E-series Broadband Services Routers

The Juniper Networks E-series platform is a central component of the broadband edge, with a proven architecture that has been deployed in many different roles in the world's largest broadband networks, the E-series family is capable of providing multiple services-including broadband remote access server, broadband video services, dedicated access, 802.11 wireless subscriber management, voice over IP, internet access, security services, network address translation, and others - on a single platform. The modular architecture of the E-series ensures that Service Provider need only deploy the number and types of routers that fit their needs and budget, while they retain the ability to add capacity and services as their needs grow.

The Juniper Networks E-series Edge Routers meet the diverse requirements at the service provider network edge. In more than 260 production networks worldwide, service providers rely on robust Edge Service Processors (ESP) programmable ASIC technology for predictable performance and service flexibility. The innovative design of the ERX provides a fast path for IP traffic by taking the route processor out of the forwarding path and distributing route and policy information to each line module.

This carrier-class architecture allows Juniper Networks to combine Broadband Remote Access Server (B-RAS) and dedicated access capabilities (T1/E1 and above) on a single, integrated platform. With an agnostic approach to access technologies featuring support for IP, ATM, and Frame Relay, the E-series routers provide a highly reliable, scalable, and flexible routing platform for deploying IP services. This flexibility lowers ongoing operational costs by enabling rapid deployment of new edge services from a single router platform and also provides the ability to offer new services in the future.

E-series platforms provide the port variety, performance, and flexible IP service capabilities to meet the evolving demands of service providers. The ability to combine a wide range of high-performance interfaces ranging from DS-0 through OC-48c/STM-16 with a consistent feature set and predictable performance enables the E-series to satisfy critical applications at the edge, including voice, video and data. Hardware-based Multiprotocol Label Switching (MPLS) and fine-grained Quality of Service (QoS) features ensure the ability to support a variety of traffic types ranging from the best-effort requirements of IP traffic to the time-sensitive requirements of legacy ATM, and Frame Relay traffic.

Features	Benefits
Cost-efficient scalability	• Industry-leading performance with aggregate throughput rates ranging from 5 Gbps to 40 Gbps • All features and services available across all ports without sacrificing performance • Maximizes investment by deploying multiple IP-based edge services from a single E-series platform • Scales to support large, complex forwarding tables • Interoperable with other vendors' equipment for easy integration into existing networks
Dependability	• Redundant switch fabric, power, and route processors to ensure continuous operation with minimal downtime • 1:N line card redundancy • Single JUNOSe software release for all E-series platforms • Reliable and predictable performance for latency-sensitive traffic, such as voice over IP and streaming video • Separate control and forwarding planes ensure that routing and forwarding functions do not compete for the same resources • Stateful switch over to maintain subscriber session during switch to redundant routing processor
Service flexibility	• Programmable ASICs enable deterministic performance to be applied to existing services as well as future services • Agnostic access supports both IP and legacy ATM and Frame Relay • Combined B-RAS and dedicated access support on a single router platform ensures robust solution for evolving needs of network edge • Fine-grained QoS enables increased revenue streams via service differentiation

Router	Aggregate Throughput	Line Modules per Chassis	Chassis per Rack	Switch Fabric and Routing Engine Redundancy	Line Module Redundancy
310	10 Gbps	2	14	No	No
705	5 Gbps	5	7	Yes	Yes
710	10 Gbps	5	7	Yes	Yes
1410	10 Gbps	12	3	Yes	Yes
1440	40 Gbps	12	3	Yes	Yes

ERX-310

The ERX-310 Broadband Services Router is a very compact, high-performance routing platform targeted at small, distributed environments. The 3-slot router contains a 10 Gbps switch fabric / route processor (SRP) and 2 slots dedicated to line modules. The ERX-310 router utilizes the same ASIC-based line modules and I/Os used across the entire E-series product line and supports up to OC-12c/STM-4 and Gigabit Ethernet speeds.

ERX-705 and ERX-710 Broadband Services Routers

The ERX-705 and ERX-710 Broadband Services Routers are compact, high-performance routing platforms targeted at environments where space is at a premium. Each 7-slot router contains either a 5 Gbps or 10 Gbps switch fabric / route processor (SRP) with optional SRP redundancy for high availability and 5 slots dedicated to line modules. The ERX-705 and ERX-710 routers utilize the same line modules and I/Os used across the entire E-series product line and support up to OC-12c/STM-4 and Gigabit Ethernet speeds.

ERX-1410 Broadband Services Router

The ERX-1410 Broadband Services Router is a high-performance routing platform targeted at larger environments. Each 14-slot router contains a 10 Gbps switch fabric / route processor (SRP) with optional SRP redundancy for high availability and 12 slots dedicated to line modules. The ERX-1410 utilizes the same line modules and I/Os used across the entire E-series product line and supports up to OC-12c/STM-4 and Gigabit Ethernet speeds.

