SAVOIR

space avionics open interface architecture

SAVOIR Handbook

Torbjörn Hult

Savoir handbook activity

- Started beginning of 2016 as an extension of the ASRA contract that generated the first issues of the SAVOIR Functional Architecture document and the SAVOIR OBC Functional Specification.
- RUAG Space is prime with contributions from Airbus D&S and TAS.
- ESA technical officer: Jean-Loup Terraillon
- Main tasks:
  - Identify SAVOIR stakeholders and how they will be affected by the introduction of SAVOIR.
  - Gather experience on the problems and unclear points when using spacecraft avionics in past and present programmes.
  - Analyse the outcome of the public review of the SAVOIR documents and identify unclear point.
  - Write guidelines covering the typical problem areas and discussion items in programmes.

Example of concerns derived from the public review

- RID from TAS (TAS-008):
  - It seems the MAPID definition is fixed while usually it is defined in the SGICD that is a program based document. Is it only a suggestion or it is a recommendation/fixed value? In this case it would be useful to provide a rationale / justification of this choice.
- RID ECE-3:
  - Using RF-receivers with two TC outputs allows a cross strap configuration thanks to the dual input per decoder in the OBC (dotted lines in figure 4) but perhaps it is useful to be compatible with receivers with a single output.
  - This would need the OBC to generate an output from the incoming TC.
  - Is this the intention of the sentence ¿Using an optional cross-strapping capability between the two TC Decoders it is possible to connect four receivers to the TC Decoding function¿ ? it is not clear if this capability is expected in the reference architecture on not. Remind that cross strapping in the harness is not recommended.

Savoir handbook scope

"This document presents the SAVOIR Data Handling Handbook. It supplements the set of SAVOIR Data Handling documents listed in section 2.1 below. This handbook mainly deals with the Data Handling aspects of SAVOIR. Software aspects and sensor/actuator aspects needed to make up a full avionics handbook are not covered by this document.

The handbook deals with topics often found in real projects, like how and where to introduce cross-strappings, how to use features on the TM and TC links and how data buses are used. It also deals with the introduction of new functionality into SAVOIR, like new security protocols, new technology, Time and Space Partitioning, and file management and transfer, all based on experience from various development activities."

