



ADHA Future Products and Targeted Applications

ADCSS

Date: 22/10/2020

ThalesAlenia
a Thales / Leonardo company **Space**



Table of content

- 🌐 Introduction
- 🌐 TAS Future Products
 - 🌐 Telecommand, Telemetry, Platform Mass Memory & Reconfiguration
 - 🌐 Processor and GNSS Board
 - 🌐 SSMM boards
 - 🌐 Generic I/O concept
 - 🌐 Power Module
- 🌐 Summary

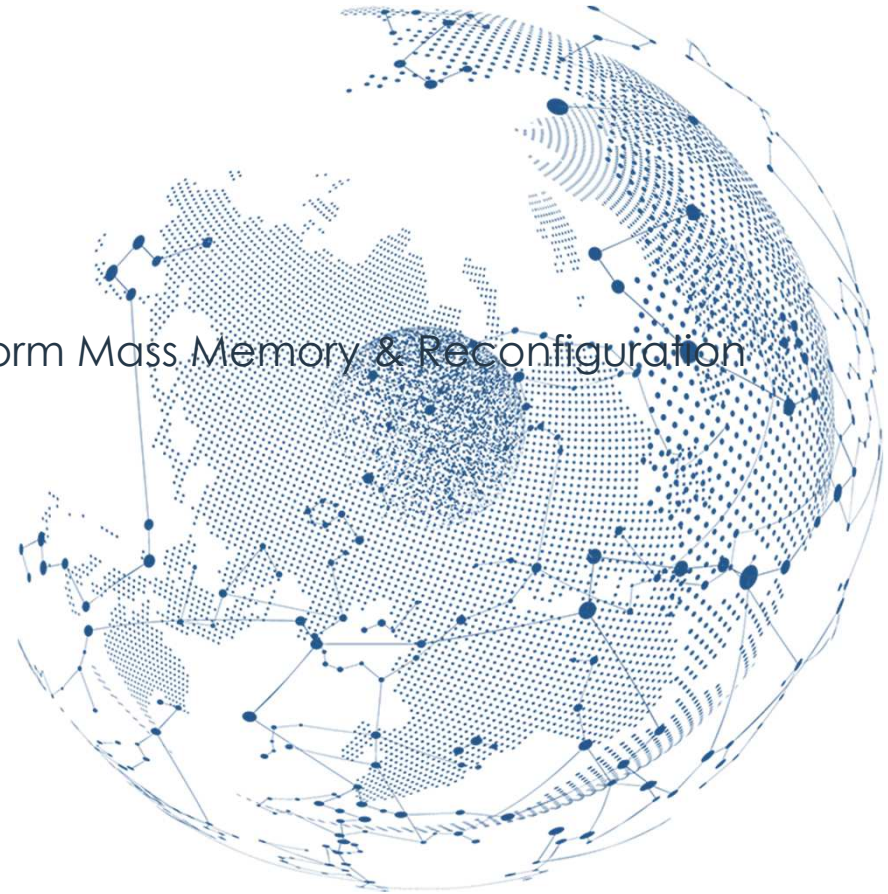


Table of content

 **Introduction**

 TAS Future Products

 Telecommand, Telemetry, Platform Mass Memory & Reconfiguration

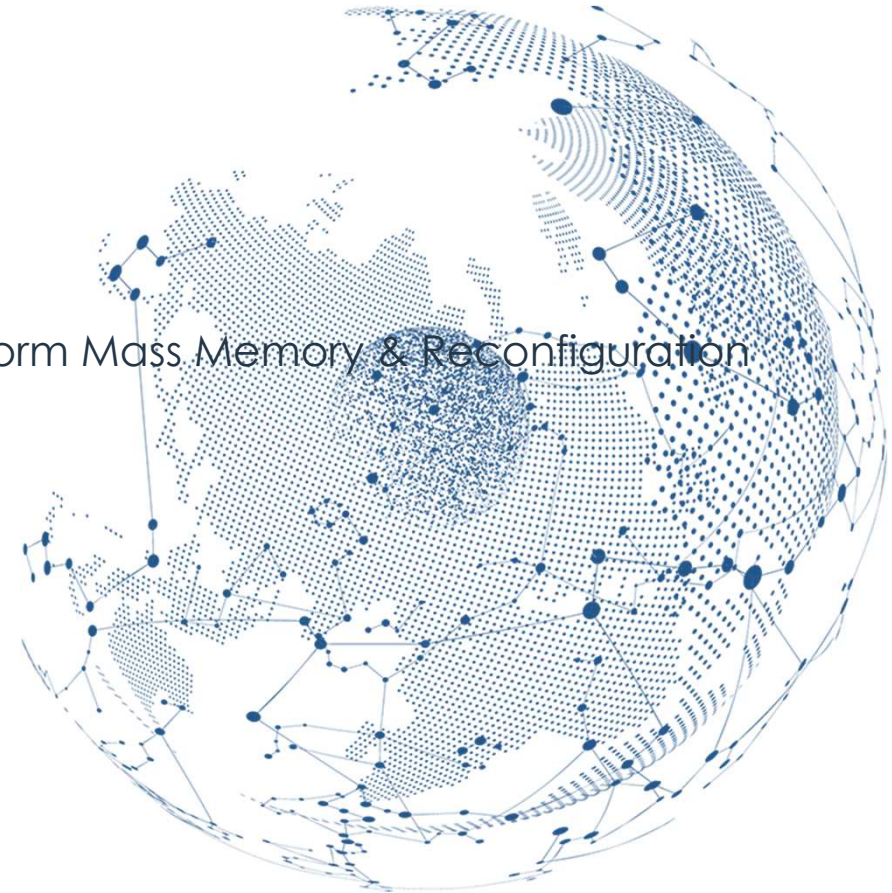
 Processor and GNSS Board

 SSMM boards

 Generic I/O concept

 Power Module

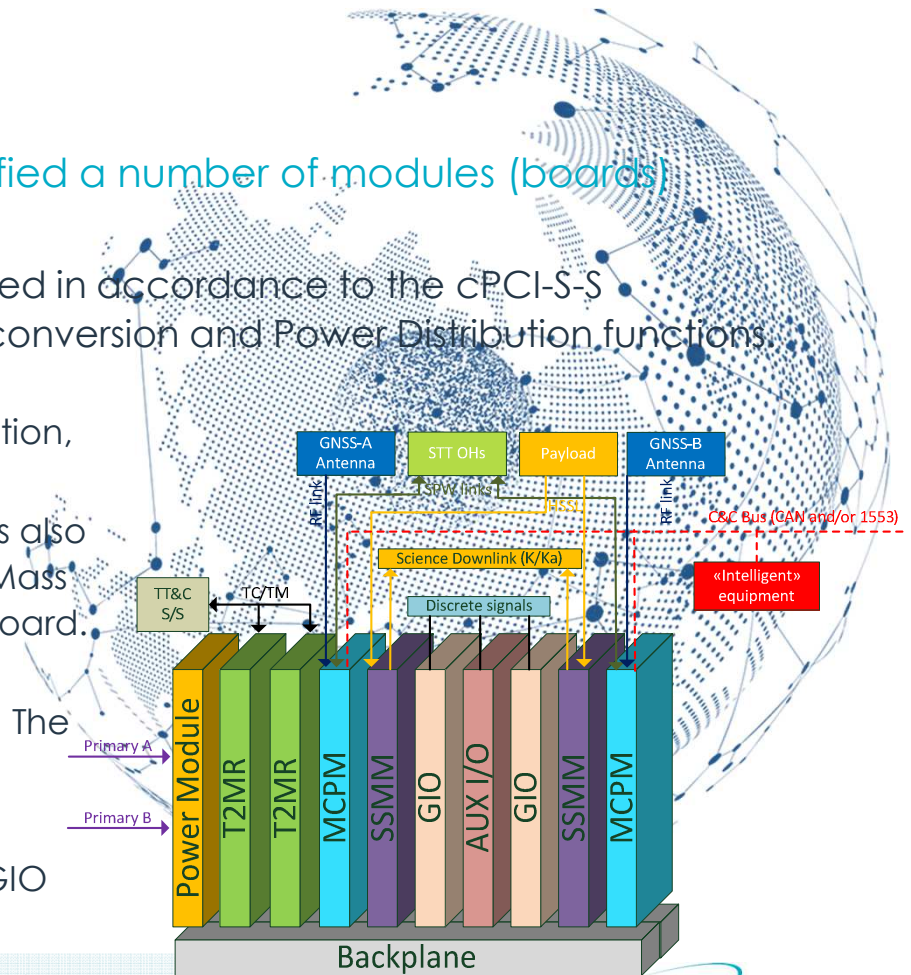
 Summary



Introduction (1/2)

TAS has identified, defined and specified a number of modules (boards) which compose the ADHA System

- The Power Module has been identified in accordance to the cPCI-S-S architecture, including the DC/DC conversion and Power Distribution functions.
