



SAVOIR Industrial Consultation

Jean-Loup TERRAILLON TEC-S

Giorgio MAGISTRATI TEC-EDD

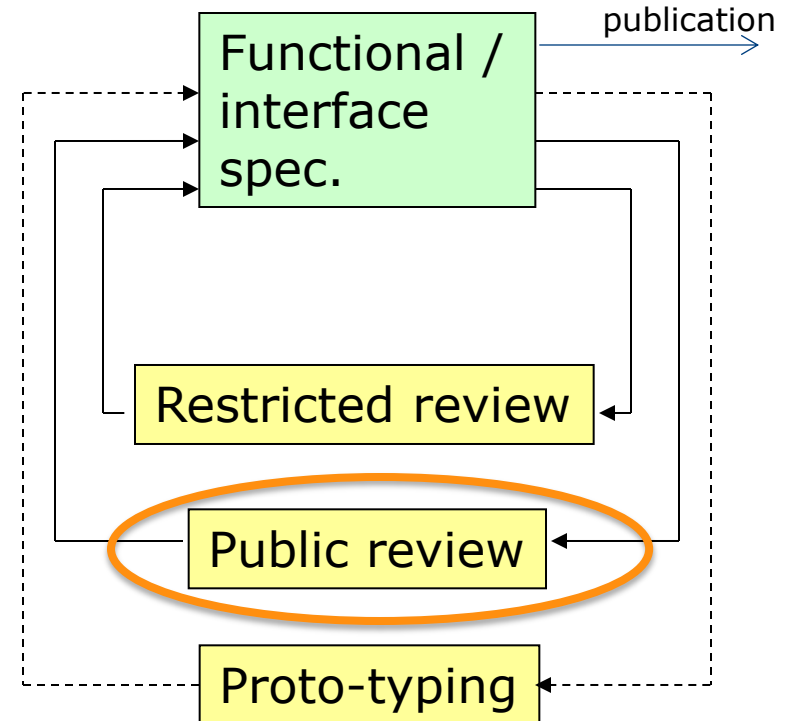


Specification production scheme.



Under SAG agreement;

1. A draft version is produced;
 - By a SAG working group
 - Output of an R&D activity
 - Proposed by Industry
 - ESA internal
2. Submitted for **restricted review** and updated as needed
 - Check compliance to SAVOIR architecture and principle
 - Completeness / consistency / etc
3. Submitted for **public review** and updated (same objective as 2)
4. Verified by **prototyping** – to demonstrate maturity of the spec., consistency with the ref architecture (as far as possible on a case by case basis)
5. **Publication**



Consultation process, tool and O.N.



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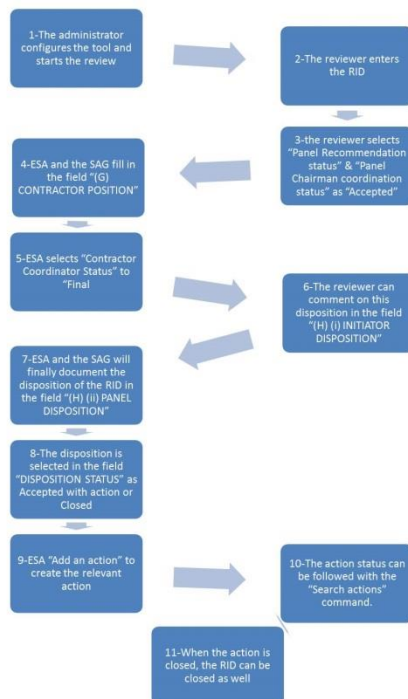
DOCUMENT

SAVOIR Document Review Organisation Note



Prepared by
Reference
Issue
Revision
Date of Issue
Status
Document Type
Distribution

Jean-Loup Terrailon
TEC-SW/13-647/JLT
a
8
05/03/2015



prisma PROJECT REPORTING INTEGRATED SYSTEM FOR MANAGEMENT AND ADMINISTRATION

RID

Personal Queries

Saved queries: [dropdown] [Update] [Delete] [Add]

Advanced Search RID

☒ RID Number : [text] ☐ Exact Match ☐ Assoc. RID Number: [text]

