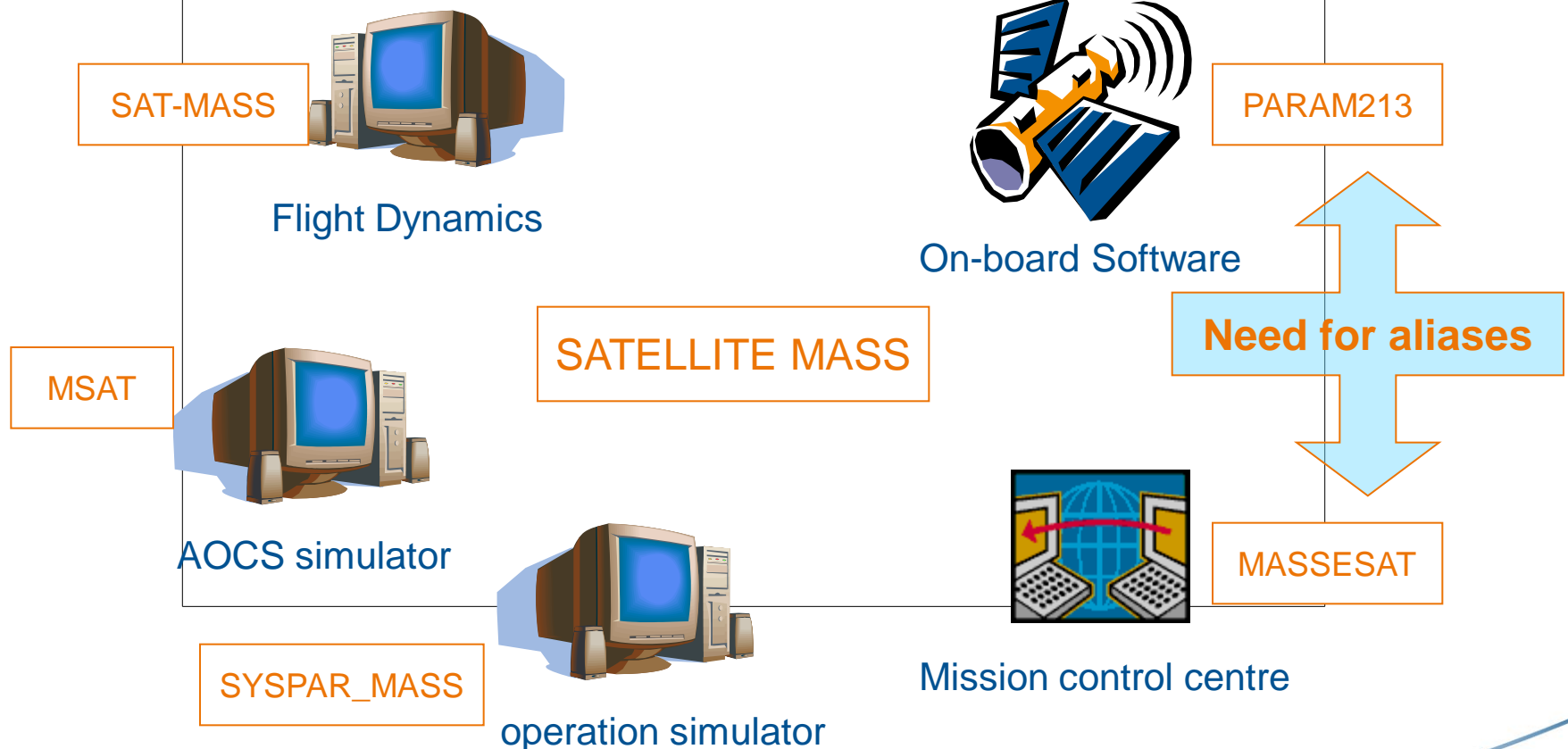# PERSPECTIVE ON SYSTEM DATABASE MANAGEMENT AT CNES

