
WICSA: Software Architecture Evaluation and Analysis

David Garlan, Chair
Carnegie Mellon University

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Interests of Attendees

- Conformance (arch-impl) and reverse eng
- Relation between Enterprise Arch & SW Arch
- Improving arch practices in industry.
- Disciplined processes for arch development
- What is hard to do? What is state of art?
- Tradeoff analysis
- Analysis for dependability
- Use of scenarios and other eval techniques
- Product lines and mergers
- Patterns (artificial and natural)
- Causal Analysis

Examples of Architecture Descriptions

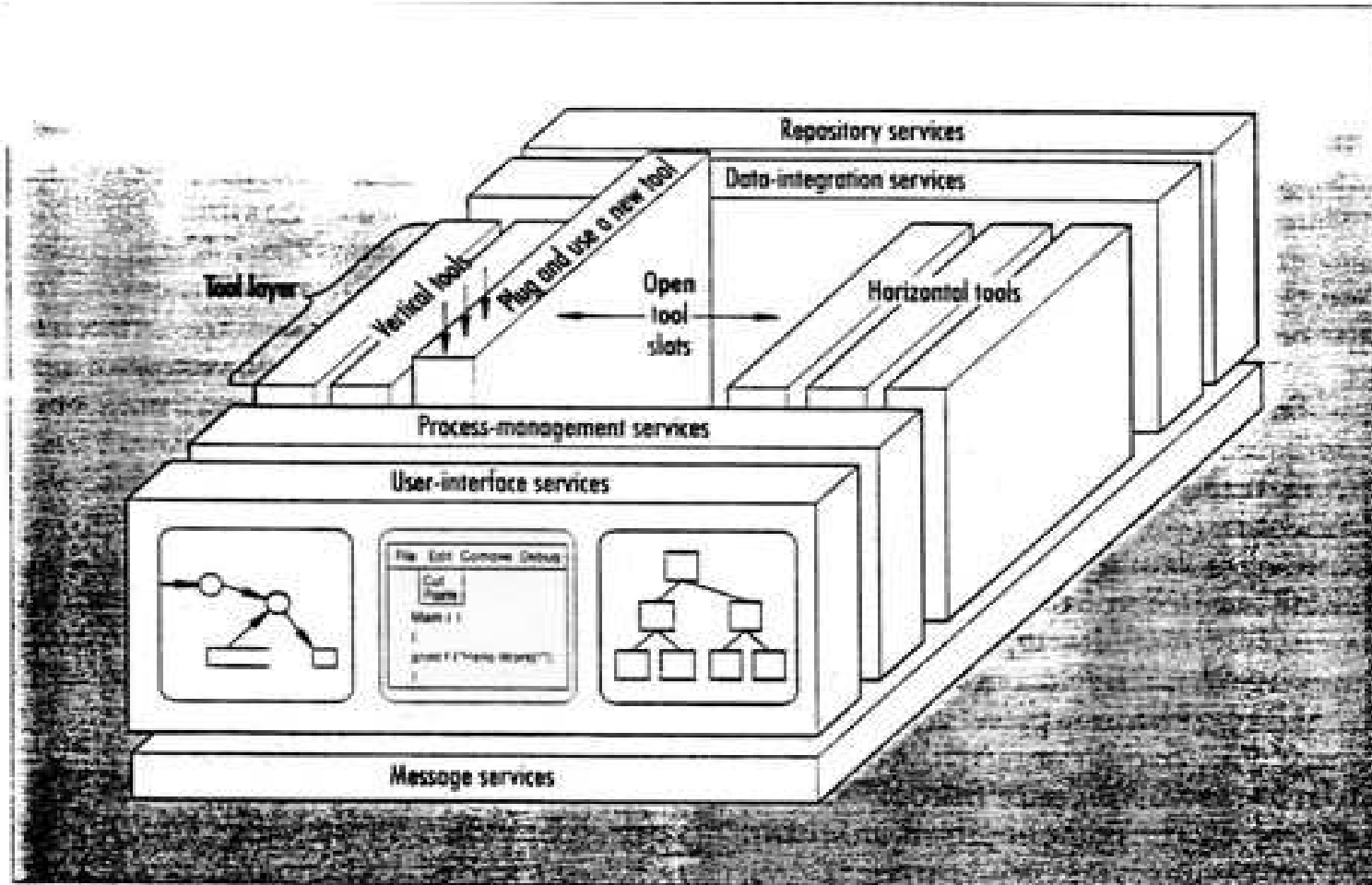


Figure 1. The NIST/ECMA reference model.

