Lab Testing Summary Report

March 2012

Report SR120125B

Product Category:

Enterprise Switch

Vendor Tested:

HUAWEI

Product Tested:

S5700-EI Series Switches

Key findings and conclusions:

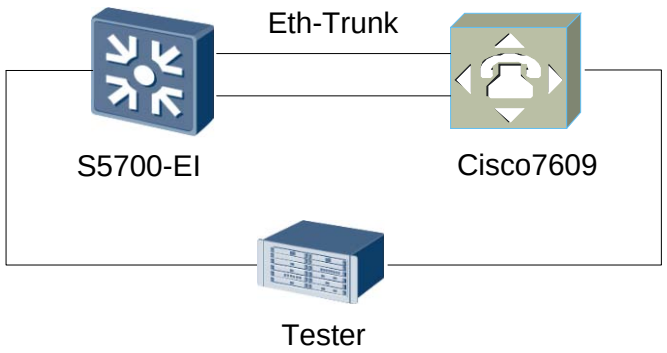
- **Huawei S5700-52C-PWR-EI enterprise switch has IPv6 migration support that includes dual-stack and IPv6 to IPv4 tunneling for increased flexibility**
- **Supports PoE+, supplying 30W of power to endpoint devices from multiple vendors**
- **Ring network fault convergence time is less than 50ms using G.8032, SEP and other interoperable protocols**
- **iStack bandwidth shows 48Gbps throughput**
- **Batch updating allows software upgrades en masse to switches**

Huawei Technologies engaged Miercom to conduct an independent evaluation of the S5700-EI series Gigabit enterprise switches. The S5700 series contains the S5700-28C-EI, S5700-52C-EI, S5700-28C-EI-24S, S5700-28C-PWR-EI and the S5700-52C-PWR-EI, which have similar functions. The S5700-52C-PWR-EI was chosen for testing. The S5700-52C-PWR-EI features forty-eight 10/100/1000 Base-T ports, redundant hot-swappable power supplies, and supports GE and 10GE cards for use in data center or campus environments. We examined this switch for its forwarding performance, advanced features, interoperability, resilient architecture, and energy efficiency.

Some of the advanced features include high level fault detection and convergence, explained in the following sections in detail. A feature unique to products in this class, Batch Update can push updates to switches en masse with feedback using a graphical user interface.

Batch Update was shown to operate seamlessly and easily. The software is a GUI that is straightforward and cleanly designed. Inputting

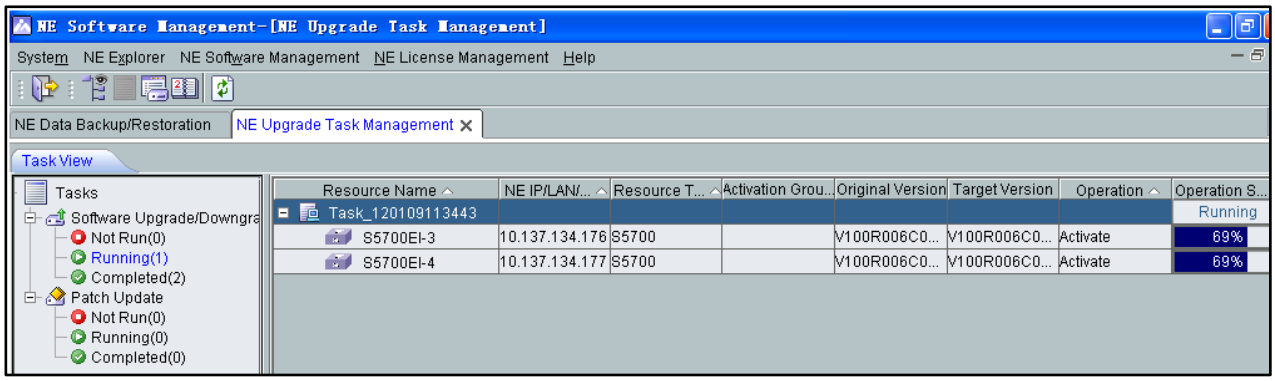
Figure 1: Huawei S5700-52C-PWR-EI Enterprise Switch
LACP Interoperability Test Bed



Source: Miercom, March 2012

A simple test bed was constructed of one Huawei switch and one Cisco switch to demonstrate full interoperability between the two vendors.

