

# Quo Vadis, Spacecraft Data Handling? – Current Trends and Developments

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SpaceTechExpo 2024

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DSi Aerospace GmbH is a privately-owned SME headquartered in Bremen, Germany providing dependable electronics since 1997

**DSi**  
Aerospace

Bremen &  
Braunschweig

Payload Data  
Handling  
Units

Data  
Processing  
Units

Currently with 100 employees.

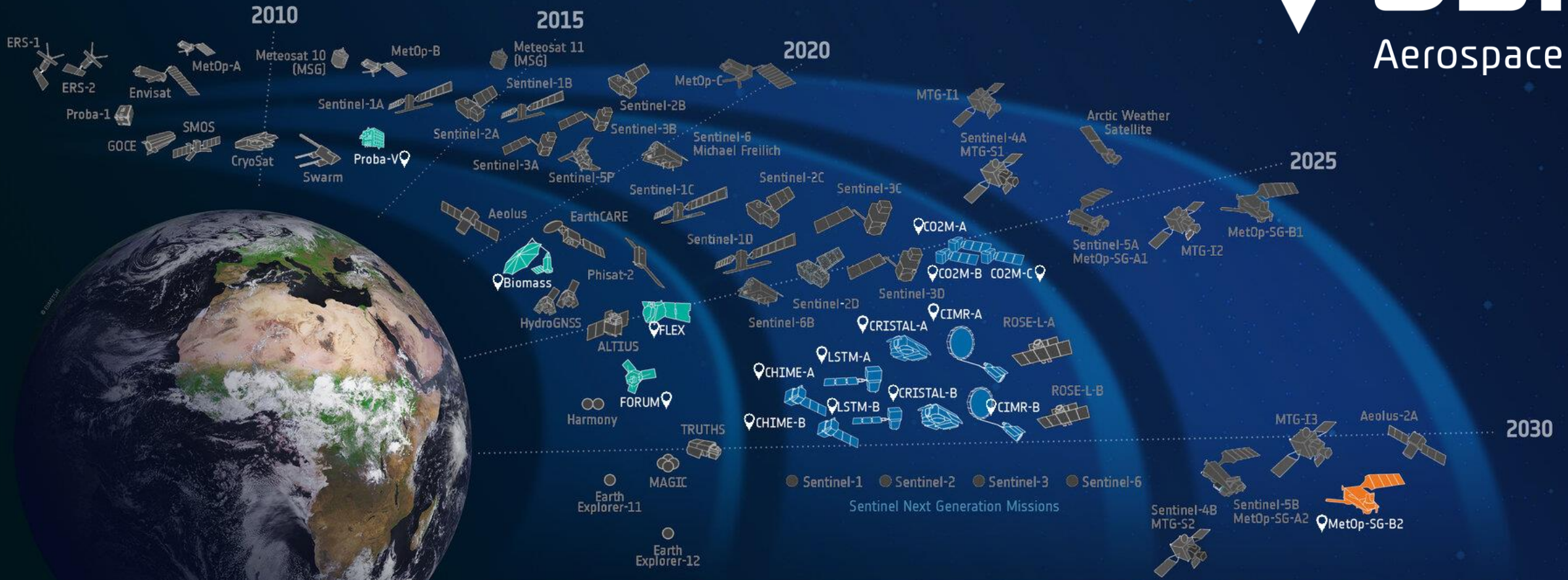
On-Board  
Computers

Instrume  
nt Control  
Units

Ground  
Support  
Equipment

**DSi**  
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Hungary

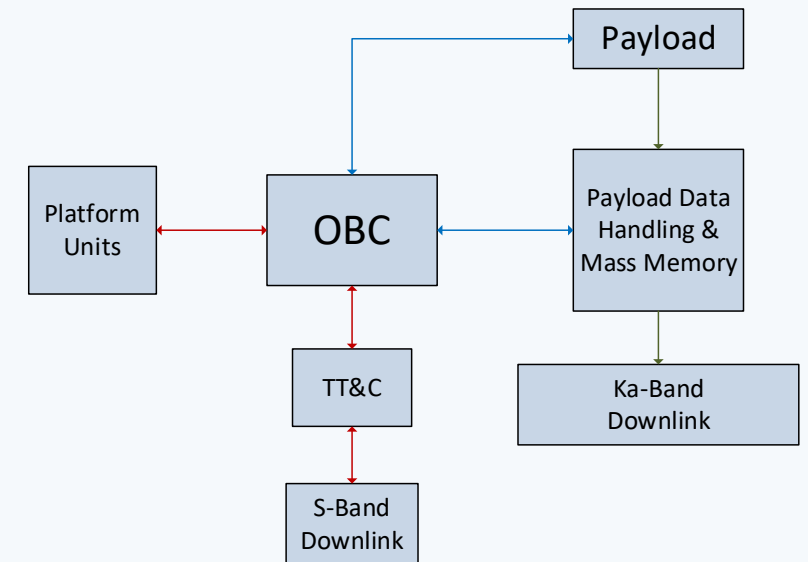
Subsidiary in Budapest established 03.2024





# General

- Data handling systems involve on-board computers, telemetry/telecommand modules, data storage, and communication protocols
- Mission requirements are evolving, demanding higher **processing power** and efficiency while managing the constraints of size, weight, and power.
- **Reliability and availability** constraints remain the main driving requirements for established space hardware manufacturers
- The shift towards **commercial off-the-shelf components** for non-critical missions is growing, but rad-hard parts remain essential for long-term missions.
- **Standardization** efforts aim to streamline avionics systems across multiple missions, increasing efficiency.



for a better space.

