PROUST FRONTEND

SPACECRAFT INSTRUMENT TESTING

ProUST FrontEnd (ProUST FE) is a cost-effective, versatile platform designed to serve as a core component in various types of Electrical Ground Support Equipment (EGSE), including RF-suitcases, Power SCOEs, and primarily Instrument EGSEs. Its adaptability makes it especially valuable in environments where the density and diversity of communication channels and protocols are continuously increasing.

The ProUST-FE is an extension of the ProUST device **designed for spacecraft (S/C) test setups**, positioned close to the S/C to minimize harness length and improve signal quality.

Designed in support of ESA science missions, in collaboration with leading space industry customers.

A modular, state-of-the-art hardware and software platform that offers:

- Low recurring cost
- High reliability through reuse
- Reduced operational costs via increased efficiency and flexibility
- Reduced Footprint
- Local & remote Digital Management system
- Modular architecture for fast configuration and reconfiguration.
- Improved signal quality

Key focus on high-speed interface integrity, ensuring resistance to crosstalk and degradation from power line proximity.

ProUST FE is one device that can support all your needs in terms of interfaces. ProUST-FE provides a combination of standard S/C interfaces in one device. It is the interface to your high speed Spacewire links (4 times up to 200 MBit/s, expandable by an additional 12 connections). It also supports in its combined role as Bus controller, multi–Remote Terminals and Bus Monitor two fully redundant MIL-1553 interfaces.

Broad Compatibility

Supports a wide range of spacecraft I/O standards, including:
- MIL-STD-1553B, a 1 Mbps link widely used in aerospace
- Standard data links and interfaces, such as Space Wire
- PCI Express Endpoint 2.5 GB/s
- multi-line generic LVDS, LVTTL, RS485 interfaces

Feature Overview

ProUST-FE is composed of following features:
S/C interfaces:
- 4 x SpaceWire (pairwise isolated) a high speed serial link based on IEEE 1355
- 2 x Generic I/O (camera link – fully isolated, RX and TX each)
- 2 x MIL-STD-1553B (fully isolated)
- Generic differential 24 pair configurable I/O interface at 2.5V
- 32 x GRAIN interface (individually isolated)
- 4 x RS485 – pairwise isolated (2 domains), generic usage

OVP/UVP for protection PC I/Fs:
- 2× Fiber Optic Links – EMI-immune connection to ProUST-FE
- PCIe 8X – 20Gbps PC I/F
- LAN configuration & status over SCPI

GRAIN (Generic pRogrammable Analog Interface) provides several operation modes, including LCL (Latching Current Limiter) emulation

LCL parameters:
- Channels 1–16: up to 59 V / 6 A
- Channels 17–32: up to 30 V / 2 A
- 16-bit current limit resolution, ≥ 20 μs reaction time, parallel operation for higher LCL classes

ProUST-FE Functional Overview

In addition to the standard device configuration, specific upgrades to enhance interface performance and flexibility can be also done.

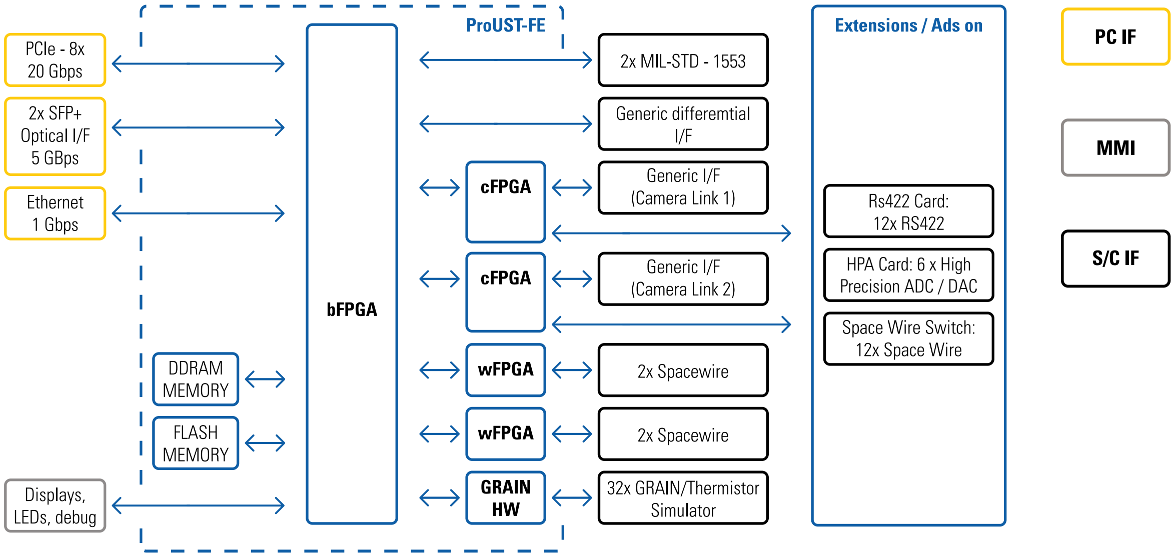

Figure 1: ProUST-FE usage close to S/C

Currently, the following upgrade options are available:

- **MIL-STD-1553 (MIL BUS) Upgrade** – Enhances communication performance over MIL BUS, commonly used in aerospace and defense systems. This upgrade is more in Software level.
- **Space Wire Extension** – Expands the number of Space Wire interfaces, allowing for more high-speed, low-latency connections to additional subsystems or payloads.
- **RS422 Extension:** Provides 12 * RS422
- **HPA (High Precision Analogue Interface) Extension:** With 6 x ADC / DAC each

These upgrades enable the device to support more complex and demanding mission requirements.

PC Interfaces

- 2× Fiber Optic Links – EMI-immune connection to ProUST
- PCIe 8x – High-speed (20 Gbps) PC interface
- 1 Gb LAN – For SCPI-based configuration and status

Man-Machine Interface (MMI)

- RS232 Debug Port
- 2× 7-Segment, 4-Digit LED Displays
- Full Graphic LCD Displays
- 32×2 Generic LEDs
- 42 Buttons – Full front panel interaction

User-Friendly Configuration

- All interfaces are easily accessible and configurable through our Graphical User Interface (GUI), enabling rapid setup, monitoring, and reconfiguration without deep hardware-level involvement.

ProUST has been already supporting several ESA missions, proving its value in real-world space applications:

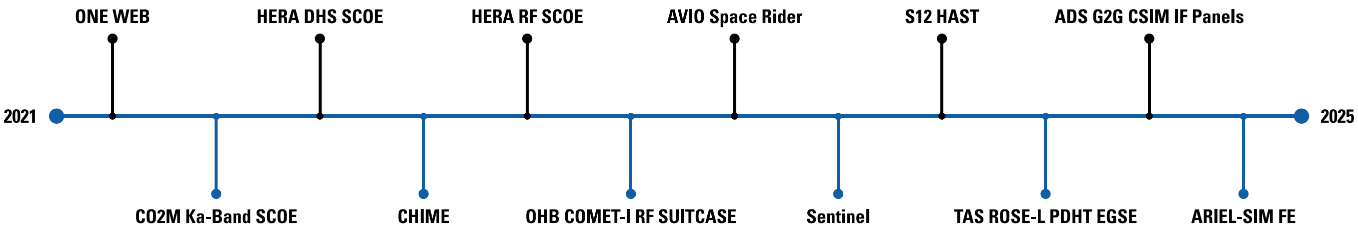

Figure 2: ProUST-FE heritage