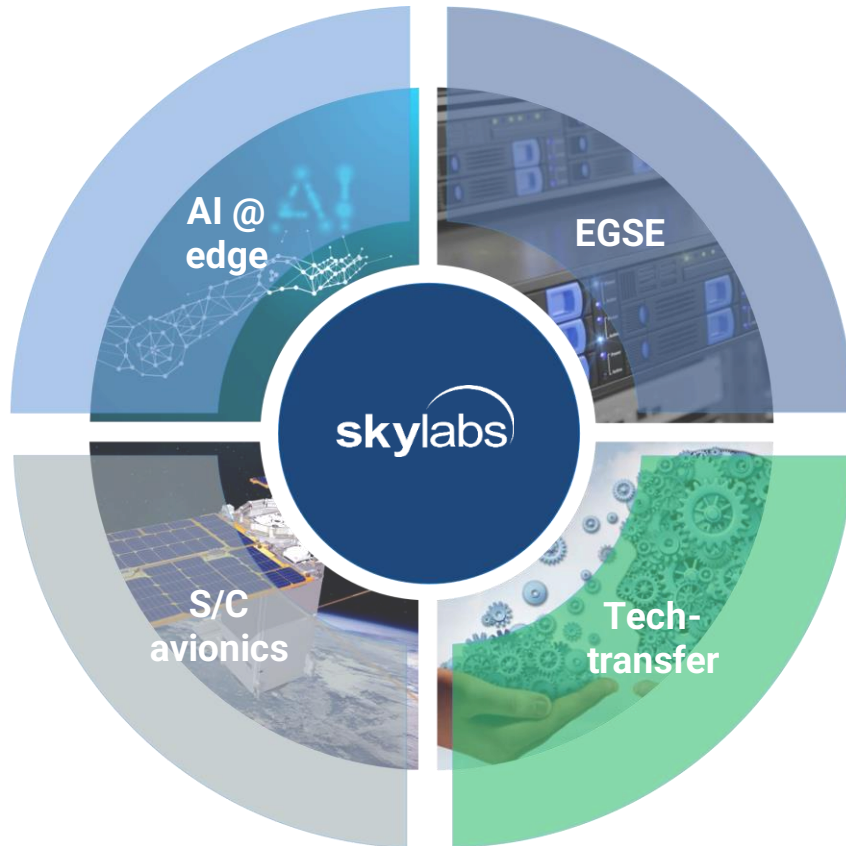


NANOskey platform 2nd GEN with NOEL-V in MEO

RISC-V in Space Workshop / 14.12.2022 / Dejan Gačnik



skylabs



NANOsky platform



Image: Microsatellite with NANOsky avionics - © OHB-Italia

EPS

- High-level of integration
- All-in-one approach
- **Best-in-class** battery life-time

OBC & Payload computers

- Highly miniaturised with FT
- Mid to high performance
- **AI@Edge** enabler

COMM

- Best SWaP
- CCSDS compliant
- **SDLP-Secure** connectivity
- UHF/VHS/S-bands
- X coming soon

RTU

- Highly scalable & modular
- Build-in intelligence



Constellations
8

Units sold
75

S/C up to
300 kg

NANOsky platform

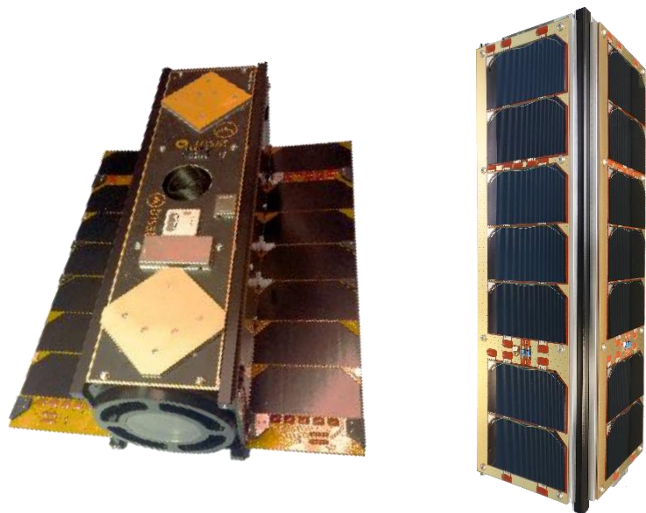


Image: Nanosatellite with NANOsky I avionics - © University of Maribor

Radiation tolerance

SEE tolerant, TID > 20 krad

Manufacturing

IPC Class3+ (with full traceability)

