

SM Family of Systems

TECHNICAL PRODUCT DESCRIPTION

Copyright

© Ericsson AB 2009–2011. All rights reserved. No part of this document may be reproduced in any form without the written permission of the copyright owner.

Disclaimer

The contents of this document are subject to revision without notice due to continued progress in methodology, design and manufacturing. Ericsson shall have no liability for any error or damage of any kind resulting from the use of this document.

Trademark List

SmartEdge is a registered trademark of Telefonaktiebolaget LM Ericsson.

NetOp is a trademark of Telefonaktiebolaget LM Ericsson.



Contents

1	Introduction	1
1.1	Scope	1
1.2	Target Groups	1
2	Network Overview	3
2.1	SM 480 Metro Ethernet Service Transport Platform	3
2.2	SM 240 Metro Ethernet Service Transport Platform	4
3	Network Functions	5
3.1	Network Convergence	5
3.2	Differentiated Layer 2 VPN and Transport	5
3.3	Business, Residential, and Backhaul Services	6
4	SM Family Hardware	9
4.1	Chassis	9
4.2	Card Support	9
5	SM Family Software	13
5.1	Modular OS	13
5.2	Availability, Reliability, and Resilience	13
5.3	Standards-Based OAM Suite	14
5.4	Routing Protocols	14
5.5	Multicast Protocols	15
5.6	MPLS, VLANs, and Tunneling	15
5.7	Quality of Service	15
5.8	Security	16
6	CPI	17
6.1	Hardware Documentation	17
6.2	Software Documentation	18
	Glossary	25





1 Introduction

This document gives an overview of the Ericsson SM family[®] of Metro Ethernet Service Transport platforms.

The SM family of systems is a family of Smart Ethernet Switches, providing a metro platform optimized to deliver scalable Metro Ethernet services. Smart Ethernet provides the ability to perform both fixed and mobile services on a single, converged carrier Ethernet network, with simplified network architectures and lower carrier infrastructure costs. This family of platforms includes an advanced combination of IP/Multiprotocol Label Switching (MPLS) transport, traffic engineering with tiered or hierarchical quality of service (QoS) support, and comprehensive integrated Ethernet operation, administration, and maintenance capabilities for bridging between transport and IP domains.

1.1 Scope

This document gives a high-level description of the SM family of systems. This document is intended to introduce readers to the general capabilities of the SM family of systems and show how to understand and use SM family hardware and software documentation.

1.2 Target Groups

This document is intended for network operators, network and service planners, as well as system engineers and administrators. It assumes a working knowledge of networking and telecommunications.





2 Network Overview

The SM family of systems is designed to support converged metro networks, bridging legacy transport and IP domains. This family of chassis focuses on providing Metro Ethernet service transport capabilities for carriers, converging Ethernet service delivery and high-density Ethernet aggregation with IP/MPLS traffic support.

The SM family product offering includes the SM 480 and SM 240 Metro Ethernet service transport platforms. These platforms can be used in conjunction with the NetOp Element Management System (EMS) and the NetOp Network Service Manager (NSM).

Figure 1 shows the SM family of systems.

