FoX Platform

3U SpaceVPX flexible avionics for LEO, MEO, GEO and cislunar applications

The high-performance FoX platform is a modular system of off-the-shelf modules, including Software/Firmware, to meet any need for your space electronics. Applications include spacecraft control, edge/payload processing, payload/robotics control, GNSS receiver, cloud computing and much more.

Key Features

- **Outstanding performance at competitive cost.** Beyond Gravity's innovative component selection and test approach based on decades of successfully building space equipment delivers "traditional space" reliability & quality at "new space" cost.

- Guaranteed resilience and flexibility due to design dedicated to space applications

- **Ethernet-based communication** facilitates redundancy and robustness at high data rates to ensure mission success.

- **3U SpaceVPX modular platform** allows you to scale the Fox Platform to match your mission's need.

Standards Modules

- Single Board Computer (SBC)
- NavRIX (GNSS Rx Module)
- Mass Memory
- Ethernet Switch (1/10G)
- Robust Timing Module
- GPU Module
- SBC Light (LEON5)
- FPGA Module
- Power Converters 28V unreg.

Radiation Tolerance

- All orbits suitable (additional shielding for long missions in challenging orbits)
- Latch-up free (53 MeV.cm^2/mg)
- Component Total Ionising Dose   (TID) > 36 kRad
- All memories with ECC
- Triple modular redundancy in FPGAs

Physical / Environment

- Operating temperature: -20ºC to +60ºC
- TID allows >10 years in LEO
- Random Vibration 15g RMS
- Shock 2000g @ 2000Hz

Example Configurations

FoX PicoCore
- Processing/control unit for satellite payloads or robotics
- Quad Core ARM, > 20.000 DMIPS
- 8 GiB DDR & 20 GiB NVM (ECC)
- GNSS Receiver (opt)
- Robust Timing Module (opt)
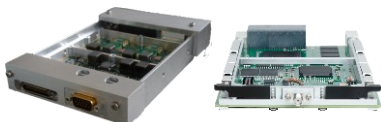- Dimensions: 131x148x217 mm (5.2x5.8x8.5 in)
- Weight: 3.6 kg
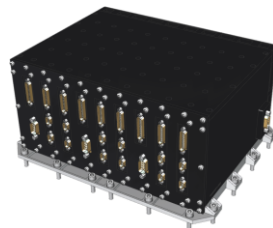
FoX MegaNode
- Large processing/control unit for satellite payloads and/or robotics
- Many SBCs for max computing power
- Mass memory for storage
- Dimensions: 131x275x217 mm (5.2x10.8x8.5 in)
- Weight: 9 kg
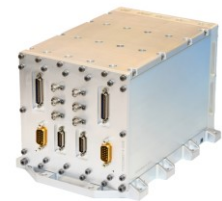
FoX NavRIX
- Dual frequency, dual antenna GNSS receiver
- Precision down to 20cm / 5ns
- Dual redundant in a single housing
- Resilient to jamming/spoofing
- Dimensions: 131x148x217 mm (5.2x5.8x8.5 in)
- Weight: 3.6 kg

PicoCore modules: DC/DC | SBC | SBC Ext. | DC/DC | GNSS Rx | RTM

MegaNode modules: DC/DC | SBC | SBC Ext. | DC/DC | SBC | SBC Ext. | Mass Memory | ETH Switch | DC/DC

NavRIX modules: DC/DC | GNSS Rx | GNSS Rx | DC/DC

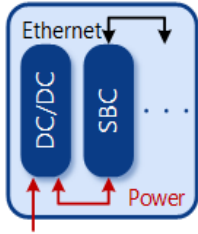Units can be configured depending on the mission requirements.

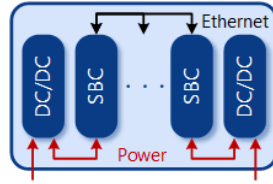All FoX Modules also available stand-alone upon request

Supported Architectures
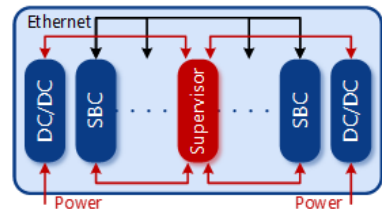
Single String
- No redundancy

Dual Redundant
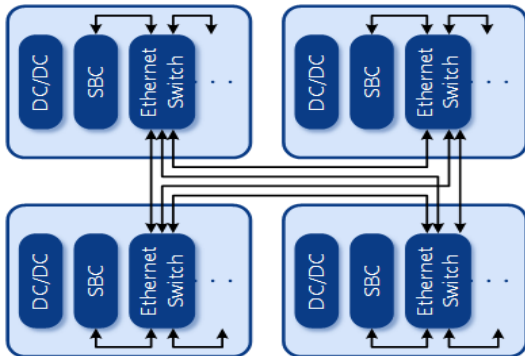- External select of side

Dual Redundant (supervised)
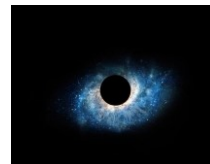- Automatic Reconfiguration

