# Requirements of shared Data Management Services facilitating a Reference Architecture realizing the Concepts of ECSS-E-TM-10-23

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The engineering process for spacecrafts requires a close collaboration between various engineering disciplines

Thermica Thermal Analysis Model

CATIA V5 DMU

AIT Sequence Model

Visio Operational Model

Spacecraft engineering data

DOORS Requirements Model

SRDB TM/TC Model

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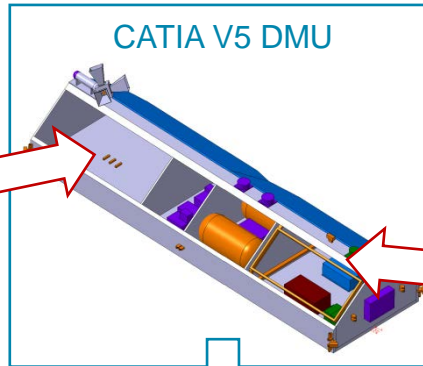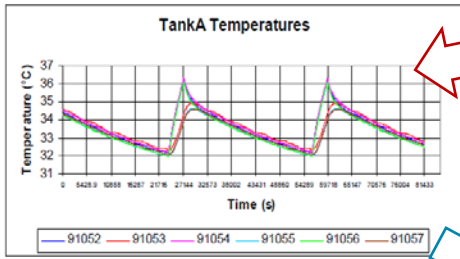
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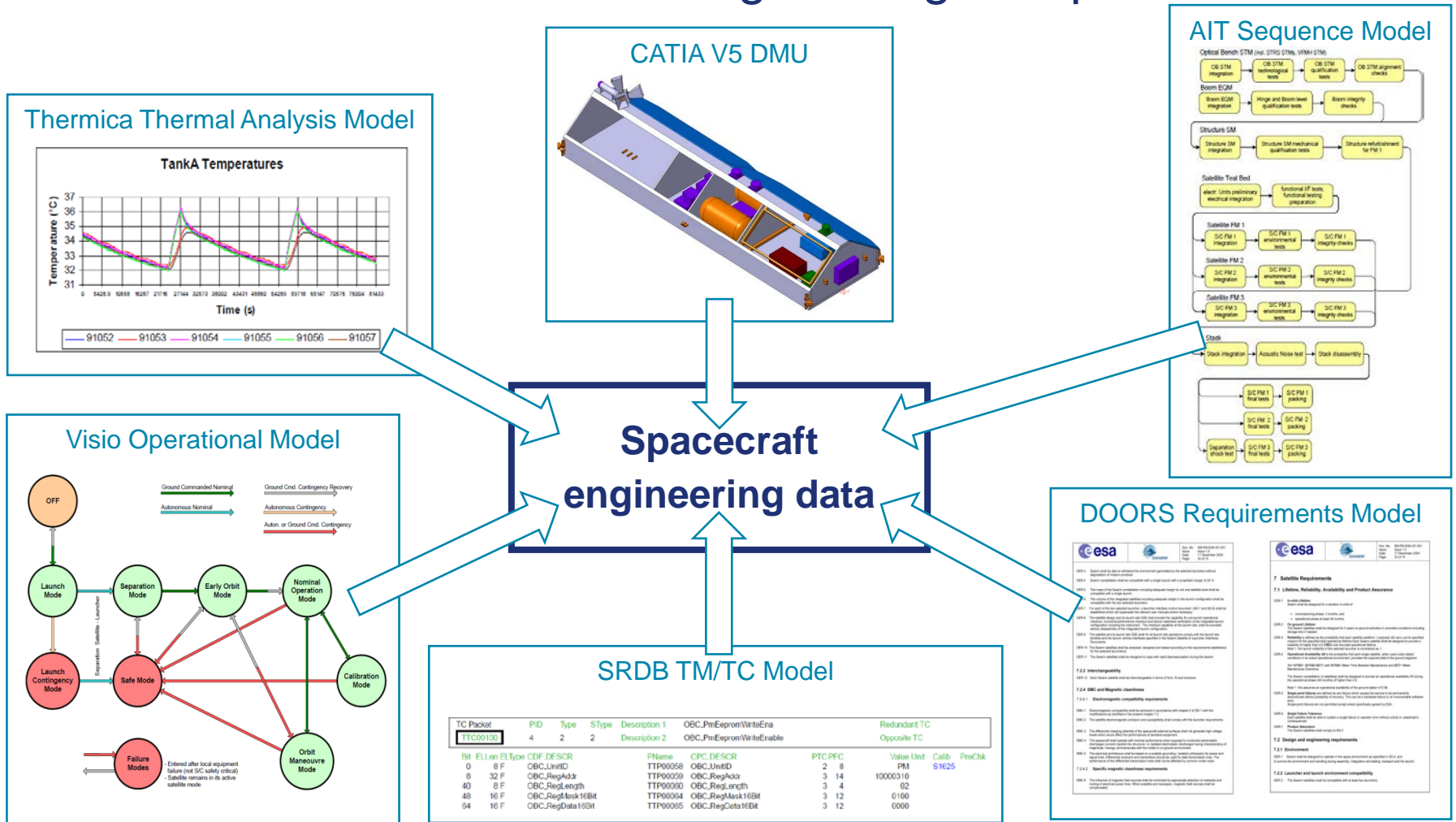
With the current tools and data exchange solutions multiple functionalities are still a tedious, manual, labor-intensive work

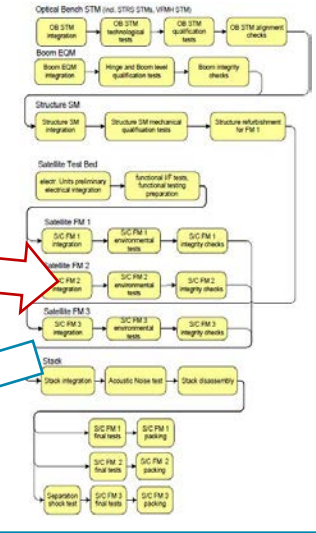Data exchange is a manual process with some drawbacks

Thermica Thermal Analysis Model

CATIA V5 DMU

Employment of different product structures, e.g. items "as specified" vs. "as built"

AIT Sequence Model

Visio Operational Model

Spacecraft engineering data

DOORS Requirements Model
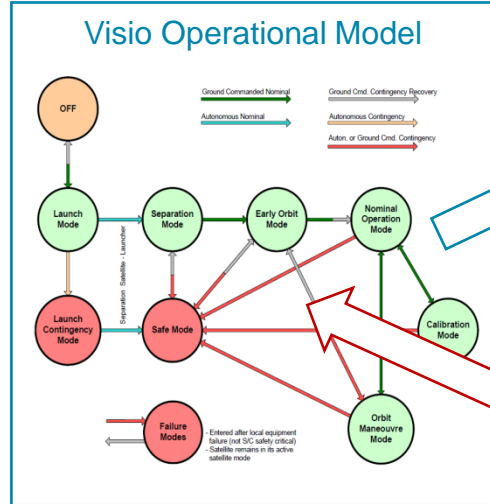
SRDB TM/TC Model

