tecture Development Leveraging the Attribute Driven Design and the CMMI Methodologies

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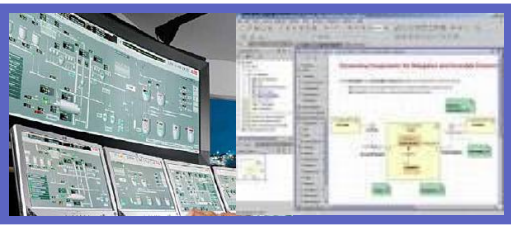
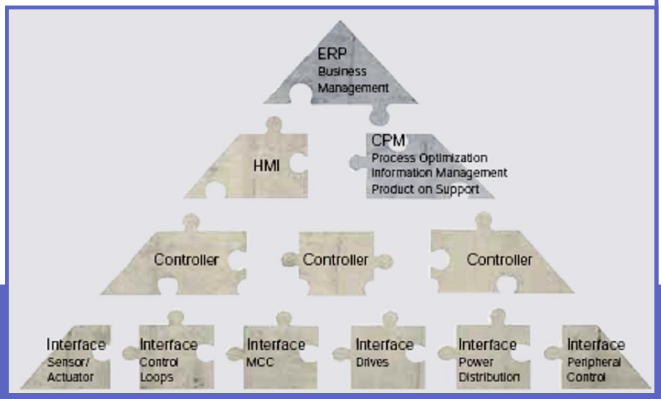
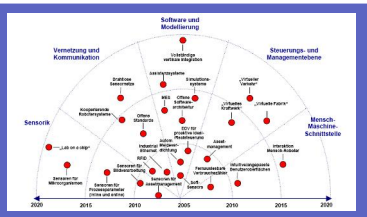
ABB Inc. US Corporate Research Center







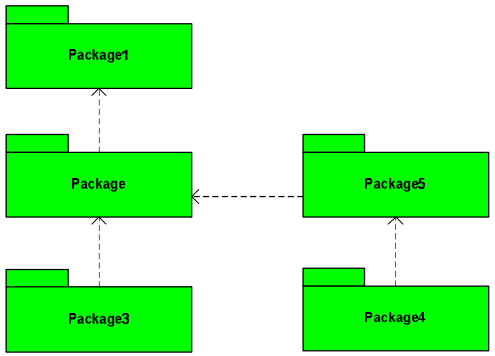
CMMI Technology Conference and User Group

November 12-15, 2007

Hyatt Regency Tech Center, Denver CO

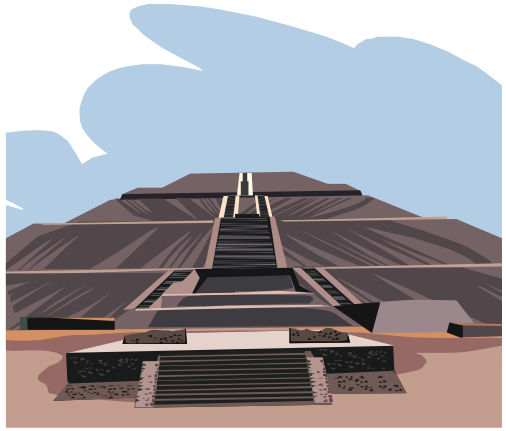
bute Driven Design (ADD)

- ADD is a methodology used to define a system architecture that bases the decomposition process on the quality attributes the system (software) has to fulfill.
- The architectural design using the ADD methodology can begin when the architectural drivers are known with some level of confidence.
- In ADD Tactics and Architectural patterns are selected to satisfy a set of quality attributes within a critical scenario that provides context for those quality attributes



for Creating a Software Architecture

- Creating the business case for the system
- Understanding and documenting the requirements
- Leveraging Quality Attribute Scenarios
- Creating or selecting the architecture
- Documenting and communicating the architecture
- Analyzing or evaluating the architecture
- Implementing the system based on the architecture
- Ensuring that the implementation conforms to architecture