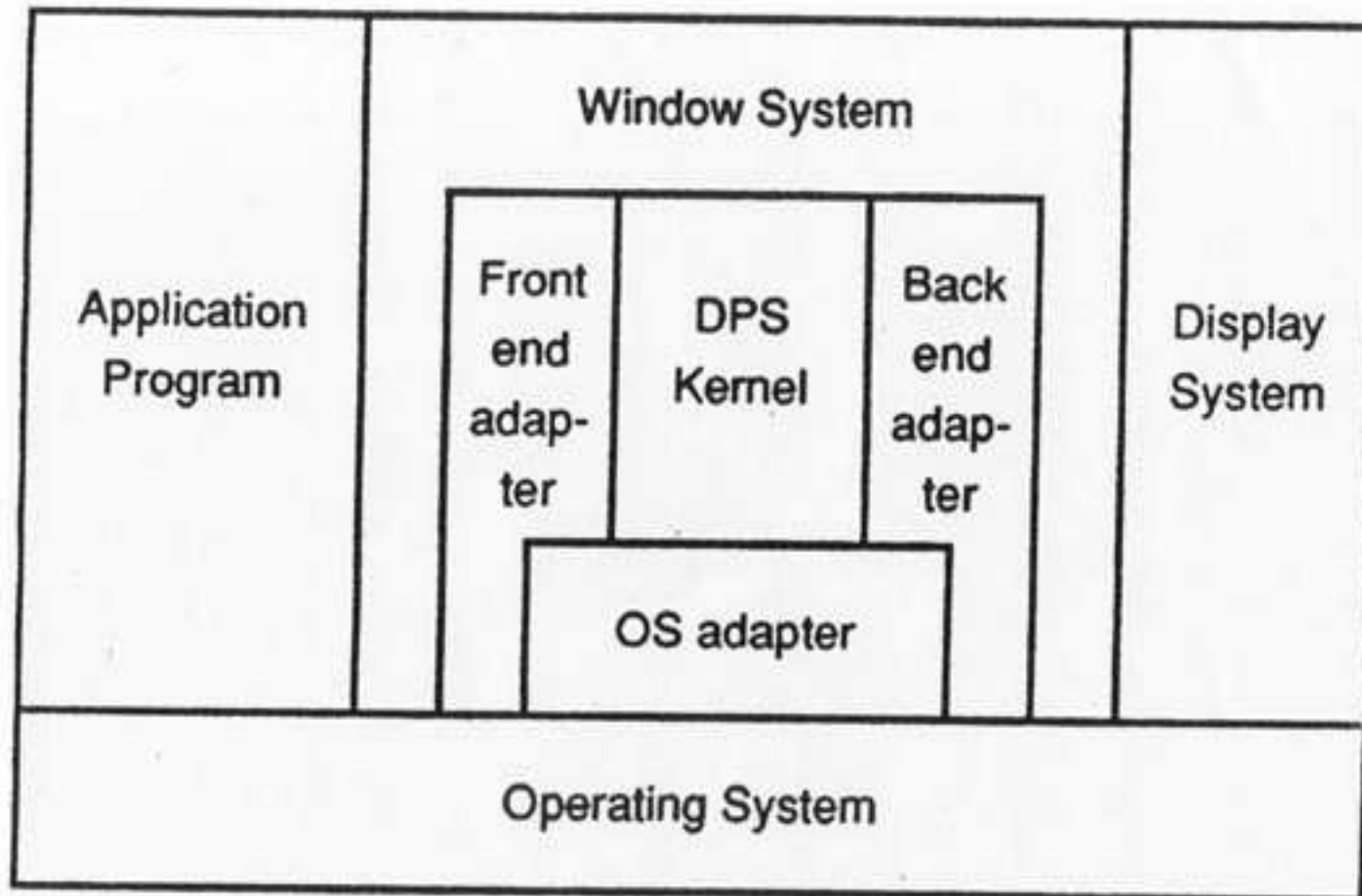


Figure 2. Display PostScript interpreter components.