- The System Controller (or MCPM). This includes the Processing and GNSS function, as well as the C&C and mission links.
- The System Controller Extension Board is also referred as Telecommand, Telemetry, Mass Memory and Reconfiguration (T2MR) board.
- The Generic I/O interfaces boards, corresponding to the function of a RTU. The Payload Mass Memory board
- The Payload Mass Memory board
- The AUX I/O board is a variant of the GIO (including SADM drivers, APM, etc.).



Introduction (2/2)

The combination of modules in the ADHA system, as well as the number of interconnected ADHA boxes, is not predefined but may be selected according to the mission needs

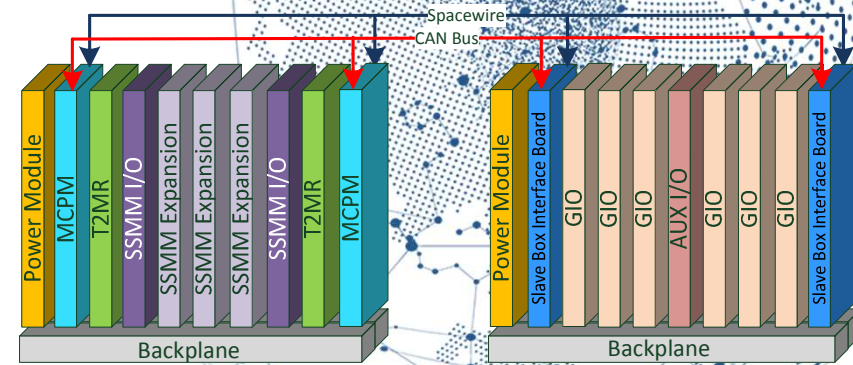
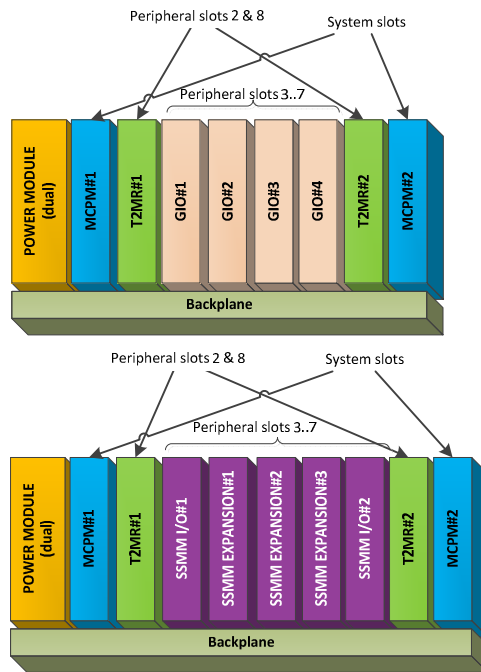
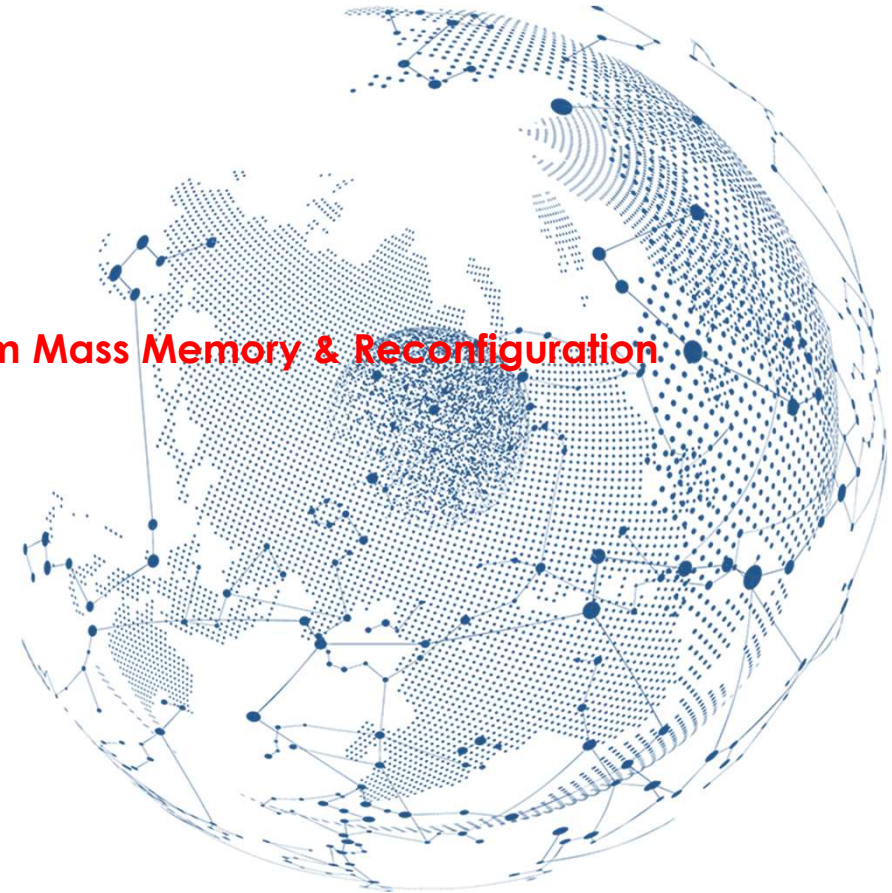


Table of content

- 🌐 Introduction
- 🌐 TAS Future Products
 - 🌐 **Telecommand, Telemetry, Platform Mass Memory & Reconfiguration**
 - 🌐 Processor and GNSS Board
 - 🌐 SSMM boards
 - 🌐 Generic I/O concept
 - 🌐 Power Module
- 🌐 Summary



