Ada 95 as a Base to Architect Systems in O4S™
(Objects For Systems)

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1 Abstract

Traditional "architecture" for buildings is studied to find what "architecture" should mean for complex information systems with a high software content. Different architectural qualities are presented and referenced to Ada 95-based work.

The system development O4S™ (Objects For Systems) is presented as a method that handles not only the information aspect of software and/or software, but complete systems including missions and operator's roles. In connection to O4S™, the Ada 95-inspired design language Odel is presented as a means to describe structure and behaviour of complex systems.

The concept of "architectural base" is introduced as a necessary base to architect and describe systems. It is shown how the architectural base for systems work can be connected to software standards:

- Ada 95 to provide semantics, syntax and formal base.
- MIL-STD-498 (Software development and documentation) to govern structure and documentation for systems work.

An applicatory example is given to show how the "architectural base" can be used to architect and describe complex systems on different levels.

Conclusion and message of this paper is: Ada 95 and MIL-STD-498 can be used, not only for software development, but also to create an architectural base for systems work concerning information systems work in general. This work can be extended to create a formal base for the information aspects of total systems.

2 Introduction

Engineering of complex systems means that you must create an architecture, composed from components of categories operator, software and hardware that co-operate to complete missions. The architecture must be described in a way that is readily understood by end users, system engineers and component implementors, such as software engineers.

The O4S™ systems engineering method uses the Odel (Object Design Language) that is defined in reference to Ada 95 (formalised English). This creates a way to architect and document complex systems.
3 What is Architecture?
When you study various papers on software and systems architecture, it is easy to get the impression that "systems architecture" can be anything. To get some idea what "architecture" should mean it can be a good idea to return to traditional architecture.

In architecture textbooks you will find some information about traditional architecture that is relevant also for software and information systems architecture (IT architecture):

Architecture encompasses all kinds of human building (thus including software and systems in general).

Architecting an information system should thus include not only software, but also humans and hardware when these take part in the information processing and/or are important for understanding the information in the software.

Architecture combines functionality with aesthetics
An architected system with its software must not only meet its functional requirements, but should also include an element of aesthetics. Aesthetics will concern both the user's impressions of the system and the system structure, as experienced by the analyst, designer and supporter.

An architectural implementation concerns components, design method and tradition.
The architecture should give a clear coupling between a completed product and its components. Architectural implementations can be grouped depending on design method and tradition. One such group, for information systems can be based on the combination of object-oriented methods and Ada.

Architectural work is basically a description of a product that is to be built. You can use models to clarify the description.
You can describe information systems with e.g. graphs, pseudo code, etc. Models can be software prototypes.

Architecture contains the three aspects design, function and form.
- The development process includes the design aspect.
- Requirements handling and verification of information systems represent the functional aspect.
- The form for information systems can vary. One possibility is to use a standardised form based on Ada 95 and MIL-STD-498.

4 What is Architecture good for?

4.1 Human needs
Architecture concentrates on human needs. For traditional architecture this means mainly dimensions like ceiling height, step heights, etc. that are adjusted to suit the average human.