

**ADCSS Workshop**

# **PERSPECTIVE ON SYSTEM DATABASE MANAGEMENT AT CNES**

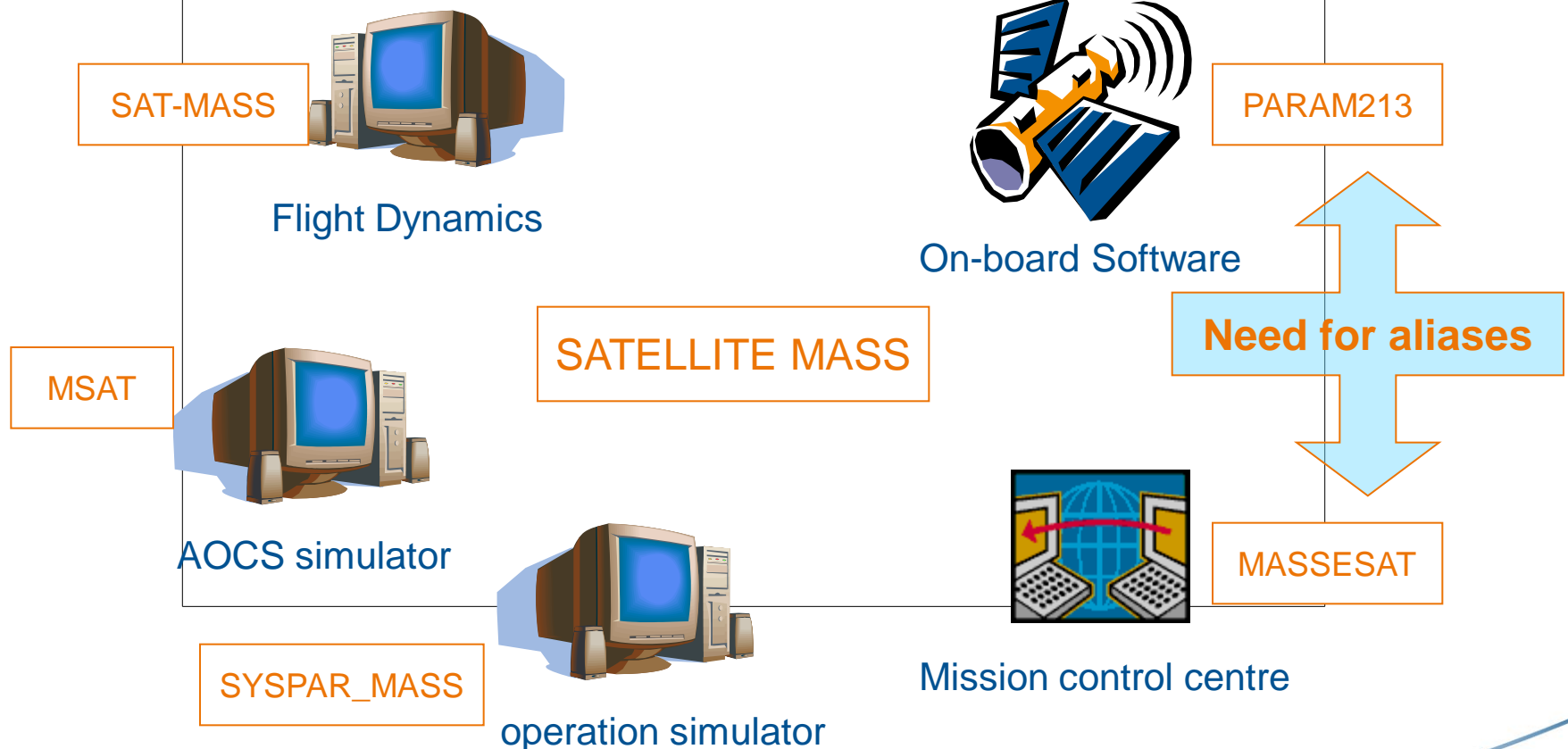
**Marie-Claire CHARMEAU**

**25/10/2012**

# WHAT ARE SYSTEM DATA?

System data are shared by several elements in the system and have to be managed in a centralized way to avoid inconsistencies.

A data item may have different names depending on the context, but it has a unique definition

