rate traffic and 28,800 Mpps forwarding rate
- Ultra low latency of 2-5 µs and low jitter even during high volume traffic tests and regardless of frame size
- High reliability with hot swappable components including line cards, power supplies, cooling fans and processing modules
- Energy efficiency superior to competitive products in this class by more than 50% based on the Miercom industry average for core switches

About Miercom’s Product Testing Services

Miercom has hundreds of product-comparison analyses published over the years in leading network trade periodicals including Network World, Business Communications Review, Tech Web - NoJitter, Communications News, xchange, Internet Telephony and other leading publications. Miercom’s reputation as the leading, independent product test center is unquestioned.

Miercom’s private test services include competitive product analyses, as well as individual product evaluations. Miercom features comprehensive certification and test programs including: Certified Interoperable, Certified Reliable, Certified Secure and Certified Green. Products may also be evaluated under the Performance Verified program, the industry’s most thorough and trusted assessment for product usability and performance.