

ANEXOS

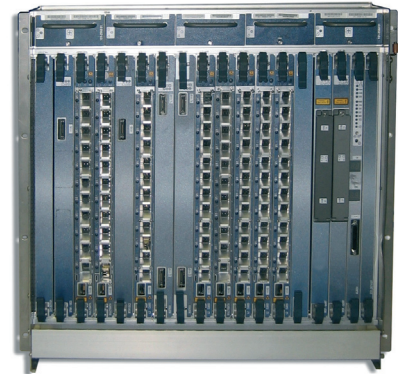
ANEXO1

MARCONI OMS 2400

Optical MultiService Ethernet Transport



Marconi OMS 2450



Marconi OMS 2430

General

The OMS 2400 is a family of Ethernet transport platforms, covering a range of switch and port capacities, offering network operators and service providers a level of carrier class performance for Ethernet services to that which they have come to expect from SDH transport networks.

Designed specifically to meet the demanding requirements of data-centric networks, the OMS 2400 is positioned primarily as an Ethernet aggregation, switching and transport node for use in access and metropolitan networks, although its flexibility and scalability makes it equally suited for regional and national backbone applications. Ethernet, Pseudo Wire Emulation, IETF IP/MPLS and ITU-T Transport-MPLS are all supported, with client and network interfaces available in native Ethernet, xWDM and SDH form. These features coupled with the high port density and scalability of the OMS 2400, ensure that network operators and service providers can be confident of meeting existing and future requirements for business Ethernet and residential multi-media services. An important and distinguishing feature of the OMS 2400 is its adherence to established and proven networking principles. Here, Ericsson has been able to leverage Marconi's heritage as a leader in TDM transport networking to bring carrier class packet transport into next generation networking, through an economic and evolutionary path from

existing network technologies to an Ethernet environment. As a key member of Ericsson's Optical Multi-Service portfolio, the OMS 2400 brings to Metro Ethernet networks the protection, scalability, OAM functionality and real CoS/QoS management needed to cope with the ever changing service demands.

In summary, the OMS 2400 family features:

- Ethernet transport switch capacities from 10Gbit/s to 320Gbit/s
- Support for actual QoS and data traffic via carrier grade Ethernet
- Full Layer-2 Provider Bridge functionality for Ethernet traffic switching and transport.
- EPL, EVPL, EVPLAN service support (via Layer-2 Provider Bridge or VPLS/VPWS MPLS technology).
- "Triple-Play" service support, including IGMP "snooping" and all security features required for the handling of public services.
- Ethernet & Transport MPLS OA&M (ITU-T Y.1711) for rapid service provisioning, efficient troubleshooting, and protection switching.
- Ethernet, SDH/SONET and xWDM Client/tributary interfaces

Applications

Ethernet service delivery

The OMS 2400 is optimized to deliver Ethernet Layer 2 VPN services (EPL, M-EPL, EVPL, EVPLAN) for end-to-end services or as an aggregation and grooming function for use with edge routers and BRAS to deliver a wide range of broadband services.

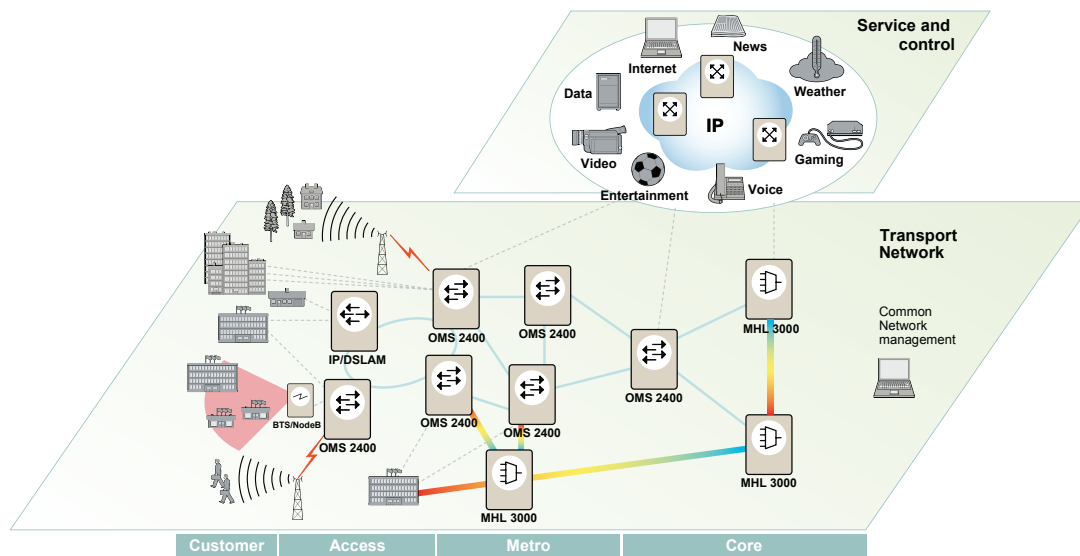
Triple-play services

The OMS 2400 is specifically designed to provide IP-based multimedia services such as VoIP, High Speed Internet, IPTV, VoD, L3 VPNs, and other triple-play and business IP applications.

Resilience and security

Support for Pseudo-Wire Emulation Edge-to-Edge Encapsulation (PWE3) along with ITU-T Transport MPLS and its associated OAM (Y.1711) functionality, offers operators and service providers traffic management, sub 50ms network and equipment protection necessary to support a wide range of services and service levels..

Security is handled through strict resource control (e.g. admission control) and strict functional plane separation to complement the overall carrier grade requirements.



