

# ETS-1-10G-A

## Ethernet Aggregation Switches



- Bandwidth up to 640 GBPS
- Non-blocking architecture
- Up to 48x1G or 32x10G ports
- L3 switches
- Front-to-Back cooling
- Stacking up to eight devices
- Hot-swappable redundant power supplies

### MARKET SEGMENTS AND APPLICATIONS

ETS-1-10G-A switches are high performance devices with 10GBASE-R/1000BASE-X that can be used as aggregation switches in carrier networks and small data centers.

The devices support operating bandwidths of 1 Gbps (SFP/UTP) and 10 Gbps (SFP+), which enable flexible use and smooth transition to higher data rates. The non-blocking architecture guarantees lossless packet forwarding at high loads with minimum and predictable delays for all types of traffic.

The front-to-back cooling provides effective cooldown in modern data centers.

The redundant and hot-swappable AC/DC power supplies with advanced hardware monitoring functions provide high reliability and uninterrupted services.

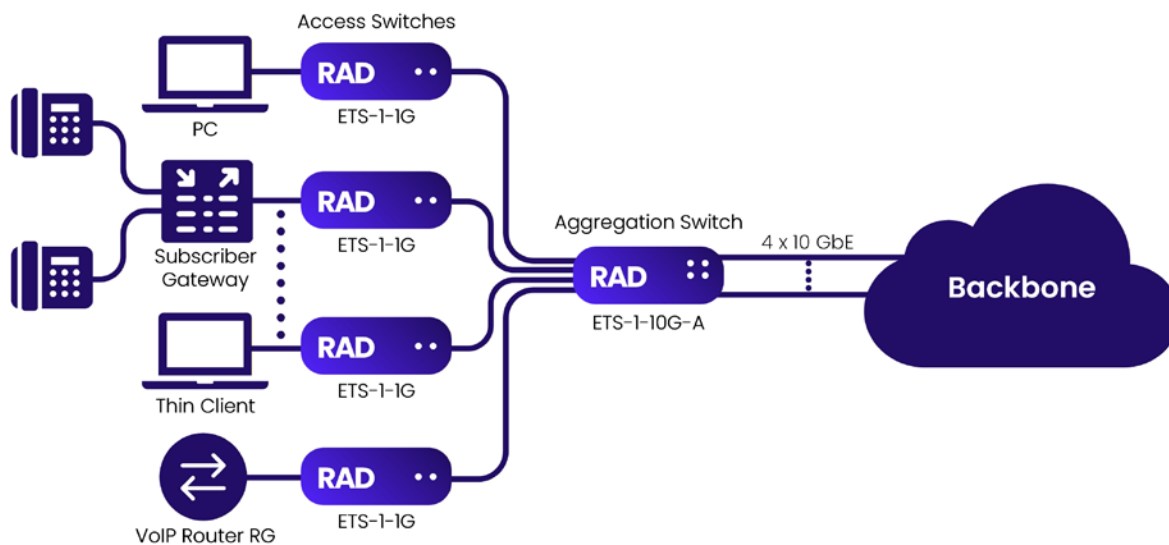


Figure 1. ETS-1-10G-A Ethernet Aggregation Switch Application



# ETS-1-10G-A

## Ethernet Aggregation Switches

### Specifications

#### CAPACITY

Switching Capacity	See Table 1
Throughput on 64-byte packets	See Table 1
Buffer Memory	See Table 1
VLAN Table Size	4094
L2 Multicast Groups	4092
SQinQ Rules	1320 ingress, 1320 egress
ARP Table	4087
MAC ACL	3000
IPv4/IPv6 ACL	2999/1500
Maximum size of ECMP groups	8
Link Aggregation Groups (LAG)	32 groups, up to 8 ports in one LAG
QoS	8 egress queues per port
Stacking	Up to 8 devices

#### ETHERNET INTERFACES

Ports	See Table 1
Features	<ul style="list-style-type: none"> <li>Head-of-line blocking (HOL) protection</li> <li>Auto MDI/MDIX</li> <li>Flow control (IEEE 802.3X)</li> <li>Jumbo frames</li> <li>Stacking</li> <li>Back pressure</li> <li>Port Mirroring (SPAN, RSPAN)</li> </ul>