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

SAT-MASS

Flight Dynamics

PARAM213

On-board Software

SATELLITE MASS

MSAT

Need for aliases

AOCS simulator

MASSESAT

SYSPAR_MASS
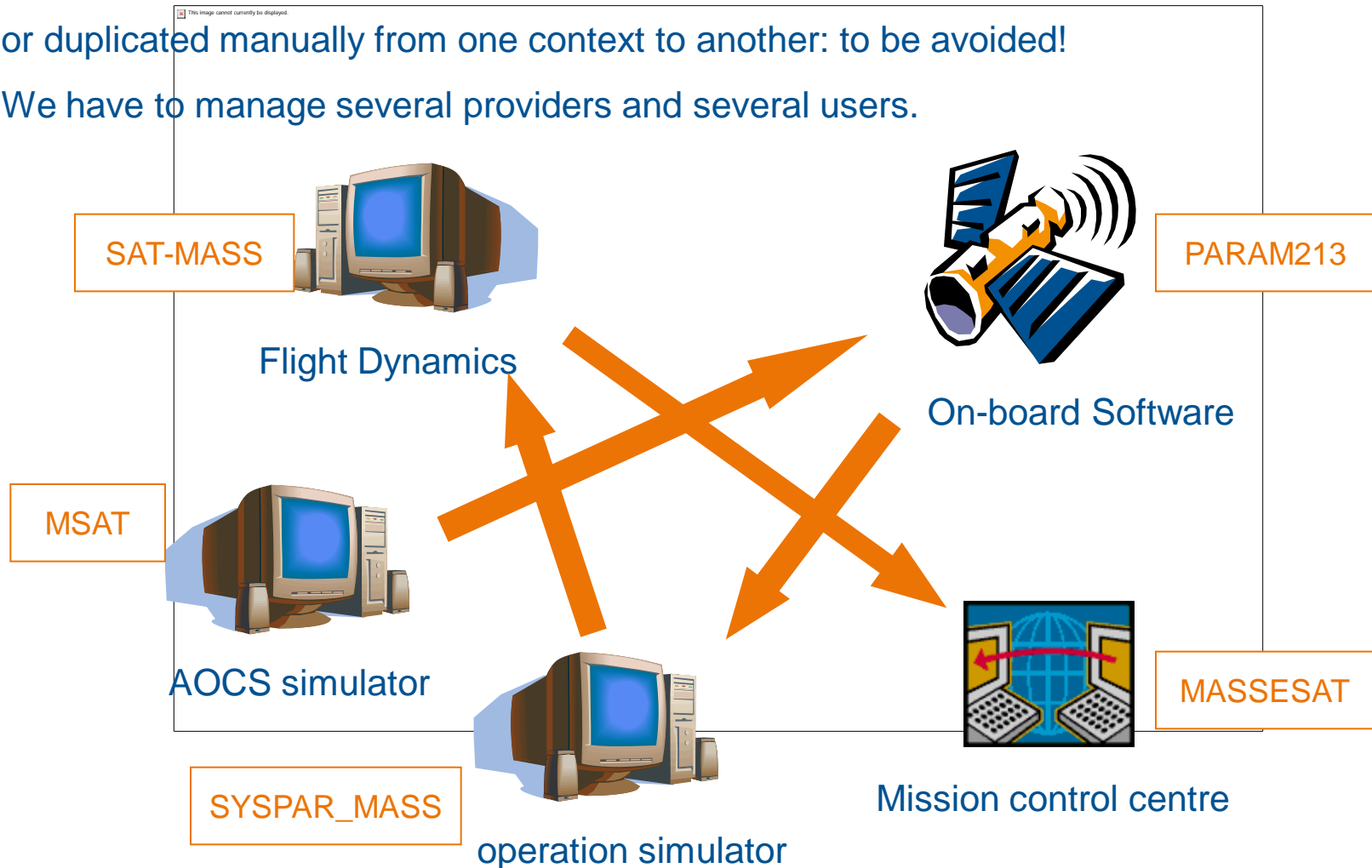
Mission control centre

operation simulator

cnes

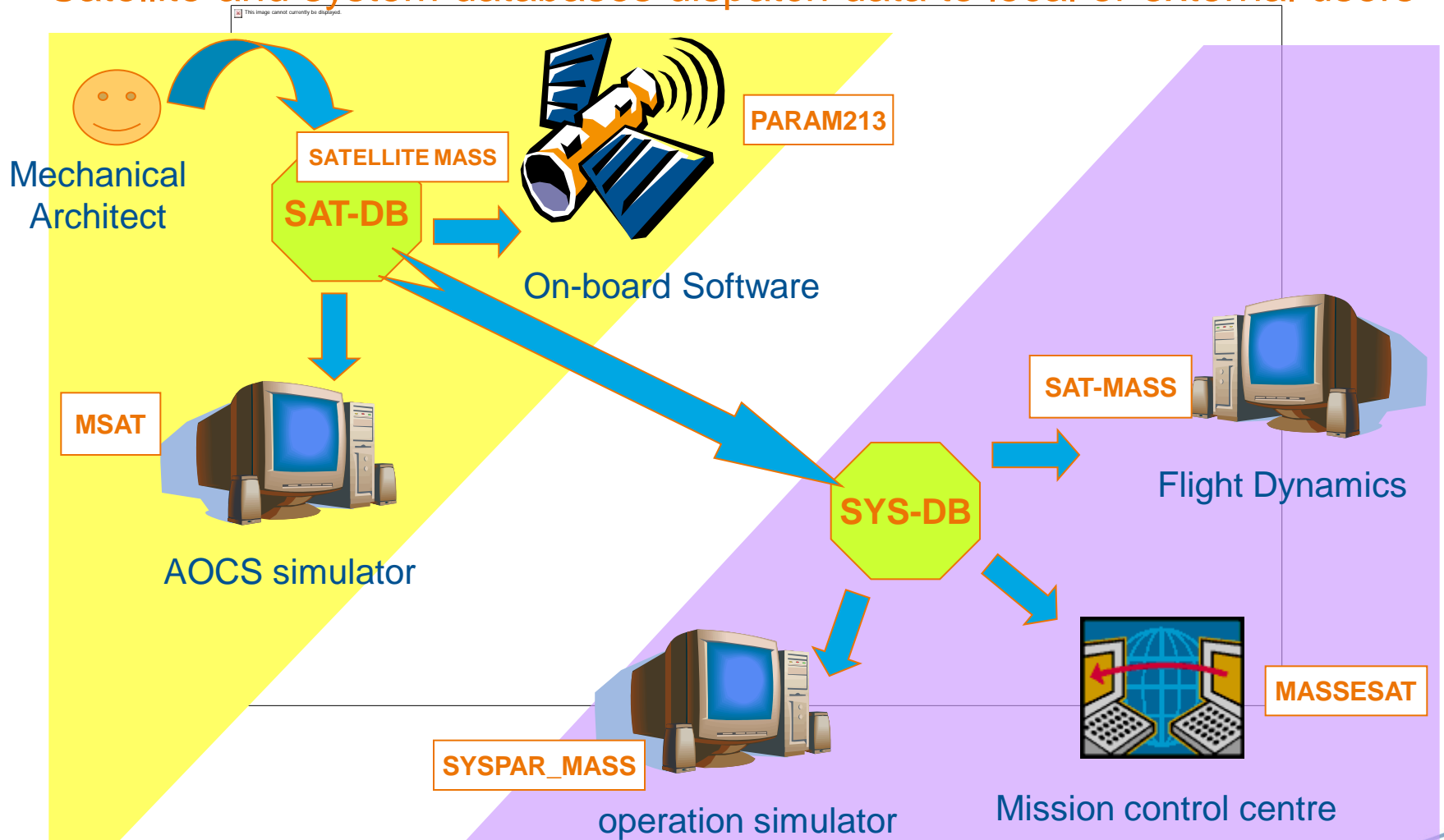# EXCHANGES OF SYSTEM DATA

