Lab Testing Summary Report

March 2012

Report SR120127B

Product Category:

Enterprise Switch

Vendor Tested:

HUAWEI

Product Tested:

S5700-LI Series Switches

Miercom PERFORMANCE VERIFIED™

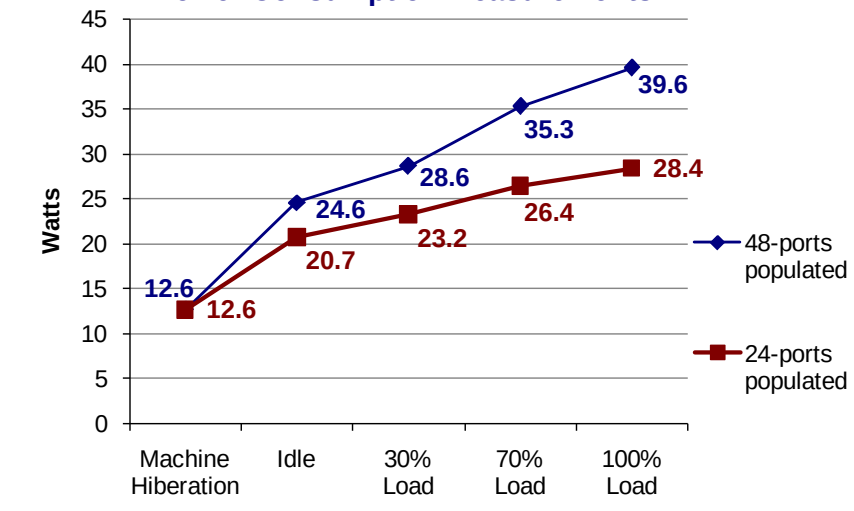
Key findings and conclusions:

- **Advanced Hibernation Management (AHM), Energy Efficient Ethernet (EEE) and flexible time-based strategy for energy savings reduce power consumption by 50%**
- **Unique Dying Gasp feature provides immediate notification of switch power off with SNMP**
- **Ring network fault convergence time is less than 50ms using G.8032, SEP and other interoperable protocols**
- **iStack bandwidth shows 10Gbps throughput**
- **Batch updating allows software upgrades en masse to switches**

Huawei Technologies engaged Miercom to conduct an independent evaluation of the S5700-LI series Gigabit Ethernet switches. The S5700-52P-LI features forty-eight 10/100/1000 Base-T ports, redundant hot-swappable power supplies, and supports GE and 10GE cards for use in a datacenter or campus environment. We examined this switch for its forwarding performance, advanced features, interoperability, resilient architecture, and energy efficiency. The S5700-LI switch family is ideal for access or aggregation functionality on a campus network, but also works well for an Internet data center or as a desktop switch to provide gigabit access for terminals.

The full series contains the S5700-28P-LI, S5700-52P-LI, S5700-28P-PWR-LI, S5700-52P-PWR-LI, S5700S-28P-LI, and S5700S-52P-LI. The S5700-52P-LI switch was chosen for testing because it has the features and capabilities of the series, but represents the best performance the series has to offer.

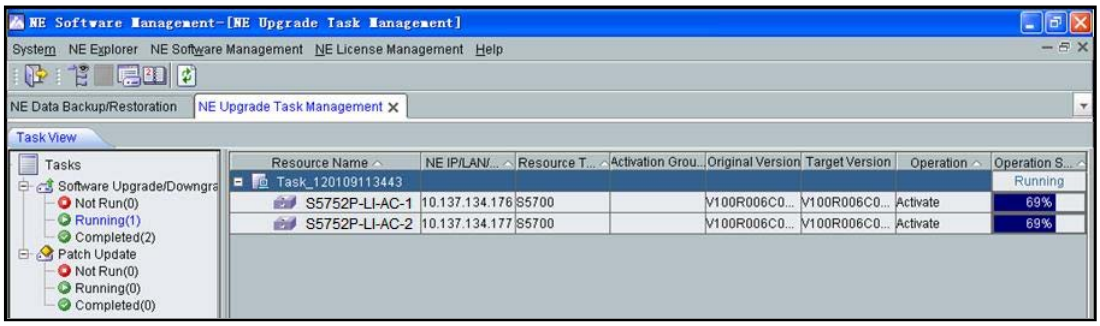
Figure 1: Huawei S5700-52P-LI Switch Power Consumption Measurements



Source: Miercom, March 2012

Power consumption of the S5700-52P-LI switch. The numbers represent actual readings with 24 or 48 ports populated. Power usage is low due to implementation of Energy Efficient Ethernet.