Redundancy by having the same data in different tools

Ensuring consistency between different baselines of models can be a challenge

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ECSS-E-TM-10-23 is an emerging European Standard facilitating the alignment of tools for improved data sharing
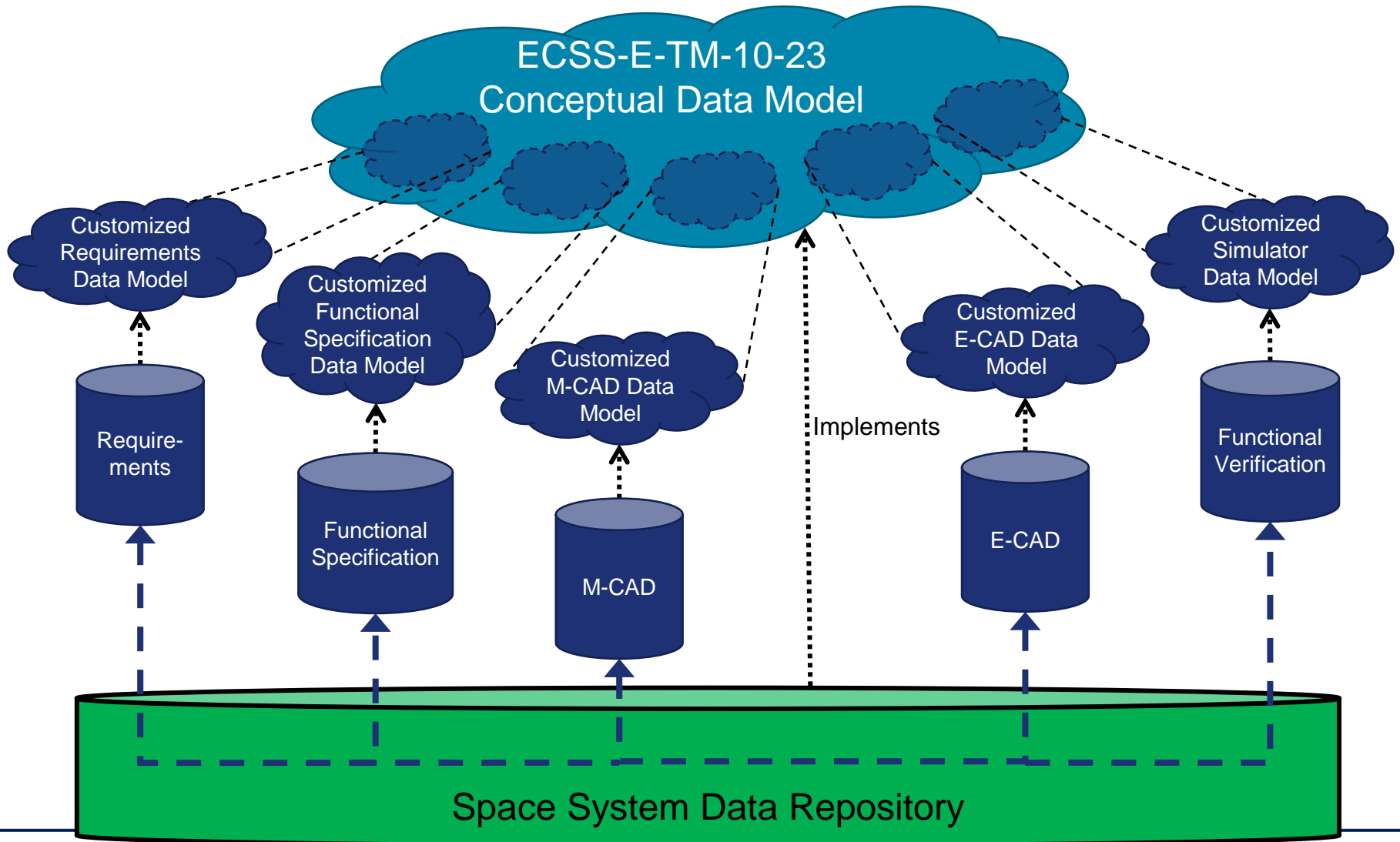
Assuring consistency and preserving semantics are central services of Space System Data Repository

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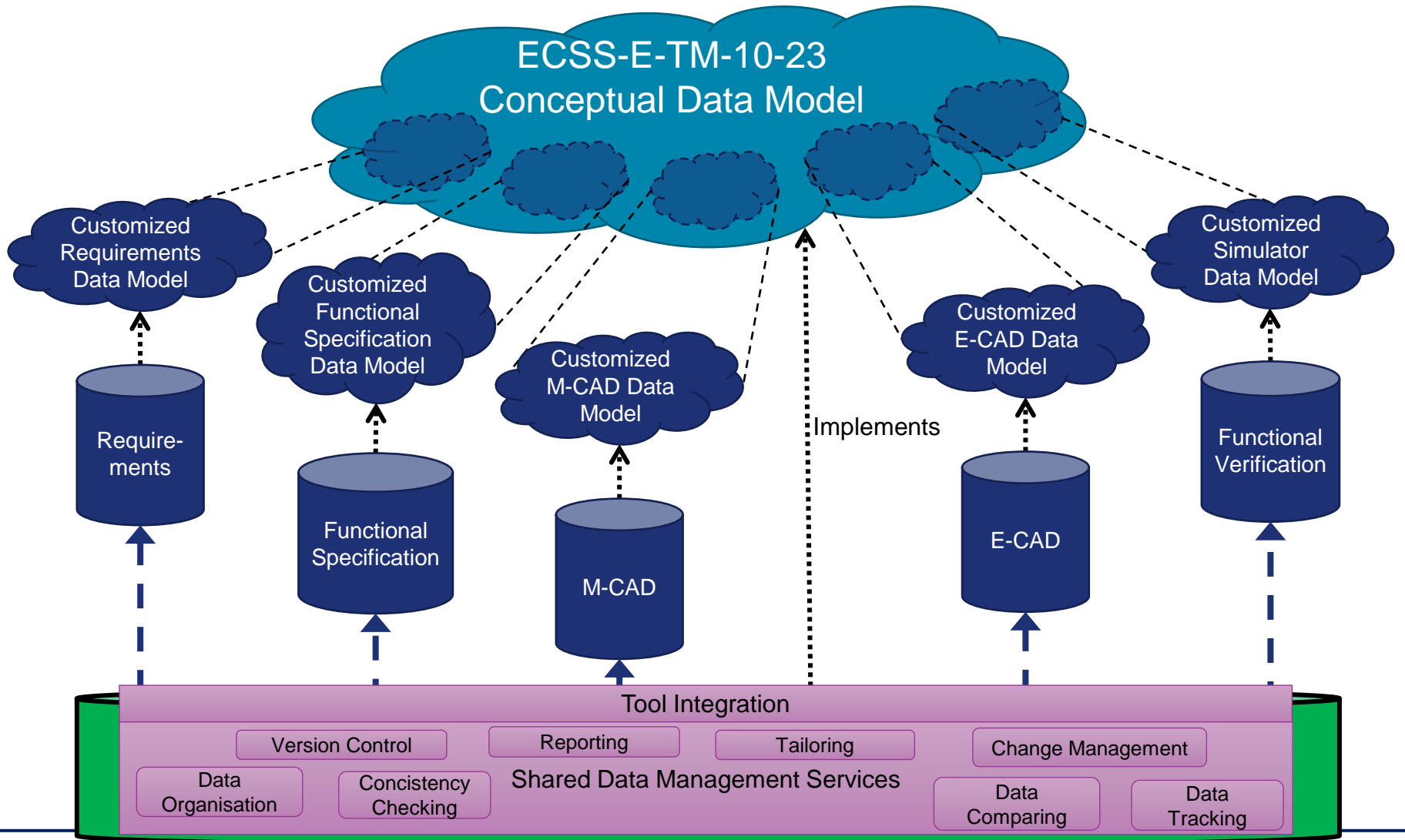
Role of data management services of Space System Data Repository during data exchange between tools

