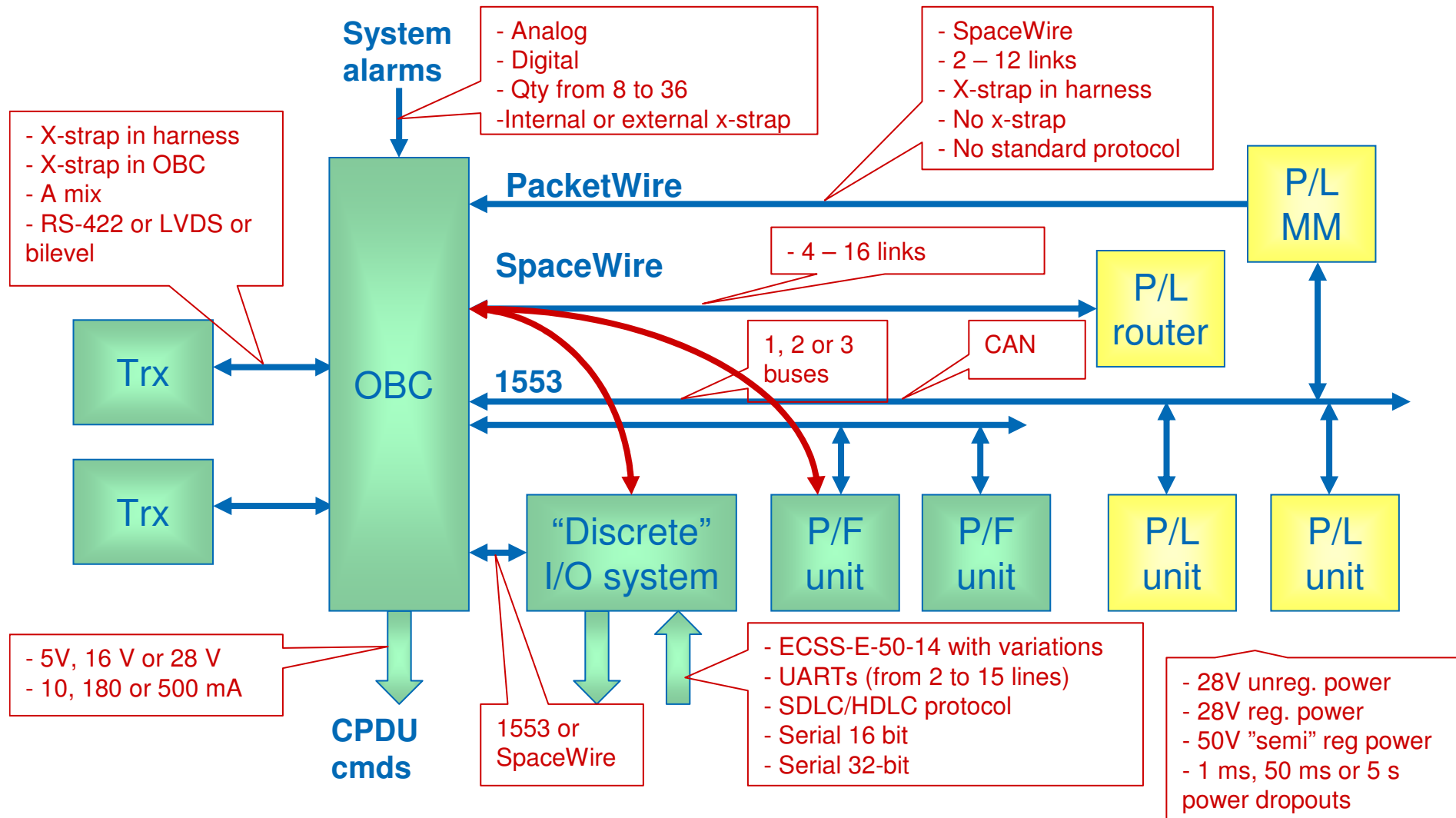


RUAG View on Getting a Standard OBC and RTU Specification

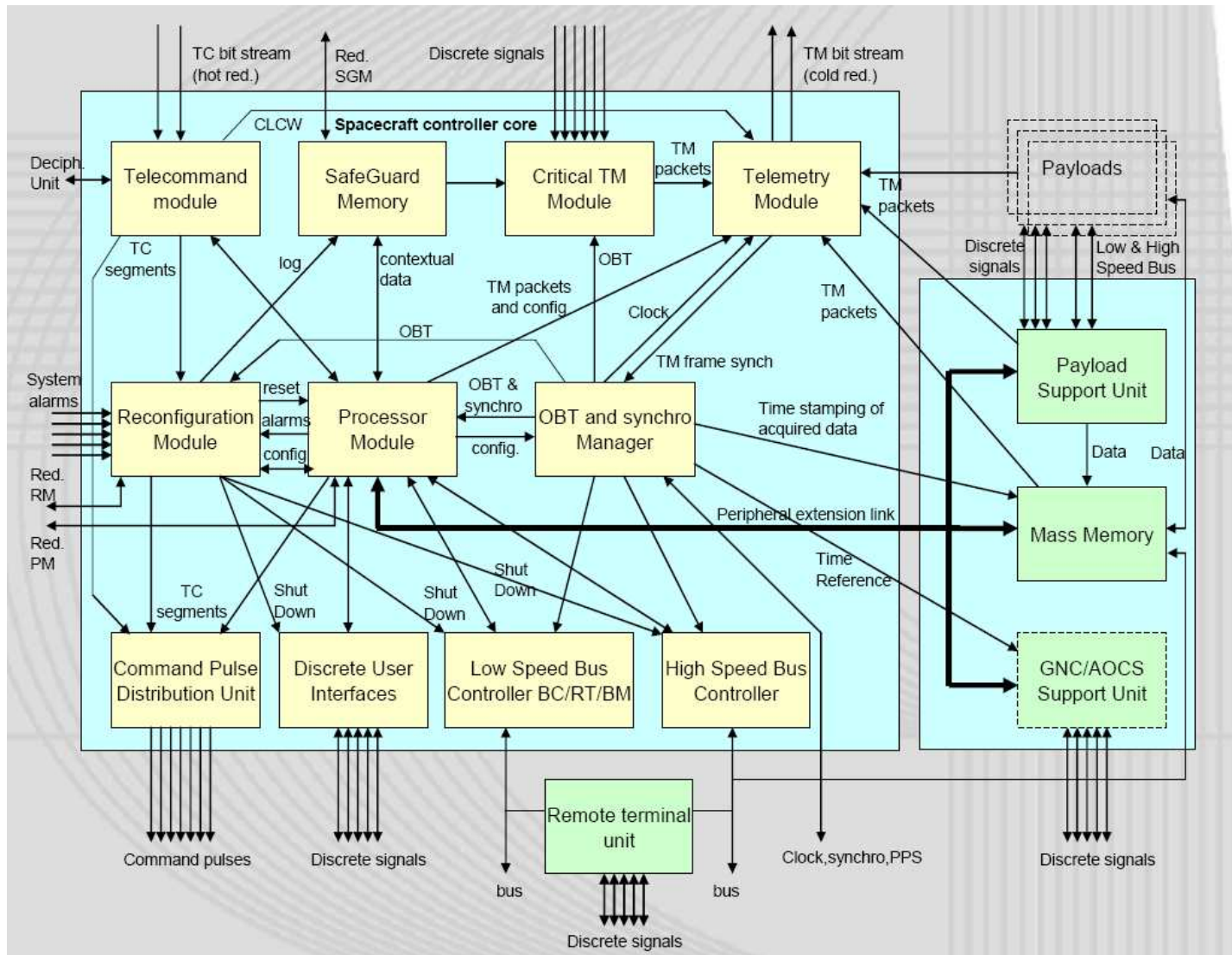
Torbjörn Hult



Avionics architecture Some of the variabilities



Avionics functions



From: Aurora Avionics presentation, Olivier Notebaert, SDSS workshop 17-20 Oct 2005

Is there a need for standardisation?

