

Computers in engineering

From Ada to outer space

In 1974, the **Department of Defense** (DOD) realized that having software for embedded computers developed and maintained in hundreds of programming languages was excessively costly. The following year, the DOD established requirements for a high-level language that could be used in all defense projects. In 1976, 23 existing languages were formally reviewed; none met the requirements. It was concluded that a new language was needed.

Almost 20 language proposals were made by design teams from all over the world. Four contractors were selected to produce prototype languages, and finally one was chosen, developed by a **Honeywell/Bull** team located in France. The language proposal and the requirements were repeatedly submitted to public review. The language was revised in response to hundreds of comments coming from academia and industry all over the world, and finally became an ANSI standard in 1983 and an ISO standard in 1987.

This modern, high-level programming language was named Ada, in honor of the first programmer in history, Lady Ada Lovelace. In 1843, Ada, daughter of the poet Lord Byron, suggested a plan to Charles Babbage for how his Analytical Engine might calculate Bernoulli numbers. This plan is now regarded as the world's first computer program.

Moving forward to 2005, **Aonix**

provides mission- and safety-critical applications primarily to the military, aerospace, telecommunications, and transportation-related industries. The company delivers high-reliability, real-time embedded Java solutions and has a large number of certified Ada applications. Now, Aonix tools have been selected by the **European Space Agency's** Vega Programme for Ada application development, along with its reliable real-time executive.

The Vega Programme, a satellite launcher for satellites weighing 1 ton or less that are used for scientific Earth observation, telecommunications, and technology applications in low-Earth orbits, came into being in the early 1990s when several European countries began to investigate the possibility of complementing the Ariane launchers' family with a capability for smaller payloads. These preparatory activities concluded in 1998, and in 2000 the member countries approved the launcher's full development phase.

Aonix COTS (commercial off-the-shelf) products were selected as the mission-critical software phase of the project opened up. The AdaWorld Solaris to ERC-32 product implements the board segment software that controls and monitors all phases of the launcher's takeoff and flight until the satellite is in orbit.

To reduce costs, the Vega Programme uses a flexible modular approach that employs advanced low-



Source: ESA

The European Space Agency's Vega Programme, a launcher for satellites weighing 1 ton or less that are used in low-Earth orbits, has selected Aonix tools for Ada application development.

cost technologies and takes advantage of existing production facilities used for Ariane launchers. Aonix provides COTS products for onboard software development, based on technology already proven in previous Ariane launchers.

The first qualification launch for Vega is planned in 2006 from the French Guiana Space Center. Following this, there will be an average of three to four launches each year.

David Alexander

METEOR guided by Statemate

Statemate, from embedded systems and software solutions provider **I-Logix**, has been selected by missile systems manufacturer **MBDA** to aid in the development of METEOR, a flexible, visual- and beyond-visual-range air-to-air missile to be incorporated into the next generation of European fighter aircraft, including the **Eurofighter** Typhoon, **Dassault** Rafale, and **Saab** Gripen.

MBDA is the prime contractor for The METEOR Program, part of a multi-

national defense agreement signed by its six member countries, which include the UK, France, Germany, Italy, Sweden, and Spain. MBDA is a global missile systems company with 45 missile systems and countermeasure programs in operational service, and experience leading multinational projects. MBDA is jointly owned by **BAE Systems** (37.5%), **EADS** (37.5%), and **Finmeccanica** (25%).

METEOR will engage air targets autonomously (whether fighters,

bombers, transport aircraft, or cruise missiles) by using its active radar seeker. The technology works day or night and in all weathers. METEOR is equipped with a variable-flow ducted ram-rocket propulsion system that ensures longer engagement ranges and higher sustained missile speeds than current medium-range missiles. Even when launched from long range, the missile will be able to defeat fast, maneuvering targets. To ensure total target destruction, METEOR contains



METEOR, a flexible, visual- and beyond-visual-range air-to-air missile to be incorporated into the next generation of European fighter aircraft, will use StateMate from I-Logix for model-driven algorithm development.

both proximity and impact fuses and a fragmentation warhead that is detonated at the optimum point to maximize lethality.

According to the company, MBDA selected I-Logix because StateMate was the only model-driven development solution on the market that met all of its key requirements. In

Briefs

Smiths Aerospace has delivered mission display system hardware and software to **Boeing** for the **U.S. Air Force C-130 Avionics Modernization Program (AMP)**. Known as the mission display processor, it is the principal computing environment for the C-130 AMP, and provides the cockpit display generation. Smiths is also responsible for integration of communication management software from **Teledyne Controls**.

NASA's Langley, Kennedy, and Ames research centers have made a significant investment in **MSC.Nastran** and related training and support services from **MSC.Software**. The newest version of the software features enhanced functionality for NVH, integrated non-linear analysis capability from **MSC.Marc**, and embedded flexible body transfer with **MSC.ADAMS**. A new feature for analyzing rotor dynamics was developed with help from NASA engineers.

Raytheon Integrated Defense Systems is using communications products and software from **Performance Technologies** in the development of simulation and testing applications for the U.S. government. The company's **PCI334A WAN** communications adapter is designed as a fully programmable communications subsystem capable of sustaining high data rates for a variety of protocols used in synchronous data communications. With **X.25 Protocol Software**, it is used to evaluate performance in a controlled environment before deployment, and to examine options before making costly implementation decisions.

Northrop Grumman has selected the Platform for Safety Critical from **Wind River** as the device software foundation for both the mission and vehicle-management computer on the X-47B portion of the Joint Unmanned Combat Air Systems program. Northrop Grumman will produce and flight-test three X-47B unmanned demonstration vehicles with associated mission-control and logistical support elements beginning in 2007.

addition, I-Logix's continuous successes with MBDA's partner companies, **BAE Systems**, **Airbus**, and **Alenia-Marconi Systems**, further demonstrates its capacity to understand and develop solutions for today's defense industry design problems.

METEOR's key features include stealthy launch, enhanced propulsion system motor performance, and robust countermeasure capabilities, all made possible by the increased sophistication of the algorithm system that controls missile guidance, navigation, airframe, propulsion, and RF signal processing. StateMate will create, navigate, update, check, simulate, and analyze the algorithm system ensuring that all mission-critical requirements are met. StateMate models can be shared electronically with other members of the design, development, and testing teams to facilitate collaboration worldwide, a significant feature because the algorithm-development teams are located at multiple sites throughout the UK, France, and Sweden.

StateMate helps system integration in a highly dispersed development program such as METEOR, according to MBDA. The sharing of design information during the early stages of development means algorithms of significantly higher integrity—beyond that achievable through a traditional approach.

"MBDA's collaborative hurdles are similar to many international defense projects currently under way," said Neeraj Chandra, I-Logix Senior Vice President of Marketing and Corporate Development. "MBDA's use of StateMate across multiple locations highlights the collaborative value of our solution and represents a major triumph of model-driven development in a missile design environment."

David Alexander

INTRODUCING

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