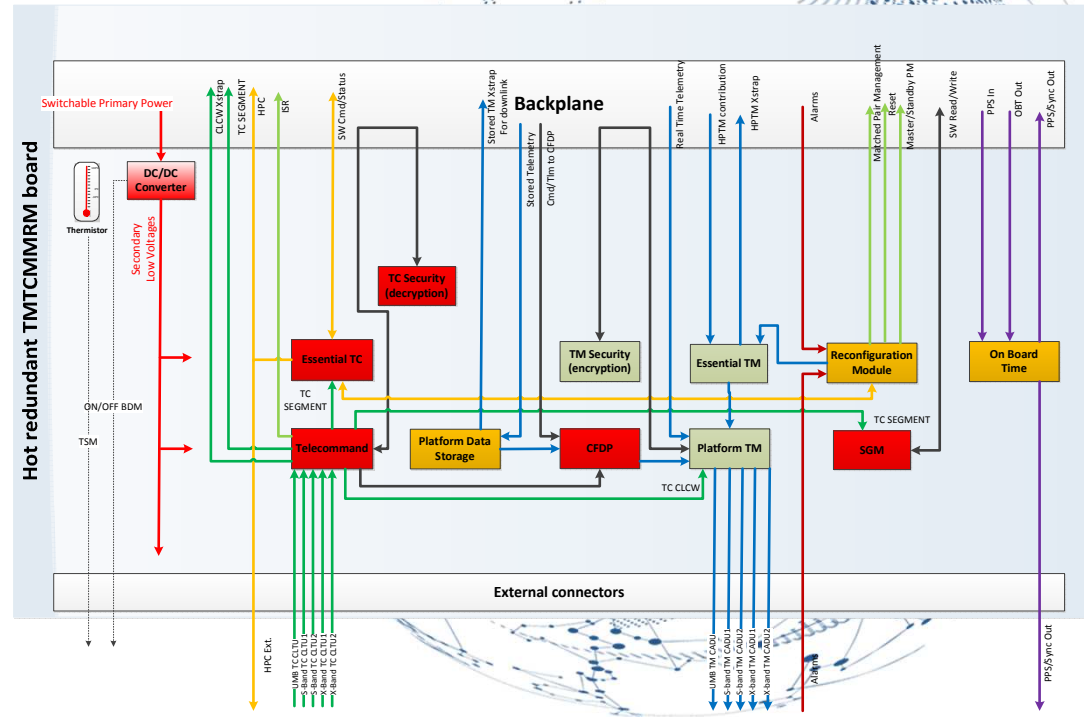
ADHA-4-EO T2MR



Board Description: the Telemetry, Telecommand, Mass Memory and Reconfiguration Module (T2MR) board has the purpose to implement the telecommand and telemetry according to CCSDS/ECSS protocols, the P/F mass memory (supporting CFDP protocol) and the reconfiguration module (with related protected resources like the OBT and SGM).



Redundancy Concept: two T2MR boards are present in the system. They are both powered-on, with some of their functions working in hot redundancy between the two boards (e.g. Telecommand Decoder and Essential TC), some other in warm redundancy (the Reconfiguration Module) and others in cold redundancy (e.g. Telemetry).



ADHA-4-EO T2MR

- Module allocation: Peripheral Slots 2 & 8
- Functions physical apportionment

Function	Front module	Rear module
Telecommand	X	
Telemetry	X	
Mass Memory	X	
Reconfiguration	X	
Security		X

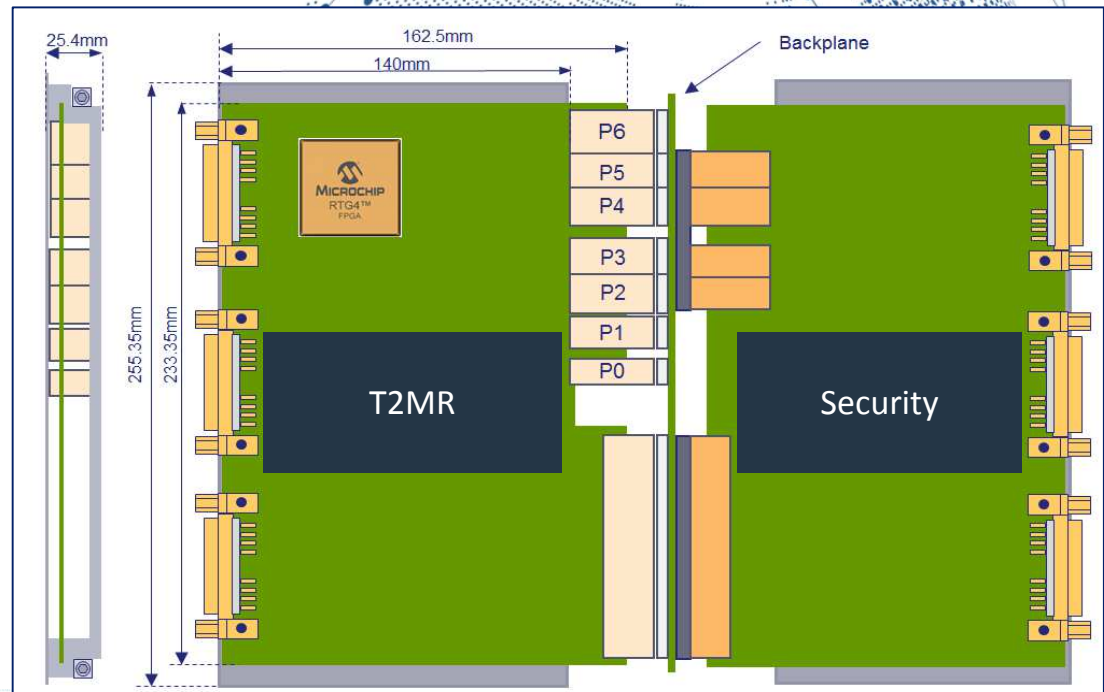
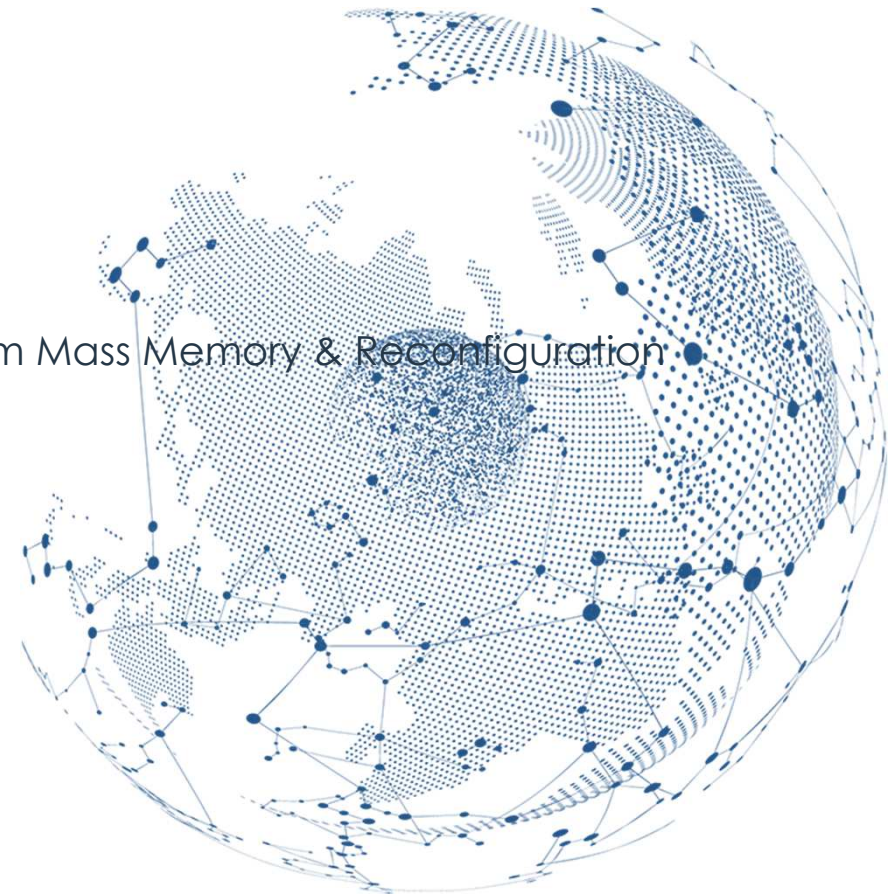


