SAVOIR

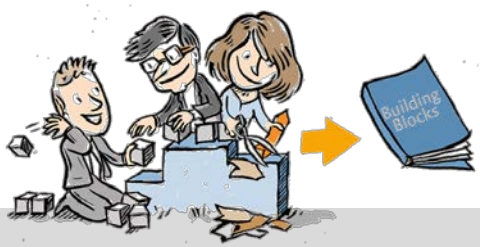
space avionics open interface architecture

Avionics System Reference Architecture (ASRA) reporting

Avionics System Reference Architecture (ASRA), ESA contract 4 000 102 927

GIORGIO MAGISTRATI ESA-ESTEC TEC-EDD

TORBJÖRN HULT RUAG-S

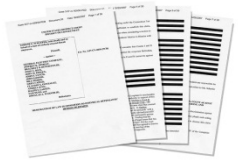


SAVOIR mission

- Improve the way we deliver Space Systems (risk & schedule, and therefore cost, and industry competitiveness) by

An *agreed* Reference Architecture

Functional Specifications (OBC, RTU, …)



Pre-developed / to be developed Building Blocks

Standardized Interfaces

- If, in ITTs, Customers use *agreed* mission specification and System Integrators use *agreed* product specification, then Suppliers should be in a position to have product lines, and System Integrators should have easier integration phases

Mission domains considered

- Science and Earth Observation missions with up to 12 years duration to:
  - LEO
  - GEO
  - Lagrange points
  - Interplanetary space
- Telecom missions with up to 15 years lifetime
- The excluded missions are:
  - Manned missions
  - Launchers
- There is however nothing that prevents the Savoir concept and “products” from being used in these missions if the special needs can be somehow fulfilled.

Objectives of the ASRA contract

- The aim of ASRA (Avionics System Reference Architecture, ESA contract) is to define an avionics reference architecture meeting the needs of the various mission domains. Commonality between the solutions recommended for each domain has been maximised whenever possible.
- The ASRA ESA contract (Nr.4000102927) has been assigned to the consortium of the SAG industries with RUAG-S as prime in 2011.
- First work package scope was to agree on a common functional architecture and outline the main functions per functional block. **Functional Reference Architecture** (presented at ADCSS2011)
- Four subsequent work packages for generating:
    1) Ground to Space interfacing, general recommendations
    2) **Generic OBC specification (presented at ADCSS2012)**
    3) **Generic RTU specification**
    4) Platform/Payload interfacing, general recommendations (presented on day 3 of ADCSS2014)

ASRA documents – events

May 2012:	OBC and RTU Generic Spec delivery by SAG industries together with the Functional Reference Architecture
June –September 2012:	**(1st) ESA Review cycle (projects involved !!!)**
Oct 2012-January 2013 :	ESA-SAG industries meetings on provided comments
June 2013 - SAG mtg:	The following decisions have been taken: a) SAG industries to update the (1) ***Functional Reference Architecture*** and the (2) ***OBC Generic Specification*** b) ESA to write a doc specifying the (3) ***operability requirements*** for a RTU
Sept 2013 – SAG Meeting:	A dedicated contract [follow on of ASRA contract] to cover the SAG industries costs for the updating of the documents (1) and 2)), SAG industries to comment/integrate the (3) ***RTU Operability requirements***
End of the Year 2013 - 1Q2014	Updated issues of the three documents (doc (1) issue 5 and doc (2) issue 6) have been extensively modified by SAG industries > a new ESA review needed)
Late spring 2014	**2st ESA Review cycle (projects involved !!!)**
August 2014	ESA-SAG industries meetings on provided comments
September 2014	Updated issues of doc (1) (issue 6) and doc (2) (issue 7). ESA is working on *RTU* ***Functional*** *and Operability requirements doc*

Produced Documents

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esa estec

European Space Research and Technology Centre
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
T +31 (0)71 565 6565
F +31 (0)71 565 6040
www.esa.int

DOCUMENT

SAVOIR Functional Reference Architecture

SAVOIR
space avionics open interface architecture

Prepared by	ASRA project team
Reference	TEC-SW/11-477/JLT
Issue	3
Revision	0
Date of Issue	11/05/2012
Status	
Document Type	
Distribution	

