

3DEXPERIENCE



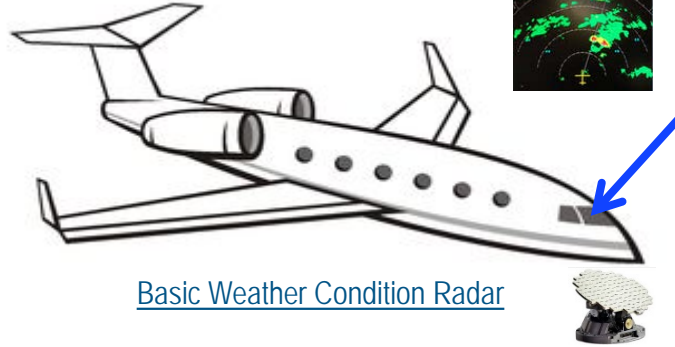
3DEXPERIENCE Platform &
Ellidiss Software AADL Inspector
5 October 2016

Franck Corbier – Dassault Systèmes
Pierre Dissaux – Ellidiss Software
Garrett Thurston – Dassault Systèmes

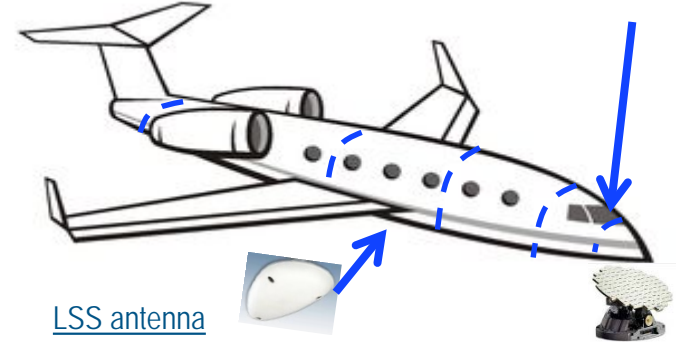
Context: Lightning Sensor System (LSS) capability & modification

Dedicated pages on cockpit screens

Primary Display Unit (PDU) screens & data fusion

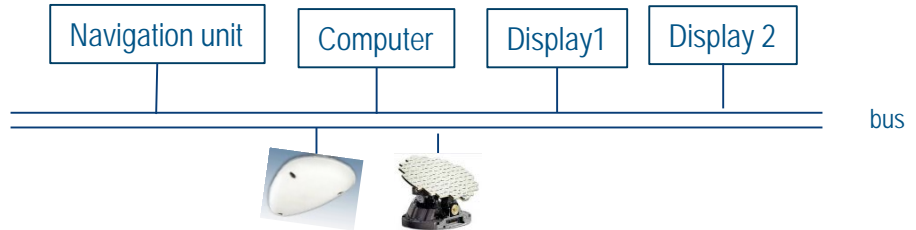
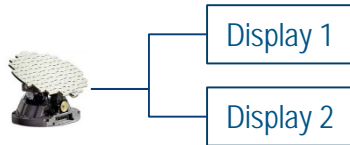


Basic Weather Condition Radar



LSS antenna

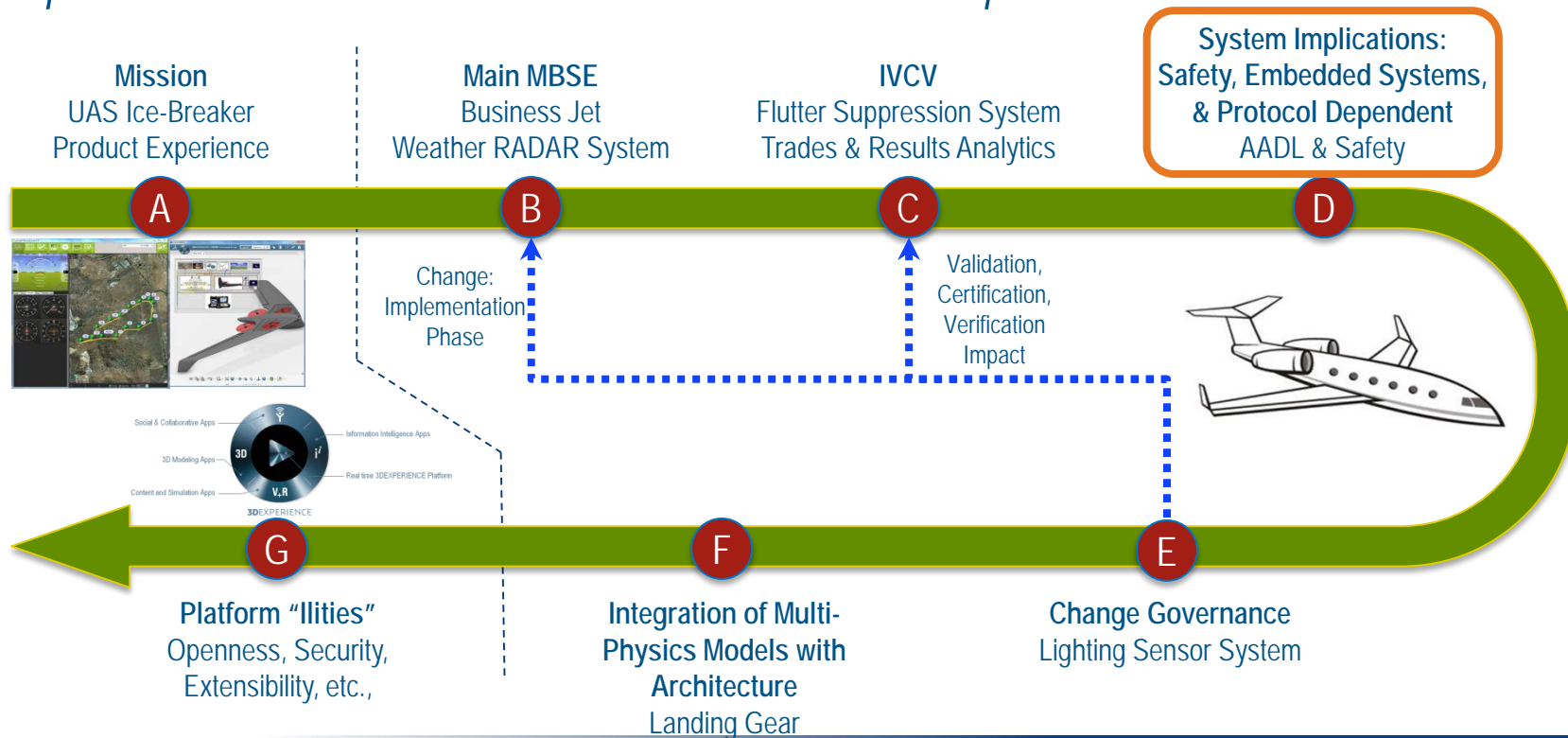
Basic Weather Condition Radar



bus

High Level DS Scenarios Organization

Duplication Avoidance: Scenario elements are interdependent.



Architecture is taken to mean: Requirements,
Functional, Logical, Physical, and Integrated Modular

JMR/FVL Stated Values

- ▶ **Approach:** Model-Based Engineering Enhanced Modeling and Simulation Support throughout the Lifecycle
 - ▷ Model-Based Specification & Acquisition for Improved Validity
 - ▷ Enhanced Consistency, Reduced Redundancy, Increased Focus on Ambiguous, Conflicting, or Missing Definition Aspects
 - ▷ Enhanced Tool Interoperability
 - ▷ Enhanced Quality, Communications, and Productivity (reduced churn).
- ▶ **Process:** Architecture-Centric Virtual Integration Process (ACVIP)
 - ▷ Early Identification of Defect and Integration Issues
 - ▷ Single Truth Architecture Models
 - ▷ Mature Tool Usability, and qualification including associated methods and processes
 - ▷ Government—Industry Mutual adoption/Buy-in





- ▶ **Technical Standards and Reuse Basis:** OSA/JCA/FACE/HOST
- ▶ A set of Reference Architectures that Facilitate Good Architecture Principles Practice of Modularity, Functional Isolation, etc.
 - ▷ While Constraining and Enforcing Compliance for Enhanced Evolution Aspects, including decomposition, interfaces, COTS Standards, & Data rights.
 - ▷ Facilitates Commonality, Variability, and Reuse
 - ▷ Facilitates Component-level competition and innovation.

