Carnegie Mellon University
Software Engineering Institute

Reduce Risk with Architecture Evaluation

Address architecture deficiencies early

ARCHITECTURE HOLDS THE KEY TO SYSTEM SUCCESS. Much more than programming language choice, algorithms, data structures, testing, or other code-related matters, the architecture is the primary carrier of system quality attributes such as performance, modifiability, and security.

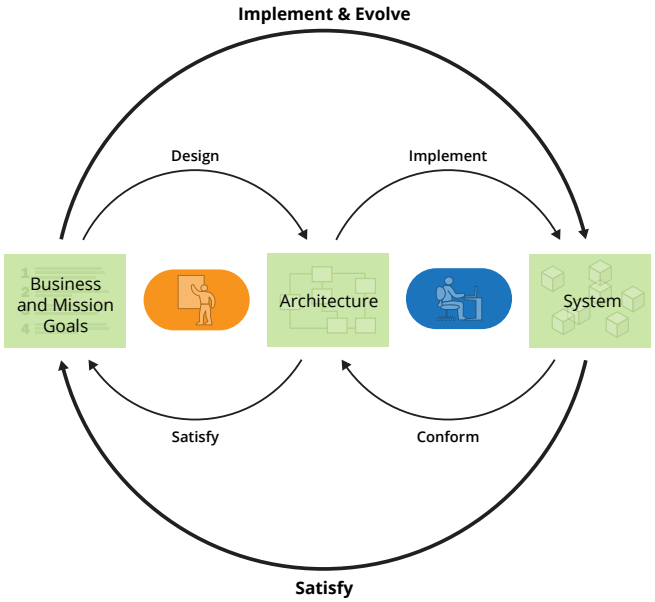
You need to evaluate the architecture of a system for its capacity to support the quality attributes that will meet the organization's business or mission goals. Architecture evaluation is a cost-effective way of mitigating substantial risks to system and organization success.

Benefits of Architecture Evaluation

The SEI's architecture evaluation methods can help you improve software development and quality and gain early confidence in achieving system-related business and mission goals, through

- early identification and mitigation of design risks—yielding fewer downstream, costly problems and more cost savings during integration and test
- predictable system quality—creating a competitive advantage for your organization
- flexibility—enabling cost-effective system evolution and sustainment

Our methods are informed by the experience of working with dozens of organizations over the past 25 years, helping them achieve significant cost reductions, quicker time to market, and higher product quality by applying architecture-centric practices to the development of their systems.



We use architecture as the focal point for performing ongoing analyses to gain increasing levels of confidence that systems will support their missions

Evaluate How Well Your Software Architecture Supports the System's Quality Attribute Requirements with the SEI ATAM®

The Architecture Tradeoff Analysis Method® (ATAM) is a leading risk-reduction process that also helps design teams improve a software architecture.

In this method, business drivers and the software architecture are elicited from project decision makers. These are refined into scenarios, with supporting architectural decisions. Analysis of scenarios and decisions results in identification of risks, non-risks, sensitivity points, and tradeoff points in the architecture. Risks are synthesized into a set of risk themes, showing how each one threatens a business driver.

This method has been shown, through use in many application domains, to provide development organizations with these benefits:

- the gathering of precise quality requirements
- an early start at architecture documentation
- a documented basis for architectural decisions
- identification of risks early in the lifecycle
- increased communication among stakeholders
- prioritization of conflicting goals
- opportunities for cross-project reuse
- improved architecture practices

Use the ATAM Approach for System or System-of-Systems (SoS) SOS Architectures

The SEI offers variants of the ATAM approach, which also rely on scenarios and mission threads to reveal risks to the architecture's support for desired quality attributes.

The SEI System ATAM

With a System ATAM, your organization will address

- system architecture notions and specifications, such as functional block diagrams, system control and data flow diagrams, and so on
- engineering considerations, including simulation studies, prototype development, and operator workload and stress studies
- concerns arising from new quality attributes that serve as system architectural drivers (e.g., physical robustness, continuity of power supply source, and field-ability)
- decisions about whether new architectural approaches are needed (e.g., dynamic resource management, use of development common tool sets)
- additional considerations for a system, including logistical, electrical, mechanical, weapon, or sensor systems

SEI SoS Architecture Evaluation Method

In conjunction with a Mission Thread Workshop, the SEI SoS Architecture Evaluation method provides an initial identification of SoS architectural risks and quality attribute inconsistencies. This evaluation

- probes architecture at the areas where the systems interact to identify risks
- incorporates the expertise of a trained evaluation team and SoS stakeholders, including the SoS and system architects
- organizes the individual risks into risk themes that can be comprehended (and mitigated later) by program management
- assesses the sufficiency of architecture documentation
- identifies potentially problematic systems for focused follow-on evaluations using the specific augmented mission threads

> An SEI Mission Thread Workshop brings together SoS stakeholders to augment existing mission threads with quality attribute considerations.

Architecture Evaluation Education

The SEI offers a comprehensive curriculum of software architecture courses and certificate programs:

- Courses in software architecture essentials, documenting software architecture, software architecture design and analysis, ATAM evaluators, and modeling system architectures
- Software Architecture Professional and ATAM Evaluator certificates

More than 20,000 people from more than 1,800 organizations have attended courses in the SEI Software Architecture Curriculum, and more than 2,500 people have earned software-architecture-related certificates.

About the SEI

The Software Engineering Institute is a research and development center that works with defense and government organizations, industry, and academia to advance the state-of-the art in software engineering and cybersecurity to benefit public interest. Part of Carnegie Mellon University, the SEI is a national resource in pioneering emerging technologies, cybersecurity, software acquisition, and software lifecycle assurance.

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