TRISKEL
OBC+TTC+OBSW SOLUTION

TRISKEL is an integral solution for CubeSats command and data handling and communications that integrates the core of any platform, the OBC, TTC and OBSW in one single module.

"Always-on" operation and "no-code" development for standard CubeSat missions. Customizable for high requirements and unique missions.

OBC: On-board Computer
TTC: Telemetry, Tracking, and Command
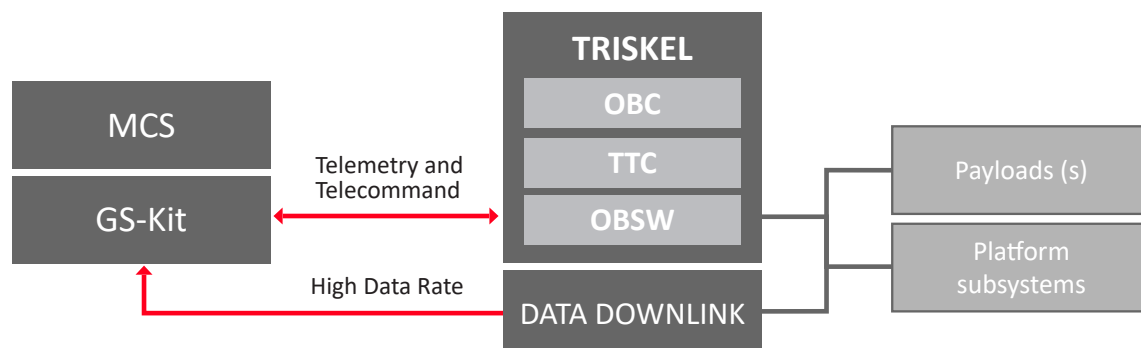**OBSW:** On-board Software

Features

- Platform and subsystem agnostic command and data handling solution based on the ESA/ECSS PUS standard
- Independent Cortex-M7 microcontrollers for the OBC and the TTC subsystems
- IMU (Inertial Measurement Unit):
  · 3-Axis Digital Magnetometer
  · 3-Axis Gyroscope
  · 3-Axis Accelerometer
- GNSS Options:
  · Internal GNSS (GPS, Galileo, GLONASS, Beidou)
  · External GNSS via PPS signal input
- Hardware watchdog and reset circuit
- SDK version for custom development or OBSW version for use with Alén Space platforms

Characteristics

- PC/104 board with shielding protection
- Operational temperature: -30ºC to +85ºC
- Integrated temperature and current sensors

Complete Data Handling Chain

MCS

GS-Kit

Telemetry and Telecommand

High Data Rate

TRISKEL
OBC
TTC
OBSW
DATA DOWNLINK

Payloads (s)

Platform subsystems

Integration and Compatibility

- Interfaces: 1xUART, 2xCAN, 2xI2C, 3xRS422, PPS, 15xGPIO, 8xADC, SPI, 6xPWM over an H-Bridge
- Umbilical: CAN, OBC JTAG, 4xGPIOs, OBC UART for debugging, Multipurpose OBC UART, 2xUARTs for payload access

OBC SPECIFICATIONS	TTC SPECIFICATIONS	OBSW	
		Core Services	**Additional Services**

• Cortex M7, up to 280 MHz
• RTC with external power supply
• Memories:
  · 2MB program flash memory
  · 1.4 MB internal RAM
  · EEPROM for board configuration
  · 32 MB high - speed SDRAM for code execution
  · 512 KB SEU and SEL immune MRAM for critical data storage
• Storage:
  · Up to 128 GBs of massive storage (2x microSD card slots)
  · 128 MB NAND flash
• IMU: Magnetometer, gyroscope, accelerometer
• Optional GNSS module: internal or external
• Sensors: Temperature, current
• SDK with FreeRTOS (CSP compatible)
• Switchable power for the NAND flash memory, PWM H-Bridge, internal GNSS
• Switchable external independent power supply for external sensors
• Cryptographic capabilities (AES, HMAC)
	• Cortex M7, up to 280 MHz
	• Frequency bands:
	  · UHF 395 - 410 MHz
	  · UHF 430 - 440 MHz
	• 400 or 435MHz band frontend
	• Half-duplex communication
	• GFSK modulation (GMSK)
	• Data rates up to 19.2 kbps
	• Transmission power: 30 dBm
	• Reception sensitivity: -123 dBm @1.2 kbps
	• Golay + Reed-Solomon codification
	• Cryptographic capabilities (AES, HMAC)
		• Event reporting
		• Housekeeping
		• Configuration parameters management
		• Real-time forwarding control
		• On-board telemetry storage
		• Scheduler
		• On-board request sequencing for automation
		• Telecommand execution verification
		• On-board time management
		• Memory management
		• Test service
			• Recovery system
			• FDIR for software and hardware
			• TMTC transfer layer
			• Autonomous payloads monitoring and data collection
			• PUS based hardware services to manage platform subsystems and payloads
			• Filesystem and file transmission protocol

PC 104 System Bus

Watchdog Reset circuit — IMU — Sensors — Interfaces — OBC Cortex-M7 — MRAM — Flash — GNSS module — ANT GNSS — RTC

Watchdog Reset circuit — TTC Cortex-M7 — Interfaces — Transceiver — Front-End — ANT RF