Overview


- ▶ 3DEXPERIENCE platform
- ▶ EEA Application
- ▶ AADL Introduction
 - ▷ Benefits early & enduring timing, fault modeling, error-handling, analysis, etc.
 - ▷ Enablement: Platform, Bus, Thread-level timing simulation, analysis , & code generation
 - ▷ AADL Inspector -- complete AADL model processing toolbox
 - ▶ parse, print, query, constrain, transform
 - ▶ strong relationships with partners in the AADL community who provide advanced AADL tools such as Cheddar (scheduling), Marzhin (simulation) or Ocarina (code generation)
- ▶ The Network LRUs/System Mapping
- ▶ Illustrate the Link between the objects in EEA and AADL
- ▶ Illustrate the EEA-AADL translation
- ▶ Make a snapshot of the results in AADL inspector
- ▶ Demonstrate the Simulation

Presented at:
MSAD Industry Day 2015





**Architecture Centric
Virtual Integration
Process (ACVIP)
Shadow Effort**



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TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



September 3, 2015

Presented by:
Alex Boydston
MSAD Project Engineer
U.S. Army Aviation and Missile Research,
Development, and Engineering Center



ACVIP Process on JCA Demo



DCFM Supplemental Requirements

DCFM EA UML Data Model

MIS Stakeholder Requirements

MIS System Requirements

MIS Rhapsody UML Model

MIS Build 2 Plan (system description)

Assumptions

Conceptual Integration Model

AADL Model Construction In OSATE

Run-time Integration Model

Architecture Led Requirements Specification (ALRS) Analysis

Architecture Led Safety Analysis (ALSA)

Architecture Led Timing Analysis

Requirements Analysis Report & Model

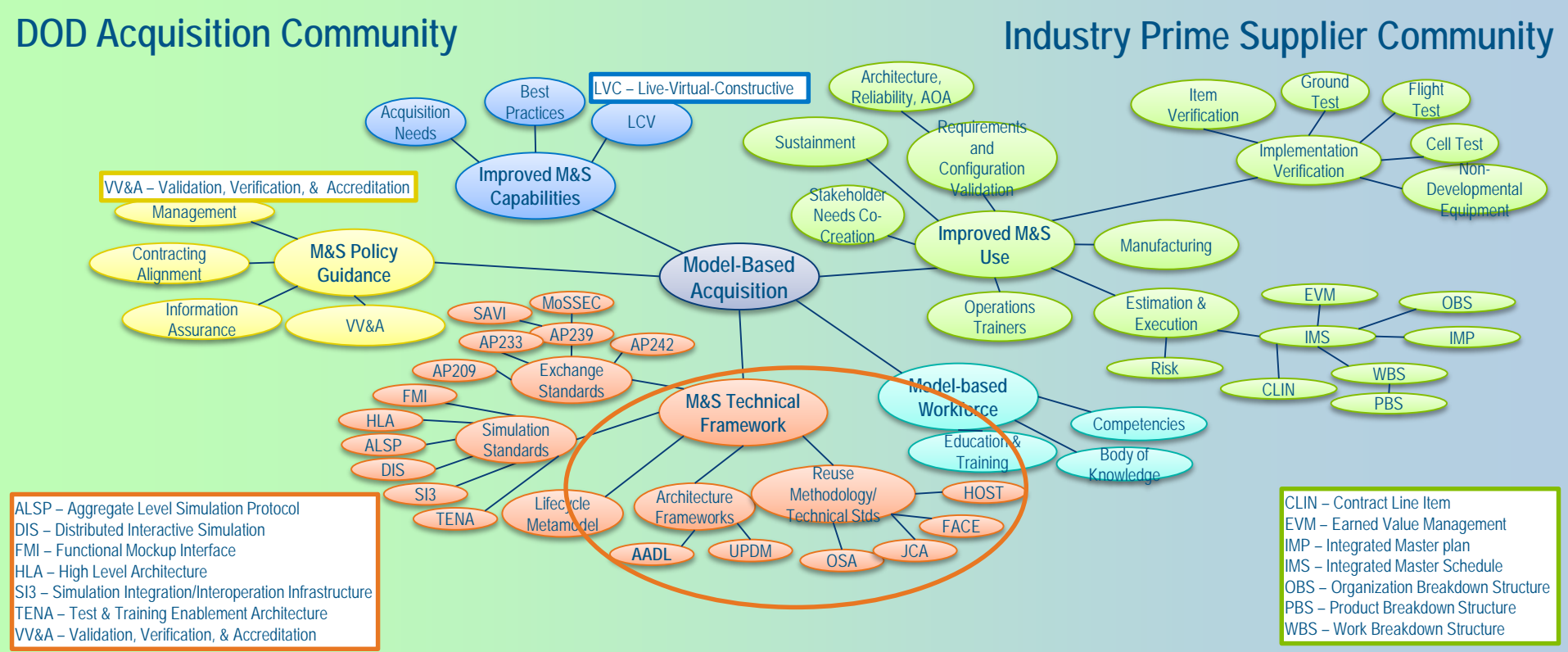
Safety Analysis Report & Model

Timing Analysis Report & Model

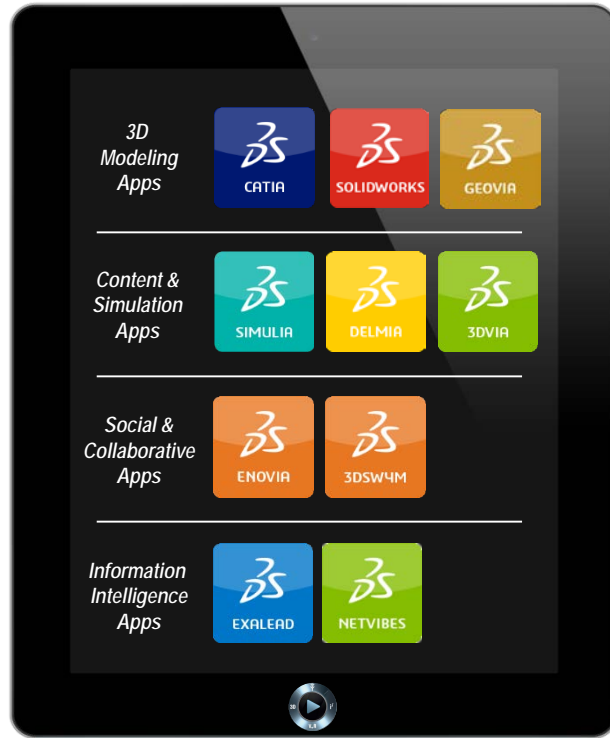
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TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Create the Backbone for MBE while addressing other Competency areas.

