

# Avionics Architecture Description Language (AADL) Seminar

Toulouse (France), October 1st and 2<sup>nd</sup>, 2002

## What is an AADL?

In the early 90's, some research initiatives have been started in the domain of Software Architecture with the purpose to shift the focus from lines-of-code to coarser-grained elements and their interconnection structure. The expected benefits were to improve software and system evolvability and understanding, support architecture based development (product lines, reuse) and to provide a more flexible approach for system integration. An Architecture Description Language (ADL) is a formal approach for software and system architecture specification. An ADL is a computer language used to describe the software, or software and hardware components of a system and the interfaces between those components. The language is used to describe the structure of such a system as an assembly of software and hardware components. The language can describe functional interfaces to components (for both control and data flows) and non-functional aspects of components (such as timing, safety level, reliability attributes). At a higher level, an architecture specification describes how components are combined into subsystems, how they interact (structure of data flow and control flow), and how they are allocated to hardware components.

## *MetaH as the first integrated ADL*

MetaH is a domain-specific ADL dedicated to avionics systems which has been developed at Honeywell Labs since 1993 under the sponsorship of DARPA and the US Army. A significant set of tools (graphical editor, typing, safety, reliability, and timing/loading/schedulability analyzers, code generator...) has already been prototyped and used in the context of several experimentation projects which have shown development benefits ranging from 50% (new project) to 90% (modification of an existing project).

In 2001, MetaH has been taken as the basis of a standardization effort aiming to defining an Avionics Architecture Description Language (AADL) standard under the authority of SAE<sup>1</sup>. This emerging AADL is a domain-specific ADL developed to meet the special needs of embedded real-time systems such as avionics systems. In particular, the language can describe standard control and data flow mechanisms used in avionics systems, and important non-functional aspects such as timing requirements, fault and error behaviors, time and space partitioning, and safety and certification properties.

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<sup>1</sup> Society of Automotive Engineers - AS5C sub-committee.

## **Purpose of the seminar**

This seminar has the objective to introduce the AADL approach to people who are concerned with embedded real-time system development (Project managers, system and software designers, software developers, etc). This may be of high interest in various application domains for which a “modular avionics” like approach can be appropriate, namely: aeronautics, space, automotive applications, railways, nuclear industry, etc.

This seminar will be organized in two separate phases described further.

### ***Phase 1: one-day tutorial introducing AADL and MetaH***

The tutorial will be given by people who are actually the leaders of the AADL approach: Bruce Lewis from US Army/AMCOM, Steve Vestal from Honeywell Labs, Peter Feiler from Carnegie Mellon Software Engineering Institute (SEI).

This tutorial is open to anybody having some interest in AADL.

### ***Phase 2: coordination meeting for presentation of current US and European works on AADL***

Many experiments have been conducted in the US with MetaH, which provide background and experience to the standardization committee for analysis and improvement of existing and new AADL features. Some experiments have recently started in Europe to investigate the use of AADL in application domains like aeronautics and space. Some of these experiments will be presented.

A round table discussion will be organized at the end to draw some recommendations and to establish common interest areas between the US and Europe.

This coordination meeting is dedicated to people having already a good knowledge of AADL or a known interest in this approach. Attendance to this meeting is by invitation only, but anybody can apply to be invited by sending to the organization committee a short description of his current works and fields of interest.

# Seminar Organization

## Organization Committee

Thierry BILLOIR	AXLOG Ingénierie	Thierry.Billoir@axlog.fr
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## Contributors

### Bruce Lewis

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). He has been an employee of SED for 15 years. His work has focused on software architecture and system evolution since 1992. His group has been experimenting with MetaH since 1993. He has served as the government lead on various DARPA projects including those developing MetaH. He is the chairman of the AADL standardization committee.

### Steve Vestal

Dr. Steve Vestal is a technical fellow at Honeywell Laboratories. He specializes in languages, tools, and formal methods for real-time safety-critical embedded software. He led the project that developed the original MetaH language and toolset, and serves as a technical co-editor on the AADL standardization committee.