Figure 2: Huawei S5700-52P-LI Switch
Batch Update Graphical User Interface



Source: Miercom, March 2012

Batch update software has a graphical user interface that allows uploading firmware files to switches.

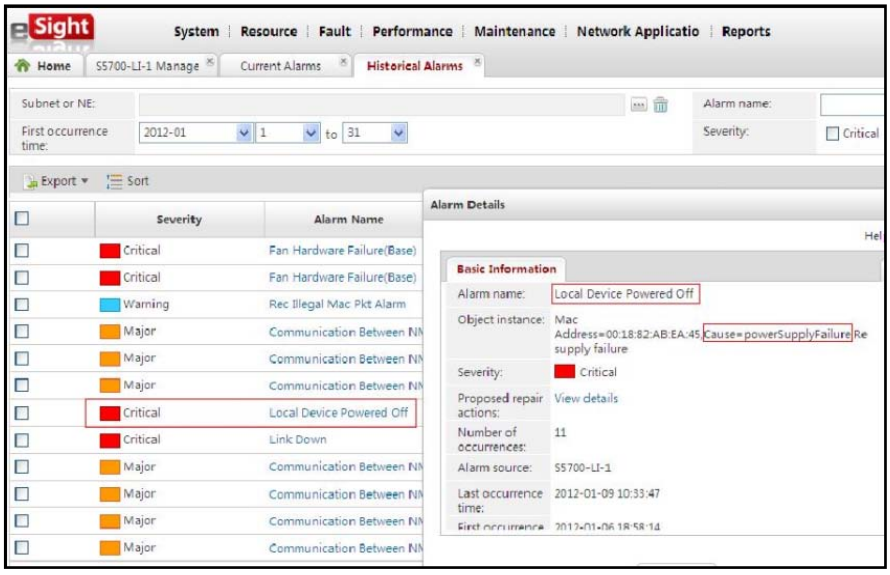
Some of the advanced features include high level fault detection and convergence, explained in detail in the following sections. A unique feature of this system is the Batch Update, which can push updates to switches en masse with feedback using a graphical user interface.

Batch Update operates seamlessly and easily. The software uses a GUI that is straightforward and cleanly designed. Uploading firmware files 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. Immediately the designated FTP server was found, and the configuration file was loaded without any intervention. After the system was live, the configuration could be implemented.

To simulate a power failure failover, a power cable was pulled when the switch was operating. During the power failure, the system failed over to a new power supply flawlessly, with no packet loss or abnormal operation observed. PoE redundancy works equally as well as the power supply redundancy without any packet loss.

Figure 3: Huawei S5700-52P-LI-AC Enterprise Switch - Dying Gasp Alarm



Source: Miercom, March 2012

Dying Gasp feature gives an immediate notification that a switch is offline. Even when power is out, a SNMP trap is sent to eSight or any other designated SNMP Manager.

Basic Features

The S5700-LI series of switches include a list of basic features. VLAN table size is 4K, and MAC table size is 16K, QinQ is 512. In addition, the switches support 1K multicast groups and IGMP snooping.

LACP grouping for up to 64 separate LACPs and eight member ports in each is supported. Various SEP ring networks are supported and interoperate with other vendor products. Convergence time for LACP and SEP are both under 50ms. All switches in the series are Ethernet trunking capable, as well as supporting of other reliability features: STP, RSTP, MSTP, and RRPP.

In addition to basic routing and switching features, the switches also have some security options. This includes Mac Forced Forwarding (MFF), DHCP Snooping, HTTPS management, Voice VLAN support, IP Source guarding, and Dynamic ARP Inspection (DAI). Queuing for the switches is allowed for up to eight queues across the series.

S5700-LI switches are designed for simple management and easy maintenance. S5700-LI can connect to Cisco switches with VTP protocol, and they interoperate with Cisco switches. Users can also deploy GVRP instead of Cisco's private VTP.