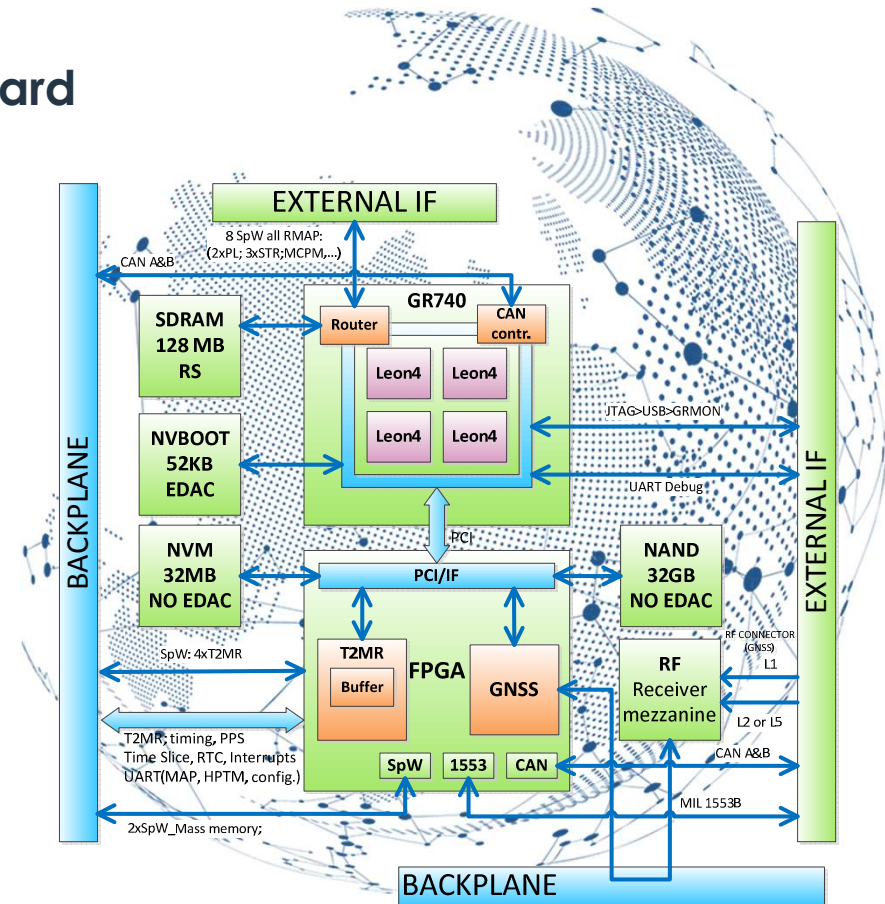
Table of content

- 🌐 Introduction
- 🌐 TAS Future Products
 - 🌐 Telecommand, Telemetry, Platform Mass Memory & Reconfiguration
 - 🌐 **Processor and GNSS Board**
 - 🌐 SSMM boards
 - 🌐 Generic I/O concept
 - 🌐 Power Module
- 🌐 Summary



ADHA-4-EO Processor and GNSS board

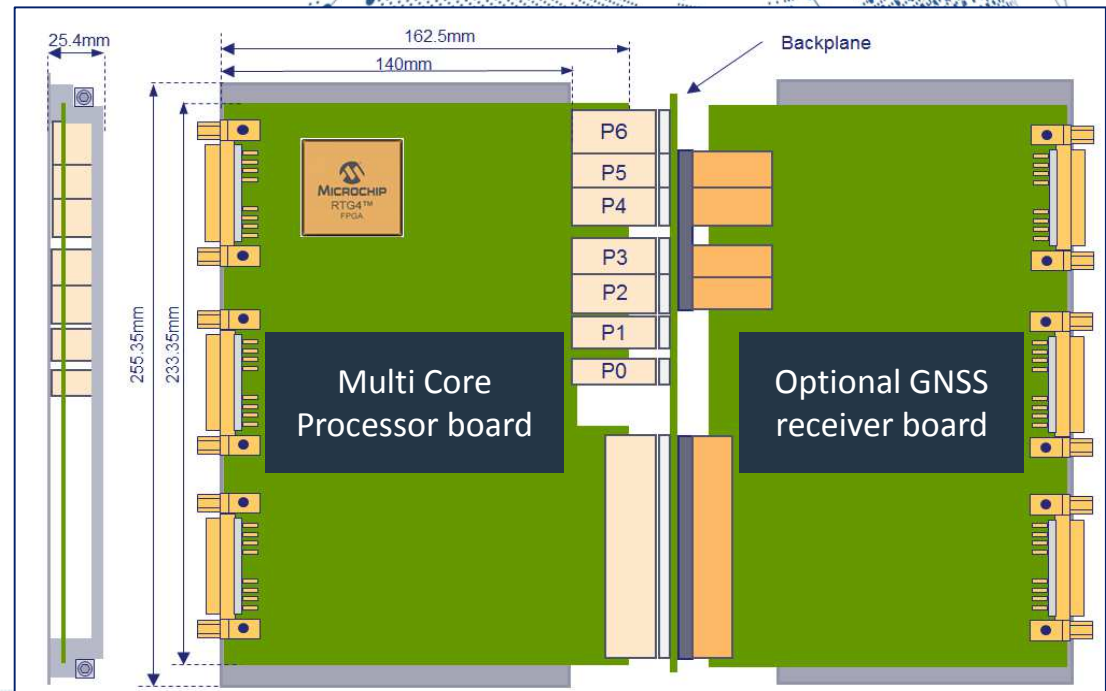
- Board Description:** The Processor module is based on a quad core Leon4 (GR740) with 128MB of SDRAM, 52KB of NVM for Boot, 32MB NVM for ASW in flash OR and 32GB NVM flash NAND. A Companion FPGA is used support the memory need of the processor and to interface the T2MR modules. The FPGA includes the digital section of e GNSS receiver. A mezzanine RF board is hosted on the processor module to manage the RF signals from the antenna. Two RF input are foreseen: L1 and L2 or L5.
- Redundancy Concept:** The processor module is in mainly used in COLD redundancy or in hot standby.



