AdaCore

The GNAT Pro Company

Executive Summary

EADS CASA is one of the Spanish branches of the European Aeronautic Defense and Space company (EADS), the largest European aerospace company and the second largest worldwide.

EADS/CASA's Military Transport Aircraft Division (MTAD) is responsible for all the company's military transport aircraft, including the new A330 Multi Role Tanker Transport (MRTT). Derived from the successful Airbus A330 commercial airliner, the MRTT is being developed with sophisticated control software that enables it to refuel other aircraft in the air through a new tail boom system.

Already selected by the Royal Australian Airforce, the A330 MRTT is the world's most capable and flexible tanker transport aircraft. It combines the qualities of the Airbus A330 with a state of the art in-flight Air Refuelling Boom System (ARBS) from EADS.

EADS CASA therefore required a programming environment that combined the highest levels of safety with development speed and flexibility. The complex nature of the system required RTCA DO-178B level A safety certification, while the foundation operating system needed to be ARINC 653 compliant.

To meet these needs the MTAD project team chose a combination of AdaCore's GNAT Pro development environment with Wind River's Platform for Safety Critical ARINC 653 to control the tail boom system. Working in partnership, this solution provides a fully integrated platform that meets stringent safety certification while retaining flexibility and ease of development.

Ada was selected due to its unparalleled record in safety-critical software solutions. It provides a high-integrity, high-quality development environment with a well defined structure that is designed to produce highly reliable and maintainable real-time software. AdaCore has been closely involved with the Ada language since its inception, meaning it provides the strongest level of expertise in Ada software and the best technical support for Ada users.

AdaCore and Wind River have been working in partnership for over 7 years. In 2001 Wind River selected AdaCore as its preferred Ada technology supplier, bringing

together their best of breed tools to enable the development of reliable applications with fast, predictable performance. AdaCore's GNAT Pro High Integrity Edition for AE653 was developed specifically for Wind River Platform for Safety Critical ARINC 653. By building GNAT Pro High Integrity Edition into Wind River's Platform users benefit from the power and reliability of Ada 95, and now Ada 2005, combined with a familiar tool suite, interoperability with other languages, and easy interfacing to third-party tools such as configuration management systems.

Since the tail boom project began in 2003, development has been remarkably fast with a demonstration prototype expected to be flying by the end of 2005. EADS CASA believes that much of this progress has been due to its previous experience of Ada and the flexibility and support of AdaCore.

"The complex nature of air-to-air refuelling meant that we needed a solution that would meet the highest levels of safety. The combination of AdaCore and Wind River has provided us with the safest possible solution for our critical systems," said Carlos Fernàndez de la Hoz, SW Engineering Manager, EADS CASA. "The flexibility and ease of use of GNAT Pro has enabled us to develop the project quickly, enhanced by the high levels of support we've received from AdaCore."

Background

EADS is a global leader in aerospace, defence and related services, with 2003 revenues of €30.1 billion. The EADS Group includes the aircraft manufacturer Airbus, the world's largest helicopter supplier Eurocopter and the joint venture MBDA, the second largest missile producer in the global market. EADS is the major partner in the Eurofighter consortium, is the prime contractor for the Ariane launcher, develops the A400M military transport aircraft and is the largest industrial partner for the European satellite navigation system Galileo.

EADS CASA is one of the Spanish branches of EADS. Its Military Transport Aircraft Division (MTAD) designs, manufactures and commercialises light and medium transport aircraft. Tanker aircraft represent a growing market for EADS/CASA with the company responsible for the transformation of Airbus A310-300 and A330-200 platforms into the Combi/Cargo/Passenger configuration and into the Multi-role Tanker Transport (MRTT). Together with four other companies, MTAD is part of the

joint Air Tanker project which has been selected as a Preferred Bidder for Britain's Future Strategic Tanker Aircraft programme (FSTA).

The A330 MRTT is the world's most modern tanker transport plane. Developed from the Airbus A330 family it provides a combination of versatility and flexibility to deliver cost-effective high performance. Central to this is its advanced state-of-the-art fly-by-wire boom. This is controlled by sophisticated control software to allow in-flight refuelling with avionics that can be customised to client needs.

