



IMAGE

Interoperable Management of Aeronautical Generic Executive software

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D 5.4 : Single synthesized and consolidated report of applications cases results

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1 Introduction

One of the main goals of the IMAGE project is to create a generic environment allowing to facilitate the cooperation between different platforms federated in a same simulation. It is not to develop new simulation software but to interconnect existing ones and to convert them in standard components

WP5 deals with the Prototype validation.

Three new applications were selected with the purpose of validating the integration of the IMAGE components:

- **A real time simulation** (full flight simulator coupled with ATC training simulator and computer based training). This validation case uses IMAGE components for communication and management of ATC simulation processes.
- **Numerical simulation application.** This validation case demonstrates that the IMAGE results are applicable to the entire simulation domain. The generic IMAGE result is an environment for interactive simulations, allowing an easier simultaneous operations of these different tools. The genericity of IMAGE's project applications is tested on a non-real time numerical simulation.
- **A mixed real-time and numerical simulation application.** The task explores how to utilise IMAGE supervision, administration and security components for the set up and execution of a heterogeneous real-use simulation application based on a mixed set of numerical and real-time simulations. The application is tested against a set of predefined application functional and performance requirements.

2 IMAGE System Validation Items

The project scientific and technical objectives are to :

- Undertake research on a set of methods and component libraries to insure the deployment of complex simulations.
- Achieve a technological development that enables simulation designers to make the best of their available software and hardware resources
- Implement research results validation into three prototypes (real time, non-real time and mixed real/non-real time simulators and simulations applications).
- Accomplish a first important step towards distributed simulations and simulators that are no longer restricted to development experts.

To ensure traceability between the design of the standard simulation software components prototyped the user requirements and IMAGE services specified, it was elaborated the integrated user requirements / services matrix. The elaboration mainly related to:

- Consistency checking;
- Completeness checking.

From the resulting matrix, the following services (or IMAGE system requirements) were selected :

- Security: Information Hiding, Authentication, Access Control, Integrity Checking, Non-Repudiation, Security Administration;
- Administration: Federation Management, Declaration Management, Object Management, Ownership Management, Time and Time Advancement Management, Data Distribution, Transportation, Configuration Management, Configuration Maintenance Management;
- Supervision: Simulation Entity, Simulation Time, Simulation State, Simulation Management, Simulation Recording and Replaying, Simulation Controlling Tools, Simulation Testing Tools, Assembling and Deploying Simulation Component, Clustering, Loads Balancing, Error Handling, Fault Tolerance;
- Middleware: Event, Publish and Subscribe, Scheduler, Network Protocols, Communication, Data Management, Analysis and Statistics, Repository, Interface, Wrapper, Gateway, Naming & Trader, Marshalling/Demarshalling, Remote Procedure Calling.

With respect to the IMAGE System architecture it was also necessary to validate the integration of various of the above system requirements through their integration in larger IMAGE System modules.

3 COMMON POSITIVE VIEWPOINT

The validation of the IMAGE prototype through the identified Test Bench applications demonstrate that the initial objectives of the project have been achieved.

The implemented middleware for real time and numerical simulations applications is a step forward in the integration of different softwares, the environment makes possible the communication between heterogeneous software/hardware and enables the optimisation of the sharing of computers and network resources.

IMAGE is the first generic development environment able to make heterogeneous simulations communicate.

This allows two important evolutions:

- Push forward the limits of complex system simulations by making dedicated simulators cooperate.
- Push forward the processing limits by making efficient use of all hardware resource available.

Strictly following the standards, the IMAGE software has been developed with a constant focus on stability, robustness, reusability, extensibility and user-friendliness, resulting in both a high professional and easy to use technology.

The validation applications were able to demonstrate that the IMAGE services are fulfilled in the three cases (real-time application, numerical application and mixed real-time and numerical application).

Therefore it is demonstrated the genericity, power and efficiency of the developed system:

- IMAGE interoperability. The validation applications made heterogeneous and multi platform applications interoperate. In the already performed validation cases, the various applications that have to interoperate run on heterogeneous and multi platform applications.
- IMAGE middleware services. The validation applications made its simulation components communicate with others simulation components, which are located in a distant site, making possible the communication capability between applications presently non compatibles.
- It was demonstrated IMAGE 's ability to develop the three kinds of applications (real-time, numerical and mixed real-time numerical simulations). The validation applications were modeled, assembled and deployed using IMAGE as their development environment.
- The IMAGE development environment is flexible and allows easy updates.
- The IMAGE system control tools allows a constant check of the simulation process execution.
- The IMAGE environment reduces engineering effort and time to product via virtual product management and more generally simulation.
- The IMAGE environment optimise the computing resources and enhance their capabilities.

The usage of IMAGE should considerably simplify and reduce the cost of simulation development, making researchers able to better master simulation systems complexity.

4 COMMON NEGATIVE VIEWPOINT

In order to reach all the required functionalities (like interoperability and portability), many technologies have been put together. This results in a quite complex system to maintain and develop. Increasing the automation of some development tasks could enhance the IMAGE developer productivity.

In order to cope with that negative aspect, the IMAGE team has already produced a developer support internet site that propose a first set of clear and concise documentation.

In order to make the user master all the IMAGE concepts, the IMAGE development team has created a first version of a user-friendly installation and user guide. The automation of some user tasks (e.g.: paradigm and interpreter registration, installation and customization of the COTS, etc) could enhance the reduction of the user development effort.