



Early Software Discipline for Ground Systems: The Incremental Commitment Model

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What is the Incremental Commitment Model (ICM)?

- **System development model to respond to the challenges to future projects**
 - Adapting with agility to emergent and rapidly changing requirements
 - Concurrently providing high assurance to all of the system's success-critical stakeholders
- **Achieves goals through**
 - Involvement of stakeholders in a series of incremental commitment milestone events
 - Stabilizing each increment's development while accommodating most change in future increments
 - Providing continuous verification and validation

ICM Principles

1. **Success-critical stakeholder satisficing**
2. **Incremental growth of system definition and stakeholder commitment**
- 3,4. **Concurrent, iterative system definition and development cycles**

Cycles can be viewed as sequential concurrently-performed phases or spiral growth of system definition
5. **Risk-based activity levels and anchor point commitment milestones**

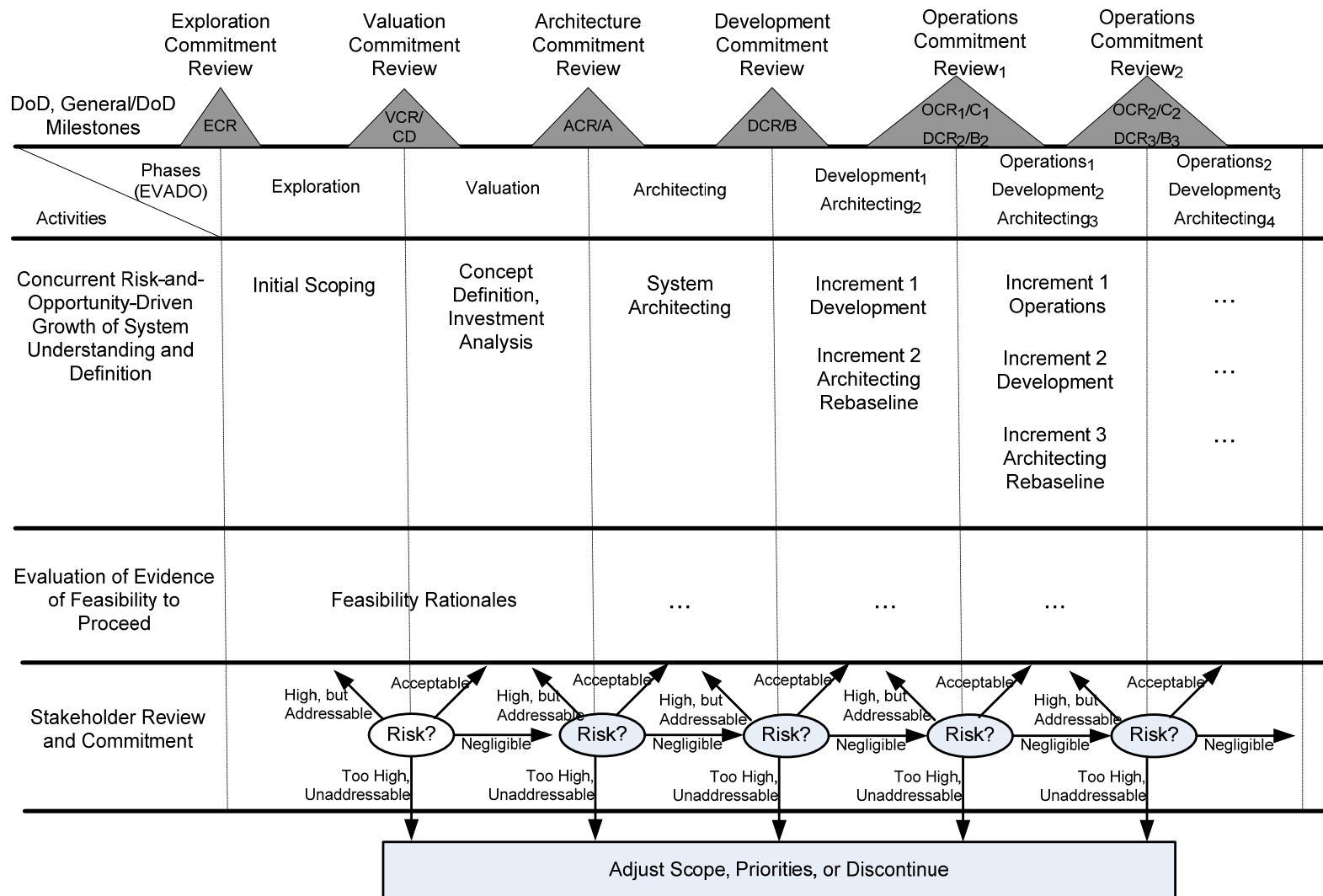
Incremental Commitment in Gambling

- **Total Commitment: Roulette**
 - Put your chips on a number
 - Build a single ground control system for 6 diverse satellite systems
 - Wait and see if you win or lose
- **Incremental Commitment: Poker, Blackjack**
 - Put some chips in
 - See your cards, some of others' cards
 - Decide whether, how much to commit to proceed