System data are exchanged through system interfaces

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

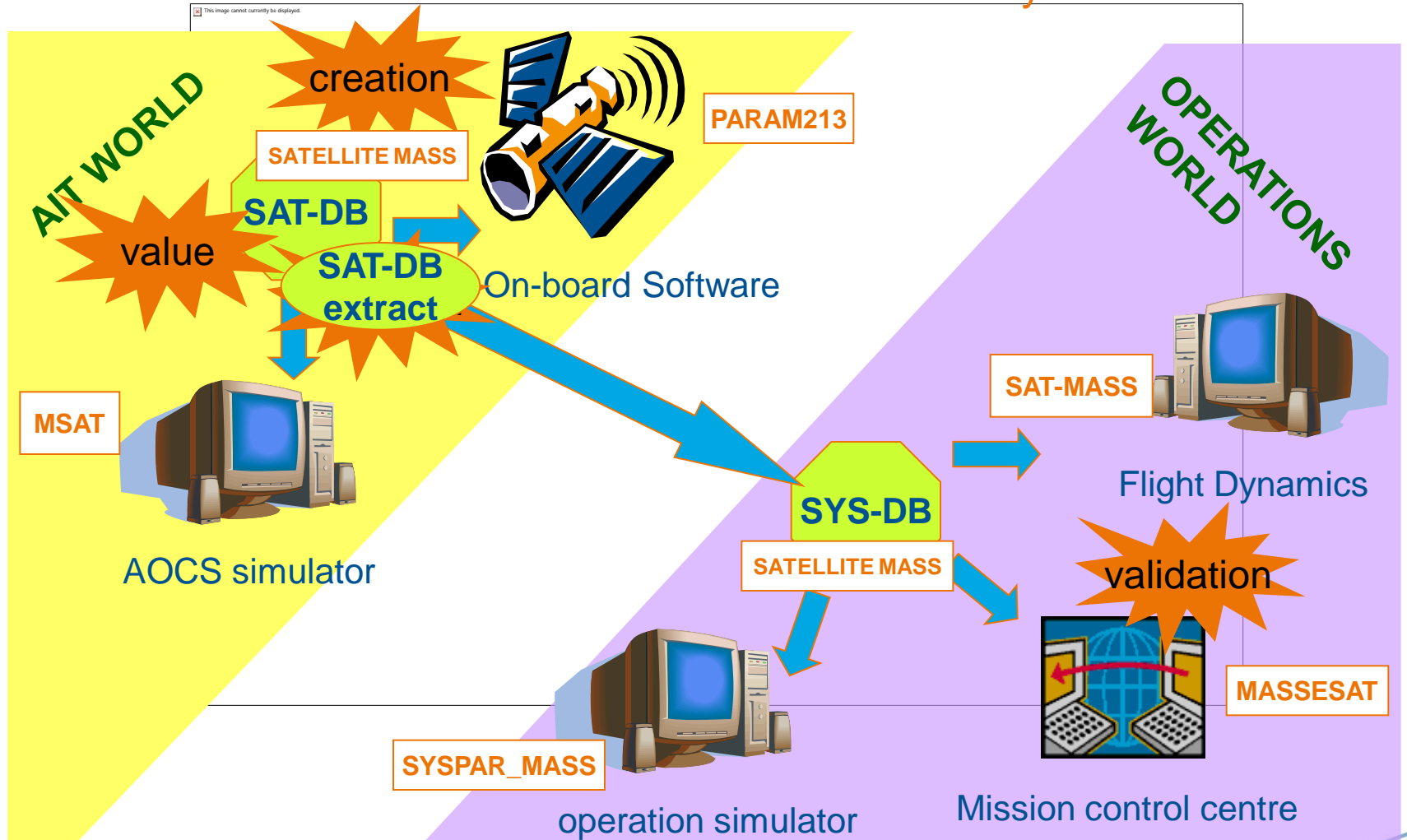We have to manage several providers and several users.