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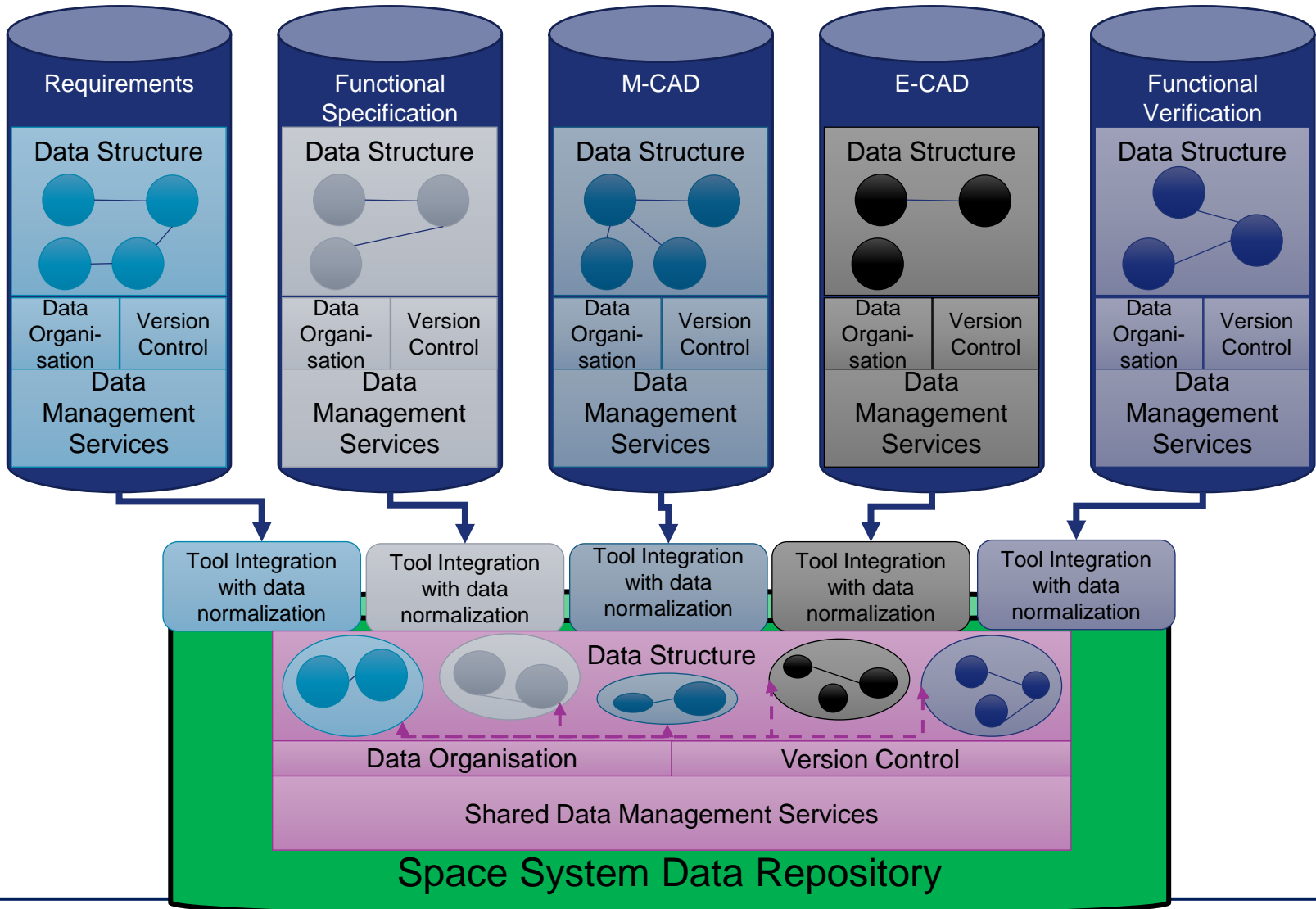
Forming data into knowledge requires appropriate data structures, an computer and human interpretation

