Airbus Crisa

A new concept of Remote Interface Units

CRISA

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EDHPC, 02-06 October 2023

AIRBUS

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Introduction

Product Lines in Airbus Crisa




Actuators driving

- Electric motors driving
- Cooler electronics
- Thermal control units

Power

- Power management and distribution
- Electric propulsion
- Power for active antennas
- Power subsystems

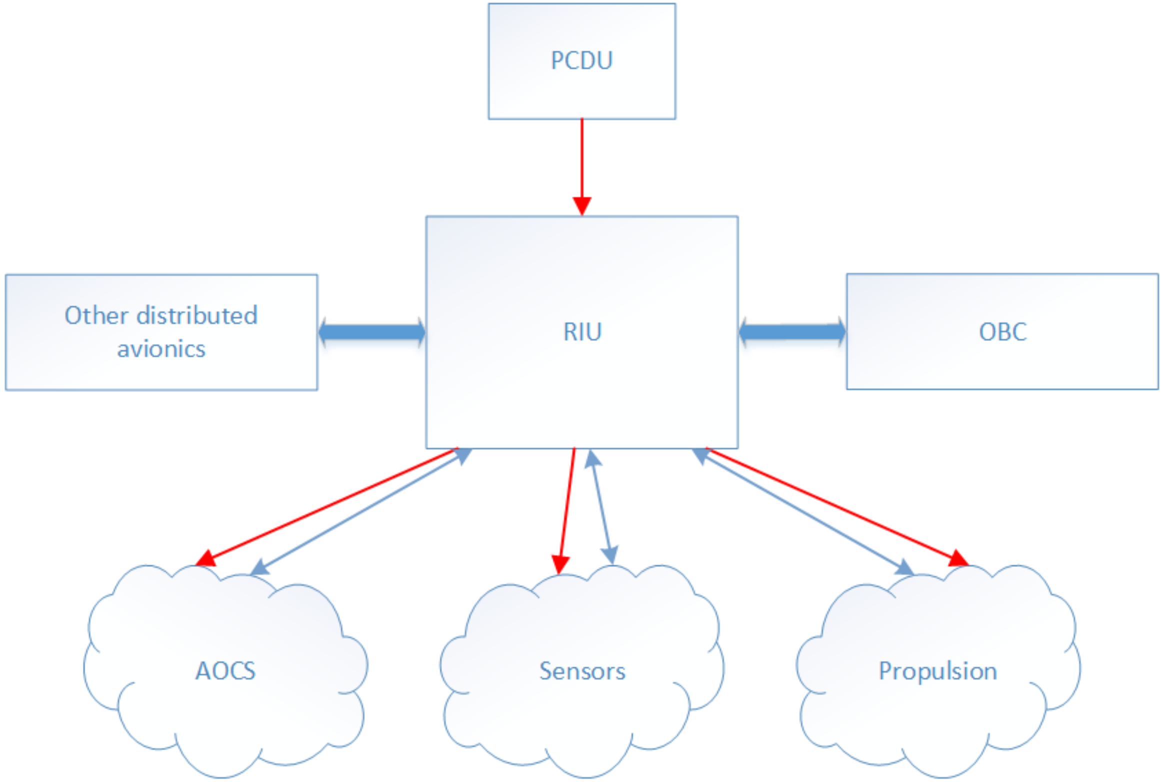
Launchers

- Power distribution
- Avionics bus control
- Engine controllers
- Payload release driving
- Wiring harness
- Li-Ion batteries

Processing

- On-Board computers
- Instrument controllers
- Video electronics
- Active antenna controllers
- Remote interface units
- Security units

What RIUs / RTUs do?

