

# Architecturally Significant Requirements

Requirements that will affect the architecture and are essential for its success, often focusing on quality attributes.

An ASR has two key properties:

1. It has a **substantial impact** on architectural decisions (structure, components, interactions).
2. It has **high business or mission value**, contributing to stakeholder goals such as market positioning, product quality, adaptability, or performance.

They can appear across many parts of the requirement space:

- **Usage:** support for user roles, multiple system modes, or internationalization.
- **Orchestration:** sequencing of processes or workflows.
- **Time:** coordination, deadlines, or real-time constraints.
- **Networking:** protocol choices, bandwidth, latency.
- **Security:** authentication, access control, sensitive data.
- **Hardware and devices:** processor types, memory needs, sensors/actuators.
- **Resources:** concurrency, scheduling, time, and energy usage.
- **Flexibility:** modifiability, configurability, portability.
- **Technologies:** specified platforms, COTS components, or named tools.
- **Data:** persistence, consistency, concurrent access.
- **Project concerns:** team experience, training needs, coordination.

These show that ASRs can be **functional or non-functional**, and often relate to **quality attributes**

## Method to identify and capture ASRs

Quality Attribute Workshop: stakeholder driven method to generate prioritize and refine quality scenarios before finalizing the architecture.

- Steps:
  - Business/mission presentation: business context, main functionalities, price...
  - Architectural plan presentation: shows high level design ideas

- Identification of architectural drivers (including ASRs): major requirements for the system
- Scenario Brainstorming: stakeholders express concerns and scenarios
- Scenario Consolidation: merging similar scenarios
- Scenario prioritization - vote for most important scenarios
- Scenario Refinement: describe them using the six-part scenario template (stimuli - artifact – response)

## Utility Tree

ASRs are documented and prioritized using a **Utility Tree**, which organizes them into a structured form:

- The **root** node is a generic "Utility" or "Goodness".
- The **second level** contains broad quality attributes (e.g., performance, availability).
- The **third level** contains **refinements** (e.g., for performance: framerate, load time).
- Each ASR scenario is placed under a relevant quality category and scored:
  - By **impact** on architecture (low, medium, high).
  - And by **business/mission value** (low, medium, high).

**TABLE 19.1** Tabular Form of the Utility Tree for a System in the Healthcare Space

Quality Attribute	Attribute Refinement	ASR Scenario
Performance	Transaction response time	A user updates a patient's account in response to a change-of-address notification while the system is under peak load, and the transaction completes in less than 0.75 seconds. (H, H)
	Throughput	At peak load, the system is able to complete 150 normalized transactions per second. (M, M)
Usability	Proficiency training	A new hire with two or more years' experience in the business can learn, with 1 week of training, to execute any of the system's core functions in less than 5 seconds. (M, L)
	Efficiency of operations	A hospital payment officer initiates a payment plan for a patient while interacting with that patient and completes the process with no input errors. (M, M)
Configurability	Data configurability	A hospital increases the fee for a particular service. The configuration team makes and tests the change in 1 working day; no source code needs to change. (H, L)
Maintainability	Routine changes	A maintainer encounters response-time deficiencies, fixes the bug, and distributes the bug fix with no more than 3 person-days of effort. (H, M)
		A reporting requirement requires a change to the report-generating metadata. Change is made and tested in 4 person-hours of effort (M, L)
	Upgrades to commercial components	The database vendor releases a new major version that is successfully tested and installed in less than 3 person-weeks. (H, M)
Security	Adding new feature	A feature that tracks blood bank donors is created and successfully integrated within 2 person-months. (M, M)
	Confidentiality	A physical therapist is allowed to see that part of a patient's record dealing with orthopedic treatment, but not other parts or any financial information. (H, M)
Availability	Resisting attacks	The system repels an unauthorized intrusion attempt and reports the attempt to authorities within 90 seconds. (H, M)
	No down time	The database vendor releases new software, which is hot-swapped into place, with no downtime. (H, L) The system supports 24/7/365 web-based account access by patients. (M, M)