☒ Originator reference : [text] ☒ Originator : [text]

☐ Status : [dropdown] ☒ Panel : [dropdown] SAG

☒ RID title : [text] ☐ ID Number : [text]

☐ Document Title and Ref. : [text]

☐ Baseline Document : [text]

☐ Panel Chairman Coord. : [text]

☐ RID Classification : [dropdown] ☐ Group : [dropdown]

☐ Contractor Status : [dropdown] ☐ Contractor Answer : [dropdown]

☐ Contractor Responsible : [text]

☐ (I, P, PB, B) Disposition (*) : [text] ☐ Disposition Status : [dropdown]

Disposition Answer : [dropdown]

☐ Close Out References : [text]

☐ Closure Date: From [text] to [text] (dd-mm-yy)

☐ Final Status : [dropdown]

Order result on: [dropdown] Display result as: [dropdown] List

Rows per page: [dropdown] 1000

☐ Attachments : [text]

☐ Exported RIDs: [dropdown] ☐ Exported by: [dropdown]

The use of the Prisma Rid tool allows to give full visibility to the reviewers.



Consultation focal points, Objectives



GMV	ALANA SALAZAR	Elena
Telespazio	BECO	Stefano
GTD	BENNASSAR	Ricardo
SSF	BOS	Victor
SODERN	BRETECHER	Pierre-Yves
OHB	BRUNJES	Bernhard
Thales Alenia Space	BUSSEUIL	Jacques
Airbus Defence & Space	DUHAMEL	Thierry
Dutch Space (now Airbus Defense & Space Netherlands)	DUHAMEL	Thierry
Jena Optronik	HARTMANN	Rolf
Kayser-Threde	HEYER	Heinz-Volker
QinetiQ	HOLSTERS	Peter
TERMA	JOERGENSEN	Carsten
Sydéral	LOMBARDI	Pasquale
Compagnia Generale per lo Spazio (CGS)	LORENZI	Paolo
CSEM	MADRIGAL	Ana Maria
LuxSpace	MOLON-NOBLOT	Christophe
Astrium CRISA	MORENO	Jose Francisco
Space Applications Services	MUNOZ	Miguel
LogicaCMG (CGI)	NORRIS	Pat
RUAG	OLSON	Bjorn
SpaceBel	PARISIS	Paul
4-Links	WALKER	Paul
NLR	WIEGMINK	Klaas
SCISYS	WAUMSLEY	Kevin
SELEX	BOLDRINI	Franco
Surrey Satellite Technology Ltd (SSTL)	JACKSON	C
DEIMOS	RENNIE	Mike
CNES	BRICOUT	Jean-Noël
DLR	DANNEMANN	Frank
ESA	MAIORANO	Elena
ESA	ROOS	Peter
ESA	FURNELL	Robert
ESA	TORELLI	Felice
ESA	ROSELLO	Josep
ESA	PALACIOS	Alex
ESA	GABRIELE	Antonio
ESA	STAGNARO	Luca
ESA	EHRlich	Klaus
EUROSPACE	MORANTA	Sebastien
EADS CASA	SANZ	Juan Andrés
INTA	DIAZ	Carlos

- Focal Points reviewers selected in industry with support of EuroSpace



- Objectives of the consultation:
 - Verify **reusability**
 - Verify **domain of reuse**
 - Verify **completeness**
 - Verify **industrial aspects** (w.r.t. product lines)
 - Verify **dissemination aspects**



Schedule



- November 2014: First contacts with Eurospace
- List of companies, list of focal points, consolidation of the Organisation Note, preparation of the Rid tool
- 9 March 2015: kick-off of the review
- 17 April 2015: Rid cut-off date
- Rid disposition process, documents update
- October 2015: ADCSS



➔ Industrial consultation nearly completed!



