The MBASE* Life Cycle Architecture Package -and Relations to the Draft DoD 5000 Series

Barry Boehm, USC
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boehm@sunset.usc.edu
http://sunset.usc.edu/MBASE

*Model Based (System) Architecting and Software Engineering
Outline

• Draft DoD 5000 Series Highlights
• Evolutionary Acquisition Critical Success Factors
• Relation to MBASE Life Cycle Architecture Package
• Summary; Relation of MBASE LCA Package to Draft DoD 5000 Series
Draft DoD 5000 Series Highlights

• Rapid transition from technology to products
  – Time-phased requirements
  – Use of commercial products and technologies

• Rapid transition from acquisition to fielding
  – Evolutionary acquisition (EA)
  – Integrated test and evaluation
  – Interoperability
  – Competition
  – Commitment Criteria
    • Mature technology, well-understood requirements, strong
      EA plan covering factors above

• Integrated operational support

• Guidelines in DoDI 5000.2, DoD 5000.2-R
  – New decision milestones
A MODIFIED ACQUISITION PROCESS

- **New milestone names** to emphasize new approach
- **Multiple entry points** possible depending on technical/concept maturity
- **Three basic options at each decision point**: Proceed into next phase; do additional work; terminate effort

**Technology Opportunities & User Challenges**

- **MS X**: Initiation of exploration phase including analysis of alternatives; refinement of operational goals
- **MS D**: Demonstration phase. Entry point continuum and funding commitment based on technical/concept maturity; projects may enter at any of the D points; acquisition strategy in place
- **MS C**: Go-No Go Decision. Commitment to rapid acquisition (abbreviated development and/or expedited LRIP). Successful ACTDs enter at this point. Exit criteria must be satisfied.
- **IPRs**: Interim progress reviews. Held as appropriate in phase. Post-Milestone C IPRs indicate LRIP and rate production reviews. Beyond LRIP requires OT&E certification of suitability and effectiveness.

**EXIT CRITERIA**
- Demonstrated/commercial technology
- Approved ORD & certified interoperability
- CA IV/affordability assessment
- Strategy in place (transition plan, evolutionary path, open systems, competition, supportability concept, testing, production readiness)

**Evolutionary development & fielding the strongly preferred approach**
Some EA Critical Success Factors

• Assurance that requirements are achievable
  – Via architecture-based analysis and demonstration

• Assurance that architecture will scale to life-cycle
  – Need to specify evolution requirements

• Assurance that cost, schedule targets can be met
  – CAIV, SAIV, and architecture implications

• Replacements for waterfall contract milestones
  – Clear milestone pass/fail criteria
Schedule As Independent Variable (SAIV)

- Build a core capability early
- Drop additional features as necessary to meet schedule
  - Need prioritized features (“requirements”).
  - Need an architecture enabling easily-dropped features.
  - Need good estimates, planning and control.
Outline

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Life Cycle Anchor Points

• Common System/Software stakeholder commitment points
  – Defined in concert with Government, industry affiliates
  – Coordinated with Rational’s Unified Software Development Process

• Life Cycle Objectives (LCO)
  – Stakeholders’ commitment to support system architecting
  – Like getting engaged

• Life Cycle Architecture (LCA)
  – Stakeholders’ commitment to support full life cycle
  – Like getting married

• Initial Operational Capability (IOC)
  – Stakeholders’ commitment to support operations
  – Like having your first child
Win Win Spiral Anchor Points
(Risk-driven level of detail for each element)

<table>
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<tr>
<th>Milestone Element</th>
<th>Life Cycle Objectives (LCO)</th>
<th>Life Cycle Architecture (LCA)</th>
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| Definition of Operational Concept | • Top-level system objectives and scope  
- System boundary  
- Environment parameters and assumptions  
- Evolution parameters  
- Operational concept  
- Operations and maintenance scenarios and parameters  
- Organizational life-cycle responsibilities (stakeholders) | • Elaboration of system objectives and scope of increment  
• Elaboration of operational concept by increment |
| System Prototype(s)               | • Exercise key usage scenarios  
• Resolve critical risks                                                                          | • Exercise range of usage scenarios  
• Resolve major outstanding risks                                                                      |
| Definition of System Requirements | • Top-level functions, interfaces, quality attribute levels, including:  
- Growth vectors and priorities  
- Prototypes  
- Stakeholders’ concurrence on essentials  
• Elaboration of functions, interfaces, quality attributes, and prototypes by increment  
- Identification of TBD’s (to-be-determined items)  
- Stakeholders’ concurrence on their priority concerns |                                                                                             |
| Definition of System and Software Architecture | • Top-level definition of at least one feasible architecture  
- Physical and logical elements and relationships  
- Choices of COTS and reusable software elements  
- Identification of infeasible architecture options  
• Choice of architecture and elaboration by increment  
- Physical and logical components, connectors, configurations, constraints  
- COTS, reuse choices  
- Domain-architecture and architectural style choices  
- Architecture evolution parameters |                                                                                             |
| Definition of Life-Cycle Plan     | • Identification of life-cycle stakeholders  
- Users, customers, developers, maintainers, interoperators, general public, others  
- Identification of life-cycle process model  
- Top-level stages, increments  
- Top-level WWWWWHH* by stage  
• Elaboration of WWWWWHH* for Initial Operational Capability (IOC)  
- Partial elaboration, identification of key TBD’s for later increments |                                                                                             |
| Feasibility Rationale            | • Assurance of consistency among elements above  
- via analysis, measurement, prototyping, simulation, etc.  
- Business case analysis for requirements, feasible architectures  
• Assurance of consistency among elements above  
• All major risks resolved or covered by risk management plan |                                                                                             |

Anchor Points and Rational Process Phases

**Engineering Stage**

- Inception
  - Feasibility Iterations
- Elaboration
  - Architecture Iterations
- Construction
  - Usable Iterations
- Transition
  - Product Releases

**Manufacturing Stage**

- LCO
- LCA
- IOC

Management

RATIONAL Software Corporation
MBASE Electronic Process Guide (1)

- Developed in collaboration with CMU-SEI
- Using SEI EPG tool
MBASE Electronic Process Guide (2)
MBASE LCO and LCA Pass/Fail Criteria

- LCO and LCA Feasibility Rationale:
  - If we build a system to the given architecture, it will
    - Satisfy the requirements (including evolution)
    - Be faithful to the prototype
    - Support the operational concept
    - Be buildable within the budget and schedule in the plan
    - Satisfy a viable business case for the investment

- LCO: Satisfies criteria for at least one choice of architecture and COTS

- LCA: Satisfies criteria for specific detailed choice of architecture and COTS
  - All major risks resolved or covered by risk management plan
Summary: Relation of MBASE LCA Package to Draft DoD 5000 Series

- MBASE LCO content and pass/fail criteria fit new DoD-5000 milestone D
- MBASE LCA content and pass/fail criteria fit new DoD-5000 milestone C
- LCO and LCA milestones satisfy EA critical success factors
  - Assurance that requirements are achievable
  - Assurance that architecture will scale to life-cycle needs
  - Assurance that cost, schedule targets can be met
  - Clear milestone pass/fail criteria