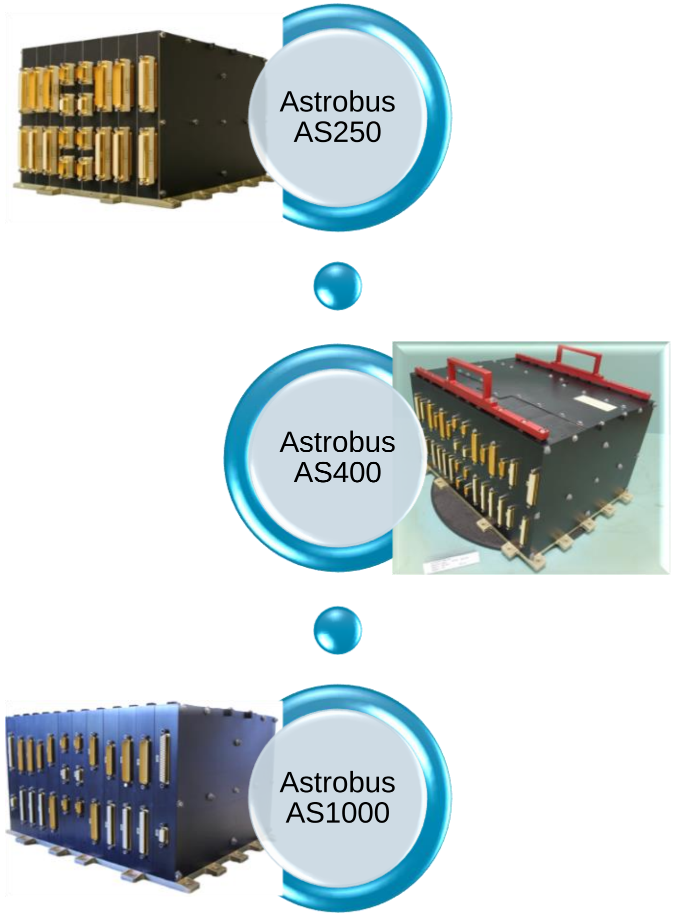


- Data concentrators, execute tasks commanded by the OBC
- Interface with most of the systems of the platform
- Can manage communication networks to relay commands generated by the OBC → distributed architectures

- Needs from the RIU very dependent on the platform
- Modular and easily scalable concepts preferable

- Potential implementations: stand-alone units, integrated with other functions (such as OBC), distributed in small units

Heritage in RIUs / RTUs



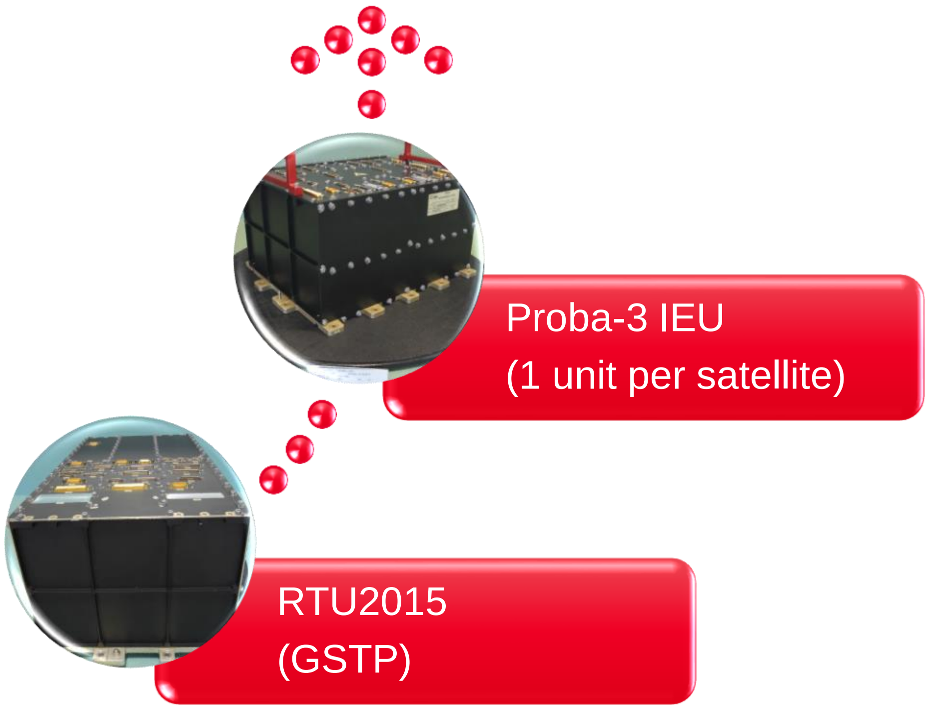
RIUs **tailored** for a family of platforms

- Airbus' Astrobus, with several variants
- Wide portfolio of modules available
- 18 FMs launched
- 7 FMs in the pipeline

>600 kh cumulated in orbit… with no reported failure!