OMS 2430	OMS 2450	OMS 2470
Compact Subrack One third rack size	Medium-size subrack Half rack size	High-capacity subrack Half rack size
8 traffic slots	12 traffic slots	16 traffic slots
2 expansion slots	10 traffic LTUs	10 traffic LTUs
Switch options:	Duplicated, hotprotected packet switch fabric card	1:2, hot-protected packet switch fabric cards
-10-40 Gbit/s capacity with passive switch fabric	- 160 Gbit/s switching capacity	- 320 Gbit/s switching capacity
50-80 Gbit/s capacity with duplicated switch fabric	Duplicated Central Control Unit	Duplicated Central Control Unit
Alarm Unit	Alarm Unit	Alarm Unit
Duplicated Central Control Unit	System slots for power supply, clock, TMN and LCT access	System slots for power supply, clock, TMN and LCT access
System slots for power supply, clock, TMN and LCT access		

Network Applications

Available in a range of switch capacities and physical enclosures, the OMS 2400 family is an ideal choice for aggregating customer services from the metro edge (e.g IP DSLAM traffic) or for aggregating and grooming traffic in the metro/core, in a variety of hubbing, ring or meshing topologies. As well as offering native Ethernet interfaces up to 10Gbit/s, the OMS 2400 has a range of other optical options, including GFP (with VCAT and LCAS) mapping into SDH, POS (STM16c/OC48c, STM64c/OC192c), CWDM and G.709 DWDM. The use of plug-in blades and SFP/XFP modules allows the OMS 2400 to be configured and reconfigured to reflect the changing demands as, for example, networks progressively migrate from client data (or CE/PWE3 services) mapped into SDH (GFP) to full Ethernet presentation. Similarly, on the network facing (aggregate) side, this flexibility enables the OMS 2400 to be used over existing SDH/SONET or Ethernet links, as required.

Key features

Scalability and high-density tributaries

The OMS 2400 family features a choice of different chassis for effective and scalable solutions for different network scenarios. High-density tributaries, combined with hot-pluggable SFP/XFP modules help deliver maximum revenue generation at low incremental cost.

Interface Type	OMS 2430 Max number of ports		OMS 2450 Max number of ports		OMS 2470 Max number of ports	
	card	shelf	card	shelf	card	shelf
Fast Ethernet	48	240	36	408	24	312
GbE	20	100	20	220	20	260
10GbE	1	8	2	16	2	32
10G POS	1	8	2	16	2	32
STM-1/OC3	8	64	8	96	8	128
STM-4/OC12	8	64	8	96	8	128
STM-16OC48	4	32	4	48	4	64
STM-64/OC192	1	8	2	16	2	32

Reducing OPEX by simpler network operation

The OMS 2400's efficient traffic management and advanced automation features, coupled with its inherent Transport-MPLS Control Plane and ServiceOn network management, makes possible the optimization and simplification of network operation.

Optimizing CAPEX in the network

The comprehensive Layer 2 features of the OMS 2400 offers an effective alternative to increasing the capacity of PE and core routers, by handling traffic which the routers do not need to deal with (for example, pass-through traffic and/or leased line businesses services). This optimizes CAPEX by reducing the need for expensive router resources, whilst the comprehensive protection and shared restoration capabilities of the OMS 2400 make it possible to reduce network resources devoted to protection paths.

Performance visibility with Transport-MPLS & Ethernet OAM

Transport-MPLS and Ethernet OAM provide valuable performance visibility for the monitoring of data paths and for fast protection switching. This provides fast and efficient fault location and enables forwarding mechanisms for remote signaling of failures and defects. The support of ITU-T Transport-MPLS provides a complete and coherent architecture for handling the operational realities of today's packet networks.

Pluggable optics

Small form factor, hot pluggable (SFP/XFP) modules offer an incremental path to accommodate increasing service demand, network reconfiguration and the provision of colored optics for WDM applications.

Efficient fiber usage with xWDM interworking

The OMS 2400 family supports C/DWDM applications (client and trunk side) for efficient fiber usage. The OMS 2400 can be used in standalone WDM applications or can be coupled with the Marconi MHL 3000 Multihaul WDM platform as an integrated and comprehensive solution in both metro and core applications (for further details refer to the Ericsson Marconi MHL 3000 data sheets).

Interoperability with existing SDH networks

Interfacing to existing SDH networks is achieved through the flexible mapping of Ethernet traffic into VCs (VCAT, GFP and LCAS). These technologies provide bandwidth efficient ability to flexibly allocate traffic to Ethernet over SDH links. As a result the OMS 2400 can operate as a hub aggregating packet traffic from other existing MSPPs (such as the Marconi OMS 1600) or as a feeder node into large backbone OXCs (such as the Marconi OMS 3250/55/60 family).

End-to-end management

Ericsson's ServiceOn NMS for the OMS 2400 gives network operators true carrier-grade manageability of their network. Using end-to-end integrated network management for both SDH and Ethernet/MPLS paths, network-wide performance monitoring and rapid fault identification, simplifies day-to-day activities for troubleshooting, protection and provisioning.

Tailored for today, flexible for tomorrow

The OMS 2400 can be software upgraded in service, while traffic cards may be added with no impact on existing operations. Moreover, with a flexible, low-first-in-cost the OMS 2400 provides a solution for today's needs with the flexibility to change and/or grow for tomorrow.

The Ericsson optical portfolio is a world leading family of next generation transport products, designed with the most demanding of customer applications in mind. Flexibility (its ability to adapt to a myriad of applications, not least evolution to packet networking and fixed mobile convergence) and innovation (technologies such as carrier grade data, ASTN, OTN and multireach WDM have built upon our heritage as a pioneer in SDH and WDM).

Technical data

IETF MPLS & ITU-T Transport -MPLS:

LSR, LER, Static and Dynamic LSPs, LDP, PWE3, VPLS, MPLS OAM (Y.1711), Fast ReRoute, LSP 1+1 protection, LSP 1+1 Packet protection (ITU-T Y.1720), Control Plane based on OSPF-TE (or ISIS-TE) and RSVP-TE.

Multicast:

MPLS multicast, IGMP snooping, restoration on MPLS Multicast, Layer-2 Multicast.

Performance:

64 Spanning Tree protocol instances, 16K VPLS, 256K MAC addresses/VPLS instance, 4096 VLAN per port.

SDH:

VCAT, GFP, LCAS, SDH alarms and performances, MSP1+1.
Synchronization for EoSDH/SONET ports.

