Agile Systems Engineering Approach to Software Project Development

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Overview

- What is “Agile?”
- How is agile development applied to software?
- What is the difference between Systems Engineering and Software Engineering?
- What lessons from Agile make sense to apply to systems engineering?
- Summary

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What is "Agile?"

See http://agilemanifesto.org/

- Time-boxed iterative approach
- Incremental
- Self-organizing, cross-functional teams
- Adaptive planning
- Rapid and flexible response to change

We have used many names for this over the years: "build a little, test a little" and "extreme programming" to name a couple

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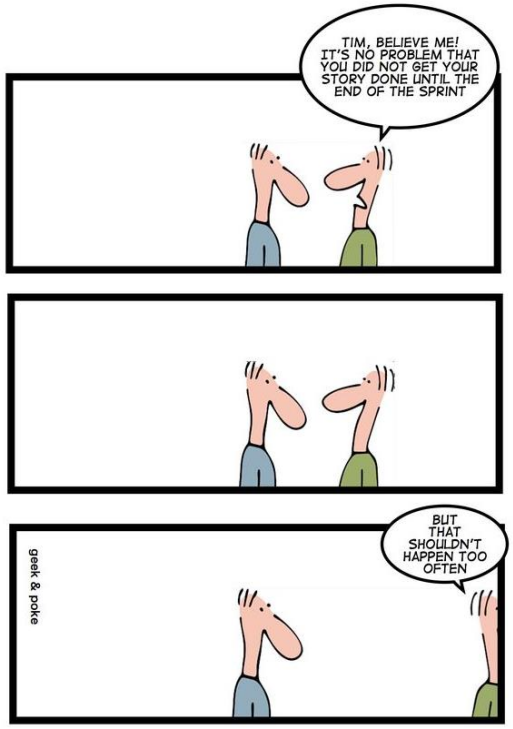
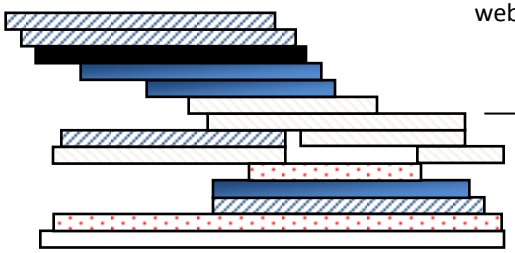
How is Agile Applied to Software Development?

- Many techniques have been derived (e.g., Kaisen, Scrum)
- But does this kind of software development approach translate well into the DoD/NASA world where software makes life and death decisions?



From http://geekandpoke.typepad.com/geekandpoke/2011/12/agile-manifesto.html

SPEC's Agile Software Production Process – Used for Commercial Software Development



SPEC Innovations Middle-Out MBSE Process

User Feedback (anytime from "Features Tracker" webpage)

Baseline Functional Requirements

Internal Lessons Learned

Monday – Week 1

Plan & Evaluate Priorities

Tuesday – Week 1

Analysis & Design

Wednesday – Week 1 to Wednesday – Week 2

Coding (New Features/Bug Fixes) & Unit/Developmental Testing (Local Host)

Bi-Weekly "Sprint" Software Production Cycle

Thursday – Week 2

Operational Test (Cloud Test Site)

Friday AM – Week 2

Final fixes (if necessary) and review

Friday PM – Week 2

Final OT & Document Updates

Friday Late PM – Week 2

Deploy to Cloud Site

New Version Available to Users

Innoslate SLOC ≈ 370k

We use a small, co-located team who went to school together and have worked together many years

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DoD Software Systems

- Characterized by
  - Millions of lines of code
  - Much of it using older software languages
  - Real-time
  - Standards-based
  - Many, many reviews
  - Many, conflicting “requirements” from many, varied stakeholders

All driven by a very non-Agile acquisition system

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What Does This Mean to DoD?