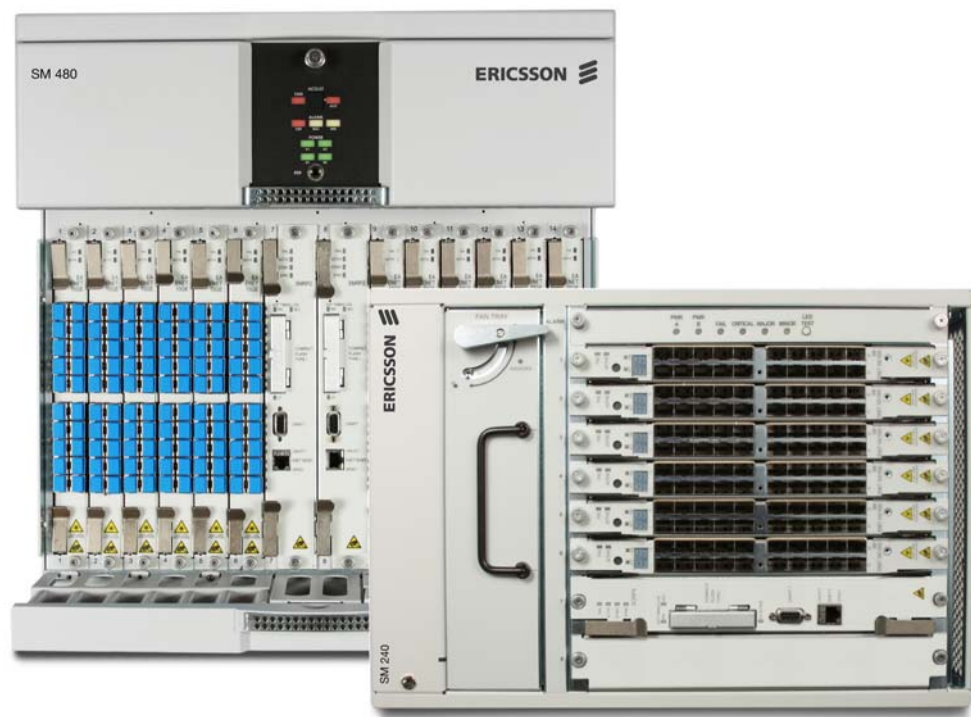


Figure 1 SM Family of Chassis

2.1 SM 480 Metro Ethernet Service Transport Platform

The SM 480 is a high-bandwidth, high-capacity platform targeted for metro core service transport. The SM 480 is purpose-built to aggregate of high-speed uplinks from the metro access transport and centralize switching and routing



functions for large numbers of Ethernet virtual private line (E-LINE) circuits and Ethernet virtual private local area network (E-LAN) customers.

2.2 SM 240 Metro Ethernet Service Transport Platform

The SM 240 targets metro access transport. The SM 240 leverages the E-LINE and E-LAN capabilities of the SM 480 in a cost-effective compact form factor designed for co-location sites and space constraint applications



3 Network Functions

The SM family of systems is designed to deliver packet-based carrier Ethernet service delivery and high-density Ethernet aggregation using Ethernet, IP, and IP/MPLS. In addition to Ethernet-based connectivity, such as Ethernet local loop (ELL), MPLS-based connectivity (pseudowires), and the typical services delivered over carrier Ethernet networks (such as virtual leased lines [VLLs] and virtual private LAN service [VPLS]), the SM family of chassis offers carrier-class IP based connectivity. The additional intelligence in the SM family of systems allows for a number of roles and functions in the carrier Ethernet wireline, wireless, and converged network.

3.1 Network Convergence

The SM family of chassis allows service providers to converge disparate access networks using any combination of Ethernet, IP, and IP/MPLS. This facilitates migration of legacy time-division multiplexing (TDM) networks into a single, packet-based metro Ethernet network, or convergence of fixed and mobile metro core and access networks; for example, as shown in Figure 2.

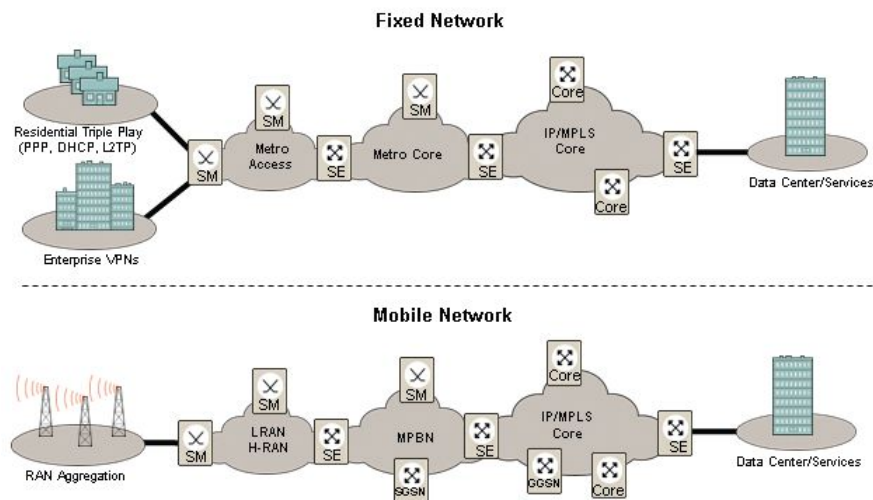


Figure 2 Convergence of Fixed and Mobile Architectures

3.2 Differentiated Layer 2 VPN and Transport

The SM family of systems includes a rich set of management capabilities not available on traditional carrier switches, allowing it to operate as both Ethernet transport and as a service-oriented Ethernet platform, without compromising performance. Granular Layer 2 hierarchical QoS (H-QoS) provides service

control to individual service sessions; these services can be provisioned from a centralized management platform. Protocol transparency of Layer 2 protocols allows a rich set of Ethernet service offerings across the access, aggregation, and core layers, as shown in Figure 3.