Ethernet Layer 2:

VLAN with Priority, Bridging & Provider Bridging, Rapid Spanning tree, Aggregation and LACP, Ethernet First Mile with OAM, Flow Control, Jumbo frames, Q-in-Q encapsulation, Performance history data.

MEF9 certification.

QoS:

Per flow queuing, shaping and policing, CoS/QoS, advanced policing and scheduling algorithms, Controlled Oversubscription and Overbooking, Broadcast/Multicast storm control, CAC.

Management:

Ericsson CLI, Telnet, FTP, TFTP, SNMPv2 and v3, HTTP/HTML server, Java Craft Terminal, Integrated SDH and data Network Management System.

Physical Interface Pluggable Modules and Optical applications:

ALS on all optical interfaces, FastE/GigE SFPs, 10GigE XFPs, STM-n/OC-n SFPs and XFPs, CWDM SFPs, CWDM/DWDM XFPs

Environmental and Electromagnetic compatibility:

ETSI 300 019 Class 3.2;
All subracks have 300 mm (ETSI standard) depth and full front access.
ANSI NEBS Level-3 compliance (GR-63-CORE, GR-1089-CORE).

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All technical data is typical and is subject to change without notice

ANEXO2

NETIRON

XMR 4000, 8000, 16000, 32000



HIGHLIGHTS

- ▶ 4-, 8-, 16-, and 32-slot high-end IPv4/IPv6/MPLS multi-service routers
- ▶ Terabit-scale architecture offering up to 3.2 Tbps data capacity and approximately 2 billion pps per system
- ▶ Up to 128 10-GbE/640 1-GbE/64 OC-192/256 OC-48 ports per system
- ▶ Built for scalable routing via OSPF, IS-IS, BGP, OSPFv3, RIPng, PIM-DM/SM
- ▶ Up to 1 million IPv4 routes in hardware to support future growth
- ▶ Carrier class IPv4, IPv6, and MPLS routing featuring Foundry Direct Routing (FDR) technology
- ▶ High-capacity MPLS Layer 3/Layer 2 VPNs and IP over MPLS routing
- ▶ Enables virtual routing in non-MPLS environments via Multi-VRF
- ▶ Highly resilient architecture offering redundant management modules, switch fabrics, power supplies, cooling, and hitless failover
- ▶ Flexible SONET/SDH support via either native POS interfaces or 10-GbE WAN PHY

IPV4/IPV6/MPLS MULTI-SERVICE
BACKBONE ROUTERS

Overview

Today's service providers face market challenges that require a new breed of solutions to ensure successful and profitable operation. Service providers operate in an environment of fierce competition that continues to drive service pricing down. A smooth introduction of new, reliable, and scalable services is difficult for many service providers, yet, it is crucial to expanding the subscriber base, and improving subscriber retention. Adding to these challenges is an exponential growth trend in Internet traffic that continues to erode network capacities. Furthermore, ensuring and increasing profitability, which require controlling Capital Expenditures (CapEx) and Operational Expenditures (OpEx), are key goals for any service provider.

Foundry's NetIron XMR Series routers are built to address all these hurdles by offering state-of-the-art design in hardware and software. Based on a superior terabit-scale architecture that includes Foundry's cutting-edge, fifth-generation network processors, this series comprises the industry's most powerful, high density IPv4/IPv6/MPLS multi-service routers. To enable the deployment of scalable, high value, and profitable services,

the NetIron XMR Series offers highly versatile, cost-efficient solutions for Internet routing, inter-Metro backbones, large scale multi-service backbones, and IP carrier's carrier transport.

The NetIron XMR Series includes the 4-slot NetIron XMR 4000, 8-slot NetIron XMR 8000, the 16-slot NetIron XMR 16000, and the 32-slot NetIron XMR 32000. The series offers industry-leading port capacity and density for both Carrier Ethernet and Packet over SONET/SDH (POS) with up to 128 10-GbE, 640 1-GbE, 64 OC-192 (STM-64), or 256 OC-48 (STM-16) ports in a single chassis, high density router.

The NetIron XMR Series is designed from the ground up for high performance and scalability to address the needs of the most demanding ISP, Internet data center, inter-Metro connectivity, and multi-service operator applications. All routers in the series feature wire-speed, low latency, and low jitter routing for IPv4, IPv6, MPLS, and MPLSVPN services, and they support both edge (PE) and core (P) router deployments. For metropolitan area networks (MANs), the NetIron XMR routers support high-performance Layer 2 switching which allows for cost efficient and seamless integration with Layer 2 MANs or Layer 2 MAN access layers without compromising performance.



FOUNDRY
NETWORKS

Designed for high-end routing applications, the NetIron XMR Series features Foundry Direct Routing (FDR) technology for full Forwarding Information Base (FIB) programming in hardware, together with hardware-based wire-speed access control lists (ACLs) and policy-based routing (PBR) for robust, high performance IPv4, IPv6, and Layer 3 VPN routing. Complementary to FDR is a full suite of unicast and multicast routing protocols for both IPv4 and IPv6. Supported IPv4 protocols include RIP, OSPF, IS-IS, BGP4, PIM-DM, PIM-SM/SSM, IGMP, BGP-MP for multicast, and MSDP. Supported IPv6 protocols include RIPng, OSPFv3, IS-IS, BGP-MP for IPv6 (BGP4+), PIM-SSM, and MLD. Building on this solid routing architecture, the NetIron XMR routers also provide dual-stack IPv4/IPv6 wire-speed routing to facilitate a seamless migration to IPv6 without sacrificing performance.

A comprehensive set of path calculation and signaling capabilities using OSPF-TE, IS-IS/TE, RSVP-TE, CSPF, and LDP allows the creation of both traffic engineered and non-traffic engineered infrastructures. Within either infrastructure, the NetIron XMR Series supports IP over MPLS as well as MPLSVPN applications. The NetIron XMR Series supports all three popular MPLSVPN services, Virtual Leased Line (VLL), LDP-Based Virtual Private LAN Service (VPLS), and BGP/MPLSVPN, on all ports at wire-speed.