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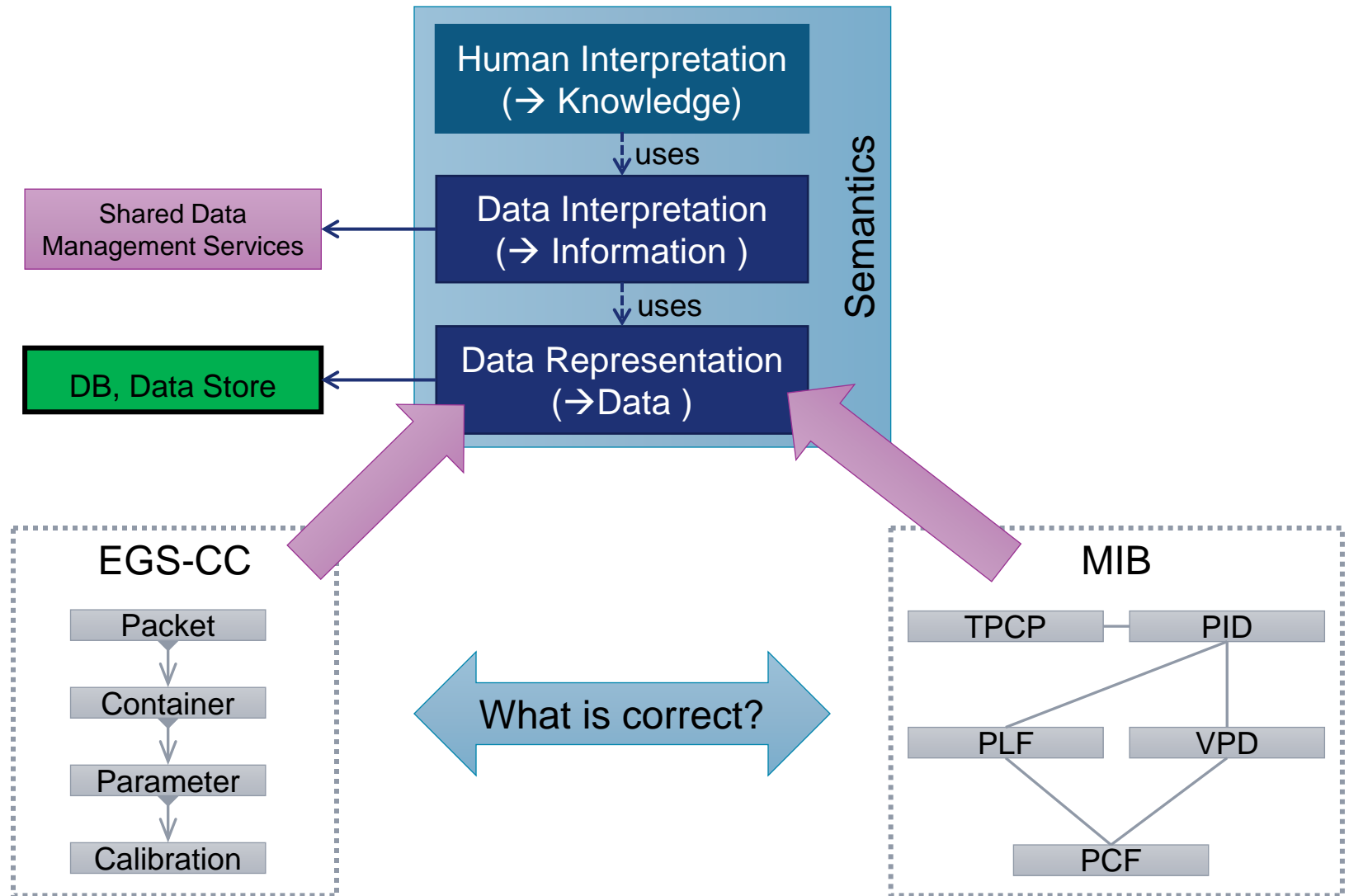
Currently a trend is observable to centralized architectures, allowing shared operations performed on a shared repository

- Virtual Spacecraft Design (VSD)

- Currently pursued developments (SECESA 2014)
    - OCDT (ESA)
    - CDP (Rhea)
    - RangeDB (Airbus)

Requirements | Functional Specification | M-CAD | E-CAD | Functional Verification

Tool Integration

→ Still ongoing discussion on usefulness to copy and replicate data

Space System Data Repository

Human Interpretation (→ Knowledge)
uses
Data Interpretation (→ Information)
uses
Data Representation (→Data)

Semantics

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Common cradles for engineering tools, would allow to "unify" the services and resolve the commonly shared bottleneck
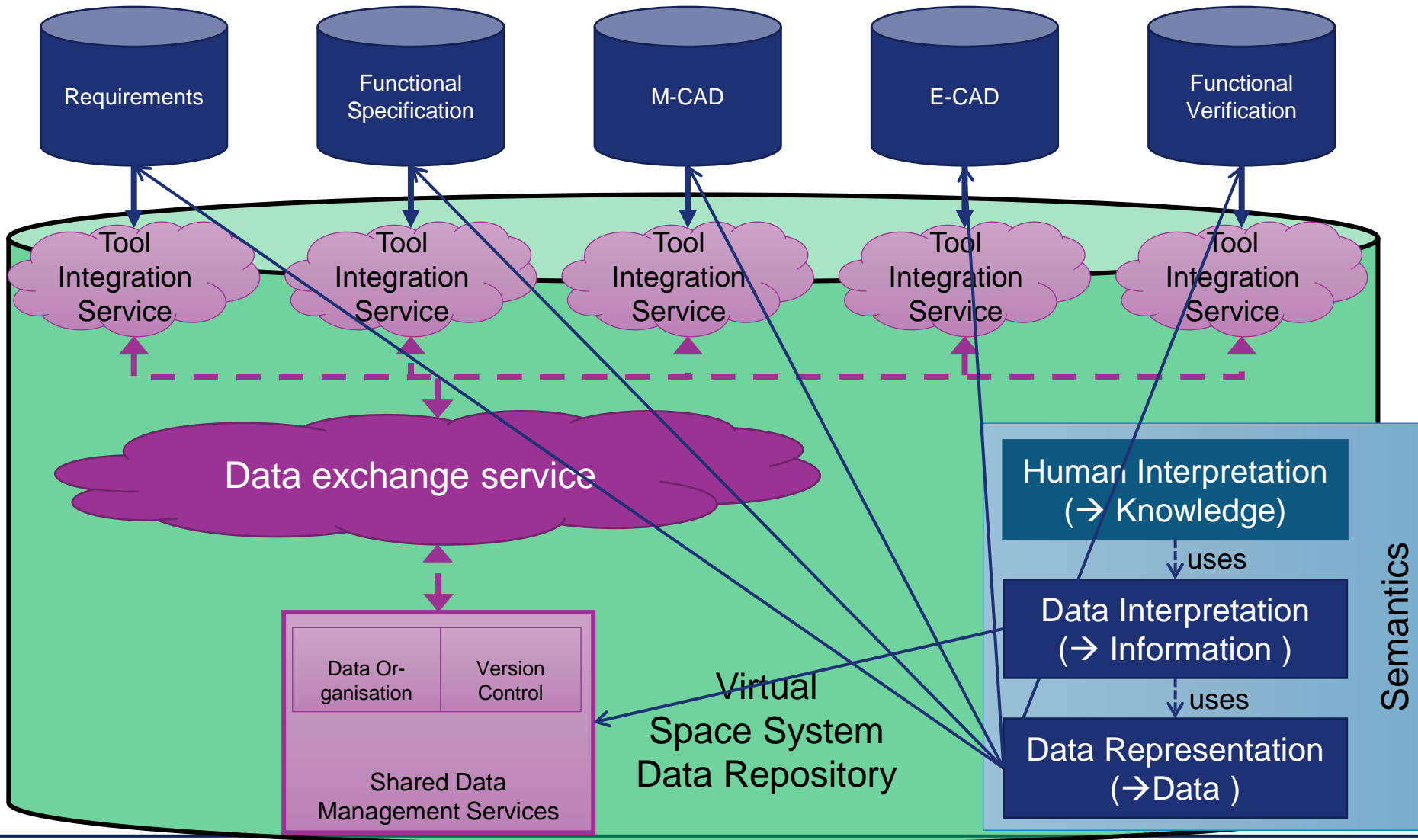
Open Services for Lifecycle Collaboration (OSLC) is an emerging technology for controlled information exchange