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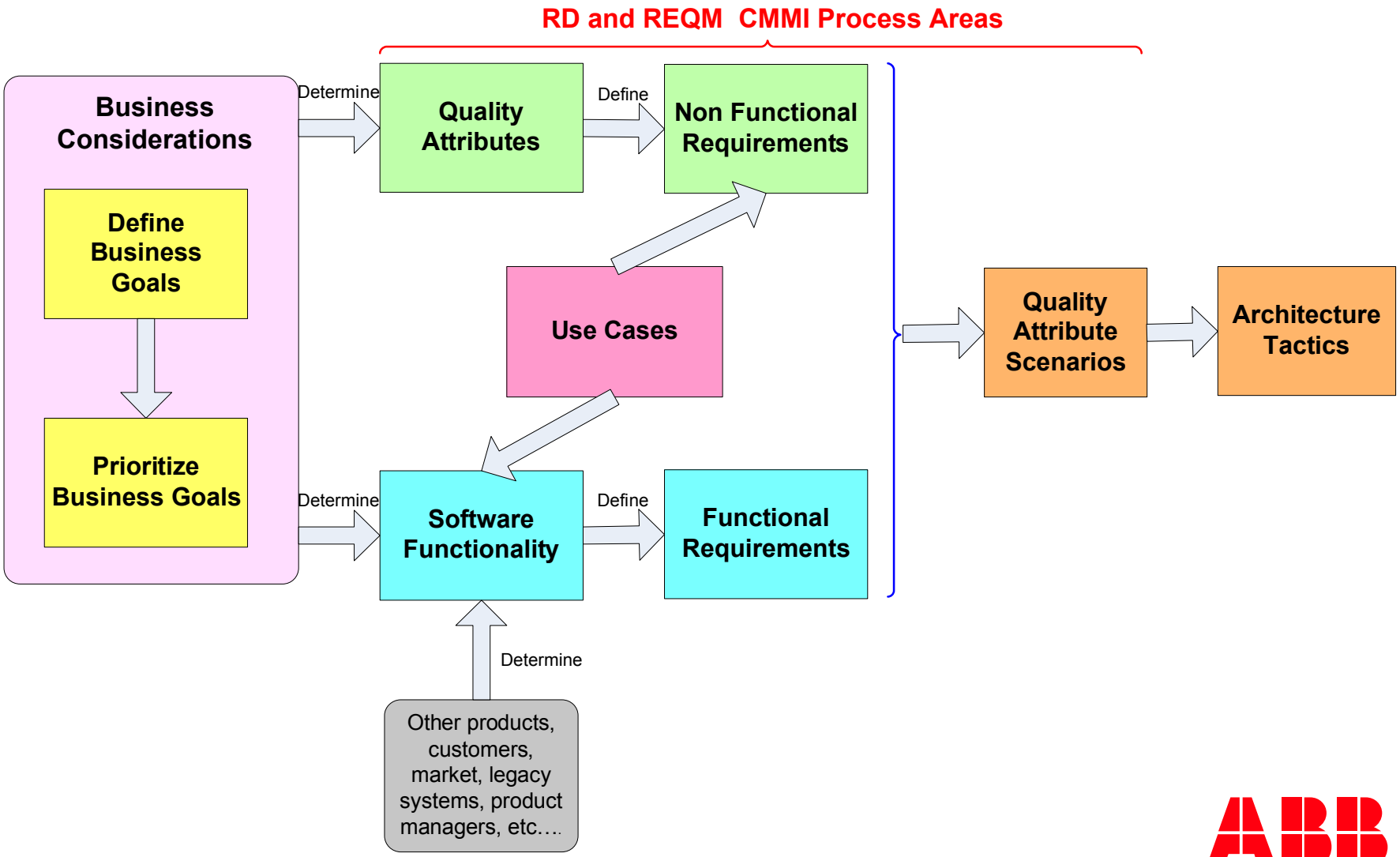
gration of ADD and CMMI



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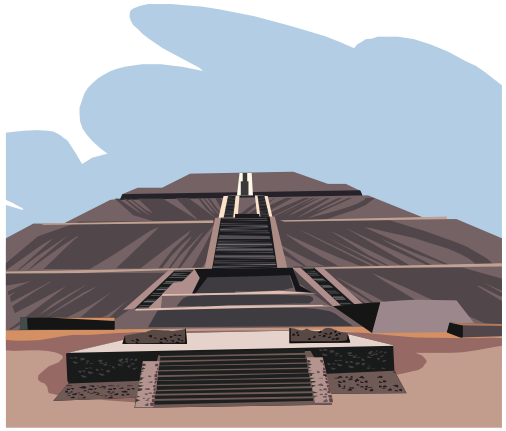