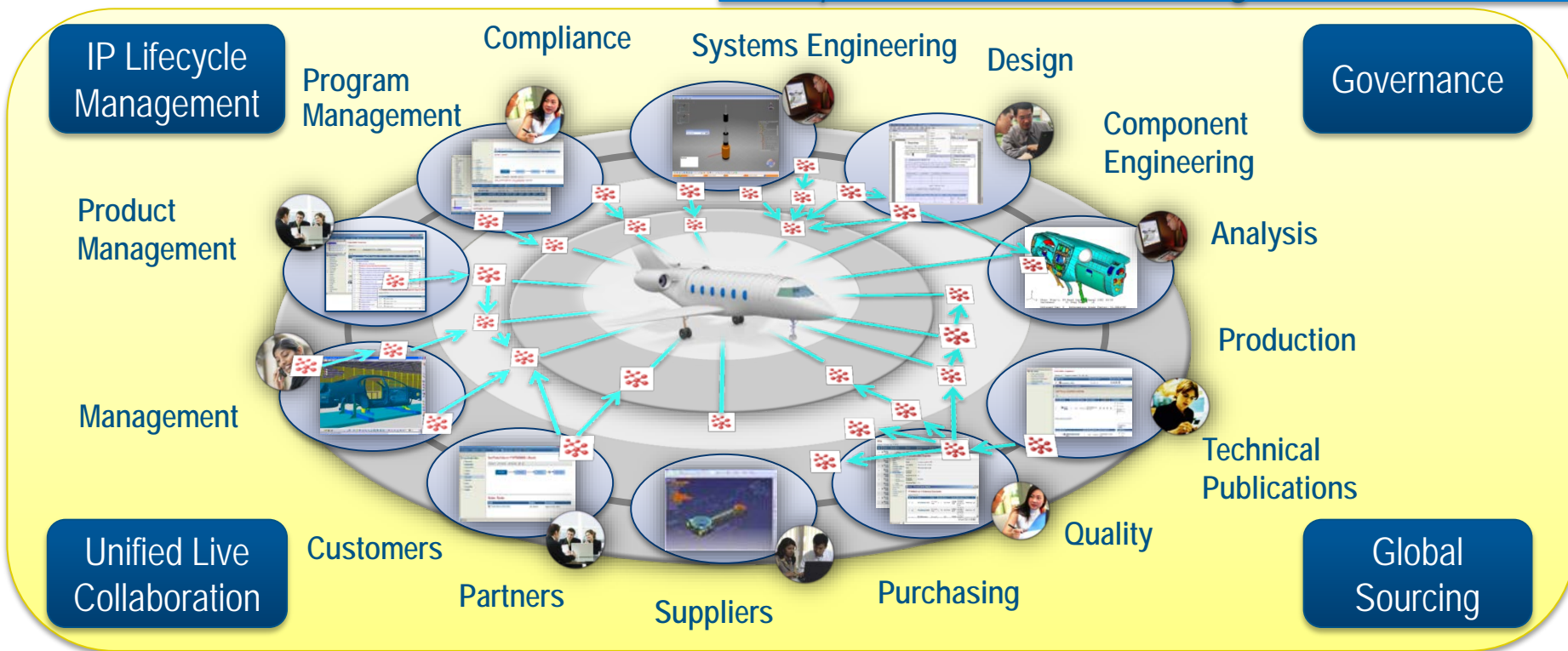


The 3DEXPERIENCE Platform is similar to the iOS



3DEXPERIENCE platform

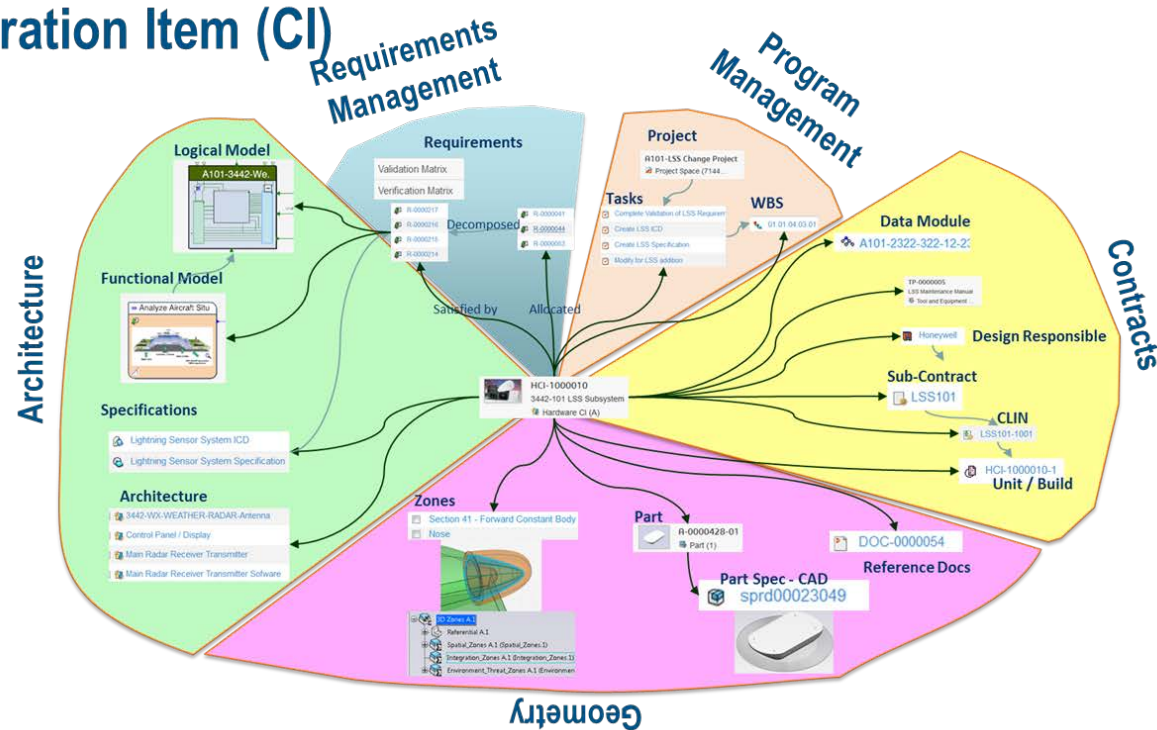
*Single Authoritative Source System of Record →
It is Upon this that is Built the Single Source of Truth*



Platform Applications Provide Multi-Perspective Information Access in Context

One of which is EEA – Electrical & Electronic Architecture

Configuration Item (CI)



3DEXPERIENCE platform for Systems Engineering

3DEXPERIENCE platform for Systems Engineering

Program & Contract management

System Architecture

- Requirements
- Operational
- Functional
- Logical
- 3D Space Allocation

System Navigation & Traceability

Safety

Report Generation

Product Line Variant Management

Embedded Electronics Architecture

Multi Discipline Modeling (Electrical, Fluidic, Mechanical, ..)

Multi-Discipline & Physics Behavior Modeling

Tests Management, Simulation & Optimization

- Performance Study
- Compose
- Run
- Analyze

Object Specialization & Extension

Knowledge & Data Setup

3DEXPERIENCE platform services

- Search & Navigate
- 3DDashboard,
- 3Dspace,
- 3DSearch,
- 6Wtagging,
- 3DPlay,
- 3DModeling
- 3DInstantMessaging
- 3DPassport
- LifeCycle Configuration
- Change management

3DEXPERIENCE OPEN

3D V.R.

ReqIF OSLC STEP

xPDM, xCAD, xECAD, CAA...



Configuration Definition Firm Concepts Authority/Officer Firm Configuration Start/Ready Assembly First Flight Certification/Delivery End of Life

Department	Configuration Definition	Firm Concepts	Authority/Officer	Firm Configuration	Start/Ready Assembly	First Flight	Certification/Delivery	End of Life
Organization	Conceptual Studies	Preliminary Design & Joint Definition		Detailed Design	Manufacturing & Assembly		In-Services Operators & Support	
Management	Sales & Marketing	Program Management						
	Project Management	Change and Configuration Management						
	Quality Management							
Engineering	Requirements Engineering	Concept Development						
	System / Cabin / Installation Engineering							
	Structural Engineering							
	Reliability and Maintainability Engineering							
	Verification and Validation							
Tests & Certification	Test Engineering							
	Ground Tests / Flight Test							
	Safety & Certification (CASR, EASA, FAA, TC, etc.)							
Manufacturing	Manufacturing Planning and Analysis							
	Manufacturing Resource & Logistics							
	Production Operations							
Services & Support	Logistics Support							
	Training, Technical Documentation, Provisioning							
	Performance Analysis & Feedback							
	Equipment Management							
	Dismantling and Recycling							

3D EXPERIENCE SYSTEMS The 3D EXPERIENCE Company

The screenshot displays the 3DEXPERIENCE platform interface, which is organized into several functional areas:

- Top Bar:** Includes the 3D logo, a search bar, and navigation icons.
- Left Sidebar:** Contains a vertical navigation menu with icons for Program & Contract management, System Architecture, Requirements, Operations, Functional, Logical, 3D Space Allocation, Object Specialization & Extension, Knowledge & Data Setup, and Report Generation.
- Main Content Area:**
 - System Architecture:** A central hub for managing the system's structure, including requirements, operations, functional, and logical models.
 - System Navigation & Traceability:** Tools for navigating through the system and tracing the history of changes.
 - Safety:** A dedicated section for managing safety-related aspects of the system.
 - Embedded Electronics Architecture:** Tools for designing and managing embedded electronics systems.
 - Multi Discipline Modeling (Electrical, Fluidic, Mechanical):** Tools for creating and managing multi-disciplinary models.
 - Multi-Discipline & Physics Behavior Modeling:** Tools for simulating and analyzing the behavior of multi-disciplinary systems.
 - Variant management:** Tools for managing different variants of the system.
 - Tests Management, Simulation & Optimization:** Tools for managing tests, running simulations, and optimizing the system.
 - Compose:** A tool for composing and managing system components.
 - Run:** A tool for running simulations and analyses.
 - Analyze:** A tool for analyzing simulation results and optimizing the system.
- Bottom Bar:** Features a large 3D play button icon and a row of logos for various 3DEXPERIENCE services, including xPDM, xCAD, xECAD, xCAA, xPLM, xSPE, and xSTEP.

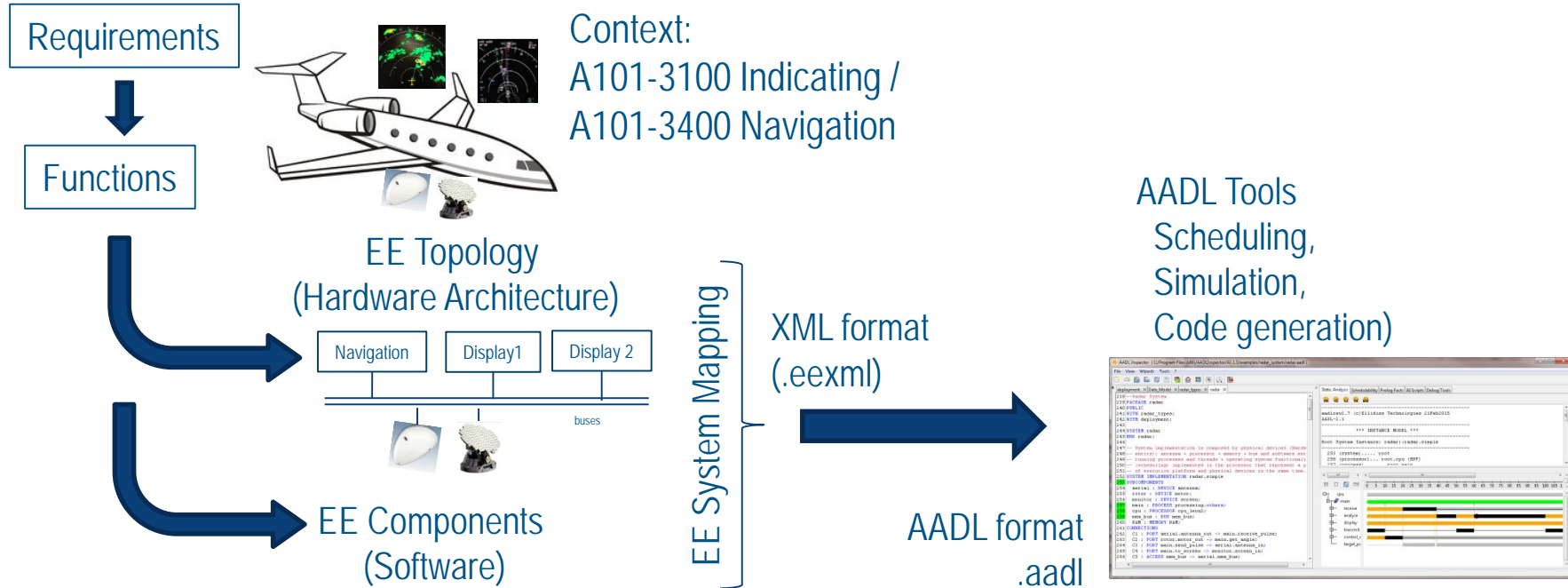


EEA to AADL Values

- ▶ AADL affords Pulling Timing Considerations into the systems level well in advance of the allocation to LRUs and even well in advance to implementation.
- ▶ This affords early exploration of Integrated Modular Avionics approaches, functional allocation based upon a number of architecture considerations including principles of isolation and separation for safety, survivability, etc.
- ▶ Downstream as implementation starts occurring the timing allocations can be managed and if one goes over budgeted trades can be made in the IMA functional distribution to LRUs to explore equally good solutions, and proactively addressing the timing budget issue.

