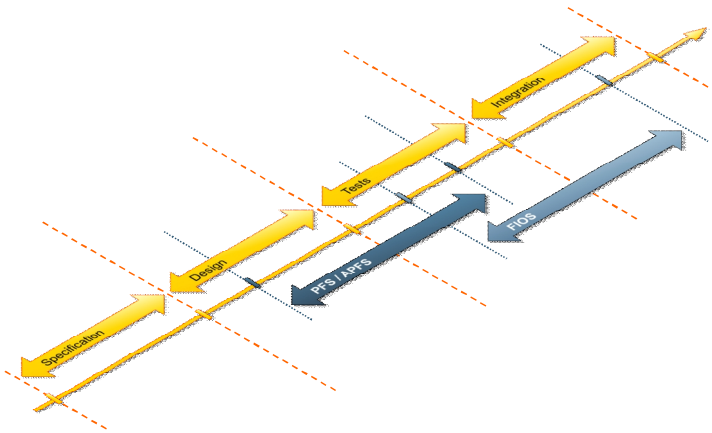
Test and Simulation Means

PFS – APFS – FIOS

Context

Ensuring the consistency of the test and simulation means should provide substantial time-savings in the development of equipments, sub-systems and systems

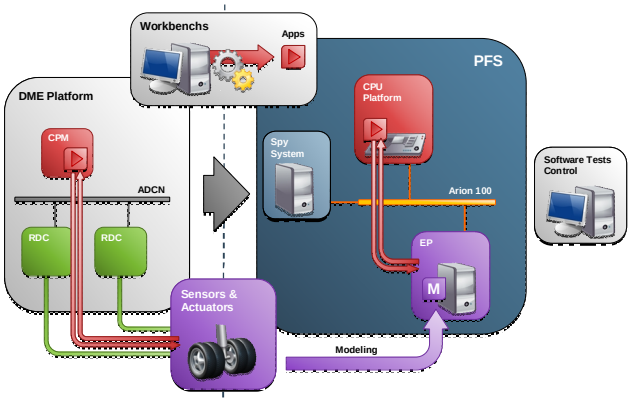


- The "**PFS**" (Platform Simulator) is directed toward the "Functions Suppliers". It offers a deterministic and real-time platform that permits the development of applications in an Arinc653 environment
- The "**APFS**" (Advanced Platform Simulator) is obtained by adding to the PFS a function for controlling the latency time of communications on the ADCN and field buses.
- The "**FIOS**" (Flexible Input Output Simulator) is directed toward integrators. It provides a means of "replacing" the real sensors / actuators of the system under test by a deterministic and dynamical simulation environment

An open source software platform named COBRA is available. This platform intends to help the users to develop their test applications. With this platform the users can build and simulate the application test and then produce all the necessary files (configuration and binary files) for the PFS, APFS or FIOS.

For more details on the COBRA platform, see the Cobra development Platform brochure.

The Platform Simulator (PFS)



The PFS provides to the "Function Supplier" a modular and scalable means of simulation representative of the DME (Distributed Modular Electronics) platform.
The PFS allows the implementation of models simulating the environment and/or behavior of the aircraft and/or behavior of sensors/actuators.
The "Function Supplier" can then connect these models on the application in order to test them during the development phases.

The basic PFS is composed of 3 elements:

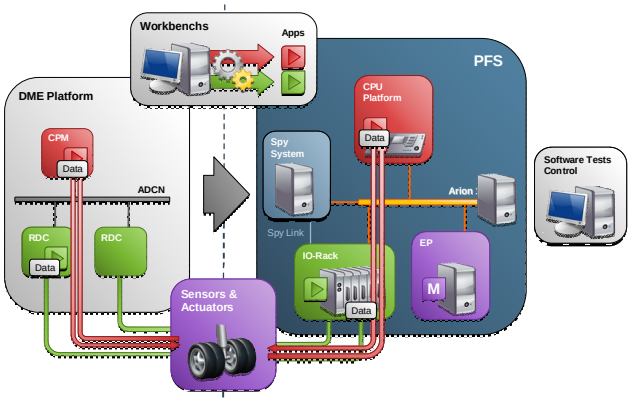
- The **CPU Platform**: This equipment consists of a SBC board (Single Board Computer) running the same OS as the Arinc653 CPM. It allows the "Function Supplier" to instantiate his application in compliance with the Arinc653.

- The **EP** (Environment Processor): This equipment consists of a PC running a real-time operating system (VxWorks 6.8). It is on this equipment that the different models run.
- The **SPY System**: This equipment allows recording the data exchanges between the CPU Platform and the EP.