SAT-MASS

PARAM213

Flight Dynamics

On-board Software

MSAT

AOCS simulator

MASSESAT

SYSPAR_MASS

Mission control centre

operation simulator

cnes

EXCHANGES OF SYSTEM DATA

Satellite and system databases dispatch data to local or external users

Mechanical Architect

SATELLITE MASS

SAT-DB

PARAM213

On-board Software

MSAT

AOCS simulator

SYS-DB

SAT-MASS

Flight Dynamics

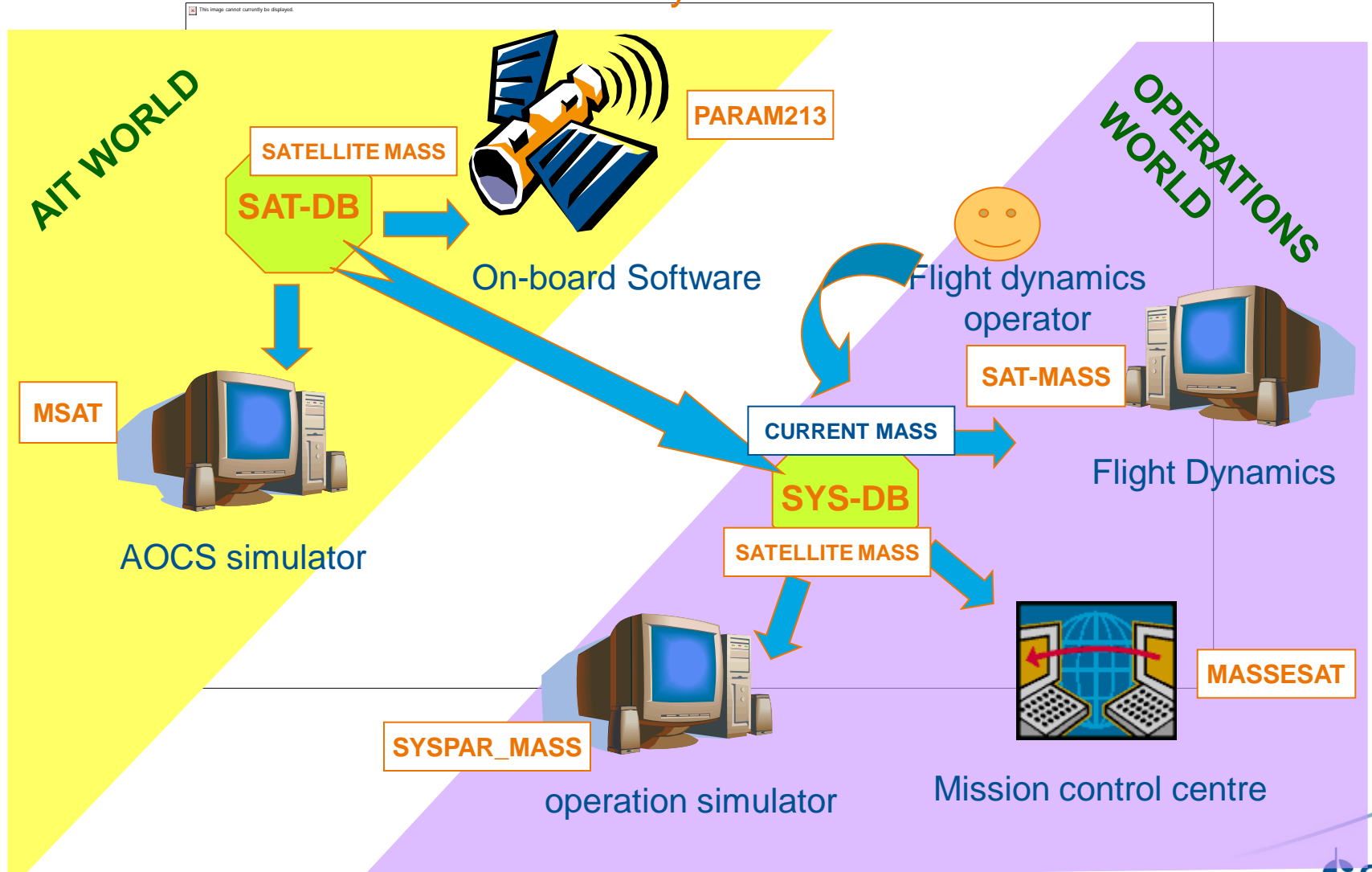**SYSPAR_MASS**

operation simulator

MASSESAT

Mission control centre

cnes

LIFECYCLE OF A SYSTEM PARAMETER

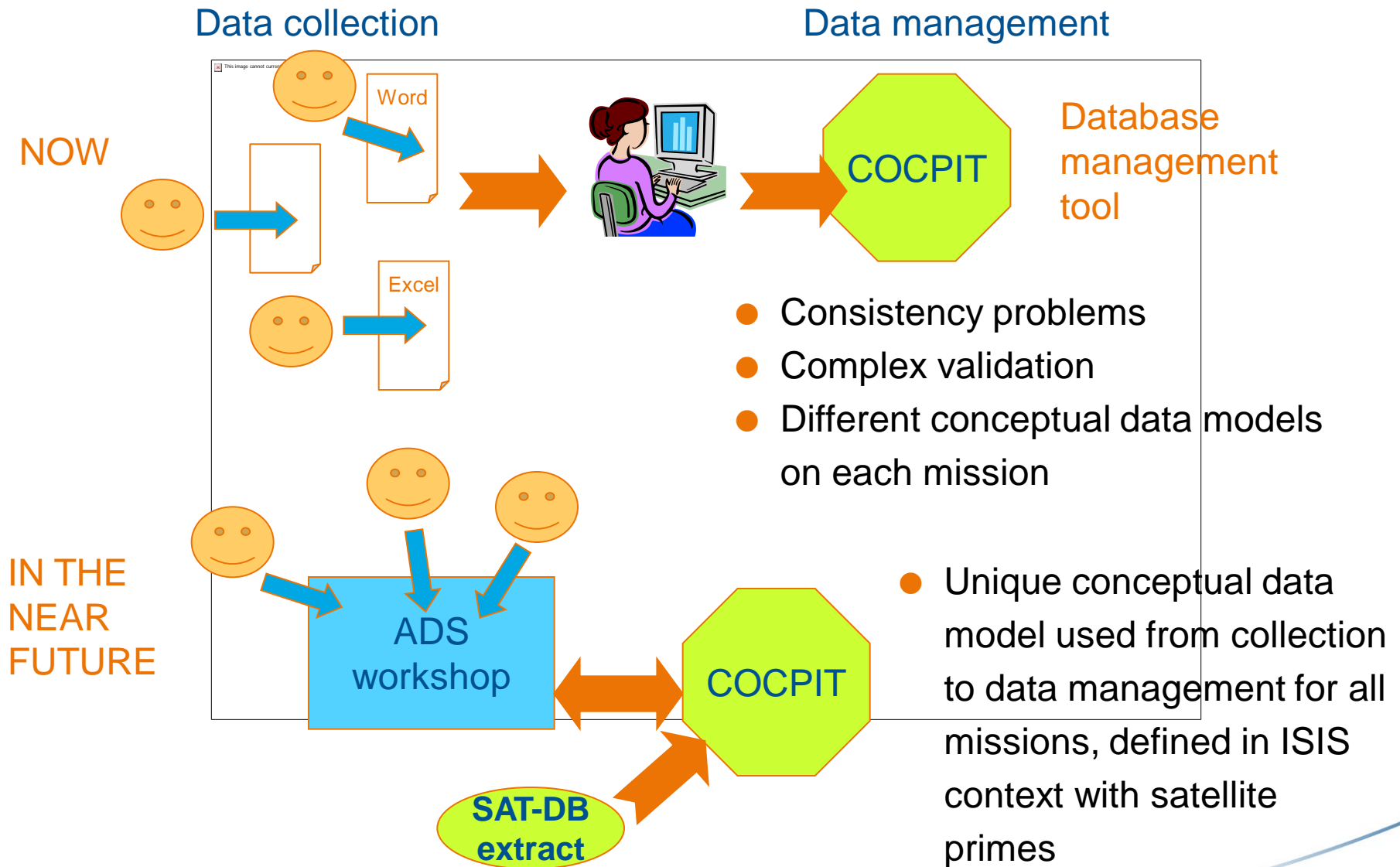Part of the satellite database is transferred into the system database

AIT WORLD

creation

SATELLITE MASS

PARAM213

OPERATIONS WORLD

SAT-DB

value

SAT-DB extract

On-board Software

MSAT

SAT-MASS

SYS-DB

Flight Dynamics

AOCS simulator

SATELLITE MASS

validation

MASSESAT

SYSPAR_MASS

operation simulator

Mission control centre

cnes

LIFECYCLE OF A SYSTEM PARAMETER

Additional data are created in the system database

AIT WORLD

OPERATIONS WORLD

PARAM213

SATELLITE MASS

SAT-DB

On-board Software

Flight dynamics operator

SAT-MASS

MSAT

CURRENT MASS

Flight Dynamics

AOCS simulator

SYS-DB

SATELLITE MASS

MASSESAT

SYSPAR_MASS

operation simulator

Mission control centre

cnes

A NEW APPROACH FOR ALL FUTURE MISSIONS

Data collection

Data management

NOW

Word

Excel

COCPIT

Database management tool

- Consistency problems
- Complex validation
- Different conceptual data models on each mission

