



Technolution
Advance

CDPU

SmallSat payload
Instrument Control
Unit (ICU)

- ▶ Instrument Control Unit
- ▶ Scalable Quality & Reliability
- ▶ Standard interfaces
- ▶ Versatile & Secure



Redefining
solutions

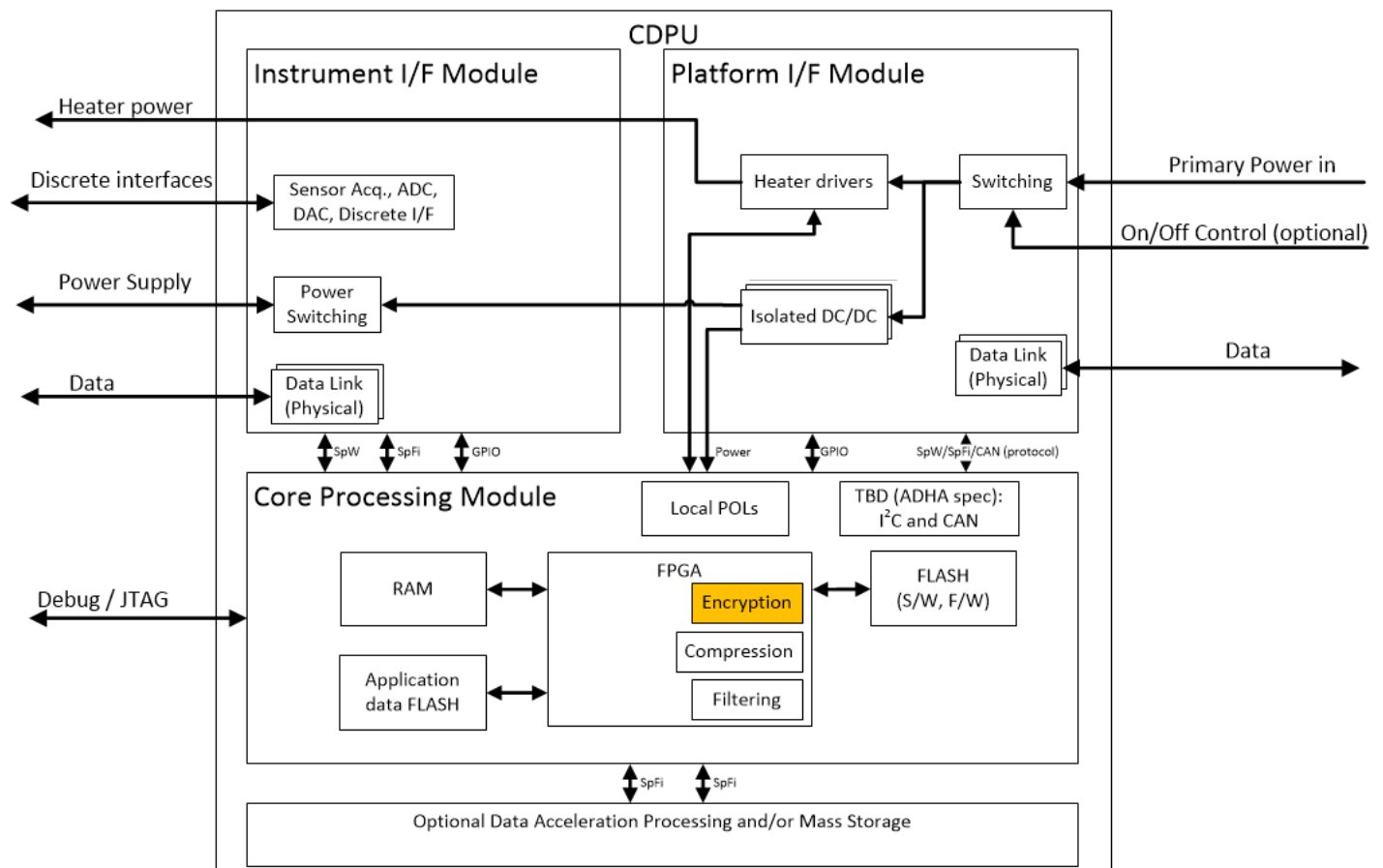
Introduction

The CDPU is a payload Instrument Control Unit (ICU) equipped with data processing capacity for small satellites. The CDPU acts as a hub for (optical) instruments that forms a logical bridge between the (payload) instruments and the SmallSat platform. It will offer standardized hardware interfaces for integrated (optical) instruments, as well as sophisticated facilities for protecting and processing the science data before it is sent down to earth. The CDPU offers versatile and secure payload integration in SmallSat platforms. The development of the CDPU was commissioned by the Netherlands Space Office (NSO).

Technolution defined a modular architecture to allow flexibility in interfaces and functions, with advanced and reliable in-orbit reprogrammability. The component quality class and applied development processes are chosen such to target for an in-orbit design lifetime in the order of 5 to 10 years.



