

# 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**

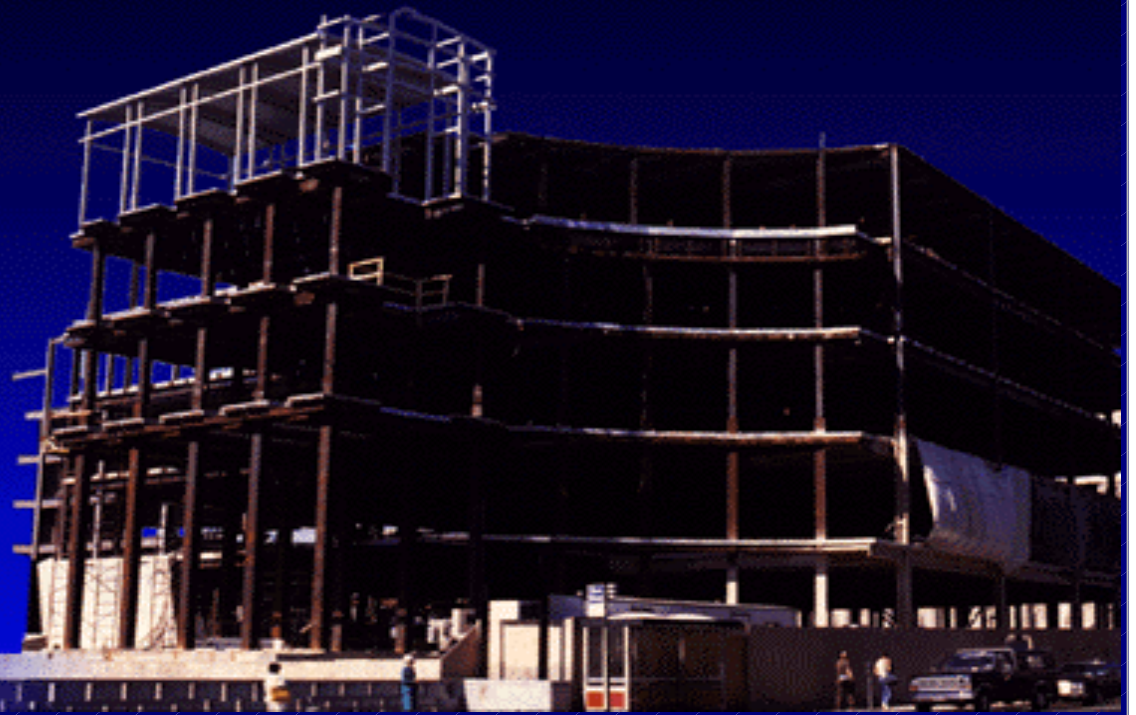
**Summary**



# 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.

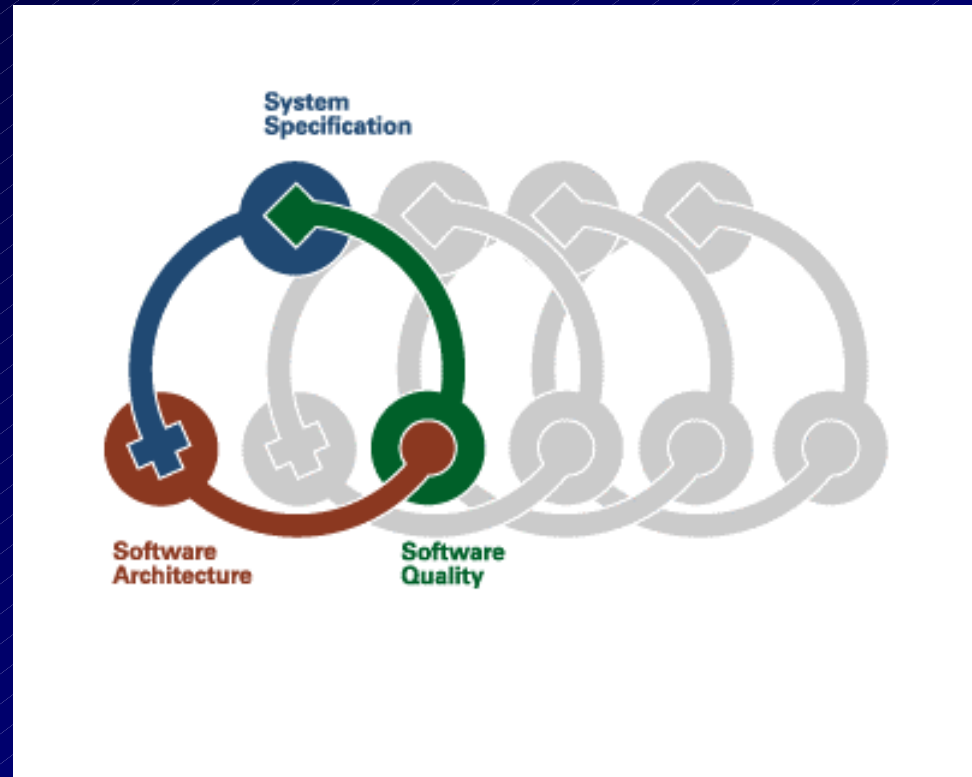
Architecture is the **foundation of product line** development.