Quality assurance

ISO 19683:2017

Turn-key solution

Comprehensive skyEGSE



Orbits
LEO, MEO

IODs
TRISAT -R,-S

Next flight
Q2/2023

A detailed illustration of the TRISAT-R satellite in orbit. The satellite is a rectangular nanosatellite with a yellow frame and dark blue solar panels. It has a large, silver, cylindrical antenna or sensor at the front and a small, circular antenna at the back. The background shows the Earth's horizon and the blackness of space.

TRISAT-R

First nanosat in MEO (with RISC-V)

Mission and technologies

IOD of a highly miniaturized and fault tolerant NANOsky platform

IOD of first RISC-V processor (NOEL-V) in Space by CAES (Cobham Gaisler)

Provide mapping of ionizing radiation and radiation effects with on-board instruments:

- **RadMon** from CERN
- **CHIMERA** RHA from ESA
- TID monitor from SkyLabs

Key facts:

Prime	University of Maribor
Launch vehicle	VEGA-C maiden flight
Orbit	MEO, 5865 km
Platform	NANOSky I avionics (SkyLabs)
Dimensions	Nanosatellite, standard 3U form factor
Communication	UHF/VHF (GFSK)

Telemetry



STATUS

IN OPERATION



BATTERY VOLTAGE

9.98 V



MISSION ELAPSED TIME

153 : 13 : 50 : 30



BATTERY TEMPERATURE

26 °C



TELEMETRY UPDATED

13.12.2022 10:01:45



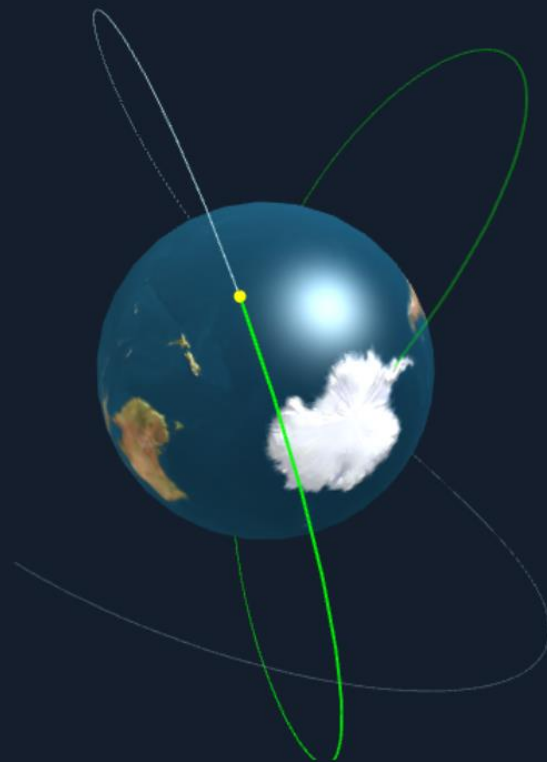
SOLAR PANELS TEMPERATURE

20 °C



ORBIT INFORMATION

ALTITUDE	5864.3 KM
VELOCITY	5.709 KM/SEC
LATITUDE	-57.8027°
LONGITUDE	-171.9813°



We downlink telemetry every time the satellite passes over our ground station



NANOhpm-obc

High Performance Fault Tolerant RISC-V OBC



