

# SAVOIR RTU Specification

ADCSS 2015

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- Background
- Contents of the SAVOIR RTU Specification
- Summary

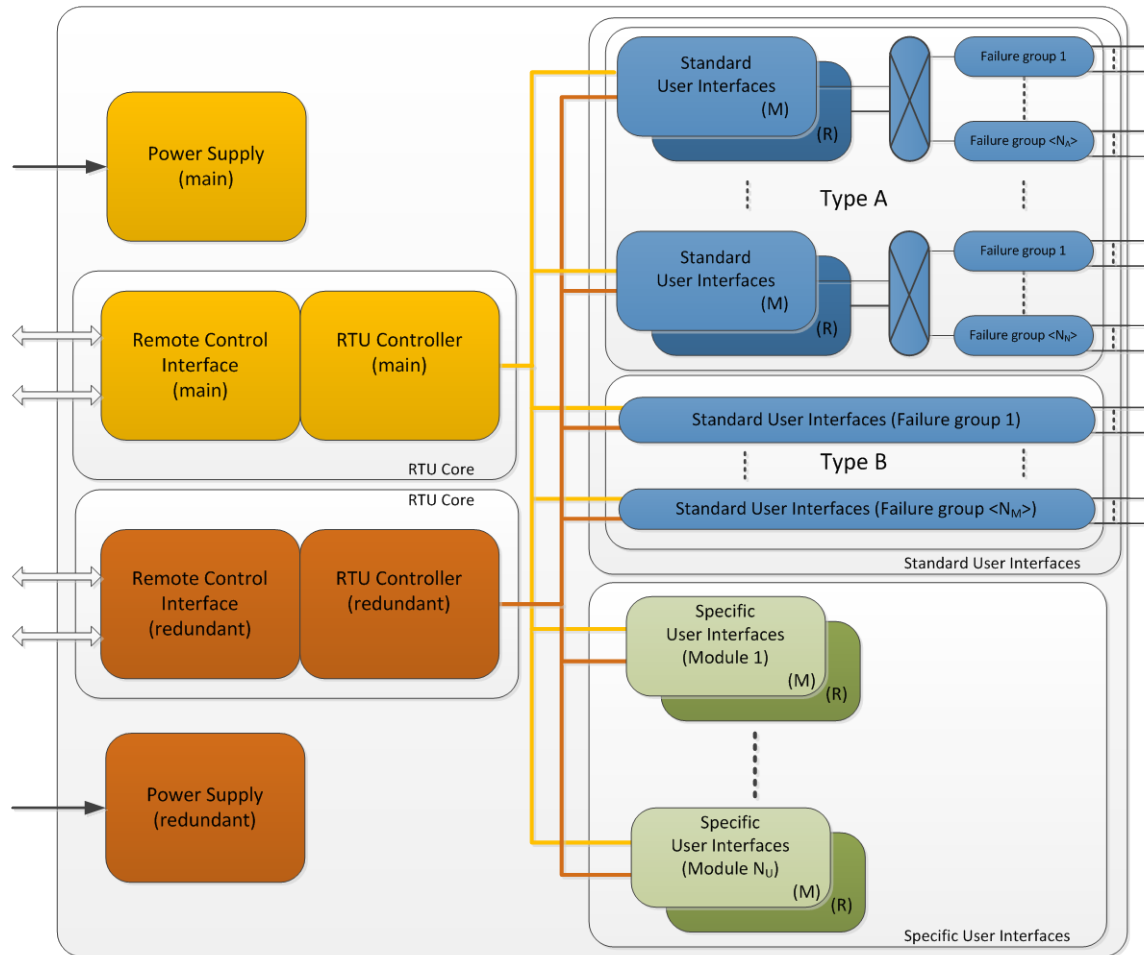
- ❑ SAVOIR Advisory Group identified the desire to establish a generic RTU Specification.
- ❑ Some iterations have been done in the past
- ❑ What is a suitable level of detail for the specification?
- ❑ Focus on “Functional and Operability Requirements”
- ❑ Specification is not intended to specify or impose constraints on detailed implementation.
- ❑ Draft specification distributed to SAVOIR Advisory Group members.