ADHA-4-EO Processor and GNSS board

- Module allocation: System Slots 1 & 9
- Functions physical apportionment:

Function	Front module	Rear module
PM	X	
SPW router	X	
1553(option)	X	
CAN	X	
GNSS(option)		X



ADHA-4-EO Processor and GNSS board

OBSW Architecture

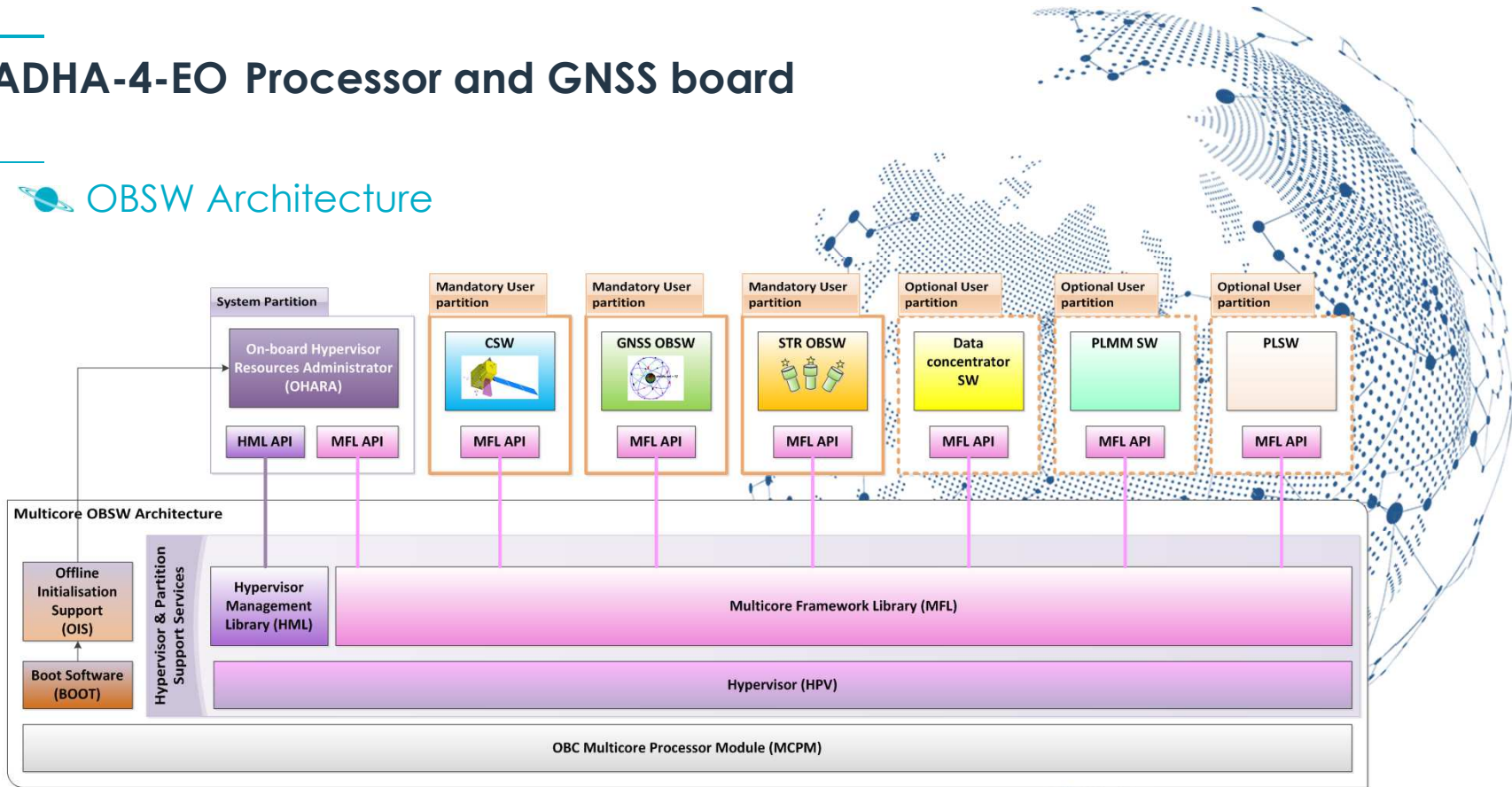
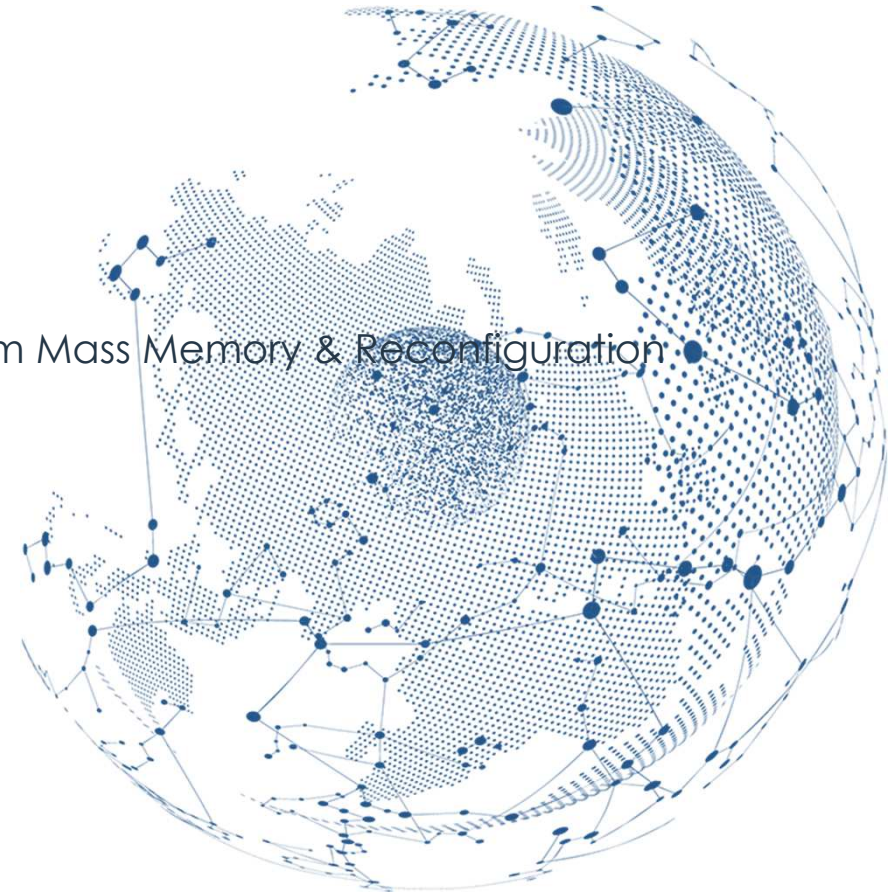


Table of content

- 🌐 Introduction
- 🌐 TAS Future Products
 - 🌐 Telecommand, Telemetry, Platform Mass Memory & Reconfiguration
 - 🌐 Processor and GNSS Board
 - 🌐 **SSMM boards**
 - 🌐 Generic I/O concept
 - 🌐 Power Module
- 🌐 Summary



