3DEXPERIENCE®

EEA to AADL translator

EEA: Embedded Electronic Architecture
AADL: Architecture Analysis & Design Language

AADL Committee Meeting
Chattanooga, 2016 – May 5th

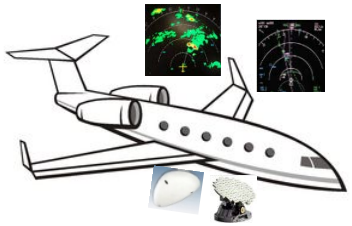
Franck Corbier

EEA to AADL translator

From System Engineering to Software Engineering

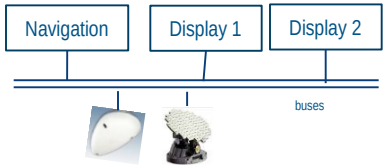
Requirements

Functions



ATA Context:
A101-3100 Indicating /
A101-3400 Navigation

EE Topology
(Hardware Architecture)



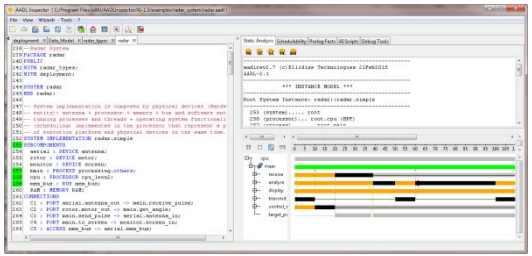
EE Components
(Software)

EE System Mapping

XML format
(.eexml)

AADL format
.aadl

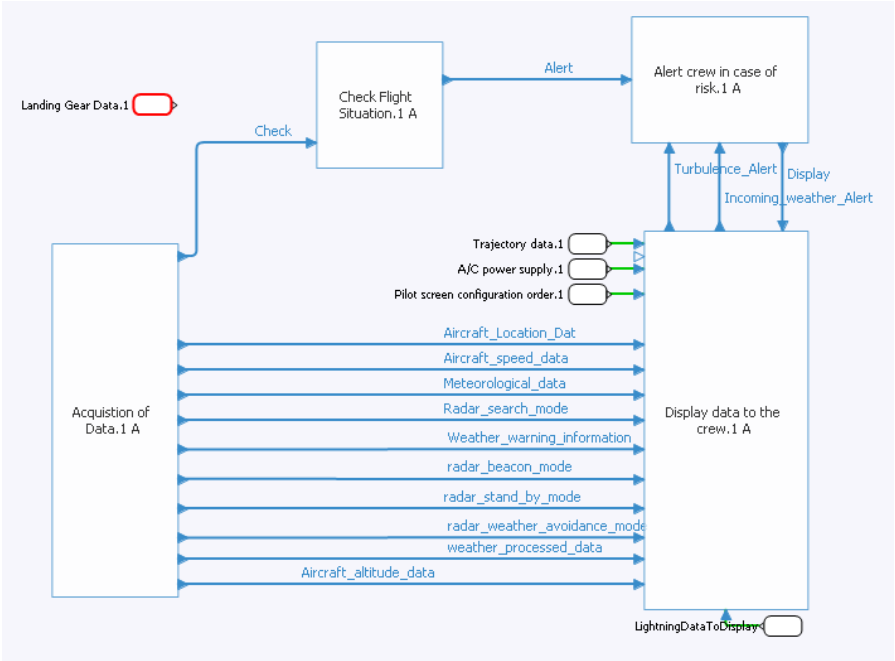
AADL Tools
Scheduling,
Simulation,
Code generation