- ❑ OBJECTIVE OF THE RTU SPECIFICATION
  
- ❑ SYSTEM OVERVIEW
  - RTU Overall Architecture and Context
  
- ❑ RTU FUNCTIONAL AND OPERABILITY REQUIREMENTS
  - Operating States & Self-test
  - Telemetry Acquisition & Observability
  - Commanding & Actuation
  - Redundancy Requirements
  - Module Requirements & Interfaces

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# RTU Overall Architecture and Context

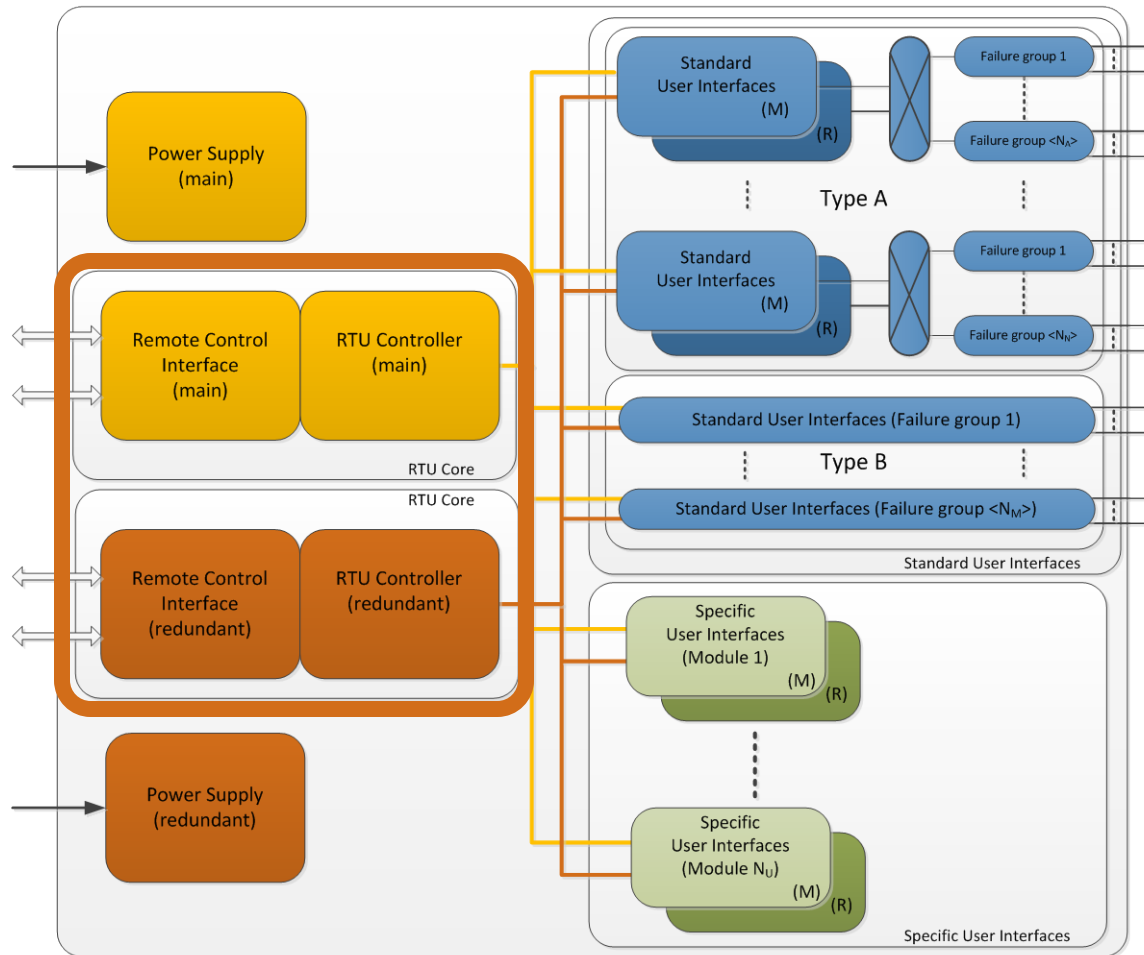
## Functional Architecture



- Major *functional* blocks
  - RTU Core
  - Standard user Interfaces
  - *Specific User Interfaces*
  - *Power Supply*
- Implementation details are not imposed by the specification

