

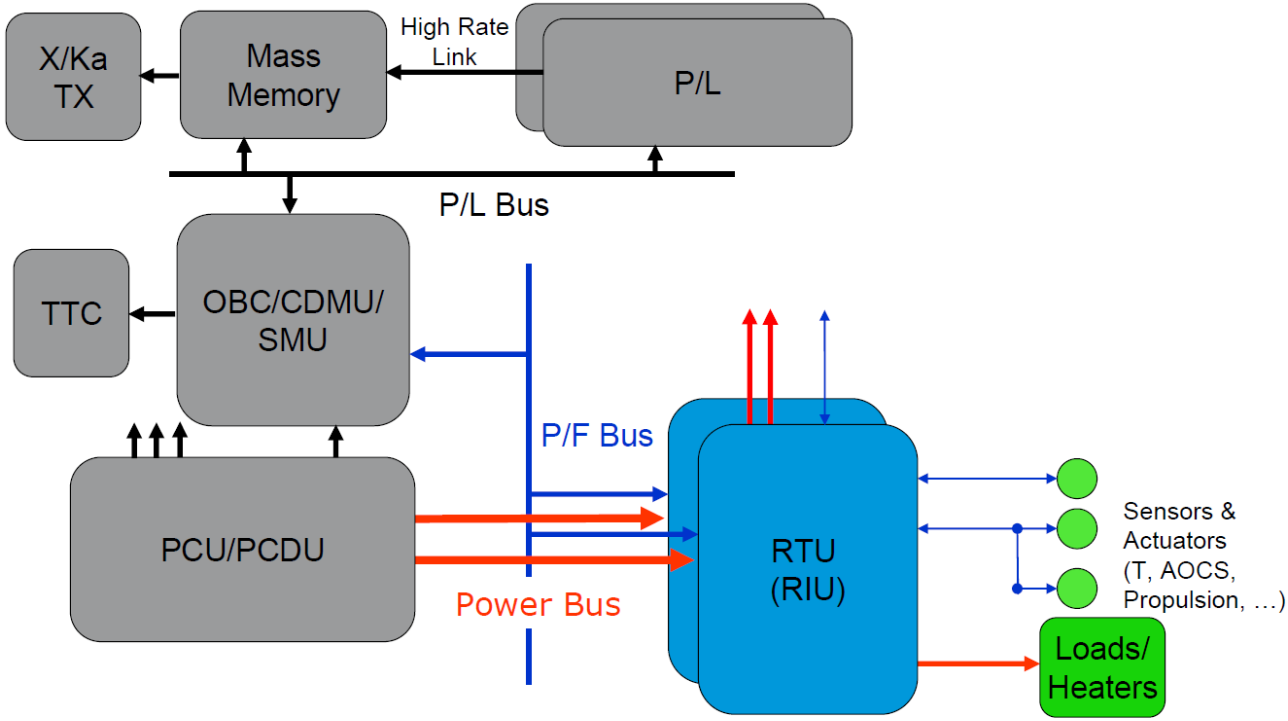


Operability and Modularity concepts of future RTUs/RIUs

ADCSS2015 – Day 3
Thursday 22 October 2015



What is a RTU ?



