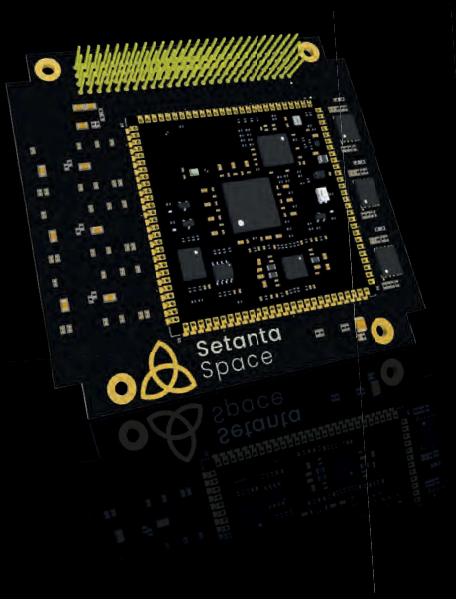
danu



Danu is a modular onboard computer platform designed for small satellites, hosted payloads, and autonomous space systems. Built around the flight proven Microchip SAMV71 architecture and a high-performance FPGA fabric, DANU delivers a flexible balance of reliability, performance, and expandability.

The platform supports **COTS**, **radiation-tolerant**, and **radiation-hard** configurations, enabling a common software and hardware baseline from early prototyping through flight deployment. A modular space tile interface allows DANU to scale from a traditional OBC to a heterogeneous compute node capable of hosting AI accelerators, FPGAs or mission-specific processing.

Key features

- Modular OBC architecture with optional compute expansion
- SAMV71 / SAMV71RT / SAMRH71 ARM Cortex-M7 processing
- Integrated FPGA for real-time processing, I/O bridging, and reconfigurable logic
- Single-slot spacecraft form factor
- Common software stack across COTS, RT, and RH variants
- Designed for AI, autonomy, and high data-rate payload handling
- Available in PC104, VPX and custom form factors

Interfaces

Communications

- Ethernet
- SpaceWire
- CAN / CAN-FD
- UART
- SPI
- I²C
- GPIO

Expansion

- Modular space tiles for:
  - AI accelerators
  - Co-processors
  - Custom mission hardware

Software Support

DANU's flight software is built using a component-based flight software kit, combining an extensive library of validated onboard software components with a lightweight service-oriented framework. This approach promotes portability and modularity across COTS, RT, and RH MCU variants, while supporting deployment on both the DANU hardware and desktop environments for early prototyping.

Standardized service interfaces are used to assemble mission-specific stacks for data handling, monitoring, automation, and communications, allowing protocols and subsystems to be swapped or emulated without impacting higher-level behaviour. Platform abstraction enables the same software model to run on operating systems from Linux to hard real-time environments such as FreeRTOS or RTEMS, with peripheral access provided through reusable library components.

Graphical and command-line tooling support configuration, code generation, build and test, integrating with common development environments, and automation pipelines. The same tooling underpins ground-like interaction and automated test scripting, enabling iterative, agile development of mission-specific flight software for DANU.

Applications

- CubeSat and SmallSat OBC
- AI-enabled Earth observation
- Space Situational Awareness
- Autonomous navigation and GNC support
- Payload control and data handling
- Technology demonstration missions
- Aerospace and Defence

Electrical & Mechanical (Summary)

- **Form Factor:** Single-slot PC/104 modular spacecraft board, VPX, and custom form factors
- **Radiation:** COTS, RT, and RH options available

Detailed electrical and mechanical specifications are available upon request.

DANU is designed as a long-lived platform, not a single-mission board. Its modularity, scalability, and common software baseline allow missions to scale capability without redesigning the core OBC, reducing non-recurring engineering costs, qualification and program risk.

DANU is available as a standard product or as a mission-customized configuration. Space tiles and software stacks can be provided to meet specific mission needs.

For detailed specifications, radiation reports, or integration discussions, contact the Setanta Space team.

danu

System Architecture

Main Processor

- **Processor Family:** Microchip SAMV71 / SAMV71RT / SAMRH71
- **Core:** ARM Cortex-M7
- **Clock Speed:** Up to 300 MHz (100 MHz for SAMRH71)
- **Architecture:** Deterministic real-time MCU suitable for FDIR and control tasks

The SAMV71 provides a flight-proven microcontroller platform with strong real-time performance, low power consumption, and extensive peripheral support.

Memory

- On-chip MCU SRAM and Flash
- External memory support (eMMC and MRAM)
- FPGA configuration memory

Space Tile Concept

- True modularity for spacecraft computing through standardized, swappable computing tiles
- Packages complex subsystems into a single module:
  - FPGA logic
  - AI accelerators
  - Control and management logic
  - Power conditioning
  - Clocking and timing
  - Configuration and system interfaces
  - Mass Memory
- Dramatically reduces hardware development time and system integration effort
- Simplifies avionics architecture by replacing custom boards with proven computing blocks
- Enables rapid mission reconfiguration without redesigning the full avionics stack
- Allows capabilities to be upgraded or changed late in the mission design cycle
- Provides a scalable path from early prototypes to flight systems

Variants

DANU

- Integrated SAMV71 /SAMV71RT / SAMRH71 MCU
- Integrated space tile
- Optimized for:
  - CubeSat OBCs
  - Payloads
- Specifically aimed at LEO, Aerospace and Defence

DANU RH

- SAMRH71 radiation-hard MCU
- Integrated space tile
- Suitable for:
  - Advanced payload handling
  - Onboard autonomy
  - AI pre-processing and inference
- Designed for:
  - Long-duration missions
  - Higher radiation environments
  - Exploration and deep-space platforms
- Total Ionizing Dose (TID): > 100 kRad (Si) accumulated tolerance. Also immune to SEL up to ~62 MeV·cm²/mg

DANU RT

- SAMV71 MCU
- Integrated space tile
- Suitable for:
  - Advanced payload handling
  - Onboard autonomy
  - AI pre-processing and inference
- Designed for:
  - High reliability
  - Short to medium duration missions
  - Low to medium radiation environments
  - Satellites in orbit
- Total Ionizing Dose (TID): ~30 kRad (Si) accumulated dose tolerance. Latch-up: Immune to single-event latch-up (SEL) up to ~62 MeV·cm²/mg