Rational software

Meeting Stringent Test Standards for Avionics Software with Rational Test RealTime at EADS/Airbus

EADS (European Aeronautic Defense and Space Company) is Europe's premier aerospace and defense company and number three worldwide. EADS comprises the activities of the founding partners Aerospatiale Matra S.A. (France), Construcciones Aeronáuticas S.A. (Spain) and DaimlerChrysler Aerospace AG (Germany). The company is listed on the Frankfurt, Madrid and Paris stock exchanges.
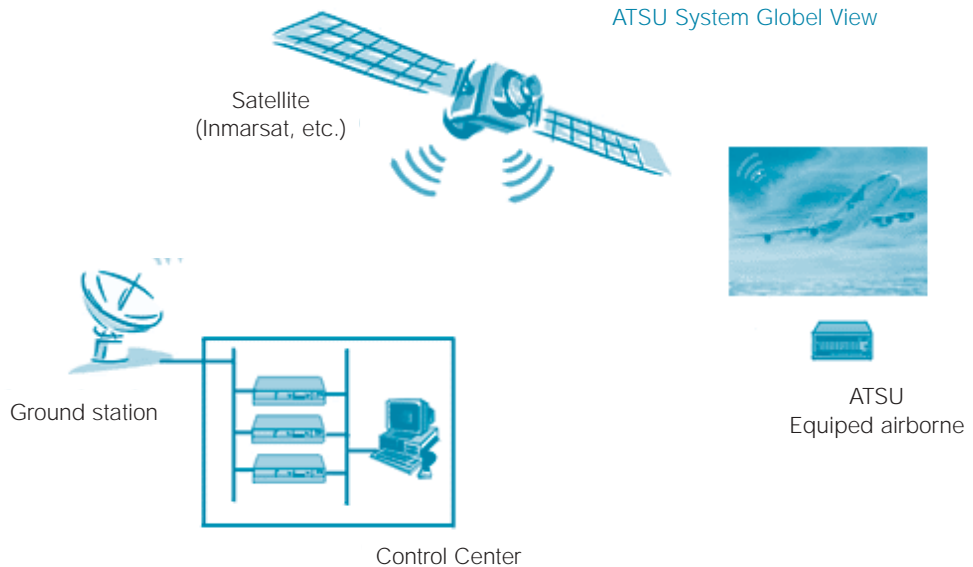
In terms of market share and profitability, EADS is one of the top aerospace and defense manufacturers.

In 2000, EADS generated pro forma sales of EUR 24.2 billion, of which 80 percent were in civil activities and 20 percent were in the military sector. EADS employs more than 100,000 people at over 70 sites in France (37 %), Germany (35 %), Great Britain and Spain. EADS is an N.V. according to Dutch company law. The central functions of the company are located in Munich and Paris.

The ATSU System

One of the specific activities of Systems and Services is the FANS (Future Air Navigation System) program, which includes the development of the ATSU (Air Traffic Services Unit) computer. To meet the constraints resulting from continuous air traffic growth, the FANS objective is to replace the existing air traffic control system by effective traffic management that relies on flight path negotiations between the ground and the aircraft. Maximum automation will be applied to these negotiations to reduce pilot and controller workload. The solution relies essentially on navigation or communications satellite technology.

As part of the FANS project, EADS Airbus implemented the AIM-FANS (Airbus Interoperable Modular - FANS) program on A330/A340 long-haul aircraft and on aircraft in the A319/A320/A321 family.

ATSU System Globel View

Satellite (Inmarsat, etc.)

Ground station

Control Center

ATSU Equiped airborne

EADS Airbus is responsible for implementing the program.

The project provides flexible, progressive and modular solutions based on aircraft architecture built around the ATSU computer developed by the Systems and Services Business Center.

Considered the heart of the system, the Air Traffic Services Unit is designed to act as a true host environment, integrating all the services dedicated to communication between the aircraft and the air traffic control centers (ATC) and the resources necessary to implement the future ATN.

To optimize the system architecture of the AIRBUS range of aircraft, the ATSU will support the functions currently provided by ACARS equipment (Aircraft Communications Addressing and Reporting System) as soon as it goes into service. These functions include addressing and the AOC set of services (Airline Operational Control) dedicated to communication between the aircraft and airline operational centers.

The Technical Environment

The ATSU is built around a real-time UNIX-style OS (LynxOS) and is developed on the SUN/Solaris platform in C.

The development process is divided into two parts:

- Part One is entirely conducted using Solaris development hardware simulating the real-time environment to allow for an initial test level validation
- Part Two is conducted on the actual target with the real-time OS or on an equivalent target PC running the same OS.

Development work must be DO-178B Class C certified. This standard enforces a test level covering 100% of instruction blocks.

Approximately 50 developers are working on this project.

The Rational Testing Solution

As part of the ATSU project, EADS Airbus performs software tests using the Unit Testing and System Testing features of Rational® Test RealTime on both the development platform, Solaris, and on the target. Test coverage is evaluated by the Coverage feature of Rational Test

RealTime.

Rational Test RealTime Unit Testing feature is used to rapidly develop C component tests. Because of its architecture, this type of test is performed on the development hardware and then on a PC integration platform.

Rational Test RealTime System Testing feature is used to validate the application's sub-systems. This phase consists of isolating a sub-system from the application (generally comprising one or more threads or processes) and testing its performance with System Testing. System Testing is used to simulate the sub-system environment via the application programming interface (API). Thanks to common API design for both platforms, these tests are performed on the development machine and then on a PC integration platform running the real-time OS.

Rational Test RealTime Coverage feature measures test coverage during both component tests using Rational Test RealTime Unit Testing and during validation tests with Rational Test RealTime System Testing.

Rational Test RealTime Coverage feature is extremely valuable for developing on-board software for civil aeronautics because it covers the modified conditions/multiple decisions demanded by DO-178B for A-criticality computers (which is of higher complexity than required for the ATSU).

Benefits to EADS Airbus

Using Rational Test RealTime on a project such as the Air Traffic Services Unit saves development time and effort because:

The product is an excellent answer to the demands of testing inter-communicating software.

Rational Test RealTime features are complementary.

Identical product architecture in each feature makes it easy to change from one to another.

Work can be performed in both native and cross-platform mode using the same product, without losing features, and with the same test scenarios.

About Rational

Rational provides a software development platform that improves the speed, quality, and predictability of software projects. This integrated, full life-cycle solution combines software engineering best practices, market-leading tools, and professional services. Ninety-six of the Fortune 100 rely on Rational tools and services to build better software, faster. This open platform is extended by partners who provide more than 500 complementary products and services.