### Peter Feiler

Dr. Peter Feiler is a senior member of the technical staff member at the Software Engineering Institute (SEI). He has been with the SEI for 16 years. Recently his work has focused on software architectures and engineering of dependable real-time systems and he has been a member of Carnegie Mellon University research teams over the last 7 years. He has been a user of MetaH for several years and serves as technical co-editor on the AADL standardization committee.

## **Practical information**

### ***Charge***

This seminar is free of charge except a contribution towards costs (30 to 50 Euros, to be paid only at the registration desk).

### ***Hotels and Accommodation***

You can find a list of hotels at the Toulouse Tourist Bureau:

Office de Tourisme de Toulouse  
Donjon du Capitole  
B.P. 0801 - 31080 Toulouse Cedex

Tel: +33 5 61 11 02 22  
Fax: +33 5 61 22 03 63  
e-mail: [infos@toulouse-tourisme-office.com](mailto:infos@toulouse-tourisme-office.com)  
<http://www.toulouse-tourisme-office.com/>

### ***Site***

The seminar will take place in a conference room of a research center, not far from Toulouse downtown.

### ***Transportation***

Transportation between the airport, the railway station and the meeting room will be organized. Please let us know if you need transportation.

# Agenda

## ***Oct. 1<sup>st</sup>: Tutorial on MetaH/AADL***

### **09h – 11h: Session 1 - Overview**

Overview of concepts and SAE Standards progress (40' – Bruce Lewis)  
MetaH Overview (40' – Steve Vestal)  
AADL Overview (40' – Peter Feiler)

### **11h – 11h15: Break**

### **11h15 – 12h45: Session 2 -**

Basic Syntax and Structure (30' – Steve Vestal)  
Describing source components (30' – Steve Vestal)  
Composing source components (30' – Steve Vestal)

### **12h45 – 14h: Lunch**

### **14h – 16h: Session 3 -**

Hardware specification (30' – Steve Vestal)  
Timing Analysis and Sequencing (90' – Steve Vestal)

### **16h – 16h15: Break**

### **16h15 – 17h45: Session 4 -**

Analysis and Reports; (60' – Steve Vestal)  
UML Specialization for AADL (30' - Peter Feiler)

### **17h45 – 18h30: Open discussion**

### **18h30: Cocktail**

## ***Oct. 2nd: AADL Coordination Meeting***

### **09h – 10h30: Session 5 – US works**

Portability Experiments (45' – Bruce Lewis)  
Use of ADL for Performance Analysis (45' – Steve Vestal)

### **10h30 – 10h45: Break**

### **10h45 – 12h45: Session 6 – European works**

Airbus/COTRE Investigations (1h)  
DASSAULT works (30')  
Introduction of existing formalisms into AADL – Application to SDL (ESA – 30')

### **12h45 – 14h: lunch**

### **14h – 15h: Session 7 – European works (Suite)**

Development of a simulation-based tool for AADL (Axlog – 30')  
Some design and validation issues with systems of components – Application to spacecraft (INRIA – 30')

### **15h – 15h15: Break**

### **15h15 – 16h45: Session 8 - Discussion**

Discussion of recommendations, issues, standard

## Registration to the AADL seminar

- To attend to this meeting, preferably, fill the online forms at:  
[http://www.axlog.fr/R\\_d/aadl/seminar.html](http://www.axlog.fr/R_d/aadl/seminar.html).
- You can also fill the registration form bellow and send it by fax to Axlog Ingénierie: [+33] 1 41 24 07 36.
- Otherwise, you can send an email with all the requested information (see form bellow) to [aadl\\_seminar@axlog.fr](mailto:aadl_seminar@axlog.fr).

Name	
Title	
Email	
Phone	
Organization	
Address	

I will attend the MetaH/AADL tutorial (Oct. 1st)

I will attend the AADL coordination meeting (Oct. 2nd), my related works and publications are described below:

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