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ess Goals

- **Prioritized Business Goals**
  - Business goals associated with the project are elicited from selected project stakeholders
  - Business goals are prioritized for stakeholders to guide architectural tradeoffs
- **Example of prioritized business goals:**
  - Lower commissioning costs by xx%
  - Ensure system is available 99.9%
  - Maintain current system performance
  - etc

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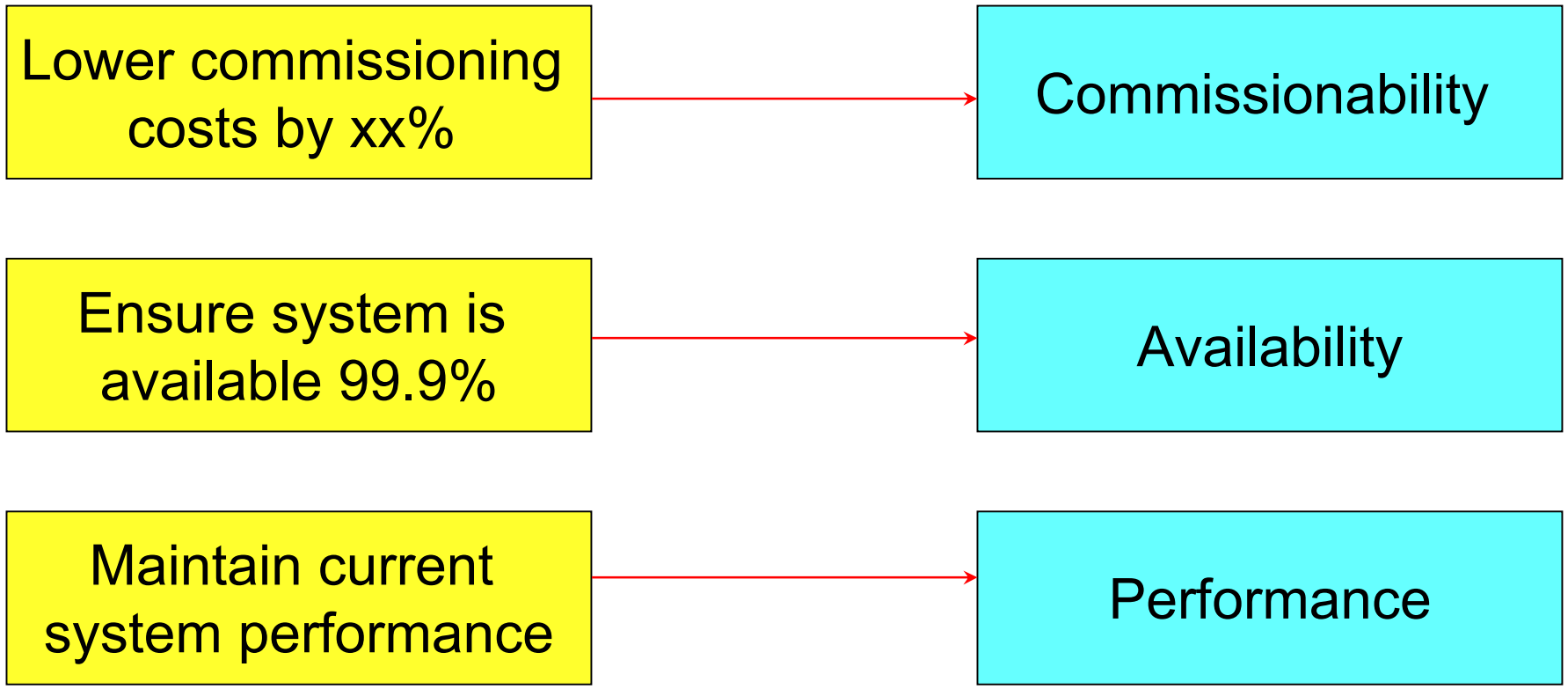
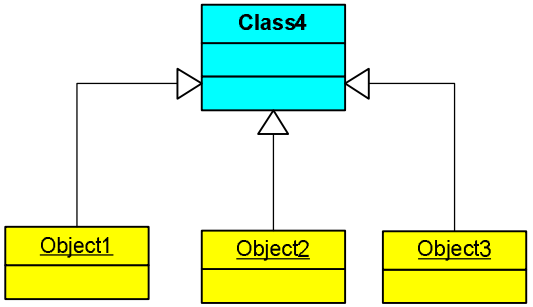
g Business Goals and Quality Attributes