In addition, the NetIron XMR Series offers Multi-VRF Routing for environments where virtual routing is needed without the complexity of MPLS. Using Multi-VRF Routing, backbone operators can create multiple routing protocol instances that peer with each other in completely virtualized domains while sharing the same physical routers and links. The NetIron XMR Series is able to support overlapping IP address spaces through complete separation of the routing tables. Forwarding plane separation is supported through the use of standard 802.1Q VLAN tags.

The NetIron XMR Series is also designed for enabling the evolving multi-service and triple-play infrastructures. Built with an innovative view of Virtual Output Queuing (VOQ) architectures, packet buffering, and packet scheduling, the NetIron XMR routers offer non-blocking packet forwarding and large capabilities for handling severe congestion scenarios. Built on that superior foundation, the NetIron XMR routers deliver a comprehensive suite of QoS mechanisms to enable next-generation architectures. Using the NetIron XMR routers, operators can implement eight distinct traffic classes of prioritization with true performance guarantees. Operators can implement those performance guarantees by choosing from different packet scheduling schemes and tweaking the associated configurable parameters. Additionally, by relying on

DSCP Drop Precedence, operators can take advantage of Weighted Random Early Discard (WRED) for differentiated packet dropping in case of congestion within a given traffic class.

High availability, crucial to converged networks, is ensured through a combination of highly resilient hardware and software design, and advanced failure detection and traffic protection/restoration schemes. The routers feature complete hardware redundancy combined with resilient software featuring hitless failover and hitless software upgrades with OSPF and BGP graceful restart for maximizing router uptime. The Multi-Service IronWare operating system, powering the NetIron XMR routers, offers advanced capabilities for rapid detection and bypass of link/node failures such as BFD, UDLD, MPLS FRR, and Hot Standby paths.

Security is an increasing concern for today's operators, and the NetIron XMR routers offer a powerful set of security mechanisms that allow operators to enhance both infrastructure security and subscriber security. The NetIron XMR routers feature highly scalable inbound and outbound ACLs, which allow operators to implement IPv4, IPv6, and Layer 2 security policies. These policies can be applied permanently or on demand without impacting normal operations. Receive ACLs further harden platform and infrastructure security, allowing operators to implement strict policies for controlling management traffic and control traffic. To counter IP address spoofing used in many forms of DoS attacks, the NetIron XMR routers offer hardware-based wire-speed Unicast Reverse Path Forwarding (uRPF) for both edge applications (strict mode), and backbone applications (loose mode). uRPF allows the routers to check the packet's source IP address against the routing table to ensure that the packet came from a valid, and expected, source network.

Using the NetIron XMR routers, operators can combine the benefits of SONET/SDH long haul transport and the abundance of cost-effective capacity of Carrier Ethernet in many POPs. The routers offer a portfolio of native POS interfaces with speeds ranging from OC-12 (STM-4) to OC-192 (STM-64), allowing for native connectivity to SONET/SDH optical transport equipment or to existing POS routers with distances up to 80 km. Carrier Ethernet interfaces offer distances up to 80 km for 10-GbE, and up to 150 km for GbE. In addition, the routers offer operators cost-effective 10-GbE transport over OC-192 (STM-64) links using IEEE standard 10-GbE WAN PHY.

Key Features

- ▶ *Service provider-grade IPv4/IPv6/MPLS multi-service backbone routers*
- ▶ *4-, 8-, 16-, and 32-slot systems for maximum deployment versatility*
- ▶ *Terabit-scale architecture designed for massive 10-GbE and OC-192 scalability*
- ▶ *Performance of competitor multi-chassis routers in a fraction of the rack space*
 - *Up to 2 billion pps routing performance with non-blocking 3.2Tbps data capacity*
- ▶ *Industry-leading port capacity for a single chassis router*
 - *128 10-GbE/640 GbE ports*
 - *64 OC-192/256 OC-48 ports*
- ▶ *Wire-speed dual stack IPv4/IPv6 routing*
- ▶ *Wire-speed edge (PE) and core (P) Label Switching Routers*
- ▶ *Industry-leading performance for MPLS services providing concurrent IP over MPLS, Virtual Leased Lines (VLLs), Virtual Private LAN Services (VPLSes), and BGP/MPLS VPNs at wire-speed*
- ▶ *High performance, robust routing via Foundry Direct Routing (FDR) for complete programming of the Forwarding Information Base (FIB) in hardware*
- ▶ *Full suite of unicast and multicast IPv4 and IPv6 routing protocols*
 - *Supported IPv4 protocols include RIP, OSPF, BGP-4, IS-IS, PIM-DM, PIM-SM/SSM, IGMP, BGP-MP for multicast, and MSDP*
 - *Supported IPv6 protocols include RIPng, OSPFv3, IS-IS for IPv6, BGP-MP for IPv6 (BGP4+), PIM-SSM, and MLD*
- ▶ *Comprehensive MPLS signaling and path calculation algorithms for both traffic engineered and non-traffic engineered applications*
 - *OSPF-TE, IS-IS/TE, RSVP-TE, CSPFF*
 - *LDP*
- ▶ *Powerful Multi-VRF Routing supports virtual routing applications over non-MPLS backbones*
- ▶ *Industry-leading scalability up to**
 - *10 million BGP routes and up to 500 BGP peers*
 - *1 million IPv4 routes in hardware (FIB)*
 - *240,000 IPv6 routes in hardware (FIB)*
 - *2,000 BGP/MPLS VPNs and up to 1 million VPN routes*
 - *16,000 VLLs/VPLSes and up to 1 million VPLS MAC addresses*
 - *4,094 VLANs and up to 2 million MAC addresses*
- ▶ *Superior high availability design*
 - *Redundant management modules*
 - *Redundant switch fabrics*
 - *Redundant power supplies and cooling system*
 - *Hitless Layer 3 and Layer 2 failover with OSPF and BGP graceful restart*
 - *Hitless (in-service) software upgrades leveraging graceful restart*
- ▶ *Rapid link/node failure detection with advanced traffic protection*
 - *BFD for rapid detection of neighbor/adjacency failure*
 - *Foundry UDLD and IEEE LFS for fast detection of link problems*
 - *MPLS FRR and Hot Standby paths for traffic protection*
- ▶ *Distributed, scalable, wire-speed tunneling for IPv4 over GRE, and IPv6 over IPv4*
- ▶ *Advanced QoS*
 - *Eight distinct priority levels*
 - *Weighted Random Early Discard (WRED) support for congestion management and precedence dropping (tunable via configuration)*
 - *Support for hybrid queue servicing disciplines: Strict Priority + Weighted Fair Queuing*
- ▶ *State-of-the-art policy enforcement and monitoring for enforcing SLAs and implementing security policies*
 - *Two rate three color traffic policers*
 - *Traffic policer accounting*
 - *Layer 3 and Layer 2 ACLs*
 - *Granular ACL accounting*
 - *Hardware-based packet filtering*
 - *Hardware-based policy based routing (PBR)*
 - *Unicast Reverse Path Forwarding (uRPF)*
 - *Receive ACLs*
 - *Extensive sFlow Layer 2-7 traffic monitoring for IPv4, IPv6 and MPLS services*
- ▶ *Combine both Carrier Ethernet and powerful Packet over SONET/SDH*
 - *MEF 9 and MEF 14 certified for offering Carrier Ethernet services*
 - *Flexible set of POS interfaces with carrier class timing offering internal stratum 3, loop, line, and BITS timing support*