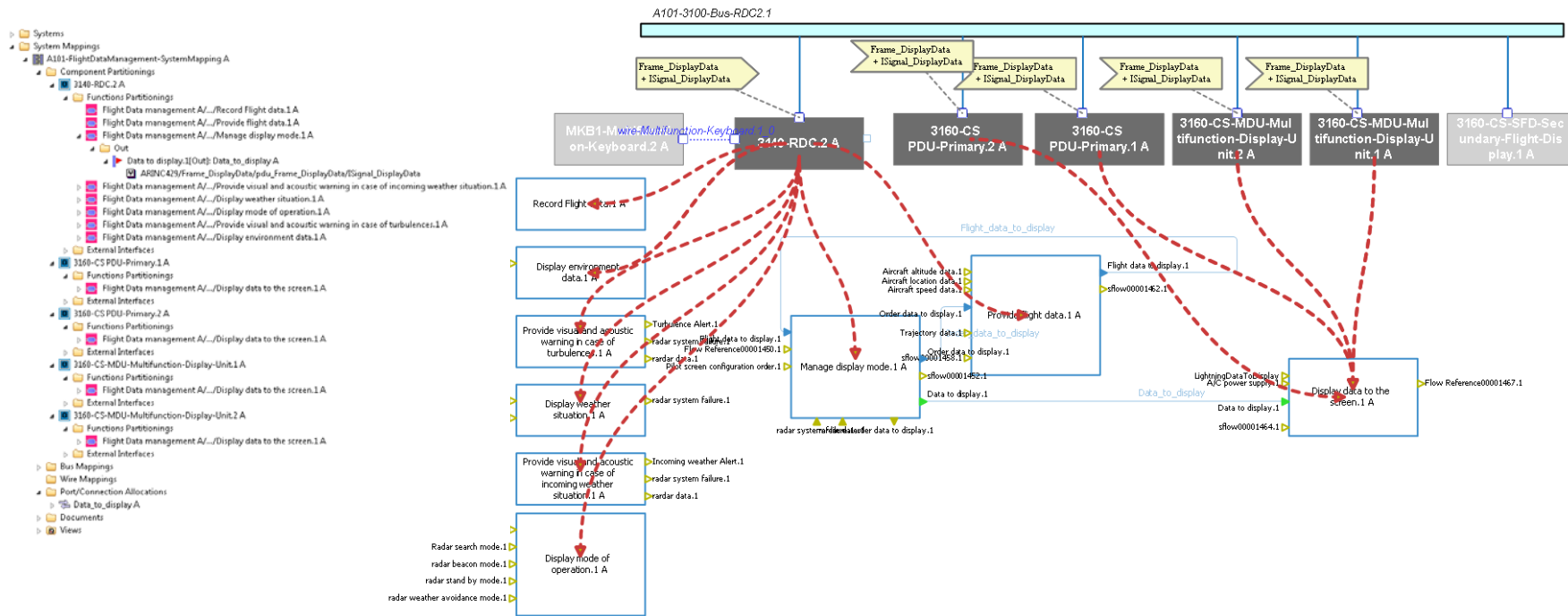
EEA to AADL translator

From System Engineering to Software Engineering



Context: EEA View Flight Data Management

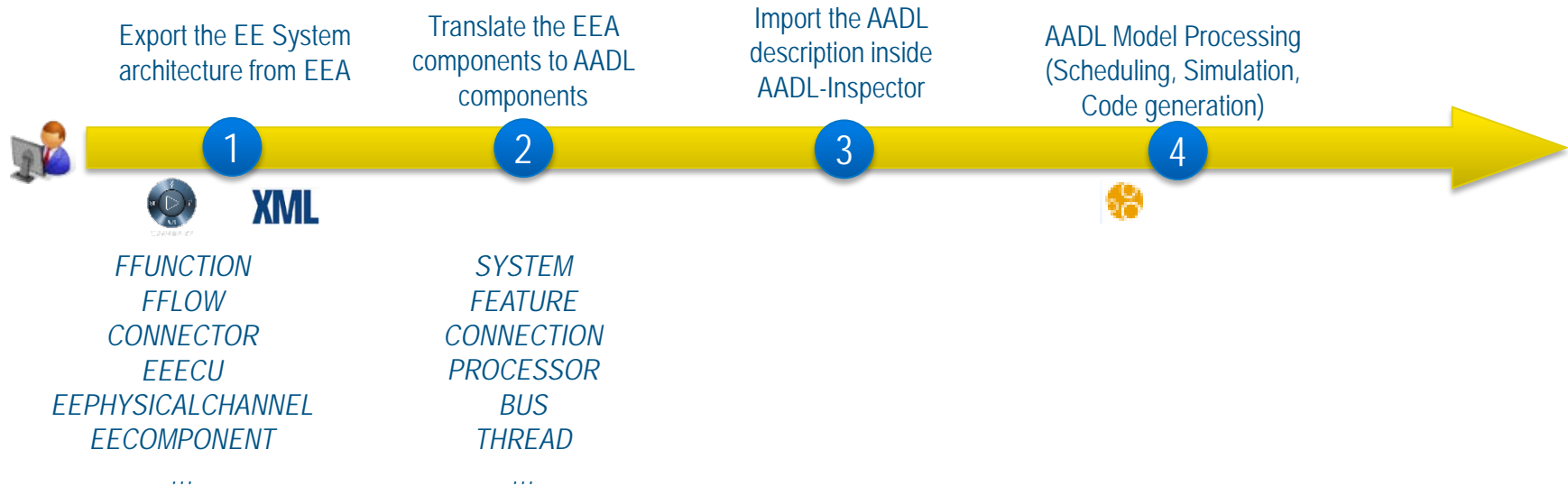
A101-3100 Indicating / A101-3400 Navigation