OSLC became part of the OASIS Open Standards Network

2013, May

2011, June

OSLC Architecture matures:
More and more specifications will be released

2010, Feb

Eclipse Lyo project created:
Provides tutorials as well as projects to ease OSLC-Adapter creation

Many new Working Groups get started

2008, June

OSLC announced:
OSLC became an open-source project

IBM in-house development:
Searching for a way to integrate all their frameworks building on the experience of the Web

OSLC enables linking of data to gain information that can facilitate applying of knowledge

- Enables integration at data level via links between related resources
  - Originally IBM initiative for tool integration
  - Inspired by the World Wide Web
  - OSLC is part of OASIS
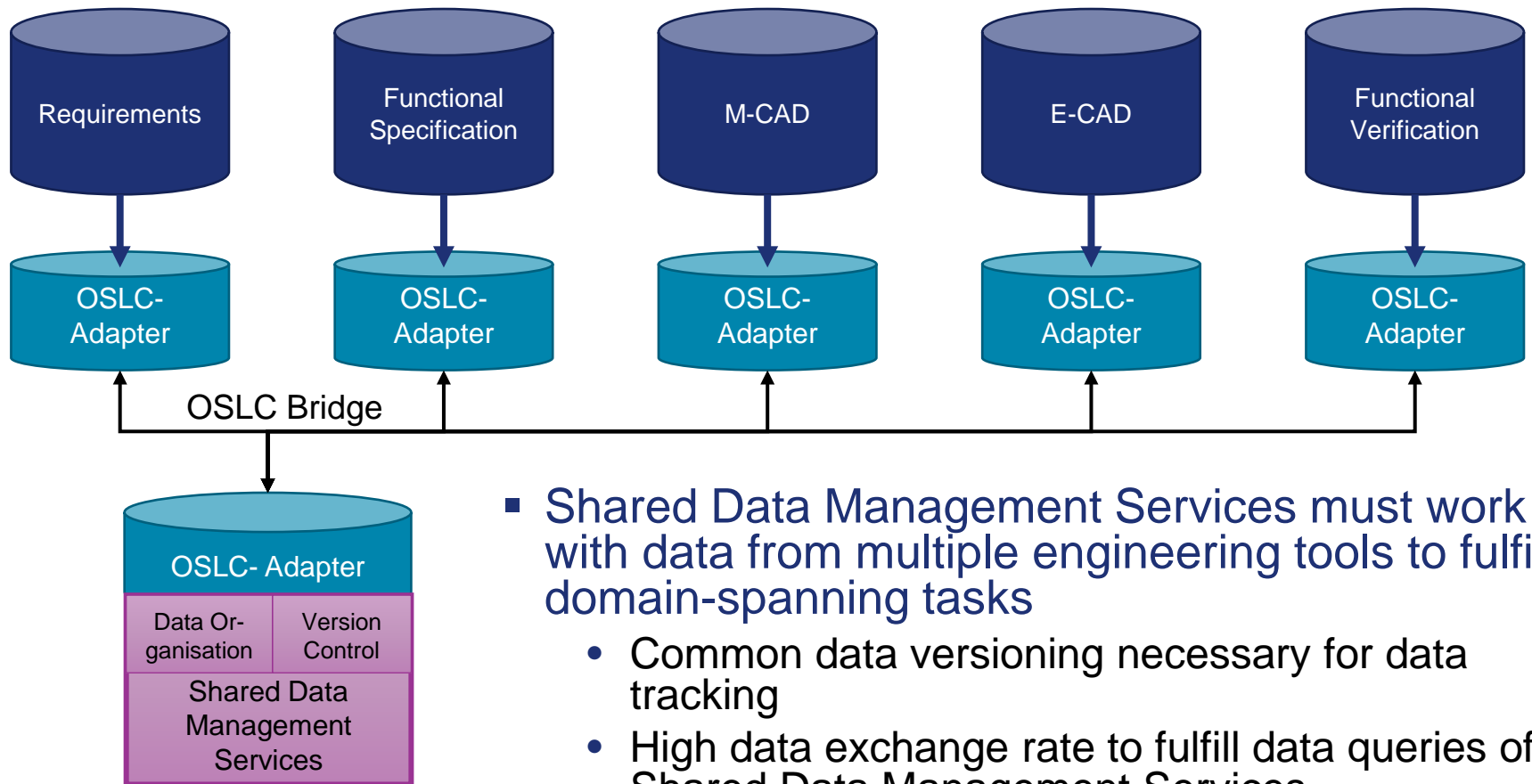 - Resources are defined in terms of W3C Resource Description Framework properties