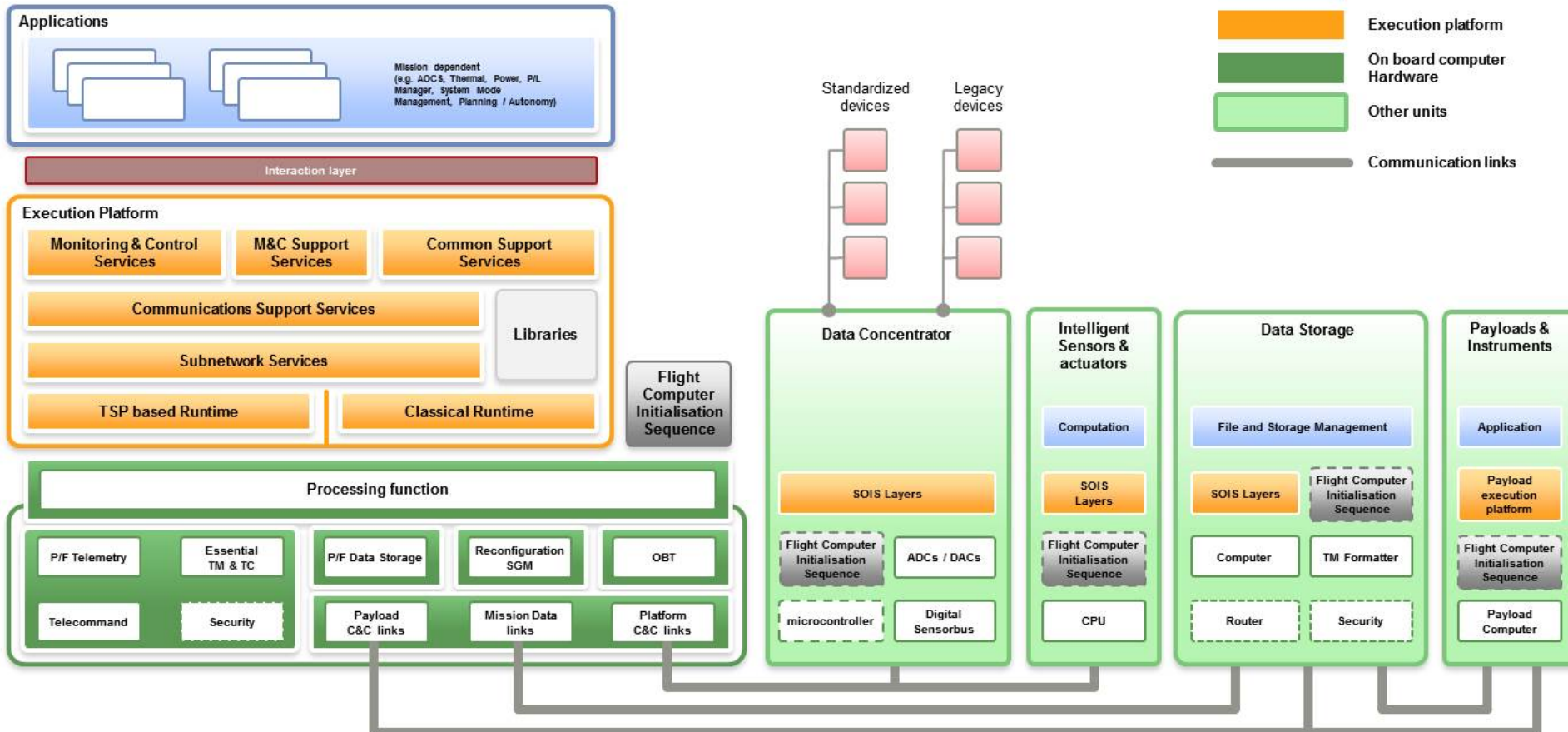
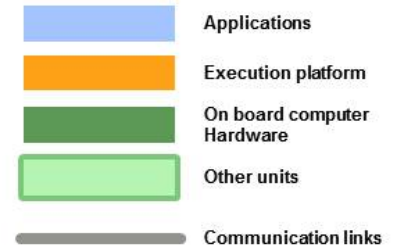
The Remote Terminal Unit (RTU) is an Avionics equipment that provides functions such as:

- collecting of housekeeping data,
- commanding of pulse commands,
- interfacing to sensors & actuators, and in general to devices which do not have a direct link to the OBC.

