MoSSEC

A new initiative for sharing Modelling and Simulation information in a collaborative Systems Engineering Context

Adrian Murton
Expert in Modelling and Simulation Collaboration Frameworks
Airbus

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Agenda

- **Why do I need MoSSEC?**

- **What is MoSSEC?**

- **How do I get involved in MoSSEC?**

- **Summary**

Adrian (Ad) Murton

- **BSc Computing & Informatics**

- **BAE SYSTEMS (1986 – 2001)**
    - **Corporate Research Centre**
    - **Led Concurrent Engineering research team**

- **Airbus UK (2001 – present)**
    - **Engineering – Knowledge Based Engineering**
    - **ICT – Product Line Manager**
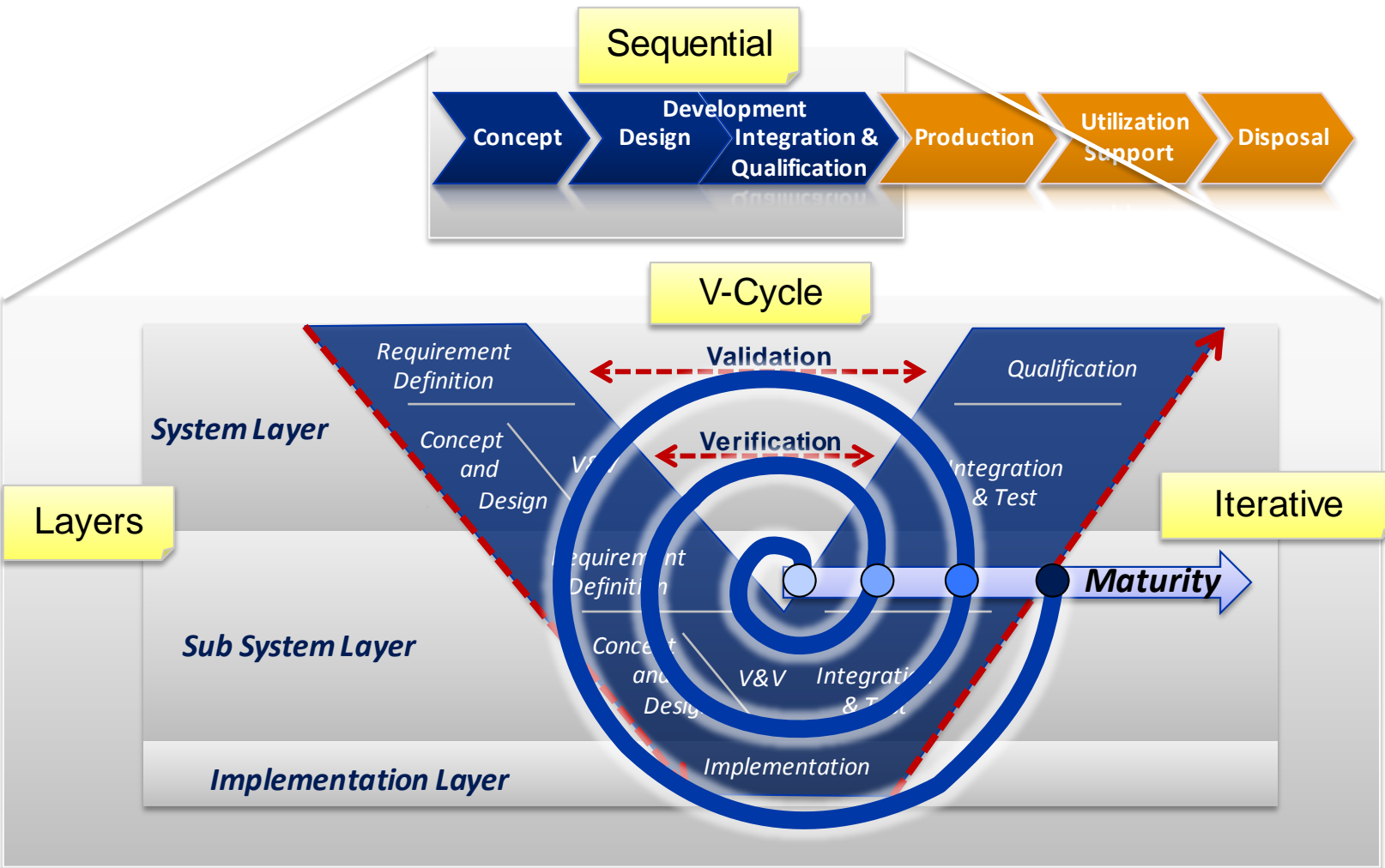   - **Engineering – Simulation Projects**

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Lifecycle of "System of Interest"

Sequential

| Concept | Development Design | Development Integration & Qualification | Production | Utilization Support | Disposal |

V-Cycle

Layers

Iterative

System Layer

Sub System Layer

Implementation Layer

Requirement Definition

Concept and Design

V&V

Validation

Verification

Qualification

Integration & Test

Requirement Definition

Concept and Design

V&V

Integration & Test

Implementation

Maturity

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Lifecycle of "System of Interest"

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V-Cycle

Layers

System Layer

Requirement Definition — **Validation** — Qualification

Concept and Design

Verification

Integration & Test

Iterative

To develop highly complex systems also involves **multiple partners** using **different platforms** in **different locations**.

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Challenges for distributed systems engineering

- **Distributed Infrastructure**
  - Secure Collaboration for:
    - Locations
    - Organisations
    - Software Platforms