SAVOIR Documentation Review



- Three docs are in public review:
 - SAVOIR-TN-001- SAVOIR Functional Reference Architecture
 - SAVOIR-GS-001- SAVOIR generic OBC specification
 - SAVOIR-GS-002- SAVOIR Flight Computer Initialisation Sequence Generic Specification

- The Review has been quite a success...
510 RIDs (159 major) have been generated...
Large participation (20 companies, ADS, TAS, OHB, CNES ...)
 - SAVOIR-TN-001- 181 RIDs (34 Major)
 - SAVOIR-GS-001- 242 RIDs (88 Major)
 - SAVOIR-GS-002- 87 RIDs (37 Major)

- Very constructive comments



Status of Rids and Actions



ESA has replied to a large number of Rids “autonomously”

- Some Rids have been discussed at SAG level in June and September meetings

All Rids have been replied by ESA.

- Authors have been notified to look at the replies and to complain if they disagree.
- Some authors have commented on the ESA reply. We have hold teleconference or e-mail exchanges to sort out the issues and come to an agreement.

All Rids are now considered agreed by the reviewers.

- 272 Rids are Accepted with Actions, 309 actions of document modifications are defined
- 238 Rids are Closed with the clarification or in favour of another Rid carrying the action.

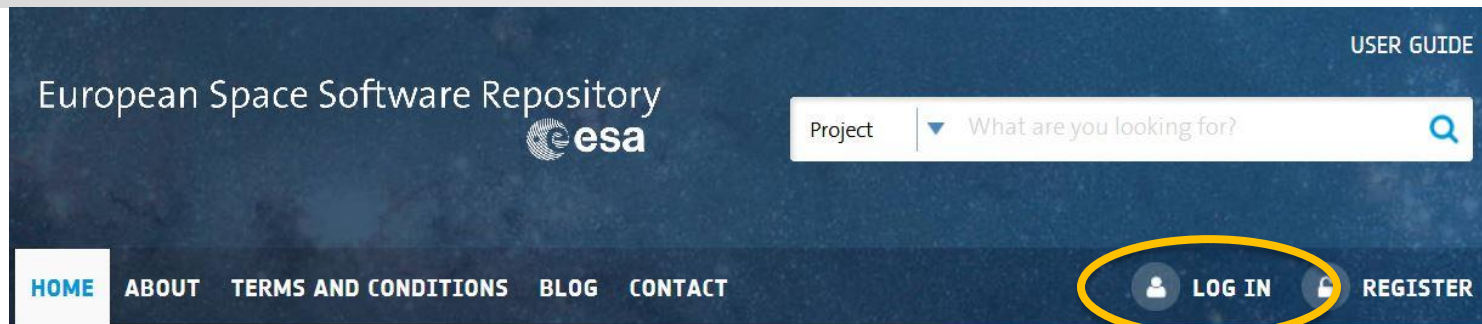
Documents are (nearly) all updated

- with change bars and trace to the Rid number

When finished (November), they will go for a short SAG review for final endorsement (mimicking the role of TA in ECSS)

➔ Then they will be published on ESSR





The European Space Software Repository (ESSR), formerly known as OSSR, is an ESA informational web portal created to promote reuse of Software including Open Source Software (OSS), and to provide all parties involved in the European Space software development (in particular SMEs) with access to results of previous investments.

Please [click here](#) to register and get full access to the ESSR.

Only a limited number of projects is visible to the non-registered users.

LATEST PROJECTS

→ ASN1SCC - ASN.1 SPACE CERTIFIABLE COMPILER

ASN1SCC is an ASN.1 compiler that was developed for ESA to cover all data modelling needs of space applications. The compiler is targeting safe systems and genera...

[READ MORE](#)

Updated on: 29/04/2015 Created on: 29/04/2015

Version Control System: git

Owner: Neuropublic


Links:

1. Source code : [ASN1SCC Source code repository](#)
2. Blog article : [Article introducing ASN1SCC](#)




<https://essr.esa.int/> + login



European Space Software Repository 

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LATEST PROJECTS



→ SAVOIR

Space AVionics Open Interface aRchitecture (<http://savoir.estec.esa.int/>) is an initiative to federate the space avionics...