Figure 2: Huawei S5700-52C-PWR-EI Switch Batch Update Graphical User Interface



Source: Miercom, March 2012

Batch update management is provided by a graphical user interface that allows uploading firmware files to switches.

Table 1: Chart of Features of the S5700-EI Series of Switches

Model	S5700-28C-EI	S5700-28C-EI-24S	S5700-28C-PWR-EI	S5700-52C-EI	S5700-52C-PWR-EI ✱
Forwarding Performance	96Mpps	96Mpps	96Mpps	132Mpps	132Mpps
Features					
1000M Port	24*10/100/1000Base-TX	20*100/1000Base-X + 4*Combo (10/100/1000 Base-T or 100/1000 Base-X	24*10/100/1000Base-TX	48*10/100/1000Base-TX	48*10/100/1000Base-TX
Expansion Slot	The S5700-28C and S5700-52C provide two extended slots, one for an uplink subcard and the other for a stack card.				
MAC Address Table Size (32K)	✓	✓	✓	✓	✓
VLANs (4K)	✓	✓	✓	✓	✓
LLDP	✓	✓	✓	✓	✓
OSPF	✓	✓	✓	✓	✓
Rich Authenti-cation	✓	✓	✓	✓	✓
STP/MSTP	✓	✓	✓	✓	✓
VRRP	✓	✓	✓	✓	✓
Multicast	✓	✓	✓	✓	✓
QoS/ACL	✓	✓	✓	✓	✓
Advanced Security Features	✓	✓	✓	✓	✓
SNMP Mgt	✓	✓	✓	✓	✓

Source: Miercom, March 2012

✱ - *Test model*

firmware files and uploading to switches with feedback is possible from any machine with the software installed. See *Figure 2*.

In addition to the batch updates, an automatic configuration can be loaded from a designated server to ensure the system can boot up during a system failure or configuration corruption. This was demonstrated after intentionally faulting the configuration and allowing the system to reboot. The system immediately found the designated FTP server, and the configuration file was loaded without any administrative intervention. After the system was live, the configuration could be implemented.

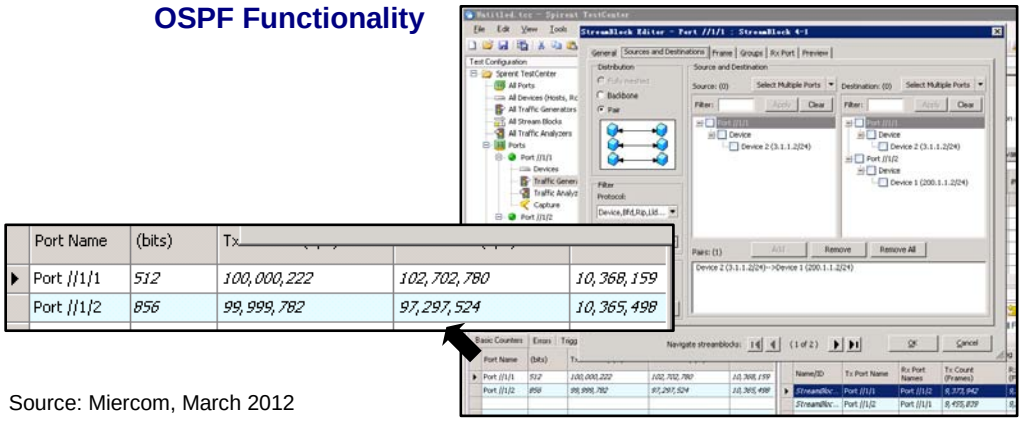
Network Time Protocol (NTP) enables a multi level system of alternate sync times. Multi-level time synchronization is used to eliminate unnecessary traffic to the headquarter NTP server. Individual sync ups are done locally. The local server will sync up to a branch sever, which will then sync to the headquarter NTP server. Eliminating individual sync ups allows for better utilization of all servers and prevents bottlenecking. This function operated as expected.