First **standardized** approach

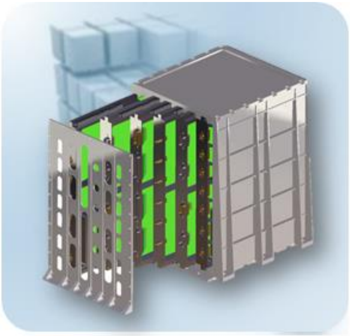
- Generic product: RTU2015
- First flight opportunity for Proba-3 mission



ADHA Standard

Standardization: advantages vs drawbacks

Benefits of standardization



- Mechanical concept, internal services of the unit / rack (power distribution, communication…) have to be developed just once
- Avionics suppliers will need to focus just on the development of electronic modules
- As more missions are developed the portfolio of available boards (modules) increases
- Generally speaking, REC might be slightly higher, but NREC and availability of Flight HW will decrease → perfectly suitable for ESA missions or scalable platforms

Drawbacks of standardization

- Over-sizing of the delivered HW
- No possibility to optimize the architecture of the equipment for certain missions
- Competition mainly just at module level

ADHA standard

General view

- Initiative promoted by the main stakeholders (ESA, prime contractors, HW suppliers)
- Based on the CompactPCI Serial industrial standard. Tailored for space applications

Main features

- Two board dimensions allowed: 3U and 6U
- Standard backplane definition
- Several internal communication protocols, such as CAN, SpaceWire, high-speed optical links…
- Daughter boards supplied mainly from 12V power rail. 5V and 28V available for specific applications

Short-term goals

- To validate the standard, by developing flight-representative ADHA racks with EM quality
- EM racks: 6U, boards with 220 mm and 6 HP (≈30 mm)
- Racks available for validating non-core modules, such as the RIU's

New Generation (NG) RIU

RIU in an ADHA system

Use cases (examples)

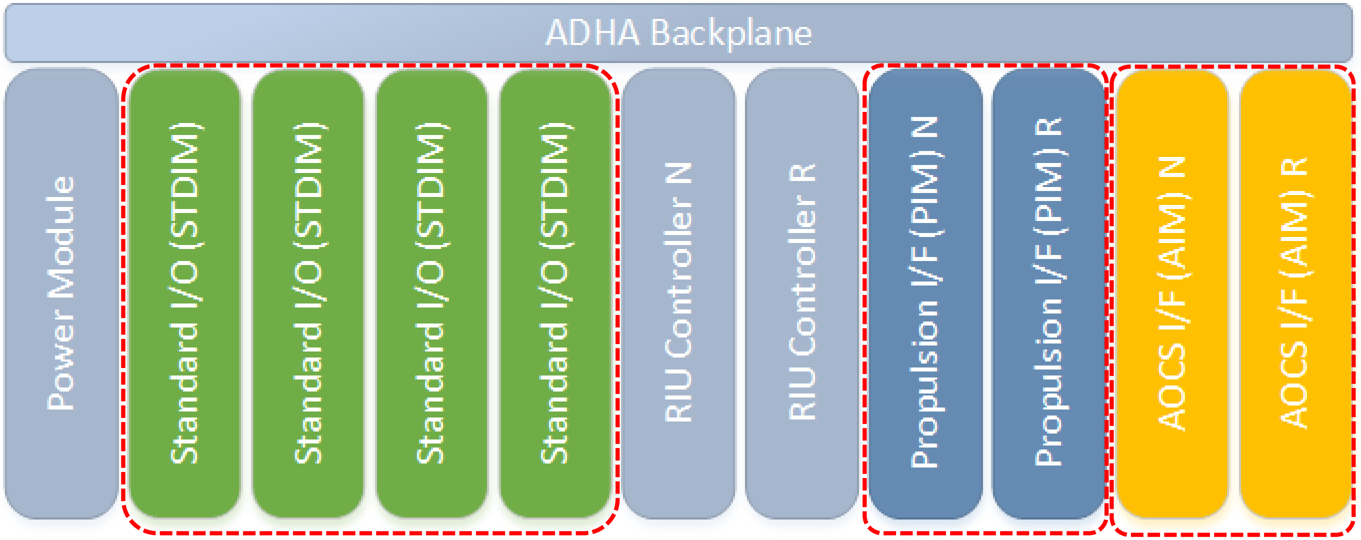
- Stand-alone RIU in a centralized architecture: 6U ADHA rack
- RIU boards integrated in a S/C management 6U ADHA rack
- Stand-alone RIU in a distributed architecture: 3U ADHA rack

