Software Architecture Review

2025 Spring

Yishuai LIN

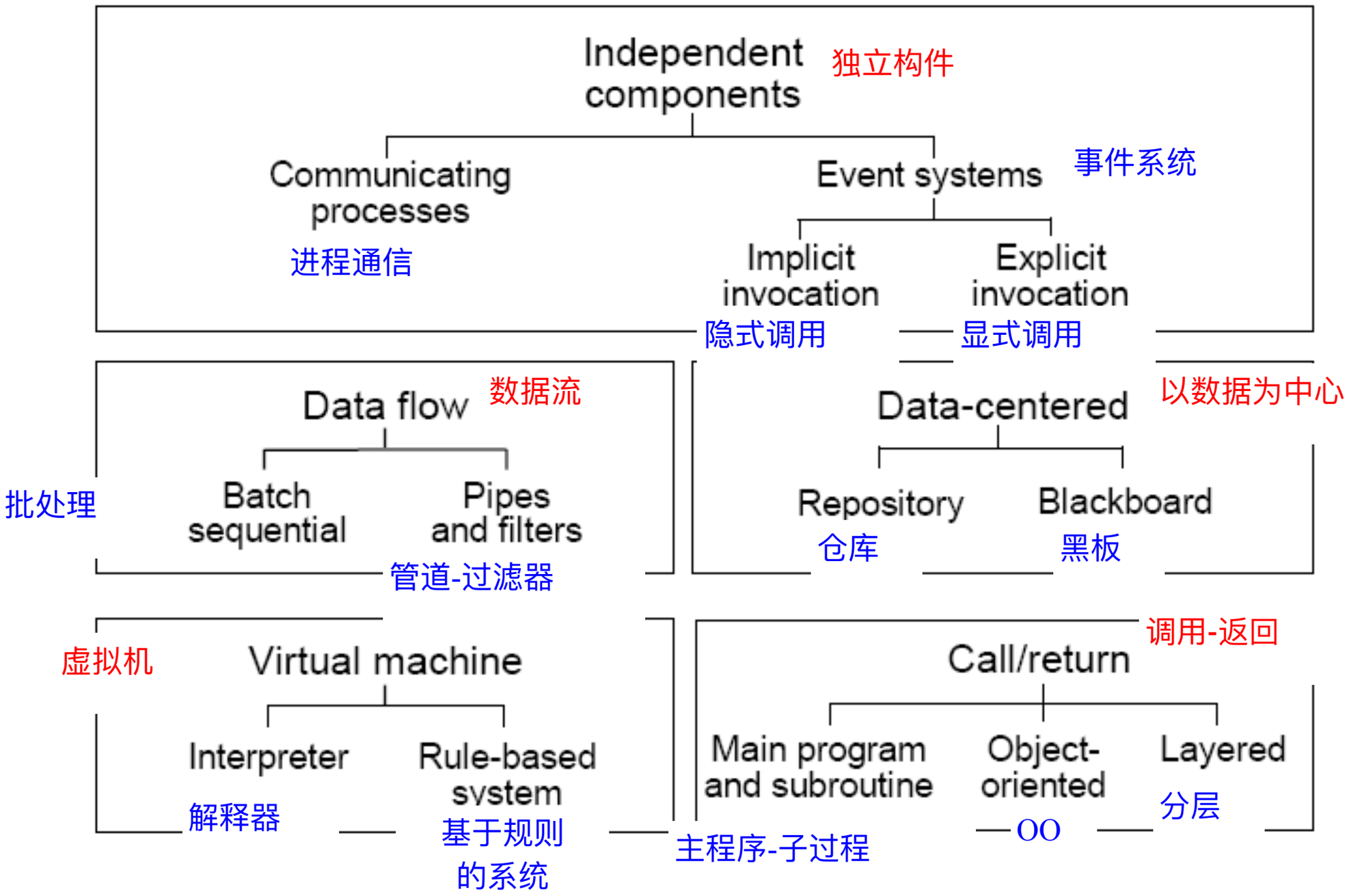
Organization

- SA Styles
- Modelling and Document

4+1 views UML 图 e.g. logic view 包含 X图

- Quality Attribute and Tactics to get Quality Attribute
- SA Evaluation
- More SA styles