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Keplerlaan 1
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The Netherlands
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F +31 (0)71 565 6040
www.esa.int

DOCUMENT

SAVOIR RTU – Operability Requirements

SAVOIR
space avionics open interface architecture

Prepared by	G.Magistrati
Reference	TEC-EDD/2013.11/GM
Issue	1
Revision	0
Date of Issue	07/08/2013
Status	Draft
Document Type	TN
Distribution	

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European Space Research and Technology Centre
Keplerlaan 1
2201 AZ Noordwijk
The Netherlands
T +31 (0)71 565 6565
F +31 (0)71 565 6040
www.esa.int

DOCUMENT

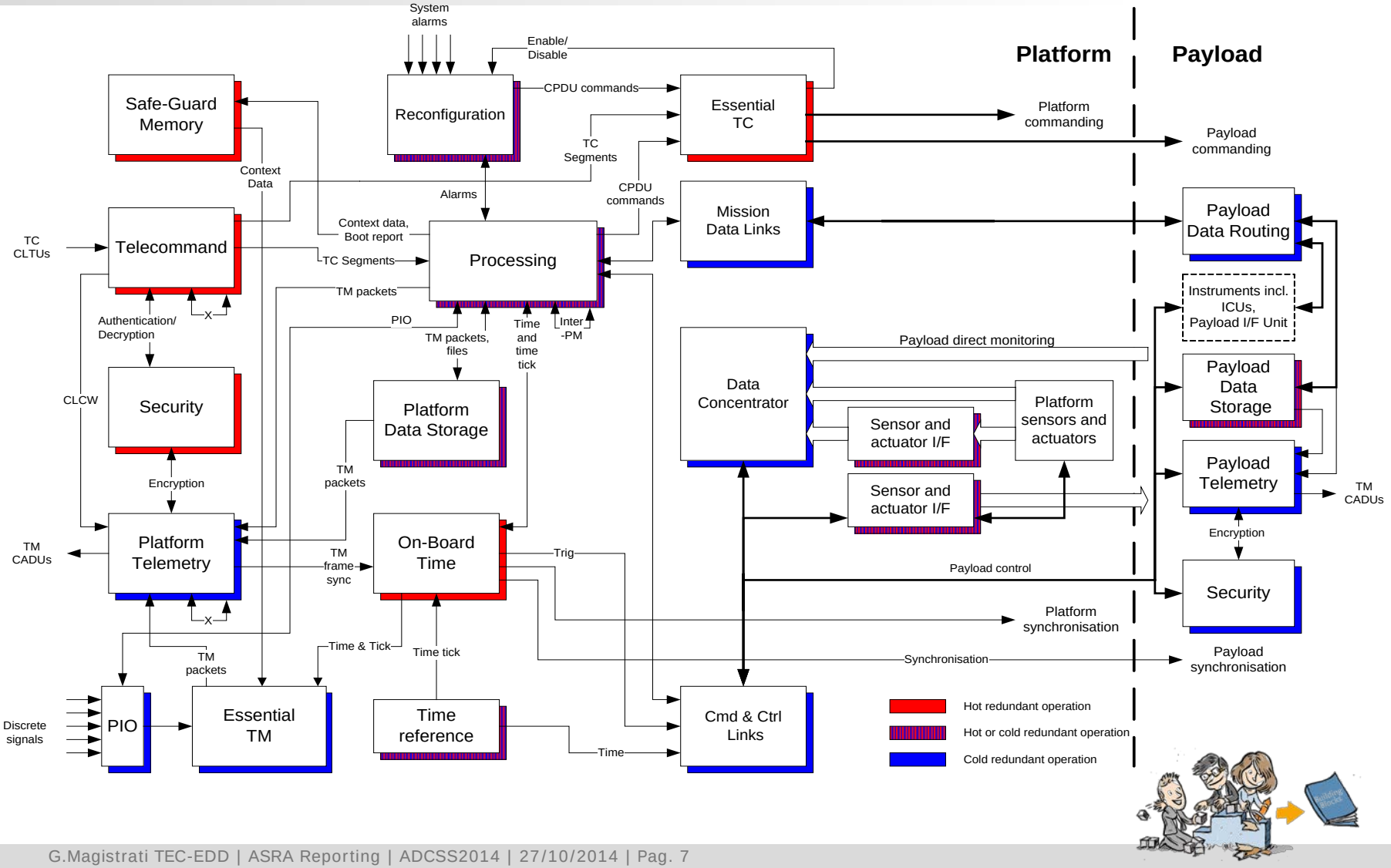
SAVOIR generic OBC specification

SAVOIR
space avionics open interface architecture

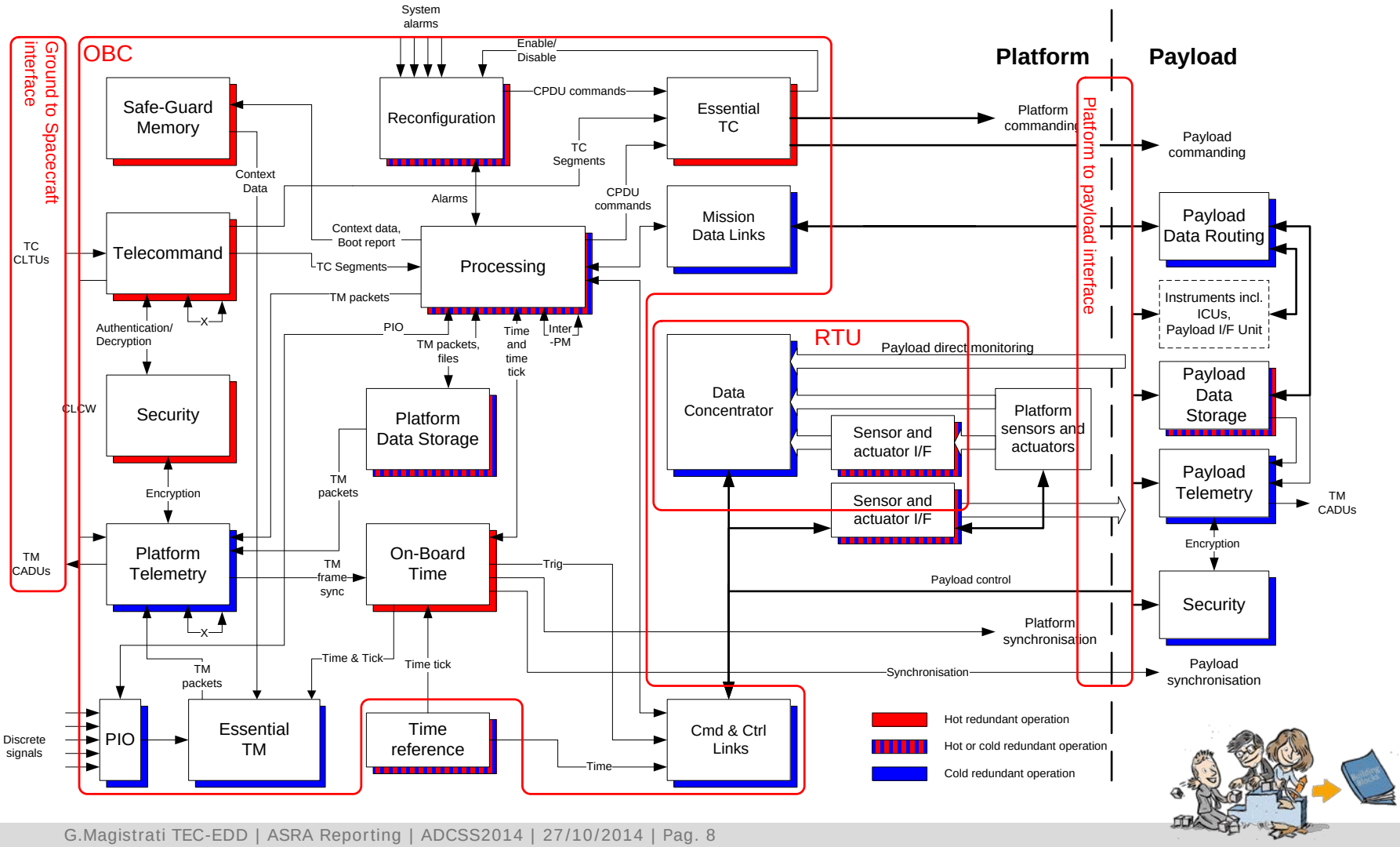
Prepared by	ASRA project team
Reference	TEC-SW/12-536/JLT
Issue	4
Revision	0
Date of Issue	11/05/2012
Status	
Document Type	
Distribution	

