Ada95 and GNATPRO in AIM generic TEST SYSTEM
A/C electronics systems life cycle

- Verification means "Are we building the product right?" It involves checking that the product conforms to its specification.
- Validation means "Are we building the right product?" It involves checking that the product as implemented meets the expectations of the product customer.

TEST Means HW/SW Facilities to support A/C equipment, Subsystem or system verification & validation process across product life-cycle.

- Verification means “Are we building the product right?” It involves checking that the product conforms to its specification.
- Validation means “Are we building the right product?” It involves checking that the product as implemented meets the expectations of the product customer.
SEAS Overview

Stimulation, Acquisition and Simulation System (SEAS)
is a modular generic distributed HW/SW items used to build test facilities
(Engineering Simulator, SW Benches, Functional test benches and Target Rigs)
SEAS MOSA principles

• Modular, Open, distributed and scalable architecture widely used with minimal changes from Desk Top Simulators to target rigs
• Reconfigurability, Portability, Interoperability, Reusability, Scalability, Reliability and Maintainability
  • Simulation environment multi-platform and multi-OS
  • Generic SW components are written in Ada95 to improve reliability
• Multi-language support for simulations and bench specific SW (Ada95, C, C++, Java, VB, Fortran, ...)
• VME, PCI, PCI-e form factors support for processors, I/O boards and USB for multimedia devices
• Open integration to:
  • COTS industrial test tools by flexible adapters
  • COTS Avionics and non-avionics I/F cards (A429, AFDX, 1553, EFEX, CAN, Analogues, Digital, Discretes, Ethernet, Shared Memory, High Speed data links)
  • COTS processors
  • COTS HMI tools (GTKADA, VI, process control…)
  • COTS multimedia products
  • COTS instruments (PXI, LXI, Ethernet)
SEAS Context Diagram

Systems Engineering domains

Test Reqmts  ICD  Models

Test System

User subsystem
- Test Preparation Mngt
- Test execution Mngt
- Test Analysis Mngt
- Master HMI

Core Processing subsystem
- CMS
- Conf. & Dict & Data Server
- Simulation Environment
- Recording Replay
- Sequencer Environment

Test engine

Test Equipments  HW Interface

Equipment/Subsystem/System Under Test

Test Sessions Configuration Items databases
Simulations Build

Matlab/Simulink model
ADA Simulation
C Simulation
Fortran Simulation
Binary Code
AP2633 Model
VI ➔ Labview/ SL-GMS...

Simulation ICD
Bench ICD

SEAS

SEAS Simulation
SEAS Simulations layers

Automatically generated by SEAS user API for ADA or C

Dynamically:
- It Receives required signals and HW interface objects serialized from server during simulation initialization
- Add new signals to server
- Create Bundle signals

SEAS Simulation

SIMULATION Variables

SIMULATION CORE
(ADA, C++, C#, VB)

Simulation Interface

Scheduler
Control
Signals Interface

SEAS RTPI lib

IO API’s

Environment

Simulation Developpers Domain

Simulation Integrator Domain

SEAS Domain

Proprietary Information
SEAS user API gives the user the capability to associate Bench signals with simulation variables. Main procedure, it instantiates a Simulation process class. It implements the simulation process class SimProcess (spec and body). It is a skeleton for the user to implement the simulation functionality (INIT, EXEC and STOP). Interface files provide signals and IFUs - HW objects pointers to perform direct IO access to HW interfaces. Object copies are serialized from server process by using ADA95 Annex E. It implements Get_Values and Put_Values functions. Simulations have capability to call directly any HW interfaces API's functions for specific board handling. Binding package to COTS APIs given in C or C++.
SEAS Simulation IDE

SEAS connect to native IDE for simulations and specific test tools

For Ada and C Code, generating a GPS project and launching GPS

... Or for Visual C source code, generating a Visual C project and launching Visual Studio Application
Matlab Simulink models to SEAS Route

ARBS application
The maturity, robustness and reliability of the system have been demonstrated throughout hundreds of test facilities in use with this common test environment including Engineering Simulators for Aircraft Refuelling Boom System, System Integration Benches for Multirole Tanker Aircrafts, A400M, Lights&Medium Transport Aircraft, Full Integrated Tactical Systems and Aircraft Interface Modules for Final Assembly Lines of A400M, Multirole Tanker Aircrafts and L&MT aircrafts.

- Proved with up to 350,000 signals per system integration bench
Conclusion

Test System built around GNATPRO-Suite:

- Ada95 for SEAS Core SW using class wide programming for Processes, Signals, HW Interfaces, Scaling
- Ada95 for Mission System simulations repertoire
- GTKADA for HMI and for special synoptic like mission scenarios, radar display simulations
- XMLADA for test system definitions Bench HW/SW definition
- Distributed Ada for shared memories, RPC, data, types and objects distribution
- GPS to create simulations
- High Flexibility for integration of non Ada SW like FORTRAN, C, C++ API’s

We consider using the provided solution by GNATPRO suite, as the core to develop such complex hybrid systems, with large life cycle like test systems for A/C V&V, offered big advantages.
THANK YOU FOR YOUR ATTENTION

AIRBUS MILITARY
Seas Simulation class and activity diagram

Simulation_main
- Simulation name
- Class
- Activity Diagram

Signal/Process
- Signal/Process/Simulation
- Simulation_Process
- Simulation_Interface

Simulation_process
- Create Log File
- Connect to Cache
- Add control signals to Process
- Signal_Process_simulation
- Simulation_Process

= End

Proprietary Information
Seas Signal class
Seas Signal class