*Scalability limits dependent on configured system parameters, system profile selected, and routing database complexity.

The Series at a Glance



FEATURE	NETIRON XMR 4000	NETIRON XMR 8000	NETIRON XMR 16000	NETIRON XMR 32000
Interface Slots	4	8	16	32
Switch Fabric Capacity	960 Gbps	1.92Tbps	3.84Tbps	7.68Tbps
Data Forwarding Capacity	400 Gbps	800 Gbps	1.6Tbps	3.2Tbps
Packet Routing Performance	240 million pps	480 million pps	~1 billion pps	~2 billion pps
Switch Fabric Redundancy	2+1	2+1	3+1	7+1
Max 10-GbE Ports	16	32	64	128
Max 1-GbE Ports	80	160	320	640
Max OC-192 (STM-64) Ports	8	16	32	64
Max OC-48 (STM-16) Ports	32	64	128	256
Height (inches/rack units)	6.96" / 4 RU	12.21" / 7 RU	24.47" / 14 RU	57.71" / 33 RU
Power Supply Redundancy	1+1, 1+2	N+1, 1+1	N+1, 1+1	N+1, 1+1
Air Flow	Side to side	Side to side	Front to back	Front to back

Technical Specifications

IEEE COMPLIANCE

- 802.3 CSMA/CD Access Method and Physical Layer Specifications
- 802.3ae 10-Gigabit Ethernet
- 802.3x Flow Control
- 802.3ad Link Aggregation
- 802.1Q Virtual Bridged LANs
- 802.1D MAC Bridges
- 802.1w Rapid STP
- 802.1s Multiple Spanning Trees

RFC COMPLIANCE

BGPv4

- RFC 4271 BGPv4
- RFC 1745 OSPF Interactions
- RFC 1997 Communities & Attributes
- RFC 2439 Route Flap Dampening
- RFC 2796 Route Reflection
- RFC 1965 BGP4 Confederations
- RFC 2842 Capability Advertisement
- RFC 2918 Route Refresh Capability

- RFC 1269 Managed Objects for BGP
- RFC 2385 BGP Session Protection via TCP MD5
- RFC 3682 Generalized TTL Security Mechanism, for eBGP Session Protection
- draft-ietf-idr-restart Graceful Restart Mechanism for BGP

OSPF

- RFC 2178 OSPF
- RFC 1583 OSPF v2
- RFC 1587 OSPF NSSA
- RFC 1745 OSPF Interactions
- RFC 1765 OSPF Database Overflow
- RFC 1850 OSPF Traps
- RFC 2154 OSPF w/Digital Signatures (Password, MD-5)
- RFC 2328 OSPF v2
- RFC 1850 OSPF v2 MIB
- RFC 2370 OSPF Opaque LSA Option
- RFC 3630 TE Extensions to OSPF v2
- RFC 3623 Graceful OSPF Restart

IS-IS

- RFC 1195 Routing in TCP/IP and Dual Environments
- RFC 2763 Dynamic Host Name Exchange
- RFC 2966 Domain-wide Prefix Distribution

RIP

- RFC 1058 RIP v1
- RFC 1723 RIP v2
- RFC 1812 RIP Requirements

IP Multicast

- RFC 1122 Host Extensions
- RFC 1112 IGMP
- RFC 2236 IGMP v2
- RFC 3973 PIM-DM
- RFC 2362 PIM-SM
- RFC 2858 BGP-MP
- RFC 3618 MSDP
- RFC 3446 Anycast RP

General Protocols

- RFC 791 IP
- RFC 792 ICMP
- RFC 793 TCP
- RFC 783 TFTP
- RFC 826 ARP
- RFC 768 UDP
- RFC 894 IP over Ethernet
- RFC 903 RARP
- RFC 906 TFTP Bootstrap
- RFC 1027 Proxy ARP
- RFC 951 BootP
- RFC 1122 Host Extensions for IP Multicasting
- RFC 1256 IRDP
- RFC 1519 CIDR
- RFC 1542 BootP Extensions
- RFC 1812 Requirements for IPv4 Routers
- RFC 1541 and 1542 DHCP
- RFC 2131 BootP/DHCP Helper
- RFC 2338 VRRP
- RFC 854 TELNET
- RFC 1591 DNS (client)