ectural Drivers

- Architectural drivers (quality attribute scenarios) include the combination of functional and quality requirements that shape the architecture:
  - Define unique functions (as architectural Functional Requirements) of modules in the system
  - Select associated Non-functional Requirements
  - Quality attribute scenarios provide the functional context under which Non Functional Requirements are defined
  - Architectural patterns that satisfy the critical scenarios are then selected



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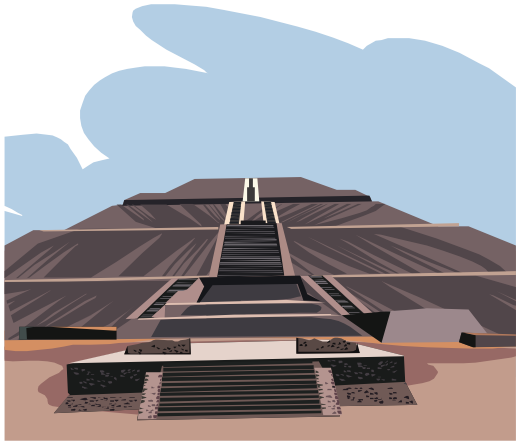

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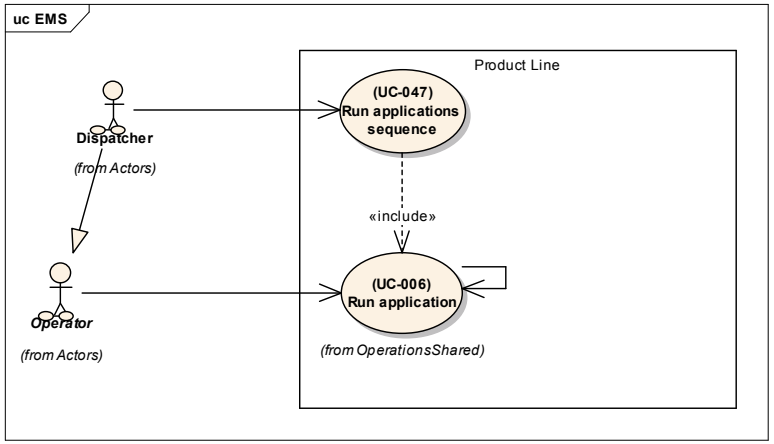
velop Customer (Architectural) Requirements -1-

SP 1.1 Elicit needs

SP 1.2 Develop the customer (architectural) requirements

Use Case
The operator runs a sequence of complex applications



Customer (Architectural) Requirements
Includes Functional and Non-functional requirements

The system shall allow the operator to run the state estimator application

The system shall allow the operator to run sensitivity analyses

The system shall allow the operator to run the PS model

The system shall allow the operator to run a sequence of applications in an "industry acceptable" time

etc . . .

velop Customer (Architectural) Requirements - 2-

SP 1.1 Elicit needs

SP 1.2 Develop the customer (architectural) requirements

Quality Attribute
System Quality

Customer-related Non Functional Requirements
Associated/derived from Quality Attribute

Commissionability

- The source code for the system shall not be modified for any customer implementation
- The software build shall be completed in an “acceptable” time period
- The complete system installation shall be completed in an “acceptable” time period

velop Product (Architectural) Requirements -1-

SP 2.1 Establish product and product component requirements

SP 2.2 Allocate product component requirements

SP 2.3 Identify interface requirements

Customer Requirements Includes Functional and Non-functional requirements	Product Architectural Requirements Testable and measurable set of requirements
The system shall allow the operator to run the state estimator application	The system shall allow the operator to run the state estimator application in xx seconds
The system shall allow the operator to run sensitivity analyses	The system shall allow the operator to run sensitivity analyses in yy seconds per run
The system shall allow the operator to run the PS model	The system shall allow the operator to run the PS model in xy seconds
The system shall allow the operator to run a sequence of applications in an “industry acceptable” time	The system shall allow the operator to run a sequence of applications in yz seconds