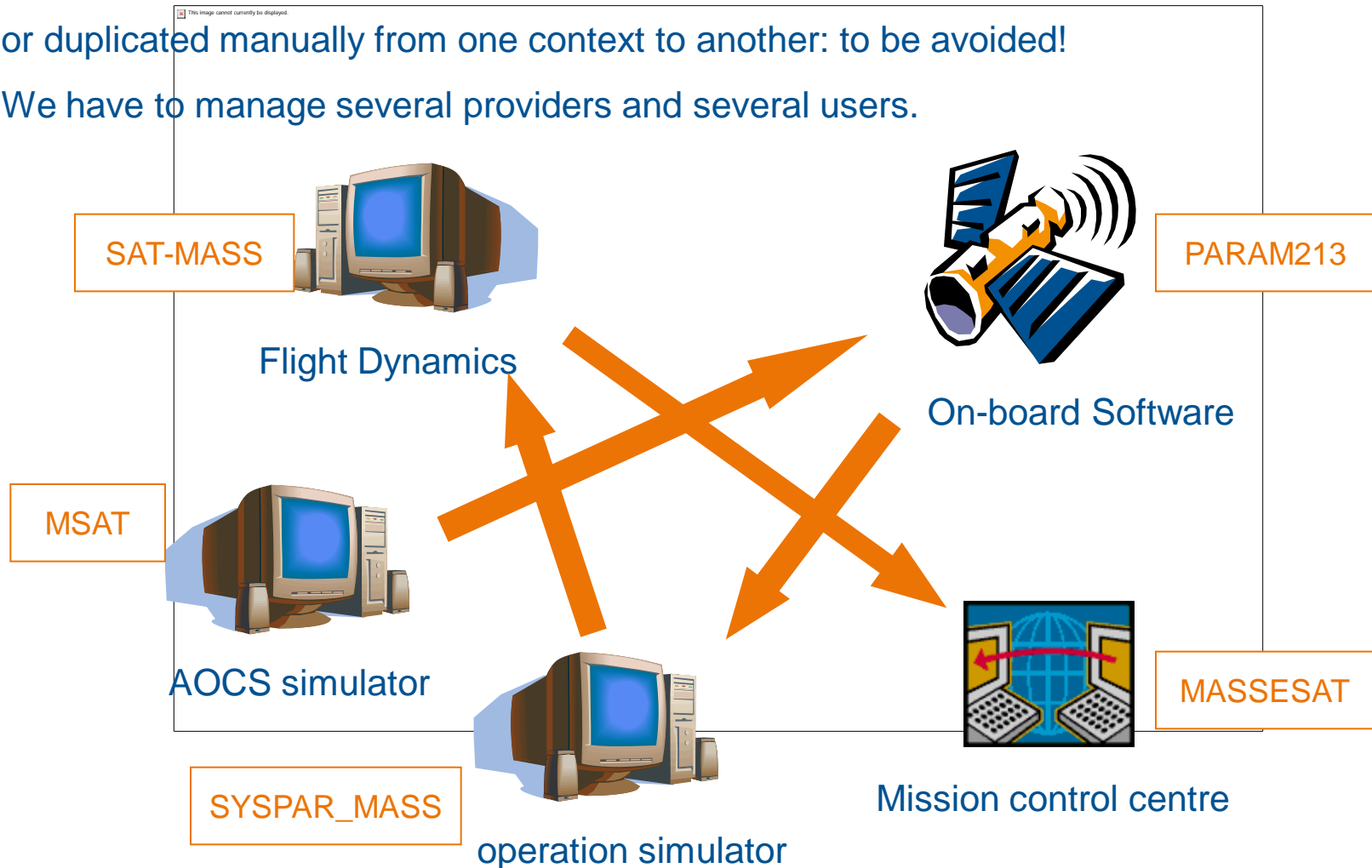


# EXCHANGES OF SYSTEM DATA

System data are exchanged through system interfaces

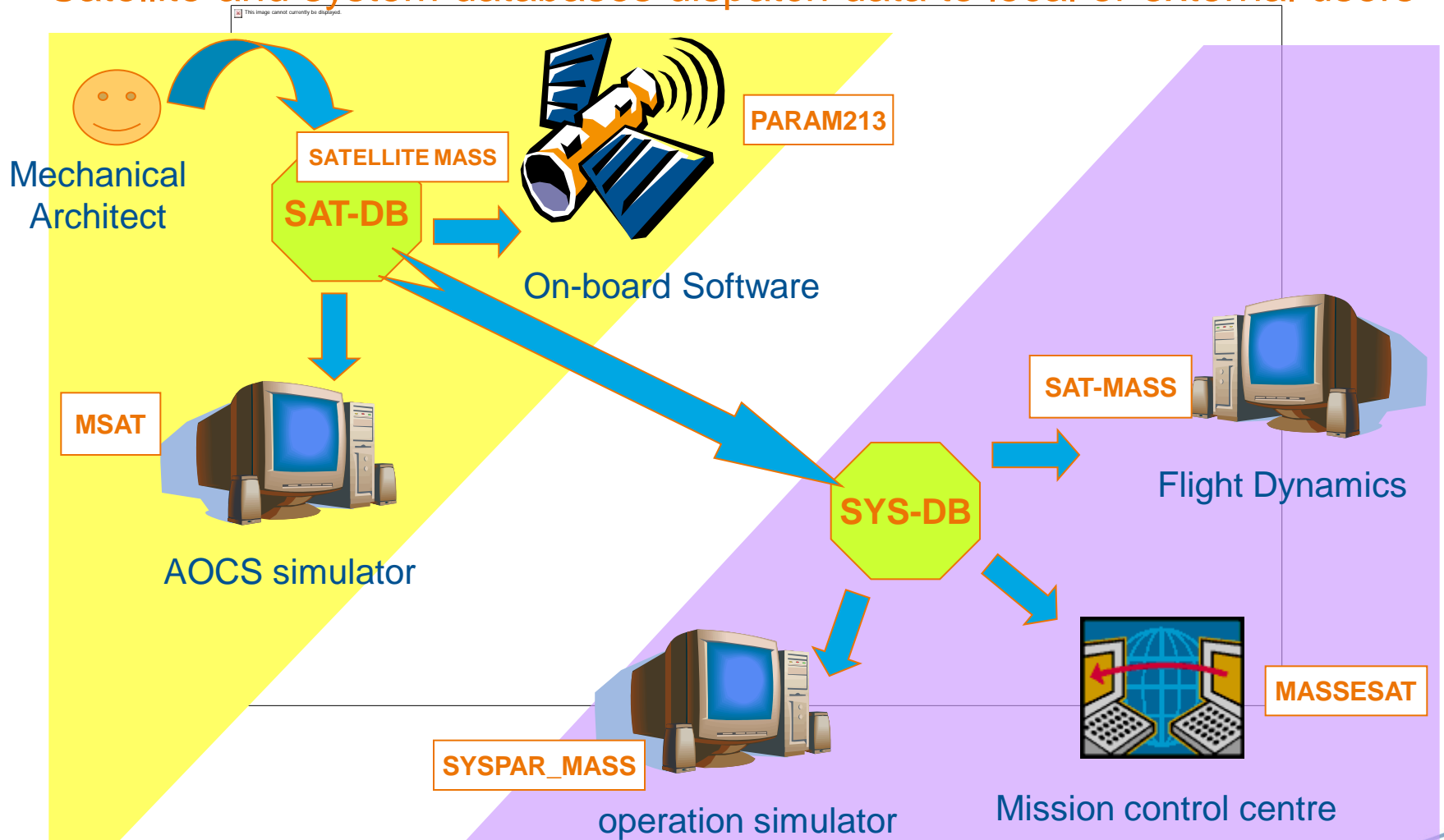
or duplicated manually from one context to another: to be avoided!