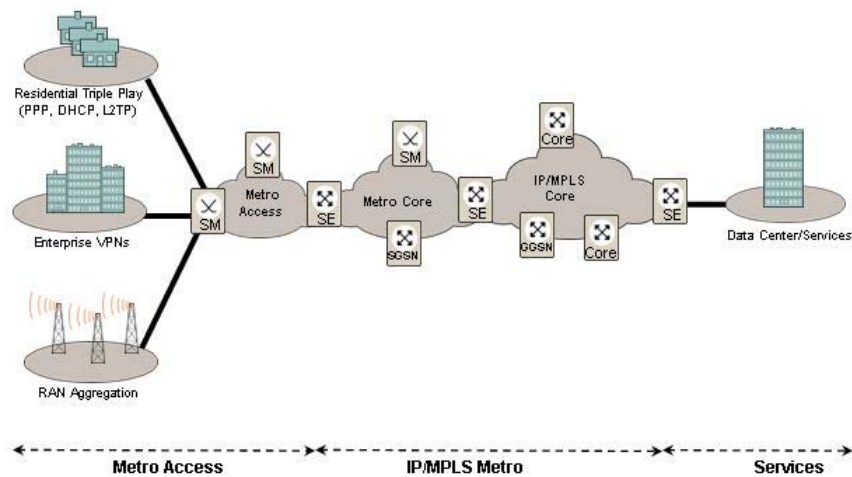


Figure 3 SM Family in Access, Aggregation, and Core Layers

3.3 Business, Residential, and Backhaul Services

The SM family of chassis can be used to provide point-to-point or multipoint-to-multipoint secure, traffic-engineered connectivity for enterprise customers, as in the following examples:

- Ethernet-based services such as VLL, Ethernet virtual private tree (E-TREE), and E-LINE
- VPLS, with hierarchical VPLS (H-VPLS) to enhance scalability
- Simple Layer 2 802.1ad bridging

To these services, the SM family of systems adds flexible tunnel policy management, stringent QoS and traffic engineering, and scalability, operating within a highly resilient operating system.

For backhauling in fixed and mobile networks, Ethernet with IP can replace less cost-effective T1/E1 links or Asynchronous Transfer Mode (ATM) channelized OC-3/STM-1 links. The SM family of chassis supports VLLs, and can therefore converge different services on a single metro network.

The SM family of chassis can also be used to implement the so-called "triple-play" services of Voice over IP (VoIP), broadband Internet access, and IPTV, where traffic for each service and subscriber can require different treatment. On the SM family of systems, the service provider can choose whether to deliver these services using either VPLS or Protocol Independent



Multicast (PIM). If PIM Dual Join is used, multicast replication and delivery can be highly optimized.

The SM family platforms converging business, Mobile, and Residential Services are shown in Figure 4.

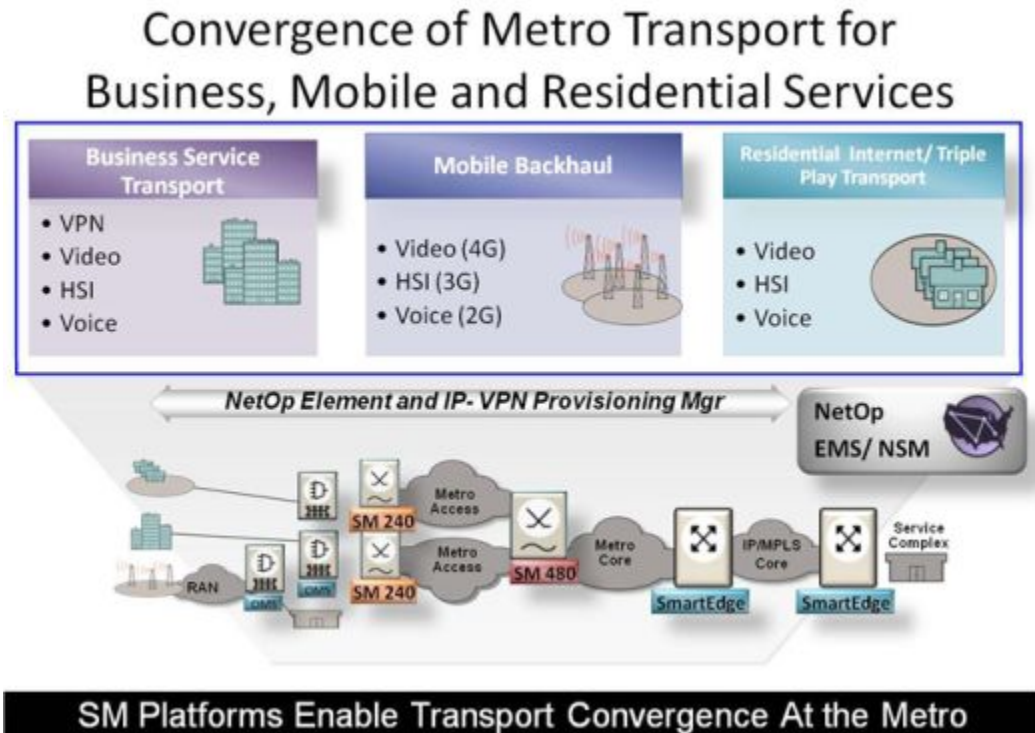


Figure 4 SM Platforms Converging Business, Mobile, and Residential Services





4 SM Family Hardware

The SM family of systems consists of the SM 480 chassis for the metro core and the SM 240 chassis for metro access.