ERX-1440 Broadband Services Router

The ERX-1440 Broadband Services Router is the highest performance routing platform in the E-series product line and is targeted at the largest edge environments. Each 14-slot router contains a 40 Gbps switch fabric / route processor (SRP) with optional SRP redundancy for high availability and 12 slots dedicated to line modules. The ERX-1440 utilizes the same ASIC-based line modules and I/Os from the E-series product line and supports up to OC-48c/STM-16 and Gigabit Ethernet speeds.

High Availability

The E-series design provides the highest levels of redundancy and resiliency to ensure that VPN customers and broadband subscribers stay connected.

- Stateful Switch Router Processor (SRP) switchover
- Line Module Redundancy
- I/O Module Redundancy
- Automatic Protection Switching (APS)

Key Components

The ERX system uses a modular, carrier-class design with a passive midplane, active front-insert line modules, and high-reliability, rear-insert input/output (I/O) modules. All chassis types use the same line modules and I/O modules. Consequently, service providers can limit their inventories of spare modules and easily upgrade from the smaller to the larger chassis as the subscriber base at a POP or central office (CO) increases. The 7-slot and 14-slot systems support full redundancy and line module hot-swapping to optimize network uptime.

The system uses a highly distributed, multiprocessor architecture that distributes processing function to each port in the system to speed decision making and scale system growth. Consequently, the ERX system supports next-generation routing features that provide differentiated services, wire-speed packet filtering, buffer management, and scheduling.

The ERX system makes use of application-specific integrated circuits (ASICs) in order to speed IP packet processing. The Juniper Networks custom ASICs, Edge Services Processors, help meet the forwarding demands of the Internet edge. Older-generation routers cannot cope with the processor demands of QoS functions, such as classification, queuing, and scheduling while routing packets at wire speed. The ERX system overcomes these limitations with its hardware-assisted architecture.

Figure 1: E-Series Routers

JUNOSe OS

The JUNOSe software architecture is modular, object oriented, and component-based to increase overall system reliability, ease software upgrades and reduce new feature development time. The modularity of the JUNOSe system architecture improves stability and reliability by ensuring that the behavior of one program module does not adversely affect others, a direct contrast to older, monolithic, code-based designs.

SDX-300 Service Delivery System

Juniper Networks Service Deployment System (SDX-300) is designed to work with the E-series routers to enable service providers to rapidly create and deploy a portfolio of new revenue-generating services, individualize and enhance their subscribers' experience, and at the same time retain full control of their underlying networks. Via the SDX, both enterprise and residential broadband subscribers are provided mechanisms for requesting new services and indicating specific needs that will support applications and services including:

- Bandwidth on Demand
- Video Services (IPTV, Video on Demand, Video Conferencing)
- IP Telephony
- Interactive Gaming
- Tiered Internet Access

E-series Product Family

Technical Specifications

Part Number	Base-3	Base-7	Base-14	Base-1440
	includes 3-slot chassis,mid-plane, fan, DC power and documentation	includes 7-slot chassis,mid-plane, fan, DC power and documentation	includes 14-slot chassis, mid-plane, fan, DC power and documentation	includes 14-slot chassis, mid-plane, fan, DC power and documentation
Physical Dimensions				
Height	5.20 in. (13.21 cm)	10.5 in. (26.67 cm)	22.75 in. (57.78 cm)	22.75 in. (57.78 cm)
Width	19 in. (48.26 cm)	19 in. (48.26 cm)	19 in. (48.26 cm)	19 in. (48.26 cm)
Depth	16 in. (40.64 cm)	16 in. (40.64 cm)	16 in. (40.64 cm)	16 in. (40.64 cm)
Weight: Chassis Only	25.5 lb (11.57 kg)	22 lb (9.9 kg)	42 lb (18.9 kg)	42 lb (18.9 kg)
Fully Configured	36 lb (16.33 kg)	46 lb (20.7 kg)	88 lb (39.6 kg)	88 lb (39.6 kg)
Architecture	Midplane design: front-loading active line modules, rear-loading passive I/O modules			
Power (AC option available)	DC:500 watt, -48 VDC AC: 500 watt, 90-265 VAC @ ~ 5A	1400 watt, -48VDC	2400 watt, -48 VDC	2400 watts, -48 VDC
Safety Approvals	UL1950, CUL950, IEC950, AS3260, EN60950, CE Mark			
Telecom Approvals	NEBS GR63, 1089, Telecom Directive			
Operating Temperature	41°- 104°F (4°- 40°C)	32°-122° F; (0° - 50° C)		
Humidity	5%-95% non-condensing	10% - 95% non-condensing		
Number of Slots	3 slots 1 reserved for SRP 2 available for line cards	7 slots 2 reserved for SRP 5 available for line cards	14 slots 2 reserved for SRP 12 available for line cards	14 slots 2 reserved for SRP 12 available for line cards
Resiliency	• Redundant Power AC and DC* • Hot-swap line modules • Non-disruptive software download • Modular software architecture		• Hot-swap line modules • Redundant Switch Fabric option • Non-disruptive software download • Auto-failover of line modules (Nx1 redundancy) • 1:1, 1:N line module redundancy	
Performance	Wire-speed throughput with 40 byte packets on all interfaces			