Functional / Software Architecture

Context: Flight Data Management - 3100 Indicating / 3400 Navigation

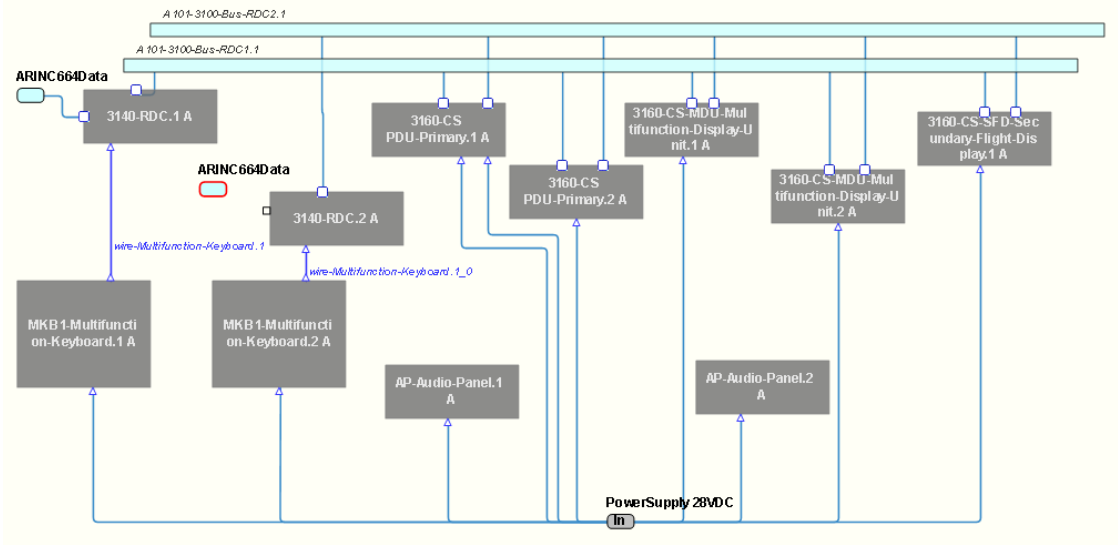
- Functions
  - Flight Data management A
    - Ports
      - A/C power supply.1[In]: A_C_power_supply A
      - Landing Gear Data.1[In]: Landing_Gear_Data A
      - LightningDataToDisplay[In]: LightningDataToDisplay A
      - Pilot screen configuration order.1[In]: Pilot_screen_configuration_order A
      - Trajectory data.1[In]: Trajectory_data A
    - Connections
    - Documents
    - Views
    - Acquisition of Data.1 A
      - Acquistion of Data A
      - Ports
      - Connections
        - Determine aircraft environment situation.1 A/Meteorological data.1 -> Meteorological data.1 [Meteorological_data A]
        - Determine aircraft environment situation.1 A/Radar search mode.1 -> Radar search mode.1 [Radar_search_mode A]
        - Determine aircraft environment situation.1 A/Weather warning information.1 -> Weather warning information.1 [Weath
        - Determine aircraft environment situation.1 A/radar beacon mode.1 -> radar beacon mode.1 [radar_beacon_mode A]
        - Determine aircraft environment situation.1 A/radar stand by mode.1 -> radar stand by mode.1 [radar_stand_by_mode A]
        - Determine aircraft environment situation.1 A/radar weather avoidance mode.1 -> radar weather avoidance mode.1 [rada
        - Determine aircraft environment situation.1 A/weather processed data.1 -> weather processed data.1 [weather_processed
        - Determine aircraft flight situation.1 A/Aircraft altitude data.1 -> Aircraft altitude data.1 [Aircraft_altitude_data A]
        - Determine aircraft flight situation.1 A/Aircraft location data.1 -> Aircraft location data.1 [Aircraft_Location_Dat A]
        - Determine aircraft flight situation.1 A/Aircraft speed data.1 -> Aircraft speed data.1 [Aircraft_speed_data A]
      - Documents
      - Views
      - Determine aircraft environment situation.1 A
      - Determine aircraft flight situation.1 A
      - Determine direction of aircraft.1 A
      - Record Flight data.1 A
    - Alert crew in case of risk.1 A
    - Check Flight Situation.1 A
    - Display data to the crew.1 A
- Flows