Functional diagram



Features

Instrument Control Unit

Targeting MicroSat and MiniSat

Scalable Quality & Reliability

Based on Rad-hard, Rad-tolerant and/or COTS components

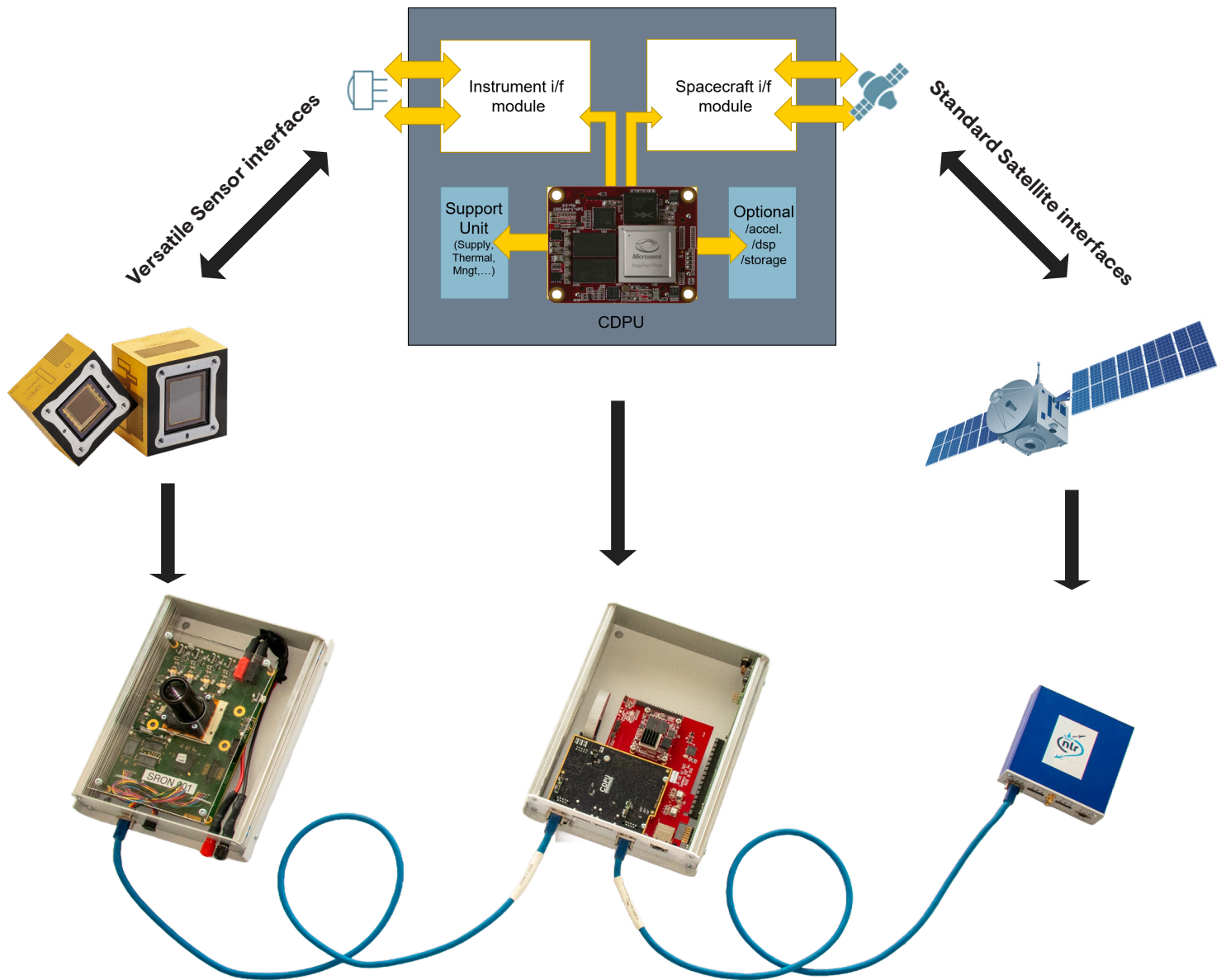
Standard interfaces:

SpaceWire, SpaceFibre*, Ethernet*.

Versatile & Secure

Autonomous instrument control & processing

Pre-engineering model demo setup



With the support from the Netherlands Institute for Space Research (SRON) and Airbus NL, we have built a demonstrator integrating an Engineering Model of the SPEXone instrument together with the CDPU; the CDPU controls the SPEXone instrument and performs the real-time image processing of the SPEXone data (both over SpaceWire using CCSDS packet handling).

SPEXone is a compact five-angle spectropolarimeter instrument for high-end aerosol monitoring, <https://earth.sron.nl/project/spexone-for-pace/>.

Specifications

CDPU-ICU	
Real-time Data Processing rate	>400 Mbit/s
Maximum Power Dissipation	<10 W
Mass	<2 kg
Dimensions	Max. 200 x 150 x 100 mm ³
Environment	5 to 10 years in-orbit operation lifetime in LEO, MEO, GEO
Satellite classes	SmallSat: MicroSat and MiniSat (20 – 1000 kg)
Instrument (payload) interfaces	SpaceWire (SpW), SpaceFibre (SpFi)*, Ethernet*, custom*
Platform (host) interfaces	SpaceWire (SpW), CAN, SpaceFibre (SpFi)*, Ethernet*, custom*
Functions	Data encryption, data compression, data filtering, payload control, TM/TC handling
Fault tolerance	Single string design; redundant interfaces; scalable quality & reliability based on Rad-hard, Rad-tolerant and/or COTS components
Hardware components	Microchip PolarFire FPGA, NanoXplore Ultra300*
Processor architecture	Soft-core RISC-V RV32IMA (lock-step)
Memory	4 GBytes

* customized on request

Instrument developers want to be as flexible as possible in terms of interfaces to enlarge their market potential. The CDPU allows accommodation of payloads on single payload MicroSats (one-offs or constellations) as well as hosted payload on bigger platforms. Thanks to the modular architecture, the CDPU enables instruments to be accommodated on multiple platforms with minimum platform interface engineering effort.



Technolution Advance

About Technolution Advance

If you are planning to develop advanced electronics and embedded systems in complex devices, you need partners that you can trust. We offer a unique combination of knowledge and experience as we join broad knowledge of software and thorough expertise in electronics. development. In addition, our engineers have a profound understanding of the underlying physics. We look forward to helping you rise to the challenge!

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