Interoperability

LACP Interoperability with other vendor products and special protocols functioned properly. *Figure 1* on *page 1* shows a test bed used to assess LACP functionality. Link teaming with Cisco 7609 switch functioned fully. After manually performing a link failure, the system detected and rerouted packets with

Configuration of OSPF functionality showed the complexity of the network configuration. We can see from the test center output that packet loss was minimal and to be expected from cable pulls. TestCenter results correlated with switch console reporting indicate OSPF was functioning as expected.

Figure 3: Huawei S5700-52C-PWR-EI Switch
OSPF Functionality



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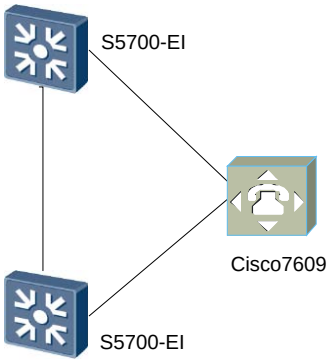
a loss of only 1.8K frames, where traffic was set to send at 422K fps. The convergence of the LACP fault detection took 4.2 ms while interoperating with the Cisco 7609 switch. When the connection was restored, 7.5K packets were lost and trunk load balancing was immediately and automatically re-enabled.

OSPF Routing through the switches using the Cisco 7609 switch with Huawei S5700-EI proved to be fully functional as well. Both Cisco and Huawei console outputs indicated the OSPF route had been established and the test center verified the results. See *Figure 3*.

BGP By adding the appropriate ports to a set VLAN and IP addresses on the opposing switch, we verified the functionality of BGP between the S5700-EI and Cisco's 7609. We validated the test bed by using an ICMP echo request.

Figure 4: Huawei S5700-EI Switch
STP/MSTP Test Bed



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A simple tree was implemented with only two branches for functionality testing of STP and MSTP protocols.

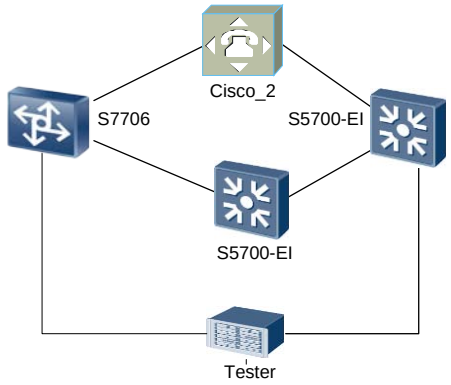
RADIUS Authentication Huawei S5700-EI series of switches work with 802.1x RADIUS authentication servers of multiple types. These servers authenticate devices on the network and initiate the permissions allowed for each switch. S5700-EI series works with Huawei and other third party RADIUS servers. Verification of interoperability was done with the connection of a Cisco RADIUS server to the S5700-EI switch. Authentication was correct and no issues occurred with the switch.

STP/MSTP Miercom tested the STP and MSTP network shown in *Figure 4* below by weighting the branches of the trees differently. While monitoring traffic and utilization on the switches, we intentionally broke the links individually to assess the resiliency of the STP and MSTP across vendor switches. The diagram below shows the STP and MSTP test bed. The system was validated and did not drop packets when shutting down the higher priority port. When the link was brought back, online traffic was immediately re-routed. Loss of the lower priority link in both cases did not affect the network.

PoE We validated the S5700-EI PoE functionality. It can supply power and basic routing to different vendor products. This was tested and verified for Cisco 7975 IP phone and Avaya 9620 IP phone. In addition to power and function, we validated switch functionality showing nearest neighbor LLDP. Both devices were properly recognized.

