

2ème Congrès annuel

SAGIP

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AIRBUS
DEFENCE AND SPACE



Governance of a Common Working Environment for System Engineering and Model Based System Engineering within a PLM Context



INE – Enterprise Engineering : architectures, methods and models



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Systems Engineering is a transdisciplinary and integrative approach to enable the successful realization, use, and retirement of engineered systems, using systems principles and concepts, and scientific, technological, and management methods. (INCOSE)

An engineered system is a system designed or adapted to interact with an anticipated operational environment to achieve one or more intended purposes while complying with applicable constraints. (INCOSE)

A system is an arrangement of parts or elements that together exhibit behavior or meaning that the individual constituents do not. (INCOSE)

System Engineering

Definitions

- System Engineering
- Engineered System
- System

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MBSE: A formalized application of modeling to support system requirements, design, analysis, verification and validation activities beginning in the conceptual design phase and continuing throughout development and later lifecycle phases. [INCOSE SE Vision 2020]

Model Based System Engineering

Definition

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Growing complexity of

- organizations
- products
- Technologies

- Issues with more and more important environmental impact
- Needs to accommodate a more and more uncertain natural and political environment

- Needs for reliance and resilience of organizations and techno-societal organization

Digitalization of enterprises and Ubiquitous usage of Information and Communication Technologies being for Information, Knowledge or Cyber Systems became an enabler but also a constraint with growing even higher complexity

Growing complexity but also growing pace of change

Why SE and MBSE

Motivation

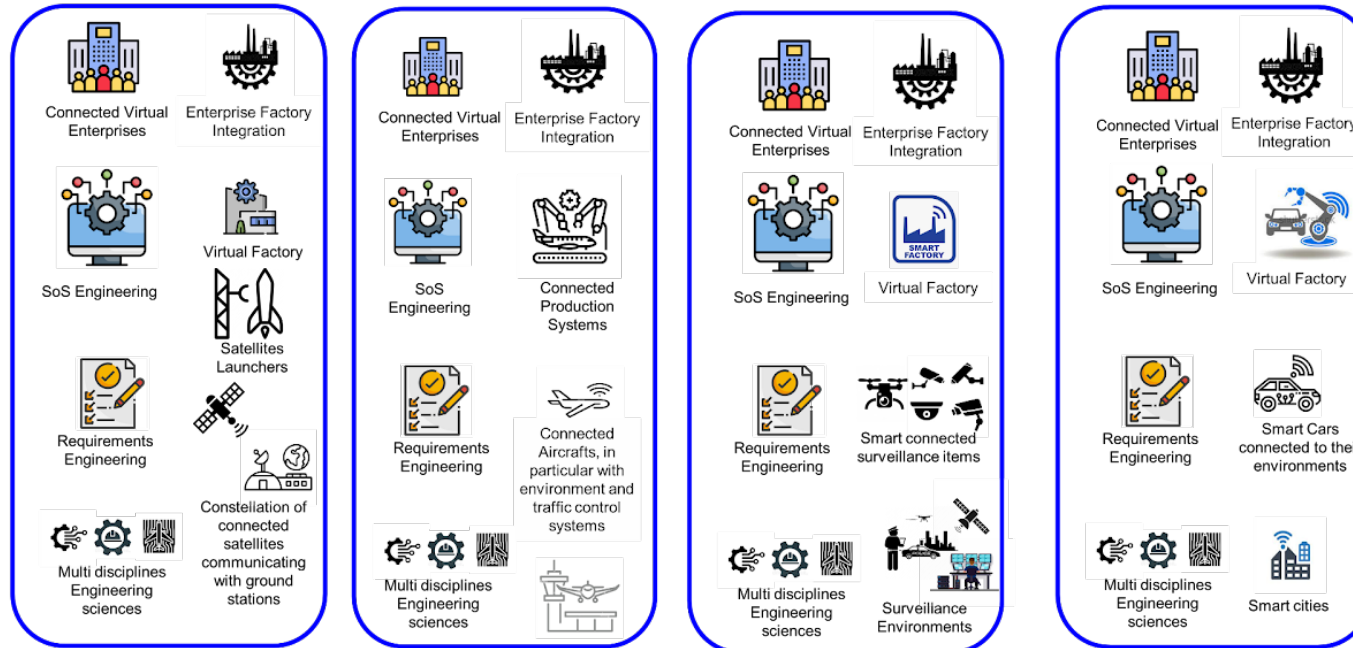
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Many on going deployment in enterprise which are heterogeneous in terms of internal standards and external considered standards, being processes, frameworks, languages, applications, used software products...