Architecture provides the most powerful handle into **system qualities** over the life cycle.



# It Makes Sense to Analyze Software Architecture and Do It Early

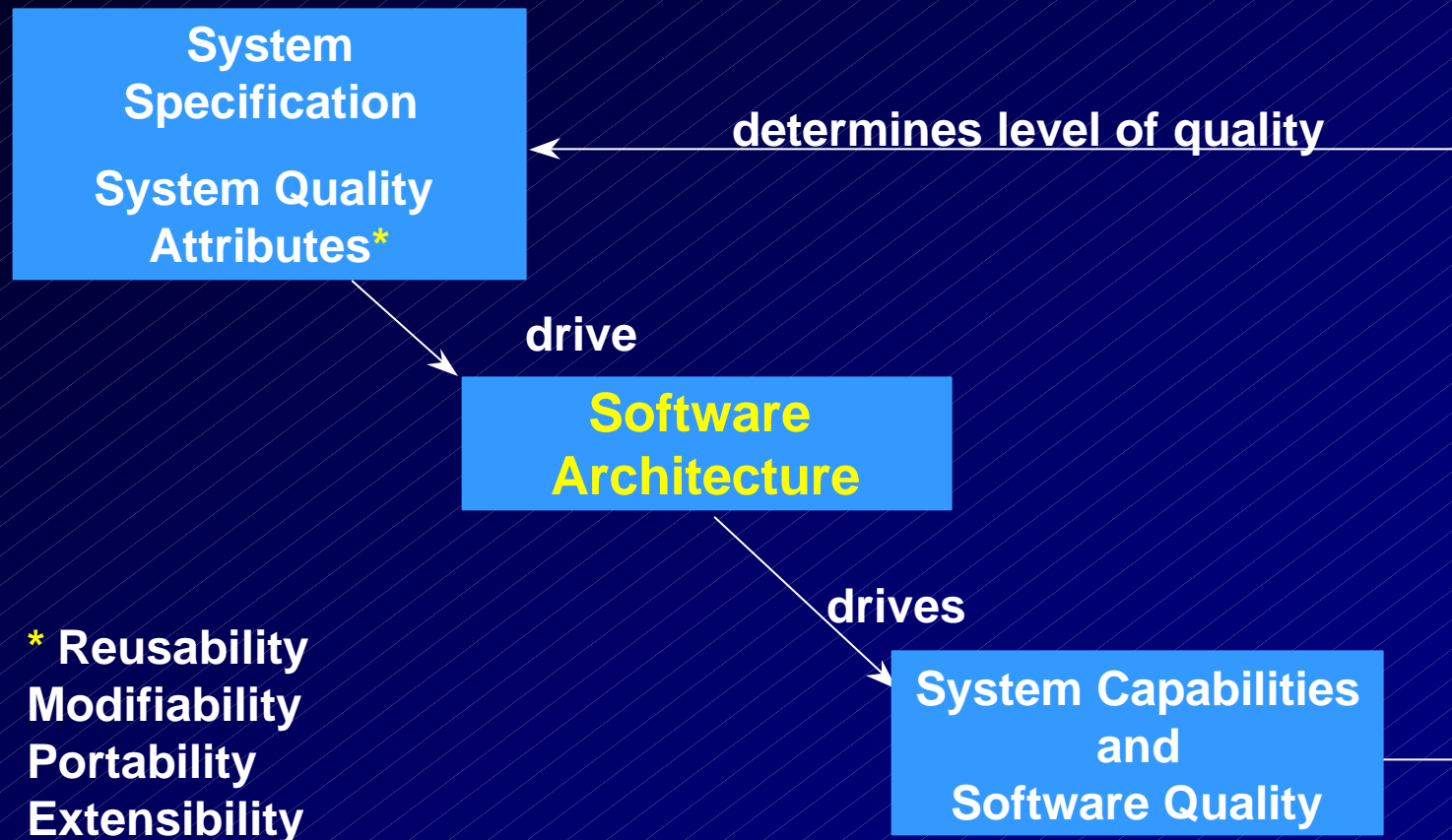
**Because of the impact of the software architecture on system quality and performance**