VRRP Routing through VLANs and with different vendor products is a key feature required to increase reliability and availability of routing paths. Huawei switches tested support standards based VRRP for high availability. The complexity and layout of the test bed is shown in *Figure 5*. We

Figure 5: Huawei S5700-EI Switch VRRP Test Bed



Source: Miercom, March 2012

A somewhat complex network of varying devices was designed to test virtual routing in a realistic deployment scenario. All tests proved functional and interoperable.

successfully configured the Cisco 7609 as secondary and the S5700-EI as the primary, and validated the configuration using a test center to send virtually routed traffic through the tunnel with no packet loss.

Reliability

Huawei supports multi-ring and semi-ring network topologies. Standard ring networks were tested by disconnecting and reconnecting each link in succession and checking for packet loss and connectivity in between trials. For interoperability, a SEP and MSTP ring network was configured with a Huawei S7706 switch and a Cisco C3750X switch. These switches were able to work together and were fully functional with a Huawei ring setup. For the SEP and MSTP ring networks, an MSTP ring was set up using two Huawei switches and a Cisco switch. A SEP semi-ring was connected to the MSTP ring and network traffic was functional. *Figure 6* shows the ring topology used for this test.

The switches are designed to unblock a port in the event a network cable is down and the blocked port is required for ring completion. In the setup of the topology, one port on the MSTP ring was set to discard packets or block and one port on the SEP ring was also set to discard packets. Traffic was still able to be passed from Tester 1 to Tester 2 using the unblocked path. Both testers in the topology were traffic load generators.

To test convergence of the rings, one cable was pulled from the MSTP ring. It was noted that once the switch detected a pulled cable, the blocked port was unblocked, enabling traffic delivery between load generators. Next, a cable was pulled on the SEP ring and had the same results. The blocked port was unblocked and traffic was re-routed across the new path to the second load generator.

SEP open rings, that can be stacked into multi-ring setups, were also tested. This setup allows for large, redundant networks across several types of switches with complex and varying configurations. Aside from standard rings, Rapid Ring Protection Protocol (RRPP) and semi-ring were also enabled. *Figure 7* on *page 5* shows one of the test scenarios used to verify operation of the rings.

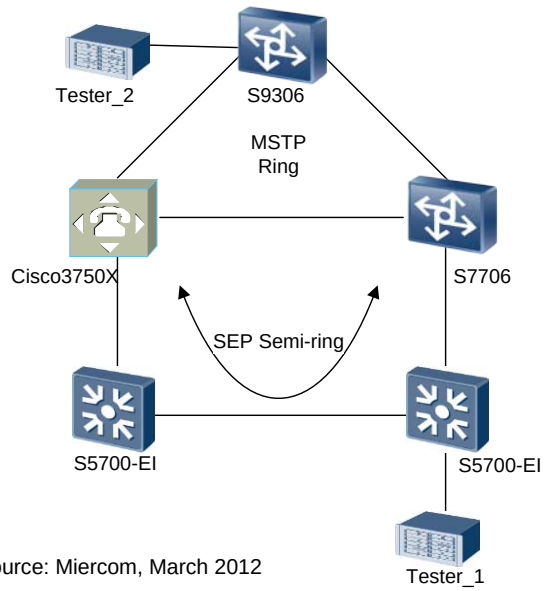
This ring topology was tested using the same methodology as was used in the previous rings. All rings tested worked and converged in minimal time with low packet loss.

Power supply redundancy maintains switch uptime in the event of a failure. To simulate a power failure, a power cable was pulled when the switch was operating. The system failed over to a new power supply flawlessly, with no packet loss or abnormal operation observed. PoE redundancy performed equally well without incurring any packet loss.

iStack

Huawei has a clustering system referred to as iStack. It has unique features and resilient

Figure 6: Huawei S5700-EI Switch MSTP Ring Topology



Source: Miercom, March 2012

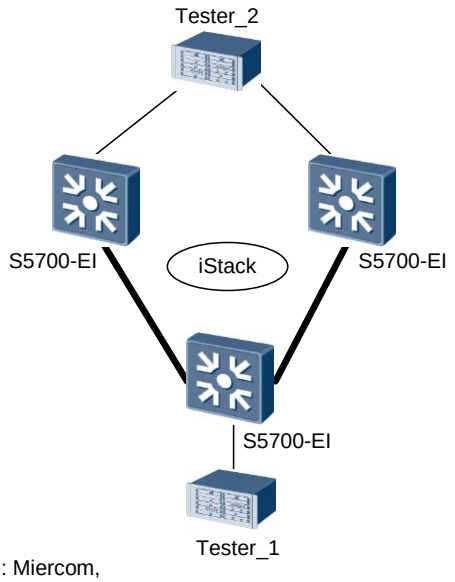
A complex MSTP and semi-ring topology unique to Huawei switch infrastructure.