Incremental Commitment In Life: Anchor Point Milestones

- **Common System/Software stakeholder commitment points**
 - Defined in concert with Government, industry organizations
 - Initially coordinated with Rational's Unified Software Development Process
- **Exploration Commitment Review (ECR)**
 - Stakeholders' commitment to support initial system scoping
 - Like dating
- **Validation Commitment Review (VCR)**
 - Stakeholders' commitment to support system concept definition and investment analysis
 - Like going steady
- **Architecting Commitment Review (ACR)**
 - Stakeholders' commitment to support system architecting
 - Like getting engaged
- **Development Commitment Review (DCR)**
 - Stakeholders' commitment to support system development
 - Like getting married
- **Incremental Operational Capabilities (OCs)**
 - Stakeholders' commitment to support operations
 - Like having children

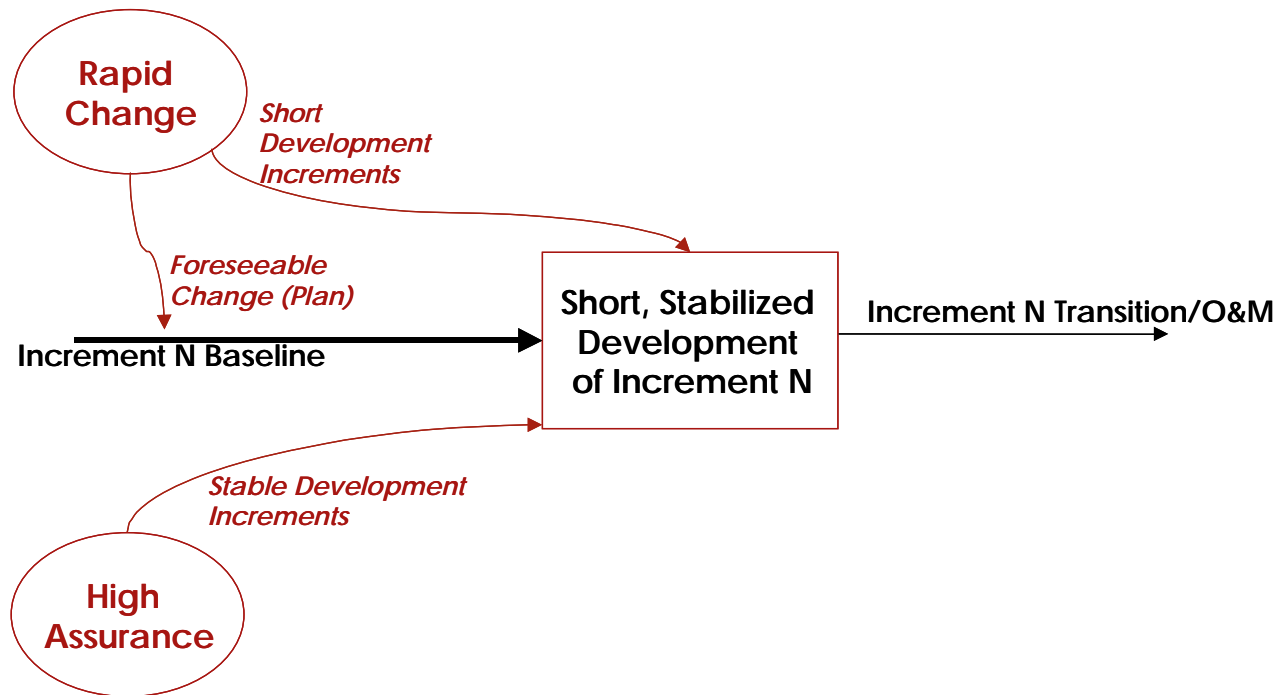
The ICM Life Cycle Process: Overview



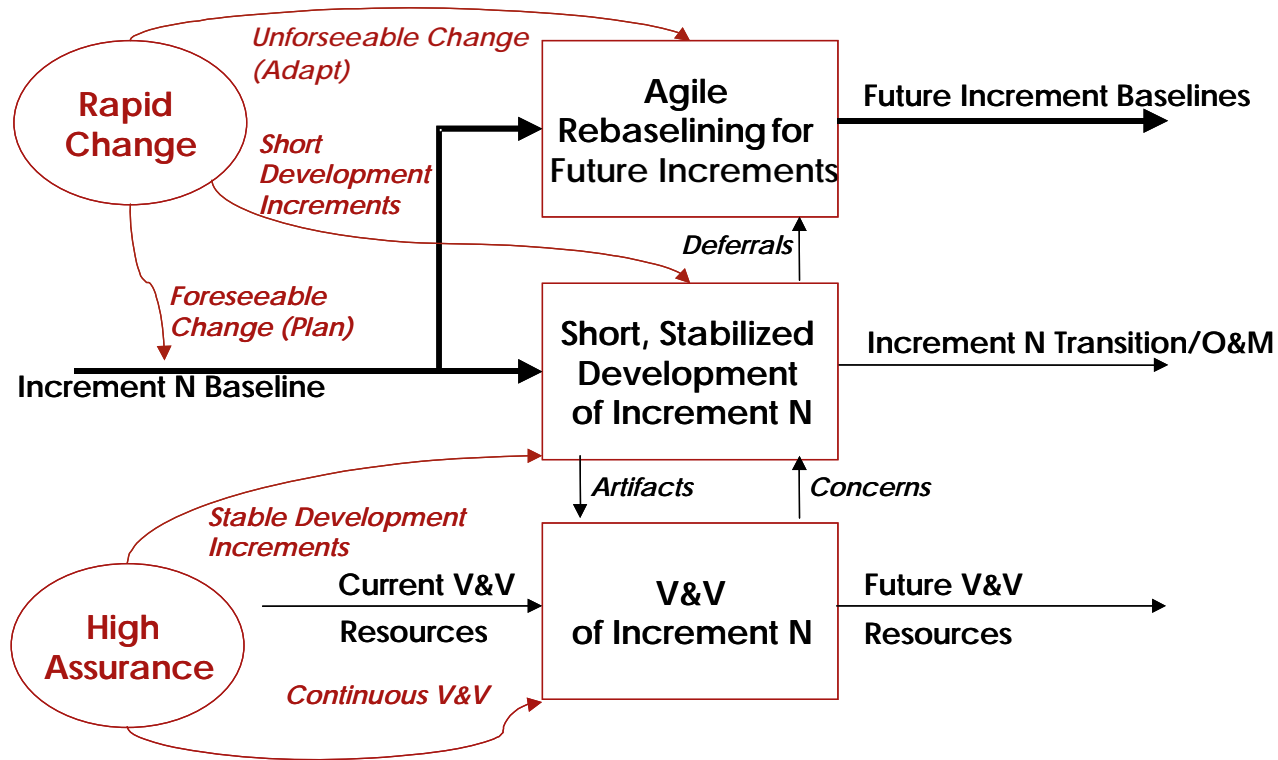
Pass/Fail Feasibility Rationales

- Evidence provided by developer and validated by independent experts that:
- If the system is built to the specified architecture, it will
 - Satisfy the requirements: capability, interfaces, level of service, and evolution
 - Support the operational concept
 - Be buildable within the budgets and schedules in the plan
 - Generate a viable return on investment
 - Generate satisfactory outcomes for all of the success-critical stakeholders
- All major risks resolved or covered by risk management plans
- Serves as basis for stakeholders' commitment to proceed

Risk-Driven Scalable Spiral Model: Increment View



Risk-Driven Scalable Spiral Model: Increment View



Conclusions

- **Current processes not well matched to future challenges**
 - Emergent, rapidly changing requirements
 - High assurance of scalable performance and qualities
- **Incremental Commitment Model addresses challenges**
 - Assurance via evidence-based milestone commitment reviews, stabilized incremental builds with concurrent V&V
 - Evidence shortfalls treated as risks
 - Adaptability via concurrent agile team handling change traffic and providing evidence-based rebaselining of next-increment specifications and plans
 - Use of critical success factor principles: stakeholder satisficing, incremental growth, concurrent engineering, iterative development, risk-based activities and milestones
- **Major implications for funding, contracting, career paths**