- **Distributed Processes**
  - Multitude of Modelling and Simulation tools

- **Distributed Data**
  - Modelling and Simulation data
  - V-cycle meta-data
    - (who what when where how why etc)
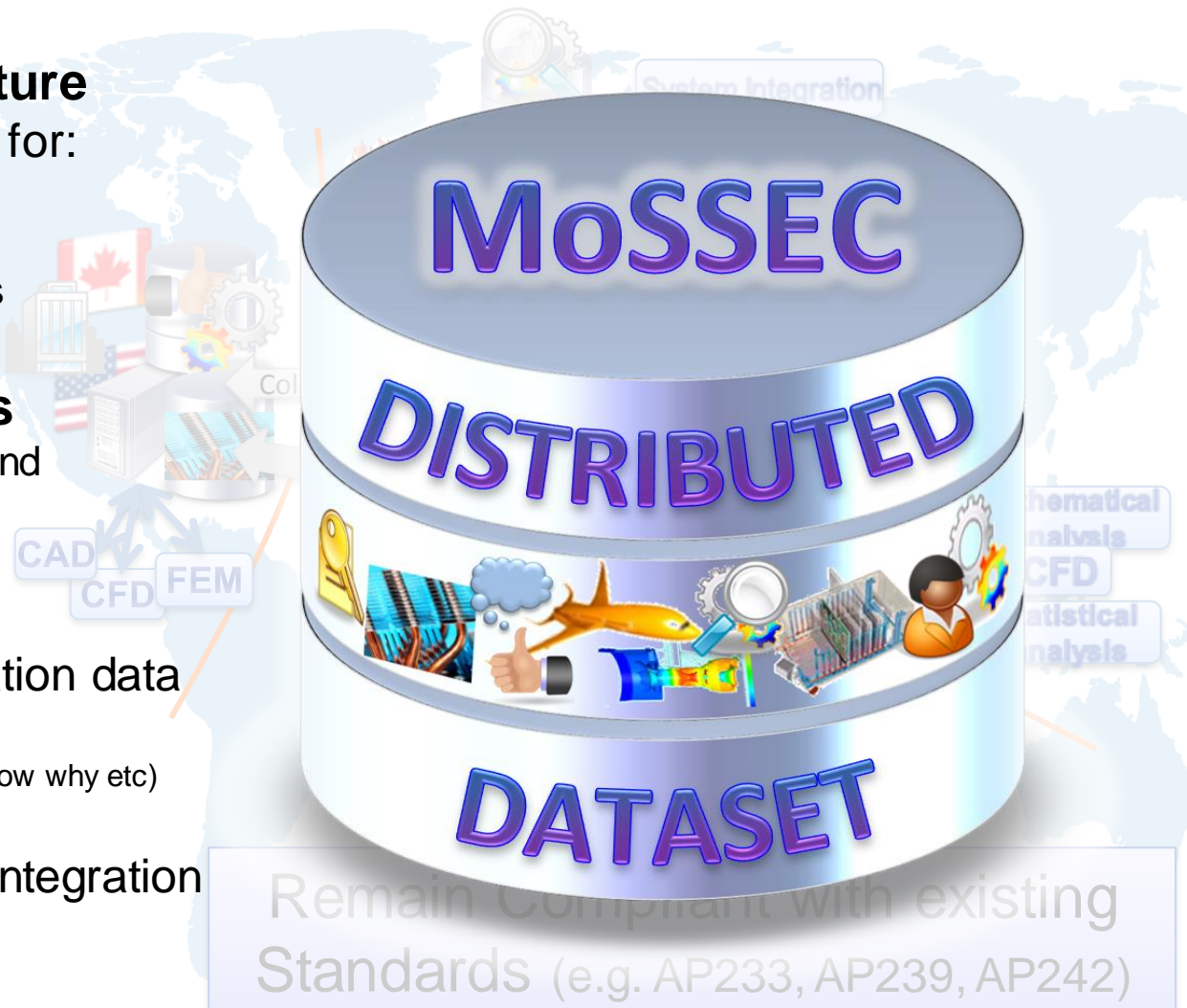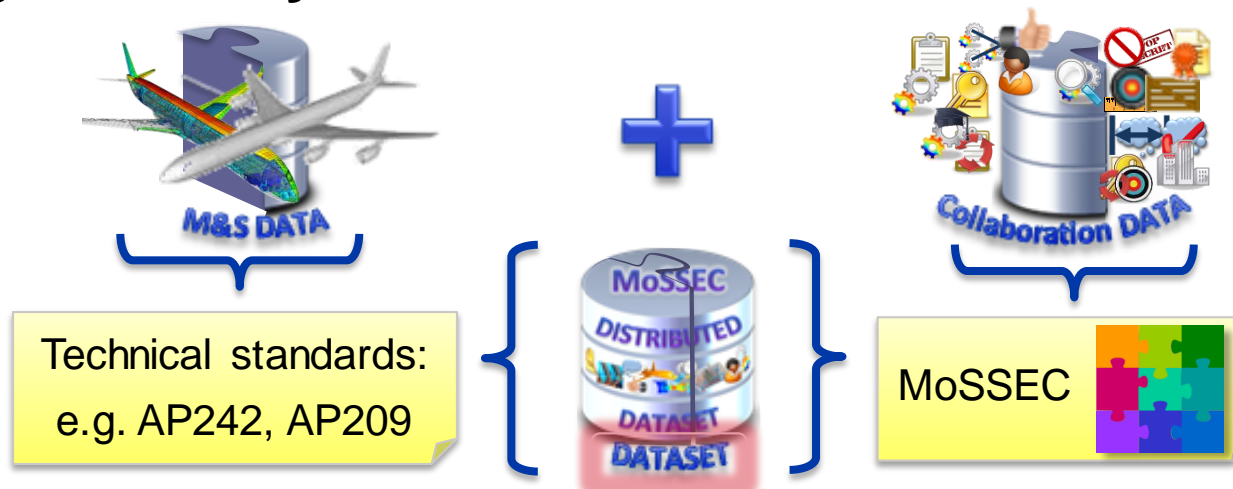 - Efficient sharing, synchronisation and integration

System Integration
CAD
Reqts Mngmt
Project planning

Collaboration Services

CAD
CFD FEA

Mathematical analysis
CFD
Statistical analysis

Remain Compliant with existing Standards (e.g. AP233, AP239, AP242)