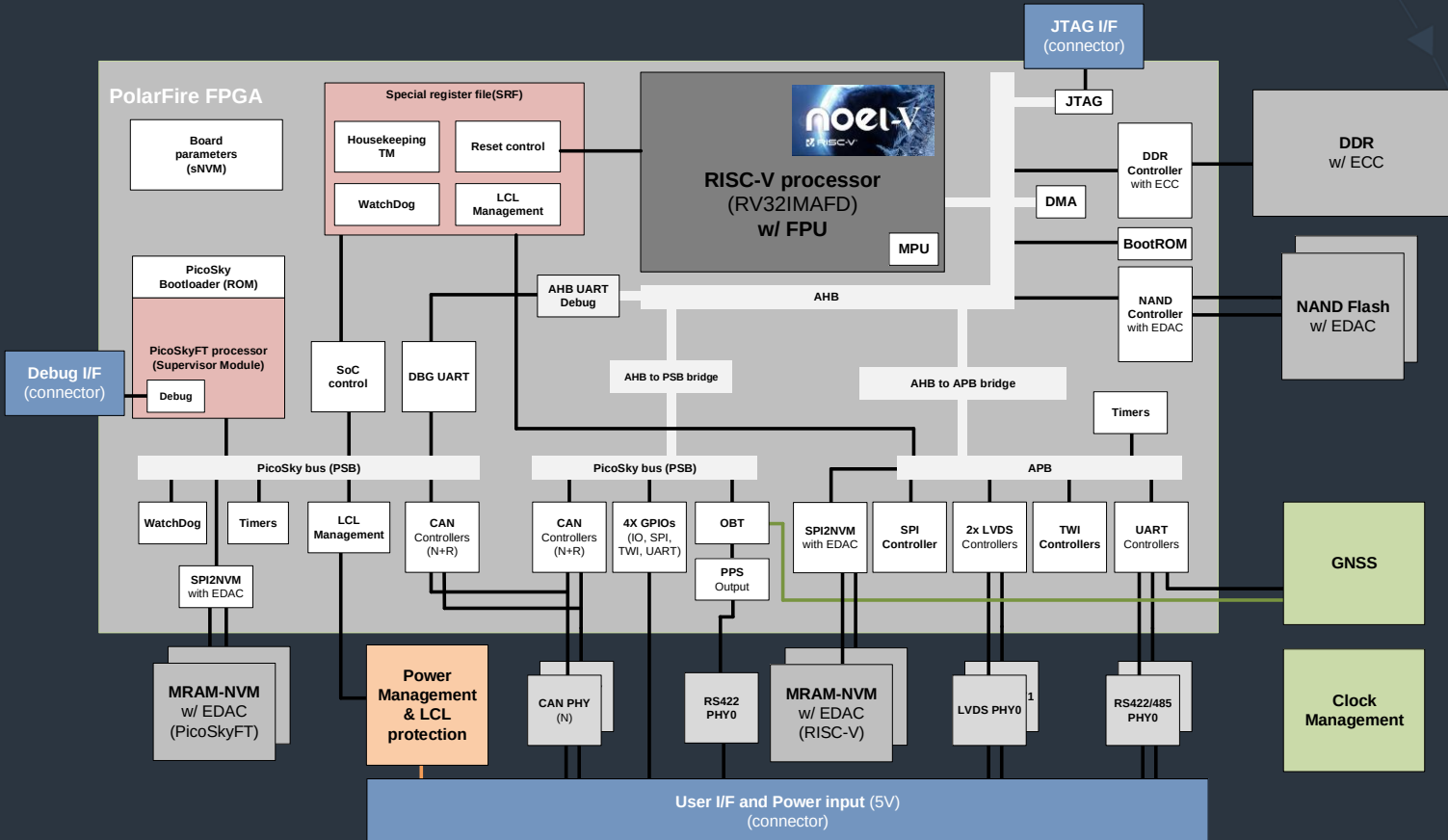


Key features

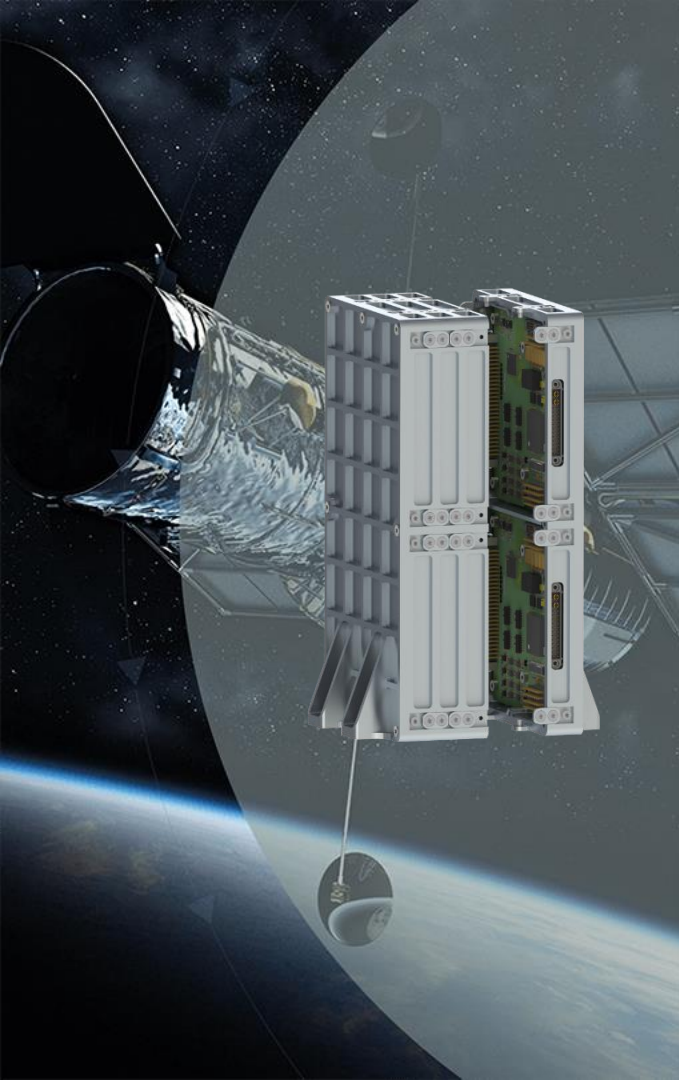
Proc	Fault Tolerant NOEL-V processor @ 50 MHz / 106 DMIPS RISC-V 32-bit architecture with FPU
Mem	256 MB DDR3 memory (SECDED) 4 Mbit MRAM for TM storage (SECDED) Redundant 2Gb NAND mass storage
I/F	Redundant CAN for TM/TC 2x High-speed LVDS or RS422/485 channels, 8x GPIO GNSS receiver on board (GPS/ LONASS/Galileo/BDS/...)

** ESA activity (70k€) to support integration of NOEL-V into SoC*





NANOstack offers complete flexibility in stack orientation, fixation positioning and even redundancy management.





NANOhpc

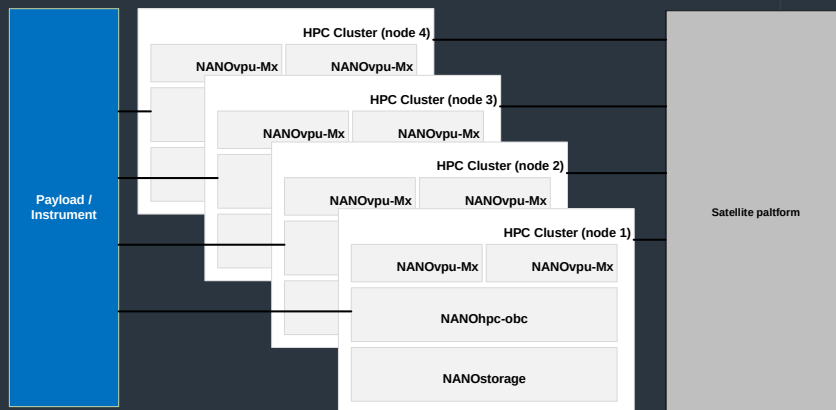
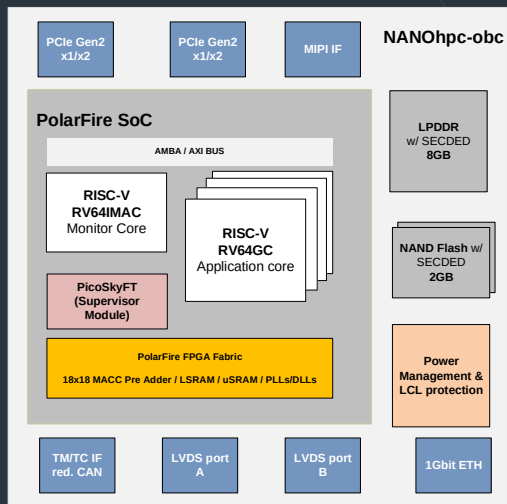
High Performance Computer for **AI@edge**

