Non-functional Requirements

Purpose

- Define qualitative aspects of requirements
- May restrict the design and implementation
- May restrict the process and/or the product
- May arise due to
  - standards
  - organizational policies
  - interoperability constraints
  - ...
Distinction between functional and non-functional requirements

- “The system shall ensure that data is protected from unauthorized access.”
  - Non-functional requirement (Security)

- “The system shall include a user authorization mechanism through <login, password>; only users with registered login id and valid password can use the system.”
  - Functional requirement

Distinction (continued)

- “The system should provide a ‘friendly’ user interface.”
  - Non-functional requirement; the word “friendly” is too subjective for a functional requirement.

- “Users must be able to select any option from the GUI and should get confirmation message back for every action.”
  - Functional requirement imposed on GUI design
Classifications of non-functional requirements

- Mostly from IEEE Std 830-1993
  - Interface requirements (interoperability constraints)
  - Security requirements (user authorization constraints)
  - Portability requirements (system usage constraints)
  - Reliability requirements
  - Safety requirements
  - Documentation requirements (Standards constraints)
  - Acceptance requirements (Standards constraints)

Classification by Ian Sommerville

Organizational Requirements
- Delivery Requirements
- Implementation Requirements
- Standards Requirements

Product Requirements
- Usability Requirements
- Reliability Requirements
- Safety Requirements
- Efficiency Requirements

Performance Requirements
- Capacity Requirements

External Requirements
- Legal Constraints
- Economic Constraints
- Interoperability Requirements
**Product Requirements Examples**

- **System shall have an availability of 99%**  
  - Reliability requirement

- **System must respond back within 5 seconds**  
  - Performance requirement

- **Executable code of the system shall not exceed 0.5 MB**  
  - Capacity requirement

- **System shall be installed on PC, Mac and UNIX stations**  
  - Portability requirement

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**Conflicting requirement examples**

- **System shall respond back within 5 seconds**  
  - May not be possible given other requirements, such as 0.5 MB limit.

- **System shall have an availability of 99%**  
  - May not be achievable if the response time is too short.

- **System shall be written in Java, using Hotspot JVM.**  
  - May result in a portable code but may not be efficient, and hence may not satisfy performance requirement.
Organizational Requirement Examples

Organizational requirements are also called “process requirements”.

- “System shall conform to IEEE Standards for processes”
  - Standards requirement

- “System shall use Rational Rose for developing the design diagrams and code generation”
  - Implementation constraint
  - Not preferred during “requirements engineering process”, but organizational policy may restrict the use of any other tool

External requirements Examples

- “The system output must be certified for format and contents by the chief medical officer.”
  - Legislation constraint

- “The automobile braking subsystem must conform to the standards defined by Professional Society of Engineers.”
  - This particular standard may describe hardware design issues only, but the control system must take into account the standards requirement

NOTE: External requirements are generally hard to achieve.
**Relationship: user needs and non-functional requirements**

- **User needs**
  - Functional
  - Performance
  - Change

- **User concerns**
  - Ease of use
  - Unauthorized Access
  - Chances of Failure
  - Resource Utilization
  - Performance verification
  - Ease of Interfacing
  - Ease of change
  - Ease of transport

- **Non-functional requirements**
  - Usability
  - Security
  - Reliability
  - Efficiency
  - Verifiability
  - Interoperability
  - Maintainability
  - Portability

**Possible Metrics for non-functional requirements**

- **Performance**
  - Processing speed
  - Response time

- **Reliability**
  - Rate of occurrences of failure
  - Mean time to failure

- **Availability**
  - Probability of failure on demand

- **Portability**
  - Number of target platforms