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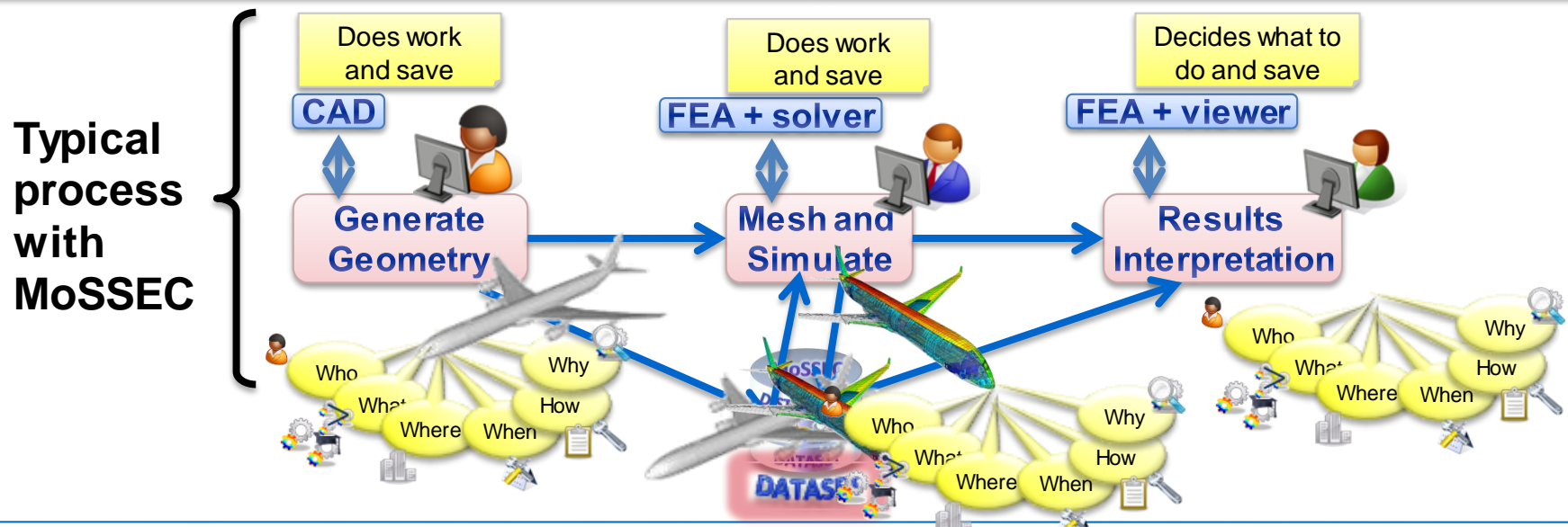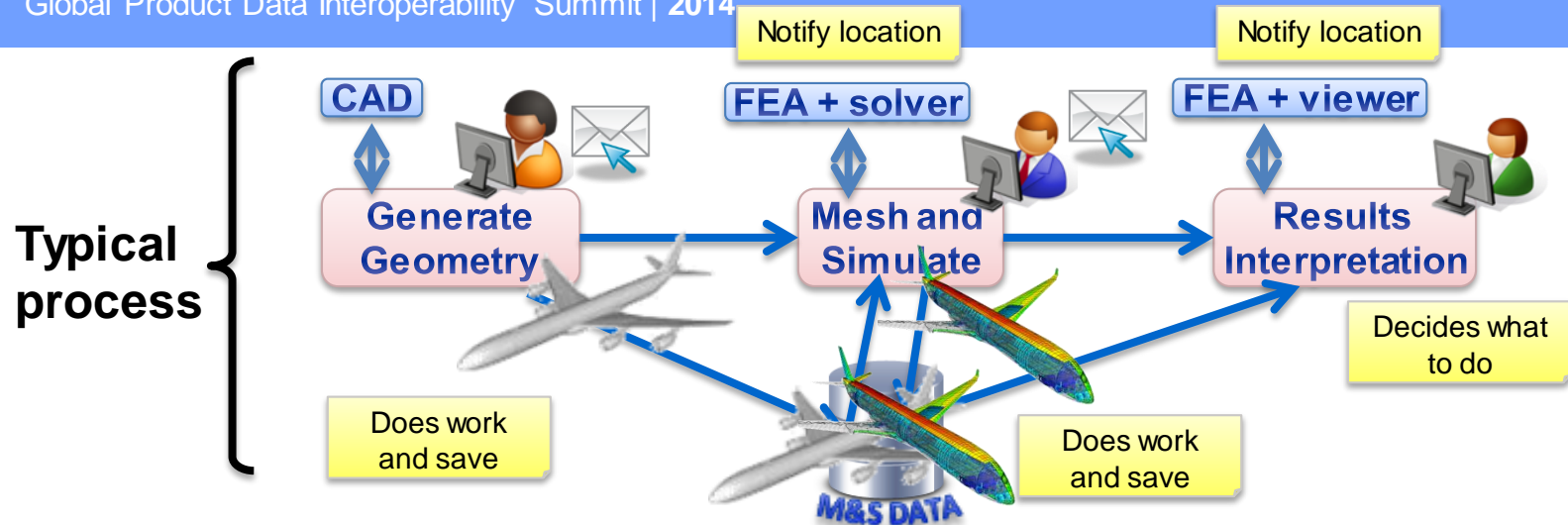 - Efficient sharing, synchronisation and integration

MoSSEC

DISTRIBUTED

DATASET

Remain Compliant with existing Standards (e.g. AP233, AP239, AP242)

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Collaboration vs Modelling & Simulation Data

- ## Modelling and Simulation data
  - ### Managed in the PLM/M&S systems
  - ### Exchanged with technical standards

- ## Collaboration data
  - ### Managed by MoSSEC Compliant Tools
  - ### Exchanged with MoSSEC services

- ## Together they enable the distributed dataset

Technical standards:
e.g. AP242, AP209

MoSSEC

How is it used in practise

Typical process

Notify location

CAD

Notify location

FEA + solver

FEA + viewer

Generate Geometry

Mesh and Simulate

Results Interpretation

Does work and save

M&S DATA

Does work and save

Decides what to do

Typical process with MoSSEC

Does work and save

Does work and save

Decides what to do and save

CAD

FEA + solver

FEA + viewer

Generate Geometry

Mesh and Simulate

Results Interpretation

Who   Why
What   How
Where   When

Who   Why
What   How
Where   When

DATASET

Who   Why
What   How
Where   When

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How is it used in practise - distributed