When one packaged set of agreed MBSE capabilities agreed, how then to deploy it quickly between partners in order to ensure the set up of a Common Working Environment for a given Program?

Heterogeneity could be related to the business context, with some generic needs and specific needs.

Similar System Development for more and more connected systems
Relying on SoS Engineering, MBSE, PLM, EA and Virtualization and digital transformation



Different Digital Business Ecosystems (DBE), Operational Environments, Regulation and Technologies/Engineering Disciplines
Different used consistent sets of relevant standards according to the DBE and its maturity in terms of Interoperability

Dr Nicolas Figay - SAGIP 2024 30th of Mai 2024

Current
adoption of
SE and MBSE
by enterprises

Motivation

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Framework for System Engineering in the Extended Enterprise

GIFAS highlighted through the analysis of the standards currently applied by companies (e.g., ISO 15288 or NASA Handbook 2016 rev 2) the need to define a generic reference framework allowing collaborative SE deployment.

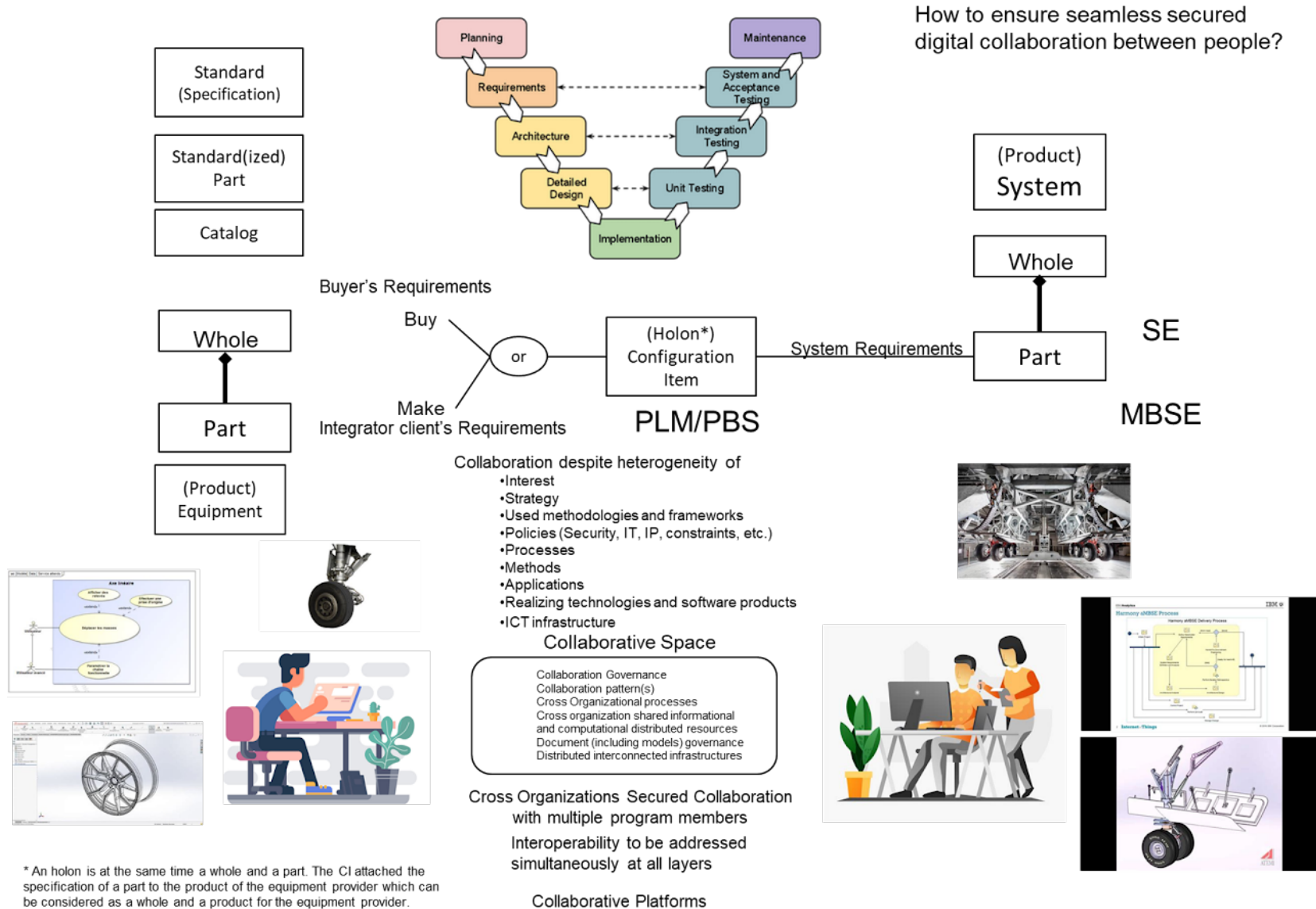
CRISEE is the generic solution allowing all industrial players to understand the constraints of SE deployment, validated by GIFAS and currently applied by industrial players. It defines processes allowing to govern the collaboration for a Program running System Engineering within the Extended Enterprise