# RTU Overall Architecture and Context

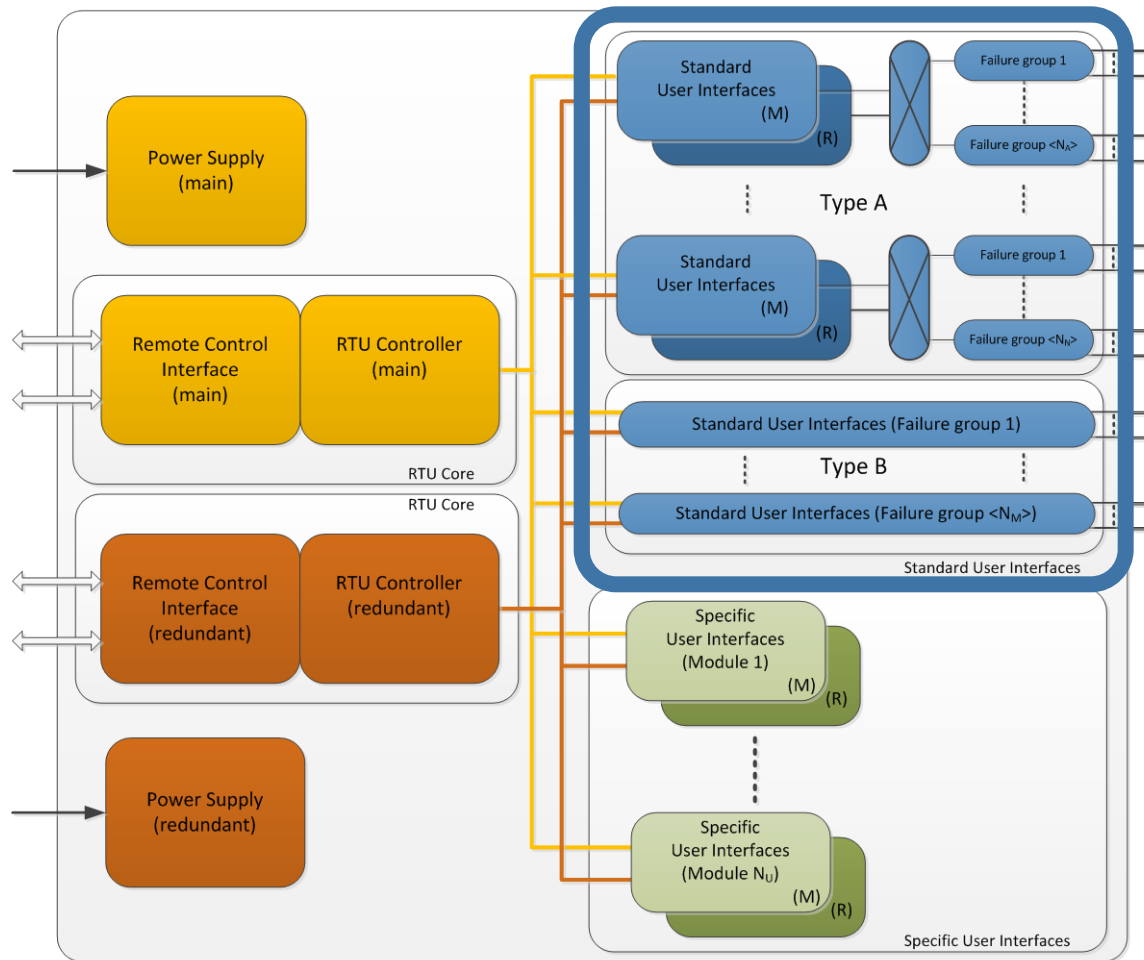
## RTU Core



- RTU Controller
  - Functional module
  - Can be a distributed function
- Remote Control Interface
  - Mil-1553
  - CAN
  - SpW