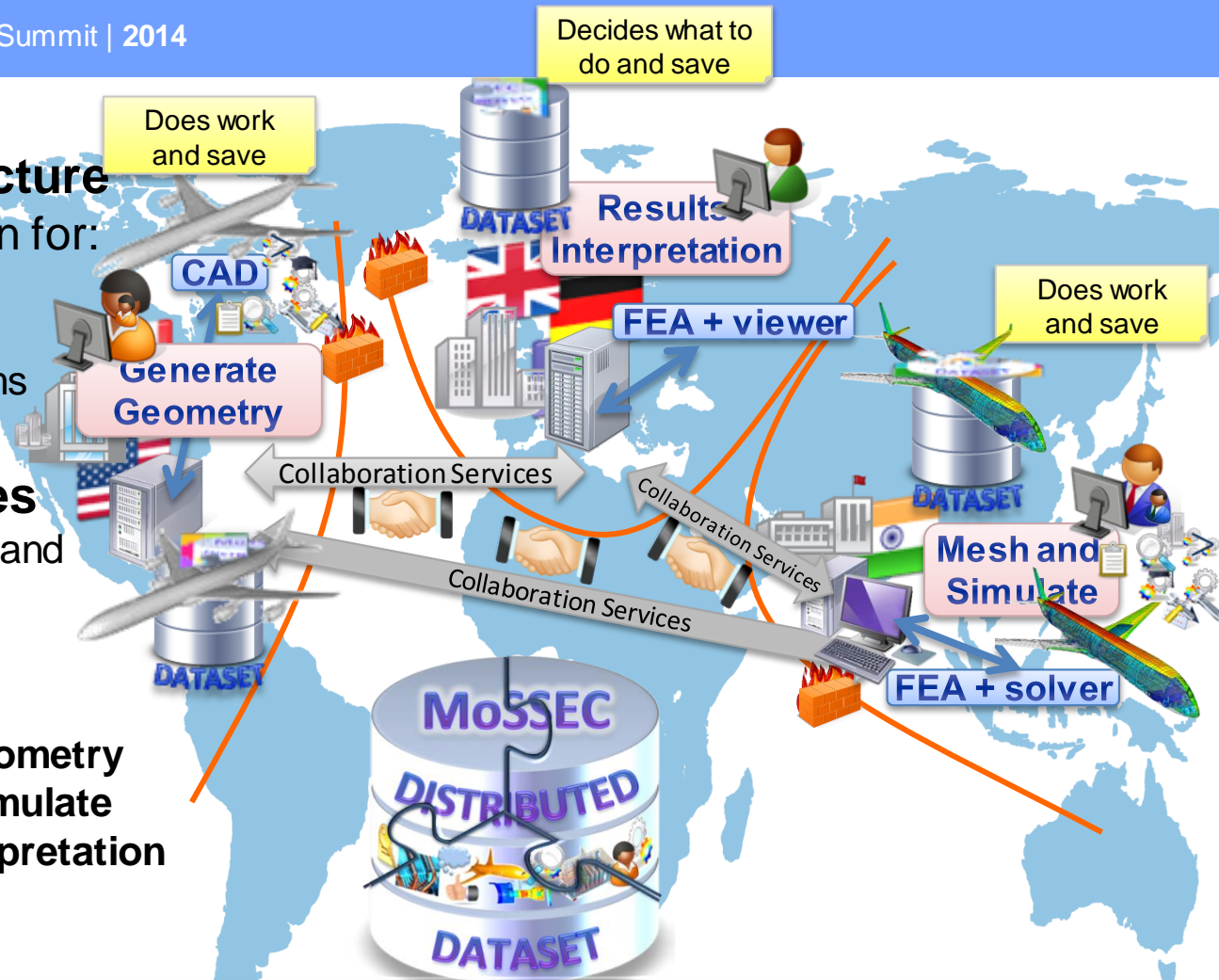- **Distributed Infrastructure**
  - Secure Collaboration for:
    - Locations
    - Organisations
    - Software Platforms

- **Distributed Processes**
  - Multitude of Modelling and Simulation tools

- **Distributed Dataset**
  - **Step1 – Generate Geometry**
  - **Step2 – Mesh and Simulate**
  - **Step3 – Results Interpretation**

Does work and save

Decides what to do and save

Results Interpretation

CAD

Generate Geometry

FEA + viewer

Does work and save

Collaboration Services

Mesh and Simulate

Collaboration Services

FEA + solver

MoSSEC DISTRIBUTED DATASET

The MoSSEC structure and services enable the distributed dataset

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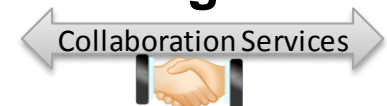
Agenda

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MoSSEC: a common approach based on standards

- ISO 10303-233 Systems Eng.
- ISO 10303-239 PLCS

Structured By

Exposed As

Defined By

MoSSEC Business Object Model
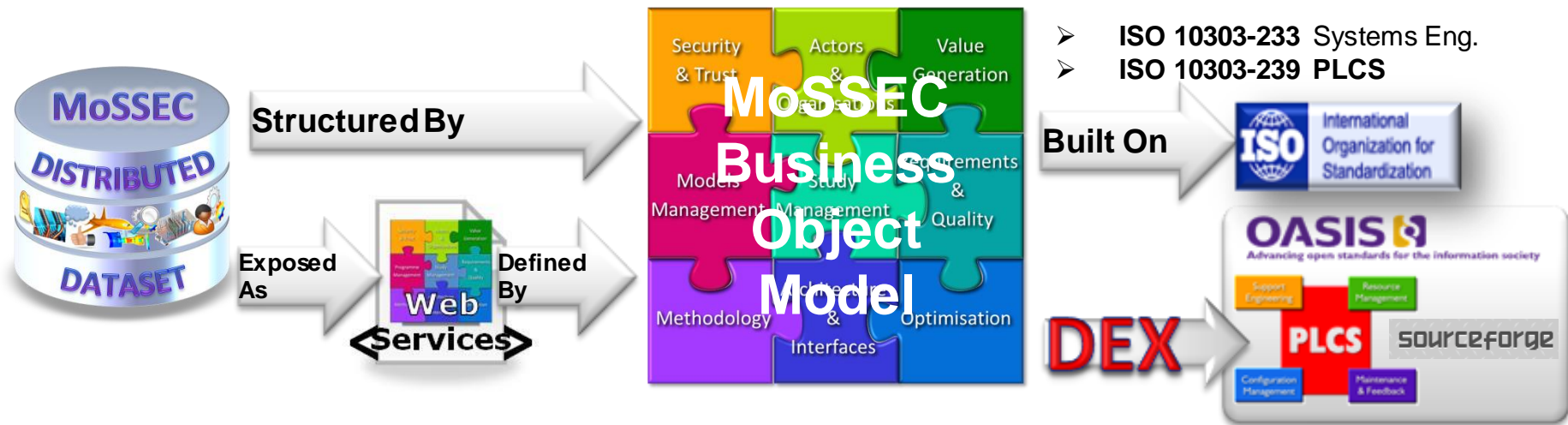
Built On

- **MoSSEC provides a common approach for:**
  - **Structuring the Distributed Dataset**
  - **Structuring the Information Services for Dataset Management**
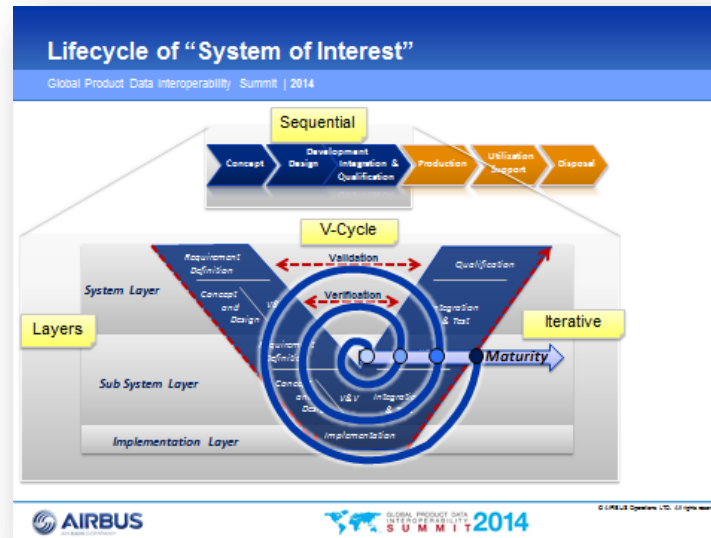
- **MoSSEC is built on ISO standards**