But what about the set up of Common Working Environment derived from CRISEE which will ensure required interoperability for PLM and Digital Collaboration relying on models – including the new kinds of MBSE models - in very heterogeneous and complex operational environments?

CRISEE

Motivation

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The problem
Heterogeneity

Introduction of
PLM

Alignment of
Holons with
Configuration
Items

How to prepare
and build
operational
interoperability
in a CWE

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- 20 years of research addressing the need of continuous operational interoperability for PLM with exchange, sharing and long term archiving of Manufacturing Data describing Products and Processes, all along the life cycle phases
- Holistic approach targeting on adaptability.
- Continuous Operational Interoperability is to be prepared (governance \leq CRISEE) and build (Architecture – Federation of Interoperability Framework and Reference Architecture)
- Enablers: Ontology, MDA, Enterprise Architecture, Service Oriented Platform
- Open Standards!
- Focus on Interoperability brakes: what prevents establishment of interoperability
- Not only scientific gaps ;) e.g. people don't want to model, document centric...
- What are the SE and MBSE specific challenges and needs for research activities?

Nicolas Figay. Continuous Operational Interoperability. Computer Science [cs]. Université Claude Bernard Lyon 1; LIRIS UMR 5205 CNRS/INSA de Lyon/Université Claude Bernard Lyon 1/Université Lumière Lyon 2/École Centrale de Lyon, 2021. fftel-04413469v2f

Proposed approach

Reuse and extension of the Federated Interoperability Framework

Identification of specific scientific gaps or interoperability brakes

Definition of a set of specific research topics (thesis, research projects...) in order to address them in a way they contribute to the overall FIF

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Model Based System Engineering

A system is an arrangement of parts or elements that together exhibit behavior or meaning that the individual constituents do not.
(INCOSE)

The definition **doesn't reflect**:

- Whole and Parts
- Multiple viewpoints coming from a complex organisation
- Complexity
- Impact on Interoperability

SoA and SoP don't reflect:

- Continuity from MBSE Model in pre design to Production or Operation (Digital Twins end Digital threads)
- Holistically in networks of enterprise