# RTU Overall Architecture and Context

## Standard User Interfaces

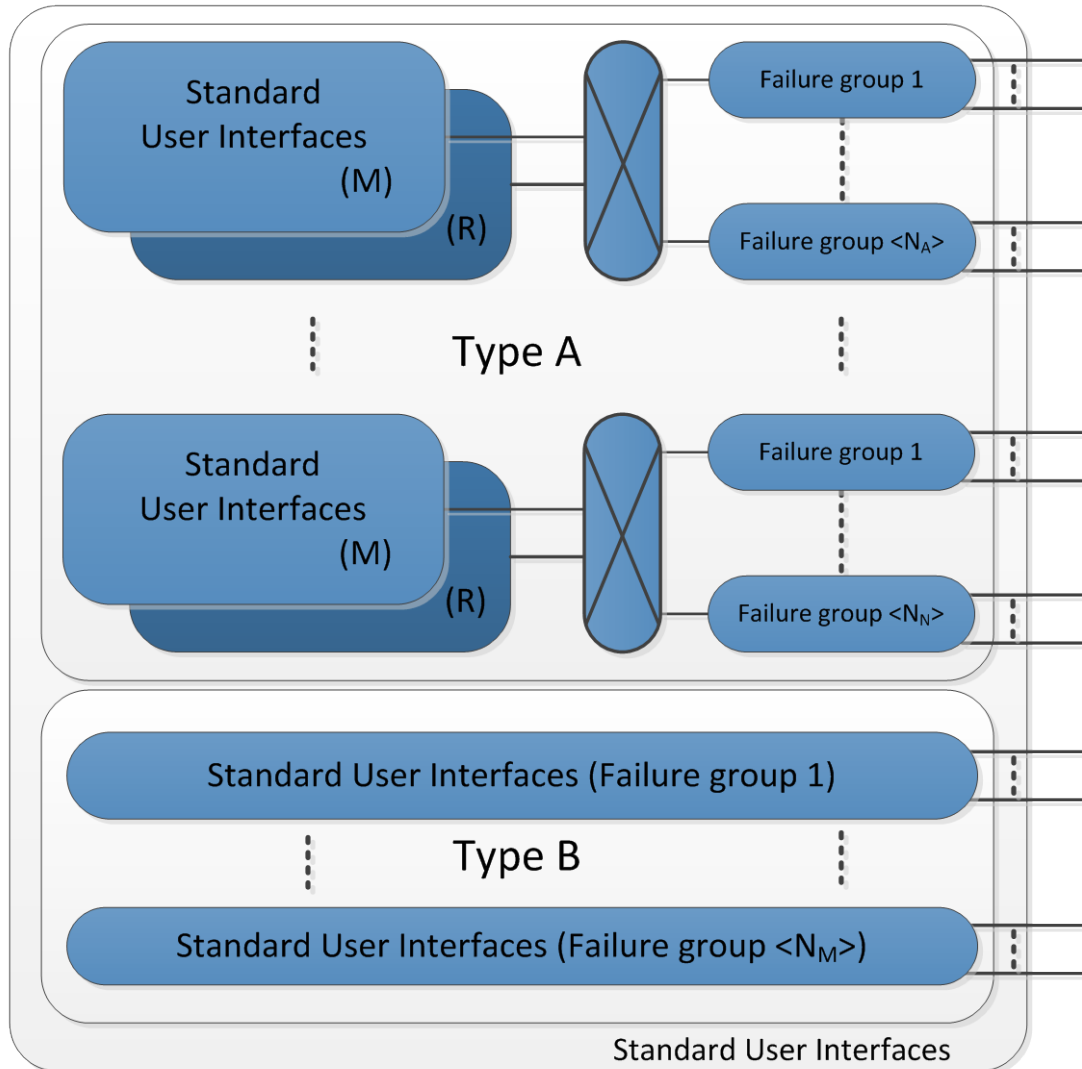


- Discrete Interfaces
