Interfaces between LMC and Dish Sub-Elements

Adriano Ingallinera

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SKA Dish internal structure

Functional decomposition:

- Dish LMC
- Single Pixel Feeds (SPF)
- Receivers (Rx)
- Dish Structure (DS)

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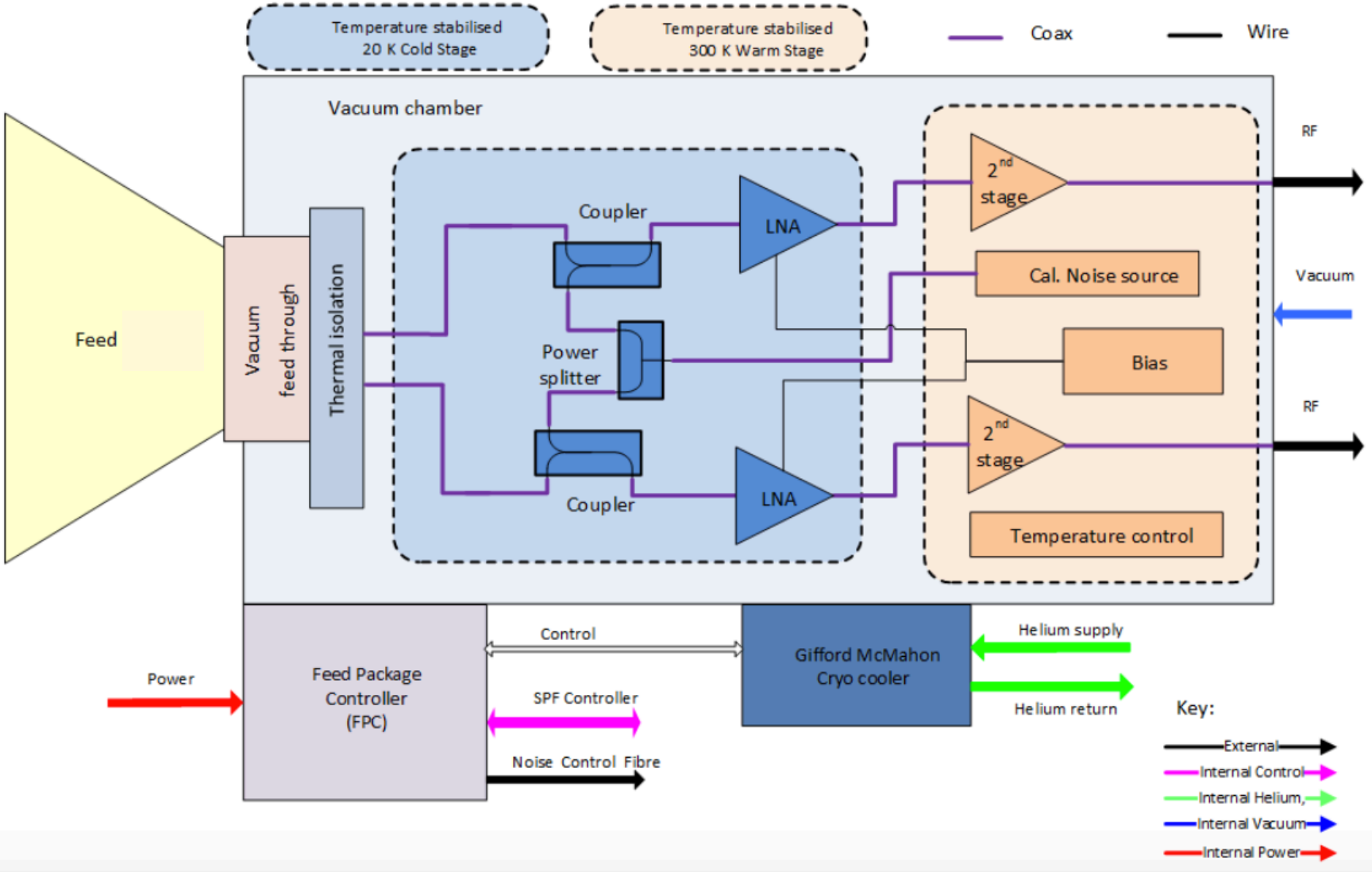
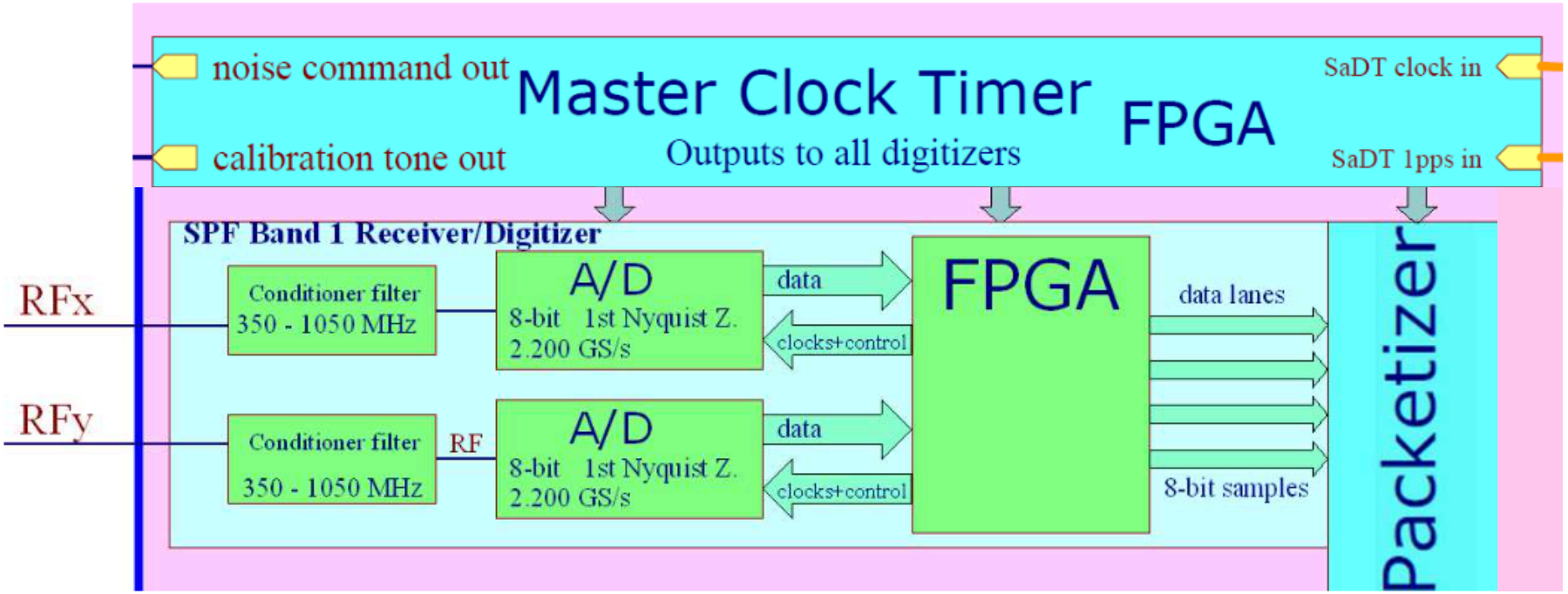
} Sub-Elements (SE)