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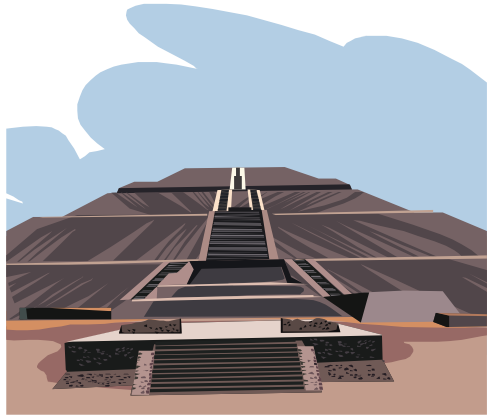

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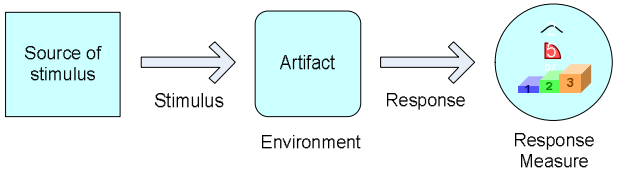
ty Attribute Scenarios



- **Encapsulate a set of architectural functional and non-functional requirements that uniquely define the system being architected**
- **Are described by a set of detailed architectural product requirements**
- **Can incorporate of one or more Use Cases**

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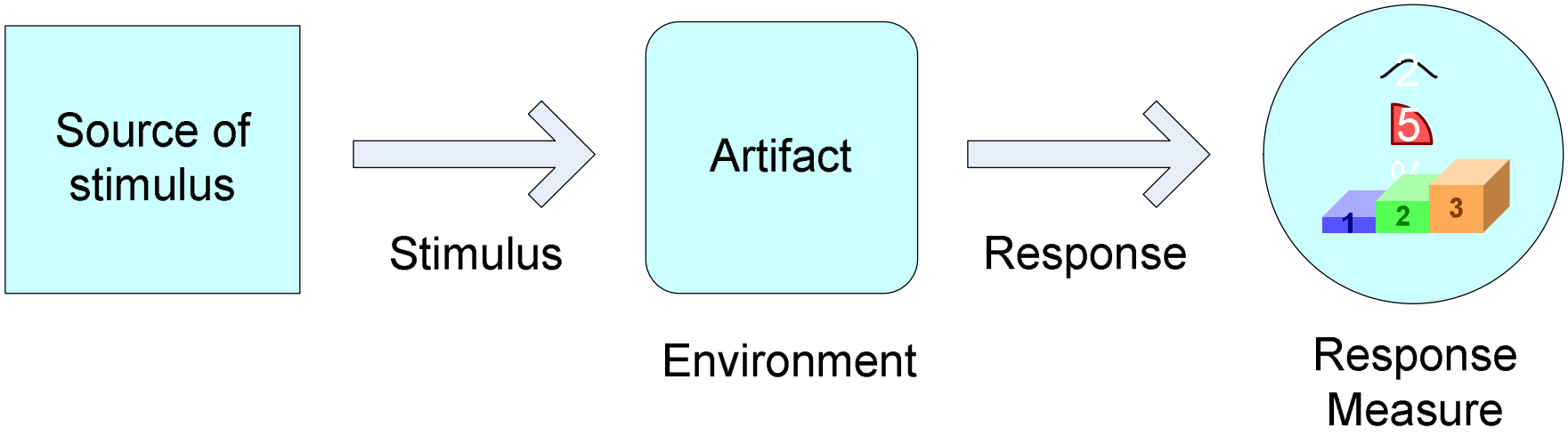
y Attribute Scenario Elements