Handbook contents

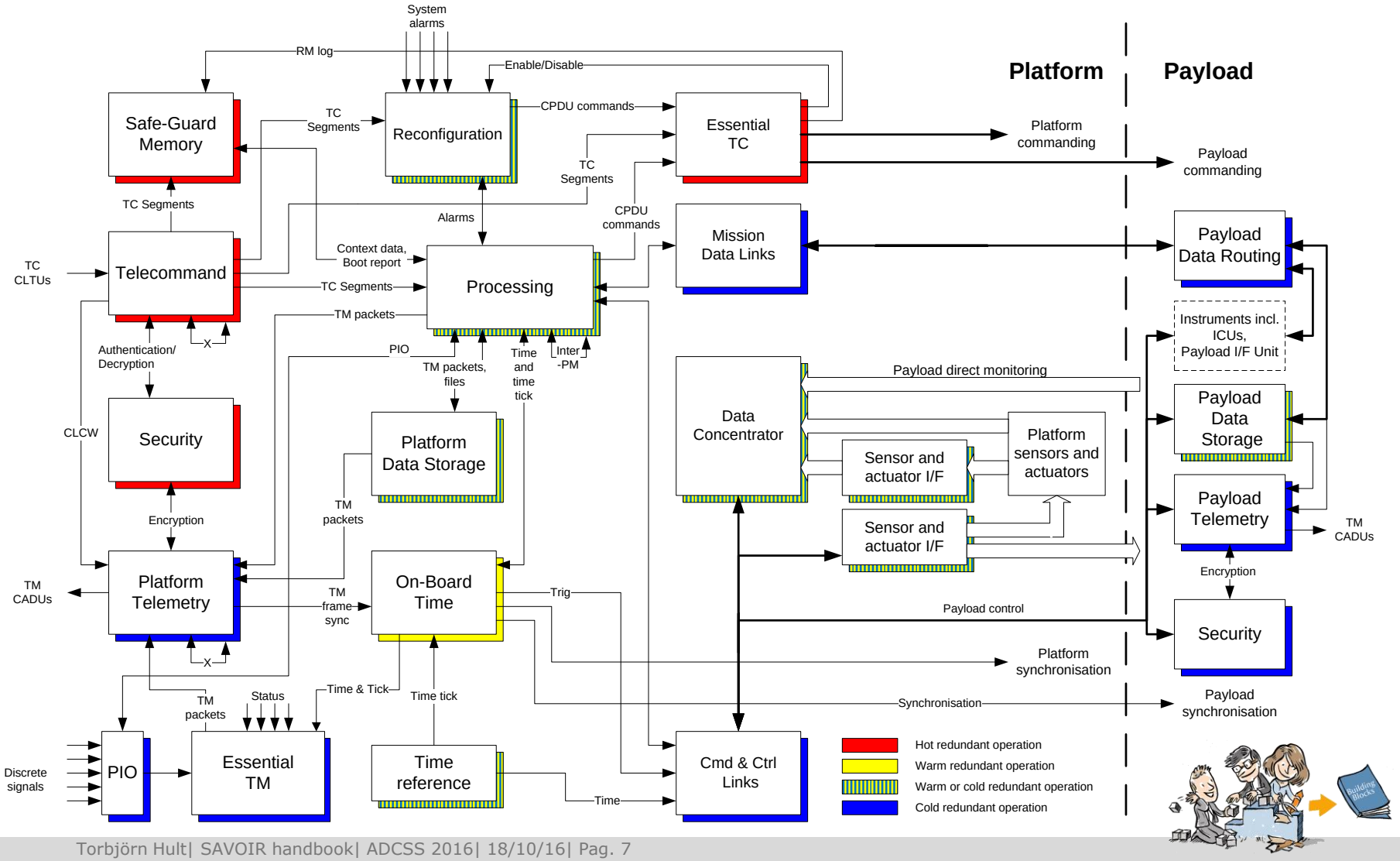
- Chapter 2 includes applicable and reference documents and abbreviated terms
- Chapter 3 introduces the SAVOIR stakeholders and their role in using SAVOIR
- Chapter 4 repeats the main elements of the SAVOIR functional architecture
- Chapter 5 presents the functions and how to use them
    - The functions are described in the same order as in the SAVOIR Functional Architecture document