QoS

- RFC 2475 An Architecture for Differentiated Services
- RFC 3246 An Expedited Forwarding PHB
- RFC 2597 Assured Forwarding PHB Group
- RFC 2698 A Two Rate Three Color Marker

Other

- RFC 1354 IP Forwarding MIB
- RFC 2665 Ethernet Interface MIB
- RFC 1757 RMON Groups 1,2,3,9
- RFC 2068 HTTP
- RFC 2030 SNMP
- RFC 2138 RADIUS
- RFC 3176 sFlow
- Draft-ietf-tcpm-tcpsecure TCP Security
- RFC 3074 Ingress Filtering for Multihomed Networks (uRPF)

- RFC 2784 Generic Routing Encapsulation (GRE)
- draft-ietf-bfd-base Bidirectional Forwarding Detection (BFD)
- draft-ietf-bfd-v4v6-1hop BFD for IPv4 and IPv6 (Single Hop); for OSPFv2, OSPFv3, IS-IS

IPv6 Core

- RFC 2460 IPv6 Specification
- RFC 2461 IPv6 Neighbor Discovery
- RFC 2462 IPv6 Stateless Address Auto-Configuration
- RFC 2463 ICMPv6
- RFC 3513 IPv6 Addressing Architecture
- RFC 3587 IPv6 Global Unicast Address Format
- RFC 2375 IPv6 Multicast Address Assignments
- RFC 2464 Transmission of IPv6 over Ethernet Networks
- RFC 2711 IPv6 Router Alert Option
- RFC 3596 DNS support

IPv6 Routing

- RFC 2080 RIPng for IPv6
- RFC 2740 OSPFv3 for IPv6
- draft-ietf-isis-ipv6 Routing IPv6 with IS-IS
- RFC 2545 Use of BGP-MP for IPv6

IPv6 Multicast

- RFC 2710 Multicast Listener Discovery (MLD) for IPv6
- draft-vida-mld-v2 Multicast Listener Discovery Version 2 for IPv6
- draft-holbrook-idmr-igmpv3-ssm IGMPv3 & MLDv2 for SSM
- draft-ietf-ssm-arch SSM for IP
- draft-ietf-pim-sm-v2-new PIM-SM Protocol Specification; partial support: SSM mode of operation

IPv6 Transitioning

- RFC 2893 Transition Mechanisms for IPv6 Hosts and Routers

MPLS

- RFC 3031 MPLS Architecture
- RFC 3032 MPLS Label Stack Encoding
- RFC 3036 LDP Specification
- RFC 2205 RSVP v1 Functional Specification

- RFC 2209 RSVP v1 Message Processing Rules
- RFC 3209 RSVP-TE
- RFC 3270 MPLS Support of Differentiated Services
- RFC 4090 Fast Reroute Extensions to RSVP-TE for LSP Tunnels; partial support: detour style

L3VPN

- RFC 2858 Multiprotocol Extensions for BGP-4
- RFC 3107 Carrying Label Information in BGP-4
- RFC 4364 BGP/MPLS IPVPNs
- draft-ietf-idr-bgp-ext-communities BGP Extended Communities Attribute
- RFC 4576 Using LSA Options Bit to Prevent Looping in BGP/MPLS IP VPNs (DN Bit)
- RFC 4577 OSPF as the PE/CE Protocol in BGP/MPLS IP VPNs
- draft-ietf-idr-route-filter Cooperative Route Filtering Capability for BGP-4
- RFC 4382 MPLS/BGP Layer 3 VPN MIB

L2VPN and PWE3

- draft-ietf-l2vpn-l2-framework Framework for Layer 2 Virtual Private Networks
- draft-ietf-l2vpn-requirements Service Requirements for Layer 2 Provider Provisioned Virtual Private Networks
- RFC 4762 VPLS Using LDP Signaling
- draft-ietf-pwe3-arch PWE3 Architecture
- RFC 4447 Pseudowire Setup and Maintenance using LDP
- RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks
- draft-ietf-pwe3-pw-tc-mib Definitions for Textual Conventions and OBJECT-IDENTITIES for Pseudo-Wires Management
- draft-ietf-pwe3-pw-mib Pseudo Wire (PW) Management Information Base

PACKET OVER SONET/SDH

- RFC 1661 The Point-to-Point Protocol (PPP)
- RFC 1662 PPP in HDLC-like Framing
- RFC 2615 PPP over SONET/SDH
- RFC 1332 Internet Protocol Control Protocol (IPCP)
- RFC 1377 The PPP OSI Network Layer Control Protocol (OSINLCP)
- GR-253-CORE SONET Transport Systems: Common Generic Criteria
- G.707/Y.1322 Network Node Interface for SDH

MEF CERTIFICATION

- MEF 9 Certified—Abstract Test Suite for Ethernet Services at the UNI
- MEF 14 Certified—Abstract Test Suite for Traffic Management Phase 1

NETWORK MANAGEMENT

- IronView Network Manager (INM) web-based graphical user interface
- Integrated industry standard Command Line Interface (CLI)
- sFlow (RFC 3176)
- Telnet
- SNMP v1, v2c, v3
- SNMP MIB II
- RMON

ELEMENT SECURITY OPTIONS

- AAA
- RADIUS
- Secure Shell (SSH v2)
- Secure Copy (SCP v2)
- HTTPs
- TACACS/TACACS+
- Username/Password (Challenge and Response)
- Bi-level Access Mode (Standard and EXEC Level)
- Protection against Denial of Service attacks, such as TCP SYN or Smurf Attacks

ENVIRONMENTAL

- Operating Temperature: 0 °C to 45 °C (32 °F to 104 °F)
- Relative Humidity: 5% to 90%, @45 °C (104 °F), non-condensing
- Operating Altitude: 6,600 ft (2,012 m)
- Storage Temperature: -25 °C to 70 °C (-13 °F to 158 °F)
- Storage Humidity: 95% maximum relative humidity, non-condensing
- Storage Altitude: 15,000 ft (4,500 m) maximum

