Rugged Ethernet Gateway (REG)

Rugged 20-Port GbE Switch, Fully Managed

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Overview

The REG is a small to medium form factor rugged Gigabit Ethernet (GbE) switch system optimised for demanding size, weight and power (SWaP) constraints of embedded space computer network systems applications.

To enhance reliably and availability, the unit features dual channel architecture for single failure tolerance with a fully customised mechanical packaging and a fully customised redundancy handling module.

The unit is designed with a physical size of less than 220 cubic inches in volume, ca. 6 pound in weight, and less than 30 Watts typical power consumption.

High performance circular connectors bring out Ethernet, power, and serial signals, while integrated EMI/power filtering is designed to meet power input voltage, spikes, surges, transients, and EMI/EMC compatibility requirements of typical space deployments.

The REG enables reliable local area

network (LAN) switching across extended operating temperature ranges, shock/vibration and radiation conditions representative of a deployment in space applications.

Featuring advanced Layer 2 networking features with 20 triple-speed (10/100/1000 Mbps) ports, the REG combines a layer 2 managed network switch with remote management capabilities for optimising communications and prioritising critical information, and layer 3 routing function.

The REG supports IPv4 and IPv6 multicast traffic, Virtual Local Area Networks (VLANs), port control (speed / mode / statistics, flow control), Quality of Service (QoS) traffic prioritisation, Link Aggregation (802.3ad), SNMPv1/v2/v3 management, secure authentication (802.1X, ACLs, Web/CLI), redundancy (RSTP/MSTP), precision timing (IEEE-1588v2), port monitoring, and IGMP Snooping. The unit also supports Layer 3 IPv4 / IPv6 unicast static routing for IP routing to attached WAN / radio ports.

Product Roadmap

Beyond the current configuration of the REG, a variant of the product with Time-Triggered Ethernet capability has been studied and is planned to be developed.

Applications

The REG is an ideal solution for connecting a large number of IP-enabled embedded devices, including cameras, sensors, payload, command-and-control equipment, and other avionics deployed in space transportation system platforms and orbital infrastructures at the network edge.

Features

- High port density with 20-Ports of 10/100/1000 Mbps Ethernet in low SWaP optimised chassis: less than 220 in³ size, 3 lbs. weight, 30 Watts power.
- Health and status data monitoring through RS-422 connection for on-board or on-ground unit monitoring.
- Comprehensive Layer 2 managed switch features, Layer 3 packet processing, service classification and traffic policing.

APPLICATIONS
- High-speed Gigabit Ethernet LAN switching for IP-enabled equipment, such as on-board computers, cameras, sensors, monitoring devices, payload, and command-and-control gear in harsh and extreme environments:
- Space: Space transportation systems, orbital infrastructures, portable ground stations.
- Military: Battlefield communication, rugged networks, combat vehicles.
- Aerospace: Military and civil aircrafts
- and mining, transportation, oil & gas industries.

SERVICES AVAILABLE
- On-board network engineering
- Unit support
- Unit customisation

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ABOUT SPACE APPLICATIONS SERVICES

Space Applications Services NV/SA is an independent Belgian company founded in 1987, with a subsidiary in Houston, USA.
Our aim is to research and develop innovative systems, solutions and products and provide services to the aerospace and security markets and related industries. Our activities cover manned and unmanned spacecraft, launch/re-entry vehicles, control centres, robotics and a wide range of information systems.

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- Layer 2+ switch management: 10/100/1000 Mbps Gigabit Ethernet connectivity, IPv4/IPv6 multicast, VLAN, QoS/CoS traffic prioritisation, multiple/rapid spanning tree, link aggregation.
- Layer 3 support for IPv4/IPv6 unicast static routing to attached radio/WAN ports.
- SNMPv3, HTTP server, Web GUI, RS-422 CLI, port monitoring, RMON, Syslog, Network Access Server (NAS), 802.1X Authentication, IGMP Snooping, Access Control Lists (ACLs), zeroization, Built-in-Test (BIT) diagnostics.
- Designed to meet space environmental conditions (temperature, shock, vibration, radiation).
- Designed to meet MIL-STD-461F & DO-160 EMI/EMC (conducted & radiated emissions & susceptibility) and to survive to typical power input and transients.
- -23 to 63C temperature operation.
- High-performance MIL circular connectors.
- Export Jurisdiction: ITAR-Free.