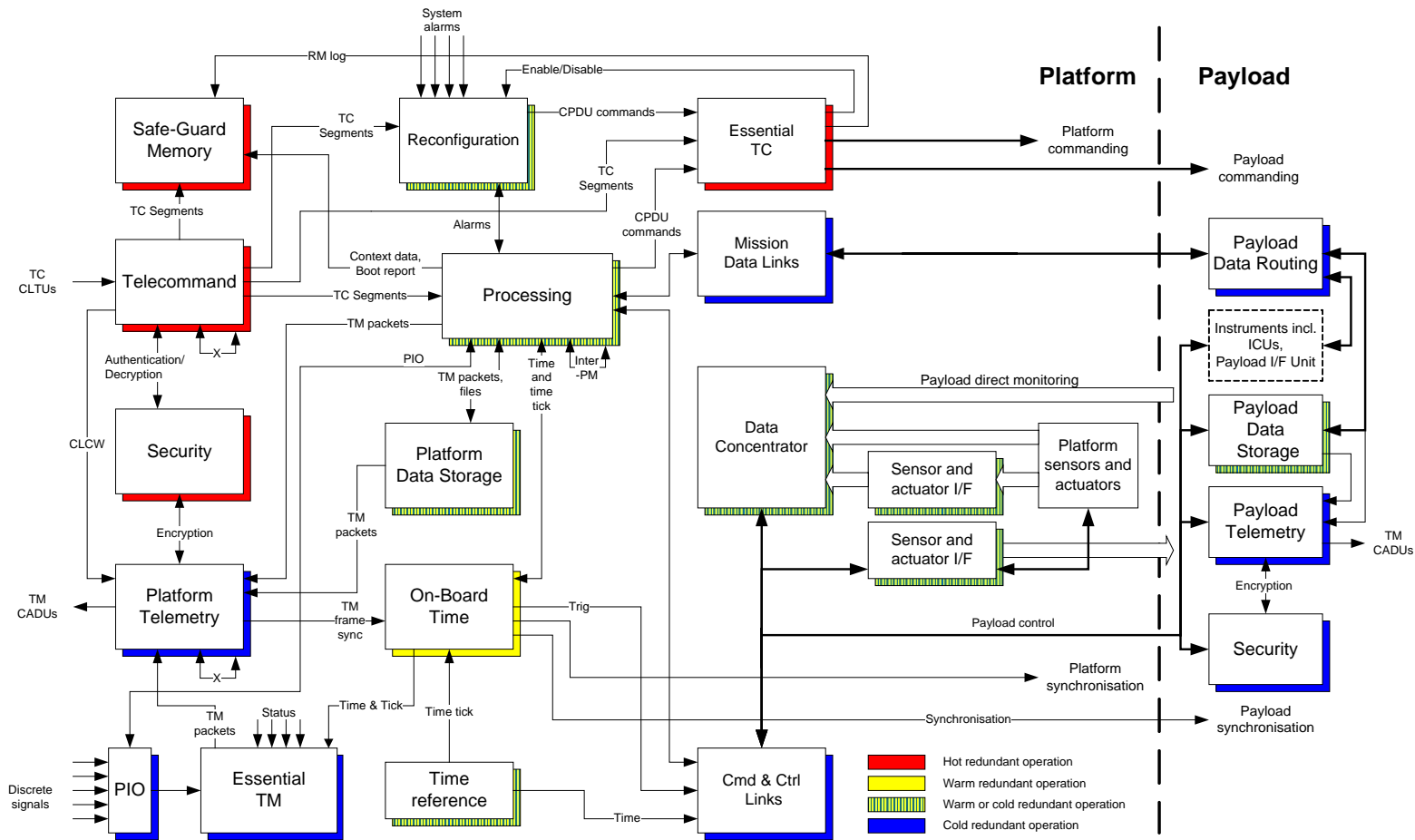
The RTU acts as a slave unit to the main S/C computer on the S/C C&C bus.



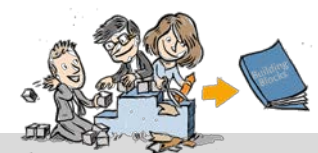
RTU as seen in SAVOIR



RTU as seen in the SAVOIR Functional Reference Architecture



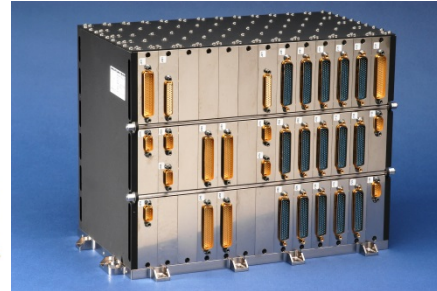
- RTU is called *Data Concentrator*
- RTU(s) can be present also on the P/L side (PIU)



Is there a common idea of RTU ?