4.1 Chassis

4.1.1 SM 480

The SM 480 provides E-LINE/ E-LAN service scalability with low power consumption. Purpose-built for the metro core transport, the SM 480 aggregates high-speed uplinks from the metro access network. It has a maximum port density of 240 ports of Gigabit Ethernet or 48 ports of 10 Gigabit Ethernet. This high bandwidth capacity and its fully-distributed control plane architecture allow the SM 480 to serve as a central platform for switching E-LINE circuits and E-LAN customers. The SM 480 provides the same compliance, electrical specifications, electrical power connections, environmental requirements, and physical specifications as the SmartEdge 800 router.

The SM 480 chassis has a carrier-grade design, engineered to standards for deployment in carrier networks including Network Equipment-Building System (NEBS) and Restriction of Hazardous Substances (RoHS). On the SM 480, 1+1 redundancy is used to protect the routing and controller card. If a fault occurs, the card continues to operating and can selectively reboot the faulted task, leaving other tasks and logical connections unaffected. The SM 480 also provides non-stop service, in that the flow of user data is either not disrupted or is minimally disrupted when a fault occurs in the system. Specifically, problems that occur in the control plane do not affect user traffic. The SM 480 includes redundant power supplies, fan trays, and port redundancy using link aggregation and Automatic Protection Switching (APS).

4.1.2 SM 240

The SM 240 is purpose-built for co-location sites and space constraint applications. It is designed to offer the same rich feature set as the SM 480 together with service scalability in a compact form factor. The SM 240 provides the same compliance, electrical specifications, electrical power connections, environmental requirements, and physical specifications as the SmartEdge 600 router.

4.2 Card Support

The SM 480 and the SM 240 each support the following cards.



4.2.1 Controller Cards

The controller card type designation for the SM 480 and SM 240 is SMRP2. This card has four processors with shared memory and is responsible for running the operating system, the NetOp Element Management System (EMS) software, and external synchronization software.

4.2.2 Line Cards

The SM 480 and the SM 240 both support a rich set of high-density line cards.

4.2.2.1 60-Port Fast Ethernet

The 60-port Fast Ethernet (FE) card, which provides 60 FE ports and two Gigabit Ethernet (GE) ports, is also referred to as the FE–GE card. The FE ports are copper-based 10Base-T or 100Base-TX with selectable speeds of 10 Mbps or 100 Mbps, and the GE ports are copper-based 1000Base-TX with selectable speeds of 100 or 1000 Mbps.

4.2.2.2 10-Port Gigabit Ethernet 1020 Card

The 10-port Gigabit Ethernet 1020 (GE1020) card is designed for traffic management. This PPA2-based card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the ports.

4.2.2.3 20-Port Gigabit Ethernet Card

The 20-port Gigabit Ethernet (GE) card is designed as a subscriber-facing module and as well as a network uplink module. This third-generation PPA card has an increased minimum memory capacity of 20 Gbps. It also has increased port density compared with previous GE cards. It supports up to 48K circuits per card.

4.2.2.4 10-Port Gigabit Ethernet DDR Card

The 10-port Gigabit Ethernet DDR-based card is designed for traffic management using second-generation PPAs. This card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the ports. It also has increased circuit density of 32K with a minimum of 24K with eight Class of Service (CoS) queues.

4.2.2.5 1-Port 10 Gigabit Ethernet Card

The 1-port 10 Gigabit Ethernet (1x10GE) card is designed for traffic management using the second-generation PPAs. This card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the port, which runs at 10 Gbps. The port on this line card can be configured as LAN-PHY at 10320 Mbits/s, or WAN-PHY at 9953.25 Mbits/s.



4.2.2.6 4-Port 10 Gigabit Ethernet Card

The 4-port 10GE line card is designed to be deployed in the SM Family router platform to address the requirements for applications and services with large volumes of network traffic. Each 4-port 10GE card is optimized to deliver Ethernet services, operates as an uplink to other switches and routers in the network or for interconnectivity between two SM family routers.

This PPA3-based card has an increased port density compared with previous 10GE cards. It supports up to 48K circuits per card. This 4-port 10GE card is capable of a maximum throughput of 20 Gbps. It can be used in ingress oversubscription mode at a maximum of 2 to 1 (40 Gbps over four 10GE faceplate ports; 20 Gbps within the card and across the backplane). Ports on this card can be configured in one of two ingress oversubscription modes for incoming traffic: priority-based packet discard for traffic from trusted networks and random-based packet discard from unfiltered nontrusted networks.