Energy Efficiency and Hibernation

The S5700-LI series is designed to be energy efficient and complies with the IEEE 802.3az standard for Energy Efficient Ethernet (EEE). This recent standard describes methods for power savings on Ethernet devices by turning off the transmitters for high speed links when no data is being sent. The objective is to reduce consumption by 50% over existing devices. The switch is also designed for operation without a fan for cooling, to further reduce energy consumption and lower noise levels.

The power savings feature of this switch is hibernation. Hibernation allows the switch to shut down its main function for power reduction. The console indicates when this feature is enabled and activated.

Normally with no link and idle, the switch uses 17.29 watts. During boot up the power fluctuated between 18.50 and 19.58 watts for less than one minute. In addition, we tested power consumption under varying loads and link densities, as shown in *Figure 1* on *page 1*.

Interoperability

LACP Interoperability with other vendor products and special protocols functioned properly. Link teaming with Cisco 7609 switch functioned fully. After manually performing a link failure, the system detected and rerouted packets with 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. Additionally, Huawei verifies that LACP supports 64 groups with a maximum of 8 member ports each.

Rich Authentication Huawei S5700-LI series of switches works with Huawei and other third party 802.1x RADIUS authentication servers. These servers authenticate devices on the network and initiate the permissions allowed for each switch. Verification of interoperability was done with the connection of a Cisco RADIUS server to the S5700-52P-LI switch. Authentication was correct and no issues occurred with the switch.

STP/MSTP Miercom tested the STP and MSTP network 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

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

Model	S5700-28P-LI	S5700-28P-PWR-LI-AC	S5700-52P-LI ✱
Features			
Port Density	24*10/100/1000Base-TX 4*100/1000Base-X	24*10/100/1000Base-TX 4*100/1000Base-X	48*10/100/1000Base-TX 4*100/1000Base-X
Forwarding Performance	41.7Mpps	41.7Mpps	77.4Mpps
VLANs (4K)	✓	✓	✓
MAC address table size (16K)	✓	✓	✓
LLDP	✓	✓	✓
Multicast	✓	✓	✓
QoS/ACL	✓	✓	✓
Advanced Security Features	✓	✓	✓
SNMP Management	✓	✓	✓
802.3az Energy Efficient Ethernet	✓	✓	✓

Source: Miercom, March 2012 ✱ - *Tested model*

MSTP across vendor switches. *Figure 4* on *page 4* 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 S5700-52P-LI PoE and PoE+ by disconnecting and reconnecting each link in succession and checking for packet loss and connectivity in between trials. IP phones from other vendors, such as Cisco and Avaya, can be powered by the S5700-52P-LI switch. LLDP also functions appropriately.

For interoperability, a SEP and MSTP ring network was configured with Huawei S5700-LI and S7706 switches 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 4* 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 cable was pulled, 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, which can be stacked into multi-ring setups, were also tested. This setup allows 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 5* on *page 5* shows one of the test scenarios used to verify operation of the rings. All rings tested worked and converged in minimal time with low packet loss.

Management and Maintenance

Management of the S5700-LI series is simple. One unique feature is Dying Gasp. During a total power failure, the system remains online long enough to send an SNMP trap to any and all designated SNMP managers. This notifies any SNMP tools, such as eSight in our test scenario, that the switch is down. The eSight console showed instantaneous proof when the switch was pulled offline, as seen in *Figure 3* on *page 2*.

SNMP requires significant amount of traffic depending on the resolution of the reporting. Systems like eSight with lower resolution reporting saves bandwidth without sacrificing speed for significant events that could otherwise lead to unwanted downtime.

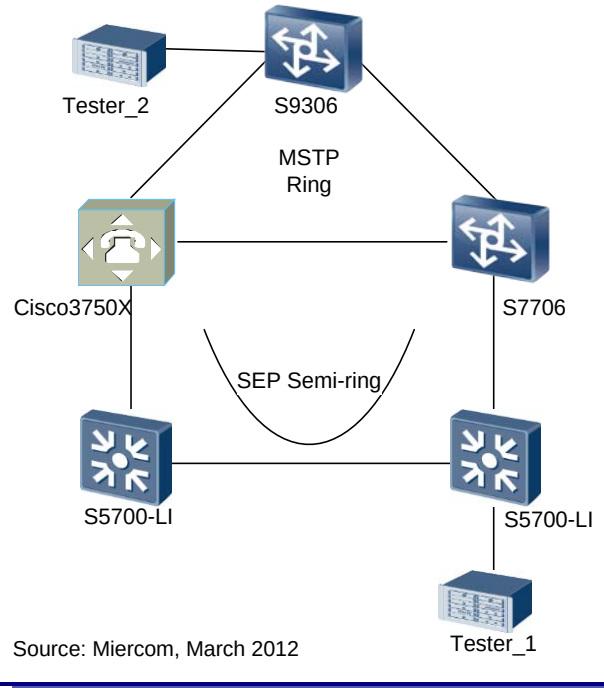
Maintenance of the S5700-52P-LI features auto configuration, WEB Management for ease of use. Additionally, LLDP and DLDP are supported.