Challenges

- Develop a portfolio of boards that can serve the typical RIUs' needs
- Interoperable and flexible to serve to multiple types of users
- Minimize (even remove) the NREC from mission to mission

STREAM project

- To develop three types of typical RIU boards: STDIM, AIM, PIM
- Heritage from previous RIU product lines in Airbus Crisa
- Developed in parallel to the ADHA-compatible GR740 PCM
- To manufacture 1 board of each type, with EM quality
- Board size: 6U, 220 mm depth, 6 HP
- Roles in the ADHA rack: extended peripheral (STDIM) and peripheral



Standard Interface Module (STDIM)

Main features

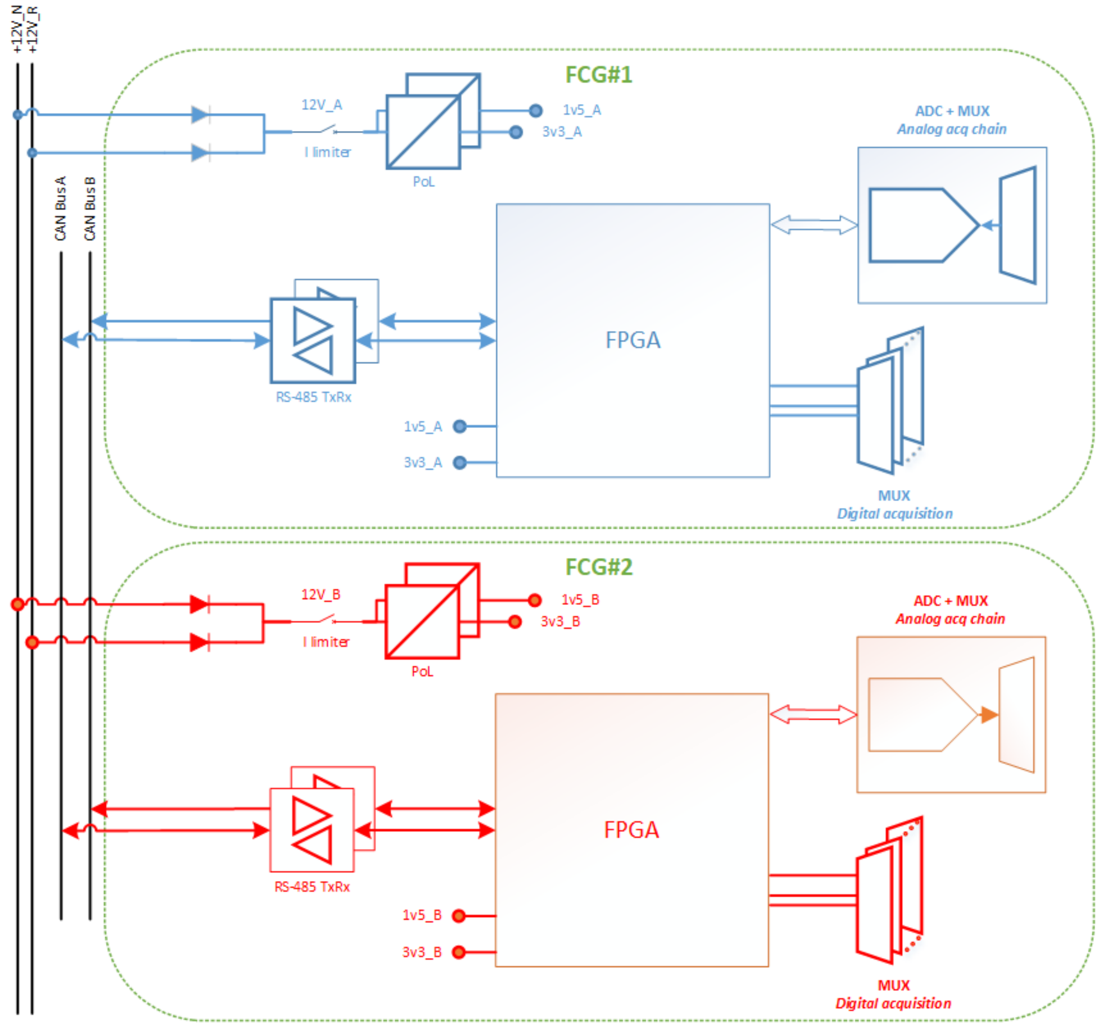
- Fully redundant board, with 2 Fault-Containment Groups (FCGs)
- Extended peripheral boards → up to 4 boards per rack (slots 1 to 4)
- Standard external interfaces, in accordance with ECSS-E-ST-50-14C