# Onboard Processing

- High-performance, low-power processors and FPGAs enable real-time data handling in space.
- Increased Processing Power and Flexibility: Use of advanced processors, and FPGAs to handle real-time data, support autonomous operations, and allow in-flight reconfiguration for mission adaptability
- Energy Efficiency and Radiation Tolerance: Emphasis on low-power, high-efficiency processors and radiation-hardened (or tolerant!) electronics to meet the power constraints of small satellites while ensuring reliability in harsh space environments
- European supply chain sovereignty driving new developments and selection of EEE components

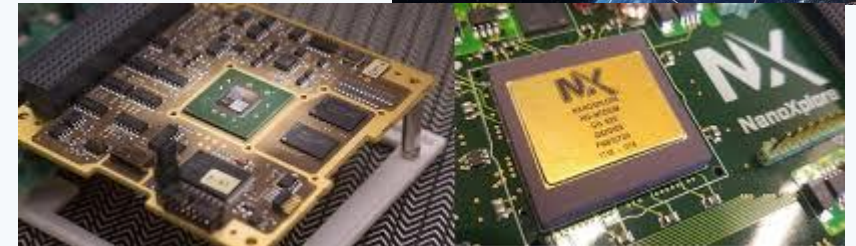
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# COTS

- **Cost Efficiency:** COTS components are widely used in space electronics to reduce costs compared to custom-built radiation-hardened (rad-hard) parts.
- **Rapid Innovation and Accessibility:** The use of COTS components allows space agencies and commercial companies to benefit from rapid advancements in commercial electronics
- **Radiation and Reliability Challenges:** One of the main issues with COTS in space is their vulnerability to radiation
- **New Testing and Qualification Methods:** To ensure COTS parts are suitable for space environments, new testing and qualification processes are being developed.
- **Trend Toward Hybrid Approaches:** There's a growing trend of combining COTS components with rad-hard parts in "hybrid" architectures.



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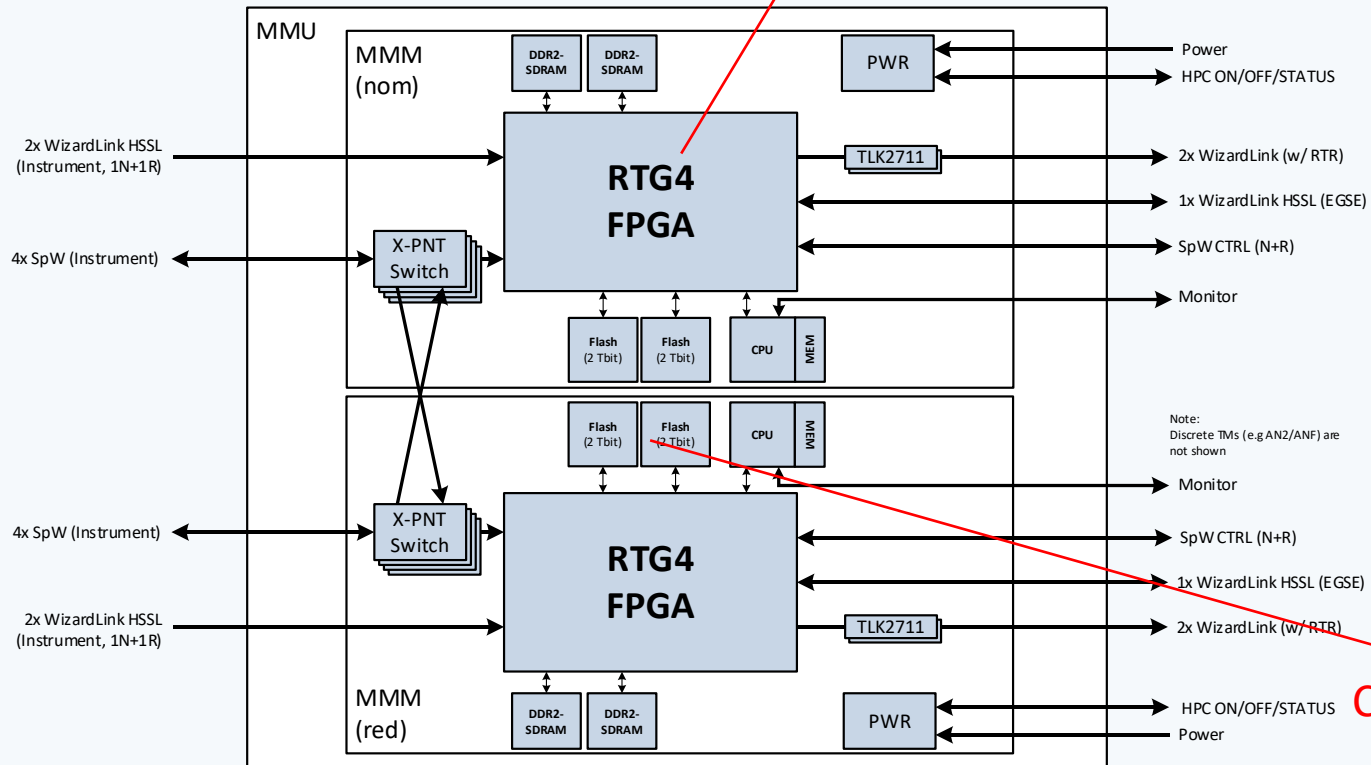
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# MMU for Copernicus Satellites