iStack

Huawei has a clustering system referred to as iStack. It has unique features and resilient 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 6* on *page 5*.

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

Figure 4: Huawei S5700-52P-LI MSTP Ring Topology



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

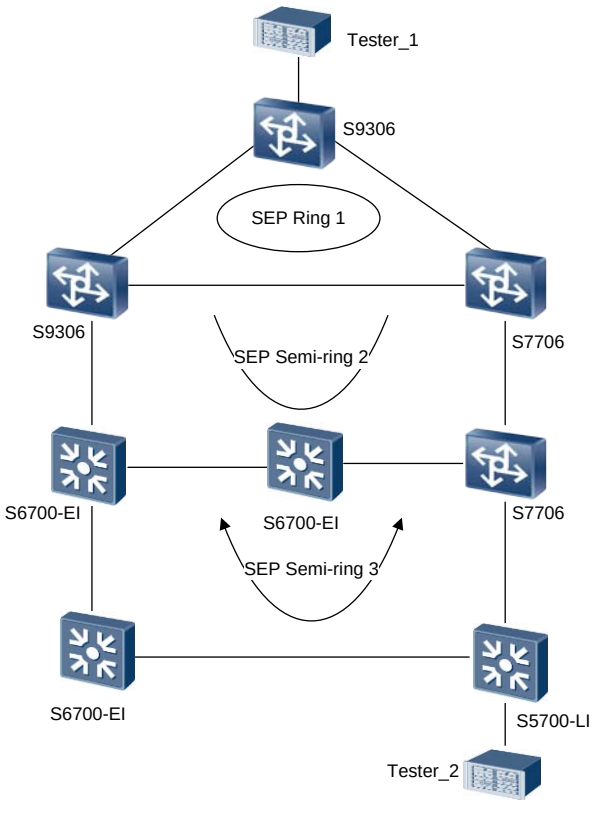
the lines properly. In addition, we conducted an iStack capacity test consisting of two link teamed channels from both the secondary switches to the test center. This system ensured the test center would send and receive 24Gbps at line rate, which totals to the expected 48Gbps throughput. Between test 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.

Advanced Features

The S5700-LI series offers special Energy Efficient Ethernet options, compliant with the newly approved 802.3az standard. By utilizing port shutdowns, and idle periods, the switch can save power normally unknown to large PoE switches of this class. The vendor reports that with PoE enabled, the switch only consumes 740W under load. PoE+ is also supported.

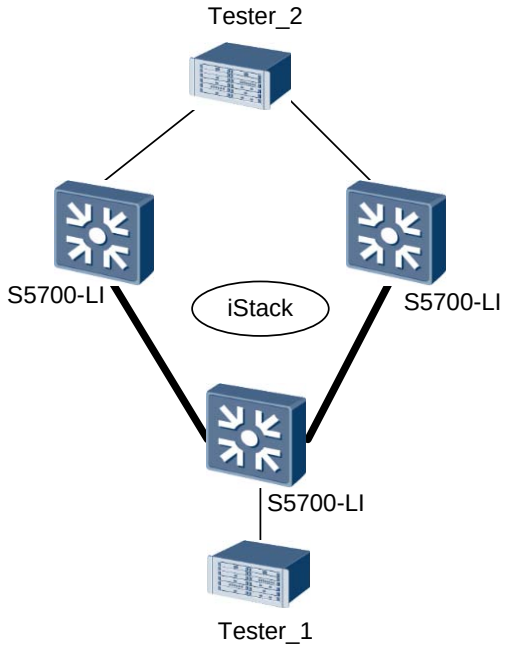
Figure 5: Huawei S5700-52P-LI SEP Multi-Ring Topology