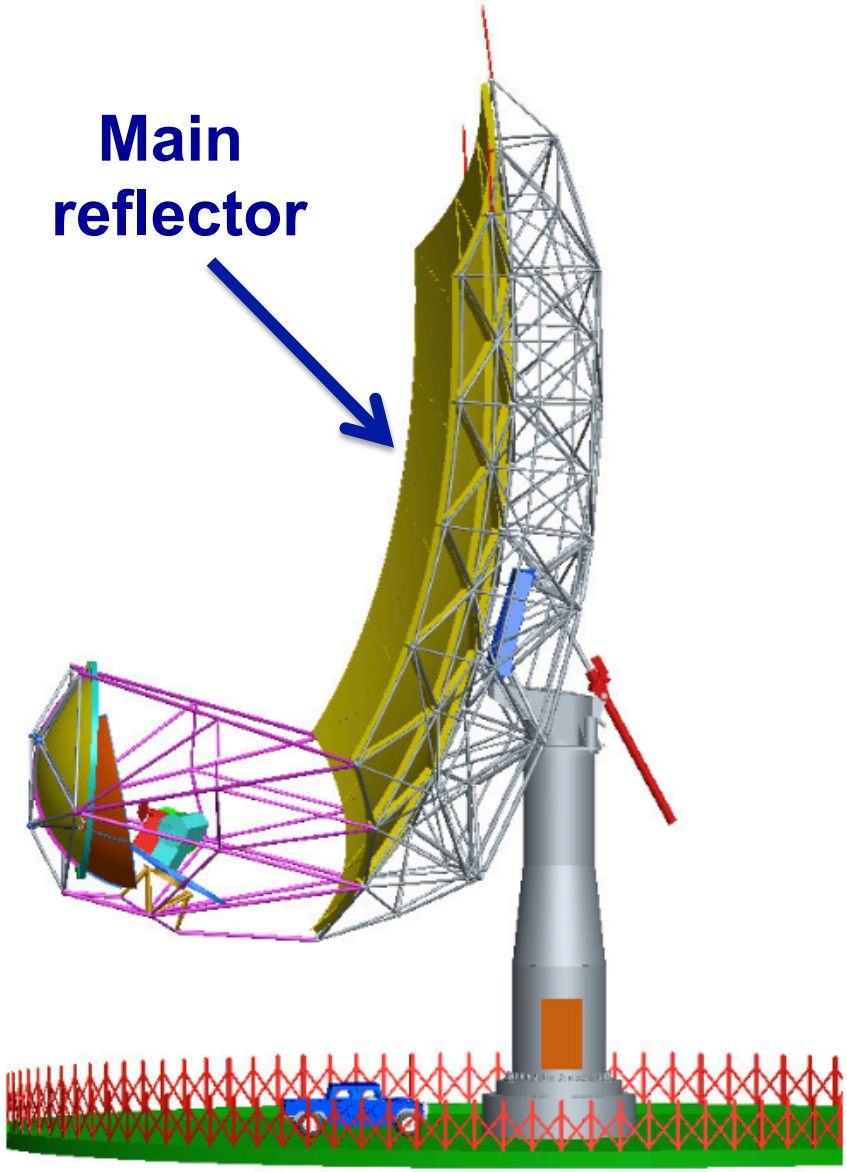
Single Pixel Feeds



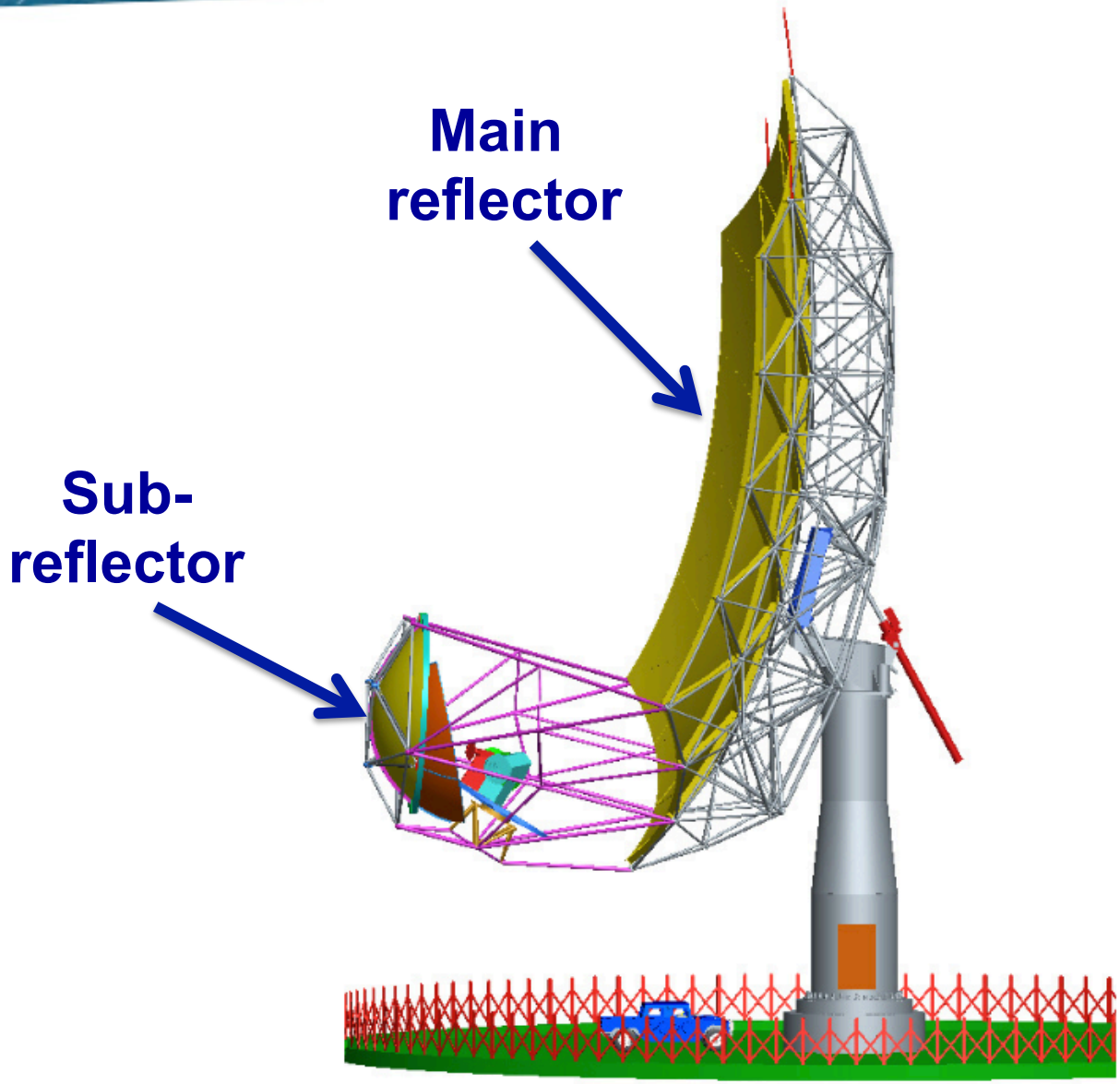
Receivers


noise command out
calibration tone out
Master Clock Timer
FPGA
Outputs to all digitizers
SaDT clock in
SaDT 1pps in
SPF Band 1 Receiver/Digitizer
RFx
RFy
Conditioner filter
350 - 1050 MHz
Conditioner filter
350 - 1050 MHz
RF
A/D
8-bit 1st Nyquist Z.
2.200 GS/s
A/D
8-bit 1st Nyquist Z.
2.200 GS/s
data
clocks+control
data
clocks+control
FPGA
data lanes
8-bit samples
Packetizer