MoSSEC Business Object Model coverage

Organizations
Persons

Expectations,
Needs and Goals,
Value Creation Strategy…

Contracts
Access rights
Security classification…

TOP SECRET

Security & Trust

Actors & Organisations

Value Generation

Networks
Models
Key Values…

Models Management

Study Management

Requirements & Quality

Requirements and Approvals
Assumptions and Justifications
Quality Gates and Reports…

Templates
Methods
Libraries…

Methodology

Architecture & Interfaces

Optimisation

Templates
Objectives
Variables…

Connections,
Components
Breakdowns…

Studies
Objectives
Concepts…

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MoSSEC Business Object Model coverage

Lifecycle of "System of Interest"

MoSSEC enables capture of data throughout the Lifecycle of the "System of interest"

Security & Trust — Actors & Organisations — Value Generation — Models Management — Study Management — Requirements & Quality — Methodology — Architecture & Interfaces — Optimisation

Why not just use the ISO standards?

PLCS (ISO 10303-239) is generic, flexible, and designed to be extended and specialised therefore:

➔ *MoSSEC Business Object Model provides usage guidance to explain how the standard is used in context*

➔ *MoSSEC Services are at a higher level than the standard, so are more efficient*

MoSSEC Business Object Model

SysML Mapping

ISO 10303-233/239

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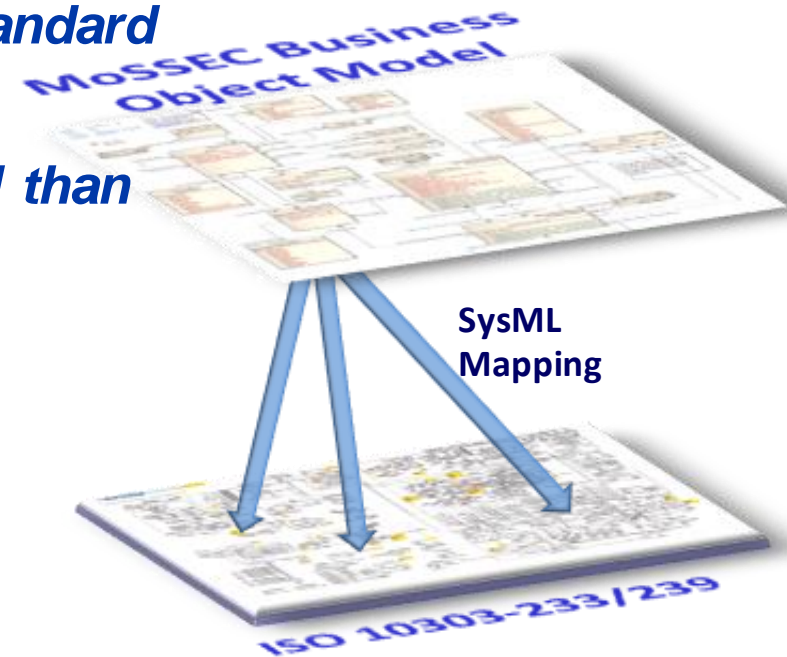
MoSSEC Business Object Model defined with SysML

Summary View

Detailed Block Diagrams
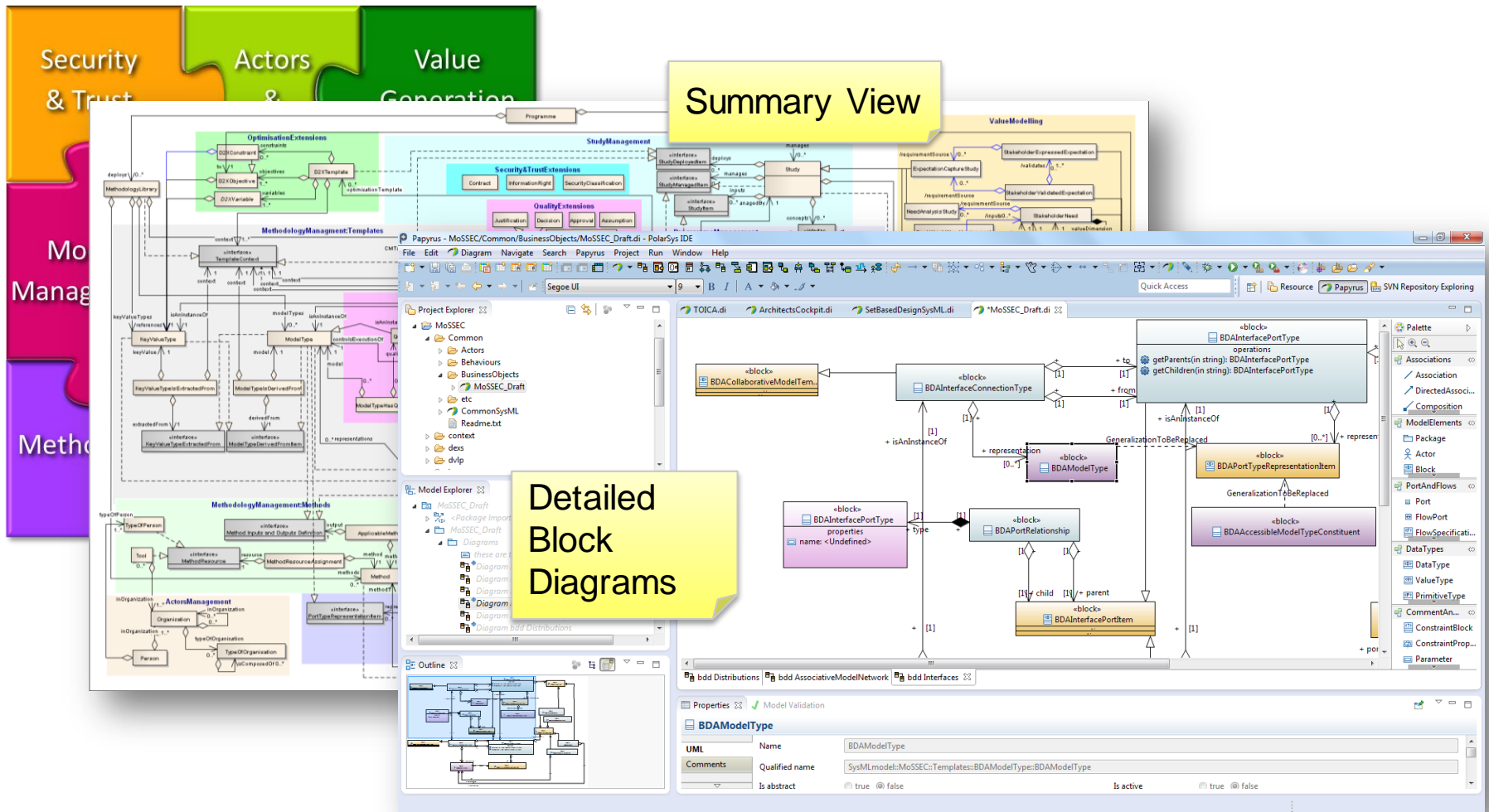
MoSSEC mapped to Standards with SysML in PLCSLib