* AC Power for ERX-310 only

Product Number	Description
CE1-FULL	20-Port Channelized E1 Frame Line Module.
CT1-FULL	24-Port Channelized T1/ J1 Frame Line Module
HSSI-3F	3-port HSSI Line Module
ERX-X21-V35-MOD	16-port X.21/V.35 Line Module
High Speed Line Module Options	
CT3 & T3/E3 Line Module Options	
ERX-UT3E3OCX-MOD	12-port Unchannelized T3/E3 Line Module
CT3-12-F0	12-Port Channelized to DS0/Unchannelized T3 Frame-Based Line Module
Optical Line Module Options*	
ERX-OCXA256M-MOD	4-port OC-3/STM-1 or 1-port OC-12/STM-4 or 4-port T3/DS-3 ATM Line Module
OC3/OC12-POS	4-port OC-3/STM-1 or 1-port OC-12/STM-4 POS Line Module
ERX-OC48ST16-MOD	1-port OC-48/STM-16 POS Line Module
Channelized Optical Line Module Options	
COCX/STMX-F0	4-port OC-3/STM-1 or 1-port OC-12/STM-4 Channelized to DS0 Frame-Based Line Module
Ethernet Line Module Options	
ERX-GEFE256M-MOD	2-port (1 active, 1 redundant) GE or 8-port 10/100 FX Line Module
ERX-GE-MOD	4-port (2 active, 2 redundant) GE
VPN Line Module Options	
ERX-IPSEC-MOD	IPSec Line Module: IPSec line module with encryption.
ERX-SERVICE-MOD	Tunnel Service Line Module: supports L2TP LNS tunnels and sessions, multicast tunnels, and GRE tunnels. Supports NAT, stateful firewall and port mirroring.
Combination Cards	
ERX-GE-MOD	4-port (2 active, 2 redundant) GE plus subscriber mangement server features
ERX-OCxGE-MOD	4-port OC-3/STM-1 ATM (2 active, 2 redundant) 2 port GE (1 active, 1 redundant)

*Optical line modules support optional APS

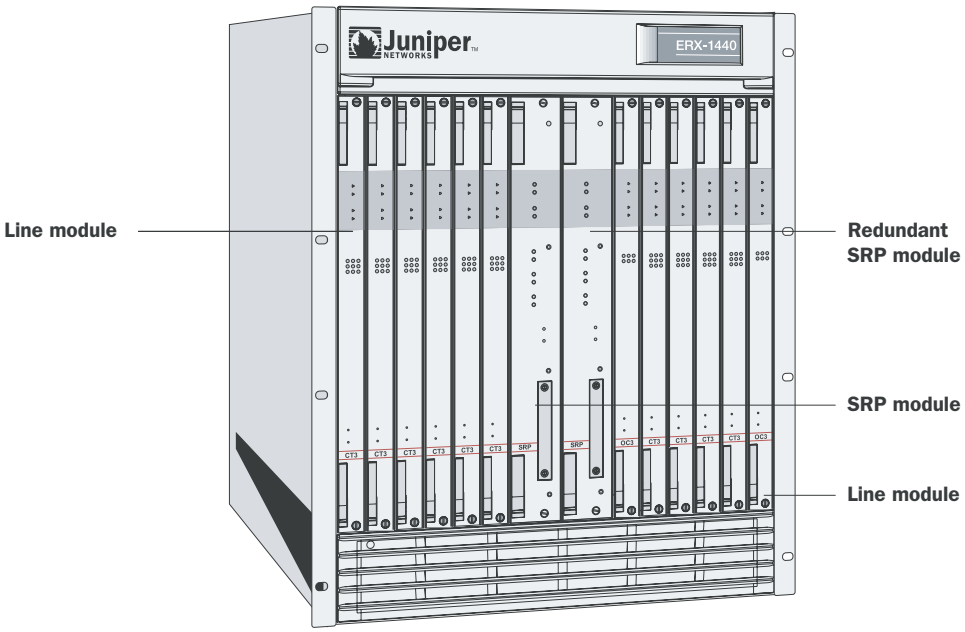
Switch Route Processor (SRP) Specifications