#### MANAGEMENT

Access Options	Web-based interface
	Command Line Interface (CLI)
Console Port	RS-232 interface, RJ-45 connector
Management	SNTP (Simple Network Time Protocol)
	Traceroute
	RADIUS/TACACS+ clients syslog
Access Control	Access control – privilege levels
	Local authentication
	IP addresses filtering for SNMP
	Rate limit of traffic to CPU
	Password encryption
	Password recovery
	Telnet server and client
	SSH server and client
	Download and upload of configuration file via TFTP/SCP
	SNMP
	Syslog
	SSL
	CLI command logging
System log	
Macro commands	
IPv6	IPv6 host
	Dual stack

# ETS-1-10G-A

## Ethernet Aggregation Switches

### SECURITY

<b>ACL</b>	L2-L3-L4 ACL
	Time-based ACL
	IPv6 ACL
	ACL based on:
	<ul style="list-style-type: none"> <li>Physical port number</li> <li>IEEE 802.1p</li> <li>VLAN ID</li> <li>EtherType</li> <li>DSCP</li> <li>Protocol type</li> <li>TCP/UDP port number</li> <li>User Defined Bytes</li> </ul>
<b>Security Features</b>	IP source guard
	sFlow
	MAC address limitation
	Guest VLAN
	Management interface blocking
	NetBIOS/NetBEUI filtering
	Dynamic ARP inspection
	Traffic segmentation
	Debugging commands
	MAC-based authentication
	Static MAC entries
	DoS attacks prevention
	First Hop Security
	Port Security
<b>IEEE 802.1X</b>	IEEE 802.1x port-based authentication

### QUALITY OF SERVICE (QOS) AND RATE LIMITING

<b>Class of Service</b>	IEEE 802.1p Class of Service (CoS)
<b>Bandwidth Control</b>	Shaping
	Policing
	ACL-based CoS/DSCP mark assignment
	ACL-based VLAN assignment
	Setting the IEEE 802.1p priority for management VLAN
	DSCP to CoS/CoS to DSCP remarking
	802.1p, DSCP mark assignment for IGMP
	Scheduling algorithms: Strict Priority/Weighted Round Robin (WRR)
	QoS statistics
	Storm Control for different types of traffic (broadcast, multicast, unknown unicast)
	Three marking colors

### LAYER 2

<b>VLAN</b>	802.1Q	
	Q-in-Q	
	Selective Q-in-Q (VLAN translation)	
	GVRP	
	Voice VLAN	
	Flex-link	
	Private VLAN	
	Layer 2 Protocol Tunneling (L2PT)	
	<b>MAC Table</b>	Independent learning mode per VLAN
		MAC multicast support
Configurable aging time of MAC addresses		
Static MAC entries		
<b>L2 Multicast</b>	MAC flapping logging	
	Multicast profiles	
	Static multicast groups	
	MVR	
<b>IGMP</b>	PIM-snooping	
	IGMP snooping v1,2,3	
	Port/host-based IGMP snooping fast leave	
	IGMP proxy-report	
	IGMP querier	
<b>MLD</b>	IGMP authorization via RADIUS	
	MLD snooping v1,2	
<b>DHCP</b>	Protection against unauthorized DHCP servers (DHCP Snooping)	
	DHCP clients filtering	
	DHCP auto provisioning	
	DHCP relay (Option 82)	
	DHCP option 12	
<b>BPDU</b>	BPDU attack prevention	
	STP BPDU guard	
	BPDU filtering	