IN THE NEAR FUTURE

ADS workshop

COCPIT

SAT-DB extract

- Unique conceptual data model used from collection to data management for all missions, defined in ISIS context with satellite primes

cnes

THE ADS-COCPIT DEMONSTRATOR

Current demonstrator development

Configuration for a mission

Architecture description

Structured SSM presentation

Data collection

Rules verification

graphics

workshop editor

conceptual data model

ADS workshop

TOPCASED

ADS Workshop MMI

COCPIT

database

Edition/management MMI

New

New

Data storage and persistency

Configuration management

Presentation of data by types

import-export

Data edition

A stand-alone version of ADS workshop also exist

cnes

A CONCEPTUAL DATA MODEL BASED ON ECSS-E-ST-70-31
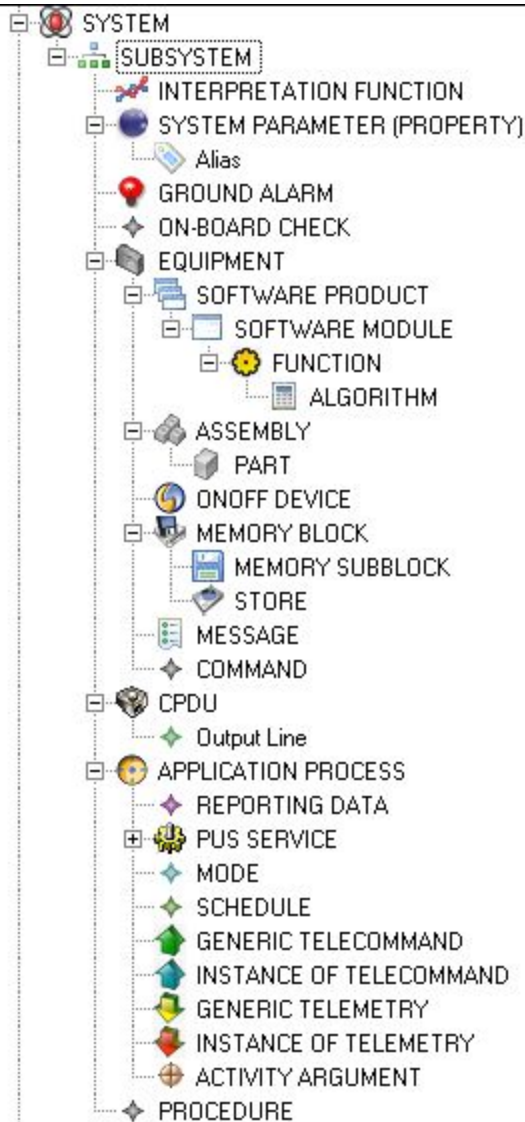
SSM elements (physical and functional):

- System, subsystem, equipement, 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

EXPRESSION OF PREDEFINED PROPERTIES

Some elements have predefined engineering properties

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

EXPRESSION OF OTHER ENGINEERING PROPERTIES

It is possible to define functional and physical equipments
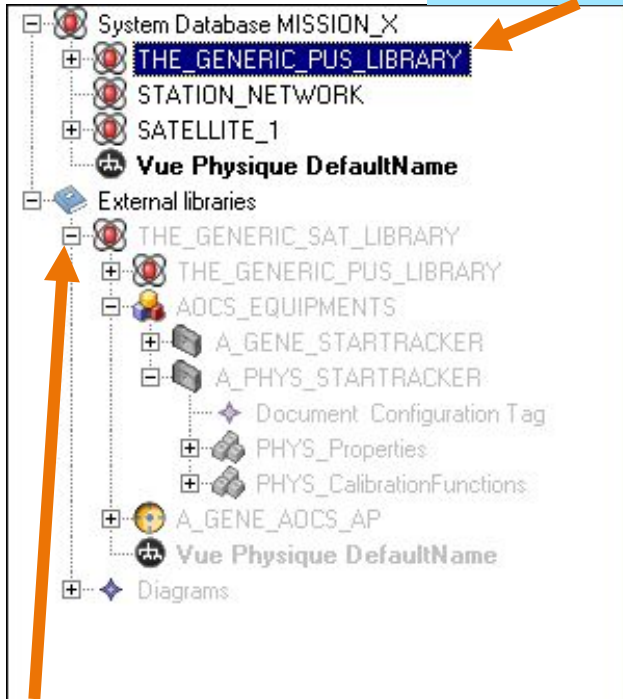
EXPRESSION OF PRODUCT CONFIGURATION DATA

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

Libraries are used to share generic data between missions

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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

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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.

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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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