4.2.2.7 1-Port 10 Gigabit Ethernet DDR Card

The 1-port 10GE DDR-based card designed for traffic management using second-generation PPAs. This multimode DDR card supports the 10GE LAN-PHY, 10GE WAN-PHY, 10GE-DWDM, or OTN-DWDM modes for the SM Family chassis.

This card supports a minimum of 1 GB of memory capacity and can process data internally to match the speed of the port — 10.3125 Gbps in 10GE LAN-PHY or 10GE DWDM; 9.953 Gbps in 10GE WAN-PHY mode; and 11.0957 Gbps in OTN-DWDM mode.

This card also supports 802.1Q and plain Ethernet encapsulations. For 10GE LAN-PHY, 10GE WAN-PHY, 10GE-DWDM, or OTN-DWDM mode, the maximum MTU is 9,198 bytes.

4.2.2.8 Channelized 8-port OC-3/STM-1 or OC-12/STM-4 Card

The Channelized OC-3/STM-1 or OC-12/STM-4 line card is an 8-port dual-services card with channelization capabilities down to fractional E1/T1. Both SONET (Synchronous Optical Networking) and SDH (Synchronous Digital Hierarchy) mappings are supported. The card hardware supports DS3, DS1, DS0 group (nx64K), and channelization for all Packet over SONET (POS) services.

4.2.3 MEF9 and MEF14 Certification

The Metro Ethernet Forum (MEF) certification program ensures that products and services are compliant to specifications that allow seamless operation through different countries and traversing multiple carrier networks. SM family chassis are certified for MEF 9, a service certification for equipment manufacturers, and MEF 14, traffic management certification for equipment manufacturers.





5 SM Family Software

The SM family of systems runs on the SmartEdge OS software platform, a rich, multipurpose, multiservice operating system that can provide Ethernet services with MPLS transport support, stringent traffic engineering, tiered or hierarchical QoS support, and integrated management capabilities.

The system is high-performance, with line-rate packet forwarding, and robust, ensuring packet reliability and meeting rigorous uptime and availability requirements. It is scalable, supporting hundreds of thousands of customers and services, and flexible, offering support for multiple services. This section describes some of the key features of the SM family's SmartEdge OS software platform.

5.1 Modular OS

The SmartEdge OS offers a modular operating system with separation of control, data, and service planes. This operating system supports multiple processors and uses a software infrastructure where major system functions run as separate tasks, each with its own thread and memory space. The modular design also provides stability and protects against protocol errors.

Contexts are supported as a separate routing and administrative domain, with separate routing protocol instances, addressing, authentication, accounting, and so on, and does not share this information with other contexts.

5.2 Availability, Reliability, and Resilience

The modular SmartEdge OS is highly resilient and field-proven. Faults in one task do not become systemic, permeate to other tasks, or bring control plane hardware down. Each task is independently rebootable without affecting overall system operation, including traffic forwarding. If the primary routing processor must switch over, data traffic continues to flow and established connections remain operational. For most routing and signaling protocols, standards-based graceful restart procedures take effect. The Channelized 8-port OC-3/STM-1 or OC-12/STM-4 Card supports Automatic Protection Switching (APS).

The SM family of systems also supports other mechanisms for ensuring non-disruption and continuity of services. These include fast and scalable restoration for hierarchical VPLS networks, link aggregation for Ethernet resiliency (802.3ad), and Label Switched Paths (LSP) protection using back-up LSPs or Fast Re-Route (FRR).

When IEEE 802.3ad Ethernet Resilience is used to protect the Ethernet link, advanced QoS and traffic engineering such as rate-limiting and policing can be configured per link bundle. Members of the link can be backed up by another



port. Ethernet resiliency can also be applied to bridge groups, either VPLS or non-VPLS. L2VPN pseudowire and L2VPN static connections are supported on Ethernet access link group connections. L2VPN support is also available at the link group pseudo-port level for Ethernet access link groups, at both the VLAN or port level. Mission-critical applications can be protected by provisioning an additional LSP to act as a second back-up for a back-up LSP.

Dual PIM Join is supported to provide resiliency for applications that require multicast operation. This feature limits interruptions from link failure for multicast traffic forwarding.

5.3 Standards-Based OAM Suite

SM family platforms are designed for rapid service provisioning, proactive fault and performance monitoring, and comprehensive diagnostic capabilities. When managed by Ericsson's NetOp Network Service Manager (NSM), service providers can provision end-to-end IP VPN circuits, automate provisioning workflows, and monitor end-to-end services with point-and-click operations.