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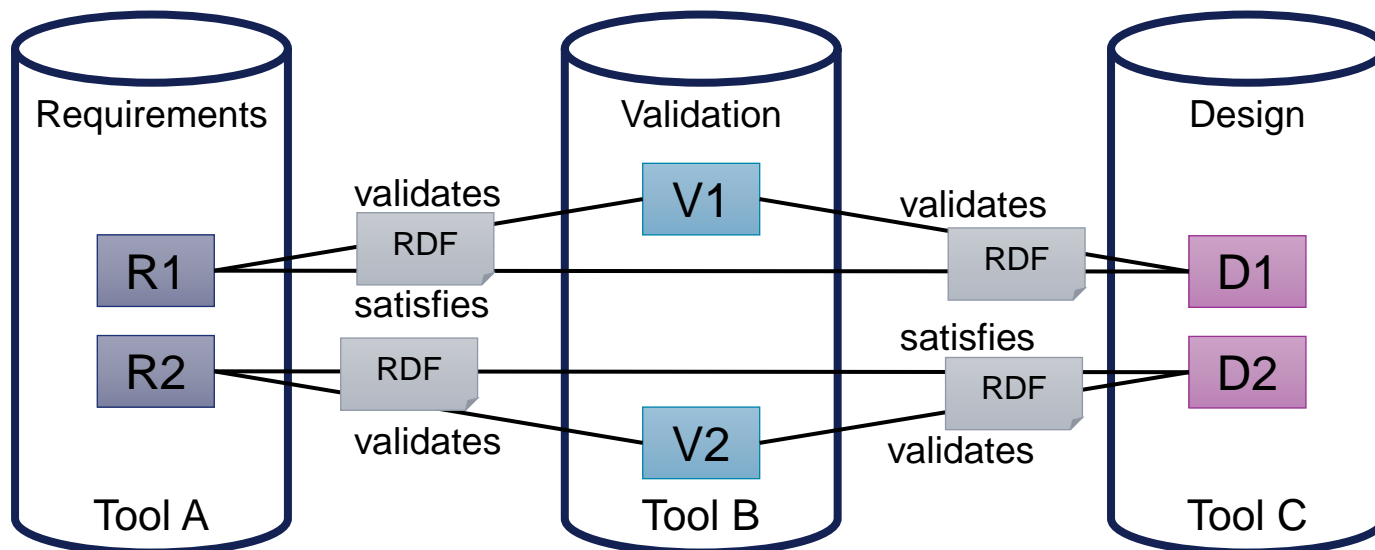
Utilization of OSLC for ECSS-E-TM-10-23 to obtain a de-centralized solution based on linked resources
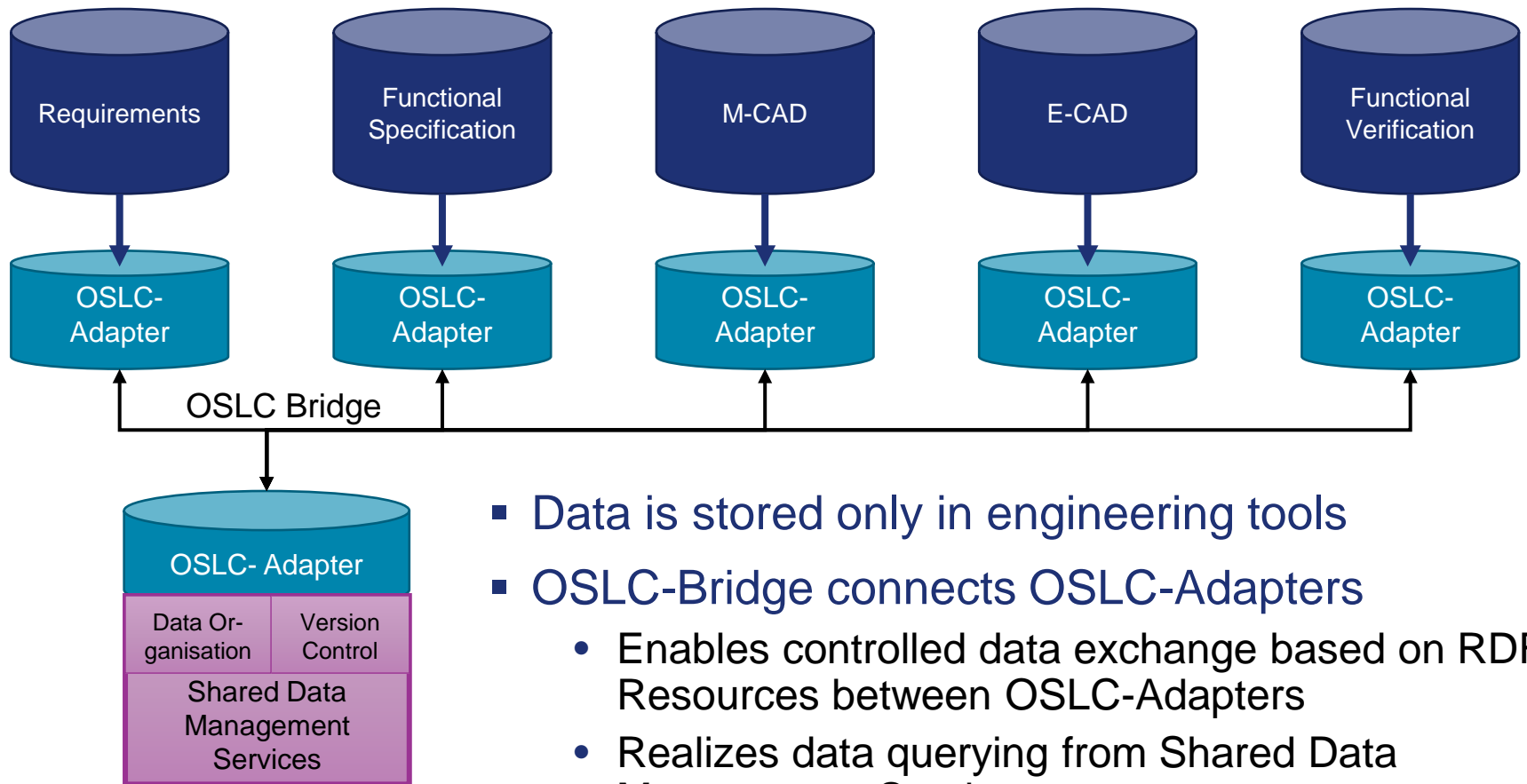

- **Data is stored only in engineering tools**
- **OSLC-Bridge connects OSLC-Adapters**
  - Enables controlled data exchange based on RDF-Resources between OSLC-Adapters
  - Realizes data querying from Shared Data Management Services

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# OSLC provides only a communication protocol to realize controlled information exchange

- Shared Data Management Services must work with data from multiple engineering tools to fulfill domain-spanning tasks
  - Common data versioning necessary for data tracking
  - High data exchange rate to fulfill data queries of Shared Data Management Services

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Role of data management services during data exchange realizing a de-centralized approach based on OSLC
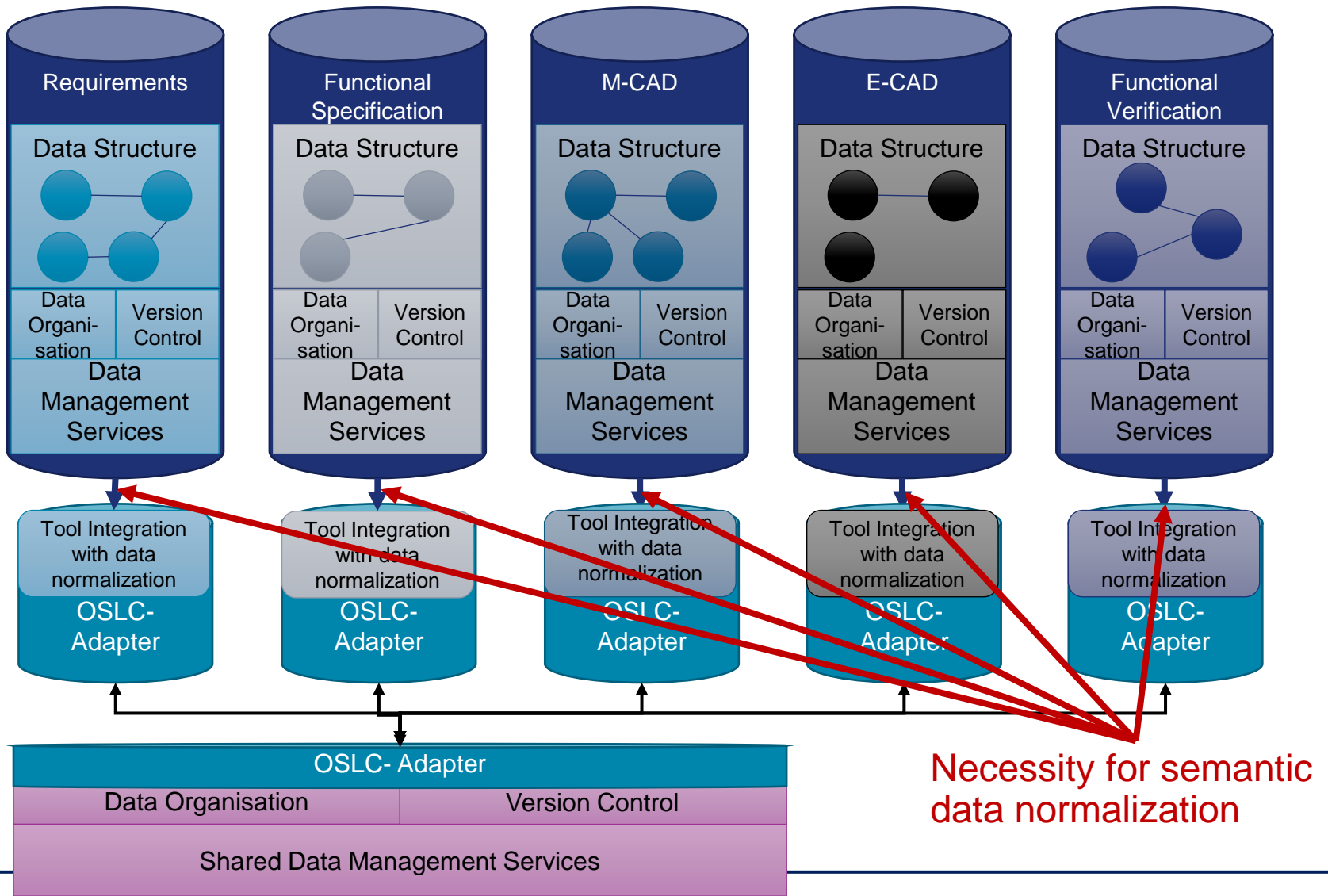
Necessity for semantic data normalization