### IP ADDRESSING AND ROUTING

<b>Addressing</b>	IPv4 and IPv6
	IP unnumbered
<b>Routing Protocols</b>	Dynamic routing protocols RIPv2
	Address Resolution Protocol (ARP)
	BFD (for BGP)
	BGP (IPv4 Unicast, IPv4 Multicast) (requires license, see Ordering)
	IS-IS (IPv4 Unicast)
	LLDP (802.1ab) + LLDP MED
	OSPFv2, OSPFv3
	Proxy ARP
	PIM SM, PIM DM, IGMP Proxy, MSDP
	ECMP Load Balancing
	VRF lite
	VRRP
	<b>Routing Technologies</b>
<b>MPLS*</b>	MPLS LSP support
	LDP protocol
	LDP session state logging
	Penultimate Hop Popping (PHP)
	P and PE roles in MPLS VPN on a single router
	BGP Community and Extended Community for MPLS/BGP VPNs
	Route Distinguisher for BGP/MPLS L3 VPNs
	Route Target for BGP/MPLS L3 VPNs
	VPN-IPv4 AFI in BGP
	BGP/MPLS L3 VPN
	BFD for OSP
	OSPF Auto-cost
	VRF in BFD for BGP sessions
	VRF in BFD for OSPF neighbors
	VRF in VRRP
	6 OSPF processes
	DHCP Relay in VRF

\*Only for ETS-1-10G-A/32SP/DPS, requires separate license (see Ordering)

### RESILIENCY

<b>L2 Protection</b>	STP (Spanning Tree Protocol, IEEE 802.1d)
	RSTP (Rapid Spanning Tree protocol, IEEE 802.1w)
	MSTP (Multiple Spanning Tree, IEEE802.1s)
	STP root guard
	Spanning tree fast link option
	Loopback Detection (LBD)
	ERPS (G.8032v2)
	PVSTP+
	RPVSTP+
<b>Link Aggregation</b>	32, up to 8 ports per LAG
	Static LAG
	Dynamic LAG (LACP)
	Multi-switch Link Aggregation Group (MLAG)
	LAG Balancing Algorithm

### MONITORING AND DIAGNOSTICS

<b>Diagnostic</b>	Ping (IPv4/IPv6 support)
	Optical transceiver diagnostics
<b>Monitoring</b>	Statistics on interfaces
	Remote monitoring RMON/SMON
	Task and traffic type-based CPU utilization monitoring
	Virtual Cable Testing (VCT)
	Green Ethernet
	IP SLA
	Temperature monitoring
<b>OAM</b>	RAM utilization monitoring
	TCAM utilization monitoring
	802.3ah Ethernet Link OAM
	802.3ah Unidirectional Link Detection (UDLD)

### GENERAL

#### Environment

See Table 1

#### Physical and Power

See Table 2

Table 1. Technical Features

Specification	ETS-1-10G-A/4SP/4CMB/20S	ETS-1-10G-A/4SP/4CMB/4S	ETS-1-10G-A/4SP/24U	ETS-1-10G-A/4SP/48U	ETS-1-10G-A/4SP/48S	ETS-1-10G-A/32SP/DPS
<b>Memory</b>						
ROM (NAND Flash)	512 MB	512 MB	512 MB	512 MB	512 MB	1 GB
RAM (DDR4)	2 GB	2 GB	2 GB	2 GB	2 GB	
RAM (DDR3)	-	-	-	-	-	1 GB
Buffer memory	1.5 MB	1.5 MB	1.5 MB	3 MB	3 MB	3 MB
<b>Interfaces</b>						
10/100/1000BASE-T (RJ-45)	-	-	24	48		
1000BASE-X/100BASE-FX (SFP)	20	4	-	-	48	
10/100/1000BASE-T/1000BASE-X/100BASE-FX Combo	4	4				
10GBASE-R (SFP+)/1000BASE-X (SFP)	4	4	4	4	4	32
Console port	RS-232/RJ-45					
<b>Performance</b>						
Bandwidth	128 Gbps	96 Gbps	128 Gbps	176 Gbps	176 Gbps	640 Gbps
Throughput for 64 bytes	95.2 MPPS	71.4 MPPS	95.2 MPPS	130.9 MPPS	130.9 MPPS	238 MPPS
MAC Table	16384	16384	16384	16384	16384	32K
L3 IPv4 Unicast routes*	13278	13278	13278	13278	13278	16286
L3 IPv6 Unicast routes*	3316	3316	3316	3316	3316	4070
L3 IPv4 Multicast (IGMP Proxy, PIM)* routes	4087	4087	4087	4087	4087	8143
L3 IPv6 Multicast (IGMP Proxy, PIM)* routes	1642	1642	1642	1642	1642	2033
* IPv4/IPv6 Unicast/Multicast routes share hardware resources						