redundancies that make it highly robust. Three switches were deployed in a primary-secondary standby stack. Traffic was sent through one and received through the other two, as shown in the configuration in *Figure 8*.

A complex system was used involving teaming copper and fiber channels in varying quantities and lengths across multiple switches. The system proved to be fast converging and well designed, balancing and loading the lines properly. In addition, we conducted an iStack capacity test consisting of two link teamed channels consisting of 1 10GE fiber link and 2 1GE copper links from both the secondary switches to the test center. The primary switch had double the links: 2 10GE fiber channels and 4 1GE copper channels. This system ensured the test center would send and receive 24Gbps at line rate, which totals to the expected 48Gbps throughput. Between test center connections, we have the iStack split into the slave and standby switches.

In conjunction with performance testing of the iStack, total size of the iStack was verified at nine devices. This large nine-component cluster design exhibited no faults and normal operation continued during validation for functionality.

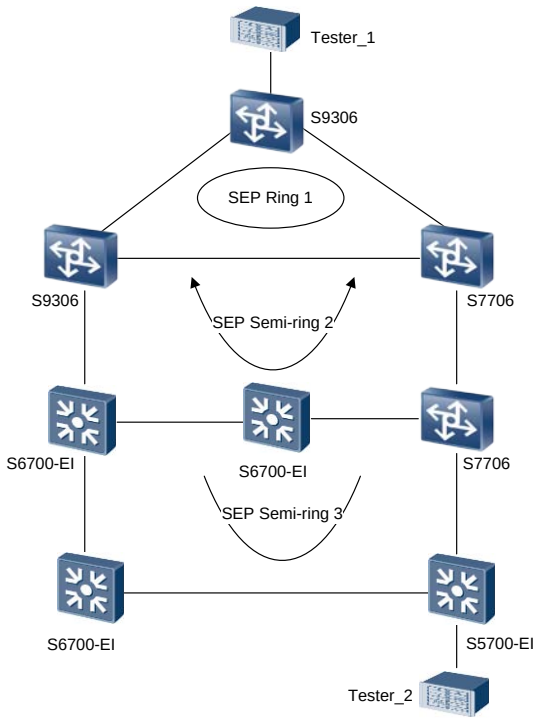
Figure 8: Huawei S5700-EI Switch
Three-Component iStack



Source: Miercom, March 2012

Huawei iStack functionality exhibited 48 Gbps throughput in a 3 device cluster.

Figure 7: Huawei S5700-EI Switch
SEP Multi-Ring Topology



Source: Miercom, March 2012

A highly redundant, complex multi-tiered SEP semi ring topology is shown with an MSTP ring.