European Space Agency
Agence spatiale européenne

SAVOIR Avionics functional diagram (including related payload functions)



SAVOIR Avionics functional diagram (including related payload functions) mapped on Units



Functional Reference Architecture

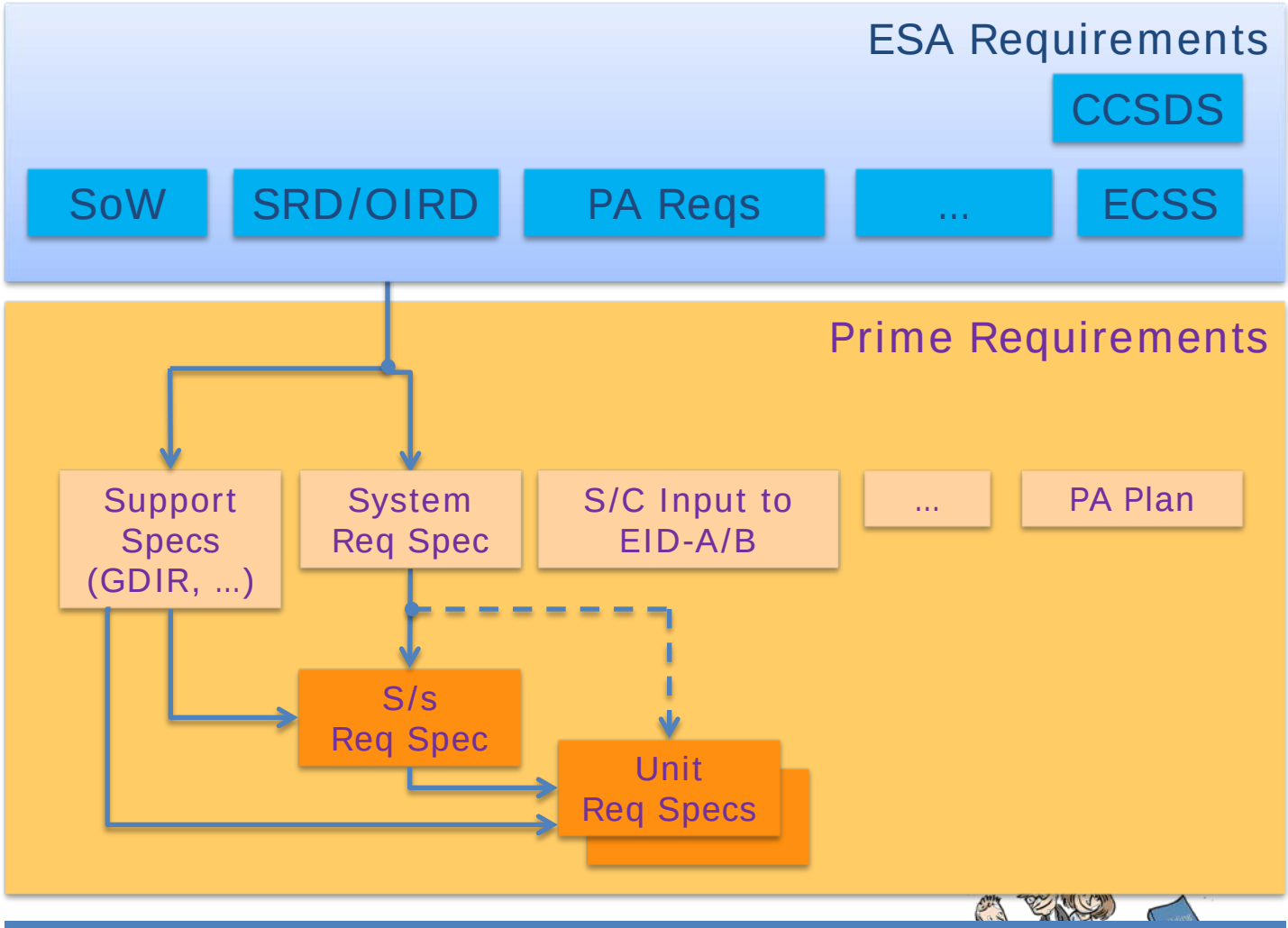
- Functional Reference architecture doc TOC:
  - **Functional Reference Architecture**
    - HW elements
    - SW elements
  - **Main requirements to be fulfilled by the architecture**
  - **Detailed Architectural Description**
    - TC, TM, PM, Platform Dara Storage, … Functions
    - Command & Control Link, Mission Data Link(s)
  - **Mapping to possible Physical Architectures**
  - **SAVOIR Glossary**

