The Importance of Software Architecture

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My Focus: Software Architecture

Software is pervasive in today’s systems and business operations.

“The only thing you can do with an F-22 that does not require software is take a picture of it” ~ Lt. Gen Fain

Software is the root cause of most of today’s system problems.

The quality and longevity of a software system is determined by its architecture.
What Is Software Architecture?

Software architecture is the structure or structures of the system, which comprise software components, the externally visible properties of these components, and the relationships among them.

*Software Architecture in Practice*, Bass, Clements, Kazman

The exact structures (views) to consider and the ways to represent them vary.
Why Architecture?

Represents *earliest* design decisions

• hardest to change
• most critical to get right

*First* design artifact addressing

• performance • modifiability
• reliability • security

Key to systematic *reuse*

*The right architecture* paves the way for system *success.*

*The wrong architecture* usually spells some form of *disaster.*
“The architecture of complex software or systems is a collection of hard decisions that are very expensive to change. Successful product development and evolution depend on making the right architectural choices.” Alexander Ran, Nokia

“Too many systems have performance and other problems caused by an inappropriate architecture. Thus problems are introduced early, but are usually detected too late – when the deadline is near or, even worse, after the problem makes the headlines.” Connie Smith, Performance Solutions
“We were thinking of the qualities first. The quality that we needed primarily to achieve was flexibility. And that’s because we needed an architecture and a set of architectural principles that were going to be able to adapt quickly to changing market drivers and business goals; our architecture enabled us to be maximally flexible with respect to all of those things.” Jeromy Carriere, AOL
What Is Architecture-Based Development?

Architecture-based development involves:

- understanding the domain requirements
- developing or selecting the software architecture
- representing and communicating the architecture
- analyzing or evaluating the architecture for ability to satisfy requirements
- organizing the work products of the architecture
- implementing the system based on the architecture
- ensuring that the implementation conforms to the architecture
- maintaining the architecture

The architecture must be both prescriptive and descriptive.
If function were all that mattered, any monolithic software would do, ..*but other things matter*... The important quality attributes and their characterizations are key.

- Modifiability
- Interoperability
- Availability
- Security
- Performance
- Portability

*analysis, design, development*

Software architecture has these qualities
Common Impediments to Achieving Architectural Success

Lack of adequate architectural talent and/or experience.

Insufficient time spent on architectural design and analysis.

Failure to identify the quality drivers and design for them.

Failure to properly document and communicate the architecture.

Failure to evaluate the architecture beyond the mandatory government review.

Failure to understand that standards are not a substitute for a software architecture.

Failure to ensure that the architecture directs the implementation.

Failure to evolve the architecture and maintain documentation that is current.
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References