Specification Summary

Architecture:

- Dual channel configuration.

Ports:

- 20x 10/100/1000BaseT Gigabit (GbE) Ethernet ports.
- RS422 management console/ health and status monitoring (one per channel).
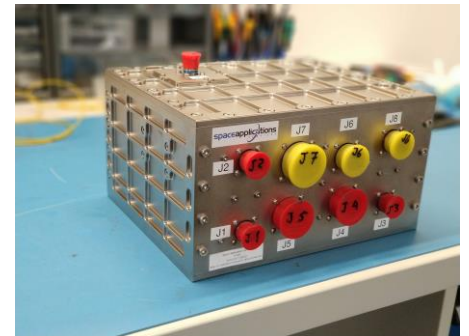- Power inputs (one per channel).

Layer 3 routing:

- Layer 3 IPv4 / IPv6 unicast static routing to attached WAN/radio port.

Layer 2 switching:

- Port control: port-speed, duplex mode, flow control, port frame size (jumbo frames), port state, port status (link monitoring), port statistics (MIB counters).
- Quality of Service (QoS) traffic prioritisation and queuing: 8 priorities, 8 CoS queues per port, strict or deficit-weighted RR scheduling, sha
- ping/policing per queue and per port, storm control.
- VLAN: 8K MAC addresses, 4K VLANs, 802.1Q static VLAN, protocol-based VLAN, MRP, MVRP, MVR, IEEE-80210ad provider bridge, link aggregation (IEEE-802.3ad).
- IEEE-802.1 D/w/s (Spanning Tree, Rapid Spanning Tree, Multiple Spanning Tree Protocol).
- L2 IEEE-1588v2 Precision Timing Protocol (PTP).

Management:

- In-band Ethernet management using web GUI or Simple Network Management Protocol (SNMP), or Command Line Interface (CLI) over RS-422 console for Telnet / SSH / Terminal.
- HTTP/HTTPS web server, SNMP v1 / v2 / v3 client, DHCP client, IEEE 802.1X authentication, system Syslog, SSHv2, IPv6 management, IGMP/MLD/DHCP snooping, Access Control Lists (ACLs), port mirroring, BPDU Guard, RMON, Cisco

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Discovery Filtering, IEEE-802.10AB LLDP.

- Built-In Test (BIT) functionality to detect system faults.

Security:

- NAS IEEE-802.1X, RADIUS accounting, MAC address limit, TACACS, web and CLI authentication, ACLs, IP source guard.
- Declassification: data zeroization / sanitisation support to erase non-volatile Flash memory and restore board to factory default configuration.

Power:

- Power Input: 28 VDC nominal steady state
- Survivability to abnormal steady state voltage, ripple, surges, spikes
- Power consumption (estimated): < 30 Watts

Physical:

- Dimensions: TBD (< 220 in3).
- Weight: approx. 3 lbs.
- Installation: TBD.
- Connectors: Circular MIL-DTL-38999.
- Cooling: passive thermal management; conductive cooling.
- Enclosure/finish: corrosion resistant, aluminium alloy w/ TBD finish.

Environmental:

- Details to be provided.

EMI/EMC

- Designed to Meet MIL-STD-461F & RTCA/DO-160G section 22 (qualification not yet done)
- Details to be provided.

Export jurisdiction:

- ITAR-free.

Reliability:

- MTBF: Estimate TBD (Calculated per MIL-HDBK-217F).
- Workmanship: assembled to IPC-A-610 Class III workmanship.
- No moving parts.
- Conformal coated PCBs.

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