SAFETY AGENCY APPROVALS

- CAN/CSA-C22.2 No. 60950-1-3
- UL 60950-1
- IEC 60950-1
- EN 60950-1 Safety of Information Technology Equipment
- EN 60825-1 Safety of Laser Products—Part 1: Equipment Classification, Requirements and User's Guide
- EN 60825-2 Safety of Laser Products—Part 2: Safety of Optical Fibre Communication Systems

ELECTROMAGNETIC EMISSION

- ICES-003 Electromagnetic Emission
- FCC Class A
- EN 55022/CISPR-22 Class A/VCCI Class A
- AS/NZS 55022
- EN 61000-3-2 Power Line Harmonics
- EN 61000-3-3 Voltage Fluctuation & Flicker
- EN 61000-6-3 Emission Standard (Supersedes: EN 50081-1)

IMMUNITY

- EN 61000-6-1 Generic Immunity and Susceptibility (Supersedes: EN 50082-1)
- EN 55024 Immunity Characteristics (Supersedes:
 - EN 61000-4-2 ESD
 - EN 61000-4-3 Radiated, radio frequency, electromagnetic field
 - EN 61000-4-4 Electrical fast transient
 - EN 61000-4-5 Surge

- EN 61000-4-6 Conducted disturbances induced by radio-frequency fields
- EN 61000-4-8 Power frequency magnetic field
- EN 61000-4-11 Voltage dips and sags)

TELCO NEBS/ETSI

Designed to meet the following specifications (formal testing under way):

- Telcordia GR-63-CORE NEBS Requirements: Physical Protection
- Telcordia GR-1089-CORE EMC and Electrical Safety
- Telcordia SR-3580 Level 3
- ETSI ETS 300-019 Physical Protection
 - Part 1-1, Class 1.1, Partly Temperature Controlled Storage Locations
 - Part 1-2, Class 2.3, Public Transportation
 - Part 1-3, Class 3.1, Temperature Controlled Locations (Operational)
- ETSI ETS 300-386 EMI/EMC

POWER AND GROUNDING

- ETS 300 132-1 Equipment Requirements for AC Power Equipment Derived from DC Sources
- ETS 300 132-2 Equipment Requirements for DC Powered Equipment
- ETS 300 253 Facility Requirements

PHYSICAL DESIGN AND MOUNTING

- 19-Inch rack mount supporting racks compliant with
 - ANSI/EIA-310-D
 - ETS 300 119
 - GR-63-CORE Seismic Zone 4
- Tabletop

ENVIRONMENTAL REGULATORY COMPLIANCE

- EU 2002/95/EC RoHS (with lead exemption)
- EU 2002/96/EC WEEE

NetIron XMR Series Power Specifications

	NETIRON XMR 4000	NETIRON XMR 8000	NETIRON XMR 16000	NETIRON XMR 32000
Maximum DC Power Consumption (W)	1,384	2,750	5,572	11,625
Maximum AC Power Consumption (W) [100 - 240 VAC]	1,384	2,750	5,572	11,625
Maximum Thermal Output (BTU/HR)	4,724	9,386	19,017	39,670

NetIron XMR Series Physical Specifications

	NETIRON XMR 4000	NETIRON XMR 8000	NETIRON XMR 16000	NETIRON XMR 32000
Dimensions	17.45"w x 6.96"h x 22.5"d 44.32w x 17.68h x 57.15d cm	17.45"w x 12.21"h x 22.5"d 44.32w x 31.01h x 57.15d cm	17.45"w x 24.47"h x 25.5"d 44.32w x 62.15h x 64.77d cm	17.45"w x 57.71"h x 24.1"d 44.32w x 146.58h x 61.21d cm
Weight (Fully loaded)	78 lbs 35 kg	131 lbs 60 kg	236 lbs 107 kg	approx 478 lbs approx 217 kg

Ordering Information

PART NUMBER	DESCRIPTION
NI-XMR-4-AC	4-slot NetIron XMR 4000 AC system
NI-XMR-8-AC	8-slot NetIron XMR 8000 AC system
NI-XMR-16-AC	16-slot NetIron XMR 16000 AC system
NI-XMR-32-AC	32-slot NetIron XMR 32000 AC system
NI-XMR-4-DC	4-slot NetIron XMR 4000 DC system
NI-XMR-8-DC	8-slot NetIron XMR 8000 DC system
NI-XMR-16-DC	16-slot NetIron XMR 16000 DC system
NI-XMR-32-DC	32-slot NetIron XMR 32000 DC system
NI-XMR-MR	NetIron XMR Series system management module, 2 GB SDRAM, dual PCMCIA slots, EIA/TIA-232 and 10/100/1000 Ethernet ports for out-of-band management
NI-XMR-32-MR	NetIron XMR 32000 system management module, 2 GB SDRAM, dual PCMCIA slots, EIA/TIA-232 and 10/100/1000 Ethernet ports for out-of-band management
NI-X-SF1	NetIron XMR 4-slot system switch fabric module
NI-X-SF3	NetIron XMR 8-/16-slot system switch fabric module
NI-X-32-SF	NetIron XMR 32-slot system switch fabric module
NI-XMR-10Gx4	NetIron XMR Series 4-port 10-GbE module with IPv4/IPv6/MPLS hardware support—requires XFP optics
NI-XMR-10Gx2	NetIron XMR Series 2-port 10-GbE module with IPv4/IPv6/MPLS hardware support—requires XFP optics
NI-XMR-1Gx20-SFP	NetIron XMR Series 20-port FE/GE (100/1000) module with IPv4/IPv6/MPLS hardware support—requires SFP optics
NI-XMR-1Gx20-GC	NetIron XMR Series 20-port 10/100/1000 copper module with IPv4/IPv6/MPLS hardware support
NI-X-OC192x2	2-port Packet over SONET (SDH) OC-192 (STM-64) interface module
NI-X-OC192x1	1-port Packet over SONET (SDH) OC-192 (STM-64) interface module
NI-X-OC48x8	8-port Packet over SONET (SDH) OC-12/48 (STM-4/16) interface module
NI-X-OC48x4	4-port Packet over SONET (SDH) OC-12/48 (STM-4/16) interface module
NI-X-OC48x2	2-port Packet over SONET (SDH) OC-12/48 (STM-4/16) interface module



