MICROSENS

Data Sheet

48 Port Gigabit Ethernet Routing Switch with Modular Uplink

Overview

The MS400960M Routing Switch is a high performance Ethernet switch to meet next generation network requirements. It includes integration of Layer 2 to Layer 4 packet processing engine, traffic management and fabric interface.

The switch offers cost effective Ethernet access and aggregation. It provides high port density with 48 Gigabit Ethernet SFP slots and adopts flexible modular design to support 4x 10G uplinks.

Benefits

- Standard 1RU pizza-box solution
- 176 Gbps switching capacity
- Green and power-saving
- Out-band RJ-45 Ethernet management port (For remote monitoring and configuration)
- RJ-45 console port (Configuration via serial RS-232 interface)
- USB interface (For Flash storage capacity extend)
- Supports ring network topologies
- Integrated Metro features

Feature List

- L2 Switching
- VLAN Classification
- Static Link Aggregation, LACP, MLAG
- STP, RST Static IPv4/IPv6 Routing, RIPv1/v2, RIPng, OSPFv2/v3, IGMP v1/v2/v3, PIM-SM, PIM-SSM, MLD, MVR6P MSTP
- VRRP
- ACL, QoS
- Storm Control, Port Security, MAC filters, DHCP Snooping, IP Source Guard, ARP Inspection, 802.1x, Radius
- Telnet, TFTP, NTP,SSH,DNS, SNMPv1/v2/v3, RMON, Port and Vlan Mirror, sFlow

Primary Features and Benefits

Multilayer Switching with High Capability at wire-speed

MS400960M provides 176 Gbps switching capacity and 132 Mpps Layer 2 and Layer 3 packet forwarding rate with wire-speed for all ports. The switch provides 48 fixed Gigabit Ethernet ports, and 4 SFP+ 1/10 GBE ports with uplink modules to meet the requirement of high density 1 GBE downlink ports and 10 GBE uplink ports.

Modular Uplink Port

MS400960M supports an uplink module with 4x 1/10G SFP+ slots.

System Design for Green and Energy Saving

MS400960M supports modularized fans with speed control as well as power consumption adjustment which is based on the flow status of the ports. Both can highly save the energy and go for green.

Customized Profile for Different Deployment Scenarios

The Flexible Table Management (FTM™) technology employed by MS400960M offers multiple table size configuration profiles as optimized choices for different network scenarios. The switch support up to 64K MAC address table.
Besides these pre-defined profiles, application-specific profile is also applicable.

Uninterrupted Performance Assurance and Multi-Node Redundancy and Robust Fault Protection System

Hardware	Hot-swappable power modules and fans. Power module supports AC or DC 1+1 redundancy. Fans support N+1 redundancy. Real-time environment monitoring for chipset temperature, status of fan and power, etc.
Software	LACP, ECMP, VRRP, STP/RSTP/MSTP, ERPS, SmartLink for redundancy and load-balancing. Sysmon for CPU status monitoring and protection upon unpredictable fault.

Outstanding QoS Control with Flexible Classification and Queuing Mechanism

Rich QoS mechanisms are implemented in MS400960M including flow classification based on source/destination MAC, source/destination IP address, protocol type, TCD/UDP port number to meet complicate network requirements.
Moreover, MS400960M provides 8 hardware queues per port to support multi-stage scheduling (WDRR, SP) and Tail Drop/WRED. 3-stage shaping (queue/group/port) can be applied for flow management. Meanwhile, ingress and egress policer provide bandwidth monitoring with a granularity of up to 32Kbps. Both srTCM (Single Rate Three Color Marker) and trTCM (two rate Three Color Marker) can be supported.

Triple-play Service Support with Bandwidth Guaranty for High Quality Application

MS400960M offers high bandwidth for Triple-Play services such as IPTV, video monitoring. The built-in QoS capabilities and flexible queuing technologies guarantee high quality of services.
Rich multicast protocol set (IGMP Snooping, IGMP v1/v2, PIM-SM) supports up to 16K multicast groups, 1K physical replications and 4K logical replications per group. IPTV service and multicast time-delay control is fully supported.

Comprehensive Network Security Policy

MS400960M supports subscriber-class, switch-class and network-class security control.
Basic IPv4/IPv6/MAC ACL is employed to filter IPv4/IPv6/Non-IP packet respectively and can be applied to both port and VLAN. Besides that, extended IPv4/IPv6 ACL is also available. In a single ACL rule, both IP and MAC ACE can take effect to filter IP and Non-IP packets simultaneously.
ARP Inspection and IP Source Guard features prevent network from malicious ARP attack. CPU Traffic Protection, Storm Control features optimize CPU load.
Centralized 802.1x authentication forbids illegal user access to the network.