We have to manage several providers and several users.



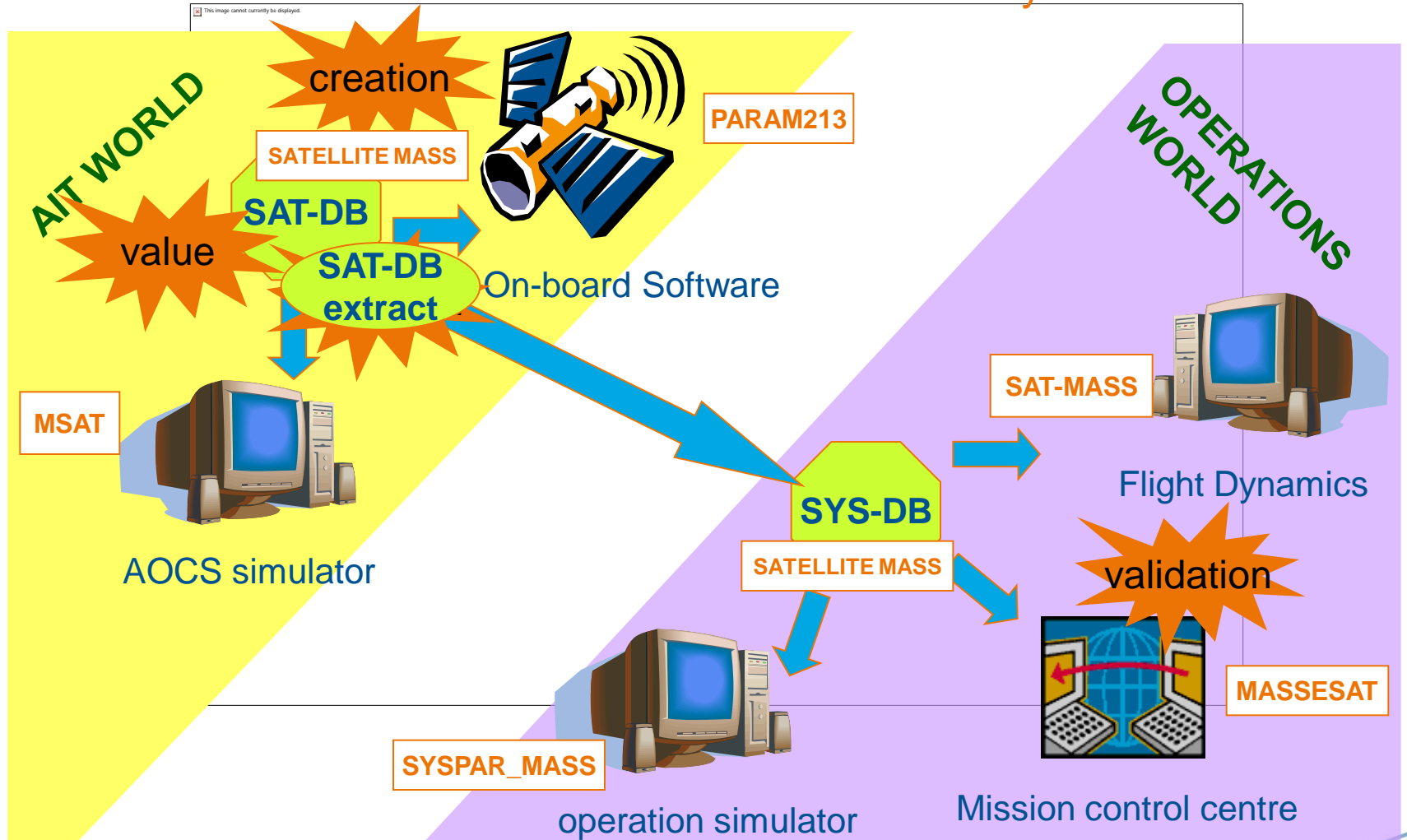
# EXCHANGES OF SYSTEM DATA

Satellite and system databases dispatch data to local or external users



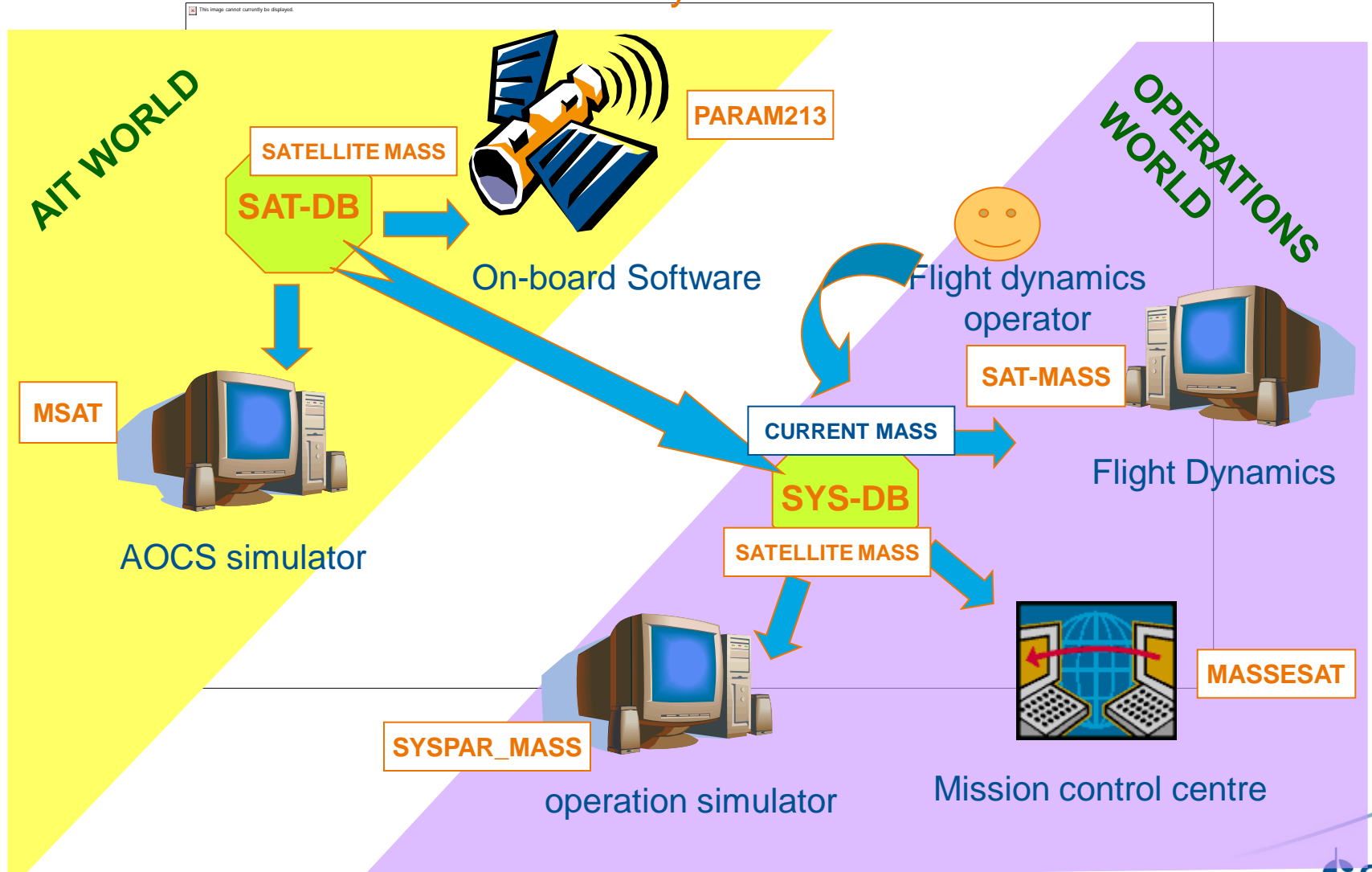
# LIFECYCLE OF A SYSTEM PARAMETER

Part of the satellite database is transferred into the system database

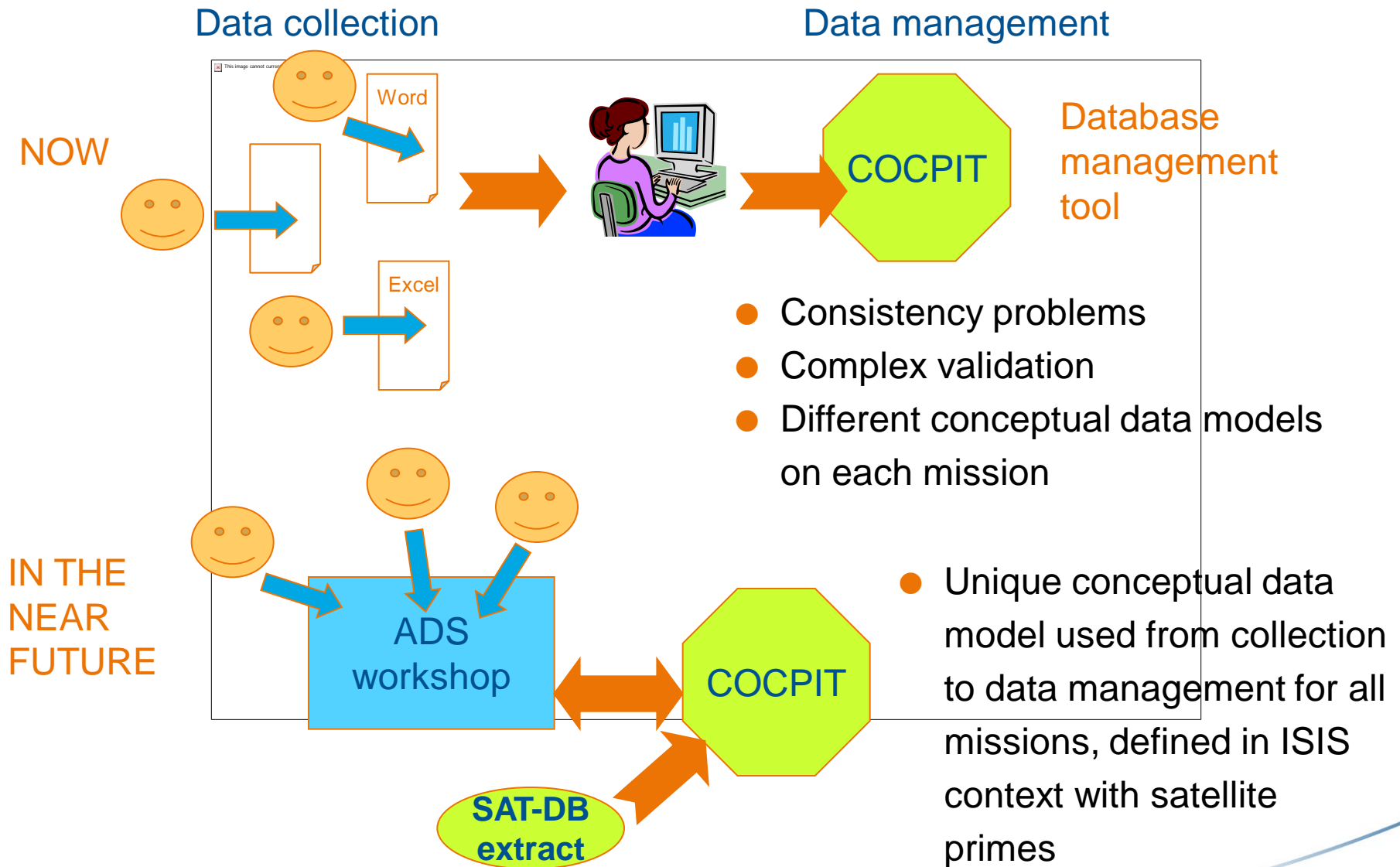


# LIFECYCLE OF A SYSTEM PARAMETER

Additional data are created in the system database

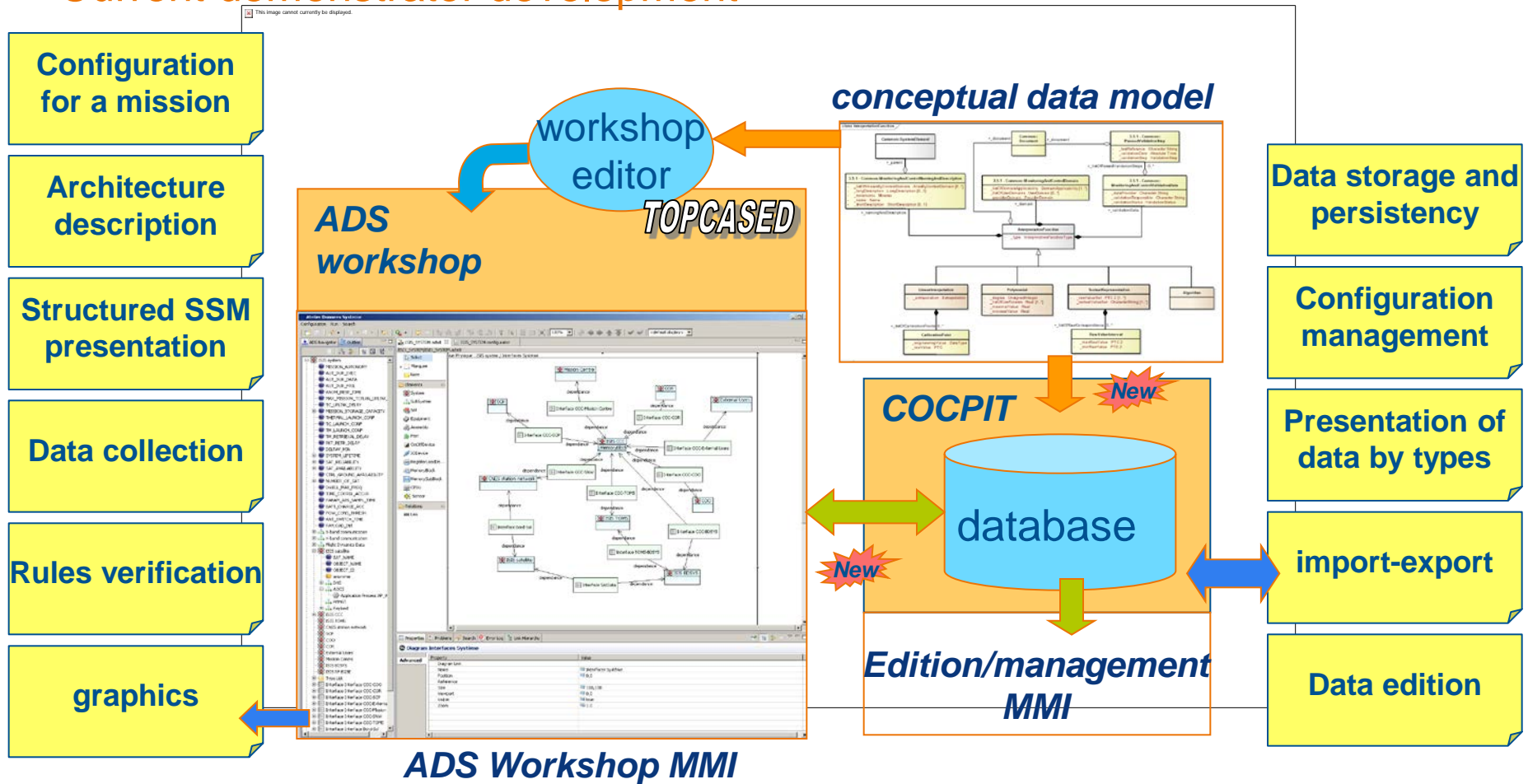


# A NEW APPROACH FOR ALL FUTURE MISSIONS



# THE ADS-COCBIT DEMONSTRATOR

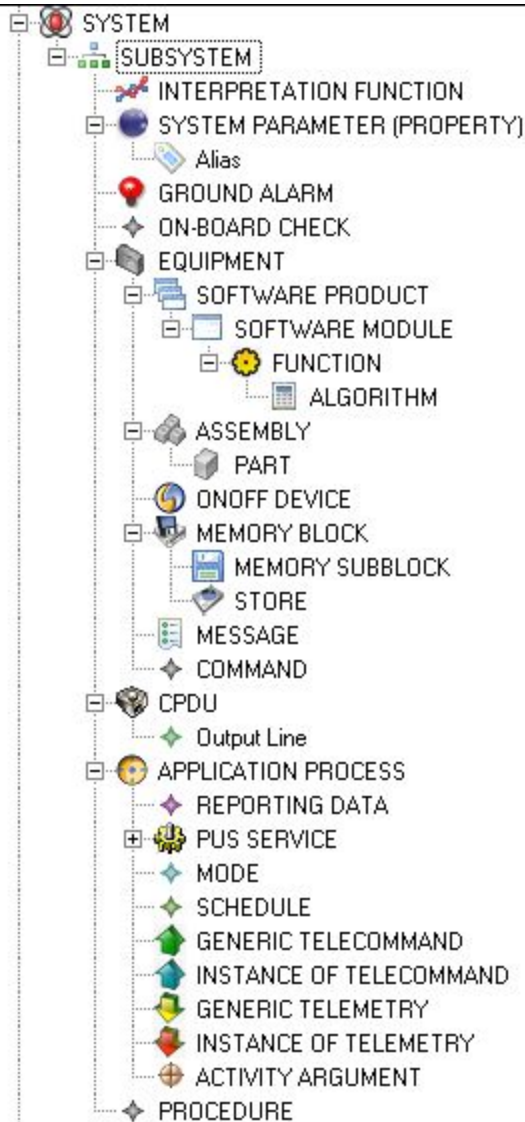
## Current demonstrator development



A stand-alone version of ADS workshop also exist