The PFS is built around a real-time communication means (Arion 100), which allows to stamp, with a microsecond accuracy, all the data produced in the means of communication.

The PFS provides a normalized API for the STC (Software Test Control) connection which can thus ensure the control of the PFS

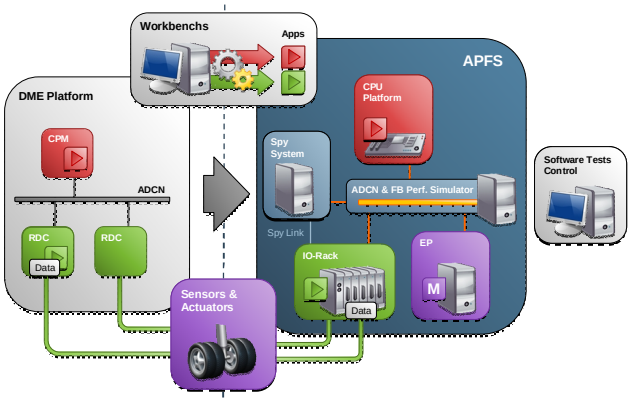
The Platform Simulator (PFS) & IO-Rack



By adding IO-Rack equipment(s) the "Function Supplier" can replace representative models of actuators, sensors by real actuators sensors.

It is also possible to simulate an IRDC by adding a processor board in an IO-Rack, software application is instantiated on this processor board to manage the fast feedback loop. The IO-Rack processor board can support the following operating systems: Linux, VxWorks6.8, VxWorks653, Pike-OS.

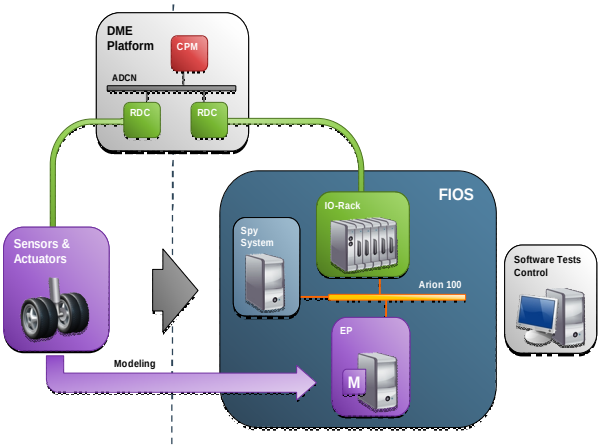
The Advanced Platform Simulator (APFS)



The representativeness of communication time (i.e. latency of VLs[1]) between the various equipments of the PFS can also be simulated by adding the AF_PS function (AFDX and FieldBus Performance Simulator) to the PFS. This function allows to precisely control each VL latency, the "Function suppliers" have thus a way of defining for each VL its temporal validity area.

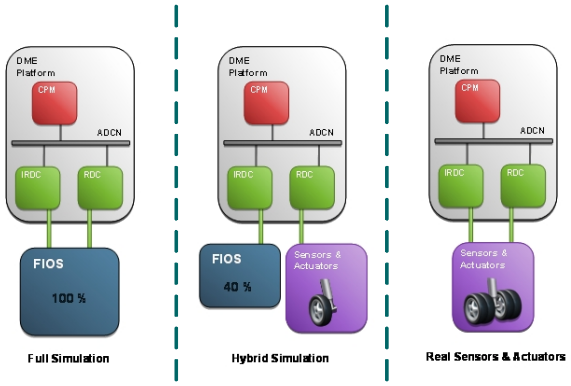
[1] VL is for Virtual Link

The Flexible Input Output Simulator (FIOS)



The FIOS provides the means to replace the actual sensors / actuators by representative models these models come from the modeling done by the "Function Suppliers" when using PFS to validate Arinc653 applications.

It is possible to achieve an overall simulation of sensors / actuators or to do an hybrid one mixing simulated and real equipment.



The FIOS is derived from the PFS. It is implemented around the same communication means, an IO-Rack for the management of the interface signals from the sensors and actuators. The FIOS also includes an EP to perform behavioral models of sensors and actuators as representative as possible of the behavior of the aircraft and environment.

Like the PFS, a SPY System is available to stamp and record all the data exchanges within the FIOS. Like the PFS, the FIOS is controlled by an external means: the STC.