Types of interfaces

- Temperature sensors, of several types
- Voltage acquisition
- Status of digital signals
- Distribution of synchronization signals
- Generation of LLC and HPC

Challenges

- To optimize the density of interfaces
- To have the right balance among the different types of interfaces
- To minimize the current demanded to 5V and 28V power rails
- To make the design easily adaptable to non-redundant architectures



Propulsion Interface Module (PIM)

Main features

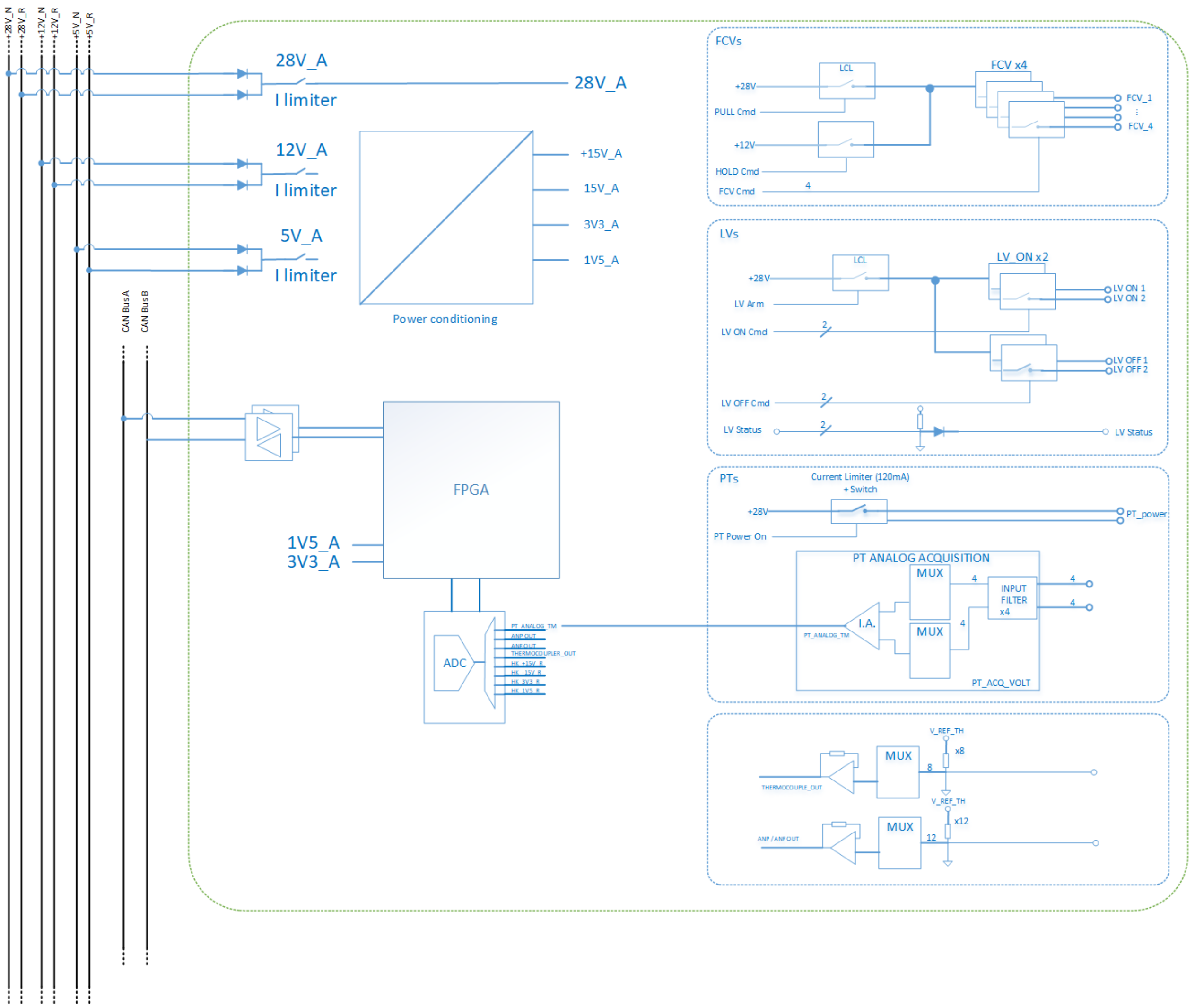
- Peripheral board, managed by the nominal or the redundant system controller
- Interface with the main elements of the S/C's chemical propulsion
- Effectors supplied from a dedicated external 28V power rail