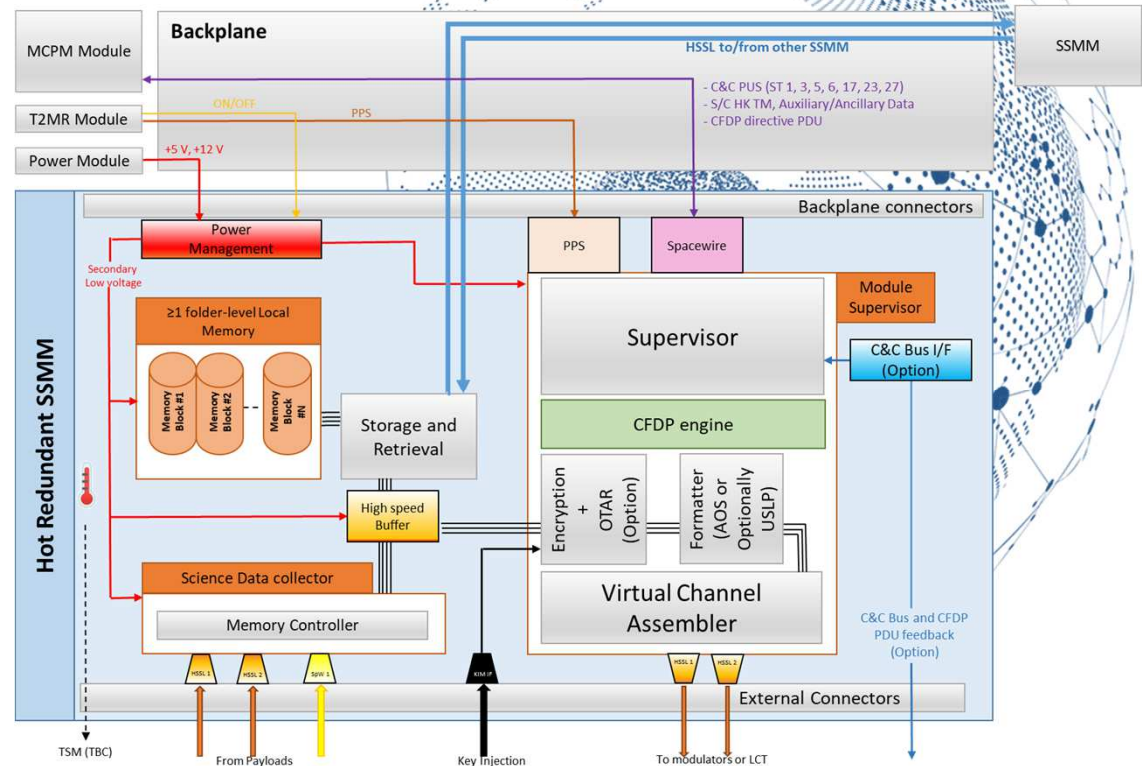
ADHA-4-EO Solid State Mass Memory

Board Description:

- Capability to store Payload Science data, Auxiliary/Ancillary data and S/C HK TM data according to the following strategies: Packet Stores or Files.
- Capability to format and retrieve stored data according to CFPD class 1/2 or PS service with optional encryption.
- Very high data throughput due to the input/output HSSLs.

Redundancy Concept: either

- 2 cold redundant self-content memory store and controllers;
- or 2 hot redundant self-content memory store and controllers.



ADHA-4-EO Solid State Mass Memory

- Module allocation: Peripheral Slots 3 to 7 basically but Slots 2 to 8
- SSMM IO Functions physical apportionment

Function	Front module	Rear module
IO	X	
TM Formatter	X	
Memory controller	X	
Download manager	X	
Optional Security		X
Storage	X	X

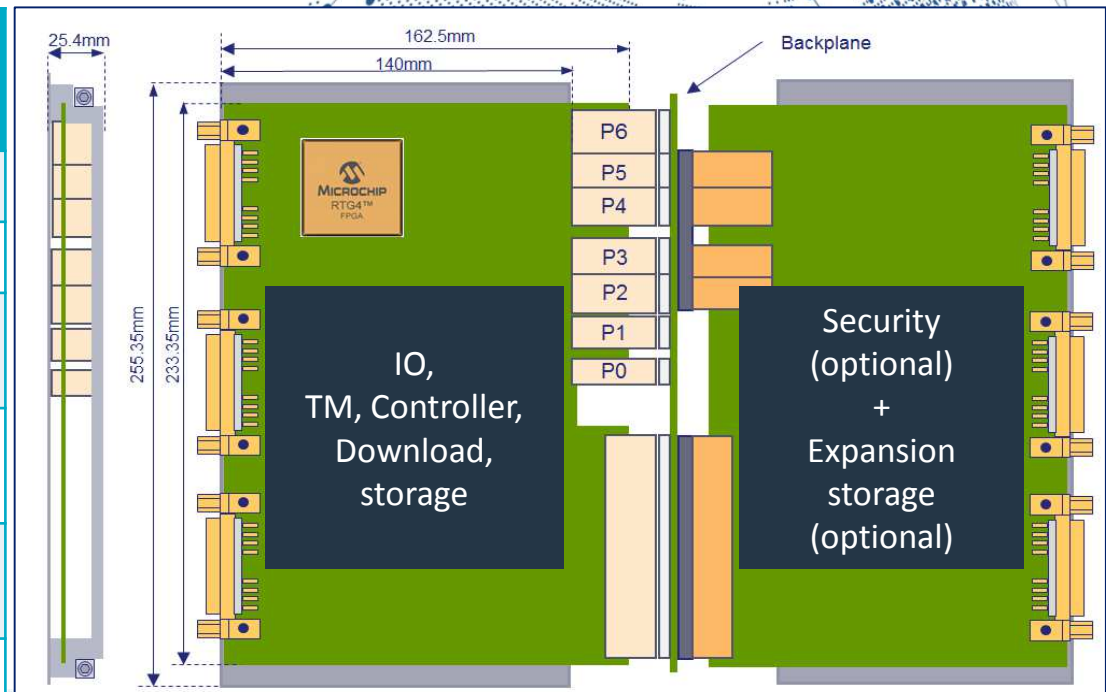
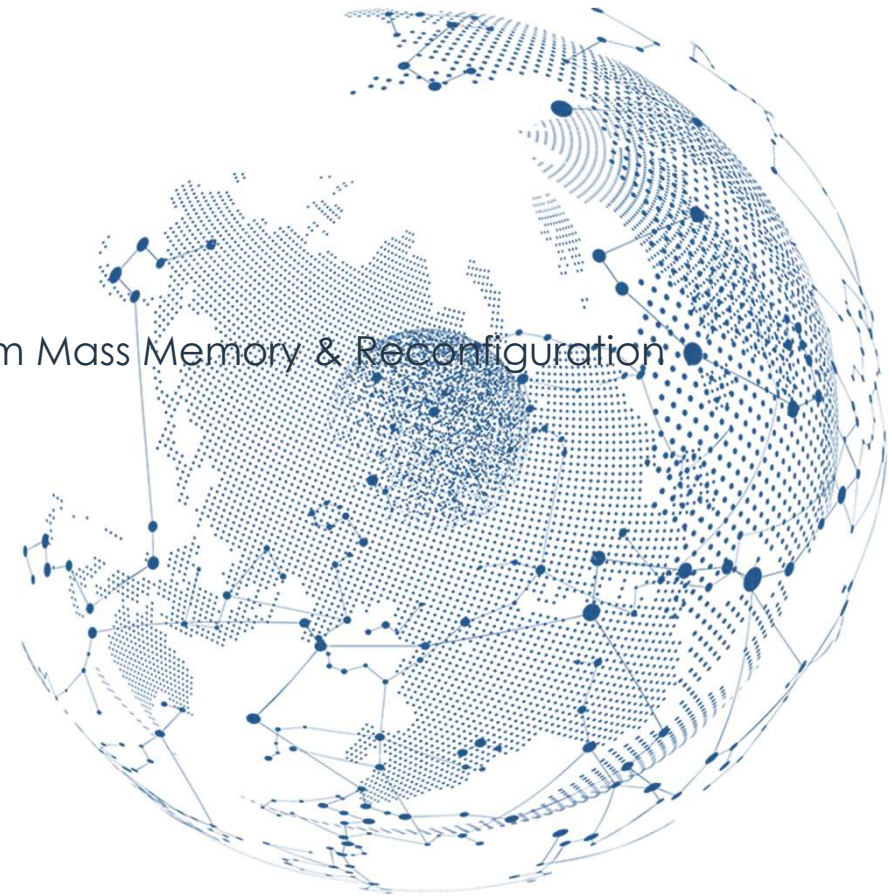