# Relationship of System Requirements to Software Architecture



- \* Reusability
- Modifiability
- Portability
- Extensibility
- ...



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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<sup>SM</sup> (ATAM)<sup>SM</sup> 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

SM Architecture Tradeoff Analysis Method and ATAM are service marks of Carnegie Mellon University.





# ATAM Approach

**Perform ATAM early in the design process.**

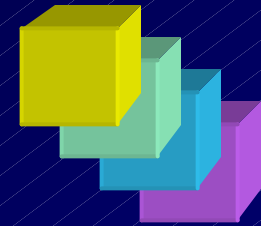
- ***NOT* to provide precise analyses**
- ***BUT* to discover risks created by architectural decisions.**

**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**



# Presentation Outline

## Software Architecture

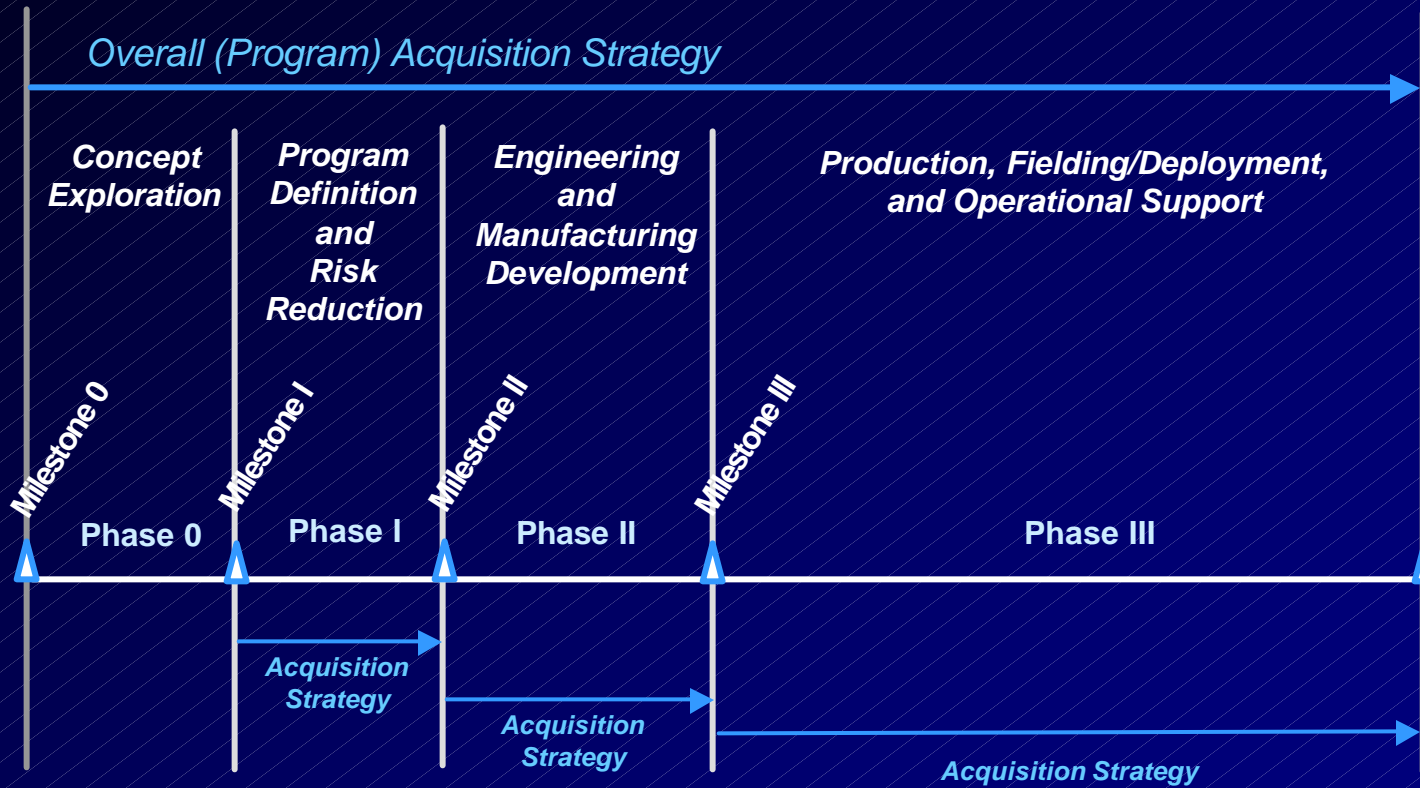
## The Architecture Tradeoff Analysis Method (ATAM)