SA Styles


Independent components
独立构件
Communicating processes
进程通信
Event systems
事件系统
Implicit invocation
Explicit invocation
隐式调用
显式调用
Data flow
数据流
批处理
Batch sequential
Pipes and filters
管道-过滤器
Data-centered
以数据为中心
Repository
仓库
Blackboard
黑板
虚拟机
Virtual machine
Interpreter
解释器
Rule-based system
基于规则的系统
调用-返回
Call/return
Main program and subroutine
主程序-子过程
Object-oriented
OO
Layered
分层

Each SA Style

- Definition
- Description from the view of SA
- Example
- Advantage & Disadvantage

Component
Connector
Topology /Semantic

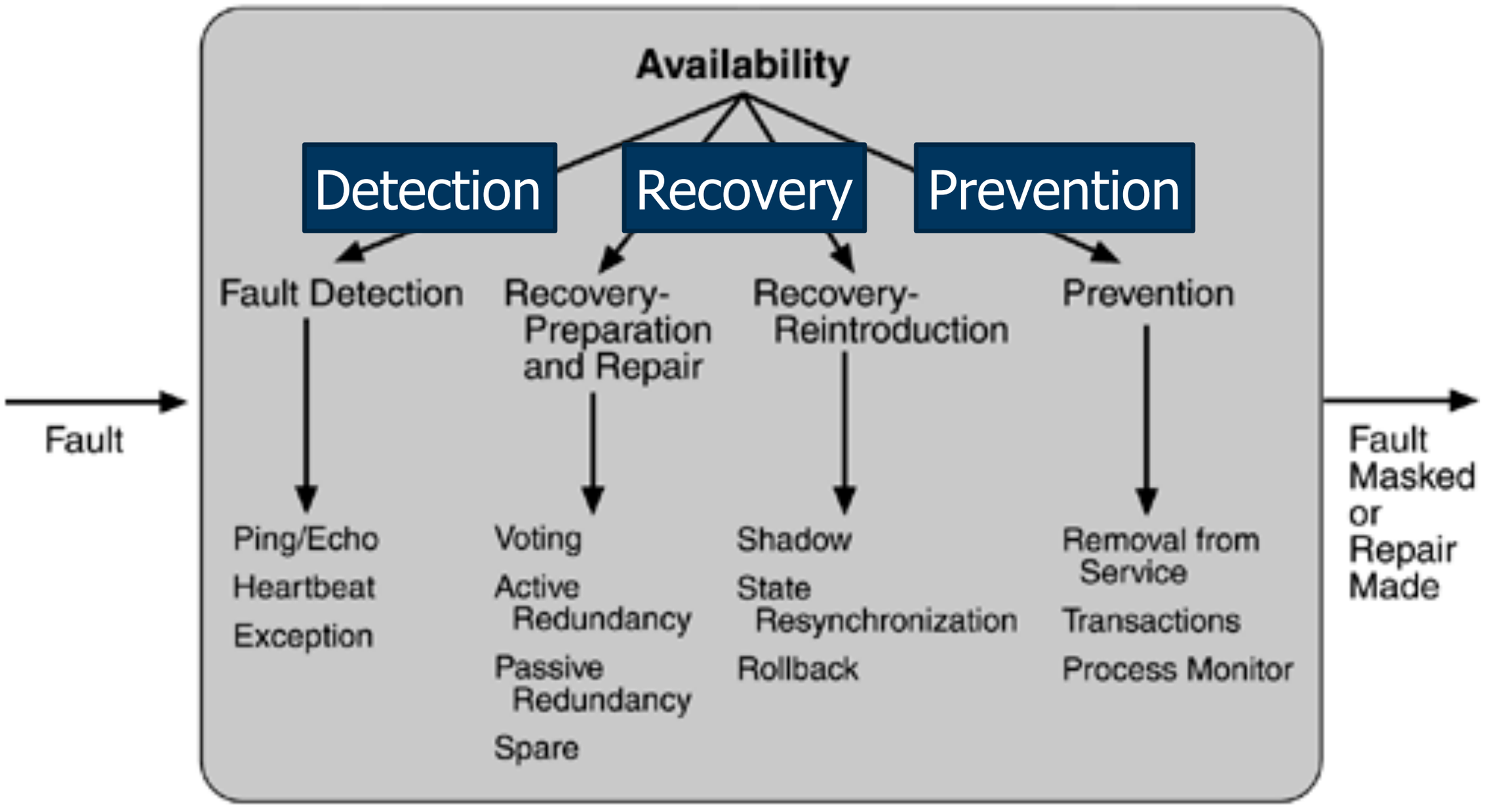
Modelling and Document

- 4+1 view models
  - Logical view
  - Development view
  - Process view
  - Physical view
  - Scenario
- Description a system from multi views
- UML example

Quality Attribute (QA) & Tactics

- Classification and Definition
  - Availability
  - Performance
  - Modifiability
  - Security
  - Testability
  - Usability
- Description Quality Attribute——Quality Attribute Scenario
  - 6 parts in QA Scenario(source, stimulus, artifact, environment, response, response measure)
  - How to use 6 parts to description a QA requirement?
- Tactics to get each Quality Attribute