As well as refuelling, this application will also be responsible for controlling an artificial 3D-vision surveillance system, a night vision compatibility system, release and retract system with redundant hoist and lock and an independent disconnection system.

Business need

Sophisticated, safety critical control systems are crucial to the successful operation of the A330 MRTT. Due to the highly competitive nature of the global tanker market, speed of development, cost and the ability to flexibly configure systems to meet individual needs were vital to the project's success.

These objectives required a programming environment that combined the highest levels of safety with development speed and flexibility. The foundation operating system needed to be ARINC 653 compliant, while the overall system required RTCA DO-178B level A safety certification.

CASA has been using Ada since the 1980s, meaning that a combination of the programming language and Wind River's Platform for Safety Critical ARINC 653 were therefore the natural choice for the tail boom project. Through AdaCore and Wind River's partnership the integrated solution combines the highest level of safety with strong support to provide the fastest development environment.

AdaCore's GNAT Pro provides a run-time suited for avionic applications that is certifiable up to level A of DO-178B, meeting the boom project's requirements for

safety- and mission-critical robustness and flexibility. Wind River Platform for Safety Critical ARINC 653 is based on VxWorks AE653, a fully ARINC653 Supplement 1 compliant operating system that includes time and space based protection domains integrated with Wind River's leading device software development tools and partner solutions including Ada, test and verification tools and market specific hardware board support packages. Platform for Safety Critical ARINC 653 enables application of different safety levels to share computing resources and is specifically designed to support applications such as integrated modular avionics.

"To ensure that together we deliver the safety-critical systems that avionics applications demand our partnership with AdaCore is extremely close, the result of a successful and long-standing collaboration," commented Rob Hoffman, Director Aerospace and Defense, Wind River. "Our work on the EADS CASA boom project demonstrates the advantages in flexibility and development speed that our combined solution delivers."

About AdaCore and GNAT Pro

Founded in 1994 by the original authors of the GNAT technology, AdaCore is the leading provider of solutions for all aspects of Ada software development. AdaCore was founded by the original developers of the GNAT Project. This means that customers access expertise provided by the actual developers of GNAT Pro themselves, ensuring the best technical support, provided by those with the strongest level of Ada expertise. AdaCore is a new kind of software company providing innovation through its market-leading GNAT Pro technology and an expert support system second to none. The net result is reduced risk, higher productivity and shorter time to delivery.

GNAT Pro is the most widely used Ada development environment, and a natural solution where efficient and reliable code is critical. At the heart of GNAT Pro is a full featured multi-language (Ada, C, C++) development environment complete with libraries, bindings and a range of supplementary tools. All its technology combines the flexibility and freedom associated with Open Source development and the assurance that comes from knowing that all tools go through a rigorous quality assurance process. It is based on the GNU GCC compiler technology and is backed by rapid and expert support service.

GNAT Pro has been used by industry and government customers worldwide in professional, mission-critical software products ranging from small-footprint real-time embedded applications to large-scale information management systems. It has been ported to more platforms, both native and embedded, than any other Ada technology.

Benefits

The GNAT Programming Studio provides the most advanced debugging facilities available, allowing faster development without compromising performance. Through its multi-language, multinational support, GNAT Pro allows seamless collaboration across the project, backed up by the ability to run natively on a wide variety of platforms, including both Windows and DEC Alpha.

As a well-structured language, Ada is perfectly suited to such a large mission-critical project. As a very readable and maintainable language it allows newcomers to the project to go through the learning curve very quickly when they pick up code written by another software engineer.

With Typhoon scheduled to continue in service until beyond 2030, the project needed a language that was scalable and easy to maintain, as well as reliable. GNAT Pro is intended for systems comprising many thousands of modules, and millions of lines of code. Its robust system architecture therefore scales based on program size and does not degrade abruptly when a fixed capacity is reached. Additionally its Project Manager facility offers users a flexible framework for organising large multi-person development efforts, such as the Typhoon project.

Typhoon is the most advanced combat aircraft in the world. To ensure that it delivers this performance a high-quality, mission-critical software development environment was essential. AdaCore and the Ada language were therefore the natural choice to power the Typhoon, throughout its 25 year lifecycle.