- The avionics Building Blocks are quite well identified
- There are some standardised functions:
 - Telecommand and Telemetry protocols, CPDU
 - On-board time formats
 - 1553 data bus protocols
 - SpaceWire protocols
- There are some de-facto standardised functions
 - Processor hardware
 - Simple AOCS sensors and actuators
- There are many non-standardised functions
 - New TM &TC functions (authentication, encryption, ...)
 - FDIR mechanisms (Reconfiguration, SGM, ...)
 - Mass Memory
 - Sync pulse generation and distribution
 - Mechanical aspects (mainly location of connectors)

Main functions that vary

- **Sync pulse generation:**
 - Synch pulses phasing to GPS PPS reference
 - Sync pulses in cold redundancy from the PM OBT
 - Sync pulses in hot redundancy from the hot redundant OBTs (2 groups)
 - Sync pulses in hot redundancy from the hot redundant OBTs (4 groups)
 - Sync pulses in cold redundancy from the hot redundant OBTs (2 groups)

- **Mass memory:**
 - Many innovative TC(15,128+) service proposals
 - Various interpretations of the ECSS-E-70-41 services
 - Varying bit error rate requirements, sometimes several orders of magnitudes lower than the hardware failure rate
 - Downloading on packet creation time instead of packet storage time

- **PM boot:**
 - A few examples on next page

More variabilities

- **“The boot software shall always try to load the application software”**
“In case of errors found during the boot an alarm shall be generated and the boot shall halt”
- **“The boot report shall be included in a single 16-bit word”**
“The boot report shall allow to identify faulty devices and memory areas on the PM”
- + **many, many more on the boot function**
- **“It shall be possible to write the Safeguard memories in parallel”**
“It shall only be possible to write to one SGM at a time”
- **“The FDIR function shall not share any resources with other functions in the SMU”**
“The FDIR function shall not share any resources with the function it supervises”
- **“It shall be possible to enable and disable the TC Authentication function by software”**
“It shall not be possible to enable the TC Authentication function from the software”

Generic OBC Specification contents



1. Applicable ECSS standards
2. OBC operational requirements (mainly modes)
3. OBC functions
 1. Requirements for all OBC functions
 2. Error handling
4. OBC performance
 1. List performances per function
5. OBC interfaces
 1. List interfaces per function
 2. The Application Program Interface is also an interface

Items excluded:

1. Physical (mass, power, dimensions) and environmental requirements
2. Design, development and verification requirements
3. Redundancy configuration requirements

OBC functions

- TC decoding and distribution
- TM collection, formatting and coding
- Mass Memory for storage of data, e.g. TM
- On-Board Time counting and distribution
- Application software execution platform (=processing)
- Communication links to platform and payload equipment (including routers?)
- Discrete interface communication to platform and payload equipment (or included in the RTU?)
- FDIR function
 - Safeguard memory
 - Reconfiguration function

Generic RTU Specification contents



1. Applicable ECSS standards
2. RTU operational requirements (mainly modes)
3. RTU functions
 1. Requirements for all RTU functions
 2. Error handling
4. RTU performance
 1. List performances per function
5. RTU interfaces
 1. List interfaces per function
 2. The access protocol via the control link is also an interface
 3. Interface redundancy requirements

Items excluded:

1. Physical (mass, power, dimensions) and environmental requirements
2. Design, development and verification requirements
3. Internal redundancy requirements

RTU functions

- RTU control, monitoring and data input/output
- Classical RTU:
 - Standard input interfaces according to ECSS-E-ST-50-14C
 - Standard output interfaces according to ECSS-E-ST-50-14C
- AOCS add-ons:
 - Magnetorquer, magnetometer
 - Reaction Wheels
 - Sun Sensors
 - Generic UARTs for other sensors (Star Tracker, Gyro, IMU, ...)
- Propulsion add-ons:
 - Thrusters + corresponding sensors
 - Latch valves
 - Protection and arming
- Others
 - Additional sync pulse distribution
 - Secondary voltage distribution