Bottom Line

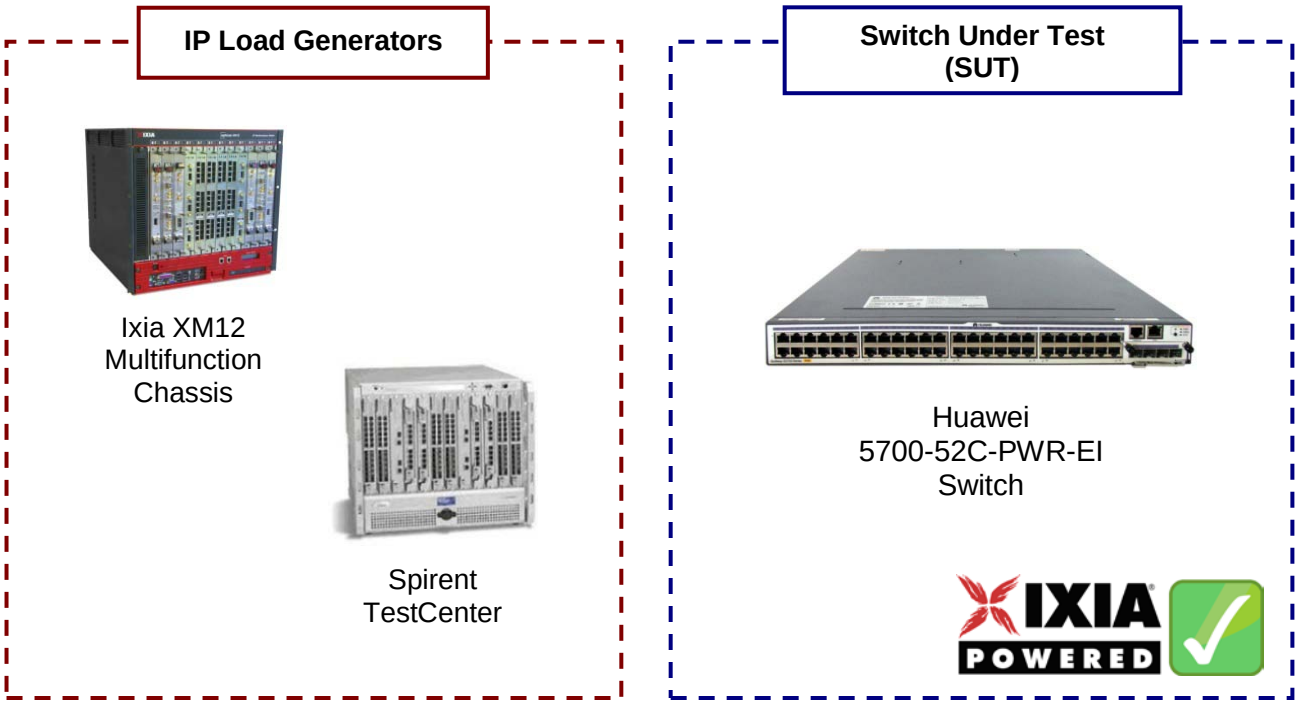
The Huawei S5700-EI switch offers value, performance and features targeted at large campus and enterprise deployments. The S5700-EI provides high bandwidth, resilient architecture, IPv6 migration support, Gigabit Ethernet speeds, and simple installation and maintenance for campus and datacenter environments.

Security features include multiple measures to prevent attacks. These are DHCP snooping, ARP learning, DoS attack defense and MFF (MAC Forced Forwarding). These features improve the security of the switch.

The switch displayed strong interoperability when working with other vendor products, indicating it is ideal for piecewise or full scale deployment into existing network infrastructures.

Overall, we found the Huawei S5700-EI to be a very feature-rich, resilient switch capable of being deployed in both carrier class network settings and enterprise environments.

Test Bed Diagram



Source: Miercom, March 2012

How We Did It

The Huawei S5700-52C-PWR-EI switch was evaluated for feature functions and operation in ring topologies. Testing was conducted to verify that the features in this report operated as advertised. Ring convergence was verified by constructing various ring networks with blocked ports and then pulling cables out of the ring. This action forced the switch to unblock the ports to deliver traffic from one load generator to the other.

The Huawei S5700-EI switch was running the latest firmware, version 5.7 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 3.76.0076.

Miercom recognizes Ixia (www.ixiacom.com) 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 Switch 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 S5700-52C-PWR-EI enterprise-class switch was verified by Miercom. In hands-on testing, Huawei demonstrated advanced performance features such as:

- Provides PoE+ to endpoint devices from multiple vendors
- Interoperability of high complexity systems, multiple vendors products and proprietary protocols
- IPv6 and IPv4 interchangeable tunneling for increased deployment flexibility
- iStack supports 48Gbps throughput and nine devices in a single cluster
- High performance: All GE ports linear forwarding, up to 4*10GE interfaces

S5700-52C-PWR-EI Switch

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http://enterprise.huawei.com

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