 Licenses: [SAVOIR documents license](#)

[READ MORE](#)




 Updated on: 16/09/2015  Created on: 25/08/2015

 OWNER: ESA

Links:

1. Homepage : [SAVOIR home page](#)
2. Documentation : [SAVOIR-HB-001 in ro - SAVOIR On-board Software Reference Architecture Training Material](#)
3. Documentation : [SAVOIR-FAIRE - OBSW reference architecture - Iss1Revo - Working group report](#)

[More links](#)

 Tags: [SAVOIR avionics reference architecture](#)





SAVOIR

Space AVionics Open Interface aRchitecture (<http://savoir.estec.esa.int/>) is an initiative to federate the space avionics community and to work together in order to improve the way that the European Space community builds avionics sub-systems.

The objectives are:

- To reduce the schedule and risk and thus cost of the avionics procurement and development, while preparing for the future
- To improve competitiveness of avionics suppliers
- To influence standardisation processes by standardising at the right level in order to get equipment interchangeability (the topology remains specific to a project)
- To define the governance model to be used for the products, generic specifications, interface definition of the elements being produced under the SAVOIR initiative.

⌵ Licenses: [SAVOIR documents license](#)

🕒 Updated on: 16/09/2015

📅 Created on: 25/08/2015

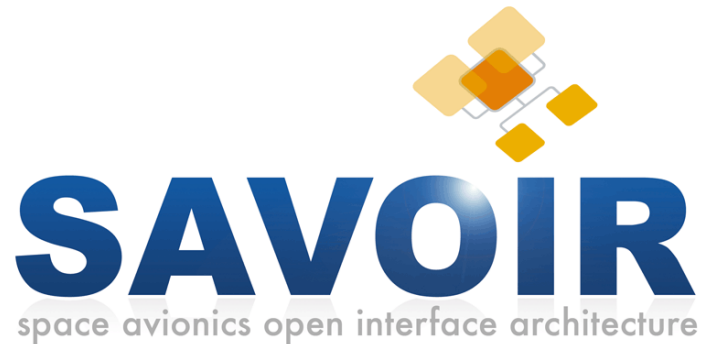
👤 Owner: ESA

🔗 Links:

1. Homepage : SAVOIR home page
2. Documentation : SAVOIR-HB-001 i1 ro - SAVOIR On-board Software Reference Architecture Training Material
3. Documentation : SAVOIR-FAIRE - OBSW reference architecture - IssiRevo - Working group report
4. Documentation : AOCS Interface (SAVOIR-SAIF) Working Group Final Report
5. Documentation : SAVOIR-SAFI - AOCS GNC Sensors and Actuators Functional Interface - Issi rev2 Working Group report

🏷️ Tags: SAVOIR avionics reference architecture





Flight Computer Initialisation Sequence Generic Specification (Boot software) Review report