Analyze and Validate Requirements

SP 3.1 Establish operational concepts and scenarios

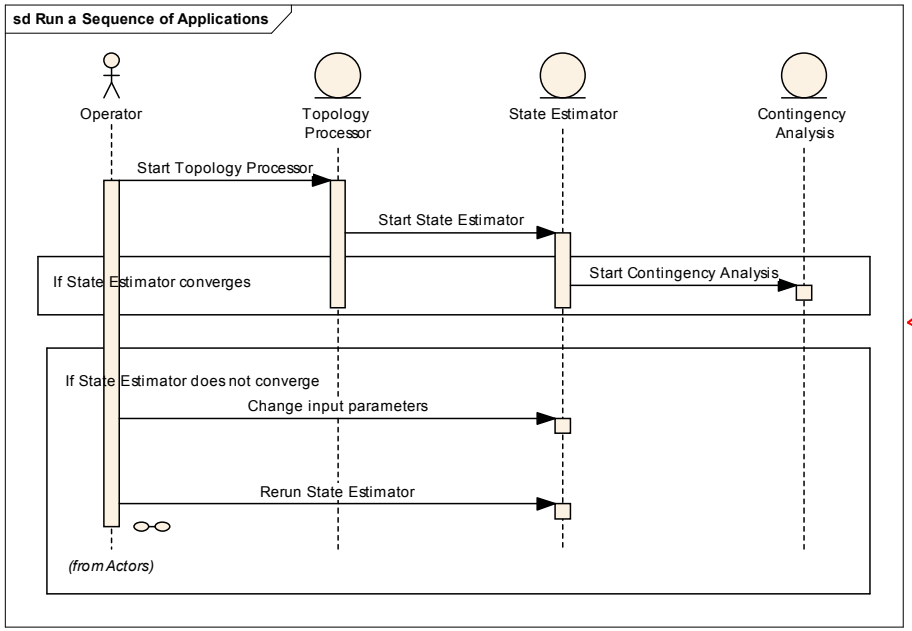
SP 3.2 Establish a definition of required functionality

SP 3.3 Analyze requirements

SP 3.4 Analyze requirements to achieve balance

SP 3.5 Validate requirements

Quality Attribute Scenario
Sequence Diagram



Detailed Architectural Non Functional Requirements
Placed in context of Critical Scenario

The time duration of sequence calculations shall be less than xx seconds under normal loading conditions

The performance of running the numerical application sequence shall be such that it will not exceed specified bounds of memory and CPU load capabilities

Manage Requirements

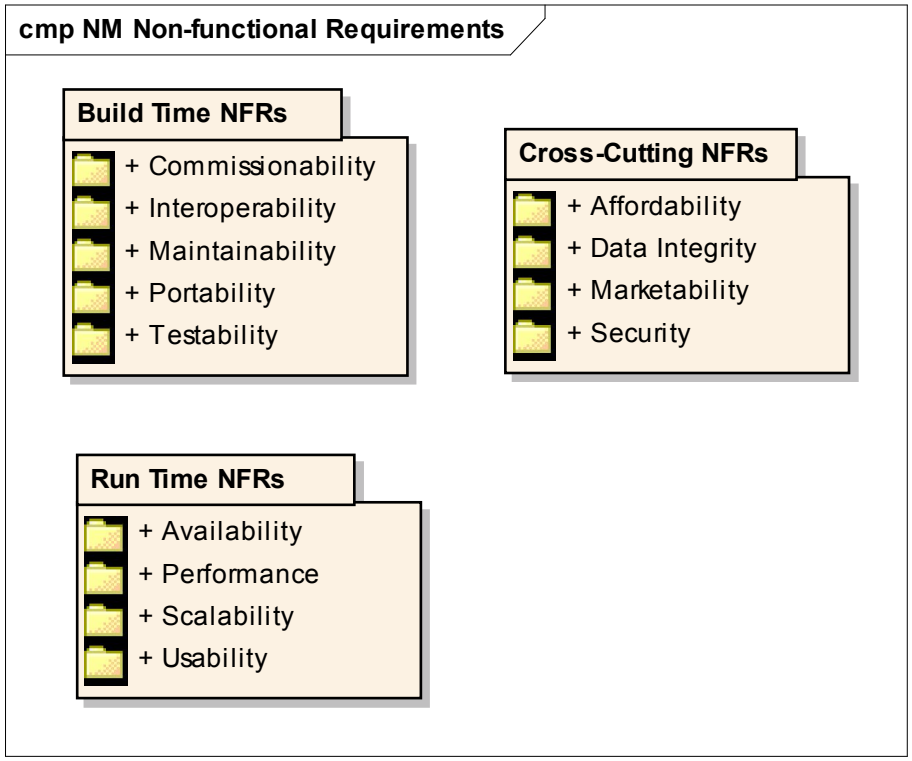
SP 1.1 Obtain an understanding of requirements