  - ECSS-E-ST-50-14C



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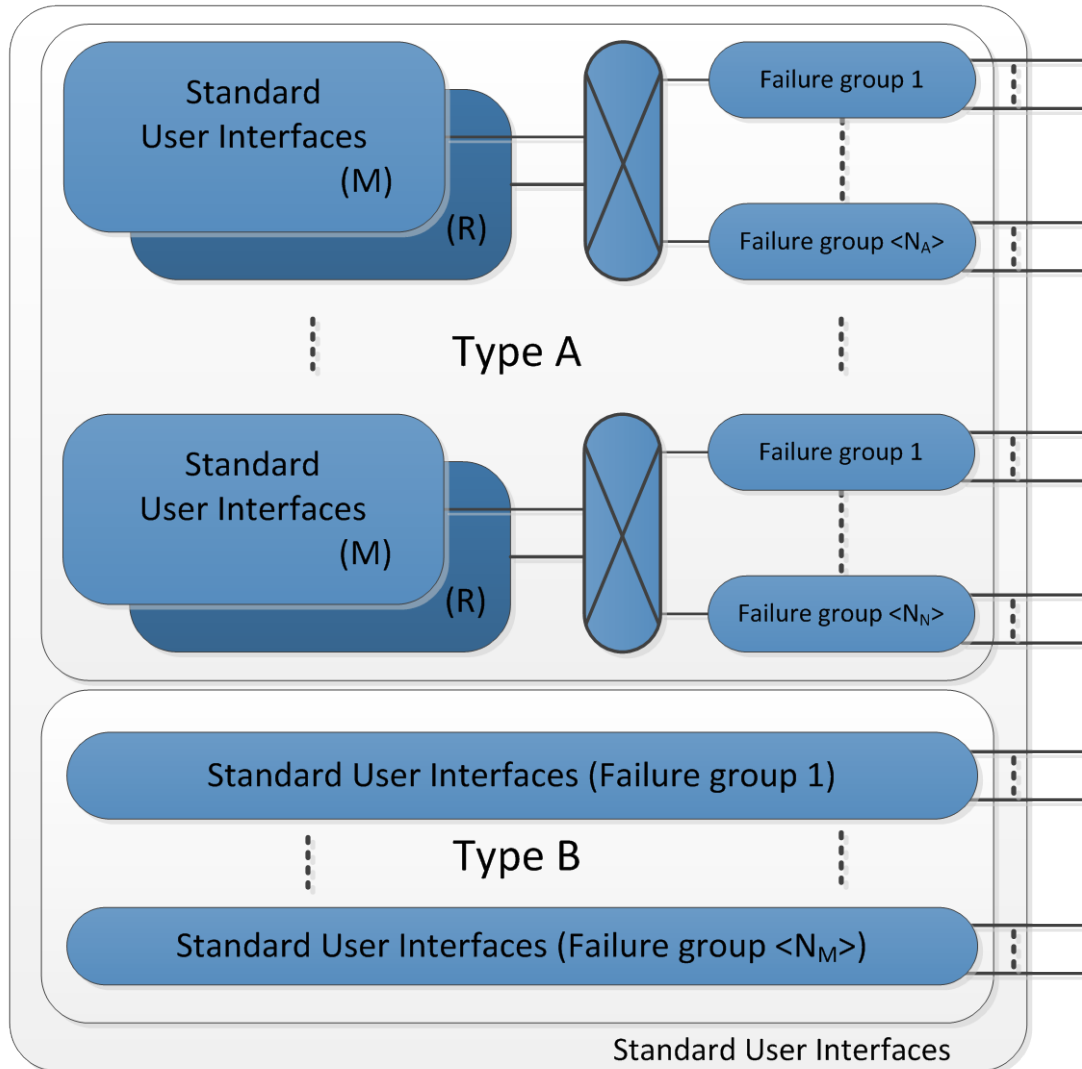
## Standard User Interfaces