J.L. Terraillon

With support of Felice Torelli



Statistics

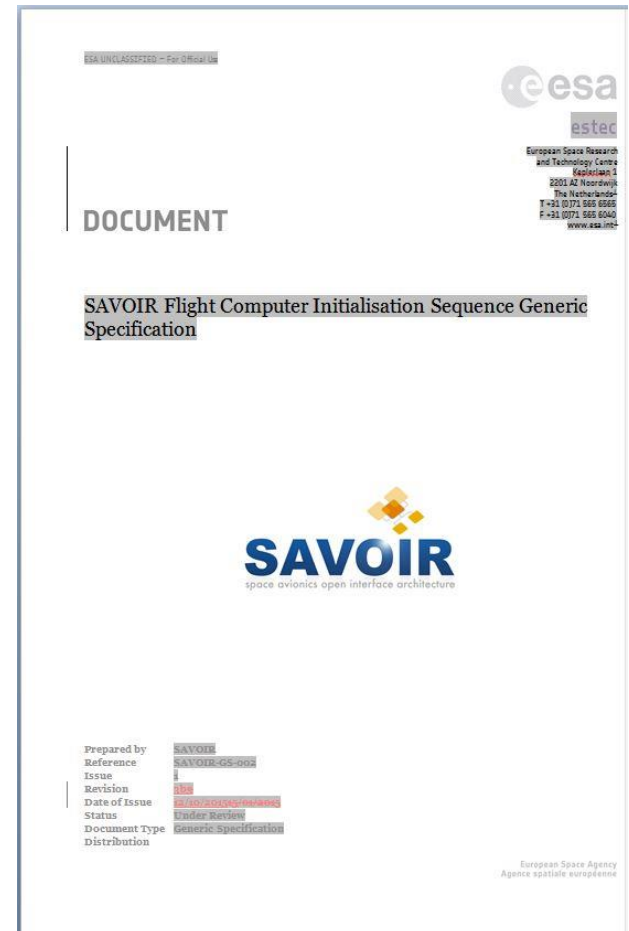


87 Rids, 37 Majors, 50 minor

- 56 Rids proposed to be closed by explanations and clarification, without modification of the document.
- 31 Rids are proposed to be closed with a modification of the document

All is documented in the Rid tool

There is a draft version of the document with the proposed changes iss1 rev3b.



Major points



1- the applicability of the document.

- OBC, PLM but which ones, and the others?
- And which kind of architecture? (not redundant, and what about multicore, and what about non-Leon...)
- ➔ The decision is that it is applicable to any flight processor, but with possibility to tailor in case of specific context.
- ➔ An annex "How to use" is added to the spec (in the spirit of "generic" spec), which are the elements that the specifier must tune or add in order to produce the real document:
 - A bit like OBC spec did
 - "Hardware Assumptions"
 - Parameters



How to use...



	HARDWARE ASSUMPTIONS		Boot Memory	Application storage memory	Working memory	Select ASW image from ground	Activate StandBy from ground	Monitor interface	Reconfiguration function	Reading recovery action in reconfiguration function	PM redundancy	Powering both nominal & redundant PM	Protected resource retaining data when fault or power loss	Access to protected resources from nominal and redundant	If PM redundancy, inter processor link	Essential telemetry	Reading the active/inactive status by PM	If PLM, link with OBC
	PARAMETERS																	
General		FN-05	x	x	x	x	x	x										
Nominal	ColdWarm	FN-10	x															
Nominal	FastBootPath	FN-15																
Nominal	NumberASWimages	FN-20		x	x	x												
Nominal	NumberASWimages	FN-25											x					
Nominal	NumberASWimages	FN-27				x			x	x								
Nominal		FN-30																
StandBy	HardwarePatch	FN-70	x								x	x			x		x	x
StandBy		FN-75																
StandBy	StbyTrigger	FN-80																
StandBy	StbyTrigger	FN-90																
StandBy	StbyTrigger	FN-95					x											
StandBy		FN-97																
Monitor	HardwareMon; Mon	FN-40						x										
Monitor	MonTrigger	FN-50																
Monitor	MonTrigger	FN-60																
Monitor	MonTrigger	FN-65																

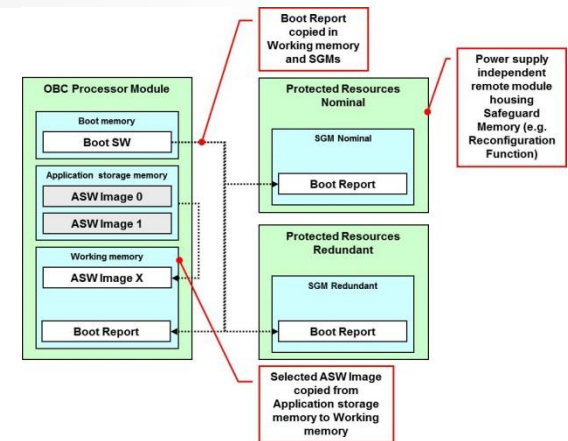


Major points



2- Some emotion about PROM and EEPROM instead of Non Volatile Memory.

- Technology name (Prom, EEPROM, etc) replaced by generic names:
[Non-]Volatile Read[-Write/-Only].