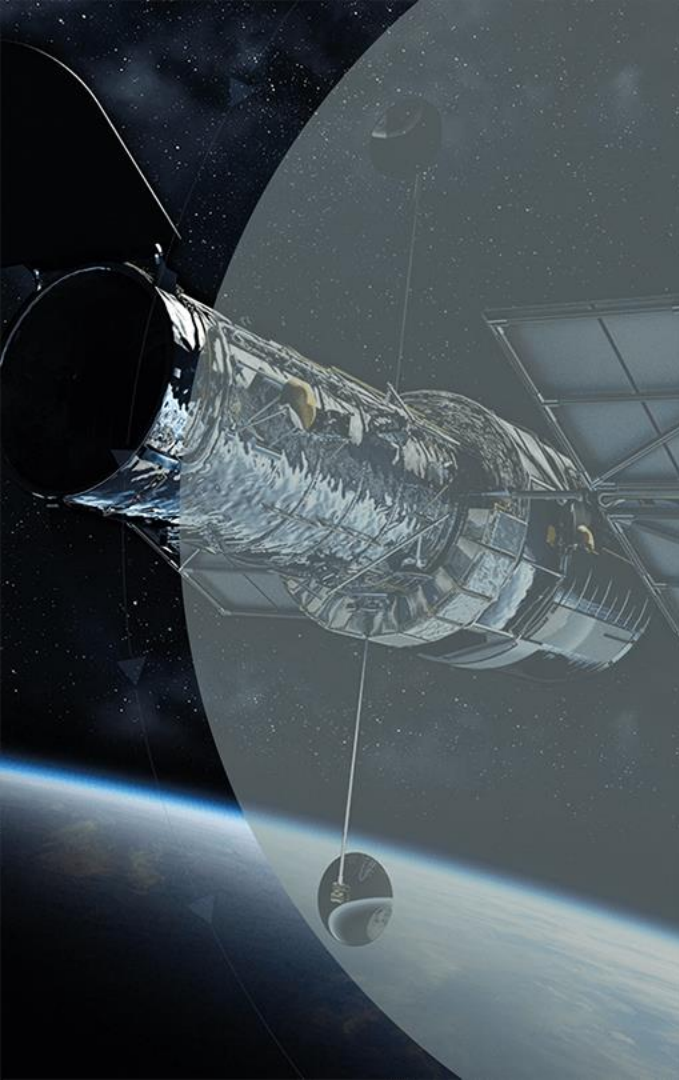


Key features

Proc	5x RISC-V 64-bit processors @ 600 MHz / 4600 DMIPS Fault Tolerant PicoSkyFt Supervisor for RISC Multicores
Mem	16Gb LPDDR4 (SECEDED protected) @ 1600 Mbps Redundant 2Gb NAND mass storage 4 Mbit MRAM for TM storage (SECEDED)
I/F	Redundant CAN for TM/TC 2x 1Gbps ETH, PCIe Gen2 X4/X2, redundant LVDS
Software	Linux (Yocto, Buildroot), RTOS