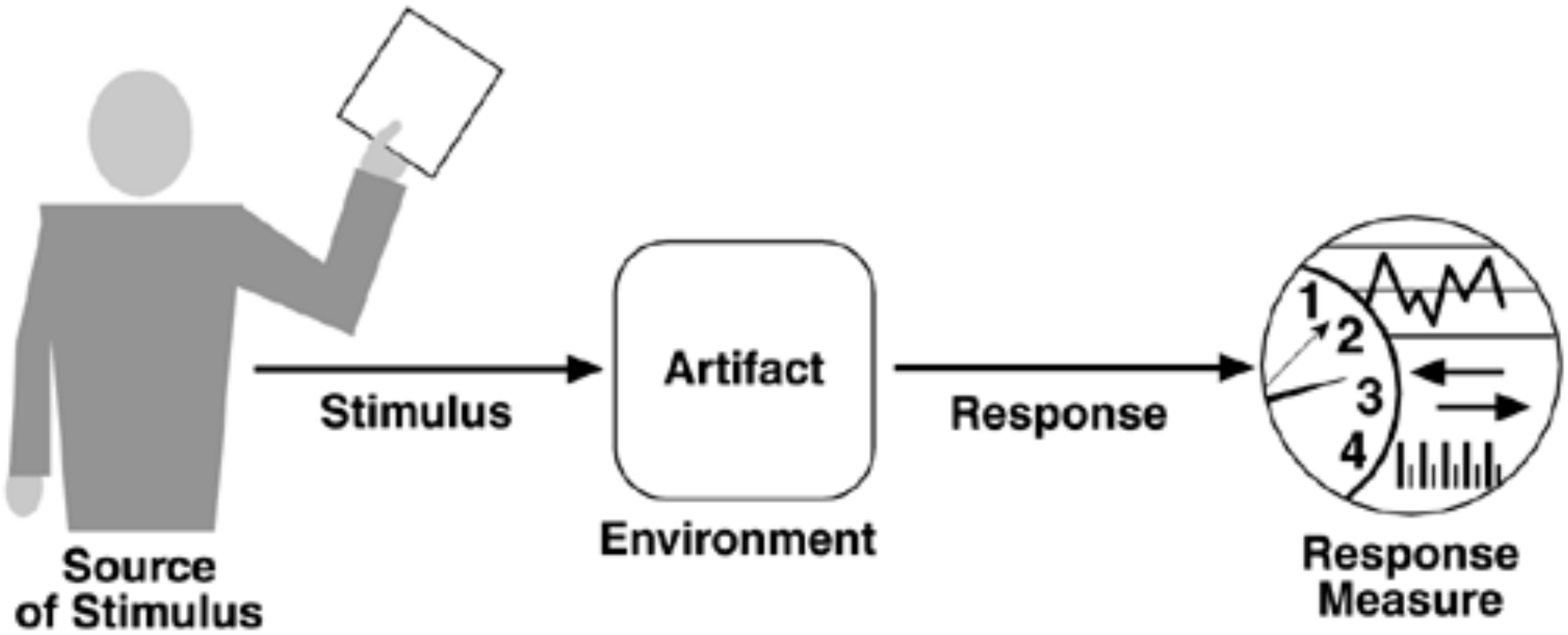
Summary of Availability Tactics



Performance

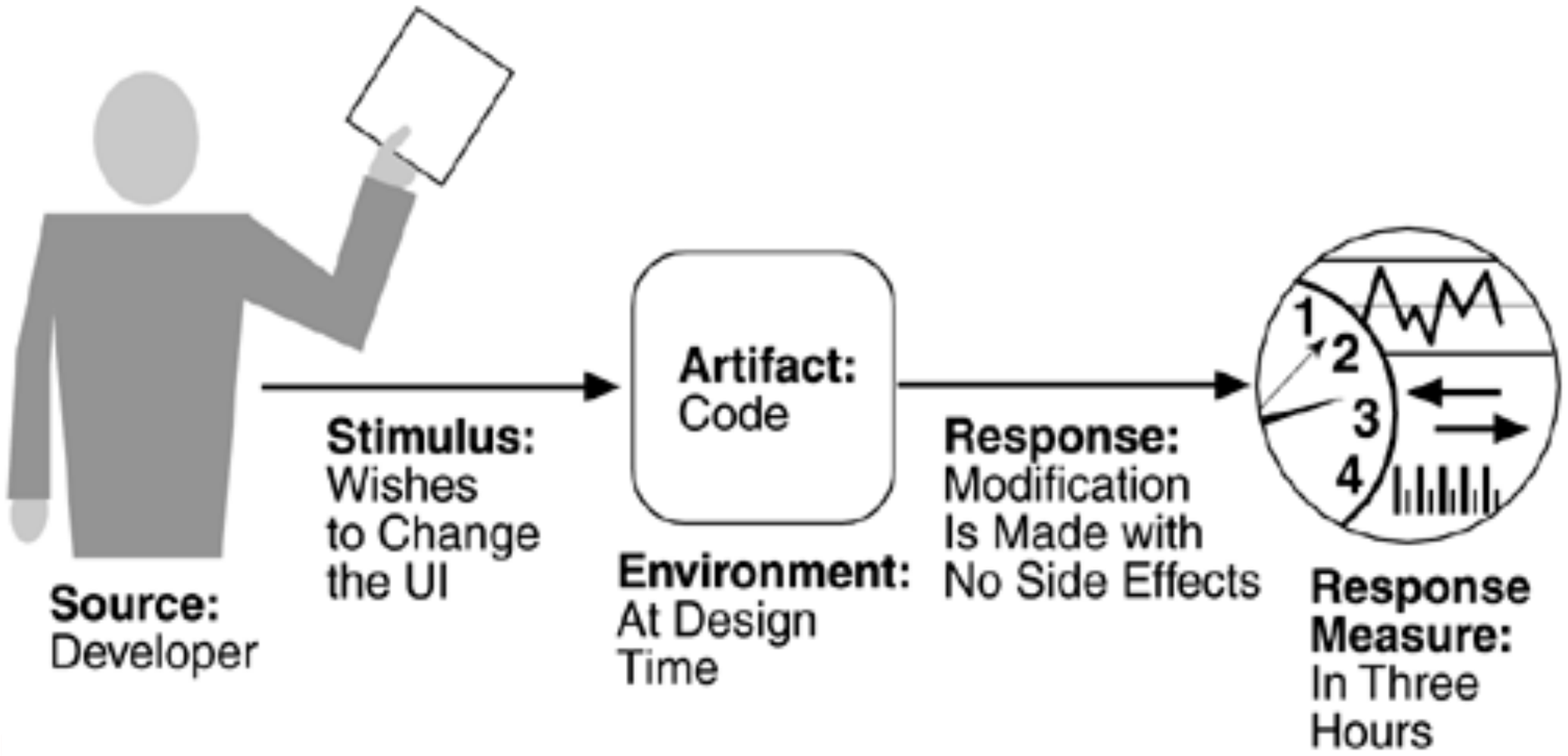
- Events (**interrupts, messages, requests from users, or the passage of time**) occur, and the system must respond to them.
- Events can arrive from user requests, from other systems, or from within the system.
- Performance is concerned with how long it takes the system to respond when an event occurs.