## → Applying ATAM within the DoD Acquisition Context

## Summary



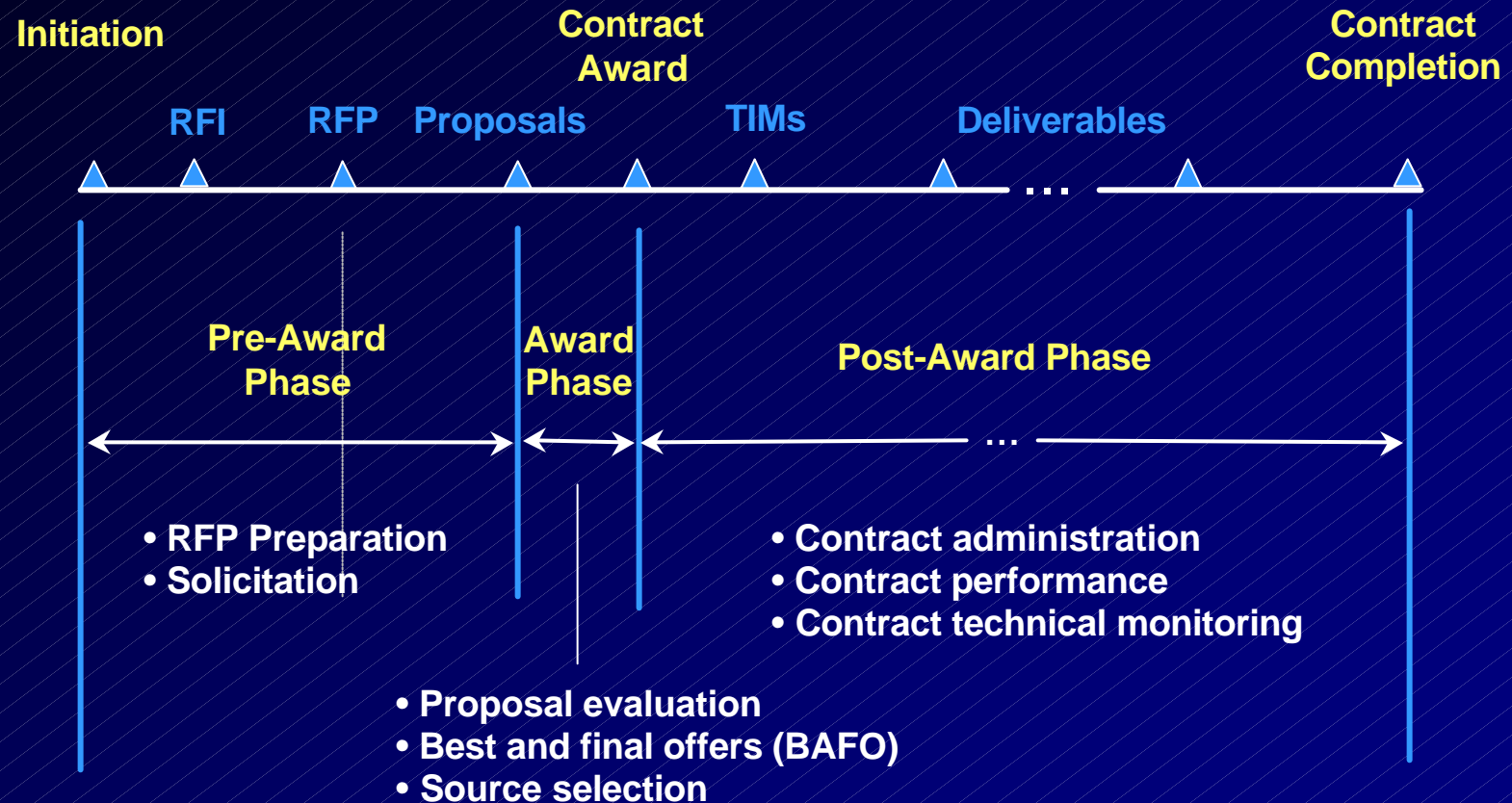
# DoD Acquisition Management Process



acquisition strategy is “*overall roadmap for program execution*” [DoD 5000.2R ]