#Low-Power, #Secure and #Reliable

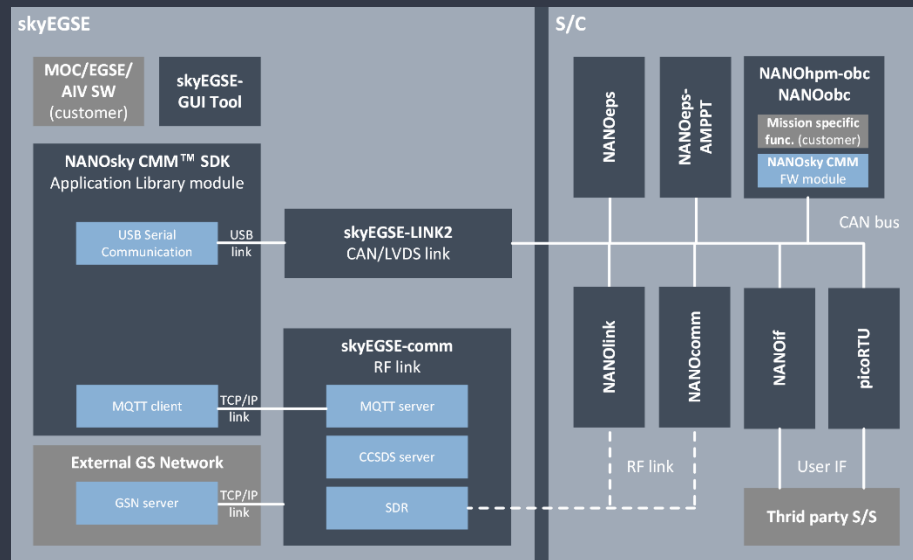




skyEGSE

Turn-key solution for constellation primes

Comprehensive
skyEGSE support
 environment with
 skyEGSE-GUI,
 skyEGSE NANOsky
 CMM™ SDK and
 skyEGSE-LINK2.



Comprehensive
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skyEGSE Project Settings Help

NANOobc [Active]

Home

Dashboard

Parameters

Analysis

Control

Logs

Summary

[Update All](#)

Device Info

Product	SKY-NANOobc-2_rev1
Device P/N	921.000003000001
Serial Number	1205-056789
F/W Version	1.2.3
PCB Version	2
HDL Version	0.12
Time	00:00:00

Firmware Status

Firmware State	Normal
Active Firmware	Secondary
Active CAN Bus	Primary

Validity Status

	Primary	Secondary	Equal
Firmware	●	●	●
Parameters	●	●	●

Alarms and Warnings

Time	Severity	Type	Data
22:28:24	Warning	2048mV reference	0.019
22:28:24	Warning	1.2V	0.020
22:28:24	Warning	1.8V	0.021
22:28:24	Warning	2.5V	0.022
22:28:24	Warning	DCDC temperature	0.23

[Clear List](#)

Telemetry

Housekeeping

Refresh period: Keep alive [Show Analysis](#)

2.048V reference	1.348	V	●
1.2V	1.347	V	●
1.8V	1.346	V	●
2.5V	1.345	V	●
DCDC temperature	23.49	°C	●
FPGA temperature	23.48	°C	●

Counters

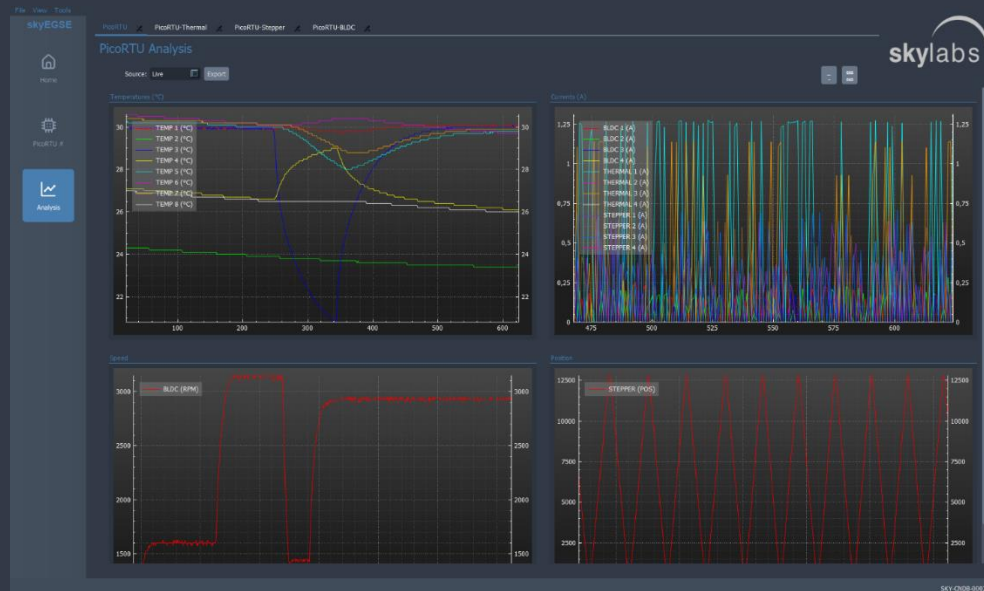
[Update Counters](#)

