



SAVOIR Communications

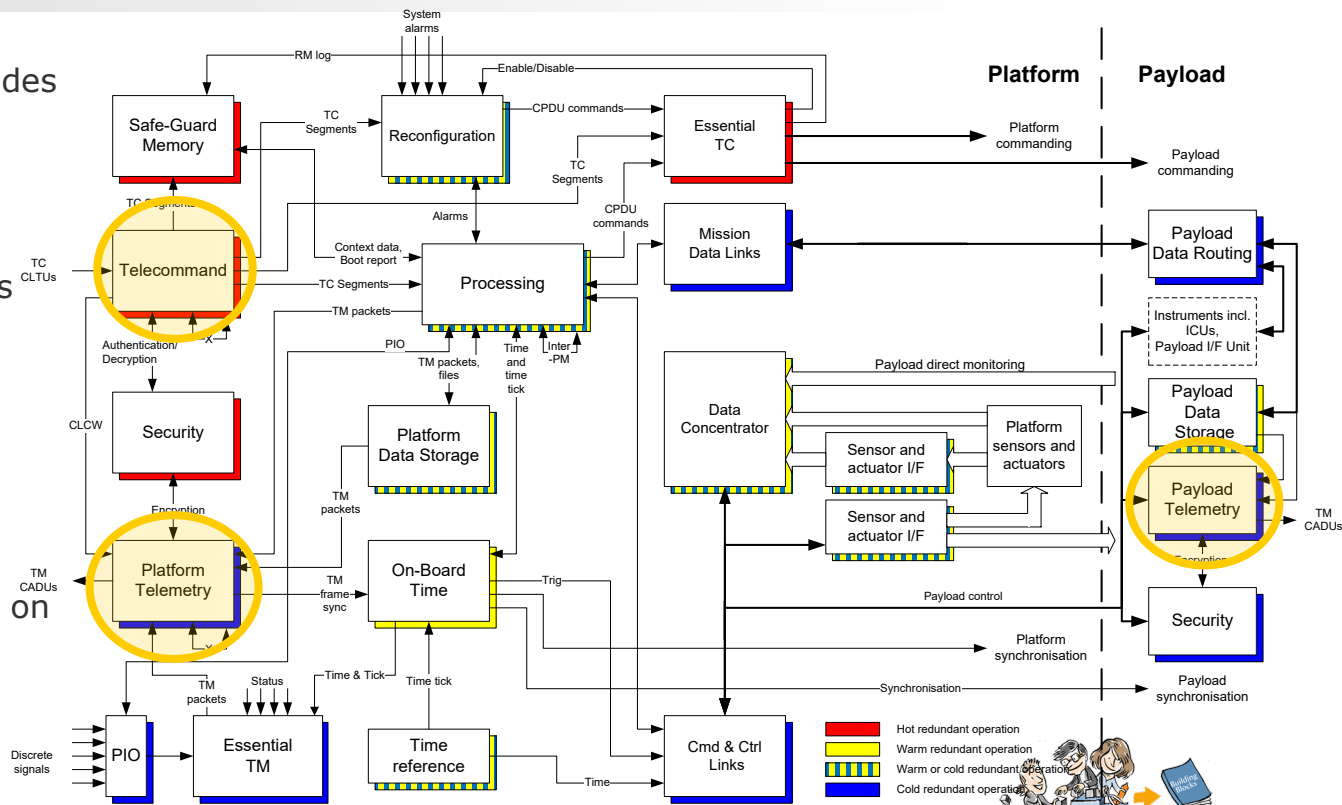


Space-Ground communications





- Avionics architecture includes TT&C
- Mission needs evolve
 - Higher data throughputs
 - Lower reliability
 - More nodes
 - Networking
 - ...
- They may have an impact on the avionics architecture