# A CONCEPTUAL DATA MODEL BASED ON ECSS-E-ST-70-31



## SSM elements (physical and functional):

- System, subsystem, equipment, software product, memory block...
- Element properties are expressed either in the model (if predefined) or as system parameters (at any level)

## Monitoring and control elements:

- Reporting data
- Arguments
- Telecommands
- Telemetry
- Alarm
- ...

# A MODEL EXTENSION FOR SYSTEM ENGINEERING

## Additional elements:

- Interfaces
- Simulation models

The screenshot displays the Atelier Donnees System software interface. The main workspace shows a diagram with three elements: SUBSYSTEM1 (SYSTEM), SUBSYSTEM2 (SYSTEM), and EXCHANGE. SUBSYSTEM1 and SUBSYSTEM2 are connected to EXCHANGE via 'dependance' relationships. The EXCHANGE element is further detailed as an 'INTERFACE (INTERFACE SET)'. The left sidebar shows a tree view of the model structure, including DATA-MODEL-VIEW, SYSTEM, SUBSYSTEM1, SUBSYSTEM2, INTERFACE SET, INTERFACE, SIMULATOR, and various simulation models. The bottom panel shows the 'INTERFACE' properties, including fields for Naming and Description, Domain, Validation, Management, General, and Advanced.

Property	Value
Definition Level	
Formal Definition	
Interface Producer	
Interface Type	
List of Domain Applicability	
List of Interface Consumers	
List of Parameters	
List of user domains	
Long description	
Mnemonic	
Name	INTERFACE
Provider domain	

The Comment of the CocpitData

# EXPRESSION OF PREDEFINED PROPERTIES

System Database MISSION\_X

- THE\_GENERIC\_PUS\_LIBRARY
- STATION\_NETWORK
- SATELLITE\_1
  - COMMON
  - AOCS
    - STARTRACKER1
      - STR1\_SOFTWARE
      - PHYS\_STARTRACKER1
      - FUNC\_Properties
      - STR1\_ONOFFDEVICE
      - STR1\_MEMORY
      - STR1\_IODEVICE
      - STR\_MG\_STRDATA1
    - STARTRACKER2
      - STR2\_SOFTWARE
      - PHYS\_STARTRACKER2
      - FUNC\_Properties
      - STR2\_ONOFFDEVICE
      - STR2\_MEMORY
      - STR2\_IODEVICE
    - AOCS\_AP
  - DHS
    - MEMORY1
    - DHS\_AP
  - MECA\_THERM
  - PAYLOAD