Parts of Quality Attribute Scenario

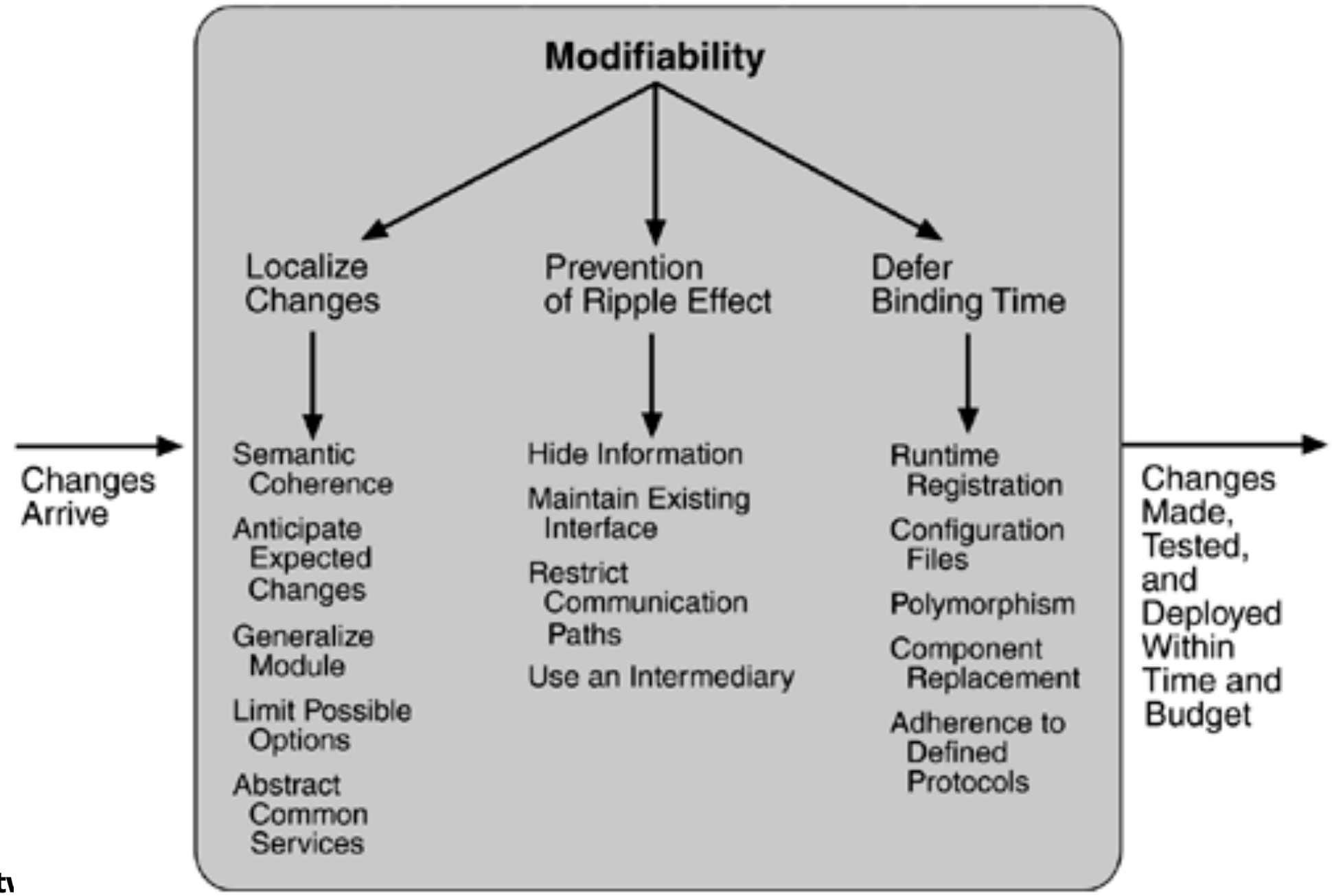


Sample modifiability scenario

"A developer wishes to change the user interface. This change will be made to the code at design time, it will take less than three hours to make and test the change, and no side-effect changes will occur in the behavior."