Configuration and network management protocol support includes RADIUS, TACACS+, and SNMP versions 1, 2, and 3. Ericsson's NetOp EMS allows management of the SM family deployment using an intuitive GUI interface, for simplified network monitoring and provisioning workflows and tasks. The NetOp EMS leverages standards-based monitoring and troubleshooting such as IEEE 802.1ag and incorporates other diagnostic mechanisms including the following:

- Bulk stats
- Bi-directional Forwarding Detection (BFD)
- Virtual Circuit Connectivity Verification (VCCV)
- Media access control (MAC) ping and traceroute
- LSP ping and traceroute
- CPE ping

5.4 Routing Protocols

The SM family supports a full range of routing protocols, including the following:

- Intermediate System-to-Intermediate System (IS-IS)
- Open Shortest Path First (OSPF) v2 and v3
- Routing Information Protocol (RIP) v2 and RIPng
- Border Gateway Protocol (BGP)
- Virtual Router Redundancy Protocol (VRRP: RFC 2338)



- Label Distribution Protocol (LDP)
- Resource Reservation Protocol (RSVP)
- Dynamically Verified Static Routing (DVSR)
- LDP tunneling over RSVP LSPs
- BFD for OSPF, IS-IS, static routes, and individual links in 802.3ad link groups
- Multicast Source Discovery Protocol (MDSP)
- Route maps and policy routing

5.5 Multicast Protocols

The SM family supports Internet Group Management Protocols (IGMP), including IGMP snooping and IGMP filtering, as well as PIM and PIM-Sparse Mode (PIM-SM).

5.6 MPLS, VLANs, and Tunneling

The SM family of systems' flexible and powerful set of transport services includes the following:

- RSVP - Traffic Engineering (RSVP-TE), LDP
- Virtual private wire service (VPWS), Pseudo Wire Emulation Edge-to-Edge (PWE3)
- VPLS, H-VPLS, link aggregation group (LAG) in VPLS
- IP-in-IP tunnels, overlay tunnels, Generic Routing Encapsulation (GRE), and Hard GRE
- 802.1Q virtual LAN (VLAN) and Q-in-Q tunnels
- ATM pseudowire (PW), ATM to Ethernet Internetworking Function (IWF)
- Bridged ATM services (RFC 1483)
- Voice and data over ATM (using AAL5 SDU and cell mode)
- Cross-connect support for Layer 2 traffic

5.7 Quality of Service

The SM family of chassis leverages the SmartEdge OS's feature-rich and granular QoS mechanisms, including the following:

- 802.1p CoS
- Differentiated Services Code Point (DSCP) Type of Service (ToS)
- IP Precedence
- MPLS EXP bits
- DiffServ packet marking by access control list (ACL)
- Ingress policing
- Class-based ingress policing and egress shaping
- Priority queuing and enhanced deficit round robin (EDRR)
- random early detection (RED) and weighted RED (WRED)
- Hierarchical scheduling

5.8 Security

SM family chassis can be fully hardened for secure operation; security features include the following:

- Reverse Path Forwarding (RPF)
- Secure Address Resolution Protocol (ARP)
- Message Digest 5 (MD5) support for routing protocols
- key rollover
- Remote Authentication Dial-In User Service (RADIUS)
- Terminal Access Controller Access Control System Plus (TACACS+)
- Administrative ACLs
- packet mirroring and sampling
- Secure Shell (SSH) v1 and v2
- Kerberos
- Simple Network Management Protocol (SNMP) v3
- IGMP filtering
- VLAN ACLs
- IP security router Layer 2/Layer 3 ACLs



6 CPI

The CPI library is available through the Ericsson CPI extranet (provided that an e-business portal is available). The CPI library contains both hardware documentation and software documentation.

6.1 Hardware Documentation

This section lists hardware documentation provided for the SM family of systems.

6.1.1 Safety and Environment

The guides in Table 1 are completely customized for the SM family of systems.

Table 1 Safety and Environment Guides

Personal Health and Safety Information
System Safety Information

6.1.2 Installation

The guides in Table 2 include content pertaining to both the SM family of systems and the SmartEdge router.

Table 2 Installation Guides

SmartEdge 600 and SM 240 Unpacking Instructions
Transceivers for SmartEdge and SM Family Line Cards

6.1.3 Operation and Maintenance

The guides in Table 3 are completely customized for the SM family of systems..

Table 3 Operation and Maintenance Guides

Inspection And Cleaning Of Optical Connectors
SM 240 Hardware Guide
SM 480 Hardware Guide



6.2 Software Documentation

The software documentation for the SM family of systems documents the capabilities of the SmartEdge OS, on which the SM family of systems is based. In addition to Metro Ethernet capability, the SmartEdge OS also includes a rich set of functions used on the SmartEdge router, Ericsson's intelligent multi-service edge router (MSER). In general, SM family software documentation does not distinguish between features supported on the SM family of systems and the SmartEdge router.