- Do we have in mind a common idea of RTU ?



- No, so many variants:

- Type of communication interface with the OBC,
- Number of Analogue and Digital I/Os (the *Standard User Interface* of a RTU, strongly depending on the size of the S/C),
- Number and type of *additional* functions (AOCS Sensors and Actuators, Propulsion, Heaters, Solar Array Drive Electronics, ...
- Number of Input Power Feeds (and quality of the Power feeds),
- Implementation aspects (redundancy scheme, location of connectors, number of RTUs, uRTUs ...) imposed/driven by System decisions/requirements/availability of technologies),



Why a Special Day on RTU ?



- The SAVOIR initiative has recently consolidated (with the help of all European companies, thanks to all of you !) a reference Functional Architecture (SAVOIR-TN-001) and the RTU has been identified as one of the fundamental building blocks of a S/C avionics
- Space industry and Agencies have been recognizing already for quite some time the need to raise the level of standardisation in the spacecraft avionics systems **in order to increase efficiency and competitiveness level of European products and to reduce development cost and schedule.**
- How to reach these targets for the RTU?
 - 1) We ESA have our views that we share with all the stakeholders, the new **Harmonization process on Data Systems and OBCs** has started on October 2015 and will conclude in early 2016. The first draft of the new Dossier (limited to the roadmap part) will be delivered to Eurospace on 27/11
 - 2) We have invited Primes and RTU Equipment suppliers with a proven flight experience to present their opinion today on the status and future of the RTU (a list of questions have been sent)
 - 3) The round table of today (opened to everyone)



RTU Topics (1 of 2)



- **Operability concept of a RTU:**

- A common RTU operability concept for different type of missions (like Science, Earth Observation, Telecom) could bring several benefits in term of cost reduction for Application SW development, implementation of a homogeneous FDIR,...
- SAVOIR will present a draft Operability and Functional specification for a RTU at ADCSS2015. To which level of details a common RTU operability concept should arrive ?

- **Modular design of a RTU:**

- Modularity is considered a viable way to reduce cost and development time for electronics unit,
- Which are industry's expectations for what concerns modularity of a RTU ?
- Modularity shall be seen as a main feature of a product portfolio from a RTU equipment supplier or modularity across RTU suppliers?





■ Building Blocks

- Which building blocks are needed for the future RTUs ? We have in mind several: Point of Loads Converters, Microcontrollers, mixed signal components (ICs and ASIC technologies), but Industry's contribution towards a more inclusive determination is paramount (also thinking to the mapping preparation)
- The availability of microcontroller (as standalone ASIC or as IP core in a FPGA) could change the avionics architecture of a S/C allowing the decentralization of tasks very often exclusively performed by the OBC: an intelligent RTU could do much more than simply storing and executing acquisition instructions list.
- We have invited component and solutions providers for RTU as exhibitors today (please visit the exhibition area during coffee break and the long break for lunch)

■ Data handling and AOCS functional chains

- The RTU is the connection link btw the OBC (and the ASW) and some AOCS sensors, can we integrate AOCS and Data Handling more efficiently (e.g. sensor in RTU, digitalization of I/Fs ,) ?



Questionnaire on SPI



As result of ESA studies on low-medium speed digital transmission buses for intra-unit comm' , the Serial Peripheral Interface (SPI) has been identified as one of the best candidates. The following potential target application scenarios for SPI have been identified:

- Internal backplane bus inside an unit (e.g. RTU) ,
- Serial bus for reprogrammable logic on board (e.g., FPGA, and NVRAM),
- Interface for standard ICs (e.g., ADC, DAC, and Wireless Analogue Radio),
- Interface with sensors (e.g., contactless sensors, etc.),

However, since the **SPI leaves complete protocol flexibility** a TRP ESA contract has been issued (4000114112 (With Cobham Gaisler) and 4000114373 (with TAS-I)) called *Prototyping of Space Protocol(s) of SPI* to specify the full protocol(s) stack (i.e., from Phy up to the Network Layer) for space applications.