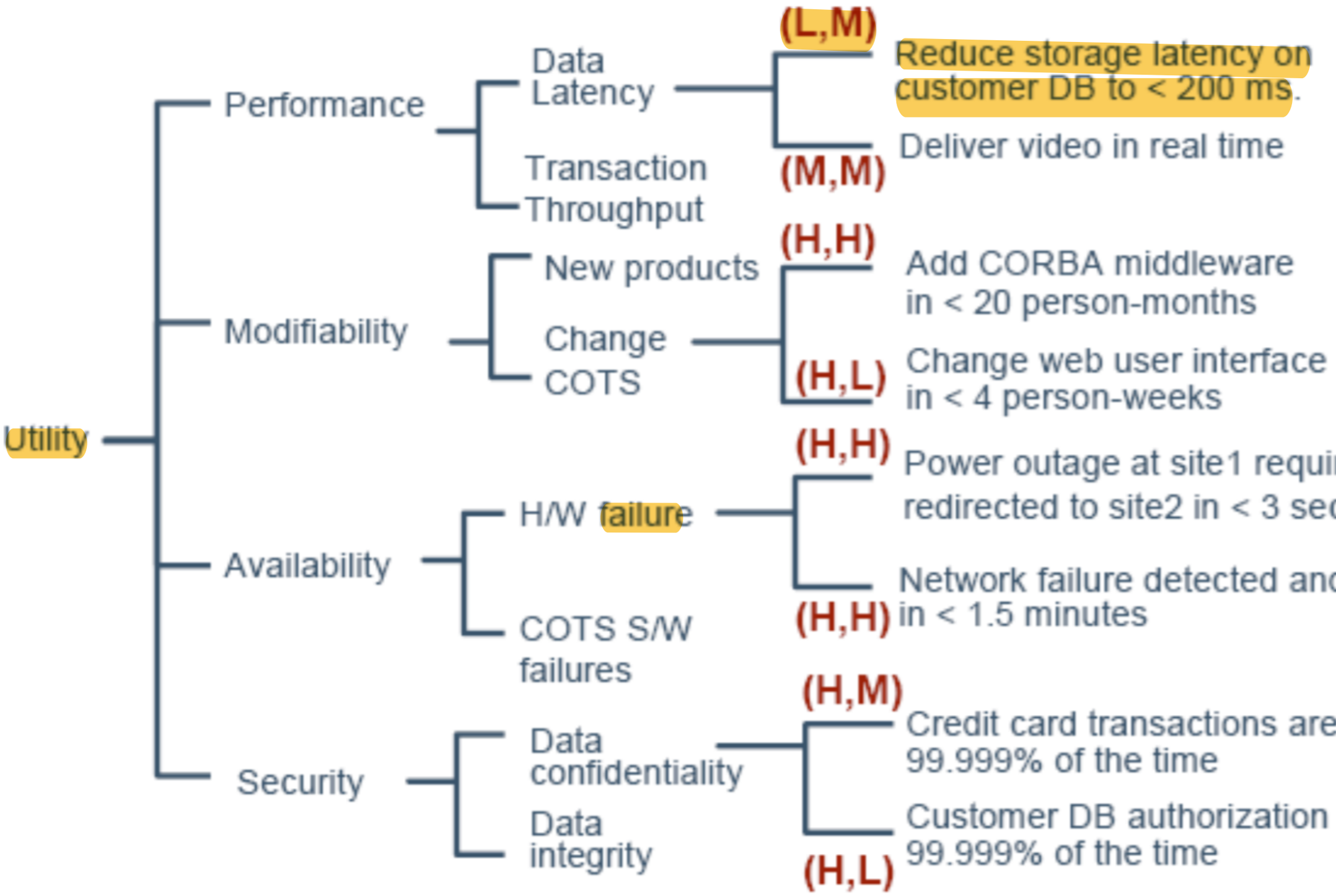
Summary of modifiability tactics



Evaluation

- SA Evaluation Method
  - Architecture Trade-off Analysis Method(ATAM)
  - Utility Trees
  - ATAM Evaluation Process
  - Risk, non-risk, sensitive point, trade-off

Utility Tree



Risks, Tradeoffs, Sensitivities, and Non-Risks

- A **sensitivity point** is a property of one or more components (and/or component relationships) that is critical for achieving a particular quality attribute response.
- A **tradeoff point** is a property that affects more than one attribute and is a sensitivity point for more than one attribute.
- A **risk** is a potentially problematic architectural decision.
- **Non-risks** are good architectural decisions that are deemed safe upon analysis.

