Architecture Analysis
Technique Development

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This presentation consists of general capabilities information that does not contain controlled technical data as defined within the International Traffic in Arms (ITAR) Part 120.10 or Export Administration Regulations (EAR) Part 734.7-11
Overview

- Architecture IV&V
- Specification completeness
- Stakeholder analysis
- Key driving requirements
- Technical budgets analysis
- Scenario analysis
- Next steps
Impact of Architecture Phase IV&V

- Architectural issues are a leading source for integration problems.
- Without systematic upfront analysis these problems are costly to repair.
- Application of complexity, safety and dependability analysis enables addressing the issues early on.
- Architectural decisions impact what is required of the software.
- Improved architecture specifications reduce software risk and increase IV&V’s ability to validate and verify the software.

Objectives

- Adequately specified
- Complies with requirements
- Feasible
Architecture Analysis Research Elements
IV&V Architecture Analysis Tasks

Completeness
- Specification completeness
- Functional Capability Mapping
- Dependency mapping analysis
- Technical budgets analysis
- Top-level requirements mapping
- Scenario development
- Fault management and redundancy analysis

Verifiability
- Reuse Analysis
- Interface requirements traceability analysis
- Key driving requirements validation

Levels of Specification
- Levels of specification identification
- Stakeholder analysis
- Evolvability analysis
- Comparison to lower level architecture specifications
Task Phasing

Concept Review
- Stakeholder analysis
- Levels of Specification Identification
- Key Driving Requirements Validation
- Top-level Requirements Mapping

SRR
- Specification Completeness SDR

SDR
- Specification Completeness PDR
- Scenario Analysis
- Technical Budgets Analysis
- Reuse Analysis
- Functional Capability Mapping
- Dependency Mapping Analysis
- Evolvability Analysis
- Interface Requirements Traceability Analysis
- Comparison to Lower Level Architecture Specifications
- Fault Management and Redundancy Analysis
- Dependency Mapping Analysis
- Interface Requirements Traceability Analysis
- Comparison to Lower Level Architecture Specifications
- Evolvability Analysis
- Functional Capability Mapping
- Reuse Analysis
- Technical Budgets Analysis

PDR
- Specification Completeness CDR

CDR
Specification Completeness

- Assess tailoring
  - Identify architecture specification
  - Analyze tailoring
  - Tailoring guidelines per lifecycle phase
- Assess viewpoint representation
  - Breadth
  - Depth
Frameworks

DoDAF 2.0

4 + 1

ATAM

Representation

Evaluation
Stakeholder Analysis

- Basis for any systems engineering activity
- Drives other IV&V (and systems engineering) tasks
- Key elements
  - Identify stakeholders
  - Assess power, influence, interest
  - For key stakeholders
    - Concerns
    - Priorities
    - Risks
## Participation Matrix

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<thead>
<tr>
<th>Participation Type</th>
<th>Inform</th>
<th>Consult</th>
<th>Partner</th>
<th>Control</th>
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<tbody>
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<td>Needs Assessment</td>
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<td>Planning</td>
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<td>Implement</td>
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<td>Monitoring &amp; Evaluation</td>
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Key Driving Requirements

- High-level (user) requirements which define mission success
- Flow from stakeholder analysis
- Sources
  - Generic based on mission type
  - Ops concepts/capabilities (CV-1, CV-4, CV-6)
  - Business case, vision
Attributes

- Requirement – succinct statement
- Stakeholder
- Success criteria
- Relevant scenarios
- Quality measures
- Priorities
- Risks
- Dependencies
- Verification
- Relevant artifacts
- How satisfied
- Issues
Technical Budgets

- Flows such as data streams, fluids, energy
- Physical characteristics such as weight, volume, moment of inertia
- Operational factors such as workload, risk
- Budget management mechanisms
  - Authority – who’s responsible
  - Tracking
  - Identification procedures
- Technical budget levels of specification
  - Operational (logical) level
  - Systems (services, physical)
Technical Budget Assessment

- Identify budgets managed / should be managed
- Evaluate consistency
- Evaluate feasibility
- Evaluate testability
Scenario Analysis

- Scenario completeness
  - Flows from stakeholder and key driving requirements analysis
  - Nominal scenarios
  - Maintenance and update scenarios
  - Abort and degraded system scenarios

- Scenario correctness
  - Analytical (decision tree, event tree, activity network diagram)
  - Simulation
Next Steps

- Test & refine methods on ongoing IV&V project
- Define additional analysis techniques
  - Levels of specification
  - Fault management & redundancy analysis
  - Mapping tasks
  - Safety analysis
- Develop tools