- Discrete Interfaces
  - ECSS-E-ST-50-14C

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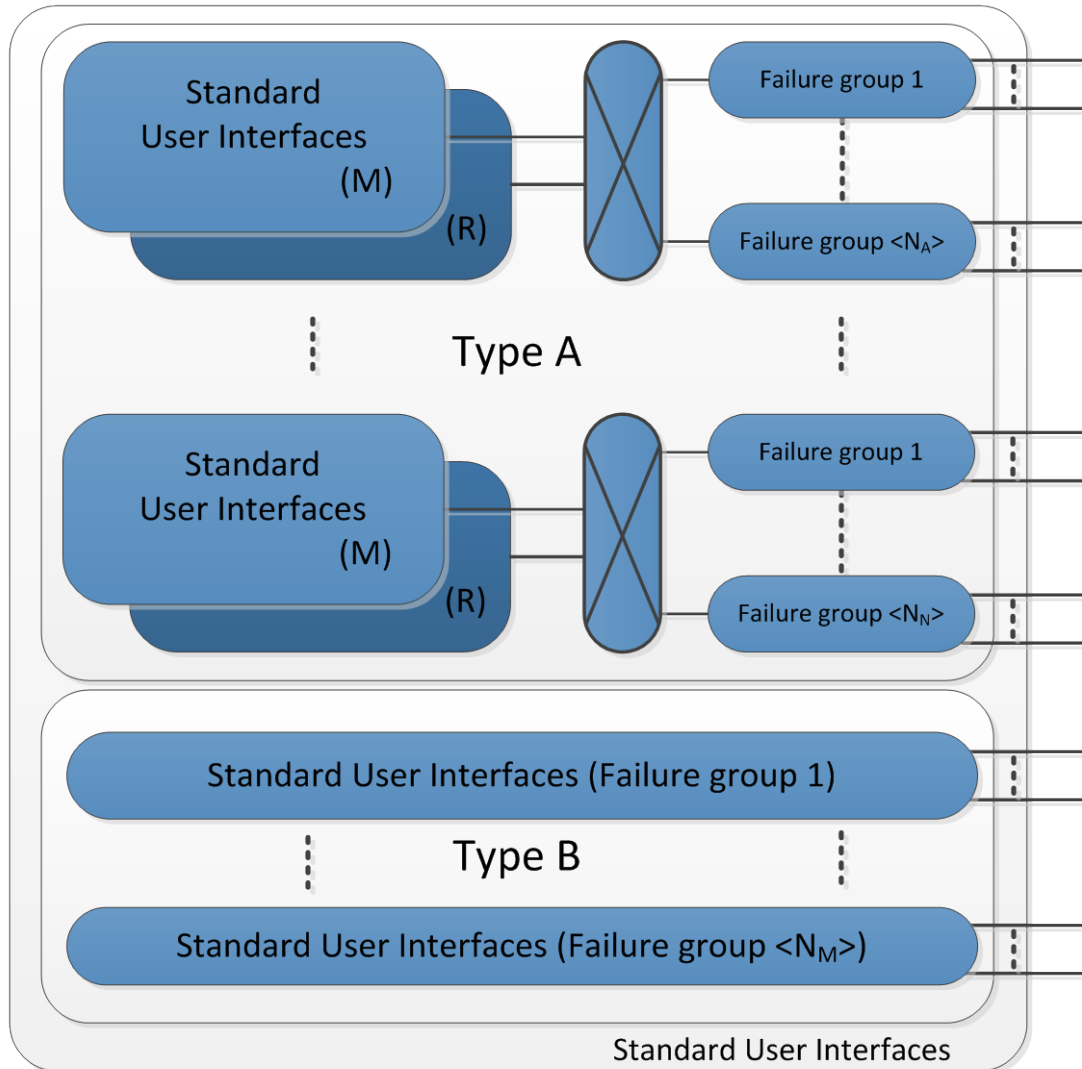
## Failure Group concept (1/2)



- Failure Groups
  - A collection of interfaces that are allowed to be lost in case of a single failure within the group.
  - Failure must not propagate outside the group
  - Group size drives both Spacecraft and RTU architectures
  - Type A & B