OBC Generic Specification

- OBC Spec TOC:
  - **Functional Requirements**
    - Packet Telecommand Handling
    - Security
    - Essential TC
    - Platform Telemetry Encoder
    - Processing Function
    - On Board Time management.
    - Platform Data Storage
    - Command& Control Link
    - Mission Data Links
    - Essential Telemetry
    - Reconfiguration Module
  - **Interface Requirements**

Note: modular structure, several requirements with parameters range, options are present (section 8 is LIST OF PARAMETERS AND OPTIONS FOR THE OBC)

Specification tree for a generic project



Legenda – SoW =Statement of Work, SRD= System Req doc, SG-ICD= Space to Ground ICD, OIRD= Operation Interface Requirements Document, GDIR = Generic Design & Interfaces Document, EID= Experiment Interface Document

Specification tree : Control & Data Mngt

SRD/OIRD

Spacecraft Reqs

General Reqs

Ctrl & Data Mgmt

AOCS

Data Storage

Operation Reqs

S/C Control: TC/TM

FDIR

Mem Mngt

CCSDS

ECSS

Prime Requirements

Support Specs (GDIR, ...)

System Req Spec

S/C Input to EID-A/B

ICDs

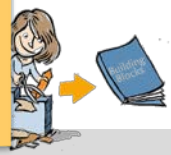
PA Plan

CDMS Req Spec

OBC

RTU/ RIU

Data Storage SSMM



Specification tree : Control & Data Mngt & Savoir

SAVOIR Initiative, EO Initiative for a generic SRD,...

Generic SRD/OIRD

(Input to) **General Requirements** (to be done)

CDMS reqs (to be done, section 9 of SAVOIR OBC spec issue 6)

Data Storage System (DSS) reqs (draft Savoir Masais WG v0)

...

Technical Notes

SAVOIR Functional Reference Architecture TN (available)

SAVOIR Ground to Space I/F, general recommend ations

SAVOIR P/F-P/L interfacing, general recommend ations

Generic Specs

SAVOIR Generic OBC Spec (available)

SAVOIR Generic RTU Spec (draft)

SAVOIR-MASAIS WG v1 + TRP Data Storage (SSMM) Spec (planned)

SRD/OIRD

Spacecraft Reqs

...

Ctrl & Data Mgmt

Data Storage

Operation Reqs

...

S/C Control: TC/TM

Mem Mngt

Prime Requirements

Support Specs (GDIR, ...)