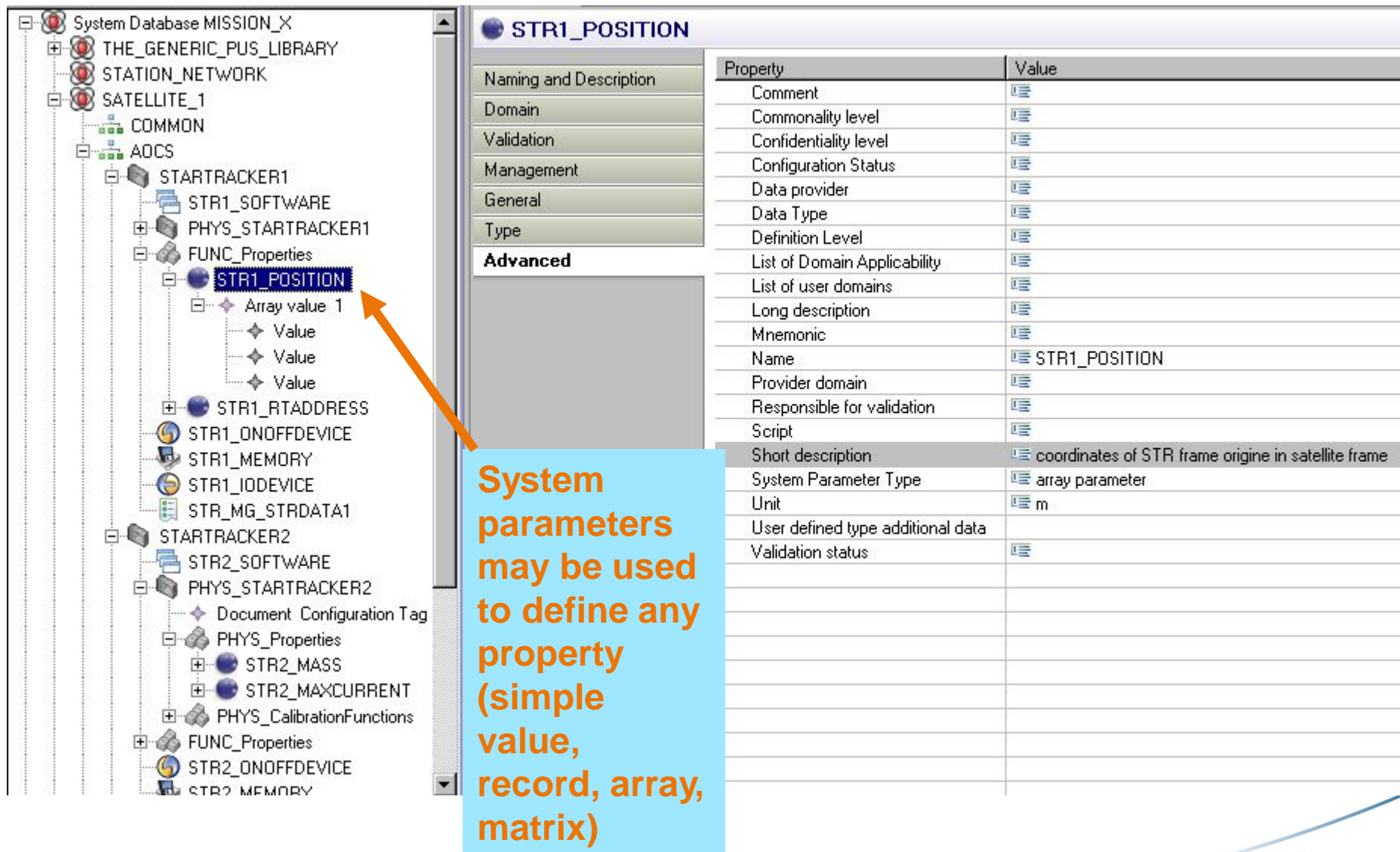
Properties | Link Hierarchy | Problems

**anonyme**

Property	Value
Addressing Technique	absolute address
Comment	
Commonality level	
Confidentiality level	
Configuration Status	
Data provider	
Definition Level	
Element provider	
Health status	
ID	123
List of Domain Applicability	
List of redundant System Elements	
List of user domains	
Long description	
Memory Accessibility	read and write
Memory Type	EEPROM
Memory word length	8
Mnemonic	
Name	MEMORY1
Provider domain	
Representation Level	
Responsible for validation	
SAU	4
Short description	
Size	123456
Validation status	

Some elements have predefined engineering properties

# EXPRESSION OF OTHER ENGINEERING PROPERTIES



**System parameters may be used to define any property (simple value, record, array, matrix)**

Property	Value
Comment	
Commonality level	
Confidentiality level	
Configuration Status	
Data provider	
Data Type	
Definition Level	
List of Domain Applicability	
List of user domains	
Long description	
Mnemonic	
Name	STR1_POSITION
Provider domain	
Responsible for validation	
Script	
Short description	coordinates of STR frame origine in satellite frame
System Parameter Type	array parameter
Unit	m
User defined type additional data	
Validation status	

# EXPRESSION OF OTHER ENGINEERING PROPERTIES

**STR1\_POSITION**

Property	Value
Comment	
Commonality level	
Confidentiality level	
Configuration Status	
Data provider	
Data Type	
Definition Level	
List of Domain Applicability	
List of user domains	
Long description	
Mnemonic	
Name	STR1_POSITION
Provider domain	
Responsible for validation	
Script	
Short description	coordinates of STR frame origine in satellite frame
System Parameter Type	array parameter
Unit	m
User defined type additional data	
Validation status	

