Architecture from the Systems Engineering Perspective

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Model-Driven Development of Embedded Systems
Integrated Systems / Software Development Process Harmony

Systems Engineering Harmony-SE

Requirements Analysis
- Test Scenarios
- System Acceptance

Systems Analysis & Design

SW Analysis & Design

Model / Requirements Repository *

SW Implementation & Unit Test

Module Integration & Test

(Sub-)System Integration & Test

* Configuration Controlled Knowledge of the System Under Development:
- Requirements Documentation
- Requirements Traceability
- Design Documentation
- Test Definitions

System Architecture Baseline

Software Implementation Model

Executable
- Use Case Models / Functional System Model
- Architectural System Model

• Requirements Models
• Use Case Models
SysML-Based Systems Engineering (*Harmony-SE*)

### Model / Requirements Repository

- Requirements
- System Use Cases
- Use Case Models, System-Level Operations
- System Architecture Model with allocated Operations
- Physical Subsystem Models with HW/SW allocated Operations

### Links providing traceability to original requirements

#### Requirements Analysis

- Requirements Capture
  - Definition of System Use Cases

#### System Functional Analysis (Use Case-Based)

- System Use Cases
  - System-Level Operations

#### Architectural Design

- System Architectural Design
  - Subsystem Architectural Design

#### HW/SW Design

- Logical ICDs
- HW/SW Req Specs incl. Test Scenarios

### SysML Artifacts

- Requirements Diagram(s) (optionally)
- Use Case Diagram(s)

**Per Use Case:**

- Activity Diagram (*Black-Box*)
- Sequence Diagrams (*Black-Box*)
- Use Case Structure Diagram (BDD, IBD) with Ports and Interfaces
- Statechart Diagram

- UC Activity Diagrams (*White-Box*)
- UC Sequence Diagrams (*White-Box*)
- System Structure Diagram (BDD, IBD) with Ports and Interfaces
- Subsystem(s)/Subsystem Component(s) Statechart Diagram
Harmony-SE: System Functional Analysis
Derivation of Use Case Scenarios from a UC Black-Box Activity Diagram
Harmony-SE: System Architectural Design
Allocation of Operations to Subsystems

Use Case Black-Box Activity Diagram

Use Case White-Box Activity Diagram
Extending the Scope: From Enterprise Architecture to System Architecture
Department of Defense Architecture Framework (DoDAF)
Telelogic MDD Tools

Enterprise Architecture

War Fighting Operations

System Architect

Rhapsody

C
C++
Ada,
J2ME

Business Operations

Software

Systems

Tau

C++
C#
J2EE