Table of content

- 🌐 Introduction
- 🌐 TAS Future Products
 - 🌐 Telecommand, Telemetry, Platform Mass Memory & Reconfiguration
 - 🌐 Processor and GNSS Board
 - 🌐 SSMM boards
 - 🌐 **Generic I/O concept**
 - 🌐 Power Module
- 🌐 Summary



ADHA-4-EO – Generic I/O Module (GIO)

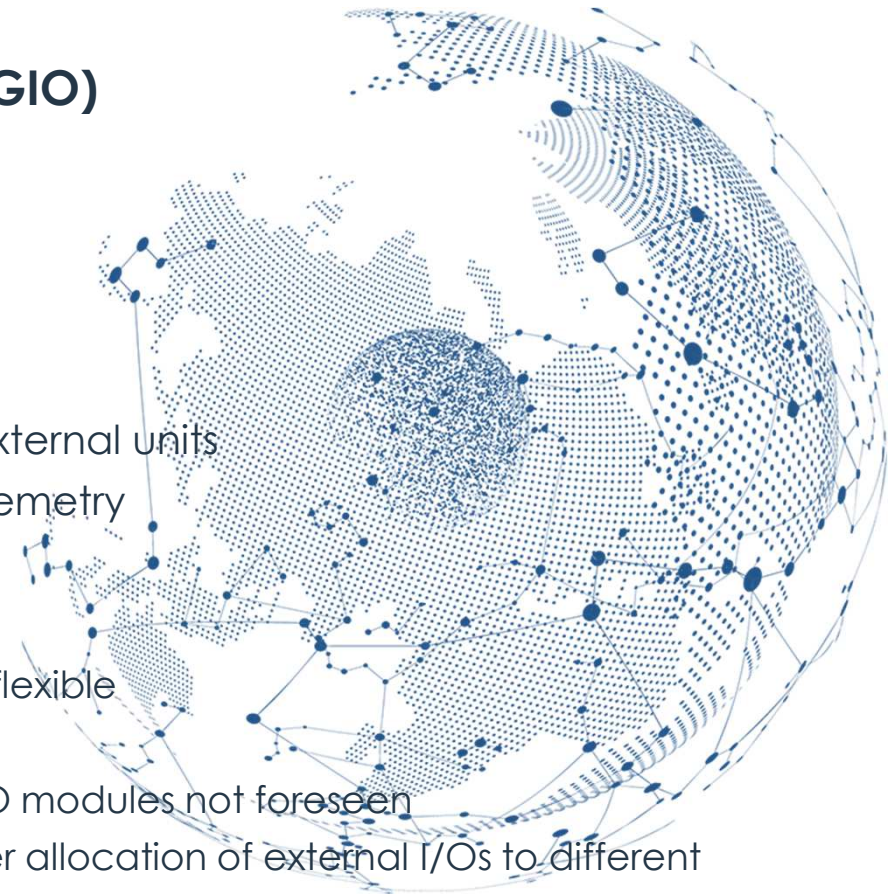
Overview

🌐 GIO Primary Function

- 🌐 Transmit discrete commands to external units
- 🌐 receive associated status and telemetry

🌐 Redundancy

- 🌐 Number of GIO modules in ADHA is flexible
- 🌐 Enables scalability of the ADHA
- 🌐 Dedicated Nominal/Redundant GIO modules not foreseen
- 🌐 Robustness achieved through proper allocation of external I/Os to different GIO modules



ADHA-4-EO – Generic I/O Module (GIO)



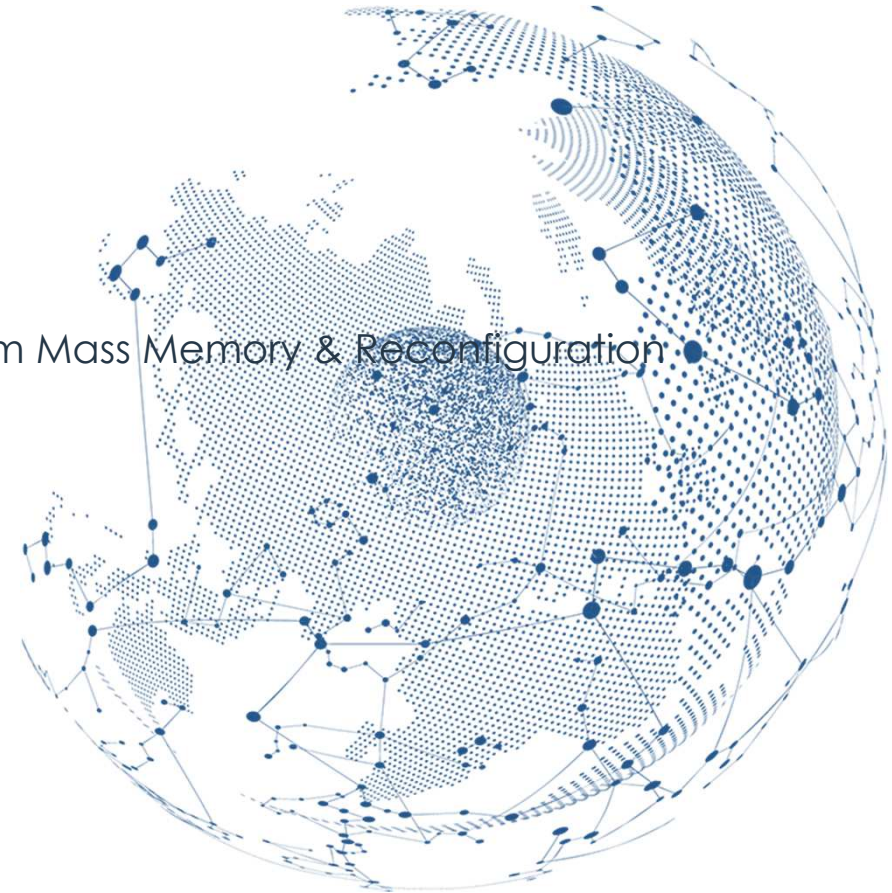
- Module allocation: Peripheral Slots 3 to 7 basically but Slots 2 to 8
- GIO Functions physical apportionment

GIO function	Multiplicity	Module allocation
MMGN/SPW/CAN/APS	1	Front
RWA	1	Front
MAG	1	Front
MTB coils	2	Front
CSS	2	Front
STR-OH	1	Front
ASM/BDM	32	Front
TSM/BSM	60	Front
LV/HV-HPC	32	Front
PT	1	Front
LV	1	Front
THR	1, 2, 4, 8	Front
Thermocouple	0, 1, 2, 4, 8	Rear
MicroStep Motor	0, 1, 2, 3, 4	Rear
Full Step Motor	0, 1, 2	Rear
ISD/OSD/BSD	0, 4	Rear
UART	0, 4	Rear
HC-HPC	0,4	Rear
Heater	0, 1, 2, 4, 8	Rear
Optional & additional ASM/BDM	32	Rear
Optional & additional TSM/BSM	60	Rear



