



## Ray Aggregation Switch

### PRODUCT OVERVIEW

The Ray Aggregation Switch is a highly versatile and advanced networking device that offers an optimal blend of power, flexibility, and intelligence. It is specifically designed to meet the demands of modern network deployments, making it an ideal choice for a wide range of applications, including enterprise network access, aggregation, core, and data center top-of-rack (ToR) deployments. With its robust features and capabilities, the Ray Switch provides high-performance support for IoT, mobile, and cloud applications.

#### Performance and Scalability:

The Ray Switch supports 10 Gigabit Ethernet connectivity through a hot-pluggable 10 Gigabit SFP+ transceiver. This enables high-speed data transfer and allows for a reach of up to 300 meters over multimode fiber and between 10 to 40 km over single-mode fiber, depending on the optical module selected. This flexibility ensures reliable connectivity over various distances. Additionally, the Ray Switch offers built-in redundant AC and DC power supplies, providing added resilience and suitability for diverse environmental applications.

#### Reliability and Network Management:

One of the key features of the Ray Switch is its Virtual Switch Framework (VSF) functionality. This innovative feature allows multiple switches to be virtualized into a single logical device. By doing so, network management becomes simplified, and overall performance, port density, and reliability are enhanced. The VSF functionality enables efficient sharing of information and data tables between different switches, resulting in improved network performance and easier management for network administrators. Moreover, the Ray Switch supports G.8032 v2, which offers sub-50ms protection and recovery switching for Ethernet traffic in diverse carrier ring topologies, including single ring, tangent ring, intersecting rings, and double rings.

### Key Features

- › Cost-effective, reliable and secure Ray Layer 3 switch series
- › Flexible Management via Ray One
- › Right size deployment with choice of 8, 24 and 48 port Gigabit and Fast Ethernet models
- › Up to 370W PoE+ to power IoT, APs and cameras
- › REST API support
- › Simple deployment with Zero Touch Provisioning
- › Managed via single pane of glass dashboard
- › Remote Packet Capture Tools via Ray One
- › Automatic Firmware upgrades
- › SNMP/Syslog Integration
- › IPv4/6 ACL support
- › 802.1q VLAN tagging
- › DHCP Snooping
- › 802.1X Authentication
- › 10/100/1000 Mbps RJ45
- › 4x 1000 Mbps SFP models available
- › PoE and PoE+ models available for device level powering



## Enhanced Features

### Enhanced Security:

The Ray Switch incorporates comprehensive security features to safeguard network resources and protect against unauthorized access. It supports IEEE 802.1X port-based access control, which ensures that all users are authorized before being granted network access. User authentication is carried out using a RADIUS server, adding an extra layer of security. The switch also offers Ingress/Egress Access Control Lists (ACLs), allowing administrators to deny packets based on L2/L3/L4 headers. This enables the protection of sensitive network resources by filtering traffic and preventing unauthorized access. Additionally, the Ray Switch supports time-based ACLs, which allow for service-specific access control based on specific time frames.

### Multicast Features:

The Ray Switch provides robust multicast capabilities to efficiently handle multicast traffic in the network. It supports Multicast VLAN Register (MVR), which enables selective traffic exchange between different VLANs for bandwidth optimization and improved security. The switch also features MVR Trunk functionality, which associates a multicast VLAN to the trunk port, consolidating VLAN data into the same link for enhanced efficiency.

### Hardware Features:

With its compact 1U design, the Ray Switch offers a space-saving solution for network deployments. It provides a choice of 10Gb and 25Gb modular uplink ports, allowing for flexible connectivity options based on specific requirements. The switch also supports Power over Ethernet (PoE) with different power levels (30W, 60W, and 90W), enabling efficient powering of connected devices. The Ray Switch features a non-blocking, wire-speed design, ensuring optimal performance and throughput. It also incorporates MACsec encryption on access and modular uplink ports, providing secure link encryption for enhanced data protection. Furthermore, the switch offers flexible cooling options with front-to-back or back-to-front airflow, allowing for seamless integration into different network environments.

### Next-Generation Enterprise Solution:

Designed for next-generation digital enterprises, the Ray Switch delivers high-performance edge and aggregation capabilities. It supports multi-gigabit Ethernet for high-speed access points and IoT devices, meeting the increasing demands of modern network environments. By upgrading to an advanced license, the Ray Switch can provide deep visibility with application recognition, identification, and flow capture from Layer 4 to Layer 7. This advanced visibility enables network administrators to gain valuable insights into network traffic and optimize network performance.