Software documentation is differentiated at the document level: if an entire document describes a feature set that is not supported on SM family platforms, the document is not included in the SM family library. For example, the *Configuring NAT Policies* document, included in the SmartEdge router documentation library, is omitted from the SM family library.

Documentation is not differentiated below the document level; therefore, individual unsupported features may appear in the documentation. For example, the SM family of systems does not support DHCP server. It does, however, support DHCP relay, and therefore the *Configuring DHCP* document is included in the SM family library, including sections on DHCP server. Similarly, command-line interface (CLI) reference documents are inclusive of both SM family and the SmartEdge router features. Unsupported commands may occur in SM family documentation, and supported commands may describe unsupported options or configuration modes. To understand which commands, options, and configuration modes are actually available on your system, it is important to understand the general capability of the SM family platform.

The functionality described in Table 4 is not supported on the SM family of chassis but may appear in SM family documentation.

Table 4 SmartEdge OS Functionality Not Supported on the SM Family of Systems

System Functionality	Notes
Subscribers	Subscribers are the end users of the high-speed access services.
Authentication, Authorization and Accounting	AAA related to subscriber access is not supported.
PPP, PPPoE, PPPoA, PPPoAoE, MLPPP	PPP-based encapsulations are not supported.
Non-Ethernet Layer 2 Encapsulations	Frame Relay and Cisco HDLC encapsulations are not supported.
CLIPS	CLIPS is not supported.
Cross-connections	Only cross-connections among Ethernet and ATM circuits are supported..
Tunnels	L2TP tunnels are not supported. IPsec VPNs are not supported.



Table 4 SmartEdge OS Functionality Not Supported on the SM Family of Systems

System Functionality	Notes
Bindings	Dynamic bindings are not supported. Multibind interfaces and IP pools are not supported.
IP Protocols	DHCP server is not supported. ANCP is not supported.
IP Services	DNS and HTTP Redirect are not supported. Hotlining and Mobile IP (wireless) are not supported. NAT policies are not supported. Service policies are not supported.
QoS	Rate limiting for subscribers (PADI and DHCP) are not supported.
RADIUS	RADIUS, RADIUS attributes, RADIUS-guided profiles, and other RADIUS services for supporting subscriber-related functions is not supported.
Routing	IGMP service profiles are not supported.
Advanced Services	Deep packet inspection (DPI) and IPsec are not supported.

The sections that follow list the documents included in the SM family library.

6.2.1 Planning

Table 5 Planning Guides

Network Impact Report

6.2.2 Installation

Table 6 Software Installation Guides

Installing the SmartEdge OS

6.2.3 Initial Configuration

Table 7 Initial Configuration Guides

Configuring Contexts and Interfaces
Managing Configuration Files
Performing Basic Configuration Tasks



6.2.4 Operation and Maintenance

6.2.4.1 Fault Management

Table 8 Fault Management Guides

Alarms and Probable Causes
SNMP MIB Notifications
Logging
Debugging

6.2.4.2 Configuration Management

6.2.4.2.1 Bridges and Cross-Connections

Table 9 Bridges and Cross-Connection Guides

Configuring Bridging
Configuring Cross-Connections

6.2.4.2.2 Cards, Ports, and Channels

Table 10 Cards, Ports, and Channels Guides

Configuring Ethernet Ports
Configuring Cards

6.2.4.2.3 Circuits

Table 11 Circuits Guides

Configuring Circuits
Configuring Link Aggregation

6.2.4.2.4 IP Routing Protocols

Table 12 IP Routing Protocol Guides

Configuring Basic IP Routing
Configuring BFD
Configuring BGP
Configuring DVSR
Configuring IP Multicast
Configuring IS-IS



Configuring OSPF
Configuring RIP
Configuring Routing Policies

6.2.4.2.5 IP Service Policies

Table 13 IP Service Policy Guides

Configuring Forward Policies

6.2.4.2.6 IP Service Protocols

Table 14 IP Service Protocol Guides

Configuring ARP
Configuring DHCP
Configuring ND
Configuring NTP

6.2.4.2.7 IP Services

Table 15 IP Services Guides

Configuring ACLs
Configuring DNS

6.2.4.2.8 MPLS Routing

Table 16 MPLS Routing Guides

Configuring BGP/MPLS
Configuring L2VPN
Configuring LDP
Configuring MPLS
Configuring VPLS
Configuring Port Pseudowire Connections

6.2.4.2.9 Network Management

Table 17 Network Management Guides

Configuring Bulkstats
Configuring RMON and SNMP

**6.2.4.2.10** Operations, Administration, and Maintenance*Table 18 Operations, Administration, and Maintenance Guides*

Configuring Ethernet CFM

6.2.4.2.11 QoS*Table 19 QoS Guides*

Configuring Circuits for QoS
Configuring Flow Admission Control
Configuring Rate-Limiting and Class-Limiting
Configuring Queuing and Scheduling