Hardware Architecture

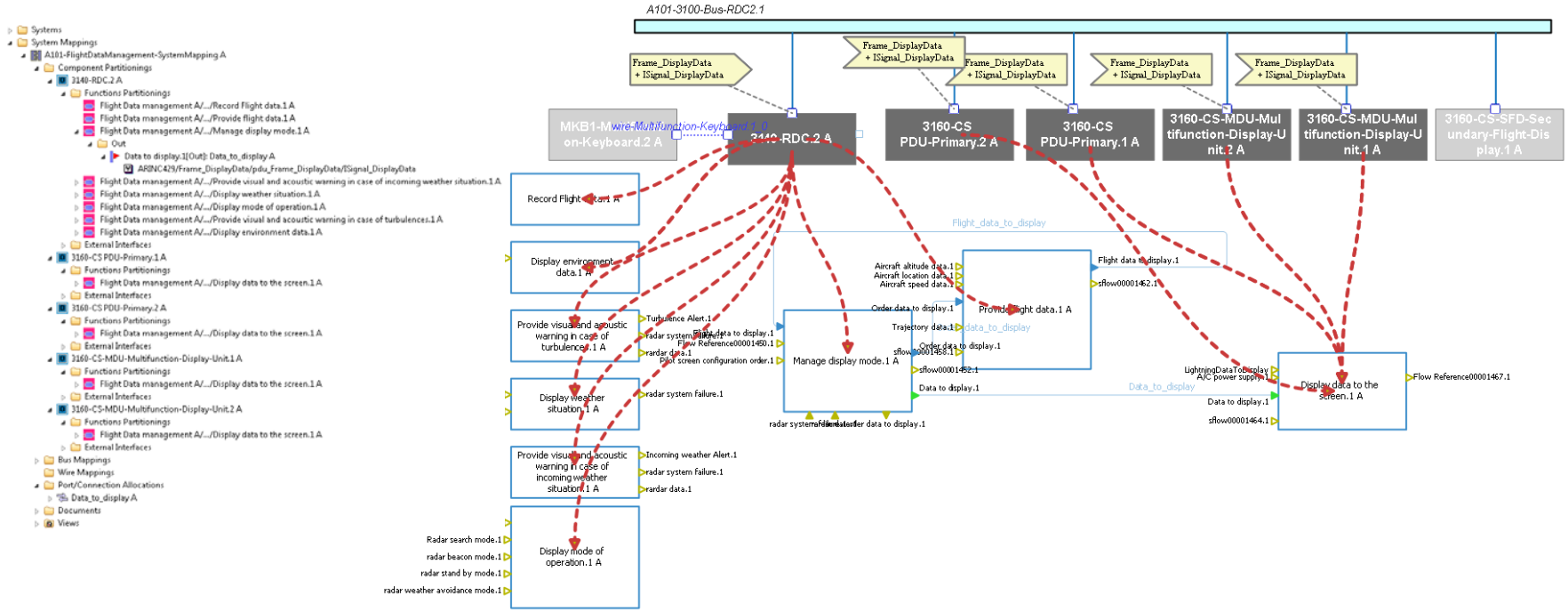
Context: Flight Data Management - 3100 Indicating / 3400 Navigation

- Topologies
  - A101-HWTopology A
    - ECUs
      - 3140-RDC.1 A
        - ARINC429: A101-3100_ARINC A
        - ARINC664: A101-3100_ARINC A
        - Port_MultiKeyBoard[In]: wire-M
      - 3140-RDC.2 A
      - 3160-CS PDU-Primary.1 A
      - 3160-CS PDU-Primary.2 A
      - 3160-CS-MDU-Multifunction-Displ
      - 3160-CS-MDU-Multifunction-Displ
      - 3160-CS-SFD-Secundary-Flight-Dis
      - AP-Audio-Panel.1 A
      - AP-Audio-Panel.2 A
      - MKB1-Multifunction-Keyboard.1 A
      - MKB1-Multifunction-Keyboard.2 A
    - Actuators
    - Sensors
    - Electrical Devices
    - Subsystems
    - Buses
    - Wires
    - Ports
    - Connections
    - Documents
    - Views
  - ECUs
    - 3140-RDC A
    - 3160-CS PDU-Primary A
    - 3160-CS-MDU-Multifunction-Display-Unit
    - 3160-CS-SFD-Secundary-Flight-Display A
    - AP-Audio-Panel A
    - MKB1-Multifunction-Keyboard A
  - Actuators
  - Sensors
  - Electrical Devices
  - Connector Types
  - Subconnector Types