### Cutting-edge Operating System:

The Ray Switch operates on AOS-CX, a modern, database-driven operating system that simplifies complex network tasks. With its built-in time-series database, AOS-CX allows for historic troubleshooting and trend analysis, empowering administrators to predict and avoid potential scale, security, and performance issues. The operating system supports REST APIs and Python scripting for fine-grained programmability, enabling automation and customization of network tasks. A micro-services architecture, continuous telemetry data, and other advanced features make AOS-CX a powerful and flexible platform for network management.

### Ray One Management:

The Ray Switch can be seamlessly managed through Ray ONE, a centralized platform that provides unified visibility and control across wired, wireless, and WAN networks. Ray ONE offers a single pane of glass for network management, allowing administrators to efficiently monitor and configure network devices, troubleshoot issues, and enforce security policies. Furthermore, Ray's Analytics Engine enhances visibility and troubleshooting capabilities, providing valuable insights into network performance and facilitating proactive network management.

### Switch Series Variants:

The Ray Aggregation Switch is available in different models, offering choices to meet specific networking needs. The switch series includes fixed 24 and 48-port models with both gigabit and multi-gigabit support, as well as a 24-port 10 Gigabit model. These variants provide flexibility in terms of port density and speed, ensuring that organizations can select the most suitable switch for their specific requirements.

### Product Overview:

The Ray Aggregation Switch is a highly versatile and modern networking device designed to deliver exceptional performance, scalability, and security. It serves as a solid foundation for high-performance networks supporting IoT, mobile, and cloud applications. With its comprehensive feature set, advanced management capabilities, and robust security measures, the Ray Switch is well-suited for diverse network deployments in various industries.

## RSL2-A-24X

## I/O ports and slots

SFP	
SFP Ports	2
10G SFP+	
SFP+ Ports	24
40G QSFP	
SFP+ Ports	2
Console Ports	
RJ-45 Serial Console	1

## Dimensions

Weight	
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## Performance

Switching Capacity	640 Gbps
System Throughput Capacity	
Average Latency (LIFO-64-bytes packets)	"1 Gbps: 1.99µSec 10Gbps: 1.49µSec 25Gbps: 2.85µSec 50Gbps1: 2.82µSec"
Stack Size	10 members
Max. Stacking Distance	"Up to 10 kms with long range transceivers"
Stacking Bandwidth	200 Gbps
Switched Virtual Interfaces (dual stack)	1,024
IPv4 Host Table (ARP)	49,152
IPv6 Host Table (ND)	49,152
IPv4 Unicast Routes	61,000
IPv6 Unicast Routes	61,000
IPv4 Multicast Routes	8,192
IPv6 Multicast Routes	8,192
MAC Table Capacity	32,768
IGMP Groups	8,192
MLD Groups	8,192
IPv4/IPv6/MAC ACL Entries (ingress)	20,480/5,120/20,480
IPv4/IPv6/MAC ACL Entries (egress)	8,192/2,048/8,192
VRF	256
Forwarding rate	480 Mpps
MAC Address	32K
Jumbo Frame	12K
ACL Table	3K (ingress) + 1K (egress)
VLAN Table	4K
Queues per port	8

## Environment

Operating temperature	0°C to 50°C
Operating relative humidity	10% to 90% @ 104°F (40°C), noncondensing
Nonoperating/Storage temperature	-40°F to 158°F (-40°C to 70°C)
Nonoperating/Storage relative humidity	15% to 90% @ 149°F (65°C), noncondensing
Max Operating Altitude	up to 10,000 ft (3 km)
Acoustic	Sound Power, LWAd = 4.9 Bel Sound Pressure, LpAm (Bystander) = 31.0 dB

## Electrical Characteristics

Operating temperature	0°C to 50°C
Operating relative humidity	"10% to 90% @ 104°F (40°C), noncondensing"
Nonoperating/Storage temperature	-40°F to 158°F (-40°C to 70°C)
Nonoperating/Storage relative humidity	"15% to 90% @ 149°F (65°C), noncondensing"
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## Safety

Europe: EN 62368-1:2014 +A11:2017 2nd Ed. EN 62368-1:2020 +A11:2020 3rd Ed.
UK: BS EN 62368-1:2014 + A11:2017 2nd Ed BS EN 62368-1:2020 + A11:2020 3rd Ed
US/Canada: UL 62368-1 2nd Ed. CAN/CSA-C22.2 No.62368-1-14 2nd Ed.
Worldwide: IEC 60950-1:2005 + Am1:2009 + Am2:2013 w/all known National Deviations IEC 62368-1:2014 2nd Ed. w/all known National Deviations IEC 62368-1:2018 3rd Ed. w/all known National Deviations

## Emissions

Europe: EN 55032:2015 +A11:2020, Class A

EN 55035:2017 +A11:2020

EN 61000-3-2:2014, Class A

EN 61000-3-3:2013

US/Canada: FCC CFR47 Part 15:2014, Class A ICES-003 Class A

Worldwide:

VCCI Class A

CISPR 32 Class A

CISPR 35:2016

## Immunity

Generic	CISPR 35
EN	EN 55035:2017
ESD	IEC 61000-4-2
Radiated	IEC 61000-4-3
EFT/Burst	IEC 61000-4-4
Surge	IEC 61000-4-5
Conducted	IEC 61000-4-6
Power frequency magnetic field	IEC 61000-4-8
Voltage dips and interruptions	IEC 61000-4-11
Harmonics	EN 61000-3-2, IEC 61000-3-2
Flicker	EN 61000-3-3, IEC 61000-3-3

## Standards

- › ANSI/TIA-1057 LLDP Media Endpoint Discovery (LLDP-MED)
- › CPU DoS Protection
- › Bootstrap Router (BSR) Mechanism for PIM, PIM WG
- › draft-ietf-savi-mix
- › IEEE 802.1AB-2005
- › IEEE 802.1ak-2007
- › IEEE 802.1AX-2008 Link Aggregation
- › IEEE 802.1D MAC Bridges
- › IEEE 802.1p Priority
- › IEEE 802.1Q VLANs
- › IEEE 802.1s Multiple Spanning Trees
- › IEEE 802.1t-2001
- › IEEE 802.1v VLAN classification by Protocol and Port
- › IEEE 802.1w Rapid Reconfiguration of Spanning Tree
- › IEEE 802.3ab 1000BASE-T
- › IEEE 802.3ad Link Aggregation Control Protocol (LACP)
- › IEEE 802.3ae 10-Gigabit Ethernet
- › IEEE 802.3af Power over Ethernet
- › IEEE 802.3at Power over Ethernet
- › IEEE 802.3bt Power over Ethernet
- › IEEE 802.3az Energy Efficient Ethernet (EEE)
- › IEEE 802.3x Flow Control
- › IEEE 802.3z 1000BASE-X
- › RFC 1122 Requirements for Internet Hosts - Communications Layers
- › RFC 1215 Convention for defining traps for use with the SNMP
- › RFC 1256 ICMP Router Discovery Messages
- › RFC 1350 TFTP Protocol (revision 2)
- › RFC 1393 Traceroute Using an IP Option
- › RFC 1403 BGP OSPF Interaction
- › RFC 1519 CIDR
- › RFC 1542 BOOTP Extensions
- › RFC 1583 OSPF Version 2
- › RFC 1591 Domain Name System Structure and Delegation
- › RFC 1657 Definitions of Managed Objects for BGP-4 using SMIv2
- › RFC 1772 Application of the Border Gateway Protocol in the Internet
- › RFC 1812 Requirements for IP Version 4 Router
- › RFC 1918 Address Allocation for Private Internet
- › RFC 1997 BGP Communities Attribute
- › RFC 1998 An Application of the BGP Community Attribute in Multi-home Routing
- › RFC 2131 DHCP
- › RFC 2132 DHCP Options and BOOTP Vendor Extensions
- › RFC 2236 IGMP
- › RFC 2328 OSPF Version 2
- › RFC 2375 IPv6 Multicast Address Assignments
- › RFC 2385 Protection of BGP Sessions via the TCP MD5 Signature Option
- › RFC 2401 Security Architecture for the Internet Protocol
- › RFC 2402 IP Authentication Header
- › RFC 2439 BGP Route Flap Damping
- › RFC 2460 Internet Protocol, Version 6 (IPv6) Specification
- › RFC 2464 Transmission of IPv6 over Ethernet Networks
- › RFC 2545 Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing
- › RFC 2576 (Coexistence between SNMP V1, V2, V3)
- › RFC 2579 (SMIv2 Text Conventions)
- › RFC 2580 (SMIv2 Conformance)
- › RFC 2710 Multicast Listener Discovery (MLD) for IPv6
- › RFC 2711 IPv6 Router Alert Option
- › RFC 2787 Definitions of Managed Objects for the Virtual Router Redundancy Protocol
- › RFC 2918 Route Refresh Capability for BGP-4
- › RFC 2925 Definitions of Managed Objects for Remote Ping, Traceroute, and Lookup Operations (Ping only)
- › RFC 2934 Protocol Independent Multicast MIB for IPv4
- › RFC 3019 MLDv1 MIB
- › RFC 3046 DHCP Relay Agent Information Option
- › RFC 3056 Connection of IPv6 Domains via IPv4 Clouds
- › RFC 3065 Autonomous System Confederation for BGP
- › RFC 3068 An Anycast prefix for 6to4 Relay Route
- › RFC 3137 OSPF Stub Router Advertisement sFlow
- › RFC 3376 IGMPv3
- › RFC 3416 (SNMP Protocol Operations v2)
- › RFC 3417 (SNMP Transport Mappings)
- › RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)
- › RFC 3484 Default Address Selection for IPv6
- › RFC 3509 Alternative Implementations of OSPF Area Border Routers
- › RFC 3575 IANA Considerations for RADIUS
- › RFC 3623 Graceful OSPF Restart
- › RFC 3768 VRRP
- › RFC 3810 Multicast Listener Discovery Version 2 (MLDv2) for IPv6
- › RFC 3973 PIM Dense Mode