An Overview of the DISPLAY POSTSCRIPT™ System, Adobe Systems Incorporated, March 16, 1988, P. 10

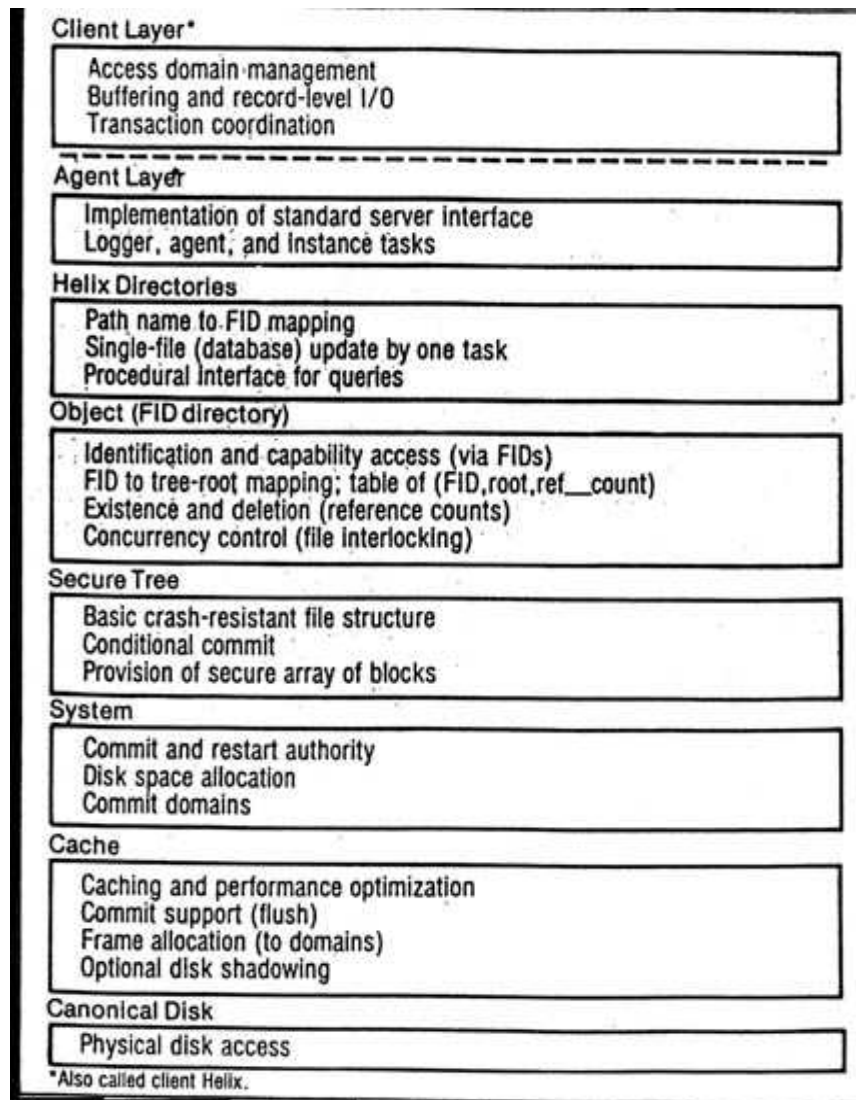
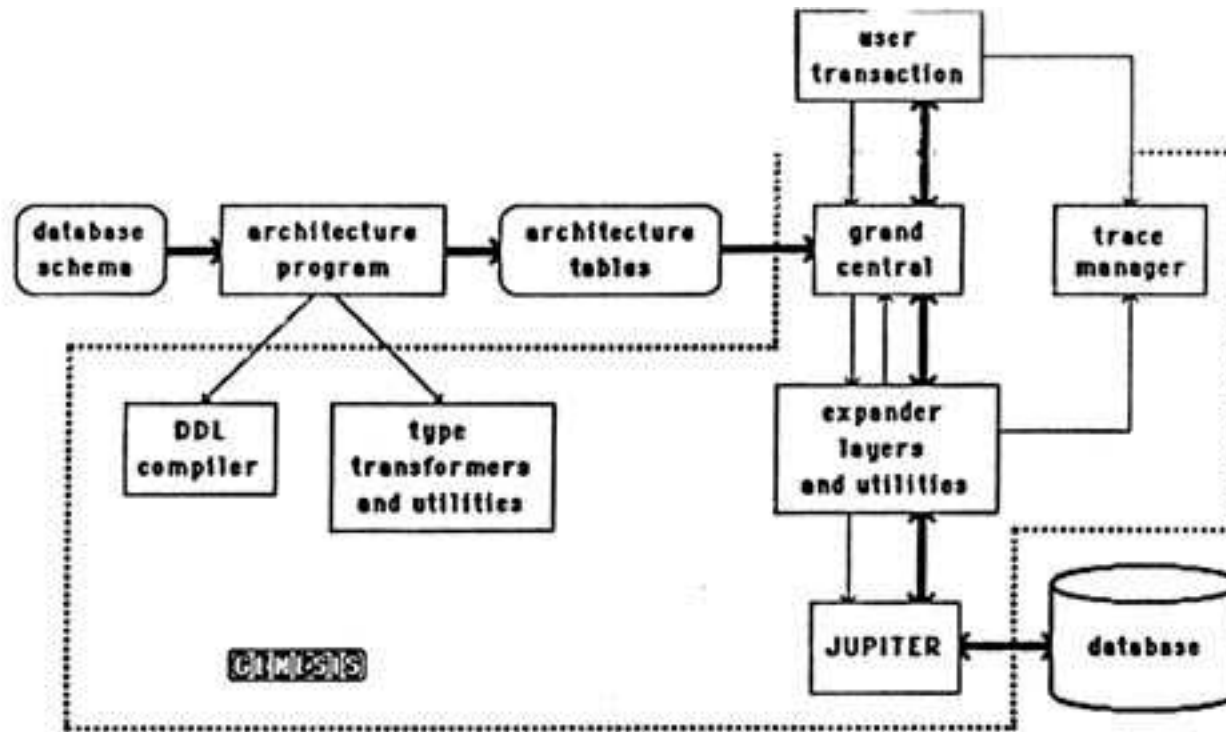