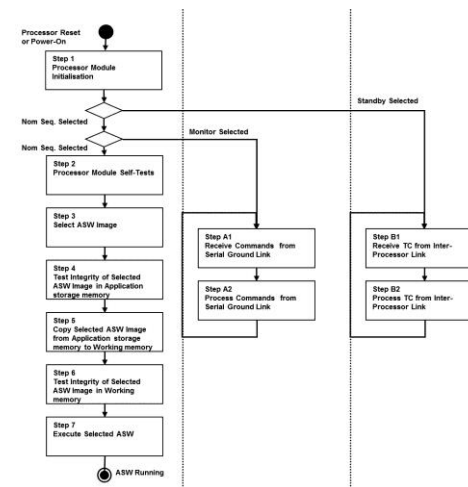


3- Lot of misunderstanding about the Watchdog, where is it , how it works, who does what, etc.

- The related text has been rephrased.

4- Some picky things in the Initialisation sequence

- sparc/non-sparc technology.

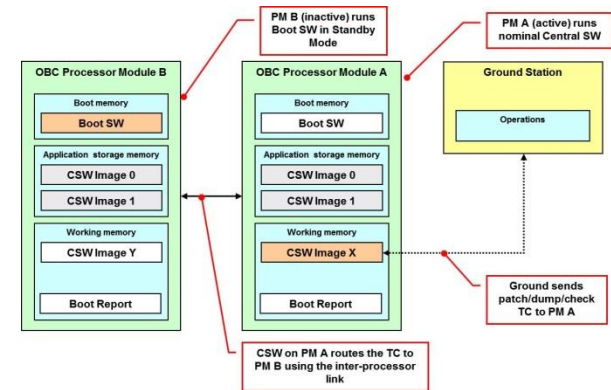


Major points



5- No full understanding of the mode management, in particular around the StandBy mode: when does it starts, how is it triggered, does it include self tests or not, how do you get out of it, what does it access...

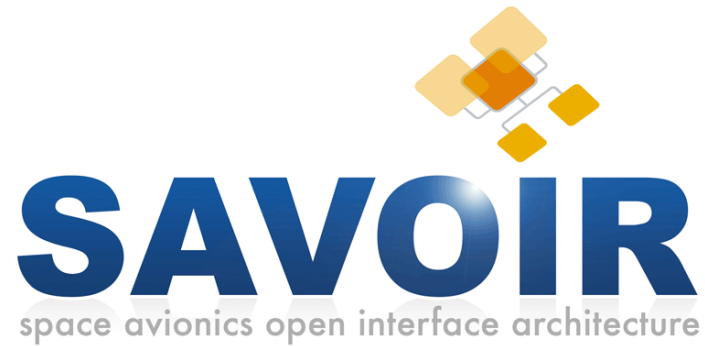
- This is due to the variability that is left for the various implementations.
- Some clarification inserted.



6- Severe inconsistency with the OBC spec, which had a complete chapter on Boot SW and said sometimes different things with different names.

- Leave in the OBC spec the BootSW requirements impacting hardware
- Concentrate the pure software requirements in the BootSW spec
➔ several requirements added or modified.





ASRA (TN-001) Review report

Giorgio Magistrati



Statistics

- 181 RIDs, 34 Major, 147 minors.
 - 141 Rids are proposed to be closed with a modification of the document
- All is documented in the Rid tool
- There is a draft version of the document with the proposed changes - iss1 rev3c



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DOCUMENT

SAVOIR Functional Reference Architecture



Prepared by SAVOIR
Reference SAVOIR-TN-001
Issue 1
Revision 3
Date of Issue 1/10/2015
Status Under Review
Document Type Technical Note
Distribution ☐

European Space Agency
Agence spatiale européenne



Major Rids



- **Functional and Physical view:** More than one RID was saying that functional and physical views were mixed. The documents has been reviewed highlighting what is functional and what is physical, and identifying in the text the parts that are functional and the parts that are physical.
 - a pragmatic approach has been followed , we cannot present the functional view in a way completely decoupled from a physical view.
 - Physical views showing functions grouped in a OBC and a RTU are presented as examples
- **Trends in Avionics** have been included in the doc:
 - Decentralized vs centralized architecture,
 - Intelligent RTUs,
 - CANBus and digital sensor buses.
 - ...