# Contracting Phases





# 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.**





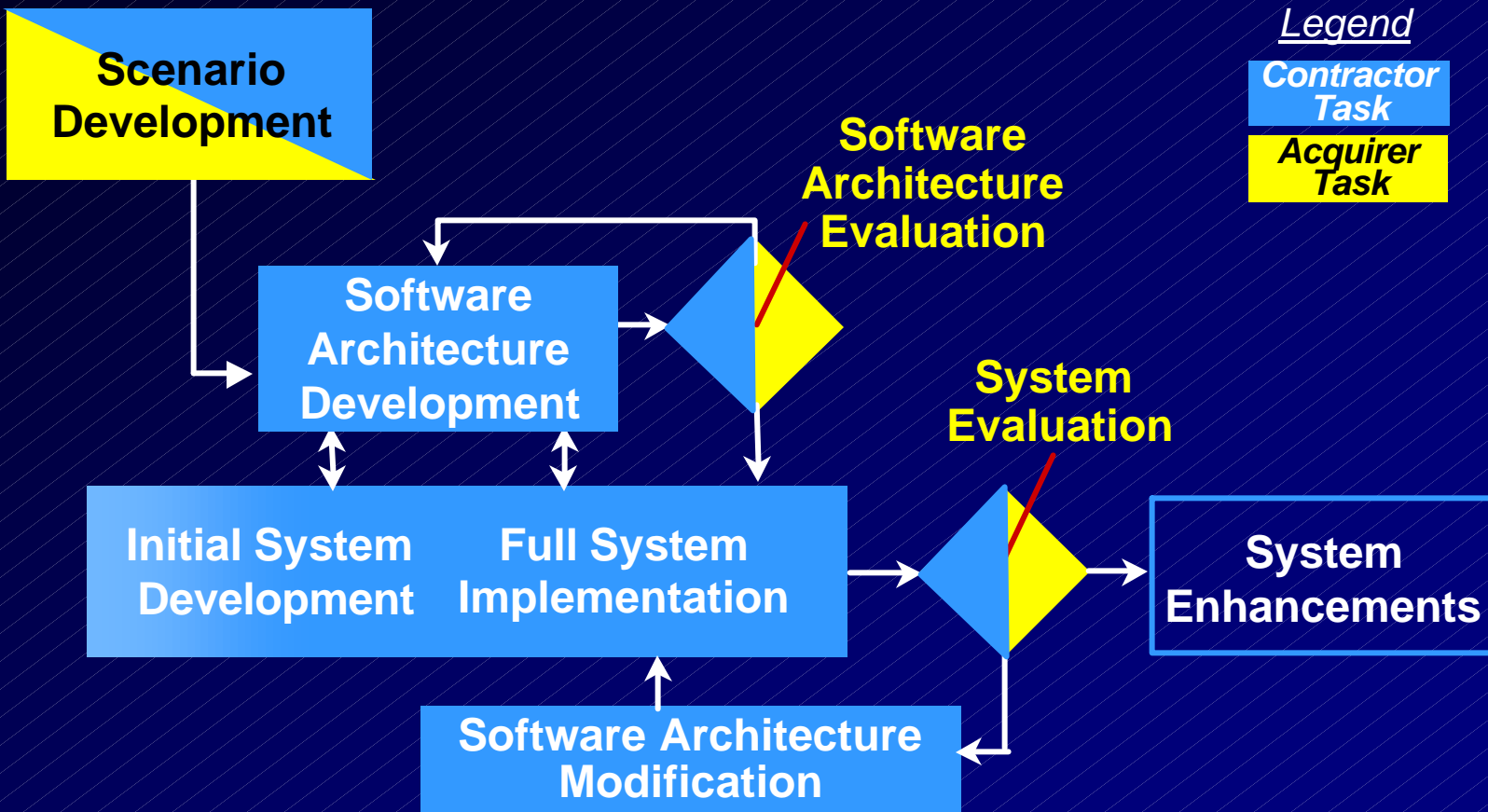
# Possible Post-Award Applications of ATAM