**It is possible to define functional and physical equipments**

# EXPRESSION OF PRODUCT CONFIGURATION DATA

**STR1\_POSITION**

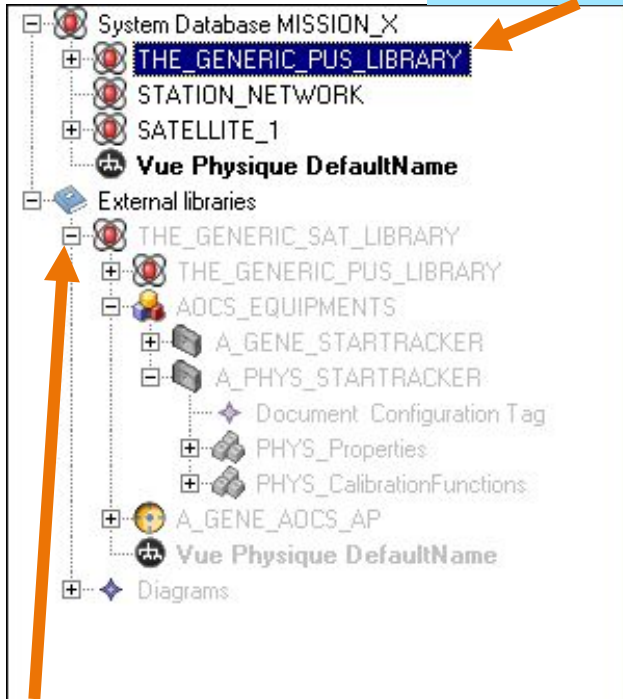
Property	Value
Comment	
Commonality level	
Confidentiality level	
Configuration Status	
Data provider	
Data Type	
Definition Level	
List of Domain Applicability	
List of user domains	
Long description	
Mnemonic	
Name	STR1_POSITION
Provider d	
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**A configuration tag will be used to describe product configuration data (as in 70-31) – not yet implemented**

- Configuration item ID
- Part Number
- Serial Number
- Lot Number
- Model ID of Manufacturer

# USE OF LIBRARIES

This library is part of the model



External library used for instantiation of elements

THE_GENERIC_PUS_LIBRARY	
Property	Value
Naming and Description	
Comment	
Commonality level	
Confidentiality level	
Configuration Status	
Data provider	
Definition Level	
Element provider	
ID	0
Library	<input checked="" type="checkbox"/> true
List of Destination	
List of Domain Applicability	
List of redundant System Elements	
List of Source	
List of user domains	
Long description	
Maximum length of telecommand so	0
Maximum length of telemetry source	0
Mnemonic	
Name	THE_GENERIC_PUS_LIBRARY
Obsolescence coefficient	0.0
Provider domain	
Responsible for validation	
Short description	Generic definition of ISIS PUS packets
Type	
Validation status	
Advanced	

Libraries are used to share generic data between missions

# XTCE exchange format for engineering properties

Local parameters can be used to describe engineering properties, they may share parameter types

- `<xtce:SpaceSystem shortDescription="AOCS subsystem" name="AOCS">`
- `<xtce:TelemetryMetaData>`
- `<xtce:ParameterTypeSet>`
- `<xtce:FloatParameterType name="TYPE_OF_AOCS_SCINERTIA_11">`
- `<xtce:UnitSet>`
- `<xtce:Unit description="kg.m2"/>`
- `</xtce:UnitSet>`
- `</xtce:FloatParameterType>`
- `</xtce:ParameterTypeSet>`
  
- `<xtce:Parameter shortDescription="Default satellite inertia matrix."`
- `name="AOCS_SCINERTIA_11" initialValue= "1234.567"`
- `parameterTypeRef="/AOCS/TYPE_OF_AOCS_SCINERTIA_11">`
- `<xtce:ParameterProperties dataSource="local" readOnly="true"/>`
- `</xtce:Parameter>`

Not ideal, but the best standard we have up to now



# LINK TO REQUIREMENTS

Parameter requirements are managed in a dedicated DOORS module. It would be possible to transfer their definition and specified value to a database.

The screenshot displays the 'ISIS-PARAM' module in the DOORS software. The interface includes a menu bar (File, Edit, View, Insert, Link, Analysis, Table, Tools, Discussions, DESIRe, MYTIC\_kitchen, Requirements, RMF\_kitchen, RMF, MYTIC, Help) and a toolbar. The main area is divided into a tree view on the left and a table on the right. The table lists parameters with their identifiers, MYTIC indices, descriptions, and units.

Parameter Identifier	MYTIC Parameter Index	Description	Value	Unit
[ISIS-PARAM-0036]	MIN_DELAY	Minimum delay for a link		min/s
[ISIS-PARAM-0037]	MIS_OPS_SYST_AVAILABILITY	Minimum availability target for CCC		(no unit)
[ISIS-PARAM-0038]	MISSION_DATA_RATE	maximum X-band data rate for mission data transfer		Mbps
[ISIS-PARAM-0039]	MISSION_PLAN_PROCESSING_TIME	Mission plan processing time from its arrival at CCC to the moment when it is ready to be uploaded.		min
[ISIS-PARAM-0190]	MISSION_SBAND_STORAGE_CAPACITY	EOL on-board memory storage capacity for mission data transmitted by S-band		Mbits
[ISIS-PARAM-0040]	MISSION_XBAND_STORAGE_CAPACITY	EOL on-board memory storage capacity for mission data transmitted by X-band		Gbits
[ISIS-PARAM-0041]	NB_SAT	Maximum number of satellites operated by the ground control centre in the context of the mission		(no unit)
[ISIS-PARAM-0156]	OCM_DUR_THRES	Threshold of OCM duration to define the accuracy levels		s
[ISIS-PARAM-0042]	ORB_PRED_FREQUENCY	Frequency of the orbit prediction		d

Save the changes that have been made to this module.

# CONCLUSION

Necessity of common or compatible conceptual data models

Standard exchange formats are missing if we except monitoring and control data

A lot of work still to be done on the process

New model-based tools are very helpful

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