# RTU Overall Architecture and Context

## Failure Group concept (2/2)

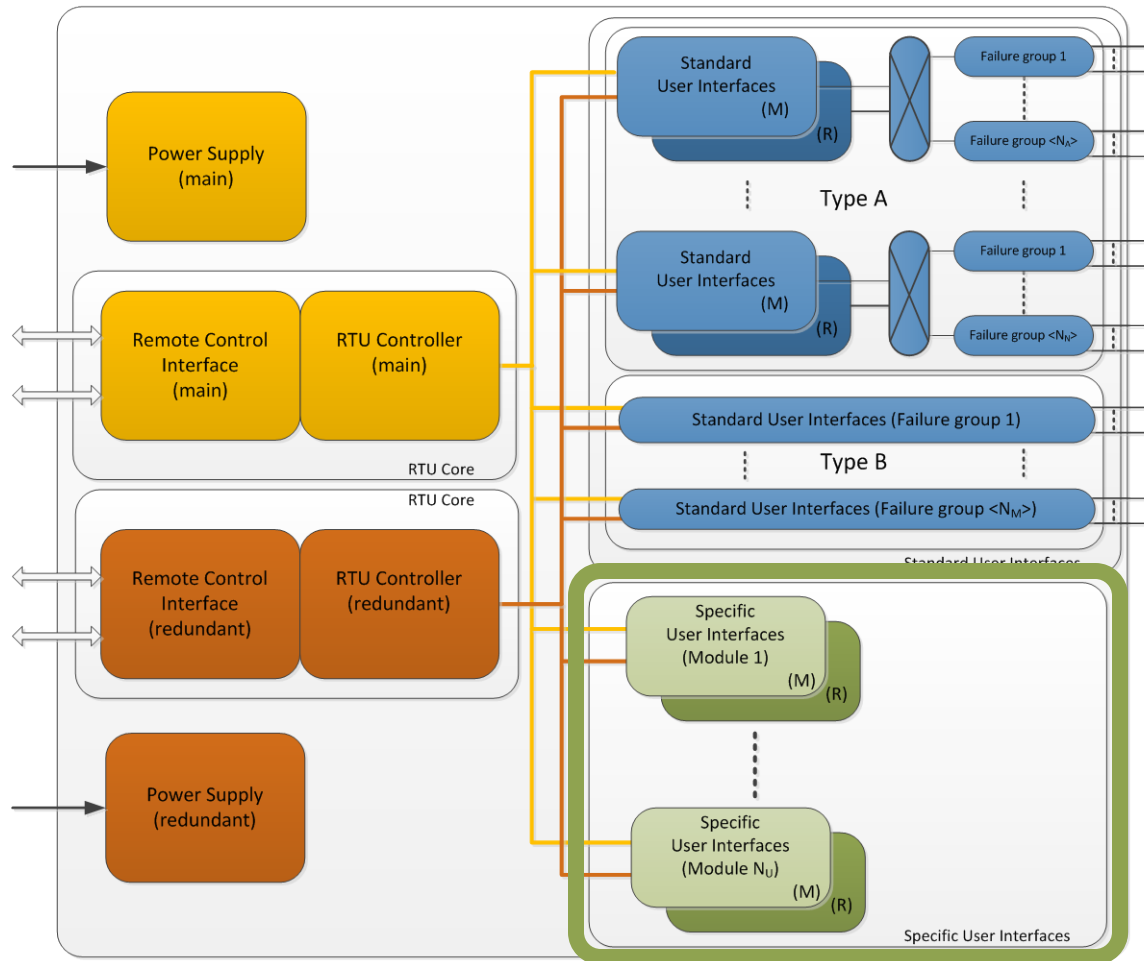


## Examples

- Type A:
  - Typical group size: 8-16 channels
  - Pulse command outputs
  - Discrete digital channels
- Type B:
  - Typical group size: 64-128 channels
  - Triple modular redundancy (TMR) thermistor acquisition for thermal control