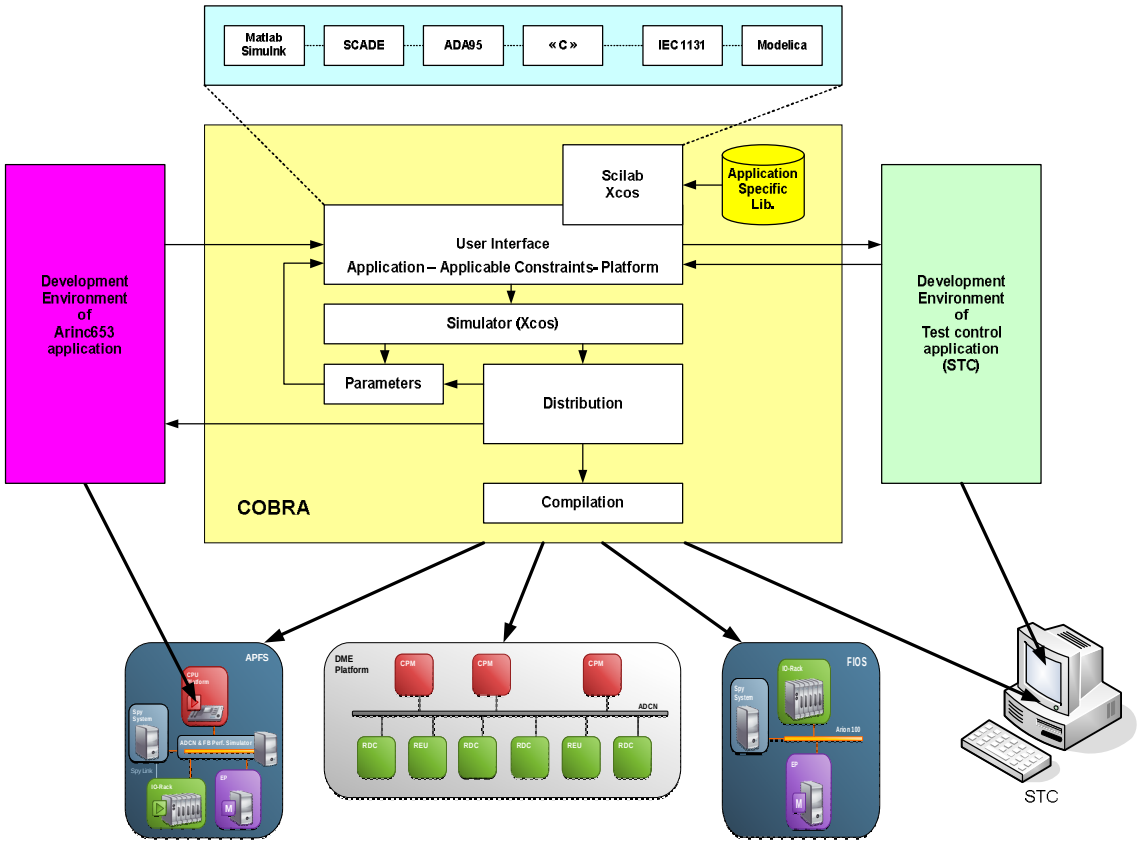
The COBRA platform

The Cobra development platform allows the user to:

- Develop functions through the use of "Scilab/Xcos[2]" products native from the Cobra platform.
- Build a model of the simulation application from C-language functions generated by application-specific tools.
- Interconnect simulation application with the embedded application that the user wants to develop and also with the Simulation Test Control (STC) for a supervisory or injection of test vectors.
- Simulate from Xcos, the model of the application realized.

[2] Xcos is an hybrid dynamic systems modeler and simulator, it is based on Scicos developed by INRIA, Xcos replaces Scicos in Scilab distribution since Scilab 5.2 release, It provides functionalities for modeling of mechanical systems (automotive, aeronautics...), hydraulic circuits (dam, pipe modeling...), control systems, etc

- Define the hardware and software host of the simulation means.
- Ask the compiler to provide an instantiation of the simulation application on the host. The settings function calculates the transmission time of data in the host structure. These times are then, by back-annotation, re-injected into the definition of the simulation application. The user can then check by a new simulation from Xcos that his application is still operational (taking into account feedback loops, for example).
- Automatically generate the simulation application on the host of simulation means.



ARION ENTREPRISE

christiangarnier@arion.fr
http://www.arion.fr

Parc Burospace, bât2bis
Route de Gisy
91571 Bièvres Cedex
FRANCE

Phone: +33(0) 1 69 35 03 03
Fax: +33(0) 1 69 35 39 01