Features

Triple-play service

- Advanced QoS functionalities provide differentiated class of service treatment to support triple-play service.
- Multicast VLAN Registration (MVR) continuously sends multicast streams in a multicast VLAN while isolating the streams from subscriber VLANs to reduce overall bandwidth requirement for multicast distribution in ring based network.
- Comprehensive security solution to provide protection of subscribers, switch, and network at the network edge.

Layer 2 VPN

- Selective Q-in-Q feature strictly conforms to 802.1Q and 802.1ad and provides more flexibility to customers while classifying VLAN based on port, original VLAN or L2/L3 information for the purpose of segregating subscriber traffic in the network.
- VLAN translation in both ingress and egress translates VLAN IDs carried in the data packets between different virtual LANs or between VLAN and non-VLAN encapsulating interfaces at Layer 2.

Layer 3 VPN

- Multi-VRF CE (VRF-lite) forms virtual packet-forwarding tables by associating one or more Layer 3 interfaces with each VRF, allowing the creation of multiple Layer 3 VPNs on a single MS400960M switch. Interfaces in a VRF could be either physical, as in an Ethernet port, or logical, as in a VLAN switch virtual interface (SVI).
- VRF-aware services (ARP, Ping, Traceroute, Telnet, SSH and FTP).
- Support for multiple IP routing protocols (RIPv1/v2, OSPF) offers flexible options for peering between end customers and service providers.

Availability and Reliability

- IEEE 802.1d Spanning Tree Protocol (STP) support for redundant backbone connections and loop-free networks simplifies network configuration and improves fault tolerance.
- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP) allows a spanning-tree instance per VLAN, for Layer 2 load sharing on redundant links.
- IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) provides rapid spanning-tree convergence independent of spanning-tree timers and also offers the benefit of distributed processing.
- Link Aggregation Control Protocol (LACP) allows the creation of Ethernet channels with devices that conform to IEEE 802.3ad.
- Equal-Cost MultiPath (ECMP) works for routing packets along multiple paths of equal cost for load balancing and redundancy.
- Virtual Router Redundancy Protocol (VRRP) is supported to create redundant, failsafe routing topologies.
- Sysmon mechanism monitors real-time CPU status and pauses switch work while unexpected fault happens.
- ERPS (Ethernet Ring Protection Switching) is used to create a fault tolerant topology by configuring a primary and secondary path for each VLAN.
- SmartLink is a fault tolerant topology for two uplink application, can provide < 50ms protection time.

High-Performance IP Routing

- Basic IP unicast routing protocols (static, Routing Information Protocol Version 1 [RIPv1], and RIPv2) are supported for small-network routing applications.
- Advanced IP unicast routing protocols (Open Shortest Path First [OSPF] and Border Gateway Protocol Version 4 [BGPv4]) is supported for load

balancing and constructing scalable LANs.

- Protocol Independent Multicast sparse mode (PIM-SM) for IP multicast routing is supported.
- Up to 256 switch virtual interfaces (SVIs) are supported; all physical ports can be routed port.
- Proxy Address Resolution Protocol (ARP) allows a network host to answer the ARP queries for the network address that it does not have configured on the receiving interface.
- Gratuitous Address Resolution Protocol (ARP) assists in the updating of other machines' ARP tables and helps detect IP conflicts and ensure load balancing on incoming traffic in some cases.
- IPv6 routing support in hardware for maximum performance.
- VRRP provides dynamic load balancing and failover for routed links.

Robust Multicast Control

- Internet Group Management Protocol (IGMP) snooping provides fast client joins and leaves of multicast streams and limits bandwidth-intensive video traffic to only the requestors.
- IGMP Snooping TCN provides quick response capability to topology changes so that the service provider’s multicast service will not be paused even the topology is altered temporarily.
- IGMP immediate leave overrides the normal checks to see if there are other hosts or proxy devices on the local segment interested in the multicast group and shorten the time of changing channels for IPTV services.
- IGMP filtering provides multicast authentication by filtering out nonsubscribers and limits the number of concurrent multicast streams available per port.
- IGMP proxy enables the system to issue IGMP host messages on behalf of hosts that the system discovered through standard IGMP interfaces to allow users on any downstream network to join an upstream sourced multicast group.
- Multicast VLAN Registration (MVR) allows one single multicast VLAN to be shared among different subscriber VLANs on the network which improves bandwidth utilization by reducing

Bandwidth Optimization

- Per-port broadcast, multicast, and unicast storm control prevents faulty end stations from degrading overall systems performance.
- Equal-cost routing facilitates Layer 3 load balancing and redundancy across the stack.
- Switch-port auto-recovery automatically attempts to reactivate a link that is disabled because of a network error.
- Up to 32 Link Aggregation groups are supported with 8 member ports per group.