# RTU Overall Architecture and Context

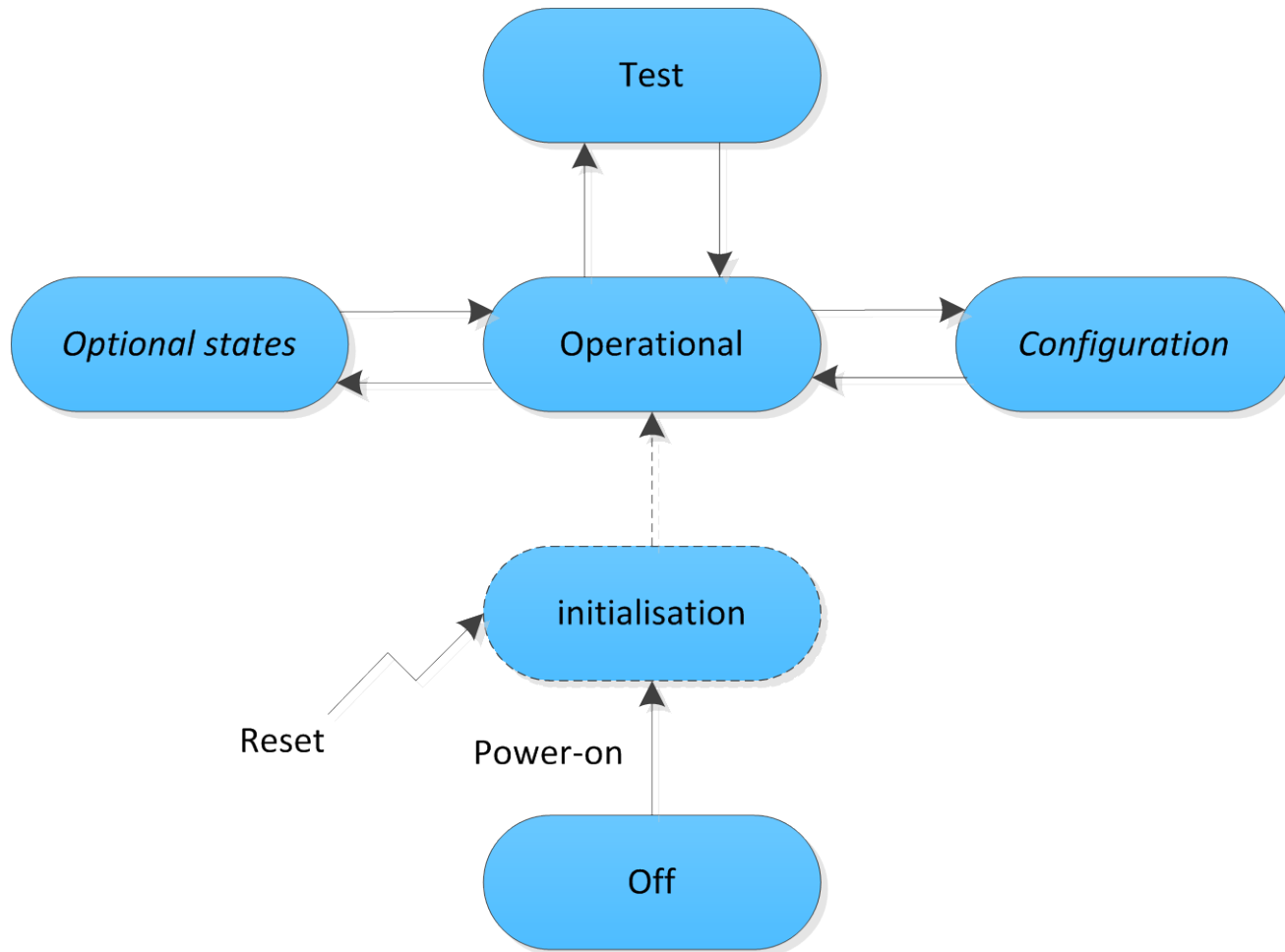
## Specific User Interfaces



- Not specified
- Possible options
  - Magnetorquer I/F
  - Magnetometer I/F
  - Solar Array Drive
  - Electronics
  - Sun Sensor I/F
  - Propulsion I/F
  - etc.

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# Operating States & Self-test



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- Telemetry Acquisition
  - Based on *TM Acquisition Lists* defined in the RTU
  - Triggered by "*Start TM Acquisition*" event(s)
    - Command
    - External pulse, e.g. PPS
    - Internal time reference
  - Key parameters
    - List size, sequencing, acquisition frequency
  
- Observability of TM acquisition process by means of *Token* allows to:
  - Verify acquisition progress
  - (Time) correlate TM data to "*Start TM Acquisition*" event



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- ❑ Commanding
  - Internal control and management of the RTU configuration.
  - Immediate control and actuation of *User Interfaces*
  - Scheduling the actuation of *User Interfaces* in relation to a dedicated reference event.
  
- ❑ Scheduled execution of command
  - Command parameters pre-loaded into RTU
    - e.g. Delay, Pulse length etc.
  - Execution triggered by a "*Start TC Actuation*" event.
    - e.g. Pulse, Command etc.
  - Typically used for commanding of AOCS actuators

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- ❑ RTU internal redundancy
  - RTU Core redundancy
  - Management of *User Interface* redundancy
  
- ❑ Failure groups
  - Key parameter: Group size
    - Drives the RTU internal implementation
    - Drives system architecture

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- ❑ Basic requirements for the operation of the RTU Core functionality.
  
- ❑ RTU Remote Control Interface
  - Mil-Std-1553
  - CAN
  - SpW
  
- ❑ Standard User Interfaces
  - ECSS-E-ST-50-14C
  
- ❑ Specific User Interfaces
  - Not specified

- ❑ Draft SAVOIR RTU Specification is available.
- ❑ Focus on “Functional and Operability Requirements”
- ❑ Specification is not intended to specify or impose constraints on architecture or detailed implementation.
- ❑ Comments have been received from some SAVOIR Advisory Group members. Thanks for that!
- ❑ After consolidation in the SAVOIR Advisory Group a public review is foreseen.

Thank you!