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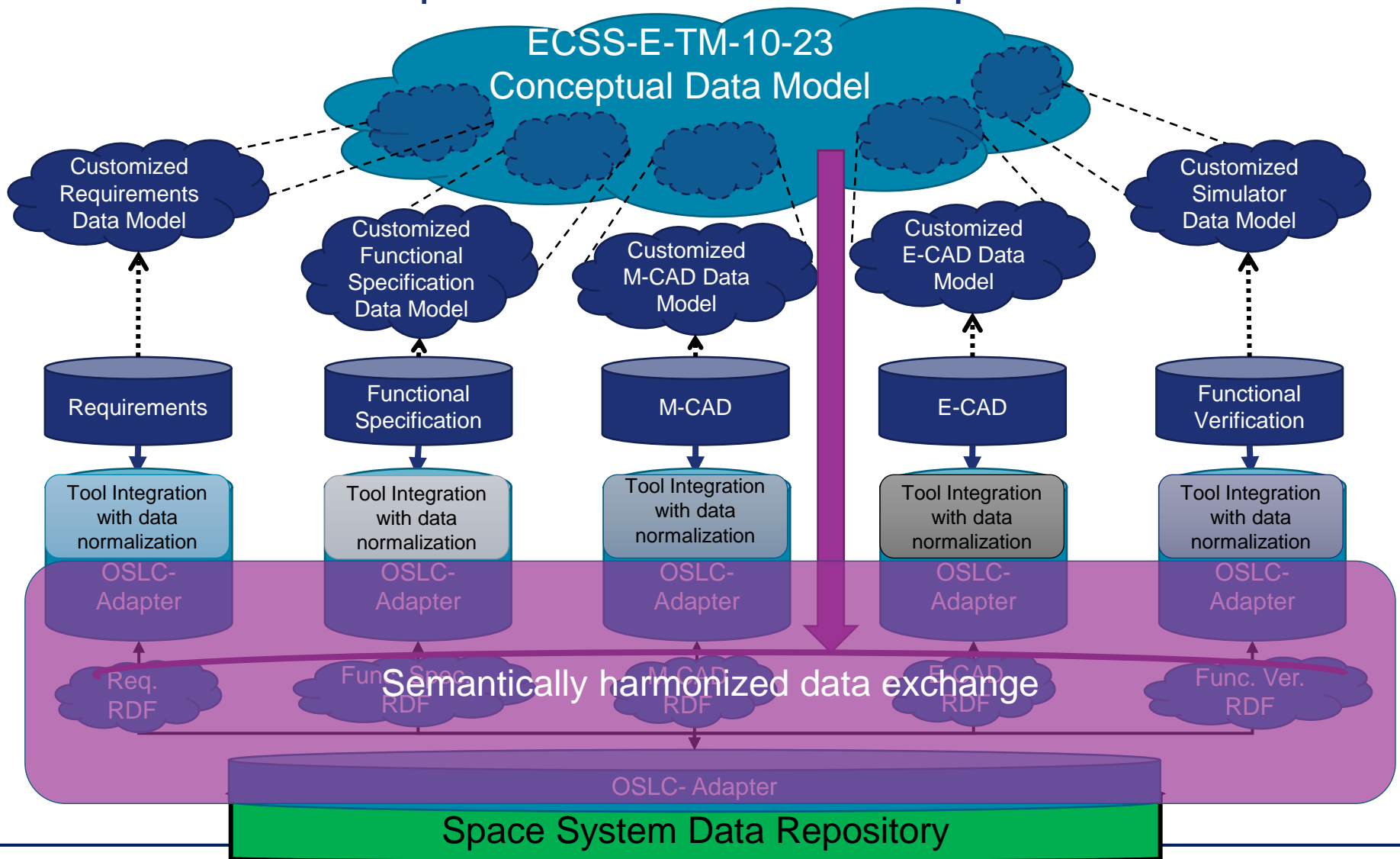DEFENCE & SPACE