Distributed Architecture
- Many units connected over Ethernet

- Earth Observation
- Transport missions
- Robotics
- Human Space Flight
- Exploration

Contact our sales team for more information:
tom.seeman@beyondgravity.com

FoX Module Details

FoX Single-Board Computer (SBC)

Key Features


- High performance processor and a powerful FPGA for flexibility in terms of communication, interface and processing capability
- Quad Core ARM, > 20.000 DMIPS
- 4 GiB DDR processing memory with ECC
- 20 GiB non-volatile storage with ECC
- Extension modules available providing additional external interfaces allowing to meet every mission's need

External Interfaces

- 2 - 4x Ethernet   (1000BASE-T, 10/100BASE-TX)
- 2 - 4x SpaceWire   (LVDS)
- 2 - 4x UART   (RS422/485)
- 1 x MIL-STD-1553B   (optional, Nom + Red)
- 2 x CAN   (optional)
- Processor Debug   (UART + JTAG)
- FPGA Debug   (UART + JTAG)
- GPIO   (CMOS in/out)

Backplane Interfaces

- 4x Ethernet   (1000BASE-KX)
- 2x PCIe   (Two 1-lane Root Complex functions)
- 4x HSSL   (4 general purpose lanes)
- 2x CAN
- 2x SpaceWire   (LVDS)
- 2x I2C
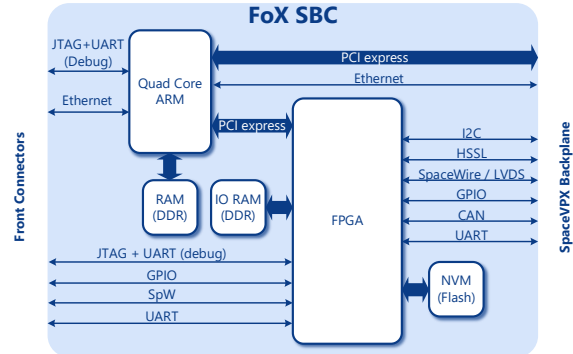
FoX Module Details

FoX NavRIX (GNSS Receiver)

Key Features

- The NavRIX Pinpoint receivers rely on BG's proven space heritage and are designed for space environments and long lifetimes, providing the highest fault tolerance and availability in the radiation environment encountered in orbit.
- Flexible Software Defined Radio design with all BG heritage building blocks unified in a single product allows adaption to the needs and requirements of different constellations or future missions even after launch.
- Outstanding position, velocity & timing performance of under 20cm 3D rms, < 1 mm/s, and < 5 ns rms applying Precise Point Positioning (PPP) technique (option)
- Highest availability in flight due to active mitigation of radiation effects in the design reducing performance outages to the bare minimum.
- The advanced dynamically filtered navigation solution implemented guarantees resilience and allows also for outstanding positional and timing performance even during periods of GNSS outage.
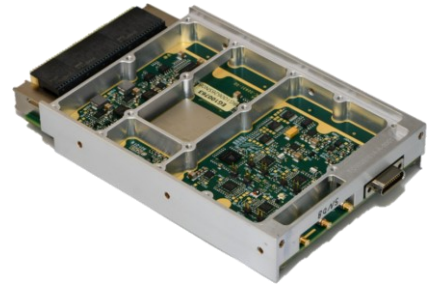
Supported Signals

- GPS L1 C/A
- GPS L5 I/Q
- GPS L2C
- Galileo E1 B/C
- Galileo E5a I/Q
- Galileo E6

Time-to-first fix

- Warm start typ. < 60s
- Cold start typ. < 60s

Performance

- Position 3D rms < 0.2m (PPP)
- Velocity 3D rms < 1mm/s (PPP)
- Time 1 sigma < 5ns (PPP)

Data Products

- Navigation solution based on multi-frequency and dual-constellation (GPS/Galileo) measurements
- Up to 2 independent PPS signals synchronized to GPS/Galileo
- Carrier & Code phase measurements for each tracked signal
- Support Data:
  - Tracking state
  - GDOP
  - Carrier to noise (C/N0) measurement of each tracked signal
  - Noise measurements of each RF down conversion chain
  - Satellites in view status
  - Satellite navigation message

Physical / environment

- Operating temperature: -20ºC to +60ºC
- Total Ionising Dose (TID) allows >10 years in LEO
- Power consumption: 10 W (avg)

Interfaces

- 2 antenna inputs
- TC/TM: UART (RS-422)
- 2 PPS outputs (RS-422)
- Primary power input 28 V unregulated (on/off command or autostart upon power application)
- Up to 2 external clock inputs (opt)

FoX Module Details

FoX Mass Memory

Key Features

- 1 Terabit (EOL) mass storage

- Advances error correcting capabilities

- Fast access from FoX SBCs

- Prepared for future extensions
  - Direct storage from instruments, cameras etc.
  - Direct downlink to ground

External Interfaces

- 4x SpaceWire   (LVDS)
- Debug   (UART + JTAG)

Backplane Interfaces

- 2x PCIe EP   (1-lane)
- 4x SpaceWire   (LVDS)
- 2x I2C

FoX Mass Memory