

RS 16000 Gigabit Ethernet Aggregation Router

KEY APPLICATIONS

- Massive Gigabit Ethernet aggregation in a small form factor — 60 wire-speed Gigabit Ethernet ports in 5 rack units — with 10-Gigabit Ethernet uplinks
- Rich service creation router with MPLS enables the deployment of IP VPNs, Transparent LAN Services, Virtual Leased Lines, and bandwidth shaping and carving
- Create 10-Gigabit Ethernet or CWDM POP-to-POP backhaul or regional transport networks

PRODUCT OVERVIEW

The RS 16000 is a new generation of aggregation router designed to aggregate Gigabit Ethernet at line rate while enabling 10-Gigabit metro networks. It provides full Metro service-creation capabilities through a hardware-based architecture in the industry's highest density chassis for Gigabit Ethernet aggregation. The RS 16000 delivers 60 wire-speed Gigabit Ethernet ports in a 5 rack unit chassis, saving rack space and decreasing operational complexity by reducing the number of deployed network elements. The modular chassis is designed to grow as customers are added — the RS 16000 can be deployed with as few as 4 Gigabit Ethernet ports, and is expandable up to 60 full wire-speed Gigabit Ethernet ports. In addition, the RS 16000's bandwidth capacity will scale as the network grows by supporting 8 Gigabit/CWDM and will support 10-Gigabit Ethernet as the standard is finalized.

Like all Riverstone RS routers, the RS 16000 features full-function routing capabilities — OSPF, BGP-4, and IS-IS — as well as an unmatched range of service-enabling features, including on-demand bandwidth provisioning and hardware-based MPLS VPNs. By supporting Riverstone's Metro-optimized MPLS implementation, the RS 16000 serves as an ideal Label Edge Router (LER) or Label Switch Router (LSR) for deployment of an MPLS VPN, Transparent LAN, or Virtual Leased Line solution. Riverstone's Lightweight Flow Accounting Protocol (LFAP) enables reliable, real time billing with wire-speed data collection to turn network services into profit generating revenue. Overall, the RS 16000 is designed for maximum capabilities at a minimum size for the most demanding points in a service provider's network.

CUSTOMER CHALLENGES & RS 16000 SOLUTIONS

Challenge

Aggregate Gigabit Ethernet while reducing operational complexity and limiting rack space utilization

High-density traffic aggregation with WDM or 10-Gigabit uplink capabilities to the metro core

Extract maximum revenue from a 7-foot rack

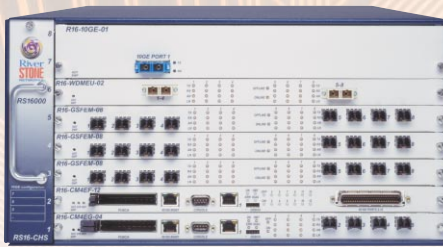
Solution

Highest Gigabit Ethernet density available means fewer deployed network elements, lowering space usage and management costs. Modular design allows service providers to grow the network as the customer base grows.

Supports high bandwidth interfaces: Gigabit Ethernet over WDM and will support 10-Gigabit Ethernet as the standard is finalized. Incorporates state-of-the-art lasers and custom ASICs for data transmission distances of 70 km or more.

Massive density in a small form factor combined with full Internet caliber routing — OSPF, BGP-4, IS-IS — as well as Metro optimized MPLS delivers best in class service creation capabilities.





Ordering Information

Part No.	Product Description
R16-CHS	8 slot chassis, which includes backplane, switch fabric, clock and fan
R16-CM4EG-04	Control module with 1 RJ45 10/100 and 4 Gigabit Ethernet ports (one required, second for redundancy)
R16-CM4EF-12	Control module with 1 RJ45 10/100 and 12 RJ21 10/100 Fast Ethernet ports
R16-PAC	AC power supply (up to three: one required for non-MPLS Gigabit Ethernet and Gigabit Ethernet over CWDM, two required for MPLS Gigabit Ethernet)
R16-PDC	DC power (up to three: one required for non-MPLS Gigabit Ethernet and Gigabit Ethernet over CWDM, two required for MPLS Gigabit Ethernet)

For complete ordering information, including specific modules, contact your Riverstone representative at (408) 878-6500. You may also visit our Website at www.riverstonenet.com.

Platform Features

Feature-rich Wire-speed Services

- IP routing, unicast, and multicast
- Routing in hardware on each line card
- LSR and LER MPLS support in hardware
- RSVP-TE and LDP-CR traffic engineering support
- Security (ACLs, L2 filters)
- Layer 4 application-flow switching and QoS
- Network Address Translation (NAT)
- Hardware-based Rate Limiting
- Jumbo Frame support
- VLANs based on port or protocol
- Server Load Balancing (LSNAT)

Highly Fault Tolerant

- Redundant CPU, power supplies
- Hot-swappable media modules
- Standards-based VRRP
- Layer 2 and 3 redundant protocol support

Extensive Management

- Wire-speed full RMON/RMON2
- SNMP manageable
- SSH and Telnet client secured by: RADIUS and TACACS+
- RS-232 (out-of-band management)
- Command Line Interface (CLI)

Interfaces

10/100 Base-TX (part of the control module)
 1000 Base-SX
 1000 Base-LX
 1000 Base-LH
 4 GbE Lambda on bi-directional CWDM (intermediate range)
 4 GbE Lambda on uni-directional CWDM (long range)
 10 GbE

Specifications

Capacity

Up to 4,096 VLANs
 Up to 250,000 routes
 Up to 20,000 security/access control filters
 Up to 1,600,000 Layer 2 MAC addresses
 Up to 8,000,000 Layer 4 application flows