Global scenario

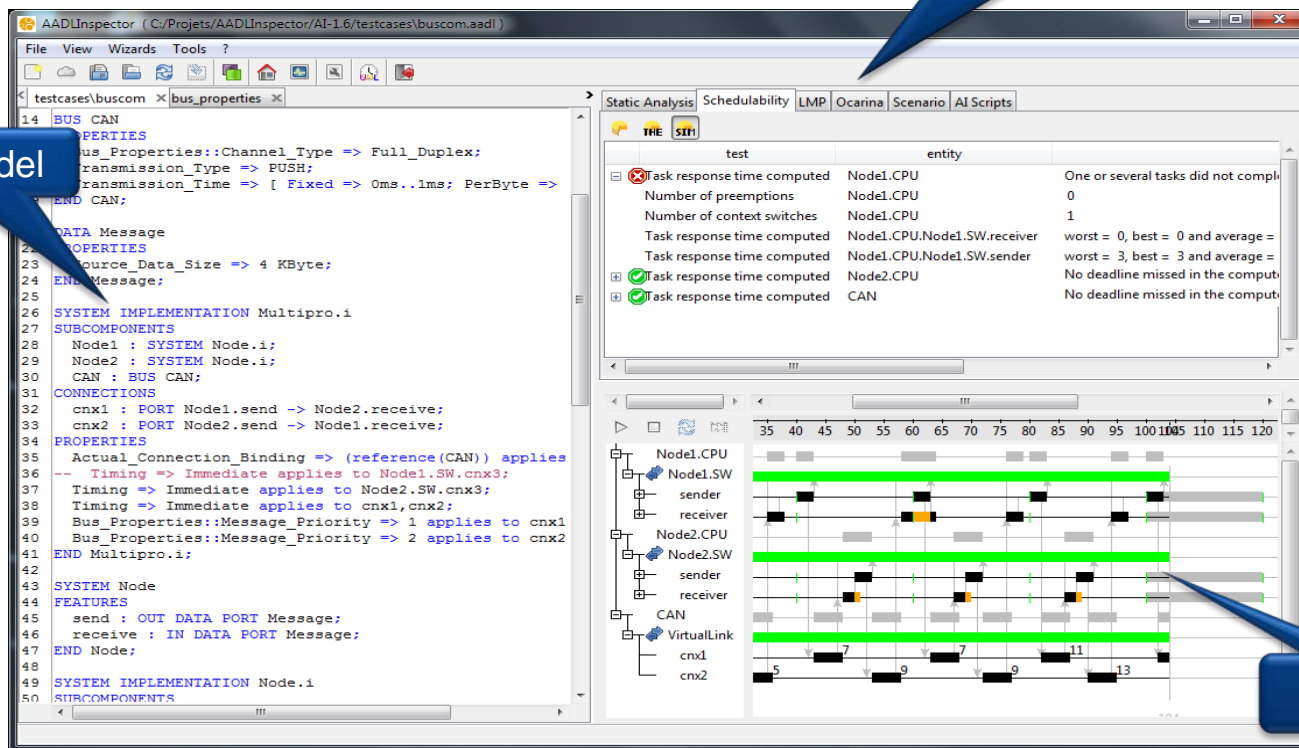
Openness with standard: EEA to AADL



AADL Inspector

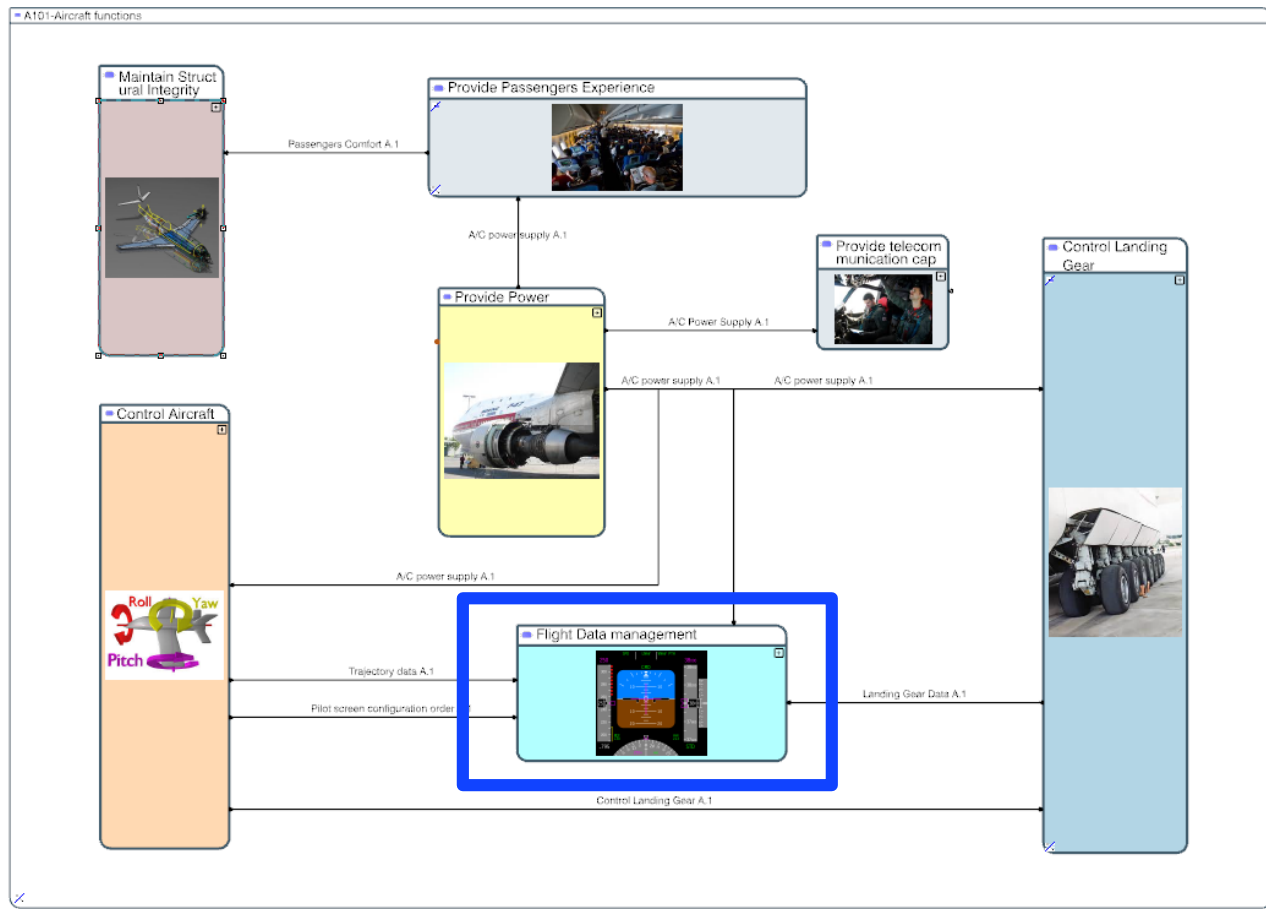
Analysis plugins

AADL model

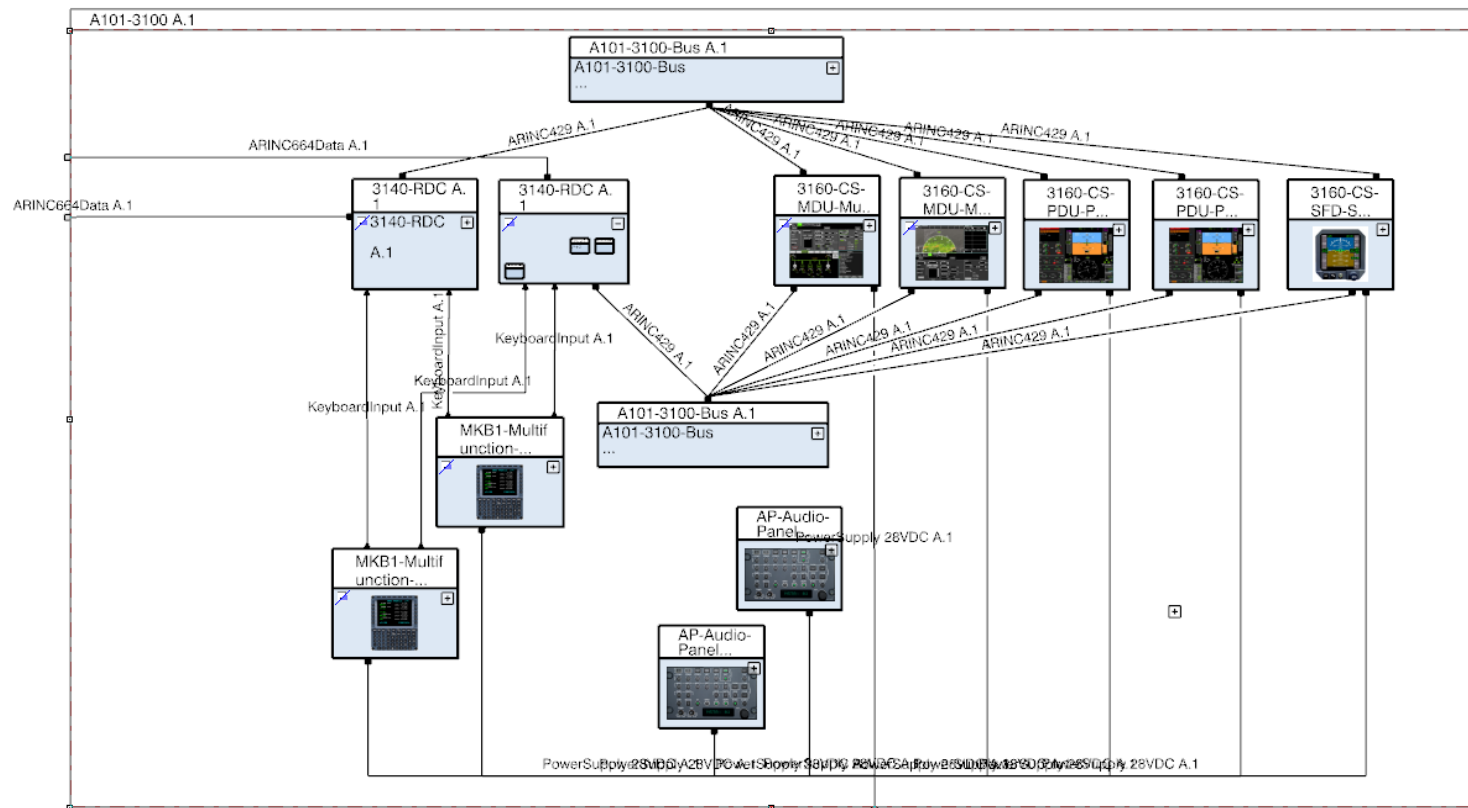


Simulation

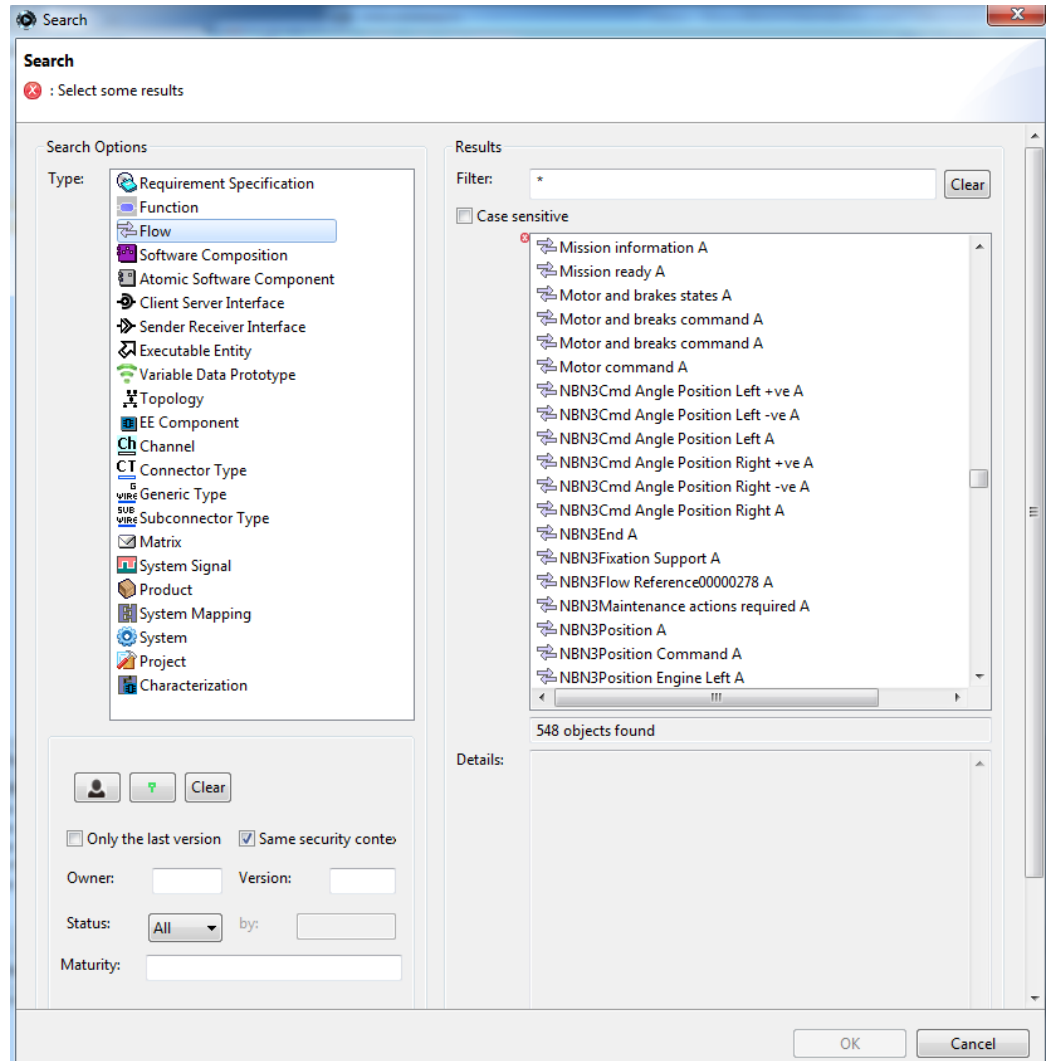
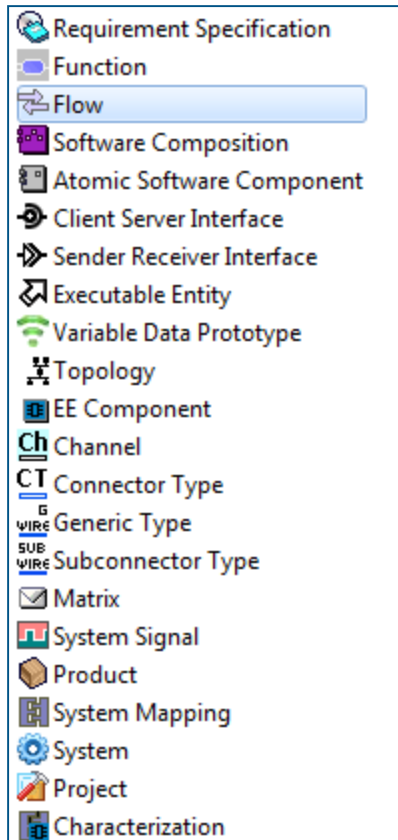
Aircraft Functions