Table of content

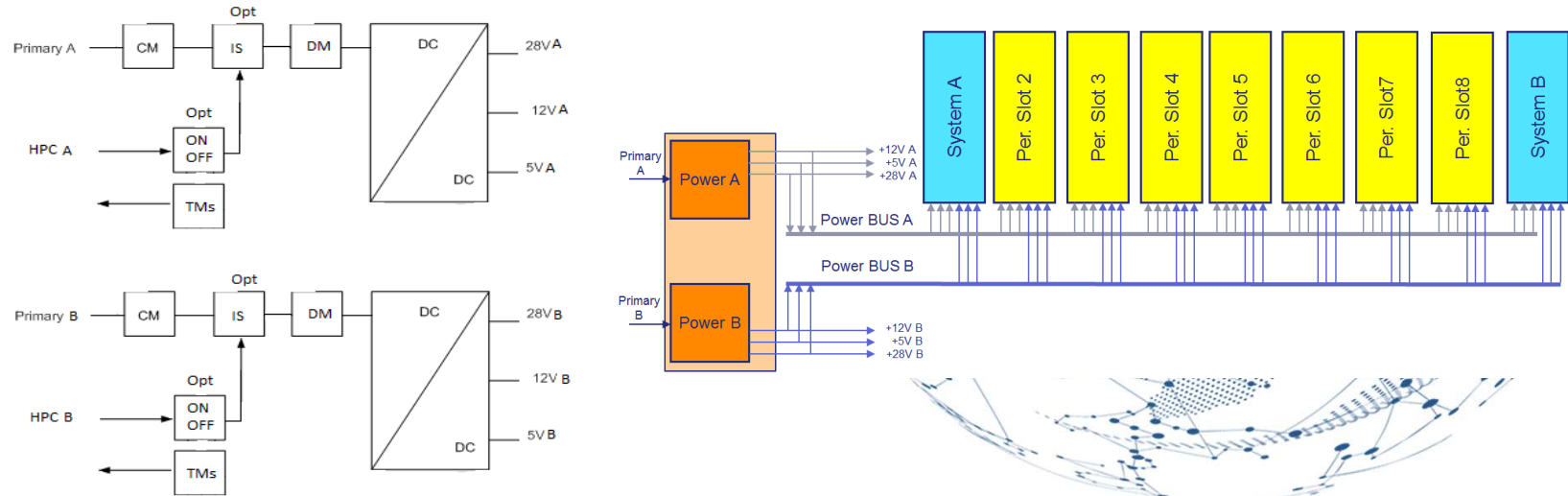
- 🌐 Introduction
- 🌐 TAS Future Products
 - 🌐 Telecommand, Telemetry, Platform Mass Memory & Reconfiguration
 - 🌐 Processor and GNSS Board
 - 🌐 SSMM boards
 - 🌐 Generic I/O concept
 - 🌐 **Power Module**
- 🌐 Summary



ADHA-4-EO – Power Module

Block Diagram

POWER module functional architecture and interfacing to boards.



ADHA-4-EO – Power Module

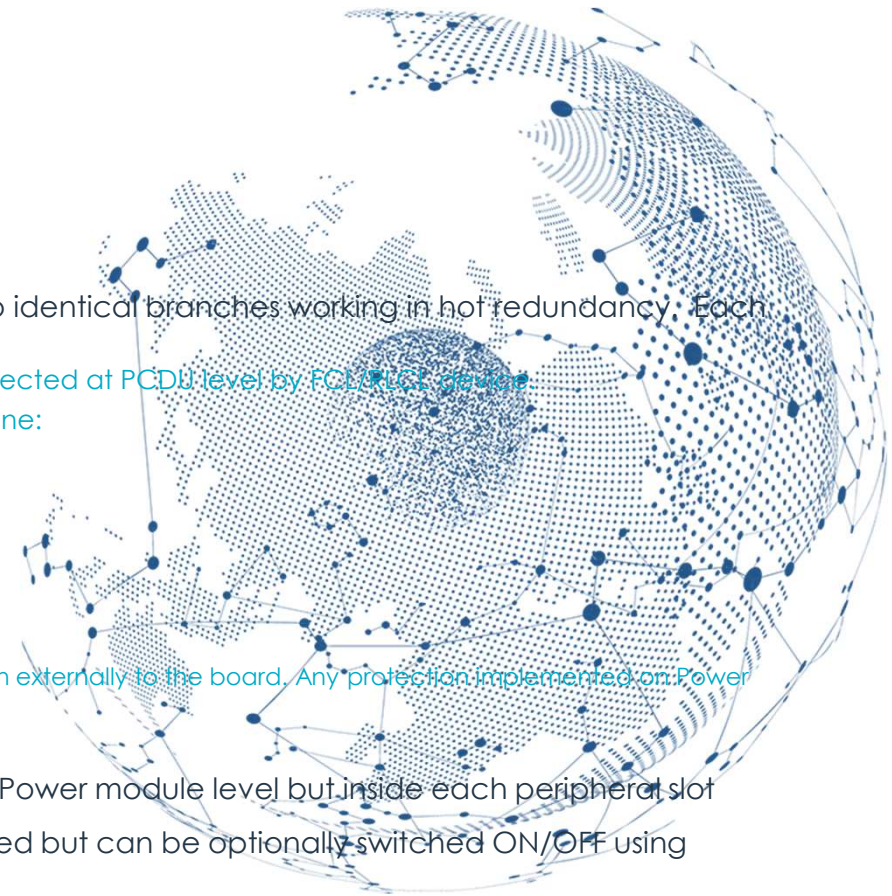
Requirements

POWER module functional architecture is composed of two identical branches working in hot redundancy. Each branch :

- is supplied by a dedicated primary power bus (PPB) protected at PCDU level by FCL/RLCL device.
- is providing following power supplies lines to the backplane:
 - +28V power supply,
 - +5V power supply
 - +12V Power supply
- is providing following telemetries to an external connector:
 - Each output voltage TM
 - Temperature monitoring (thermistor)
- is providing the needed protection to avoid failure propagation externally to the board. Any protection implemented on Power module shall not be latched
- These interfaces are specified in following document

All delivered power supplies lines are not cross-strapped at Power module level but inside each peripheral slot

Power module has to start autonomously when PPB is applied but can be optionally switched ON/OFF using external HPC in some specific configuration (eg: ICU).



ADHA-4-EO – Summary

ADHA HOT-BUTTONS

- 🌐 Modularity: straightforward system composition from building blocks
- 🌐 Scalability: re-use same building blocks from mini to large satellites
- 🌐 Interoperability: between missions and large scale integrators

ADHA INTENDED APPLICATIONS

- 🌐 Targeted (but not limited) to Earth Observation Missions
- 🌐 Envisaged application on Copernicus Extension Missions
- 🌐 Short term development timeline:
 - 🌐 TRL-4 by 2023



THANK YOU FOR YOUR ATTENTION!



Date:

Ref:

Template: 83230347-DOC-TAS-EN-006

PROPRIETARY INFORMATION

This document is not to be reproduced, modified, adapted, published, translated in any material form in whole or in part nor disclosed to any third party without the prior written permission of Thales Alenia Space. © 2019 Thales Alenia Space

THALES ALENIA SPACE INTERNAL

ThalesAlenia
Space
Thales / Leonardo company