Performance

Up to 170 Gbps non-blocking switch fabric
 Up to 90 million packets-per-second routing throughput
 MTBF > 200,000 hours

Physical

Dimensions: 8.75" H x 17" W x 21.25" D
 (22.2 cm x 43.2 cm x 54.0 cm)
 Weight: 35 lbs (15.8 kg)

Environmental

Operating Temp: +0° to +40°C (32° to 104°F)
 Non-operating Temp: -40° to +70°C (-40° to 158°F)
 Operating Relative Humidity: 10% to 90% (non-condensing)
 Non-operating Relative Humidity: 5% to 95% maximum (non-condensing)
 Altitude, Operating and Non-operating: 10,000 ft (3,000 m) maximum
 Shock and Vibration: GR63

Power Requirements

AC Power
 Input voltage: 100-240 VAC
 Input current: 12 A; 6 A
 Frequency: 50 to 60 Hz
 DC Power
 Input voltage: 48 to -60 VDC
 Input current: 50 A

Agency Standards and Specifications

Safety: Certified UL1950, CSA C22.2 No. 950, EN60950, IEC950, and 72/73/EEC
 Electromagnetic compatibility: Compliant with the requirements of FCC Part 15, CSA C108.8, EN55022, VCCI, EN50082-1, and 89/336/EEC

Standards Supported

IETF Standards Support

RFC No.	Title
RFC 768	UDP
RFC 783	TFTP
RFC 791	IP
RFC 792	ICMP
RFC 793	TCP
RFC 826	ARP
RFC 854	Telnet
RFC 951	BootP
RFC 1058	RIP v1
RFC 1075	DVMRP
RFC 1112	IGMP
RFC 1157	SNMPv1
RFC 1256	ICMP Router Discover Message
RFC 1265	BGP Protocol analysis
RFC 1266	Experience with the BGP Protocol
RFC 1267	BGP-3
RFC 1293	Inverse ARP
RFC 1332	PPP IPCP
RFC 1349	Type of service in the Internet Protocol suite
RFC 1397	BGP Default Route Advertisement
RFC 1483	Multiprotocol encapsulation over AAL5
RFC 1490	Multi-protocol over Frame Relay
RFC 1519	CIDR
RFC 1542	BootP
RFC 1552	PPP IPXCP
RFC 1570	PPP LCP extensions

RFC 1583	OSPF v2
RFC 1631	IP NAT
RFC 1638	PPP BCP
RFC 1656	BGP-4 implementation
RFC 1661	PPP
RFC 1662	PPP in HDLC-like framing
RFC 1723	RIP-2
RFC 1771	BGP-4
RFC 1772	Application of BGP in the Internet
RFC 1812	Router requirements
RFC 1966	BGP Route Reflection
RFC 1990	PPP MLP
RFC 1997	BGP communities attribute
RFC 2131	DHCP
RFC 2138	RADIUS
RFC 2139	RADIUS accounting
RFC 2178	OSPF
RFC 2225	Classical IP and ARP over ATM
RFC 2236	IGMP-2
RFC 2338	VRRP
RFC 2362	PIM-SM
RFC 2391	LSNAT

IETF Standards MIB Support

RFC No.	Title
RFC 1471	PPP-LCP-MIB
RFC 1472	PPP-SEC-MIB
RFC 1473	PPP-IP-NCP-MIB
RFC 1474	PPP-BRIDGE-NCP-MIB
RFC 1493	BRIDGE-MIB
RFC 1595	SONET-MIB
RFC 1657	BGP4-MIB
RFC 1695	ATM-MIB
RFC 1724	RIPv2-MIB
RFC 1757	RMON-MIB
RFC 1850	OSPF-MIB
RFC 1907	SNMPv2-MIB
RFC 2011	IP-MIB
RFC 2012	UDP-MIB
RFC 2013	TCP-MIB
RFC 2021	RMON2-MIB
RFC 2096	IP-FORWARD-MIB
RFC 2115	FRAME-RELAY-DTE-MIB
RFC 2233	IF-MIB
RFC 2494	DS0-MIB
	DS0BUNDLE-MIB
RFC 2495	DS1-MIB
RFC 2496	DS3-MIB
RFC 2571	SNMP-FRAMEWORK-MIB
RFC 2572	SNMP-MPD-MIB
RFC 2573	SNMP-TARGET-MIB
	SNMP-NOTIFICATION-MIB
RFC 2574	SNMP-USER-BASED-SM-MIB
RFC 2575	SNMP-VIEW-BASED-ACM-MIB
RFC 2576	SNMP-COMMUNITY-MIB
RFC 2591	DISMAN-SCHEDULE-MIB
RFC 2618	RADIUS-AUTH-CLIENT-MIB
RFC 2620	RADIUS-ACC-CLIENT-MIB
RFC 2665	ETHER-LIKE-MIB
RFC 2668	MAU-MIB
RFC 2669	DOCS-CABLE-DEVICE-MIB
RFC 2670	DOCS-IF-MIB
RFC 2674	P-Bridge-MIB, Q-Bridge-MIB
RFC 2737	ENTITY-MIB
RFC 2787	VRRP-MIB

Standards and Protocols

IP routing:	RIPv1/v2, OSPF, BGP-4, IS-IS
Multicast support:	IGMP, DVMRP, PIM-DM, PIM-SM
QoS:	Application level, RSVP
IEEE 802.1D	IEEE 802.1p
IEEE 802.1Q	IEEE 802.3
IEEE 802.3ad	IEEE 802.3u
IEEE 802.3x	IEEE 802.3z



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