Table 2. Power, Physical, and Environmental Specifications

Specification	ETS-1-10G-A/4SP/4CMB/20S	ETS-1-10G-A/4SP/4CMB/4S	ETS-1-10G-A/4SP/24U	ETS-1-10G-A/4SP/48U	ETS-1-10G-A/4SP/48S	ETS-1-10G-A/32SP/DPS
Maximum Power Consumption	45W	29W	33W	45W	89W	75W
Power Supply	Hot Swappable Power Supplies, see Ordering (ordered separately)					
Operating Temperature	-10 to 45°C (14 to 113°F)					
Storage Temperature	-50 to +70°C				-40 to +70°C	
Operating Humidity	no more than 80 %					
Cooling	Front-to-Back, 4 fans	Front-to-Back, 2 fans	Front-to-Back, 4 fans	Front-to-Back, 4 fans	Front-to-Back, 4 fans	Front-to-Back, 4 fans
Dimensions W x D x H mm	430 × 44 × 305	430 × 44 × 305	430 × 44 × 330	440 × 44 × 330	440 × 44 × 330	430 × 275 × 44
Form Factor	19", 1U					
Weight	5.04 kg	4.64 kg	5.13 kg	5.67 kg	5.68 kg	3.8 kg

# ETS-1-10G-A

## Ethernet Aggregation Switches

### Ordering

#### ETS-1-10G-A/4SP/4CMB/20S

L3 Ethernet switch, 20 ports of 1000BASE-X/100BASE-FX (SFP), 4 Combo ports of 10/100/1000BASE-T/1000BASEX/100BASE-FX, 4 ports of 10GBASE-R (SFP+)/1000BASE-X (SFP), L3, dual PS slots (PSs not included)

#### ETS-1-10G-A/4SP/4CMB/4S

L3 Ethernet switch, 4 ports of 1000BASE-X/100BASE-FX (SFP), 4 Combo ports of 10/100/1000BASE-T/1000BASEX/100BASE-FX, 4 ports of 10GBASE-R (SFP+)/1000BASE-X (SFP), dual PS slots (PSs not included)

#### ETS-1-10G-A/4SP/24U

L3 Ethernet switch, 24 ports of 10/100/1000BASE-T, 4 ports of 10GBASE-R (SFP+)/1000BASE-X (SFP), L3, dual PS slots (PSs not included)

#### ETS-1-10G-A/4SP/48U

L3 Ethernet-switch, 48 x 10/100/1000Base-T ports, 4 x 10GBase-R (SFP+)/1000Base-X (SFP) ports, dual PS slots (PSs not included)

#### ETS-1-10G-A/4SP/48S

L3 Ethernet switch, 48 x 1000BASE-X/100BASE-FX (SFP) 4 x 10GBASE-R/1000BASE-X (SFP+/SFP), dual PS slots (PSs not included)

#### ETS-1-10G-A/32SP/DPS

L3 Ethernet Aggregation switch, 32 x 10GBASE-R/1000BASE-X (SFP+/SFP), dual PS slots (PSs not included)

### Hot Swappable Power Supplies

(Must be ordered separately)

#### ETS-1-10G-PS/AC220/165W

90-264VAC 165W Power Supply Module for ETS-1-10G-A

#### ETS-1-10G-PS/DC48/100W

48VDC, 100W Power Supply Module for ETS-1-10G

#### ETS-1-BGP-LIC

License for using BGP protocol

#### ETS-1-MPLS/LIC (only for ETS-1-10G-A/32SP/DPS)

License for using MPLS protocol

### OPTIONAL ACCESSORIES

#### CBL-SGW-RJ45-D9-F-6FT

RJ-45 to DB-9 console cable

#### Transceivers

For the list of available transceivers, see the [Pluggable Transceivers data sheet](#) at [www.rad.com](http://www.rad.com)

*Note: It is strongly recommended to order this device with **original RAD SFPs installed**. This will ensure that prior to shipping, RAD has performed comprehensive functional quality tests on the entire assembled unit, including the SFP devices. RAD cannot guarantee full compliance to product specifications for units using non-RAD SFPs.*

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