SoA: State of the Art SoP: State of the Practice

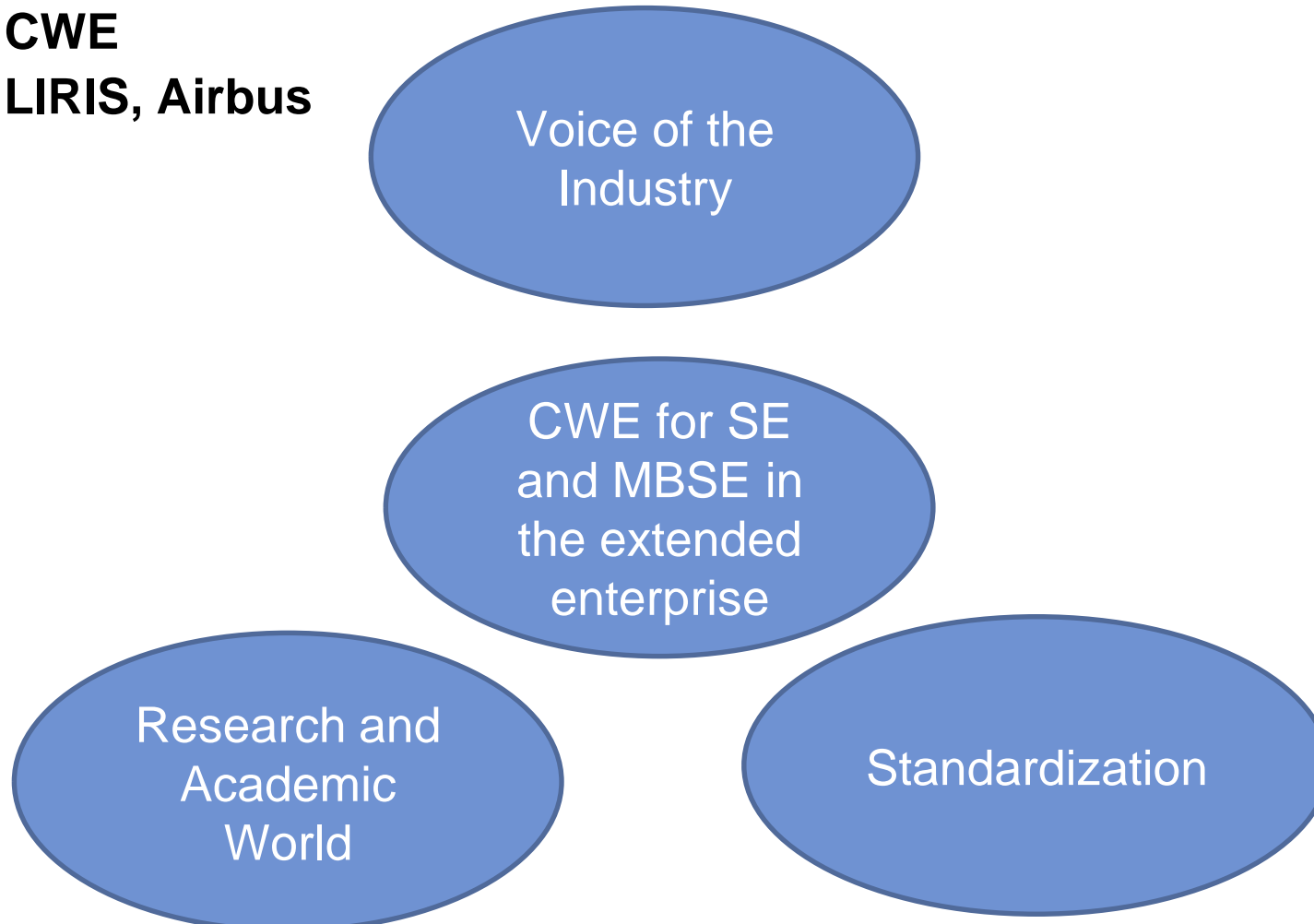
Some actual scientific issues

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AFIS/GIFAS CRISEE update

Working Group MBSE and ... at AFIS, with support of AFNET, to specify CWE

Quartz, LIRIS, Airbus



Collaboration Opportunities

About the presenter

Post impressions past / days 6,712 ▲253.5%

(Support System) Complex Connected Production System (Support System) (System of Interest)

Mastering the complexity of Digital Collaboration

End to End Cross Organizational Processes

Continuous Operational Interoperability

Enterprise Modeling, Ontology, Standardized Application Protocols, Model Driven Approaches

Dr Nicolas Figay, HDR (He/Him)

Let's prepare and build the continuous operational Interoperability supporting end to end digital collaboration

Talks about #ontology, #archimatecg, #plm_interop, #advanced_visualization_technics, and #emerging_landscape_of_graph_related_technologies

Suresnes, Île-de-France, France · [Contact info](#)

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