Stakeholders

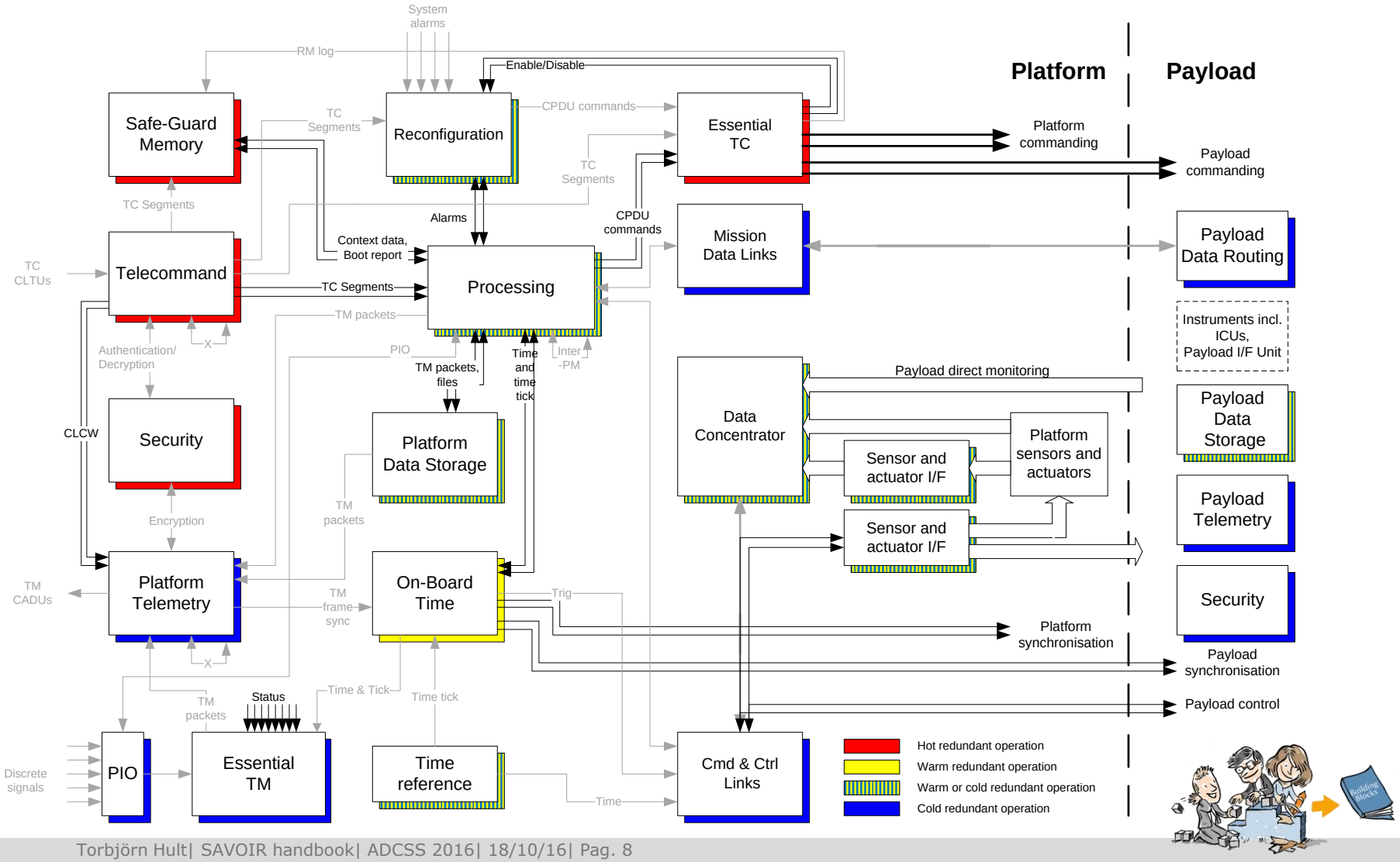
- There are a number of stakeholders in the space community that influence the decisions on implementations of the SAVOIR architecture. They are listed below and their roles are described further in chapter 2.

- The system engineer
- The data handling architect
- The avionics design engineer
- The product line manager
- The avionics integration responsible
- The verification responsible / engineer
- The project manager
- The equipment suppliers