A **questionnaire** to potential users and IC suppliers has been distributed on 21/10/2015 . If you want to contribute send an email to:

onboard.computer.data.handling@esa.int



ESA Questionnaire "Prototyping of Space Protocol(s) for SPI"

This document is issued in the frame of a study supported by the two parallel TRP ESA contracts: 4000114112 (With Cobham Gaisler) and 4000114373 (with TAS-I) called Prototyping of Space Protocol(s) for SPI.
The main driving reason of this study is the need of defining standard(s) for digital transmission of sensor data. This need has been pushed by:





See you at '**CAN IN SPACE WORKSHOP**'

Here 10th of March 2016

<https://indico.esa.int/indico/event/120/>

<https://goo.gl/kSnXMu>



Agenda

- 09:00 - 15:05 **Operability and Modularity concepts of future RTUs/RIUs: Primes + Equipment suppliers view**
Convener: Mr. Giorgio Magistrati (ESA/Data Systems Division)
- 09:00 **Welcome & Session introduction 20'**
Speaker: Mr. Giorgio Magistrati (ESA/Data Systems Division)
- 09:20 **Prime view: Airbus 25'**
Speakers: Mr. J. Dalenq (Airbus DS), Mr. R. Roques (Airbus DS)
- 09:45 **Prime view: TAS 25'**
Speakers: Mr. J.L. Petit (TAS), Mr. S. Eyraud (TAS)
- 10:10 **Prime view: Qinetiq 25'**
Speaker: Mr. Peter Holsters (Qinetiq)
- 10:35 **Building blocks for future RTUs 25'**
Speakers: Mr. Gianluca Furano (ESA/Data Systems Division), Mr. Marco Rovatti (ESA-ESTEC), Mr. Ferdinando Tonicello
- 11:00 **Coffee 30'** (Einstein)
Einstein exhibition
- 11:30 **Equipment Supplier view: RUAG 25'**
Speaker: Mr. Torbjörn Hult (RUAG)
- 11:55 **Equipment Supplier view: ADS-CRS 25'**
Speaker: Mr. Javier Goyanes (ADS-CRS)
- 12:20 **Equipment Supplier view: OHB-KT 25'**
Speaker: Mr. Heinz-Volker Heyer (OHB-KT)
- 12:45 **Exhibit 15'** (Einstein)
- 13:00 **Lunch 1h0'** (Main Cantine)
- 14:00 **Equipment Supplier view: TAS 40'**
Speakers: Mr. C. Maillard (TAS-B), Mr. A. Nairn (TAS-B), Mr. John-Paul Coetzee (TAS-UK)
- 14:40 **Equipment Supplier view: Terma 25'**
Speaker: Mr. Carsten Jorgensen (Terma)
- 15:05 - 16:00 **Operability and Modularity concepts of future RTUs/RIUs: SAVOIR RTU SPEC & Round Table**
Convener: Mr. Giorgio Magistrati (ESA/Data Systems Division)
- 15:05 **SAVOIR RTU Spec (ESA ESTEC) 25'**
Speaker: Mr. Peter Roos (ESA/ESTEC)
- 15:30 **Round Table discussion 30'**
Modular design for space: only a dream?
Intelligent vs not intelligent RTU ?
Common operability concepts for a RTU?
Data handling and AOCs functional chains : how to integrate them?
- 16:00 - 16:15 **Operability and Modularity concepts of future RTUs/RIUs: Wrap up**
Convener: Mr. Giorgio Magistrati (ESA/Data Systems Division)
- 16:00 **Wrap Up 15'**

Let's start !