Major Rids



- **Redundancy Philosophy:** cold/warm/hot redundancy are better presented and described. More complex redundancy schemes have been mentioned.
- Sections on **Command & Control Data Link function and Mission Data link function** have been partly reworded. Options and trade-off on Point-to-point and Multipoint buses have been included.
- Section on **On Board Time** function has been updated: the elements of the OBT function (including sources: clocks, GNSS receivers) , redundancy scheme , number of outputs (now a parameter) have been revised.
- **AOCS Sensors and Actuators** : lists of sensor and actuators have been updated and their use on different missions revised.
- **SECURITY** The clear mode is considered an unacceptable security risk in case of a malicious attack. It is stated that the decision to use it must be the result of a security vs dependability trade-off.

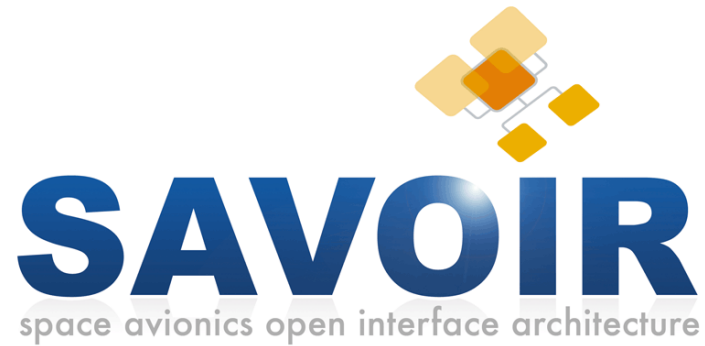


Major/minor Rids



- **MAP IDs** for TC are suggested for future implementations.(This is done in order to unify the setting of future OBCs, in an similar way a TM VCs allocation is proposed)
- List of **ADs and RDs** revised (CCSDS and ECSS docs).
- **Glossary** updated.
- **ECSS secretariat** comments have been implemented.





OBC Specification (GS-001) Review report

G. Magistrati





- 242 Rids, 88 Majors, 154 minors, 23 minors converted in editorial.
- 109 actions: 98% have been implemented updating the spec, others:
 - #1 Change request to one ECSS doc (to be done),
 - (Principle of) Tailoring proposed to be done in a separate doc,
 - New functions as CFDP support in next edition.
- 87 Rids from SAG members (Primes) – the impression is that the GS-001 has been extensively reviewed by primes – that is positive !
- Several Mtgs/TLCs with few SAG members.





- **Role of Essential TM:** The Essential TM function manages the acquisition of essential telemetry and the download of the acquired parameter through a dedicated virtual channel w/o SW intervention.
- Pure HW implementation. Inside or outside the OBC.
- As per SAG decision the ETM is optional.
- The Essential Telemetry function acquires:
 - the ON/OFF status corresponding to the most vital HPC commands
 - critical status linked to the TC reception chain (The CPDU status report elaborated by the Command Pulse Distribution Unit, Authentication status,...)
 - Other critical parameters: Power bus voltage status, Charge level of the battery status, Deployment Mechanisms status, ...
- **Better coherency between GS.001 and GS.002:** Boot Sw reqs moved to GS-002



Major Rids



- **Tailoring of OBC reqs for other missions different from the ones considered by SAVOIR:** it is proposed that (the principle of) tailoring to cover the specificities of small satellite projects and small sat OBC suppliers shall be put in the OBC handbook.
- **CAN/CANOpen** added as low-medium speed bus for Command and Control Bus and Mission Data Links.
- Requirements will be available as **DOORS Modules**.
- **PM Benchmarks:** the recommended benchmarks are Dhrystone and Whetstone. These benchmarks might be susceptible to compiler optimizations, therefore compiler options to be specified/detailed in the report – Coremark is additionally proposed.
- **Security** : strong revision of the sections dedicated to Security, the Security clause now refers directly to the CCSDS Space Data Link Security Protocol (CCSDS 355.0-B-1 Blue Book) and CCSDS Cryptographic algorithms (CCSDS 352.0-B-1 Blue Book)