Source: Miercom, March 2012

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

Figure 6: Huawei S5700-52P-LI Three-Component Cluster



Source: Miercom, March 2012

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

Bottom Line

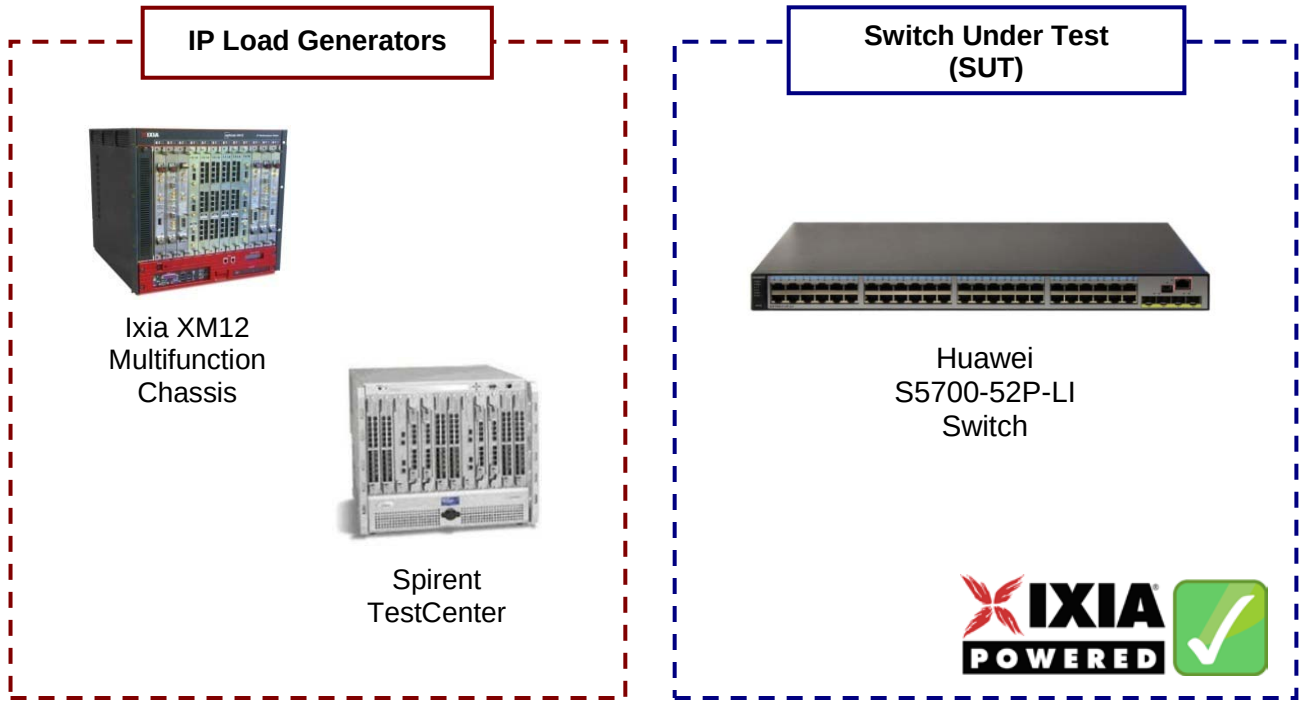
The Huawei S5700-LI switch offers value, performance and features targeted at large campus and enterprise environments. The S5700-52P-LI provides high bandwidth, resilient architecture, IPv6 migration support, 802.3az energy-efficient functionality with AHM (advanced hibernation mode), Gigabit Ethernet speeds, and simple installation and maintenance for campus and data center 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 S5700-52P-LI 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 S5700-52P-LI 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 tester to the other.

The Huawei S5700-LI 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 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 S5700-52P-LI enterprise-class switch was verified by Miercom. In hands-on testing, Huawei demonstrated advanced performance features such as:

- Dying Gasp feature provides immediate SNMP notifications of switch power off
- Ring network fault convergence time is less than 50ms using G.8032, SEP and other interoperable protocols
- Advanced Hibernation Management (AHM), Energy Efficient Ethernet (EEE) and flexible time-based strategy for energy savings reduce power consumption by 50%
- iStack achieved 10Gbps throughput as well as nine devices in a single cluster

S5700-52P-LI Switch

Huawei Technologies, Co., Ltd.

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