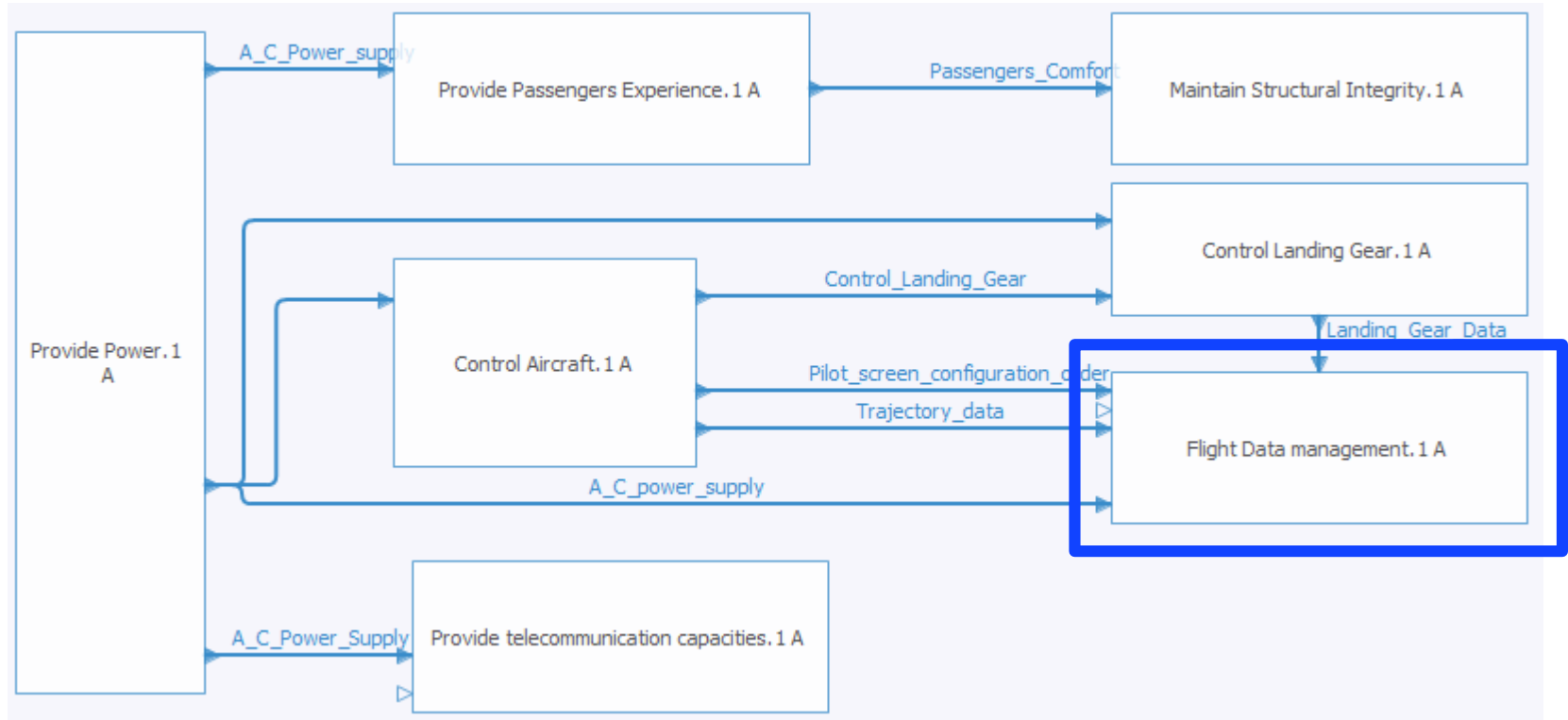
Logical Architecture



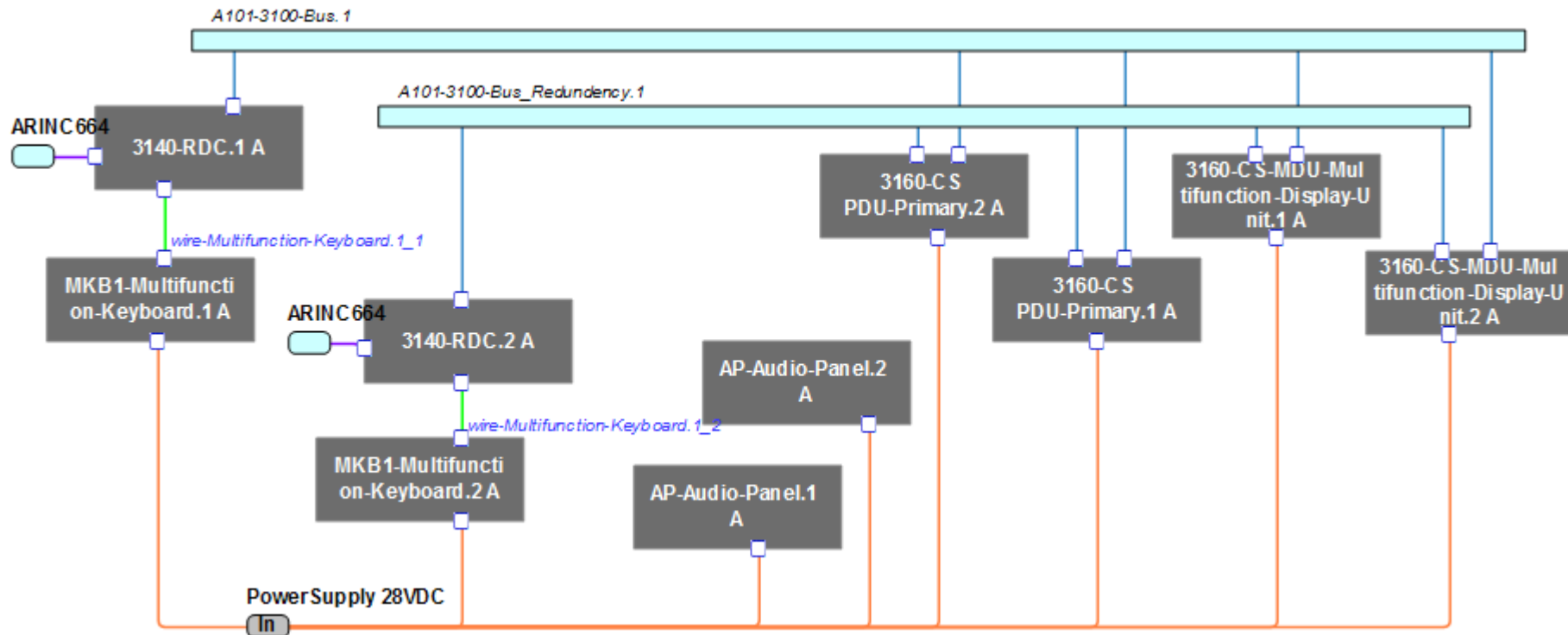
Access the Database EEA Context



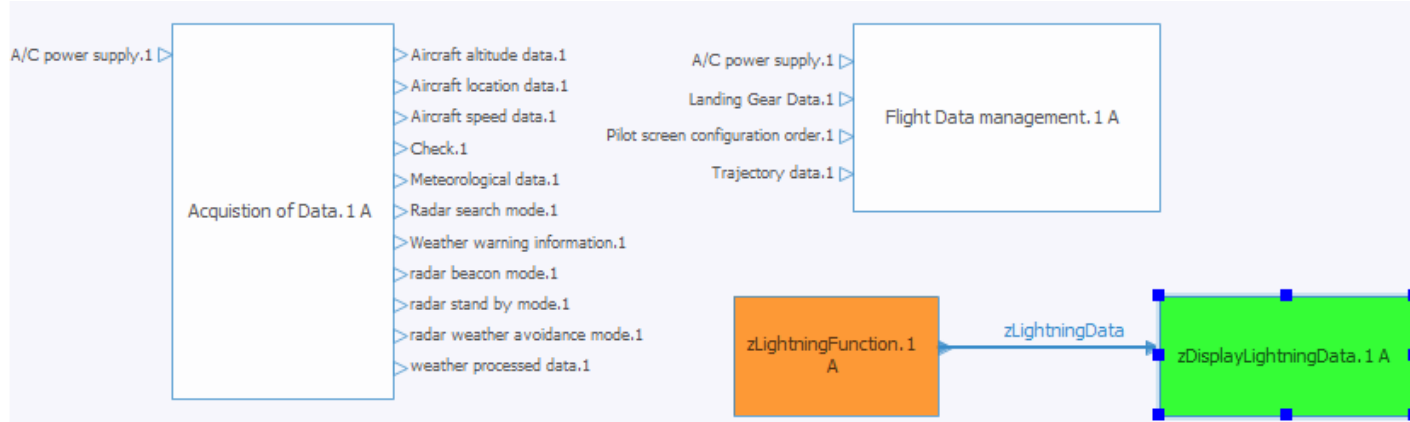
Aircraft Functions EEA view



Logical Architecture EEA view

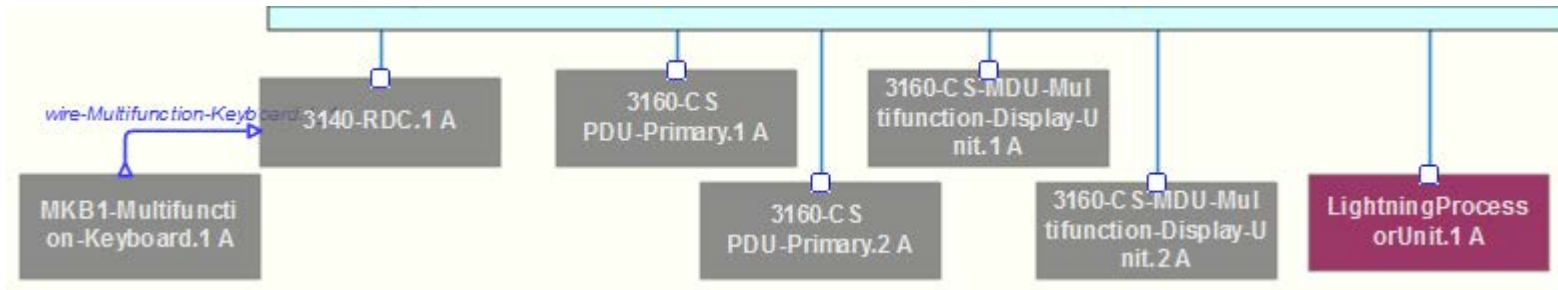


Functional-Logical Mapping EEA view



Functional

Logical

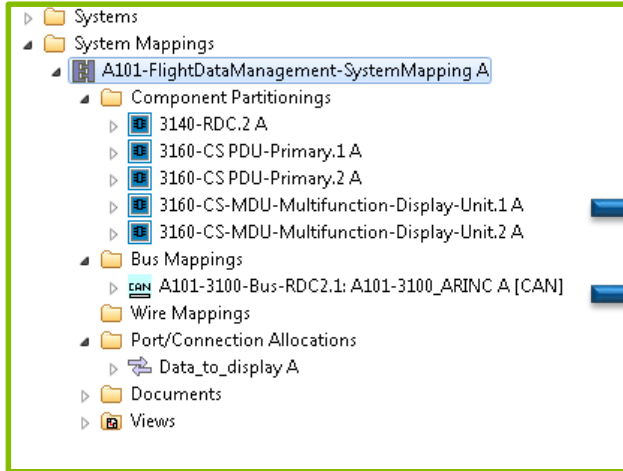


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EEA / AADL objects relationship

Example

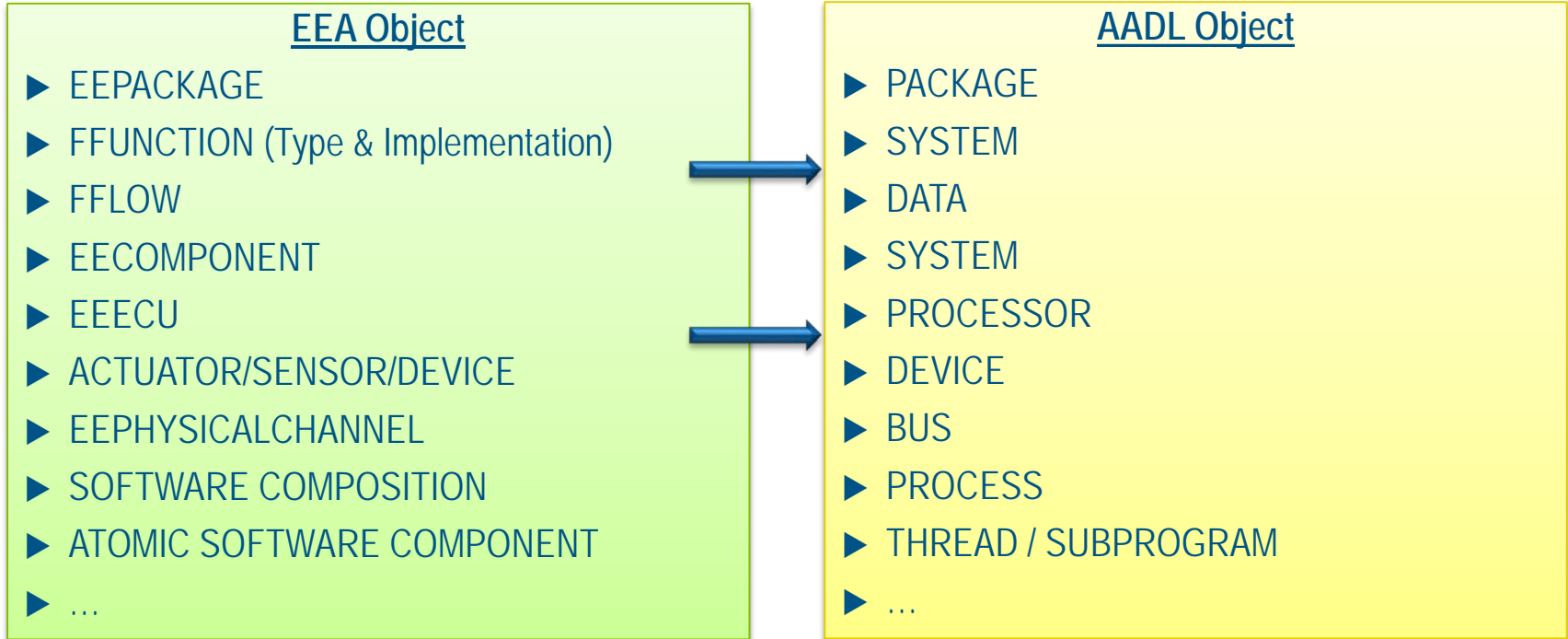


```
SYSTEM A101_FlightDataManagement_SystemMapping
FEATURES
  Landing_Gear_Data_1: IN DATA PORT Landing_Gear_Data;
  Trajectory_data_1: IN DATA PORT Trajectory_data;
  Pilot_screen_configuration_order_1: IN DATA PORT Pilot_screen_configuration_order;
  A_C_power_supply_1: IN DATA PORT A_C_power_supply;