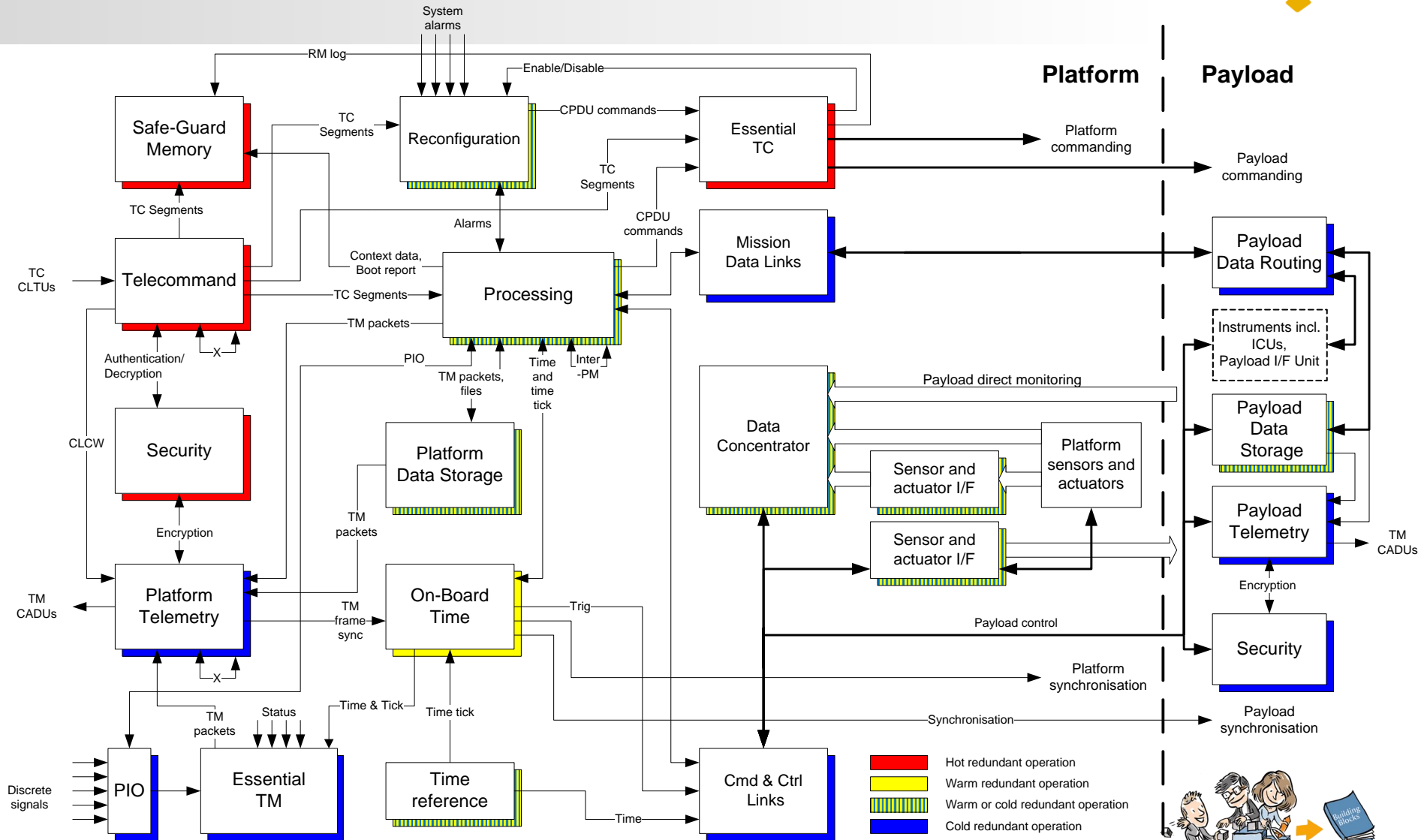
Major/minor Rids



- More **parameters** have been added for a more “generic” Spec (possible tailoring is also simplified).
- **Glossary** added.
- **ECSS secretariat** comments have been implemented.
- Basically all the **OBC functions have been upgraded** improving the text or the rationale (Also the title has changed : **SAVOIR generic OBC *functional* specification** !).



New SAVOIR Avionics Functional Diagram





■ Questions ?