System Req Spec

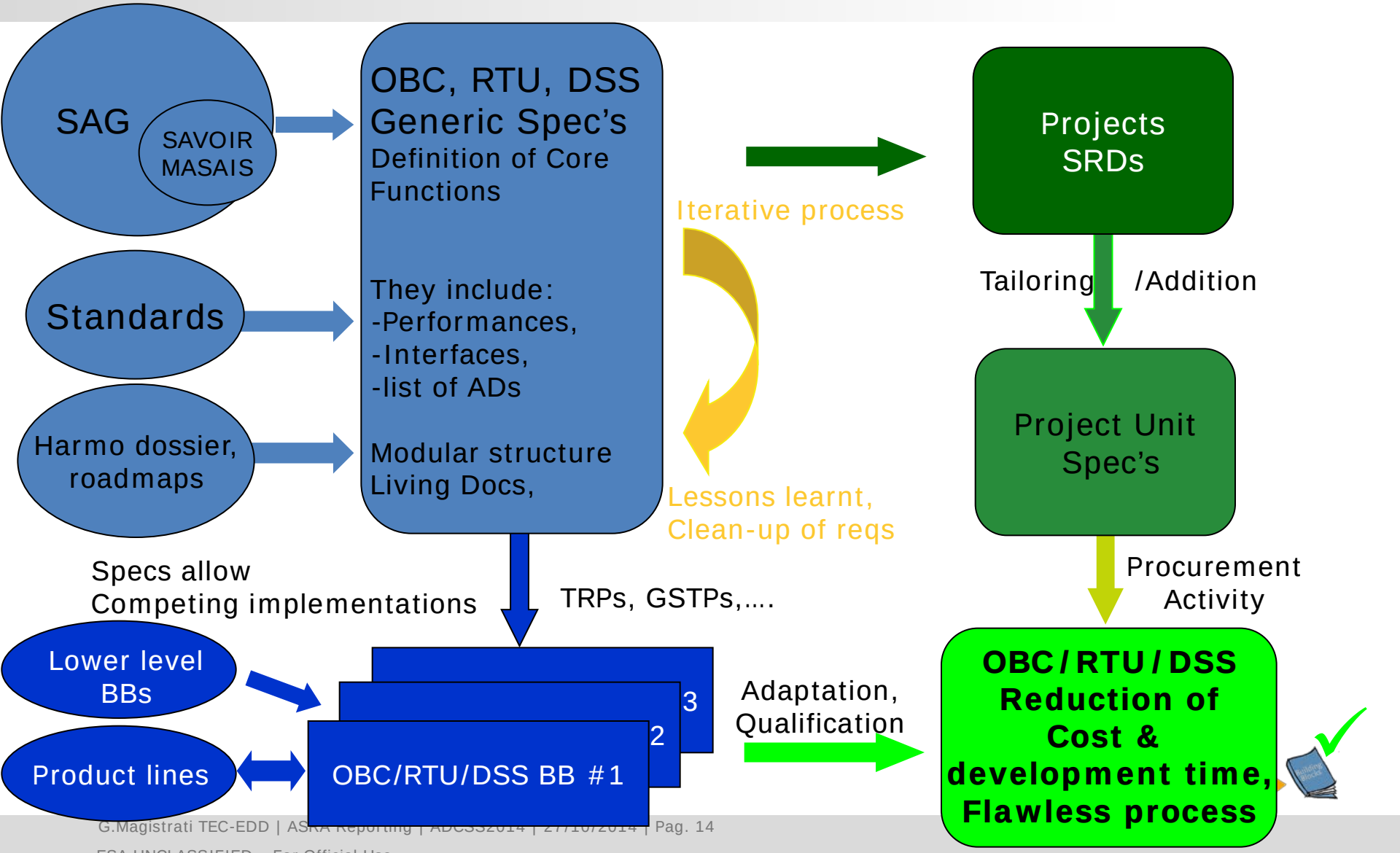
CDMS Req Spec

OBC

RTU/RIU

Data Storage SSMM

Specification tree : Control & Data Mngt & Savoir



Conclusions and Future

- ASRA Contract has completed all the tasks
- Produced Docs:
  1) Issue 6 of SAVOIR Reference Functional Architecture
  2) Issue 7 of SAVOIR generic OBC Spec
  3) Ground to Space interfacing, general recommendations
  4) Platform/Payload interfacing, general recommendations
- On-going & future activities:
  - Public review of 1) and 2) using ECSS infrastructure
  - Doors module for the SAVOIR OBC Generic Spec (to enable easily traceability)
  - Finalization of RTU Functional and Operability requirements doc (ESA task)
  - Future dissemination process controlled by ESA: ESA SRDs / OIRDs inspired by the ASRA work (done already for Euclid).

Contact

Feedback: savoir@esa.int

Questions ?