Figure 2. Abstraction layering.

IEEE Software, "Helix: The architecture of the XMS Distributed File System,"
 Marek Fridrich and William Older, May 1985, Vol. 2, No. 3, P. 23



Legend

- module or program
- scheme or tables

A → B A calls B

A → B data path

Figure 3.1 The Configuration of the GENESIS Prototype

Genesis: A Reconfiguration Database Management System, D. S. Batory, J.R. Barnett, J.F. Garza, K.P. Smith, K. Teukuda, B.C. Twitchell, T.E. Wise, Department of Computer Sciences, University of Texas at Austin.

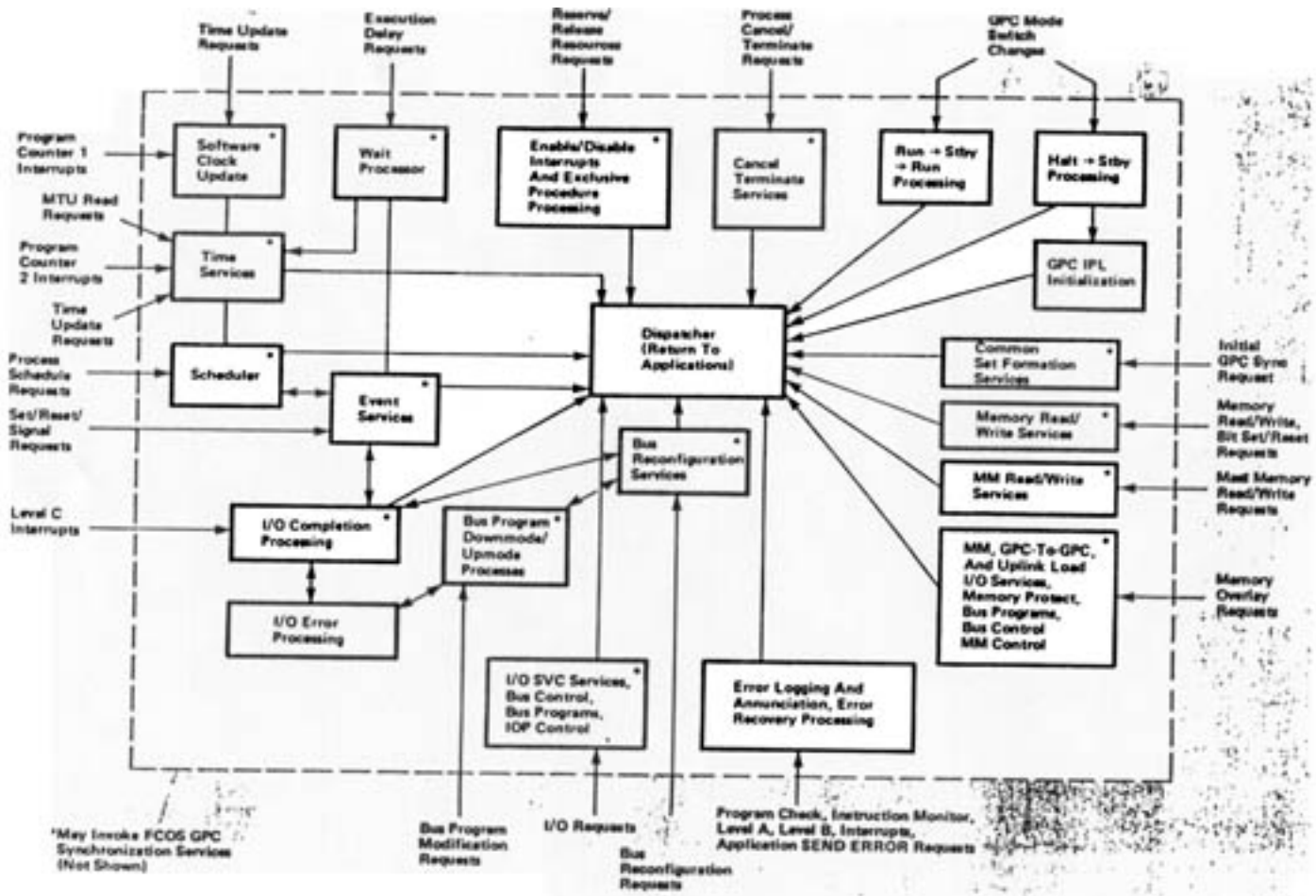


FIGURE 7. Flight Computer Operating System (The FCOS dispatcher coordinates and controls all work performed by the on-board computers.)

Communications of the ACH, "Architecture of the Space Shuttle Primary Avionics Software Systems," Gene D. Carlow, September 1984, Vol. 27, No. 9, P. 933

Some Issues Addressed by Architectural Design

- **Decomposition of a system into interacting components**
 - typically hierarchical
 - using rich abstractions for component interaction or system “glue”
- **Emergent system properties**
 - performance, throughput, latencies
 - reliability, security, fault tolerance, evolvability
- **Rationale and assignment of function to components**
 - relates requirements and implementations
- **Envelope of allowed change**
 - “load-bearing walls”, limits of scalability and adaptation
 - design idioms and styles

The Challenge

How can we establish intellectual control over this world?

- ❑ Express architectural descriptions precisely and intuitively
- ❑ Provide soundness criteria & tools to check them
- ❑ Analyze architectural designs to determine key properties
- ❑ Exploit patterns and styles
- ❑ Guarantee conformance between architecture and implementation

Today's Practice

- Growing recognition of role of sw architecture
 - Architect as distinct job title
 - Architectural design reviews part of sw devel processes
 - Investment in product lines and frameworks
 - Courses, textbooks, certificates, conferences
- Emerging notations and techniques
 - UML 2.0
 - supporting object-oriented arch modeling
 - “Model-driven architecture,”
 - addressing platform independence
 - Middleware and integration standards