OSLC is not sufficient to realize the concepts of ECSS-E-TM-10-23 but it provides an adequate data exchange approach
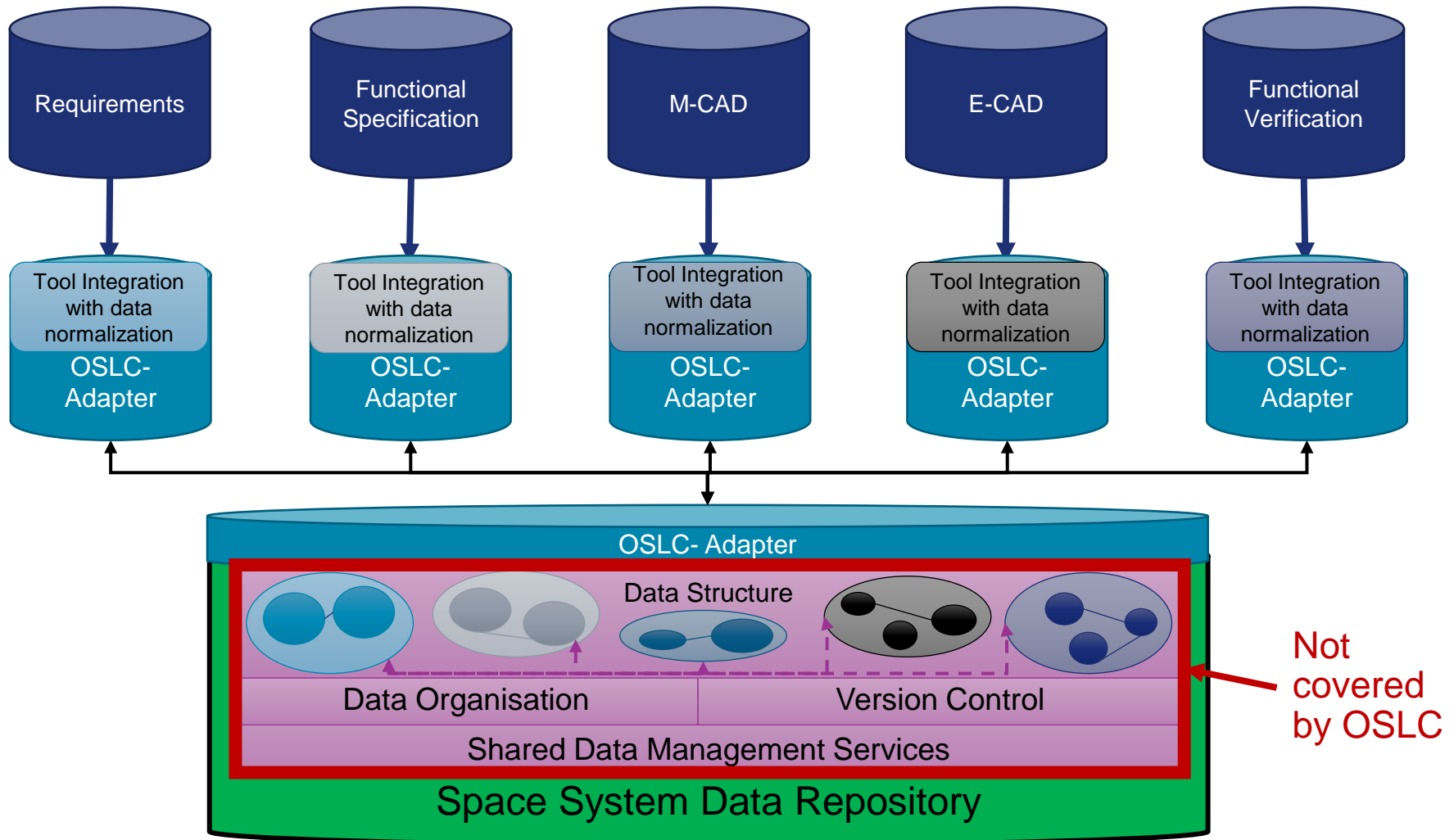
Realizing semantically stronger data exchange by deriving OSLC-Resource specifications from Conceptual Data Model

Ensuring semantically strong data exchange across engineering tools using a two-phase approach

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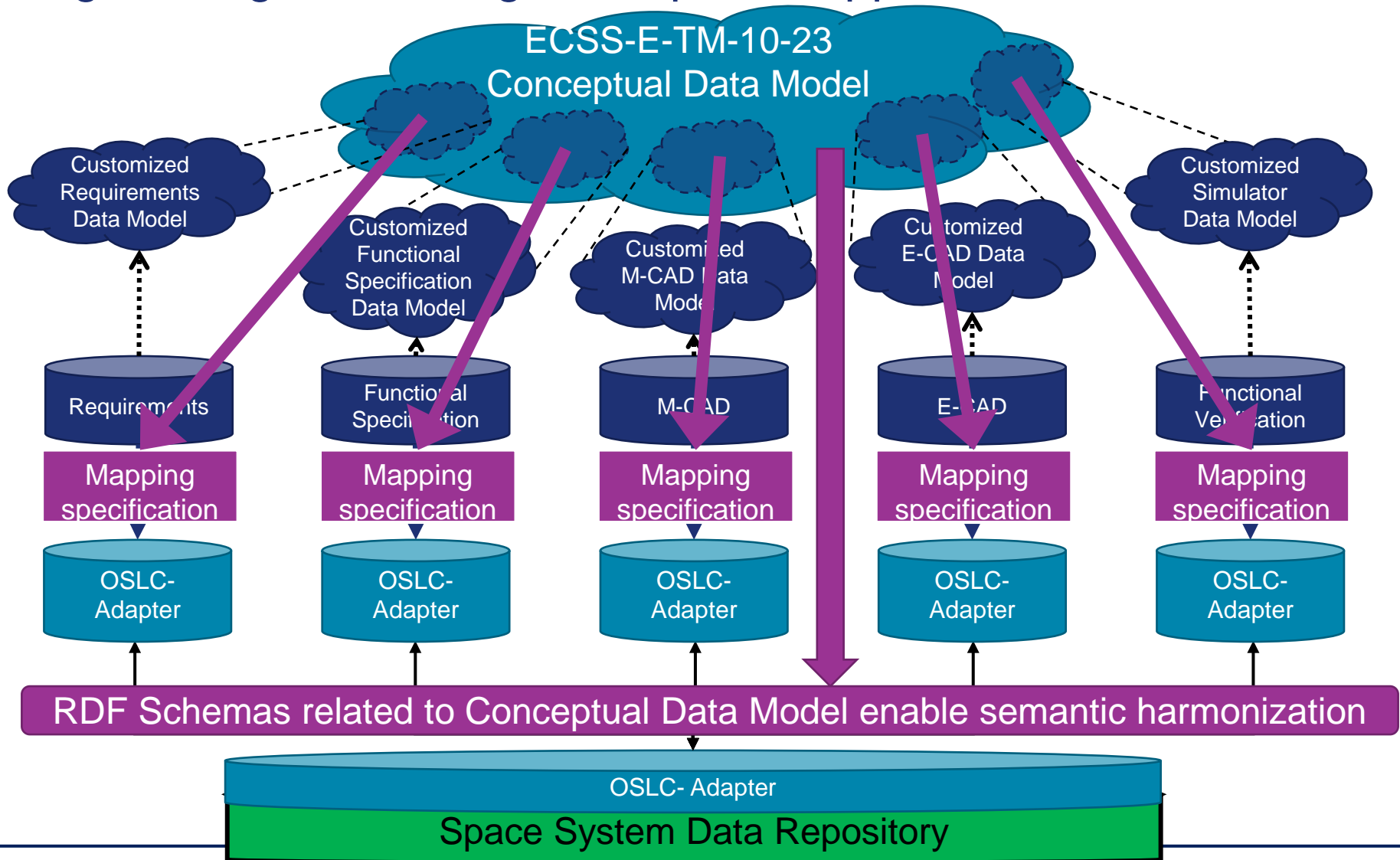
Thanks for your attention!
Any questions?

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Thank you for your Attention

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