SAVOIR Communications working group tasks



- To **update the current status of the needs**, technologies and application of space communications (in particular to look at the application of BP/LTP protocols to the uplink and downlink, the evaluation of LTP+ for hardware implementation improvement, the encoding, the impact of security, and a common interpretation of the CFDP standard implementation).
- To **elaborate on an operational concept** for end-to-end data exchange between ground and space considering available technologies and performances.
- To **assess the impact on the SAVOIR documentation**, and in particular the functional reference architecture, the link between TT&C and OBC, the impact on storage and the payload side.
- To **advise on updates of the SAVOIR documents** and the SAVOIR Capella models.
- To **verify the consistency with the Generic OIRD**, and eventually any required evolution.
- To **advise on the production of a specific handbook** related to communications.
- To **cooperate** with any R&D, standardization and coordination activities related to the domain to provide an on-board implementation perspective.



SAVOIR Communications working group



- ESA/OPS-GSB (x2)
- ESA/TEC-SWT
- ESA/OPS-OPD
- ESA/OPS-OET
- ESA/TEC-EDD
- ESA/TIA-TO
- CNES
- DLR
- ADS (x2)
- TAS (x2)
- OHB (x2)
- BEYOND GRAVITY
- TERMA
- SODERN



Timeline



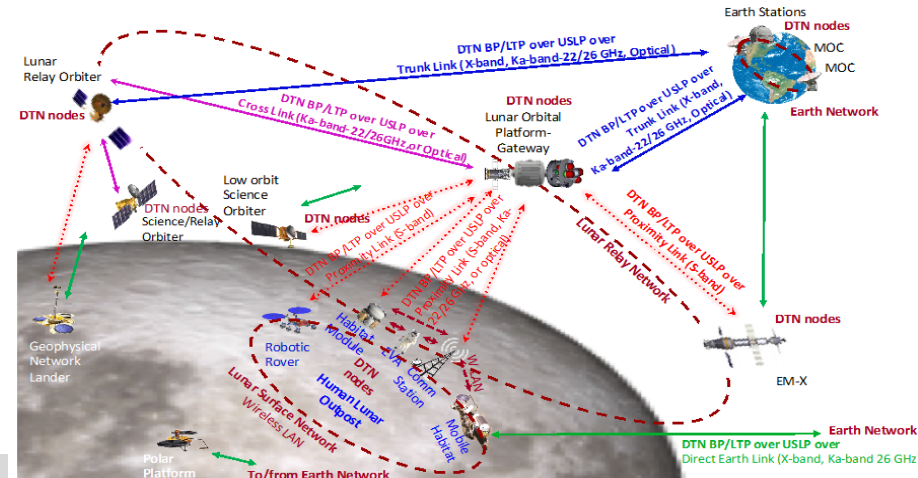
- Kick-off on 21/09/2022
- Cooperative work with regular (~monthly progress meeting)
- Presentation of the Technical Note to the Savoir Advisory Group #61 (10/10/2023)
- Presentation of resulting SAVOIR Technical Note: ADCSS 2023



Summary of needs



- Identification of needs in term of communication for various missions in different domains:
 - Higher data throughput on less reliable links (optical, Ka)
 - From point-to-point to network (moon, mars, constellations)
 - Possible long delays (moon, mars)
 - Increased security
 - Toward File Based Operation