 - enabling component composition

But ...

- **Notations are largely informal**
 - Meager analytical capability
 - No way to check/enforce compatibility with implementation
 - Hard to maintain architectural integrity over time
- **There are few practical tools for the architect**
 - Supporting scalability
 - Tailorable to domain and product family
 - Allowing flexible tool integration and analysis
 - Enabling code generation and conformance checking

This Session

- Papers & Discussion
- Possible focus topics
 - State of the field
 - What can we do routinely?
 - What can we do in a limited fashion?
 - What don't we know how to do yet?
 - Bridging the gap between research and practice
 - What are the impediments to transitioning advanced technology into practice?
 - What does the practice tell us about where research should be going on?

The Papers

1. A Framework for Measuring Architecting Effort and Its Application in Medical Imaging Systems Development
Eelco Rommes, Andre Postma, Pierre America - *Phillips*
2. Predicting Architectural Styles from Component Specifications
Sutirtha Bhattacharya - *Intel Corporation*
Dewayne Perry - *University of Texas at Austin*
3. Static Evaluation of Software Architectures - A Short Summary
Jens Knodel, Mikael Lindvall, Dirk Muthig - *Fraunhofer*

4. Introducing Ambient Calculus in Mobile Aspect-Oriented Software Architectures

Nour Ali, Jennifer Perez, Isidro Ramos, Jose A. Carsi - *Polytechnic University of Valencia*

5. Towards a Set of Application Independent Clustering Criteria within an Architecture Recovery Approach

Aline Vasconcelos - *Cefet Campos*

Claudia Werner - *Coppe Ufrj*

6. Extending SPQR to Architectural Analysis by Semi-Automated Training

Jason Smith, David Stotts - *Univ. of N. Carolina*

Session Summary Slide for Mary Shaw

- Objectives: Understand how to improve our ability to model and evaluate architectures.
- Representative issues discussed
 - How much architecture is enough? How many architects and architectural roles are needed in an organization?
 - How do you identify the 5 top arch issues for a system?
 - How do we extract arch patterns from code?
 - How do we model architectures for mobile/pervasive systems?