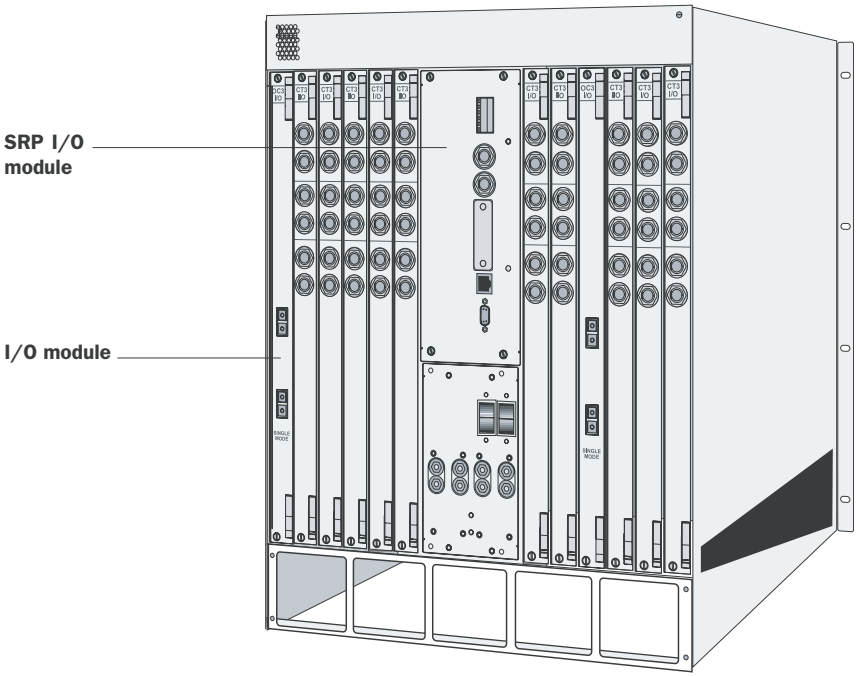
The Switch Route Processor (SRP) contains the 5, 10 or 40 Gbps switch fabric for the chassis, and is responsible for distributing code and route table information to the individual line modules. One SRP line module and I/O pair is required per chassis; a redundant SRP line module can also be installed to maximize uptime.

SRPs	SRP-5 & SRP I/O, SRP-10 & SRP I/O, SRP-40 & SRP I/O
Fabric Speed	SRP-5: 5 Gbps, SRP-10: 10 Gbps, SRP-40-ECC: 40 Gbps
Management Ports	One RJ45 10/100 Ethernet port, One DB9 RS232
Clock Ports	Two 3-pin wire-wrap (US), Two BNC (E1)

Management Specifications

SNMP	V1/V2/V3 bilingual agent
MIB Support	MIB-2, ATM, FR, IP, PPP, SONET, OSPF, BGP-4, RIP
Command Line Interface	Industry de facto, compatible with scripts developed for Cisco routers; automated scripting language Access via management console or telnet
Statistics	Collected down to the per packet level, by SNMP poll or by efficient FTP bulk transfer Telnet Local access available via management console
Element Management	System Network Management Center (NMC-RX)
Policy Management	Service Deployment System (SDX)


Juniper NETWORKS
ERX-1440
Line module
Redundant SRP module
SRP module
Line module


SRP I/O module
I/O module

CORPORATE HEADQUARTERS AND SALES HEADQUARTERS FOR NORTH AND SOUTH AMERICA
Juniper Networks, Inc.
1194 North Mathilda Avenue
Sunnyvale, CA 94089 USA
Phone: 888-JUNIPER (888-586-4737)
or 408-745-2000
Fax: 408-745-2100
www.juniper.net

EAST COAST OFFICE
Juniper Networks, Inc.
10 Technology Park Drive
Westford, MA 01886-3146 USA
Phone: 978-589-5800
Fax: 978-589-0800

ASIA PACIFIC REGIONAL SALES HEADQUARTERS
Juniper Networks (Hong Kong) Ltd.
Suite 2507-11, Asia Pacific Finance Tower
Citibank Plaza, 3 Garden Road
Central, Hong Kong
Phone: 852-2332-3636
Fax: 852-2574-7803

EUROPE, MIDDLE EAST, AFRICA REGIONAL SALES HEADQUARTERS
Juniper Networks (UK) Limited
Juniper House
Guildford Road
Leatherhead
Surrey, KT22 9JH, U. K.
Phone: 44(0)-1372-385500
Fax: 44(0)-1372-385501

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100074-005 Dec 2004