Types of functions

- Driving of flow control valves
- Driving of latching valves
- Conditioning and acquisition of pressure transducers
- Driving of catalyst bed heaters
- Conditioning and acquisition of temperature sensors. STDIM is used for this purpose

Challenges

- To optimize the density of interfaces
- To ease the tailoring between different propulsion systems



AOCS Interface Module (AIM)

Main features

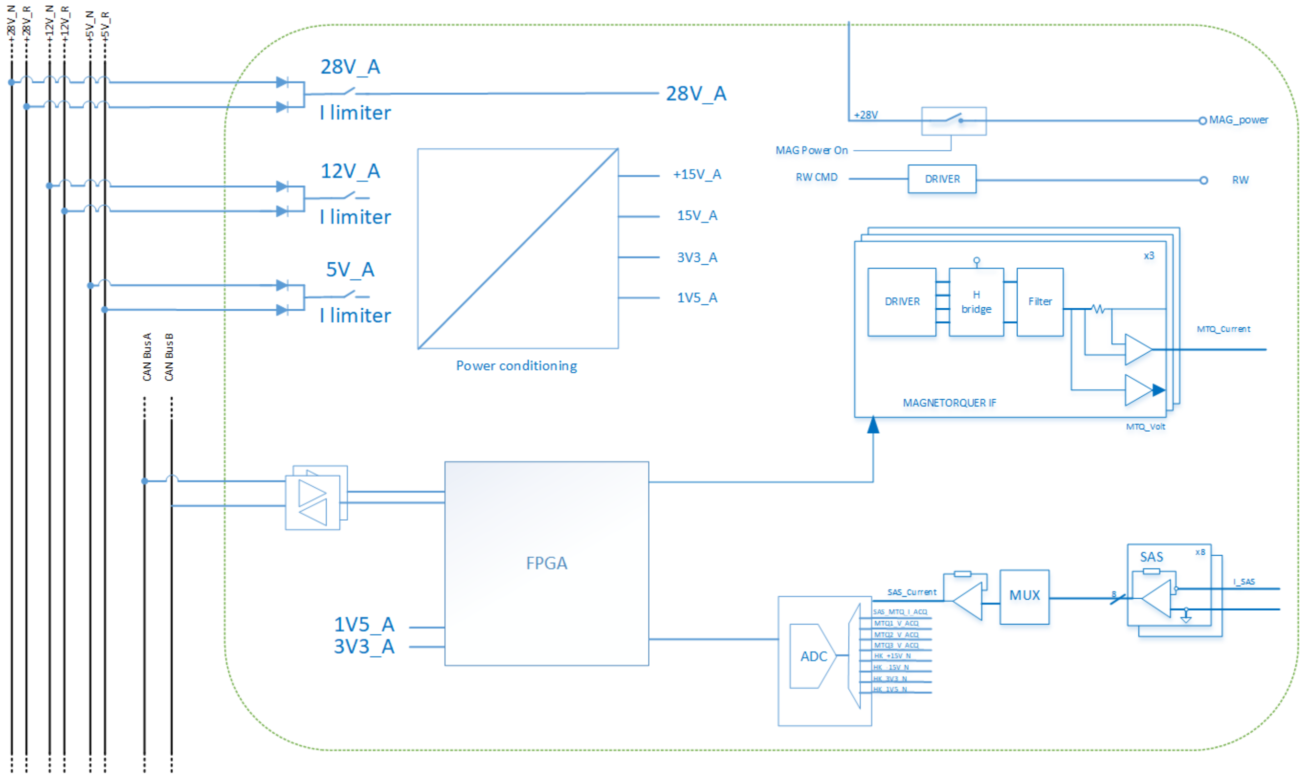
- Peripheral board, managed by the nominal or the redundant system controller
- Interface with the main elements of the satellite's AOCS
- Effectors supplied from a dedicated external 28V power rail

Types of functions

- Conditioning and acquisition of magnetometers
- Complete interface with reaction wheels (commanding and sensors' acquisition and processing)
- Commanding of magnetic rods, with energy absorption during braking
- Acquisition of coarse sun sensors

Challenges

- To optimize the density of interfaces
- To ease the tailoring between different AOCS systems