NAND LCL counter	3043	PM IPI counter	3027
GNSS LCL counter	3044	Prog. exec. fault counter	3031
LVDS LCL counter	3042	SW traps counter	3028
CAN 1 LCL counter	3040	HW resets (all) counter	3032
CAN 2 LCL counter	3041	SW resets counter	3033
Serial MRAM LCL counter	3045	Undefined resets counter	3035
Register faults counter	3029	External resets counter	3034
DM faults (all) counter	3020	PLL unlocked resets counter	3036
DM NACK counter	3019	Debugger resets counter	3039
DM DED counter	3018	Watchdog resets counter	3038
PM faults (all) counter	3026	Power-on resets counter	3037
PM NACK counter	3025	Unhandled IRQs counter	3030
PM SEC counter	3024	DM scrubber SEC counter	3022
PM DED counter	3023	DM scrubber DED counter	3021

SKY-922-1-042A<nominal> [USB]

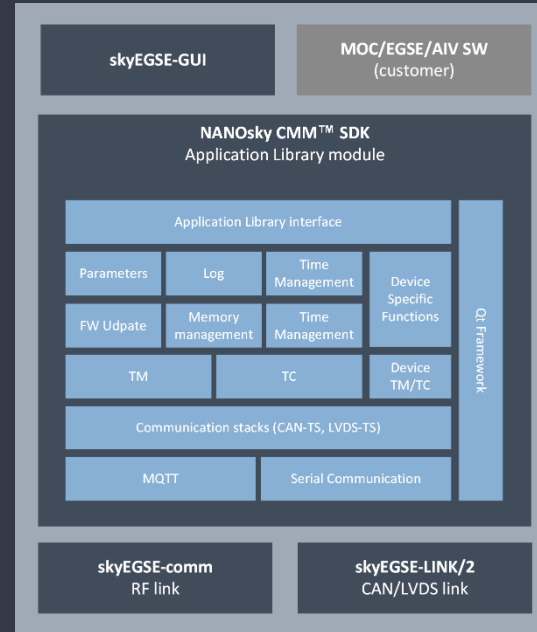
Comprehensive
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skylabs

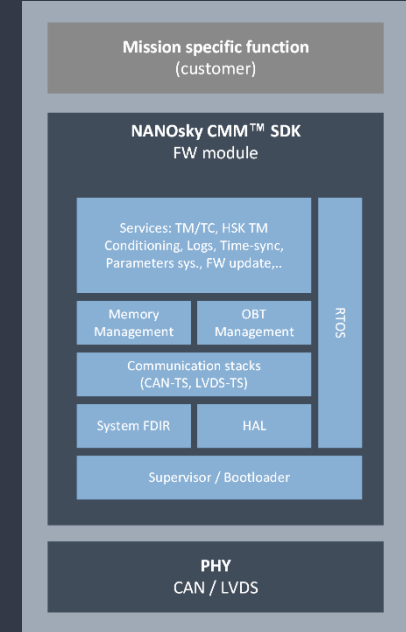




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CMM SDK for AIV/MOC SW



picorTU SW functions

Comprehensive
skyEGSE support
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skyEGSE-GUI,
skyEGSE NANOsky
CMM™ SDK and
skyEGSE-LINK2.

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Thank you

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