StarEdge

Control & Data Management System for Orbital Platforms & Payloads

Overview

StarEdge acts as the **primary on-orbit computer and IP router**, giving payloads and facilities direct, secure TM/TC capabilities and **point-to-point IP connections** with their Principal Investigators.

In addition to connectivity, StarEdge provides a suite of **mission-enhancing software services**, including:

- High-performance and high-volume on-board data processing
- Secure key and credential management
- Flexible data storage for large mission datasets
- Multipath resilient data uplink and downlink capabilities

Designed based on **state-of-the-art COTS components**, StarEdge minimizes proprietary lock-in while delivering exceptional reliability. Its architecture offers:

- Redundancy and high availability
- Scalable performance and modular design for growing mission needs
- Low-cost maintenance and streamlined lifecycle management
- Fully remote operations and monitoring

StarEdge is available as a **modular COTS platform** with customizable hardware and software options to meet specific mission requirements.

StarEdge is **used operationally in orbit since 2026**.

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
- On-board data storage & processing
- Space Based Data Centre
- Future Commercial LEO Platforms

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

AVAILABLE SERVICES

- System operation & mission support
- Hardware & software customization
- Virtualization environments
- Algorithm development
- Specialized data processing services
- Rapid deployment of simulated cloud environments at target fidelity (e.g. all virtualized or partially virtualized with hardware in the loop)

For more information:
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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
- Volume: < 0.6 m^3
- 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

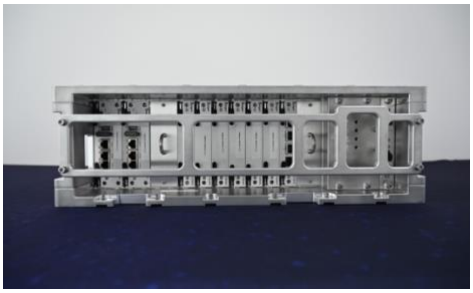
Network and Data

- 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

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