SP 1.2 Obtain commitment to requirements

SP 1.3 Manage requirements changes

SP 1.4 Maintain bi-directional traceability of requirements

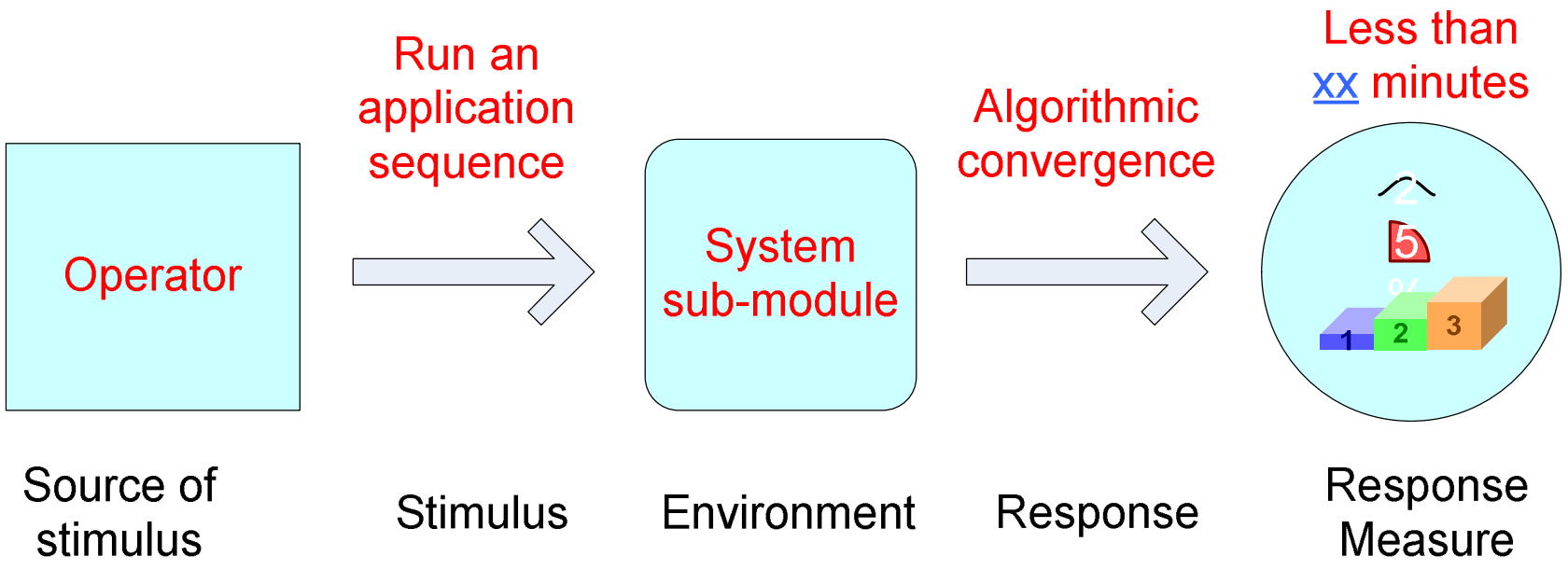
SP 1.5 Identify inconsistencies between project work and requirements



Understanding and commitment to requirements among stakeholders carried out through meetings

Functional and Non Functional requirements Stored, managed, and maintained in Enterprise Architect and Requisite Pro tools

Attribute Scenario: Run a Sequence of Applications



ons Learned

- The practices of the RD process area greatly contribute to defining the functional and non-functional architectural requirements that form the basis for ADD
- Organization business objectives are essential to establish priorities that drive the development of the architecture
- Quality attribute scenarios provide context to non-functional requirements
- To implement quality attribute scenarios, specific tactics identified in ADD provide architectural patterns

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