IPv6 Support

- Fully distributed handling and forwarding IPv6 packets at wire speed.
- Chipset supports most of IPv6 routing protocol and tunneling protocol.
- Support chipset based native tunneling.
- Support chipset based IPv6 ACL and QoS.
- Advanced chipset based IPv6 multicast

Advanced QoS

- QoS queuing mechanism differentiates flows according to any L2/L3/L4 identity and enqueues flexibly; meanwhile modifies CoS/DSCP and limits throughout.
- Ingress and egress policer is provided based on 802.1p Class of Service (CoS), Differentiated Services Code Point (DSCP), VLAN ID and QoS ACLs (IP ACLs or MAC ACLs), which can include source and destination IP address, source and destination MAC address, Layer 4 TCP/UDP information, or any combination of these fields.

- Ingress and egress aggregate policer reinforces traffic policing across all of the applied ports. QoS applies the bandwidth limits specified in an aggregate policer cumulatively to all the flows matching the criteria.
- Weighted Random Early Detection (WRED) generally drops packets selectively based on IP precedence and packets with a higher IP precedence are less likely to be dropped than packets with a lower precedence; WRED ensures higher priority traffic to be delivered with a higher probability than lower priority traffic.
- In contrast to WRED, Tail Drop provides per QoS class congestion avoidance at the queues before a disruption occurs.
- Queue, service and port based three-level traffic shaping contributes to up to 64 Kbps granularity.
- Weighted Deficit Round Robin (WDRR) extends the quantum idea from the DRR to provide weighted throughput for each queue. Different queues have different weights and the quantum assigned to each queue in its round is proportional to the relative weight of the queue among all the queues serviced by that scheduler.
- Strict Priority queue (SP) provides strict-priority queuing for a traffic class that enables delay-sensitive data, such as voice, to be sent before packets in other queues are sent. The priority queue is serviced first until it is empty.
- Strict priority queuing helps ensure that the highest-priority packets are serviced ahead of all other traffic.
- 8 egress queues per port help enable differentiated management of up to 8 traffic types across the stack.
- Support 8 differ-service domain, could provide flexible differ service for the ports.
- There is no performance loss when using advanced QoS functionalities.

Network Security

- Subscriber Security
- IEEE 802.1x allows dynamic, port-based security by providing user authentication.
- IEEE 802.1x and port security are provided to authenticate the port and manage network access for all MAC addresses, including that of the client.
- DHCP Snooping prevents malicious users from spoofing a DHCP server and sending out bogus addresses. This feature is used by other primary security features to prevent a number of other attacks such as Address Resolution Protocol (ARP) poisoning.
- DHCP Snooping helps administrators with consistent mapping of IP to MAC addresses. This can be used to prevent attacks that attempt to poison the DHCP binding database and to rate-limit the amount of DHCP traffic that enters a switch port.
- Dynamic ARP Inspection helps ensure user integrity by preventing malicious users from exploiting the insecure nature of the ARP protocol.
- IP Source Guard prevents a malicious user from spoofing or taking over another user's IP address by creating a binding table between client's IP and MAC address, port, and VLAN.
- Secure Shell (SSH) Protocol, Kerberos, and Simple Network Management Protocol Version 3 (SNMPv3) provide network security by encrypting administrator traffic during Telnet and SNMP sessions.
- MAC filtering
- MAC port binding
- MAC number limitation per port
- CPU traffic protection refuses abnormal data flow to avoid malicious attack.
- ACLs allows for multiple layer rules coexistence such L2 with L3, or even with L4.
- Security VLAN ACLs on all VLANs prevent unauthorized data flows from being bridged within VLANs.
- Port-based ACLs for Layer 2 interfaces allow security policies to be applied on individual switch ports.

- Three different mechanisms are supported to protect the STP topology from loops or undesired topology changes caused by addition of switches, mis-configuration of devices or even malicious attempts to override the current Spanning Tree Root Bridge.
- Bridge Protocol Data Unit (BPDU) Guard
- Bridge Protocol Data Unit (BPDU) Filtering
- Root Guard
- BPDU Guard and BPDU Filtering protect against possible loops created by switches added on ports configured with the STP Port Fast feature.
- Root Guard protect against added switches attempting to become the Root Bridge.