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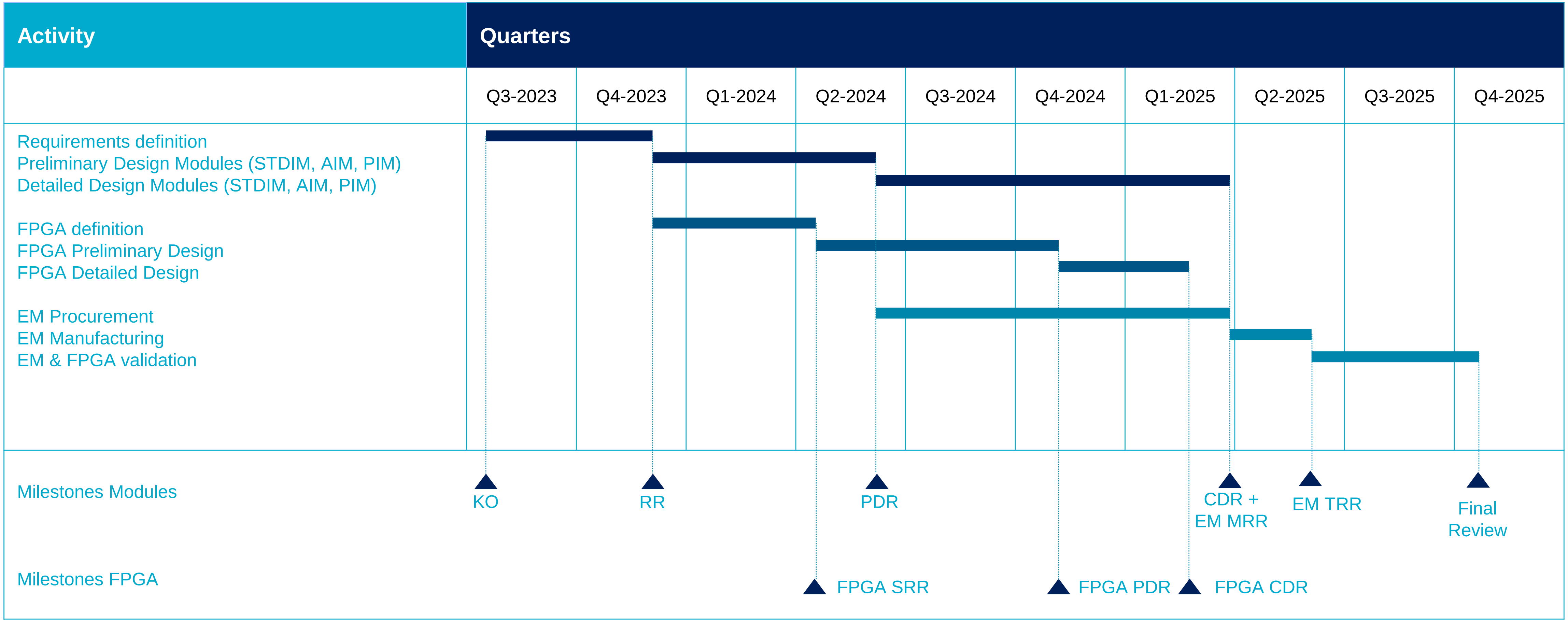
STREAM: planning and main milestones



Conclusions and way forward

Conclusions

STREAM's Main target

- To set up the basis for an Airbus Crisa's ADHA-compliant RIU

Starting point

- Heritage in RIUs for Airbus' Earth Observation platforms and ESA missions
- GR740 Payload Controller Module, ADHA-compatible, currently in development

Expected achievements

- To collect the needs of the missions that intend to use ADHA avionics
- Development of the RIU modules in close cooperation with final users
- To validate the design of the RIU EM modules in a representative environment (ADHA rack)
- To offer an attractive and competitive product to the customers

Post-STREAM steps

- Implementation of design changes due to return of experience (EM to FM design)
- To advance in the industrialization of the products developed in STREAM
- To qualify the design: TRL5 → TRL8

- To develop an EGSE that allows to accept the RIU modules / rack, maximizing the automation of the tests

- To develop a system controller module for RIU stand-alone applications

- **NICE** (New Instrument Control Electronics) project
  – To develop a power module, compatible for stand-alone RIUs and ICUs
  – To validate the use of the STDIM developed in STREAM in an ICU

Thank you

https://crisa.airbus.com/en