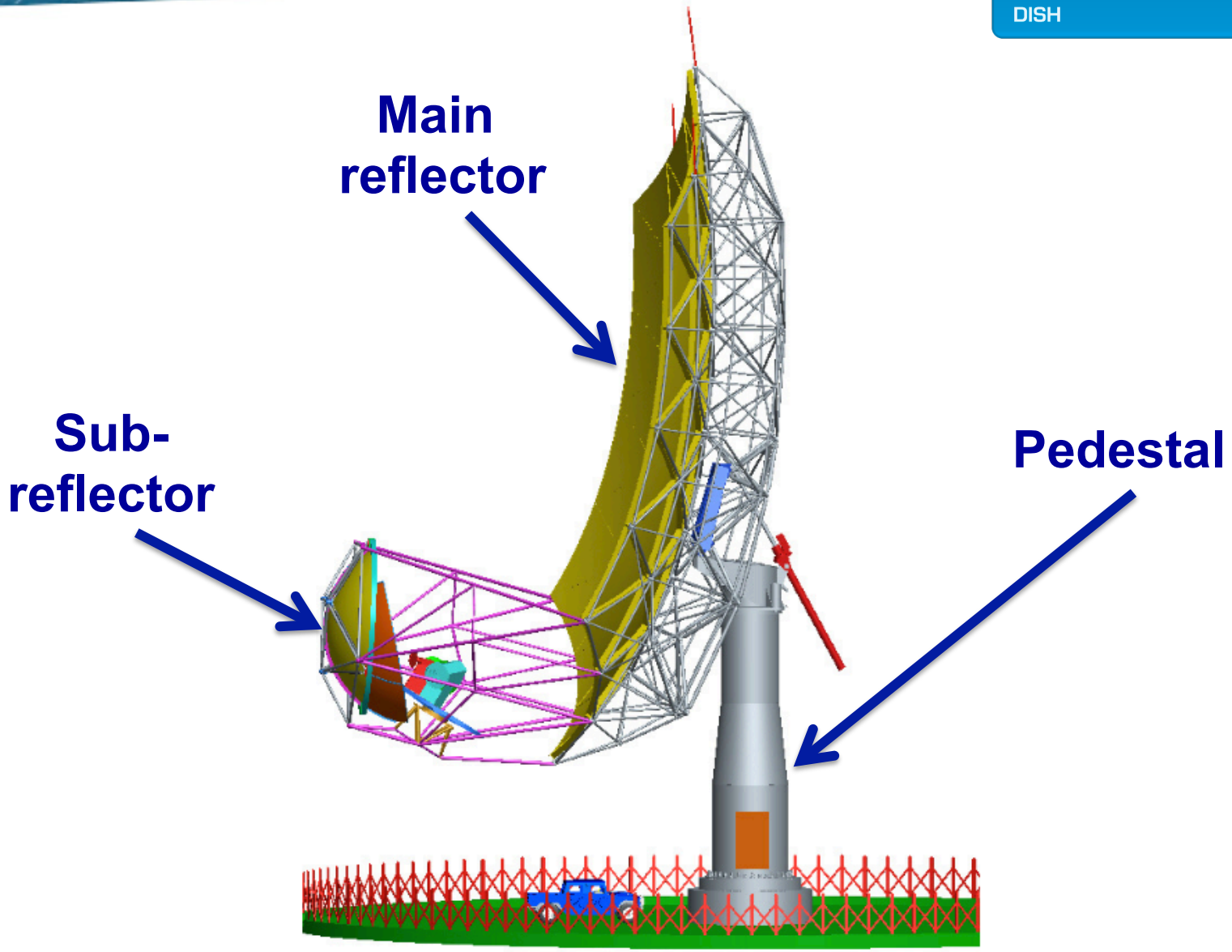
Dish Structure



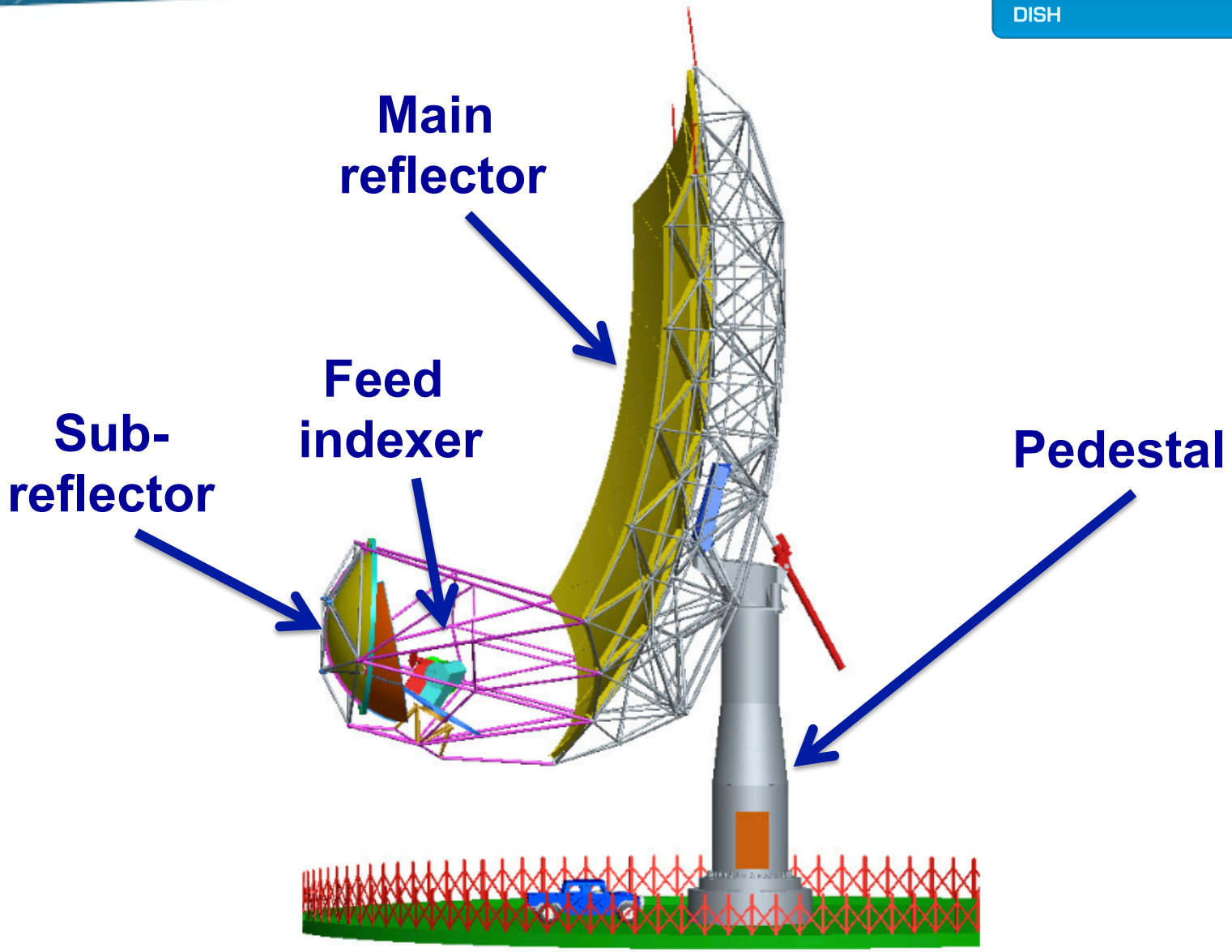
Dish Structure



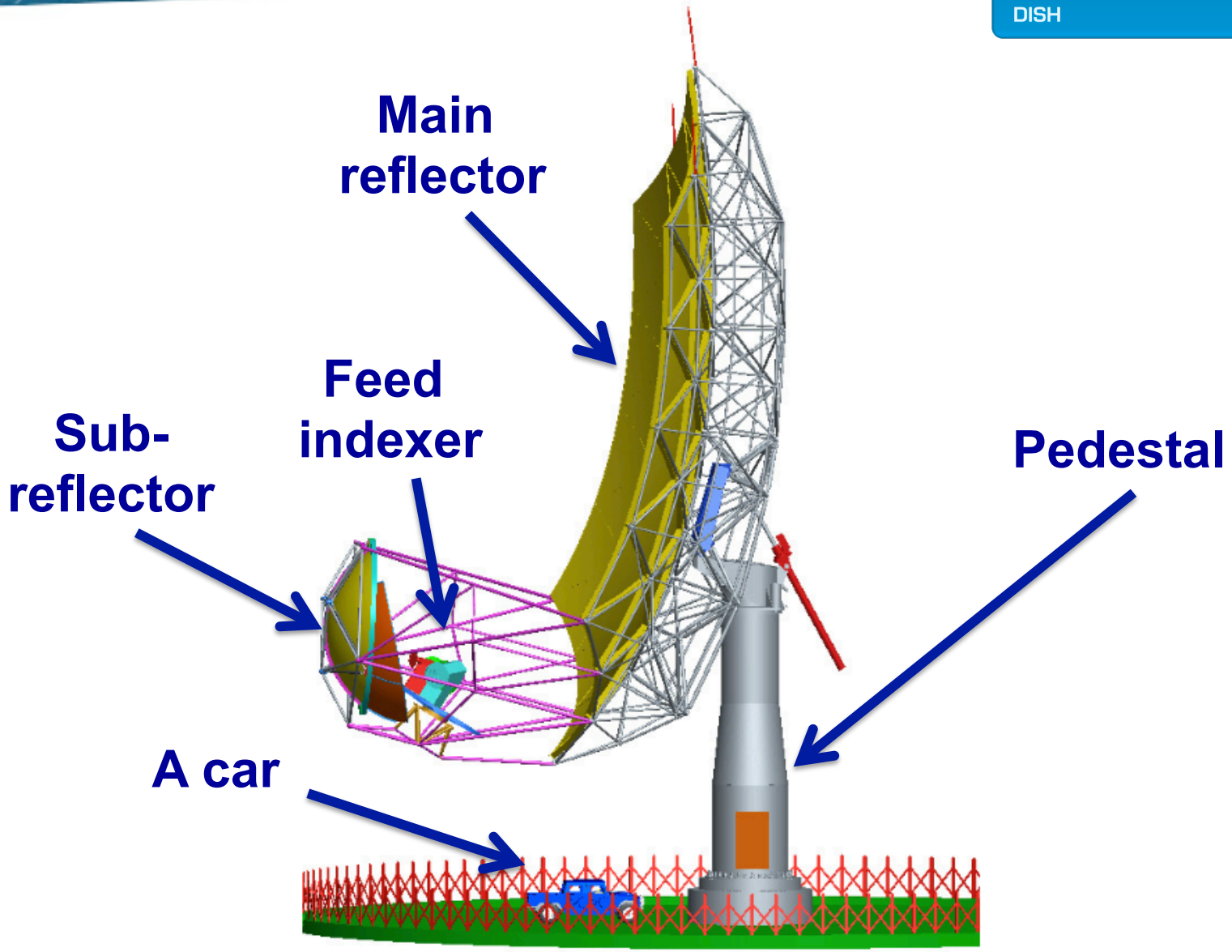
Dish Structure



Dish Structure



Dish Structure



LMC - SE software interface

Interfaces with SPF and Rx are well defined in the relative ICDs

A single TANGO device for each SE, exposing to LMC:

- ***a list of TANGO commands to configure and monitor SE***
- ***a list of TANGO attributes implementing monitoring points***

Commands and attributes are functionally grouped in the ICD

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The interface with DS is not completely defined yet

Details on SPF interface

Interface Configuration

- Discover the data reported on the interface
- Configure to what level the data are reported
- Examples:
  - *Set period of reporting*
  - *Set the suppression of events and alarms/notifications*