**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**

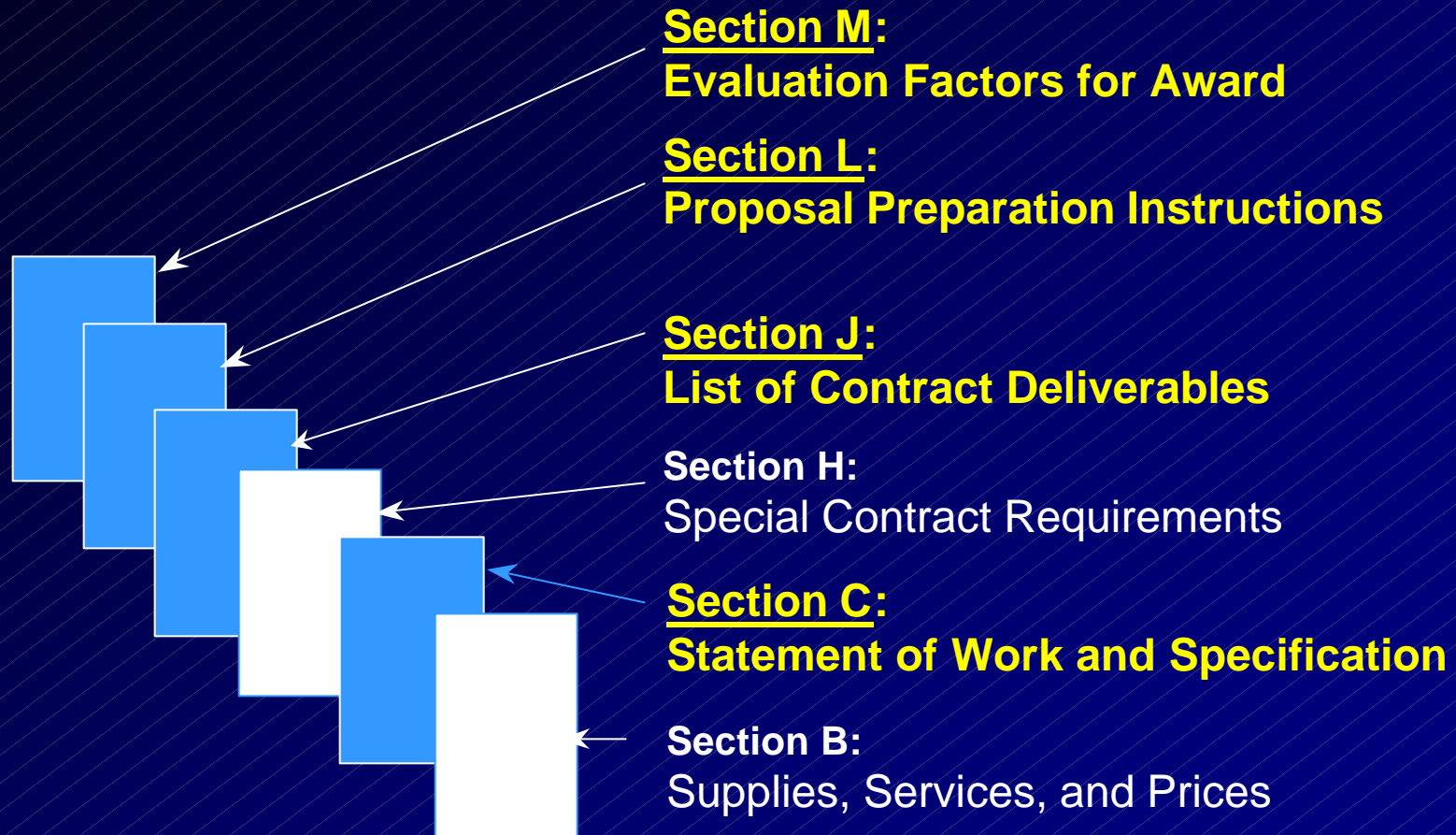


# Example System Development Tasks and Evaluations





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





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# Summary

**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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