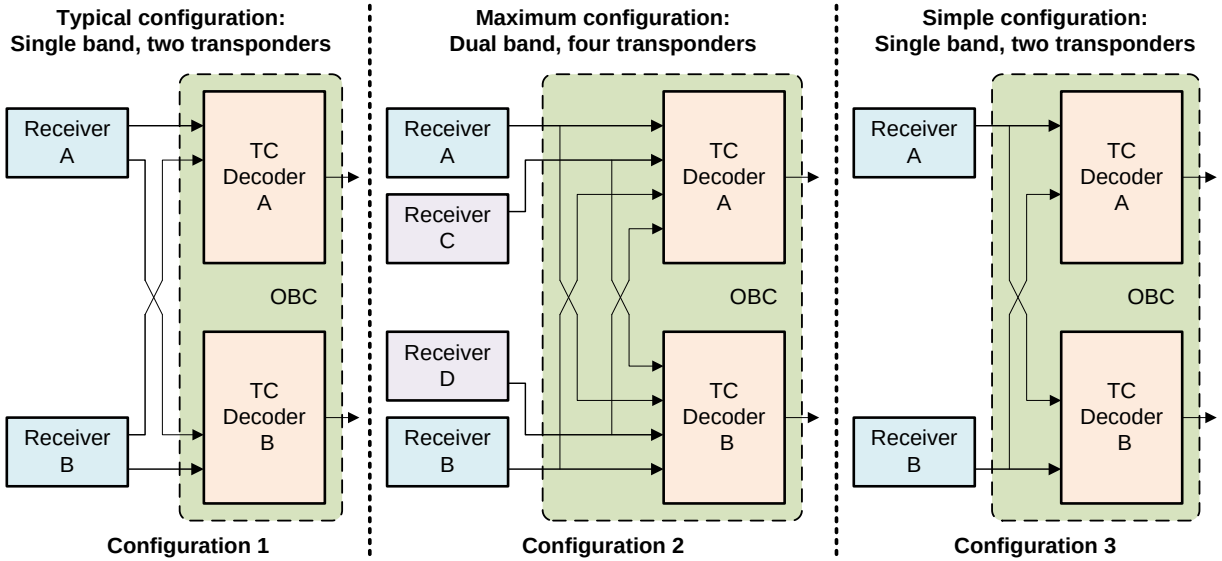
Avionics functions, updated drawing



Avionics functions, cross-strappings

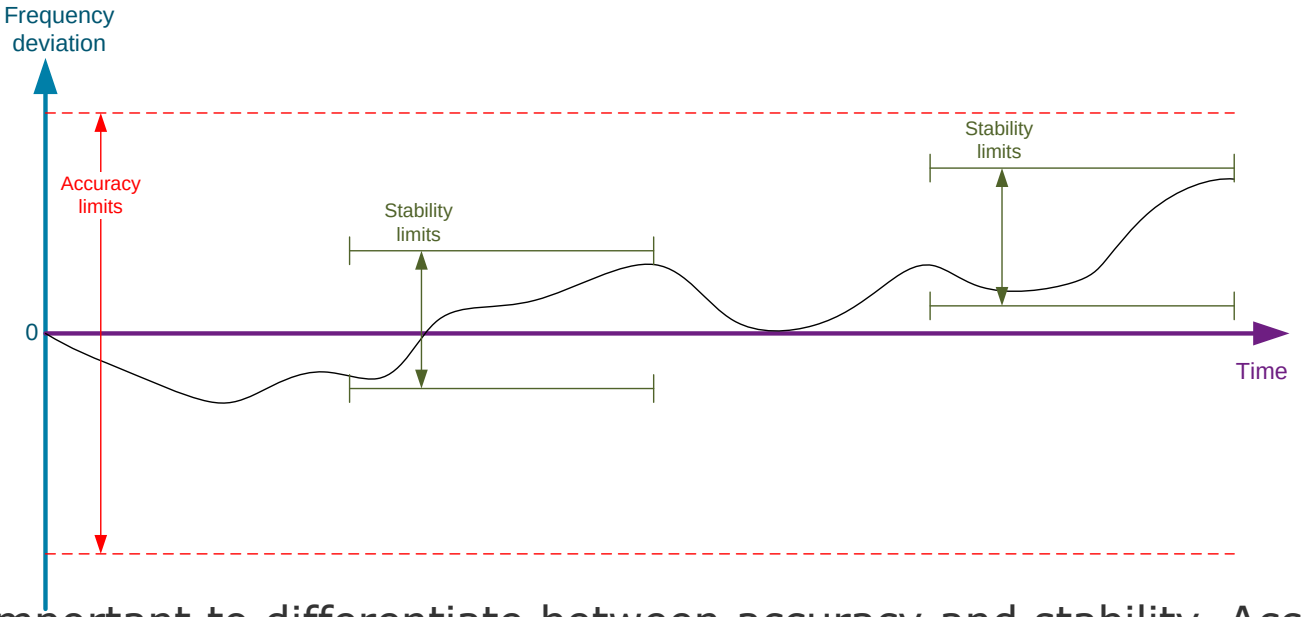


Example of handbook material: Telecommand cross-strapping



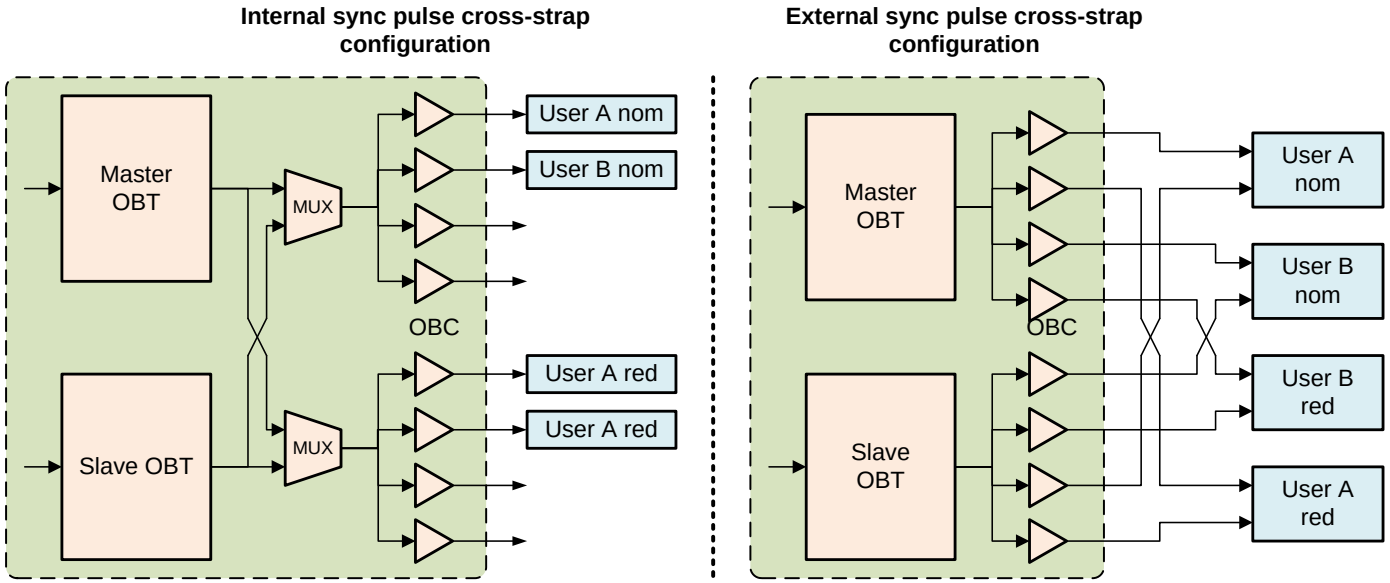
"The typical configuration, which is selected by the majority of missions, is Configuration 1. In this configuration the cross-strapping between the Transponders and the TC Decoders is made in the spacecraft harness. An OBC has four inputs and each TC Decoder has two separate inputs and the connections with the Transponders are simple point-to-point links, requiring the transponder to have two outputs. This also means that the TC Decoder receiving circuitry is quite simple, using typically a single RS-422 receiver device connected as defined in ECSS-E-ST-50-14C clause 8.8."

Example of handbook material: Definition of OBT accuracy and stability



"It is important to differentiate between accuracy and stability. Accuracy is the parameter that defines how much the oscillator frequency is allowed to deviate from the nominal value over the entire mission. Stability is the parameter defining the allowed variation over a certain period of time. Thus the stability requirement can be considered as a sliding window to be applied over the complete mission duration as shown in Figure 31."