  - *Report Interface Self-Description*
  - *Get the list of attributes and their properties*
  - *Get the list of commands*

SPF interface

Setup Configuration

- Commands typically sent before an observation and remain static for the duration of an observation
- Examples:
  - *Enable / Disable Feed Package temperature control*
  - *Enable / Disable Feed Package cooling control*
  - *Switch Feed Package LNAs on / off*

SPF interface

Modes and States

- Configure and report states, modes and capabilities

Fault Reporting

- Notify operators and maintainers of fault conditions
- Isolate faults to LRU level
- Report sensors that assist with failure prediction
- Identify components that are not fitted

Diagnostic Sensor Reporting

- Enable maintainers to isolate faults
- Enable telescope data users to trace unwanted phenomena in the data to conditions in the telescope equipment

SPF interface

SW and FW Versions and Serial Numbers

- Ensure that the deployed system is in line with the latest product configuration
- Trace problems to specific HW and SW configurations

Alarms and Events Reporting

- Notify the operator that an action is required to prevent equipment damage or telescope data corruption

Remote Support

- Enable engineers and maintainers to perform: installation and commissioning, fault diagnostics, maintenance actions, upgrade of software and firmware

Rx and DS interfaces

Rx interface

Interface functionalities are similar to SPF but

- Different Configuration Setup
- Examples:
  - *Start/stop a capture*
  - *Configure the noise-diode start time, on/off time*

- Different monitoring points
- Example:
  - *ADC current and voltage*

DS interface

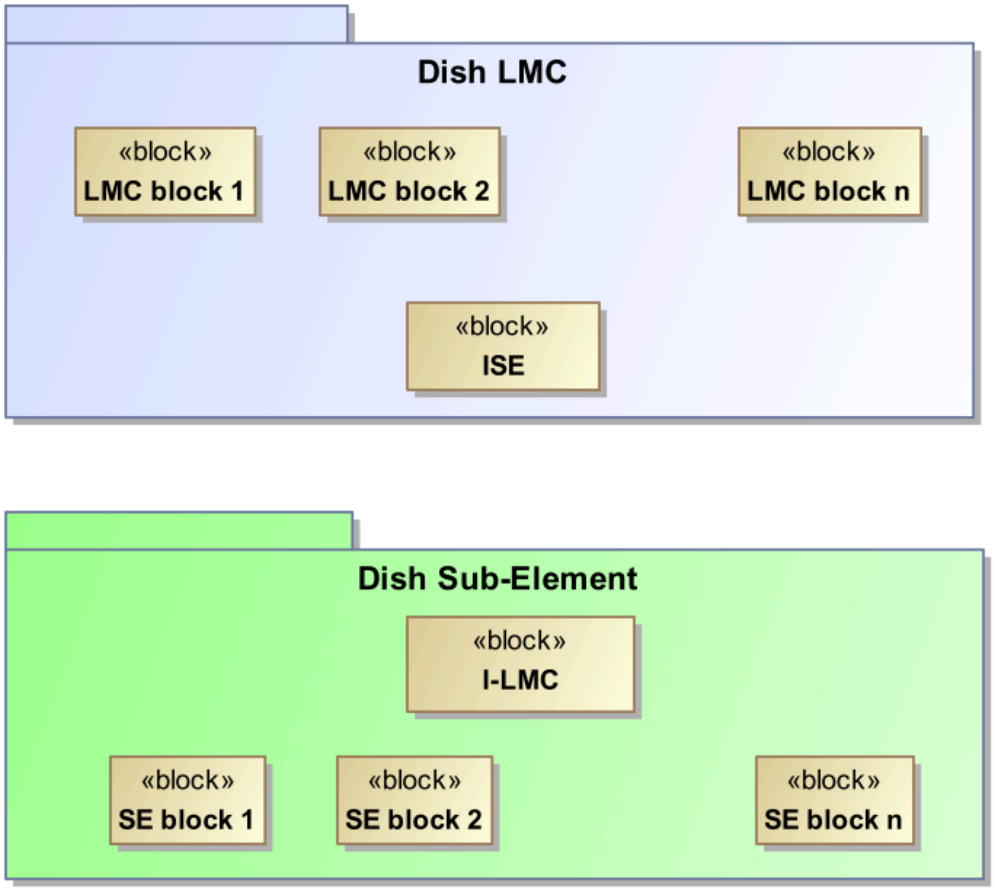
The interface with DS shall take into account different command and monitoring points:

- **Interaction with the Pointing manager**
  - ***Append corrected coordinates***
  - ***Sensors for dynamic correction (TBC)***
- **Safety operations**
  - ***Stow the antenna***
- **Indexer control**
  - ***Select an observing band***

Examples of LMC blocks interacting with Sub-Elements

LMC usage of SE interfaces

Preliminary design (PDR):

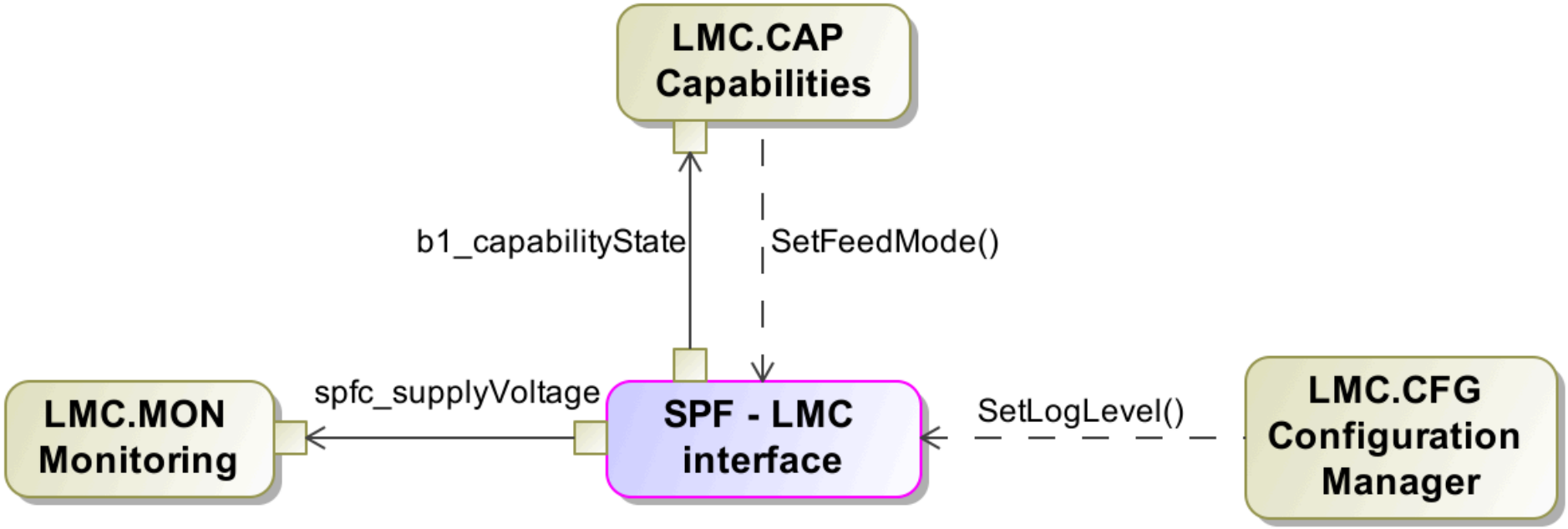


LMC usage of SE interfaces

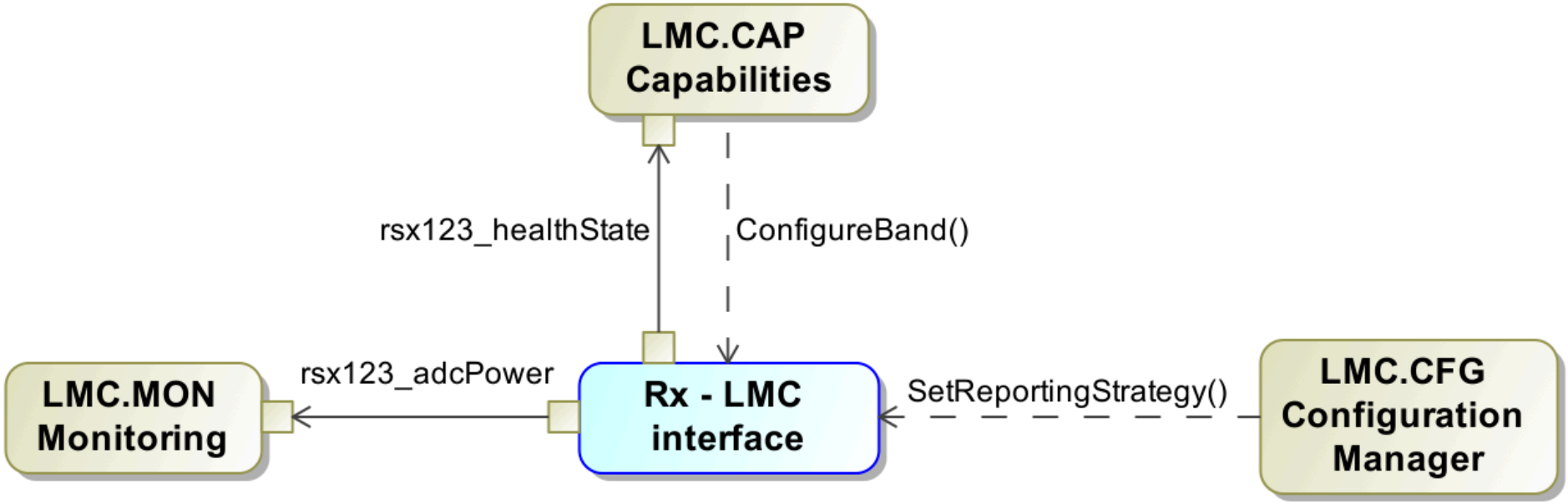
For all SE "speaking" TANGO LMC.ISE is transparent:

- each LMC.block can (shall!) directly interact with SE.ILMC
- no need for another software layer

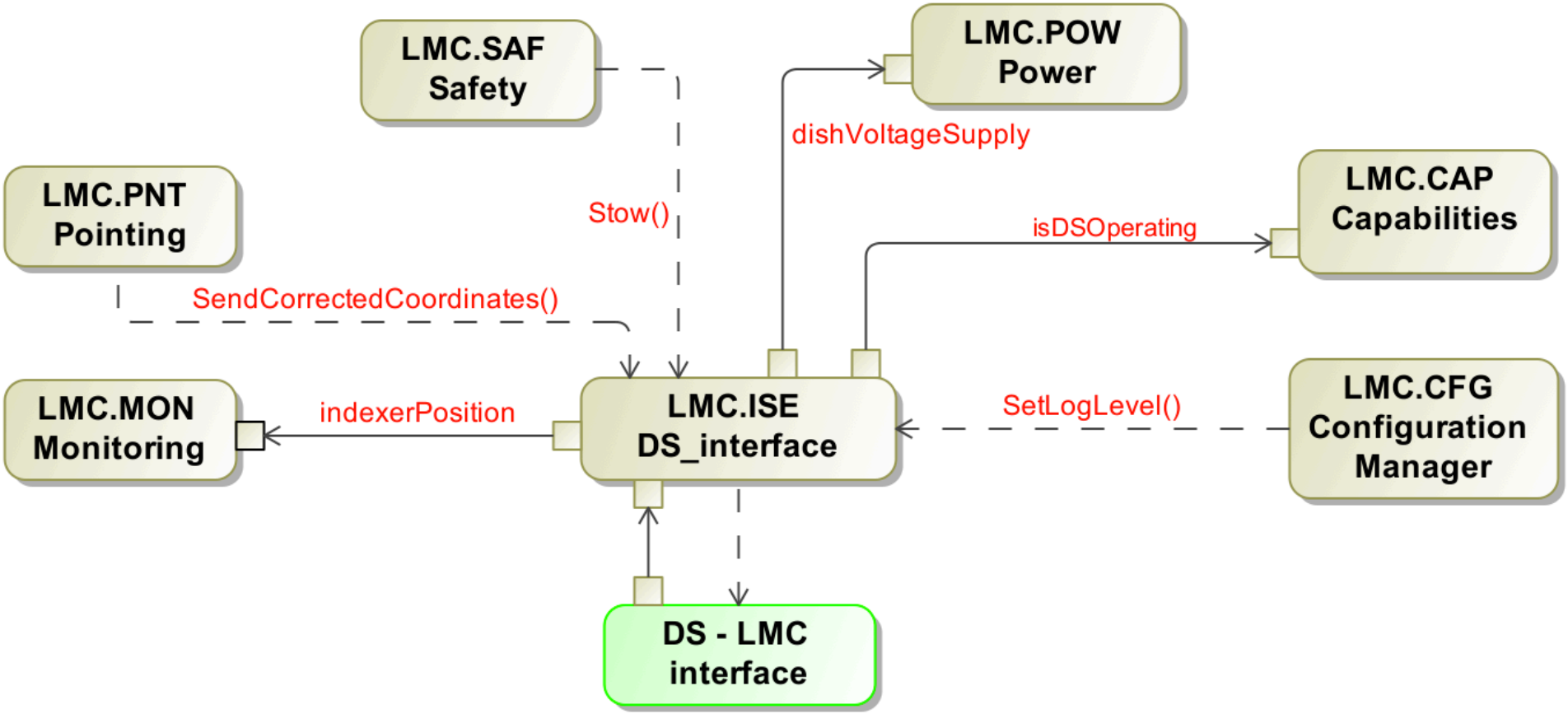
Interaction between LMC and SPF



Interaction between LMC and Rx



Interaction between LMC and DS



Thank you!