SysML Parametric Diagram for each Business Object, with binding connectors to specify how attributes or properties are represented using PLCS objects

Viewed in Parametric Diagram

Each object expressed as a template

Templates contain how represented with PLCS
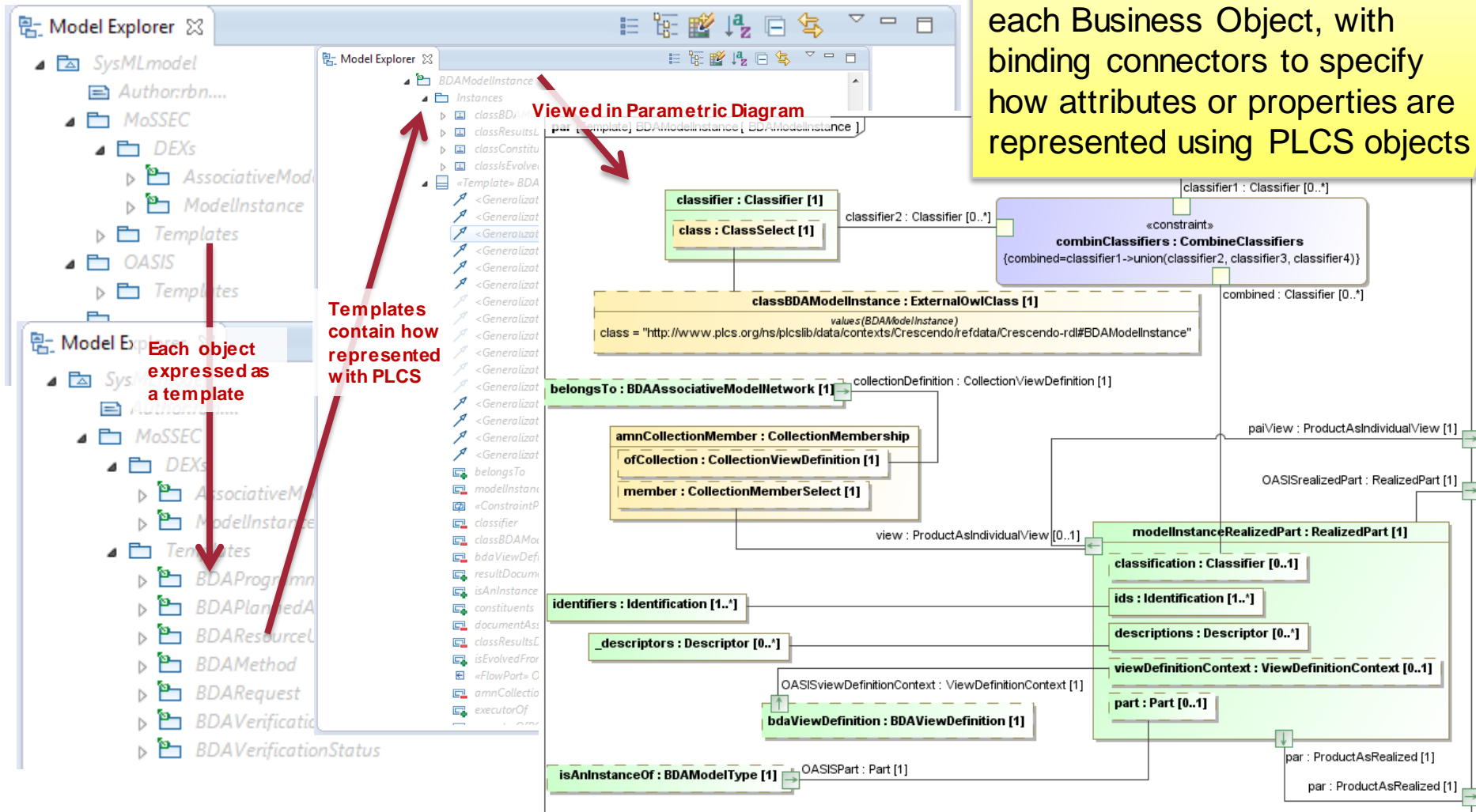
MoSSEC via Data Sharing

MoSSEC Templates

MoSSEC Data Exchange [DEX] specification

MoSSEC Web Services specification

- **Data Sharing (Web services)**

  - **Defined using WSDL + XSD**

  - **Management of WSDL: To be Defined**
    - (e.g. OASIS PLCS, OASIS OSLC, OMG, ISO TC184SC4)

using e.g. file transfer

Data **shared** using Web services

Collaboration Exchange

Collaboration Services

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MoSSEC via Data Exchange

MoSSEC Templates

MoSSEC Data Exchange [DEX] specification

Data **exchanged** using e.g. file transfer

Collaboration Exchange

• **Data Exchange (file based)**

  • **Baseline: DEXs to use OASIS PLCS PSM templates**

  • **Recommended practices (formal mapping of information model to underlying OASIS PLCS Standard)**