Manageability

- IEEE 802.1ag Connectivity Fault Management (CFM) provides standard support for transport fault management. It allows for discovery and verification of path for Layer 2 services.
- IEEE 802.1ah Ethernet in the First Mile (EFM) allows detection of faults on an EFM link and enable service providers to fully monitor a customer's end-to-end Ethernet service.
- Layer 2 traceroute eases troubleshooting by identifying the physical path that a packet takes from source to destination.
- Network Timing Protocol (NTP) client guarantees accurate and consistent time synchronization with the whole network.
- File Transfer Protocol (FTP) / Trivial File Transfer Protocol (TFTP) reduce the cost of administering software upgrades by downloading from a centralized location.
- Dynamic Host Configuration Protocol (DHCP) Relay allows a DHCP relay agent to broadcast DHCP requests to the network DHCP server.
- IGMP snooping provides fast client joins and leaves of multicast streams and limits bandwidth-intensive video traffic to only the requestors.
- Multifunction LEDs per port for port status; half-duplex and full-duplex mode; and 10BASE-T, 100BASE-TX, 1000BASE-T, 10GBASE-LR indication as well as switch-level status LEDs for system, redundant-power supply, and bandwidth utilization provide a comprehensive and convenient visual management system.

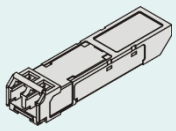
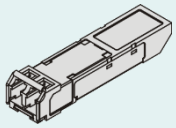
Technical Specifications

Type	**19" 48 Port Gigabit Ethernet Routing Switch Modular Uplink**	
General	Up to 4K VLAN 32K MAC addresses Up to 9216 bytes Jumbo Frames	
Switching Capability	176 Gbps	
Forwarding Rate	132 Mpps (L2/L3 packets)	
CPU	Cavium CN5010-500BG564-CP-G/500MHz	
Memory	256 MB FLASH / 512 MB DRAM	
Device Interfaces	48x GBE SFP Ports 4x 10G SFP+ Ports (Uplink Module to be ordered separately) 1x RJ-45 Port (Outband Management) 1x RJ-45 console port	
Connectors and Cabling	Single Mode or Multimode fiber with LC connectors for SFP/SFP+ ports Cat-5 UTP cabling for RJ-45 management port For the console port a RJ-45 to Sub-D9 cable is delivered with the device	
Power Supply	100..240 VAC 50/60 Hz redundant* power input * One module included at delivery	
Power Consumption	75 W without Uplink Module 85 W including MS400966	
LED Indicators	Per-port status LEDs	Link integrity, port disabled, activity, speed and full-duplex
	System LEDs	System status Power status (active, failure indications) Fan status (active, failure indications)
Operating Temperature	0 to 45° C (Long term), -5 to 55° C (Short term)	
Storage Temperature	-40 to 70° C	
Relative Humidity (operating)	10 to 90 % (non-condensing)	
Relative Humidity (non-operating)	0 to 95 % (non-condensing)	
Acoustic Noise	< 45 dB (International Organization for Standardization (ISO) 7779)	
Housing	19" 1RU (depth: 420 mm)	
Dimensions (H x W x D)	436 x 440 x 400 mm	
Weight	6,3 kg (One PSU, one 4x SFP+ uplink module)	
MTBF	174,374 h (MS400960M) 144,669 h (MS400960M + MS400966)	
EMC	CE	
Safety	CE	

Order Information

	Description	Article No.:
	**48 Port Gigabit Ethernet Routing Switch with Modular Uplink**	
	48 Port Gigabit Ethernet Routing Switch, 48x GBE SFP Ports, Modular Uplink Module Slot, 19" 1U, dual modular power supply capable (include one 230VAC power supply module)	**MS400960M**
	Uplink Module	
	Uplink Module for MS400960M, 4x 1G/10G SFP+	**MS400966**

Accessories

	SFP 1G Transceiver	
	SFP Transceiver, Gigabit Ethernet, Digital Diagnostic 850 nm Multimode, 1000Base-SX, LC duplex	**MS100200D**
	SFP Transceiver, Gigabit Ethernet, Digital Diagnostic 1310 nm single mode, 1000Base-LX, LC duplex	**MS100210D**
	**SFP+ 10G Transceiver (xWDM on request)**	
	SFP+ Transceiver, 10 Gigabit Ethernet, Digital Diagnostic 850 nm Multimode, 10GBase-SX, LC duplex, 300m	**MS100700D**
	SFP+ Transceiver, 10 Gigabit Ethernet, Digital Diagnostic 1310 nm single mode, 10GBase-LX, LC duplex, 10 km	**MS100702D**