## Standards

- › RFC 4022 MIB for TCP
- › RFC 4113 MIB for UDP
- › RFC 4213 Basic Transition Mechanisms for IPv6 Hosts and Routers
- › RFC 4251 The Secure Shell (SSH) Protocol
- › RFC 4252 SSHv6 Authentication
- › RFC 4253 SSHv6 Transport Layer
- › RFC 4254 SSHv6 Connection
- › RFC 4271 A Border Gateway Protocol 4 (BGP-4)
- › RFC 4273 Definitions of Managed Objects for BGP-4
- › RFC 4291 IP Version 6 Addressing Architecture
- › RFC 4292 IP Forwarding Table MIB
- › RFC 4293 Management Information Base for the Internet Protocol (IP)
- › RFC 4360 BGP Extended Communities Attribute
- › RFC 4419 Key Exchange for SSH
- › RFC 4443 ICMPv6
- › RFC 4456 BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP)
- › RFC 4486 Subcodes for BGP Cease Notification Message
- › RFC 4541 IGMP & MLD Snooping Switch
- › RFC 4552 Authentication/Confidentiality for OSPFv3
- › RFC 4601 PIM Sparse Mode
- › RFC 4607 Source-Specific Multicast for IP
- › RFC 4675 RADIUS VLAN & Priority
- › RFC 4724 Graceful Restart Mechanism for BGP
- › RFC 4760 Multiprotocol Extensions for BGP-4
- › RFC 4861 IPv6 Neighbor Discovery
- › RFC 4862 IPv6 Stateless Address Auto-configuration
- › RFC 4940 IANA Considerations for OSPF
- › RFC 5065 Autonomous System Confederation for BGP
- › RFC 5095 Deprecation of Type 0 Routing Headers in IPv6
- › RFC 5187 OSPFv3 Graceful Restart
- › RFC 5340 OSPFv3 for IPv6
- › RFC 5424 Syslog Protocol
- › RFC 5492 Capabilities Advertisement with BGP-4
- › RFC 5519 Multicast Group Membership Discovery MIB (MLDv2 only)
- › RFC 5701 IPv6 Address Specific BGP Extended Community Attribute
- › RFC 5722 Handling of Overlapping IPv6 Fragments
- › RFC 5798 VRRP (exclude Accept Mode and sub-sec timer)
- › RFC 5880 Bidirectional Forwarding Detection
- › RFC 5905 Network Time Protocol Version 4: Protocol and Algorithms Specification
- › RFC 6620 FCFS SAVI
- › RFC 6987 OSPF Stub Router Advertisement
- › RFC 7047 The Open vSwitch Database Management Protocol
- › RFC 7313 Enhanced Route Refresh Capability for BGP-4
- › RFC 768 User Datagram Protocol
- › RFC 783 TFTP Protocol (revision 2)
- › RFC 791 IP
- › RFC 792 ICMP
- › RFC 793 TCP
- › RFC 813 Window and Acknowledgement Strategy in TCP
- › RFC 815 IP datagram reassembly algorithms
- › RFC 8201 Path MTU Discovery for IP version 6
- › RFC 826 ARP
- › RFC 879 TCP maximum segment size and related topics
- › RFC 896 Congestion control in IP/TCP internetworks
- › RFC 917 Internet subnets
- › RFC 919 Broadcasting Internet Datagrams
- › RFC 922 Broadcasting Internet Datagrams in the Presence of Subnets (IP\_BROAD)
- › RFC 925 Multi-LAN address resolution
- › RFC 951 BOOTP
- › RFC 1027 Proxy ARP
- › SNMPv1/v2c/v3
- › RFC 4861 IPv6 Neighbor Discovery
- › RFC 4862 IPv6 Stateless Address Auto-configuration
- › ITU-T Rec G.8032/Y.1344 Mar. 2010
- › RFC 1757 Remote Network Monitoring Management Information Base
- › 2.5G/5GBASE-T (IEEE 802.3bz-2016), 2.5G/5G NBASE-T
- › 10GBASE-T (IEEE 802.3an-2006)
- › 25-Gigabit Ethernet (IEEE 802.3by-2016, 802.3cc-2017)
- › 50-Gigabit Ethernet (IEEE 802.3cd-2018)
- › RFC 3101 OSPF Not-so-stubby-area option
- › RFC 4750 OSPFv2 MIB partial support no SetMIB

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