**ATAM**

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The ATAM is a means of determining whether these goals are achievable by the architecture as it has been conceived, *before* enormous organizational resources have been committed to it

**The purpose of the ATAM is to assess the consequences of architectural decisions in light of quality attribute requirements.**

The ATAM is meant to be a risk identification method, a means of detecting areas of potential risk

within the architecture of a complex software intensive system. This has several implications:

• The ATAM can be done early in the software development life cycle.

• It can be done relatively inexpensively and quickly (because it is assessing architectural design

artifacts).

• The ATAM will produce analyses commensurate with the level of detail of the architectural

specification.

A tradeoff point is found in the architecture when a parameter of an architectural construct is host to more than one sensitivity point where the measurable quality attributes are affected differently by changing that parameter.

A prerequisite of an evaluation is to have a statement of quality attribute requirements and a specification of the architecture with a clear articulation of the architectural design decisions. However, it is not uncommon for quality attribute requirement specifications and architecture renderings to be vague and ambiguous.

Therefore, two of the major goals of ATAM are to

• elicit and refine a precise statement of the architecture’s driving quality attribute requirements

• elicit and refine a precise statement of the architectural design decisions

Given the attribute requirements and the design decisions, the third major goal of ATAM is to

• evaluate the architectural design decisions to determine if they satisfactorily address the quality

Requirements

The ATAM focuses on quality attribute requirements

*Scenarios* are the second key concept upon which ATAM is built.

The ATAM is an analysis method organized around the idea that architectural styles are the main determiners of architectural quality attributes. The method focuses on the identification of business goals which lead to quality attribute goals. Based upon the quality attribute goals, we use the ATAM to analyze how architectural styles aid in the achievement of these goals.

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Each quality attribute characterization is divided into three categories: *external stimuli, architectural*

*decisions,* and *responses*. *External stimuli* (or just *stimuli* for short) are the events that cause the architecture to respond or change. To analyze an architecture for adherence to quality requirements, those requirements need to be expressed in terms that are concrete and measurable

or observable. These measurable/observable quantities are described in the *responses* section of the attribute characterization. *architectural decisions* are those aspects of an architecture—components, connectors, and their properties—that have a direct impact on achieving attribute responses.

Scenarios

In ATAM we use three types of scenarios: *use case scenarios* (these involve typical uses of the

existing system and are used for information elicitation); *growth scenarios* (these cover anticipated

changes to the system), and *exploratory scenarios* (these cover extreme changes that are expected to “stress” the system).

Utility trees

Utility trees provide a top-down mechanism for directly and efficiently translating the business

drivers of a system into concrete quality attribute scenarios

The utility tree shown in Figure 3 contains *utility* as the root node. This is an expression of the

overall “goodness” of the system.

Typically the quality attributes of performance, modifiability, security, and availability are the high-level nodes immediately under utility.

Method

The steps of the method are as follows:

*Presentation*

1. **Present the ATAM**. The method is described to the assembled stakeholders (typically

customer representatives, the architect or architecture team, user representatives, maintainers,

administrators, managers, testers, integrators, etc.).

2. **Present business drivers**. The project manager describes what business goals are motivating

the development effort and hence what will be the primary architectural drivers

(e.g., high availability or time to market or high security).

3. **Present architecture**. The architect will describe the proposed architecture, focussing on

how it addresses the business drivers.

*Investigation and Analysis*

4. **Identify architectural approaches**. Architectural approaches are identified by the architect,

but are not analyzed.

5. **Generate quality attribute utility tree**. The quality factors that comprise system “utility”

(performance, availability, security, modifiability, etc.) are elicited, specified down to the

level of scenarios, annotated with stimuli and responses, and prioritized.

6. **Analyze architectural approaches**. Based upon the high-priority factors identified in

Step 5, the architectural approaches that address those factors are elicited and analyzed

(for example, an architectural approach aimed at meeting performance goals will be subjected

to a performance analysis). During this step architectural risks, sensitivity points,

and tradeoff points are identified.

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*Testing*

7. **Brainstorm and prioritize scenarios**. Based upon the exemplar scenarios generated in

the utility tree step, a larger set of scenarios is elicited from the entire group of stakeholders.

This set of scenarios is prioritized via a voting process involving the entire stakeholder

group.

8. **Analyze architectural approaches**. This step reiterates step 6, but here the highly ranked

scenarios from Step 7 are considered to be test cases for the analysis of the architectural

approaches determined thus far. These test case scenarios may uncover additional architectural

approaches, risks, sensitivity points, and tradeoff points which are then documented.

*Reporting*

9. **Present results**. Based upon the information collected in the ATAM (styles, scenarios,

attribute-specific questions, the utility tree, risks, sensitivity points, tradeoffs) the ATAM

team presents the findings to the assembled stakeholders and potentially writes a report

detailing this information along with any proposed mitigation strategies.