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ANEXO3

Huawei Quidway CX600



Key Specifications

Item	Description		
	CX600-16	CX600-8	CX600-4
Capacity	Switching capacity: 2.56 Tbps Port capacity: 640 Gbps Forwarding performance: 800 Mpps	Switching capacity: 640 Gbps (scalable to 1.28 Tbps) Port capacity: 320 Gbps Forwarding performance: 400 Mpps	Switching capacity: 320 Gbps (scalable to 640 Gbps) Port capacity: 160 Gbps Forwarding performance: 200 Mpps
Slots	16 for LPUs, 2 for MPUs, 4 for SFUs	8 for LPUs, 2 for SRUs, 2 for SFUs	4 for LPUs, 2 for SRUs, 2 for SFUs
Interface Types	OC-192c/STM-64c POS OC-48c/STM-16c POS OC-12c/STM-4c POS OC-3c/STM-1c POS OC-12c/STM-4c ATM OC-3c/STM-1c ATM OC-192c/STM-64c RPR OC-48c/STM-16c RPR GE RPR Channelized OC-3/STM-1 10GE-WAN/LAN GE/FE E3/T3 E1/T1 CE1/CT1		
Service Processing Unit	Netstream, Tunnel & Multicast VPN		
Clock Transmission	Synchronous Clock Based on Ethernet PHY		
L2 Ethernet	IEEE802.1q, IEEE802.1p, IEEE 802.3ad, IEEE 802.1ab, STP/RSTP/MSTP, RRPP, DHCP+, VLAN Switch, MAC-in-MAC(PBB-TE), and User Binding		

Item	Description		
	CX600-16	CX600-8	CX600-4
MAC Table	128K per slot		
IPv4/IPv6 Routing Protocols	Static routing, RIP/RIPng, OSPF/OSPFv3, IS-IS/IS-ISv6, BGPv4/BGP4+, IPv6 over Ethernet, IPv6CP、 IPv6 ACL/Telnet, IPv6 MPLS VPN(V6 PE), IS-IS MT		
L2/L3 VPN	LDP over TE, VPLS/H-VPLS, Policy routing to VPN, L2 VPN/VLL with Martini and Kompella VLL/VPLS access L3 VPN Instance Q-in-Q, MPLS/BGP L3 VPN, Inter-AS VPN with option A/B/C		
Multicast	IGMP v1/v2/v3, IGMP Snooping, Multicast VPN, IPv6 Multicast, Static Multicast Routing, PIM-DM/SM/SSM, MSDP, MBGP Deploy Multicast and TE at same time		
QoS	WRED, DS-TE , H-QoS with 5 levels, VLL/PWE3 QoS, 128K queues for ingress processing, and 128K queues for egress processing, Access Network QoS Control, User Location Report		
Network Reliability	BGP/IS-IS/OSPF GR/LDP GR/RSVP GR/NSF, VLL/VPLS/L3VPN GR/NSF, BGP/IGP/Multicast Fast Convergence IP/LDP FRR, TE FRR, VPN FRR, VLL FRR BFD for Static Routing, IS-IS, RSVP, LDP, TE, LSP, PW, OSPF, BGP, VRRP, PIM, RRPP RRPP/RPR Ring Protect MPLS OAM N:1 Protect(Trunk port support), Ethernet OAM(L2 LSA , 802.1ag and 802.1ah), Double SR Master/Slave, PWE3 End to End Protection All for one, to guarantee the service convergence less than 50ms		
Redundancy Module Hot Backup	1:1 backup of MPU/SRU 3+1 load balancing and redundancy backup of SFU 1+1 load balancing and redundancy backup of the power module 1+1 backup of the system management bus and data bus		
Dimensions (W×D×H)	442mm × 669mm × 1600mm(36U); one CX600-16 can be installed into a 2.2m standard rack	442mm × 669mm × 886mm (20U); two CX600-8 can be installed into a 2.2m standard rack	442mm×669mm×442mm(10U) ; four CX600-4 can be installed into a 2.2m standard rack
Weight	250kg (fully configured) MPU: 3.8kg SFU: 3.0kg LPU: 5.0kg	147kg(fully configured), SRU: 3.8kg SFU: 1.8kg LPU: 5.0kg	75kg (fully configured), SRU: 3.8kg SFU: 1.8kg LPU: 5.0kg
Max. Power Consumption	5000W	3000W	1800W
Environment	Long Time Work Temperature: 0~45°C Short Time Work Temperature: -5~55°C Restriction on Temperature Variation Rate: 30°C/Hour Long Time Work Humidity: 5%RH~85%RH, non-condensing Shot Time Work Humidity: 0%RH~95%RH, non-condensing Long Time Work Altitude: ≤3000m		

ANEXO4

Características del GFP

GFP-F	GFP-T
Trama Variable	Trama Fija
Usa cHEC para relimitación	Opera a la llegada de cada BIT
Puede utilizar adaptación de tasa de velocidad y multiplexado a nivel de trama	Mapeo de N a 1 en paquetes de cliente
Requiere conocimiento de MAC	No requiere MAC usa 8B/10B
Requiere <i>Buffer</i>	No requiere <i>Buffer</i>
Introduce latencia	No introduce latencia
Posee tramas de control	La capa física es terminada

Feature	GFP-F	GFP-T
Protocol transparency	low	high
Efficiency	high	low
Isocronic protocols	no	yes
Encapsulation protocol level	Layer 2 (Frames)	Layer 1 (Physical)
Optimized for	Ethernet	SAN, DVB
LCAS protection	likely	poor
Statistical submultiplexing	yes	no
SAN transport	no	yes
Ethernet transport	optimum	possible