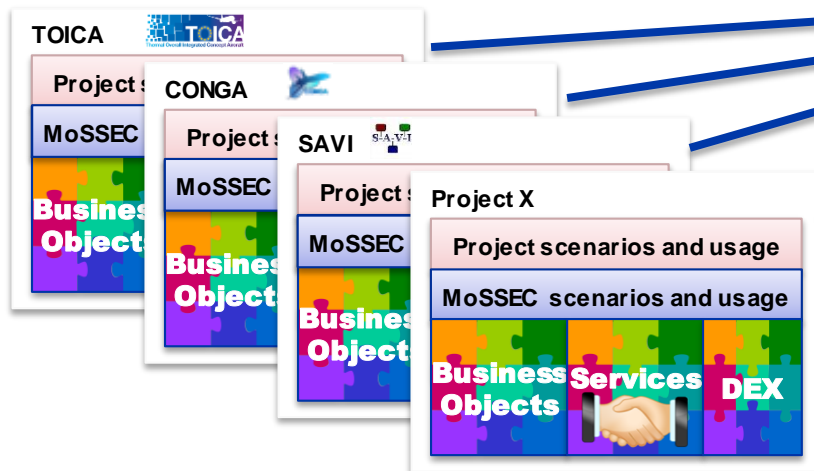 • **Target: DEXs to be based on ISO AP239 Ed 3 (assuming this happens – TBD)**

MoSSEC Evolution and Development

- **Using a MBSE approach**
  - **Captured using Polarsys**

- **Utilised by projects**

- **Contributions from Projects consolidated**

Public access
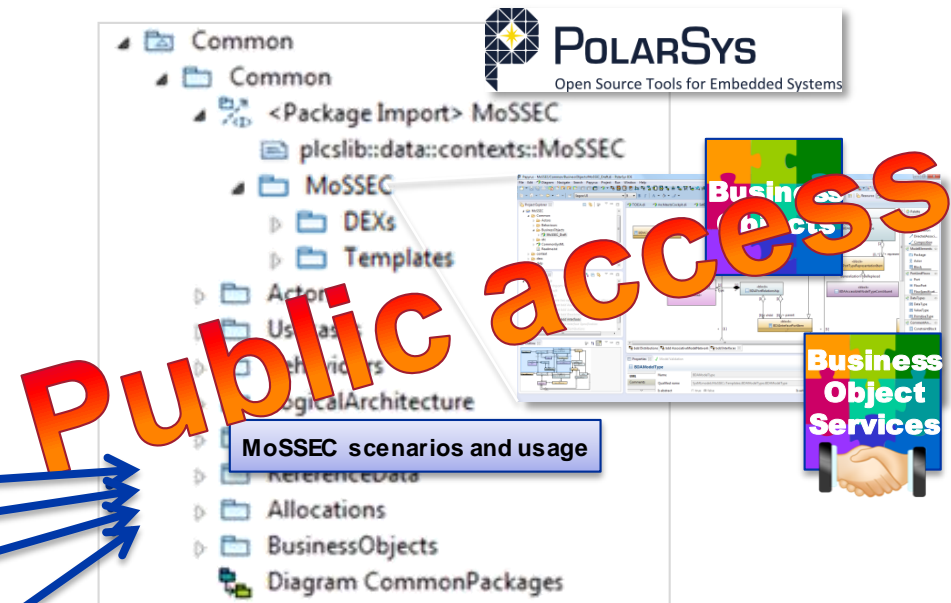
More projects are welcome to join and contribute.

# MoSSEC: Current and previous case studies

- **CRESCENDO** *Collaborative and Robust Engineering using Simulation Capability Enabling Next Design Optimisation – 59 partners*
  - **Thermal Aircraft**
  - **Power-plant integration**
  - **Energy Aircraft**
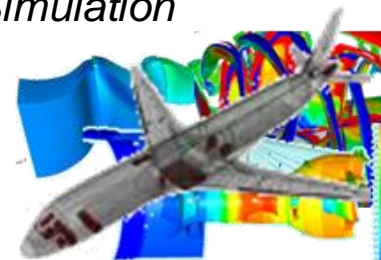
- **TOICA** *Thermal Overall Integrated Concept Aircraft – 30 partners*
  - **Dynamic Aircraft Thermal Architectures**
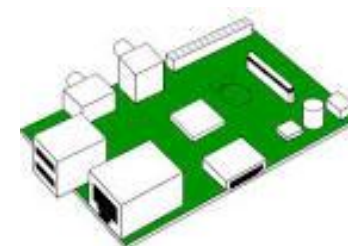   - functional, physical, zonal, logical…
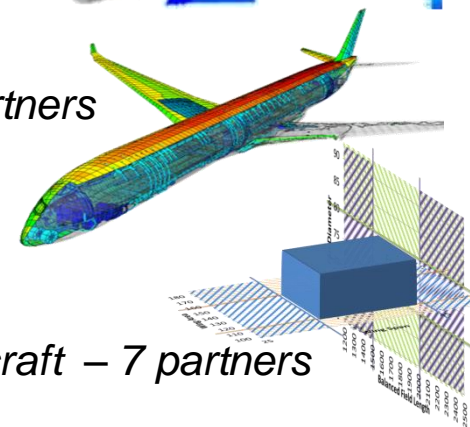
- **CONGA** *Configuration Optimisation of Next Generation Aircraft – 7 partners*
  - **Set Based Design**

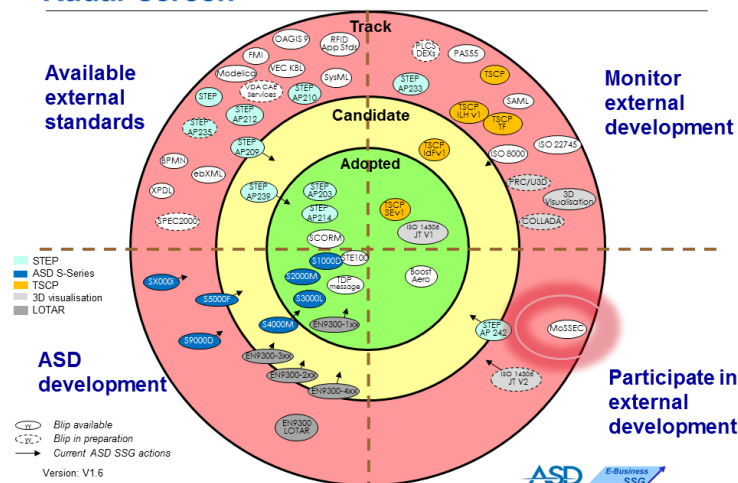- **SAVI** *System Architecture Virtual Integration – 11 partners*
  - **Printed Circuit Boards**

Vendor involvement

- **Vendors are active in evolving and implementing the standard as part of ongoing research projects**