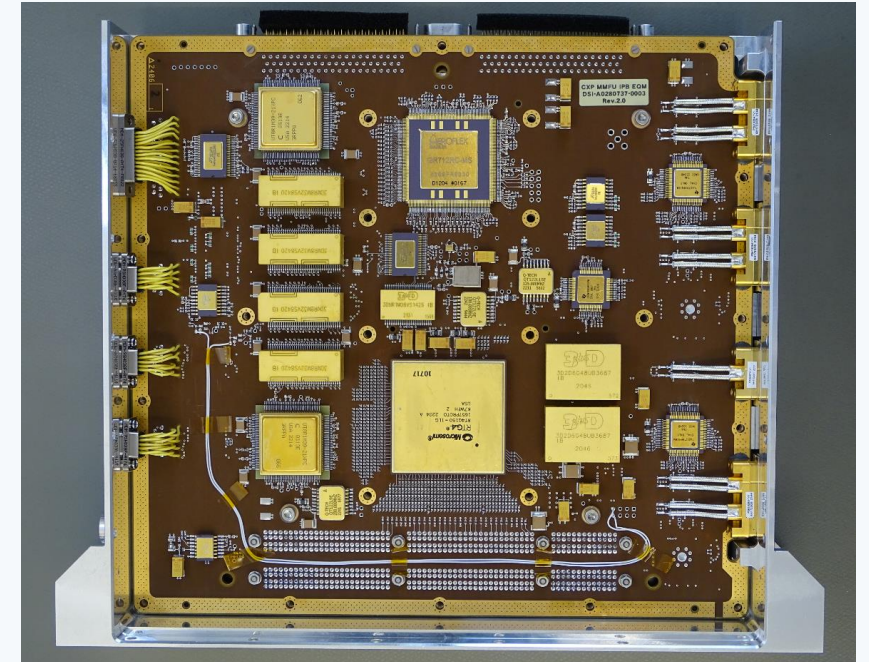
## A RTG4 Based MMU

### MMU EQM

Onboard Processing:  
Integrated Compression IP



COTS: NAND Flash Memory



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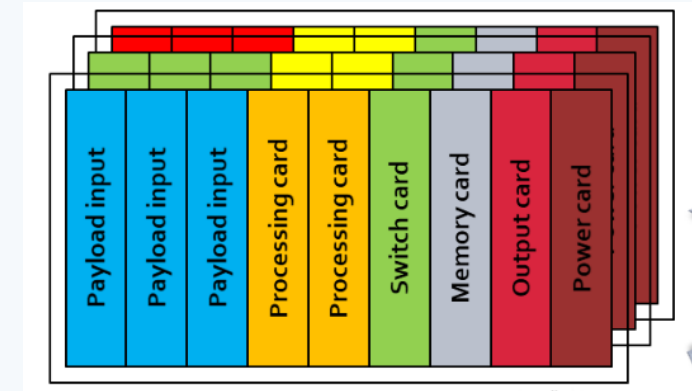
# Standardization

## Advanced Data Handling Architecture (ADHA)

- ESA-TEC driven development, all LSIs involved
- 6U Rack for data handling modules (2-13 Modules)
  - Power Module
  - On-Board Computer Module
  - Payload Processing Module
  - Solid State Mass Memory
  - ...<sup>[1]</sup>

## SpaceVPX

- VPX-based rack development
- SpaceVPX (VITA 78) builds on the VPX standard, offering a modular, open architecture that allows spacecraft systems to integrate standardized, interoperable hardware, reducing customization needs and development costs.



[1] O. Mourra *et al.*, "Advanced Data Handling Architecture (ADHA): Status, Current Activities and Industrial Road Map," 2023 European Data Handling & Data Processing Conference (EDHPC), Juan Les Pins, France, 2023, pp. 1-8, doi: 10.23919/EDHPC59100.2023.10396371.

[2] Robert F. Hodson, *et al.*, "SpaceVPX Interoperability Assessment", NASA/TM-20220013983, NESC-RP-21-01628.



Thank you for your attention!

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