Applying Software Architecture Evaluation to Systems Acquisition

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Presentation Outline

Software Architecture

The Architecture Tradeoff Analysis Method (ATAM)

Applying ATAM within the DoD Acquisition Context

Summary
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.

The exact structures to consider and the ways to represent them vary.
Why Is Software Architecture Important?

Architecture is a common high-level communication vehicle for system stakeholders.

Architecture embodies the earliest set of design decisions about a system. These decisions are the most difficult to get right and hardest to change, and they have the most far-reaching downstream effects.

Architecture forms the organizational plan for development.

Architecture is the foundation of product line development.

Architecture provides the most powerful handle into system qualities over the life cycle.
It Makes Sense to Analyze Software Architecture and Do It Early

Because of the impact of the software architecture on system quality and performance
Relationship of System Requirements to Software Architecture

System Specification

System Quality Attributes*

Software Architecture

* Reusability
  Modifiability
  Portability
  Extensibility
  ...

System Capabilities and Software Quality

determines level of quality

驱动

驱动
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Evaluating Software Architecture

Several approaches to architecture evaluation have been proposed. Building on previous work, the SEI has been developing the Architecture Tradeoff Analysis Method\textsuperscript{SM} (ATAM)\textsuperscript{SM} for the past two years.

The purpose of the ATAM is: to assess the consequences of architectural decision alternatives in light of quality attribute requirements.

ATAM allows discovery of
• risks
• design sensitivity points
• tradeoffs among competing quality requirements
ATAM Approach

Perform ATAM early in the design process.
• *NOT* to provide precise analyses
• *BUT* to discover risks created by architectural decisions.

Discovered risks can then be made the focus of mitigation activities: e.g. further design, further analysis, prototyping.

Result: improved software architectures and better systems
ATAM Steps

1. Present the ATAM
2. Present business drivers
3. Present architecture
4. Identify architectural styles
5. Generate quality attribute utility tree
6. Elicit and analyze architectural styles
7. Generate seed scenarios
8. Brainstorm and prioritize scenarios
9. Map scenarios onto styles
10. Present out-brief and/or write report
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acquisition strategy is “overall roadmap for program execution” [DoD 5000.2R]
Contracting Phases

Initiation
- RFI
- RFP
- Proposals
- TIMs

Pre-Award Phase
- RFP Preparation
- Solicitation
- Proposal evaluation
- Best and final offers (BAFO)
- Source selection

Award Phase
- Contract award
- Contract administration
- Contract performance
- Contract technical monitoring

Post-Award Phase
- Deliverables

Contract Completion
Possible Pre-Award and Award Applications of ATAM

An ATAM-based software architecture evaluation can be specified as part of the technical evaluation criteria and risk reduction for source selection.
Possible Post-Award Applications of ATAM

Include the requirement to use ATAM to
• reduce program technical risks
• help select a software architecture among candidate architectures
• assist in refinement of selected architecture
• ensure proper communication and documentation of selected architecture
Example System Development Tasks and Evaluations

Initial System Development

Full System Implementation

Software Architecture Evaluation

System Enhancements

Software Architecture Modification

Scenario Development

Legend

Contractor Task

Acquirer Task
Where Do We Codify the Acquisition Strategy in RFPs/Contracts?

**Section M:**
Evaluation Factors for Award

**Section L:**
Proposal Preparation Instructions

**Section J:**
List of Contract Deliverables

**Section H:**
Special Contract Requirements

**Section C:**
Statement of Work and Specification

**Section B:**
Supplies, Services, and Prices
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For a software-intensive system, software architecture is a key determinant of whether system quality requirements can be met.

ATAM can provide early insight into software architecture and reduce program risks.

The acquisition challenge is to specify an appropriate acquisition and contracting strategy to take advantage of ATAM.
Contact Information

Business and Acquisition Guidelines

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