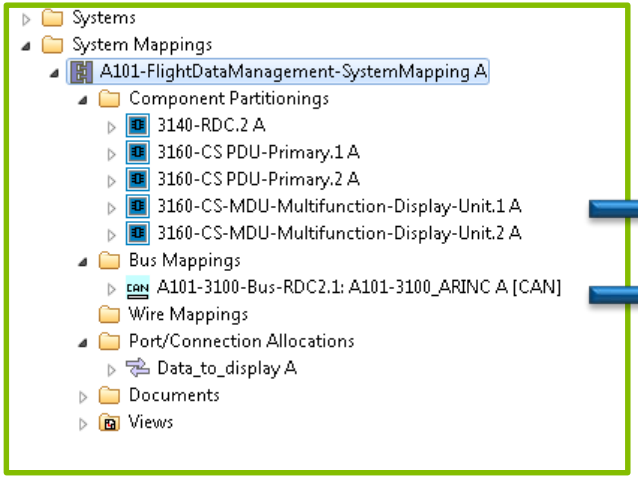
System mapping

Context: Flight Data Management - 3100 Indicating / 3400 Navigation



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 Object	AADL Object
EEPACKAGE	PACKAGE
FFUNCTION (Type & Implementation)	SYSTEM
FFLOW	DATA
EECOMPONENT	SYSTEM
EEECU	PROCESSOR
ACTUATOR/SENSOR/DEVICE	DEVICE
EEPHYSICALCHANNEL	BUS
SOFTWARE COMPOSITION	PROCESS
ATOMIC SOFTWARE COMPONENT	THREAD / SUBPROGRAM
…	…

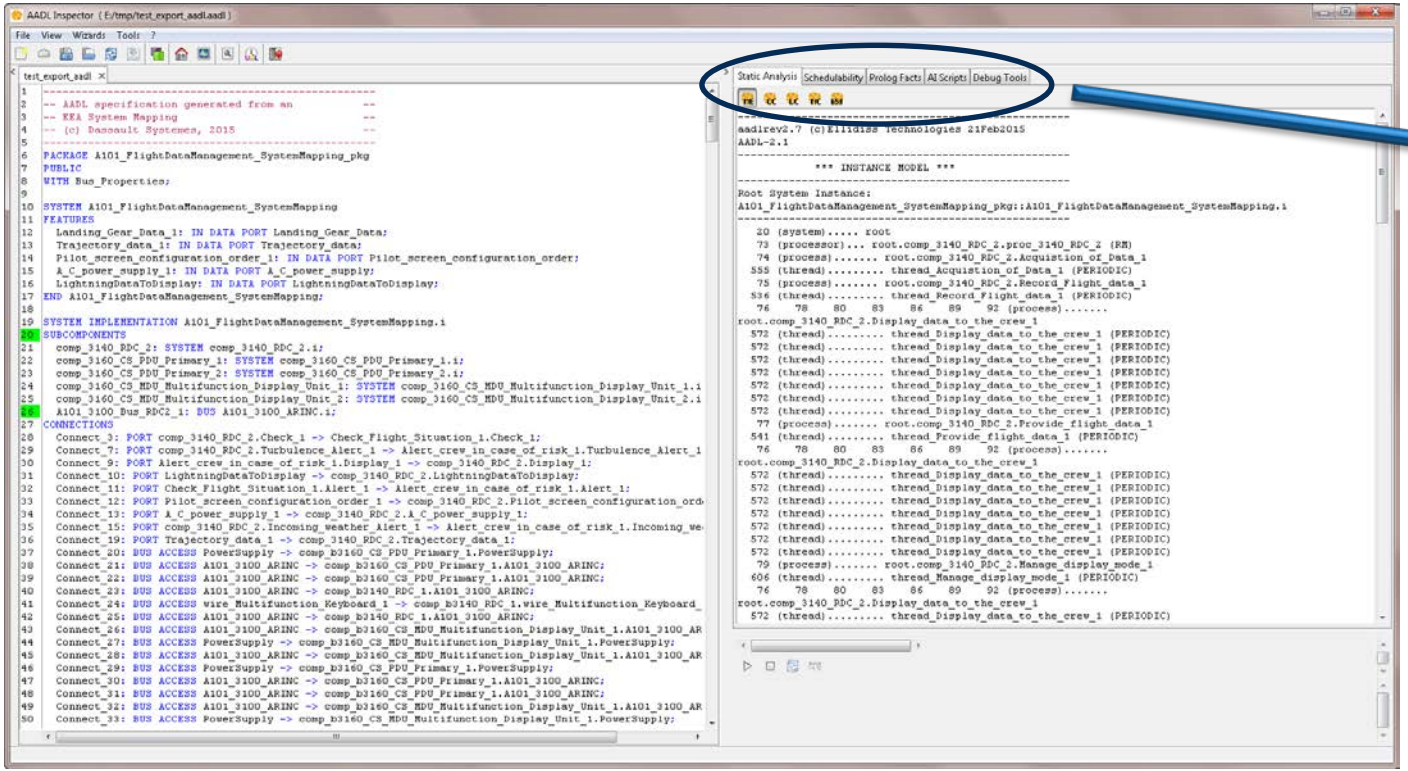
EEA / AADL Translation Demonstration


```
-------------------------------------------------
-- 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.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;
  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
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