Protocol stacks



- Make use of latest evolutions of communication protocols

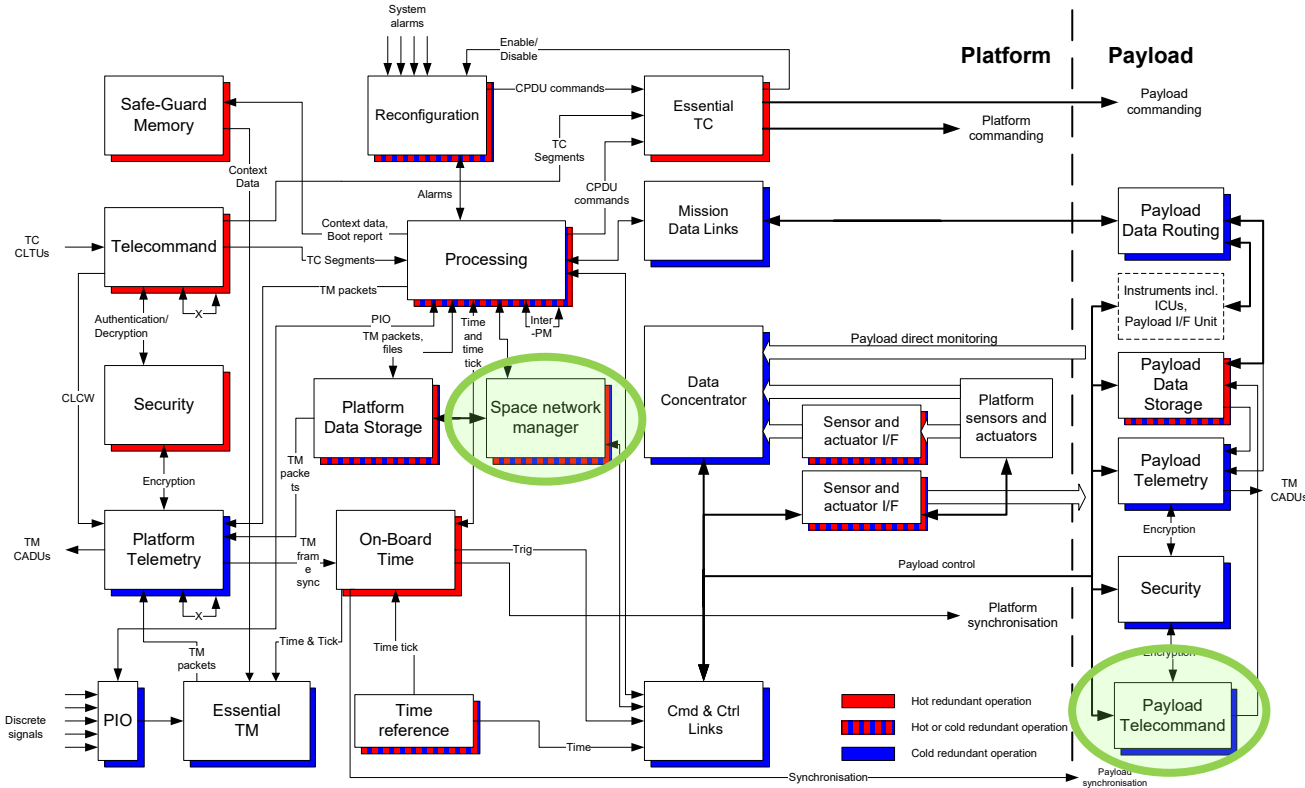
CFDP	PUS-C
Space Packet Protocol / (Encapsulation Packet Protocol)	
TM / TC / AOS / Prox-1 / (USLP) (+ optional SDLS)	
Coding & Modulation	

CFDP Class 1		other applications		PUS-C	
BPv7 (+ optional extensions: BPSEC, CBR, ...)					
EPP CL	SPP CL	LTP/ HPRP CL	UDPCL	TCPPCL	
		LTP/ HPRP	UDP / IP	TCP / IP	
			CCSDS IP Encapsulation		
Encapsulation / Space Packet Protocol			Encapsulation Packet Protocol		
TM / TC / AOS / Prox-1 / (USLP) (+ optional SDLS)					
Coding & Modulation					

CL = Convergence Layer



Impact on SAVOIR ASRA



New functions

- Space Network Manager
- Payload Telecommand

Impacted implementation

- Telemetry/Telecommand
- Data Concentrator
- Data Storage (P/F, P/L)





Activities



- Consolidate high-data throughput between Space and Ground with efficient error management (Ka-band, Optical)
- Develop “affordable” high-data throughput Inter-Satellite Links (throughput x 2,000 and cost / 100 in 25 years)
- Develop DTN network management for
 - Ground: GT17-675GS - GSTP Compendium 2022
 - Space: Not activity defined yet
 - Security: GT1Y-606ES - CCSDS delay-tolerant networking BPSec module
- In-Orbit Demonstration
 - EO “constellation”
 - Moon communications



Contact



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