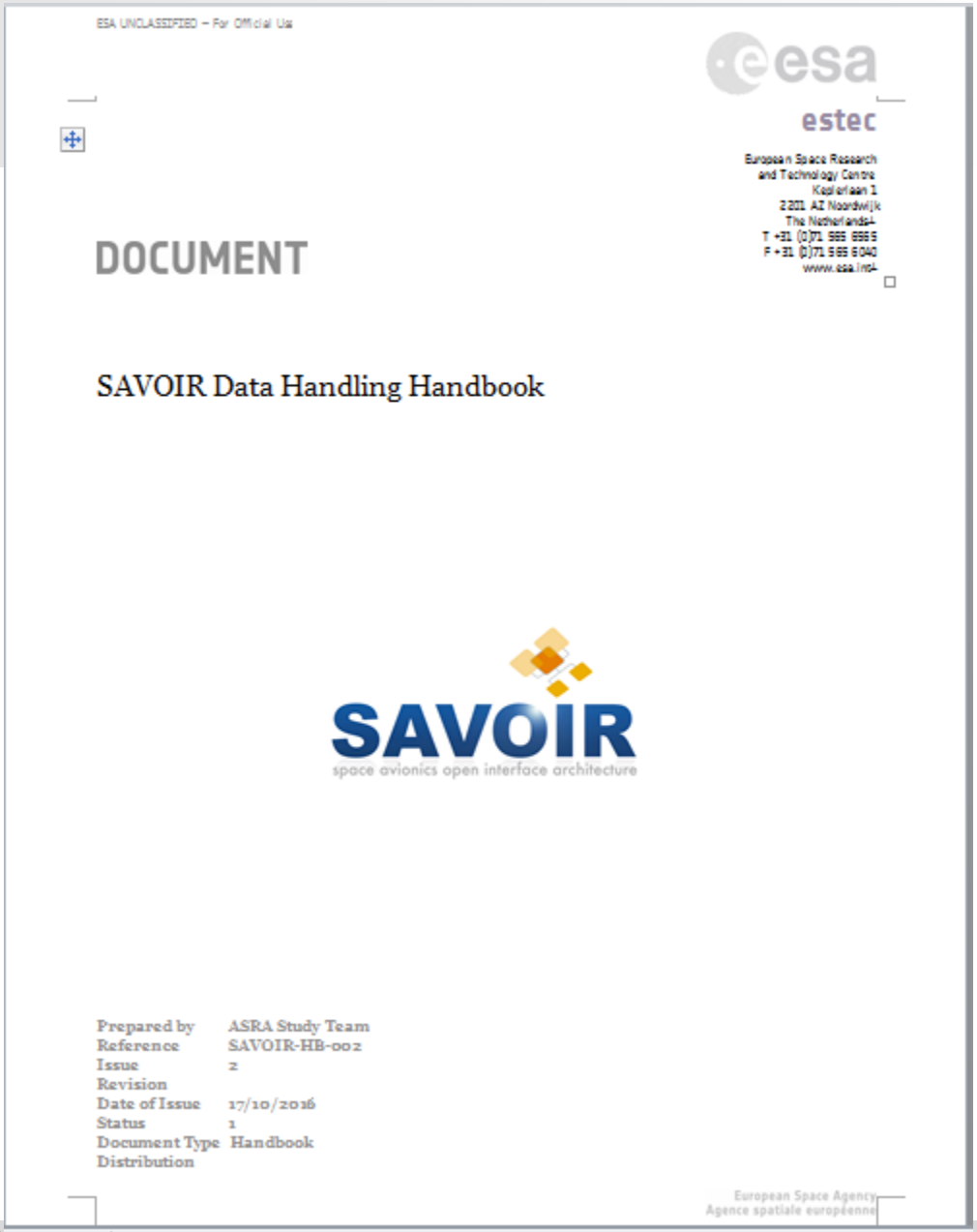
Example of handbook material: Sync signal output configurations



"The distributed sync signal cross-strapping scheme is actually not specified in SAVOIR, in contradiction to what is done for the TM signal output. The main reason is that there is less consensus of what is the preferred solution. Two common configurations are shown in Figure 32.

The left configuration includes internal cross-strapping in the OBC and provides a single sync signal to each user. The advantage is a very simple functionality at the user side since there is no need to select between …."

Handbook



ESA UNCLASSIFIED – For Official Use

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 Data Handling Handbook

SAVOIR
space avionics open interface architecture

Prepared by	ASRA Study Team
Reference	SAVOIR-HB-002
Issue	2
Revision	
Date of Issue	17/10/2016
Status	1
Document Type	Handbook
Distribution	

European Space Agency
Agence spatiale européenne

Contact

Feedback: savoir@esa.int

savoir.estec.esa.int