StarEdge

Control & Data Management System for Orbital Platforms & Payloads

Overview

StarEdge combines state-of-the-art, commercially available terrestrial internet protocol (IP) technology solutions to enable the on-board control, monitoring, data collection and processing, as well as the ground distribution of large amounts of data from orbital facilities and payloads.

Payloads and facilities can use the StarEdge as a principal computer and router for their TM/TC, for direct point to point IP connections with their Principal Investigators. Payloads can also use the StarEdge software services for data processing, security keys management and data storage.

StarEdge includes state-of-the-art COTS, with limited proprietary software. It provides redundancy, scalability, flexible upgrades and low-cost maintenance, and remote management. StarEdge is offered as COTS product with HW and SW customization options available to meet specific user needs.

Flight Segment Architecture

The main components are:
- Modular main computer ("Gateway") in high availability configuration
- Embedded Ethernet Switches
- Wireless Access Point (WAP)
- Processing and Virtualisation Nodes
- Network Attached Storage (StarEdge-NAS)
- Power Conditioning and Distribution Unit (PCDU)

Comms, Data & Software Services

StarEdge provides a reliable networking and computation platform as a hyper converged infrastructure. It provides the management of space to ground communications over IP for on-board systems and payloads.

Supported communication protocols include:
- Standard TCP and UDP protocols
- Point to point IP communication from ground users to assigned on-board payloads:
- CCSDS CFDP file transfer protocol
- Space to ground Audio and Video

StarEdge offers a persistent on-board data storage service, with redundancy, replication and data segregation.

The core of the StarEdge is the virtualization infrastructure providing computational resources to the payloads, at the edge, before any data downlink to ground. Several predefined services are provided:
- Proxmox High Availability Cluster
- Data storage
- Data synchronisation with ground
- Key Management (Cryptography)
- Binary Data Sampling towards ground
- Video Transcoding towards ground
- Telemetry Out-of-Limit Monitoring
- Import of custom virtual machines
- Import of custom container services

Power

The StarEdge PCDU provides power conversion for StarEdge components as well as control and monitoring capability for power distribution to payloads. It also provides filtering, isolation and over-current protection.

APPLICATIONS
- In-orbit payloads interfaces
- Payload software virtualization
- Payload data storage and processing
- Future Commercial LEO Destinations

FEATURES
- IP-based
- COTS-based
- Redundancy, scalability, upgradeability
- Security and data integrity
- Efficient payload/user integration
- No audible noise / no moving parts
- Qualified for ISS internal environment
- System power and temperature monitoring
- Redundant power input
- Safe touch temperatures
- Over-temperature hardware protection
- Fire: self-extinguishing system

SERVICES AVAILABLE
- System operation
- Customization
- Virtualization
- Algorithm development
- Special data processing

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ABOUT SPACE APPLICATIONS SERVICES

Space Applications Services NV/SA is an independent Belgian company founded in 1987. Aerospace Applications North America is our Partner company 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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Ground Segment Architecture

The StarEdge ground segment is designed as a Virtual Private Cloud environment, providing flexibility in terms of hardware requirements and infrastructure.

It can be deployed in a data centre or in an on-premised infrastructure.

The main components are:
- Operations and Administration workstations
- Network
- Virtual Private Cloud infrastructure
- Firewall Gateway

User Interfaces

A user on ground (end-user, principal investigator) can access the following user interfaces to manage his/her payload:
- Interfaces to the Yamcs server for TM/TC data:
  - Yamcs-Studio
  - Yamcs Web Interface
  - REST API + WebSocket
  - Python Client
- Access to data distribution server:
  - sftp, Filezilla
- Point to point connection to the payload:
  - SSH connection
  - custom ground software.

Security

The security, data segregation and authentication are managed by an anti-malware / anti-virus software, firewall, intrusion detection system (IDS), VPN and 2-factor of authentication against an LDAP database. The system makes use of SmartCards and eToken.

Specifications

General
- ITAR/EAR free
- COTS-based
- Qualified for ISS

Launch
- Mass: < 31 kg / 68 lbs
- Size: 490 x 156 x 379 mm (w x h x d)
- Power consumption (on-board): <160 W

Architecture
- CompactPCI Serial architecture
- Multi-core CPU + GPU
- Managed Ethernet Switch
- SSD storage
- Network controllers
- Over-temperature protection

Data Processing and Storage
- On-board Processing: >1 TFLOP
- 70 TB of storage in RAIDZ NAS system

Network and Data
- 10/100/1000 Megabit Ethernet interfaces
- 10 Gigabit Ethernet interfaces

Interfaces for payloads
- Wireless (IEEE 802.11 b/g/n/ac/ad/ax) and Wired (IEEE 802.3)
- MIL-STD-1553, Ethernet, USB, RS232, RS422/485, SSDs

StarEdge for Flight Segment

StarEdge for Software Development and Evaluation