  LightningDataToDisplay: IN DATA PORT LightningDataToDisplay;
END A101_FlightDataManagement_SystemMapping;

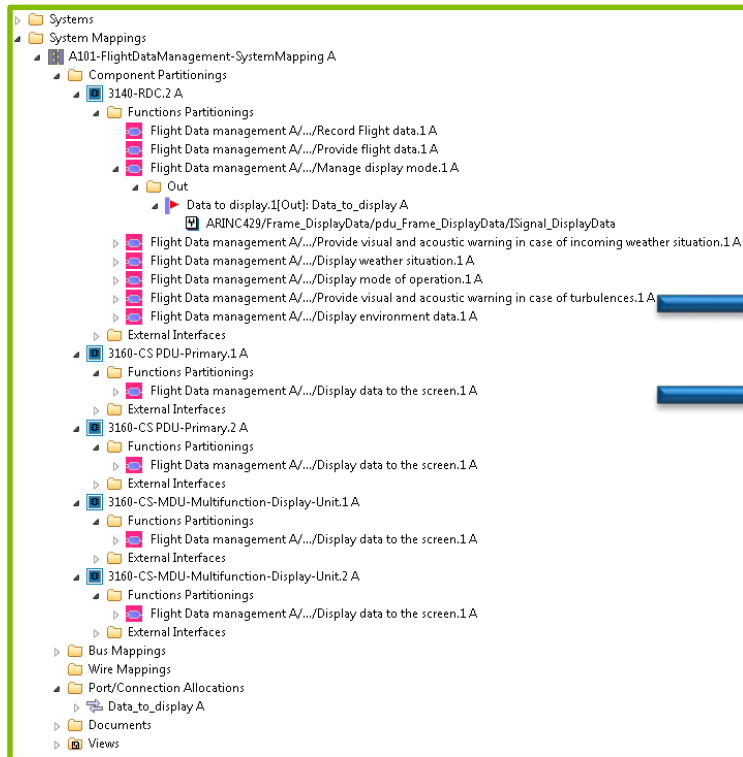
SYSTEM IMPLEMENTATION A101_FlightDataManagement_SystemMapping.i
SUBCOMPONENTS
  comp_3140_RDC_2: SYSTEM comp_3140_RDC_2.i;
  comp_3160_CS_PDU_Primary_1: SYSTEM comp_3160_CS_PDU_Primary_1.i;
  comp_3160_CS_PDU_Primary_2: SYSTEM comp_3160_CS_PDU_Primary_2.i;
  comp_3160_CS_MDU_Multifunction_Display_Unit_1: SYSTEM comp_3160_CS_MDU_Multifunction_Display_Unit_1.i;
  comp_3160_CS_MDU_Multifunction_Display_Unit_2: SYSTEM comp_3160_CS_MDU_Multifunction_Display_Unit_2.i;
  A101_3100_Bus_RDC2_1: BUS A101_3100_ARINC.i;
CONNECTIONS
  Connect_3: PORT comp_3140_RDC_2.Check_1 -> Check_Flight_Situation_1.Check_1;
  Connect_7: PORT comp_3140_RDC_2.Turbulence_Alert_1 -> Alert_crew_in_case_of_risk_1.Turbulence_Alert_1;
```