- **Vendors involved include:**

    - **Dassault Systèmes**
    - **Eurostep**
   - **MSC**
    - **Siemens**

A MoSSEC distributed dataset will only happen if vendors implement clients and servers

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Status

- # First version released through:
  - ## CRESCENDO project

- # Utilised and evolved through:
  - ## TOICA, CONGA and SAVI projects

- # Presented to:
  - ## PDES & ProSTEP

- # Support for MoSSEC from:
  - ## *AeroSpace and Defence Industries Association of Europe Strategic Standardization Group [ASD SSG]*

- **Agree scope of MoSSEC releases**

- **Create the relevant modelling, documentation and usage guidelines**

- **Push through the relevant standards bodies**

- **Agree the governance for the standard**

- **Promote approach**
  - **Internal to your companies**
  - **With your vendors**
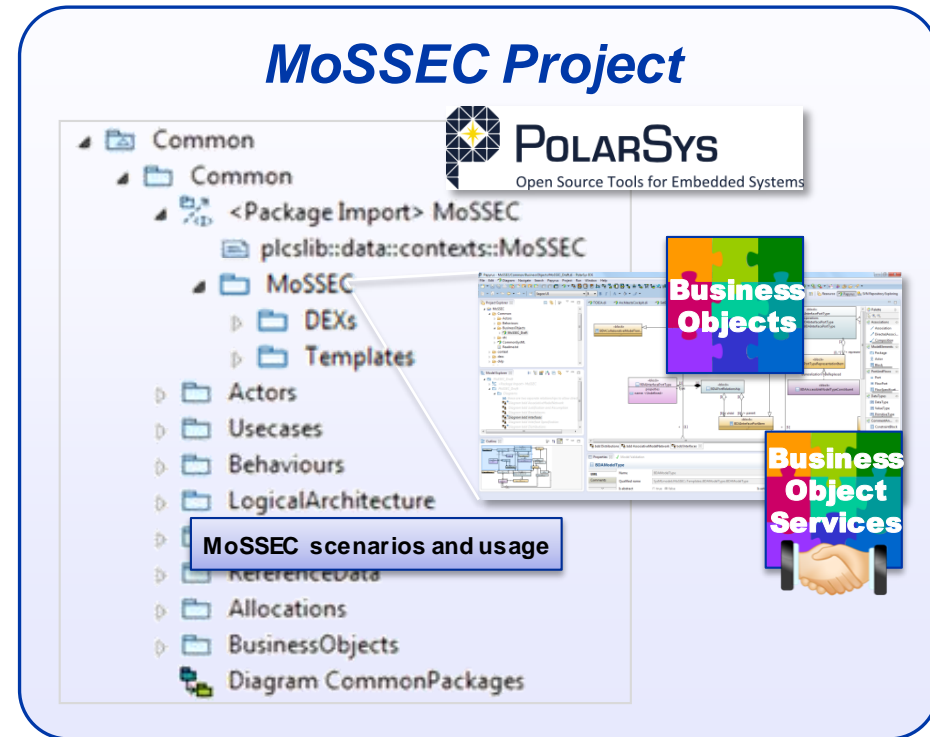
MoSSEC Project

Agenda

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Involvement: Access MoSSEC information

- **ASD-SSG website**
  - http://www.asd-ssg.org/asd_ssg_standards
  - **Overview**
  - **WSDL + XSD**
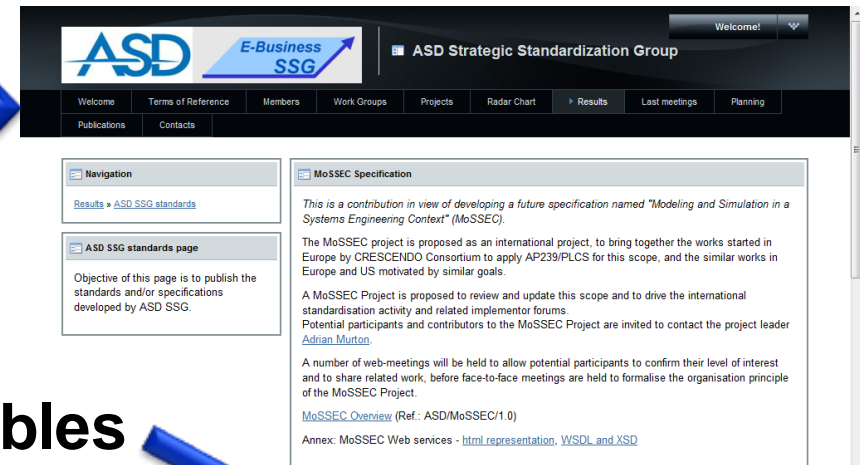
- **CRESCENDO public deliverables**
  - http://www.crescendo-fp7.eu
  - technical documentation downloads
    - UML model
    - Descriptive documentation
    - Deployment guide

- **Contact:**
  - adrian.murton@airbus.com

Involvement: Review the MoSSEC information

- **Do you agree with the scope of MoSSEC?**
  - **What is missing?**

- **Do you agree with the Object Model definitions?**
  - **How can they be improved?**

- **Do you agree with the way information is modelled?**
  - **How can it be improved?**

- **Does the user documentation make sense?**
  - **What topics could be improved?**

- **Discuss the approach with your vendors**
  - **Do they support it?**

Involvement: Attend the Project Kick Off Meeting

- **Agree initial kick off meeting:**
    - **Date: ???**

- **Agenda:**
    - **Context of the MoSSEC project**
    - **Overall planning of the standard versions**
    - **Overview of the main components**
    - **Organization of bi weekly teleconference**
    - **Preparation of a kick off international MoSSEC workshop**
    - **Consolidation of the draft list of participants**
    - **Duration: 1h30 to 2 hours**

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Summary

- **Why do I need MoSSEC?**

    ➢ *Industrialists*:

    - ➢ To provides a platform independent approach to structuring and accessing a distributed dataset

    - ➢ To enable Modelling and Simulation in a collaborative Systems Engineering Context

    ➢ *Vendors*:

    - ➢ To provide access to data and processes in other vendor platforms with one set of services

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Summary

- ## What is MoSSEC?

    - ➢ A SysML based definition of business objects and services extending/specialising ISO 10303-233 *(Systems Engineering)* and -239 *(PLCS)*

    - ➢ A proposed project launched to further develop the definitions

- ## How do I get involved in MoSSEC?

    - ➢ Use and contribute to the evolving publicly available definitions and usage guides

    - ➢ Join the kick off meeting of the proposed MoSSEC project

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