Questions

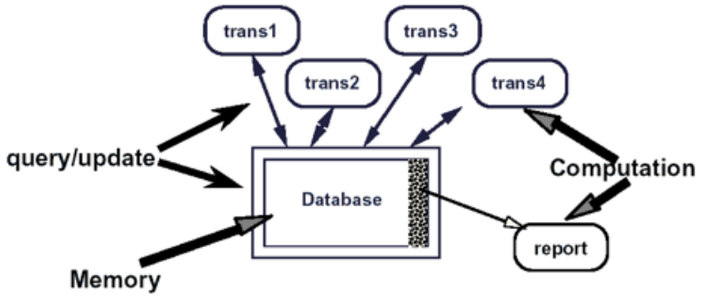
1.According to your understanding, please describe what quality attribute scenario is.

2.Please describe the "blackboard" architecture style and point out its advantages and disadvantages.

3. Which of the following tactic can be used to achieve the *Availability*?

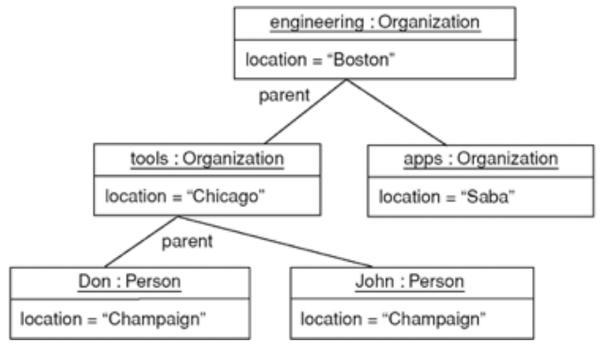
A) Hide information **B) Heartbeat**
C) Scheduling policy **D) Introduce concurrency**

10. Which architecture style does the following diagram describe?



A) Blackboard **B) Repository**
C) Implicit invocation **D) Layered**

7. Which kind of diagram is the following diagram?



A) Class diagram **B) Component diagram**
C) Object diagram **D) Package diagram**