EEA / AADL objects relationship

Short description



EEA / AADL Translation Demonstration



```

-----
-- AADL specification generated from an          --
-- EEA System Mapping                            --
-- (c) Dassault Systemes, 2015                  --
-----

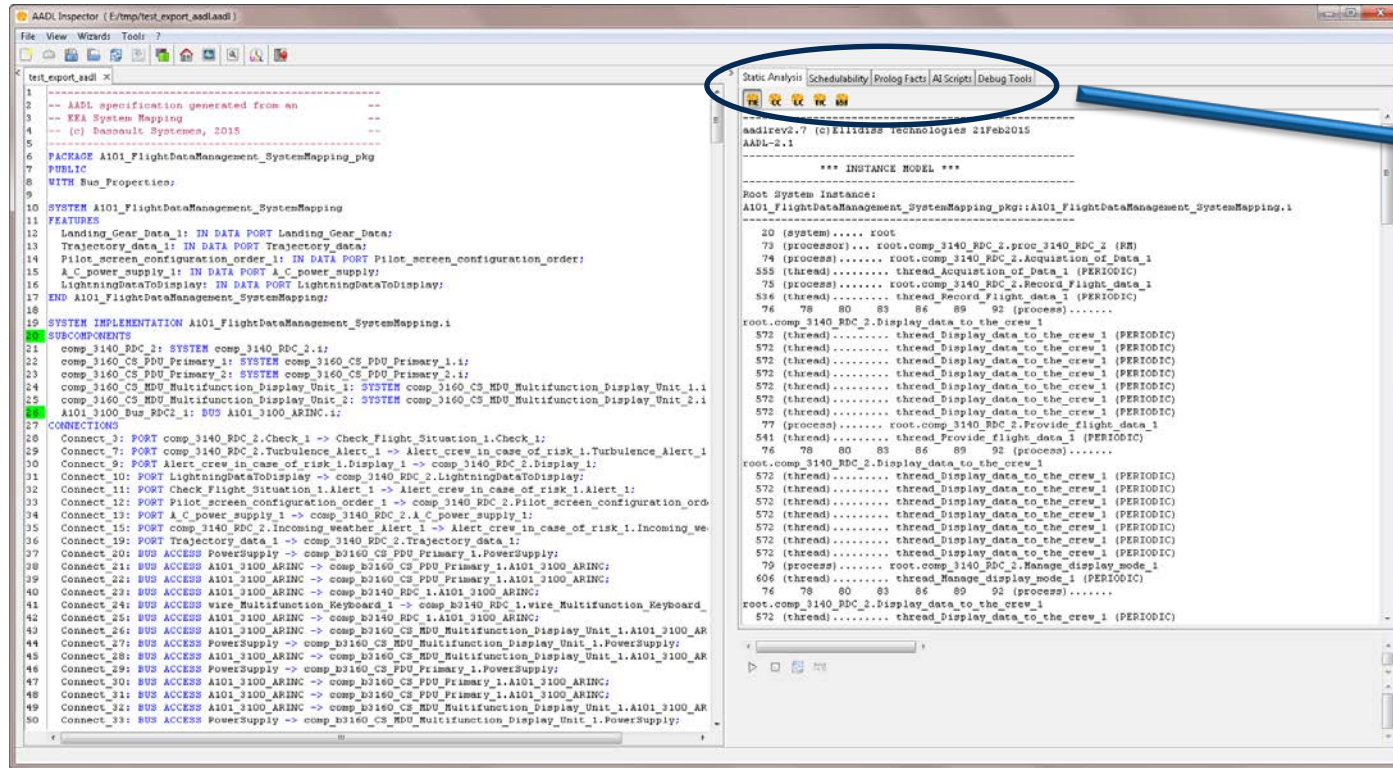
PACKAGE A101_FlightDataManagement_SystemMapping_pkg
PUBLIC
WITH Bus_Properties;

SYSTEM A101_FlightDataManagement_SystemMapping
FEATURES
  Landing_Gear_Data_1: IN DATA PORT Landing_Gear_Data;
  Trajectory_data_1: IN DATA PORT Trajectory_data;
  Pilot_screen_configuration_order_1: IN DATA PORT Pilot_screen_configuration_order;
  A_C_power_supply_1: IN DATA PORT A_C_power_supply;
  LightningDataToDisplay: IN DATA PORT LightningDataToDisplay;
END A101_FlightDataManagement_SystemMapping;

SYSTEM IMPLEMENTATION A101_FlightDataManagement_SystemMapping.1
SUBCOMPONENTS
  comp_3140_RDC_2: SYSTEM comp_3140_RDC_2.1;
  comp_3160_CS_PDU_Primary_1: SYSTEM comp_3160_CS_PDU_Primary_1.1;
  comp_3160_CS_PDU_Primary_2: SYSTEM comp_3160_CS_PDU_Primary_2.1;
  comp_3160_CS_MDU_Multifunction_Display_Unit_1: SYSTEM comp_3160_CS_MDU_Multifunction_Display_Unit_1.1;
  comp_3160_CS_MDU_Multifunction_Display_Unit_2: SYSTEM comp_3160_CS_MDU_Multifunction_Display_Unit_2.1;
  A101_3100_Bus_RDC2_1: BUS A101_3100_ARINC.1;
CONNECTIONS
  Connect_3: PORT comp_3140_RDC_2.Check_1 -> Check_Flight_Situation_1.Check_1;
  Connect_7: PORT comp_3140_RDC_2.Turbulence_Alert_1 -> Alert_crew_in_case_of_risk_1.Turbulence_Alert_1;
  Connect_9: PORT Alert_crew_in_case_of_risk_1.Display_1 -> comp_3140_RDC_2.Display_1;
  Connect_10: PORT LightningDataToDisplay -> comp_3140_RDC_2.LightningDataToDisplay;
  Connect_11: PORT Check_Flight_Situation_1.Alert_1 -> Alert_crew_in_case_of_risk_1.Alert_1;
  Connect_12: PORT Pilot_screen_configuration_order_1 -> comp_3140_RDC_2.Pilot_screen_configuration_order_1;
  Connect_13: PORT A_C_power_supply_1 -> comp_3140_RDC_2.A_C_power_supply_1;
  Connect_15: PORT comp_3140_RDC_2.Incoming_weather_Alert_1 -> Alert_crew_in_case_of_risk_1.Incoming_weather;
  Connect_19: PORT Trajectory_data_1 -> comp_3140_RDC_2.Trajectory_data_1;
  Connect_20: BUS ACCESS PowerSupply -> comp_b3160_CS_PDU_Primary_1.PowerSupply;
  Connect_21: BUS ACCESS A101_3100_ARINC -> comp_b3160_CS_PDU_Primary_1.A101_3100_ARINC;
  Connect_22: BUS ACCESS A101_3100_ARINC -> comp_b3160_CS_PDU_Primary_1.A101_3100_ARINC;

```


Exploitation of the EEA data in AADL Inspector



Static Analysis
Scheduling
Simulation

Quick Simulation using the Generated AADL Code.

