



Tutorial Form

Title: Developing Fault-Tolerant, Time-Critical Systems with AADL, UML, and Ada

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Requested level	Introductory	

Background: Understanding of current practices and problems when developing and changing real-time, reliable, fault-tolerant systems, would be helpful

Abstract:

The Society of Automotive Engineers (SAE) is developing a standard Architecture Analysis and Design Language (AADL) using UML and Honeywell's MetaH architecture language as a base. (Voting on the standard is expected to start in the first quarter of 2004.) MetaH has been used on 20 demonstration projects. The AADL specification defines an AADL profile for the Object Management Group's (OMG) Unified Modeling language (UML).

The AADL is designed to support the specification and analysis of performance-critical systems including real-time, fault-tolerant, safety-critical, securely partitioned, dynamically reconfigurable multi-processor systems, and system-of-systems architectures. The AADL enables the development of highly evolvable systems. It supports formal analyses of a system's architecture (integrated hardware and software components) early in the development. The AADL allows rapid, incremental development of prototypes that can evolve directly into the final production system.

In this tutorial, you will learn the concepts behind the AADL, the basic syntax and semantics of the textual and the UML-based graphical languages. The tutorial will also look at how to develop embedded, time-critical systems that can evolve as requirements or technology change, using AADL. The tutorial will show how a system can be designed using the AADL; analyzed for safety, timing, and reliability; and implemented using Ada.

Presenter summary

Ed Colbert is consulting with U.S. Army Aviation & Missile Command, and Honeywell Technology Center, on the definition of the Avionics Architecture Description Language (AADL) for the Society of Automotive Engineers (SAE). He is also lecturing in the Computer Science Department of the University of Southern California on software engineering and architectures, contributing to the Model-Based Software Engineering (MBASE) method of the USC Center for Software Engineering, and researching costing estimation for secure system development. Ed has been teaching object-oriented methods, software engineering, and the Ada programming language since 1982, and since 1986 consulting as well. He created the Colbert Object-Oriented Software Development method ("OOSD"), which supports analysis and design for implementation in languages such as Ada, C++, and SmallTalk. NASA Langley Research Center used OOSD for a Software Engineering Process manual, chosen partly for its strength in real-time software development.



Bruce Lewis is a senior experimental developer for the US Army's Aviation and Missile Command, Research, Development and Engineering Laboratory, Software Engineering Directorate (SED). His work has focused on software architecture, re-use, and system evolution. His group has been experimenting with using Architecture Description Language for analysis and development since 1993. He has served as the government lead on various DARPA projects related to ADLs and real-time systems, including those developing the baseline for the AADL. He is the chairman of the AADL standardization subcommittee.



Why you should participate in this tutorial?:

Because the AADL supports Model-Driven Architecture-Based Development which allows a system-engineering approach to designing the system software/hardware architecture, implementing it, and evolving it. This is a significant improvement over the empirical approaches currently used. There is strong interest in and participation in the language development in Europe and in the US. The European Space Agency has recently proposed a major research and tool development effort using the AADL. The COTRE research project on advanced computer system engineering for avionics systems, lead by Airbus, has adopted the AADL, as presented by Airbus at the last AdaEurope Conference in Toulouse.