6.2.4.2.12 Subscriber Management*Table 20 Subscriber Management Guides*

Configuring Authentication, Authorization, and Accounting
Configuring Bindings
Configuring RADIUS
Configuring RADIUS Attributes

6.2.4.2.13 Tunnels*Table 21 Tunnels Guides*

Configuring GRE Tunnels
Configuring Single-Circuit Tunnels

6.2.4.3 **Performance Management***Table 22 Performance Management Guides*

Configuring RFlow
Load Balancing
Enterprise MIBs
Standard SNMP MIBs



6.2.4.4 Security Management

Table 23 Security Management Guides

Configuring RFlow
Load Balancing
Enabling Licensed Features
Restricting Access to the CLI
Configuring Malicious Traffic Detection and Monitoring

6.2.4.5 Hardware Management

Table 24 Hardware Management Guides

Managing Hardware

6.2.4.6 Software Management

Table 25 Software Management Guides

Managing Files
Performing Basic System Tasks

6.2.4.7 CLI Commands

Table 26 CLI Command Guides

All command files are included in the SM family library.
--

6.2.5 Emergency

Table 27 Emergency Guides

Recovering Passwords

6.2.6 Interface

Table 28 Interface Guides

Configuring Communications with the NetOp EMS





Glossary

AAA

authentication, authorization, and accounting

ACL

access control list

ANCP

Access Node Control Protocol

APS

Automatic Protection Switching

ARP

Address Resolution Protocol

AS

autonomous system

ATM

Asynchronous Transfer Mode

ATMWFQ

Asynchronous Transfer Mode weighted fair queuing

BFD

Bidirectional Forwarding Detection

BGP

Border Gateway Protocol

CoS

class of service

CSPF

Constrained Shortest Path First

DHCP

Dynamic Host Configuration Protocol

DNS

Domain Name System

DSCP

Differentiated Services Code Point

DVSR

dynamically verified static routing

DWDM

dense wave division multiplexing

E-LAN

Ethernet virtual private LAN

E-LINE

Ethernet virtual private line

E-TREE

Ethernet virtual private tree

EDRR

enhanced deficit round-robin

EGPs

Exterior Gateway Protocols

ELL

Ethernet local loop

FRR

Fast Re-Route

GRE

Generic Routing Encapsulation

H-QoS

hierarchical QoS

H-VPLS

hierarchical VPLS

HA

home agent

iBGP

internal BGP

ICMP

Internet Control Message Protocol

IGMP

Internet Group Management Protocol

**IP**

Internet Protocol

IPv4

IP, Version 4

IPv6

IP, Version 6

IS-IS

Intermediate System-to-Intermediate System

IWF

Internetworking Function

LAG

link aggregation group

LAN

local area network

LAN-PHY

local area network physical layer standard

LDP

Label Distribution Protocol

L2TP

Layer 2 Tunneling Protocol

L2VPNs

Layer 2 Virtual Private Networks

LSP

Label Switched Path

MD5

Message Digest 5

MDSP

Multicast Source Discovery Protocol

MPLS

Multiprotocol Label Switching

NAT

Network Address Translation

NEBS

Network Equipment-Building System

NTP

Network Time Protocol

OSPF

Open Shortest Path First

PE

provider edge

PPAs

Packet Processing ASICs

PPP

Point-to-Point Protocol

PPPoE

PPP over Ethernet

PQ

priority queuing

PVC

permanent virtual circuits

PWE3

Pseudo Wire Emulation Edge-to-Edge

PWFQ

priority weighted fair queuing

QoS

quality of service

RADIUS

Remote Authentication Dial-In User Service

RED

random early detection

RIP

Routing Information Protocol

RoHS

Restriction of Hazardous Substances

RPF

reverse path forwarding

RSTP

Rapid Spanning Tree Protocol

RSVP

Resource Reservation Protocol

SMRP

SM Route Processor

**SPF**

Shortest Path First

SSH

Secure Shell

TACACS+

Terminal Access Controller Access Control System Plus

TCP

Transmission Control Protocol

TDM

time-division multiplexing

ToS

type of service

UDP

User Datagram Protocol

VCCV

Virtual Circuit Connectivity Verification

VLL

virtual leased line

VoIP

Voice over IP

VPLS

virtual private LAN service

VPN

Virtual Private Network

VPWS

virtual private wire service

VRID

virtual router ID

VRRP

Virtual Router Redundancy Protocol

VSA

vendor-specific attribute

WAN

wide area network

WAN-PHY

wide area network physical layer standard

WRED

weighted random early detection