- Agile clearly can be applied in non-mission critical activities, for example:
  - Websites
  - Specialized analytical tools
  - "Commercial-like applications" (although it would be better usually to just use COTS)
- It may be applicable to mission-critical software, but only when it's functional requirements are well-defined and the contracting environment allows for flexibility

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What Is the Difference between Systems Engineering and Software Engineering?

- Systems Engineering
  - Capabilities-based
  - Decomposition to many levels
  - Must support all aspects of the lifecycle
  - Hardware SE requires "measure twice, cut once" approach
- Software Engineering
  - Needs to have well-defined functional requirements
    - Verifiable
    - Clear
    - Concise …
  - Code can be executed quickly

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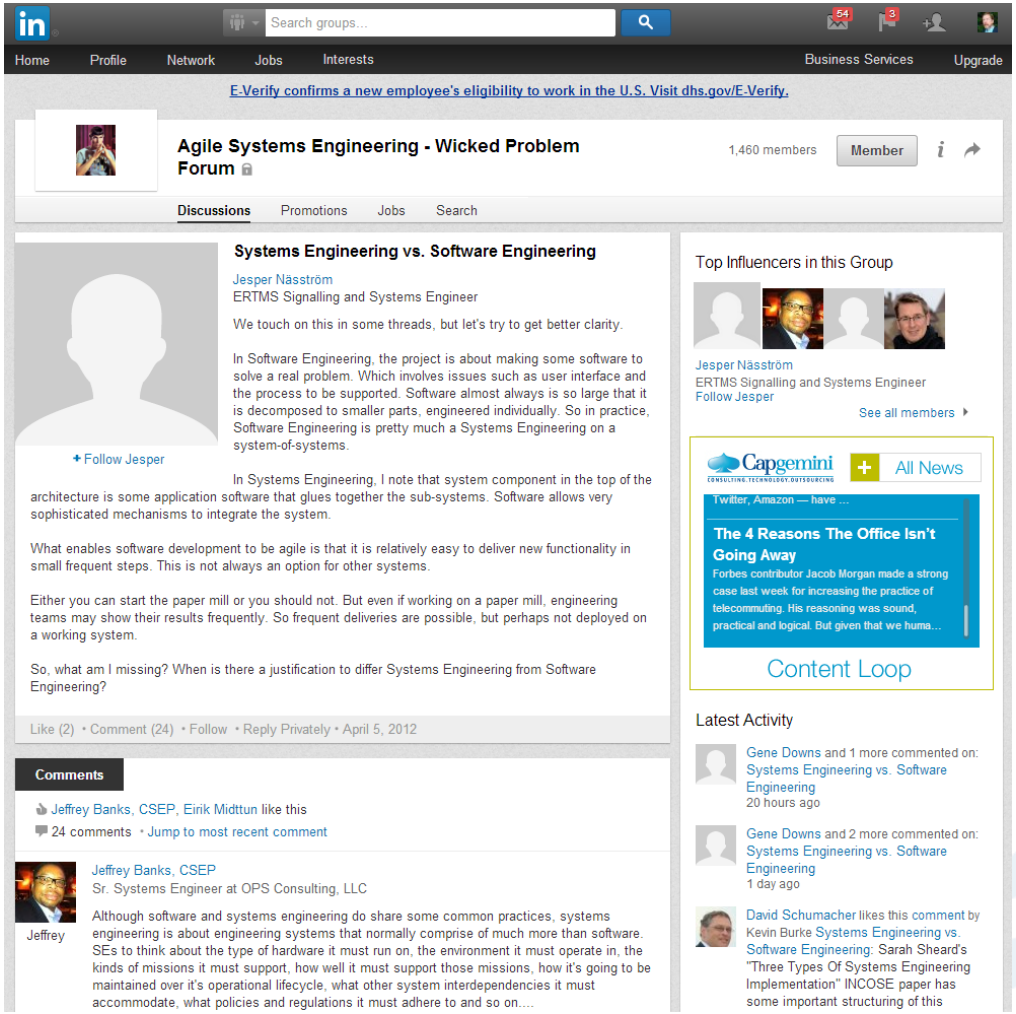
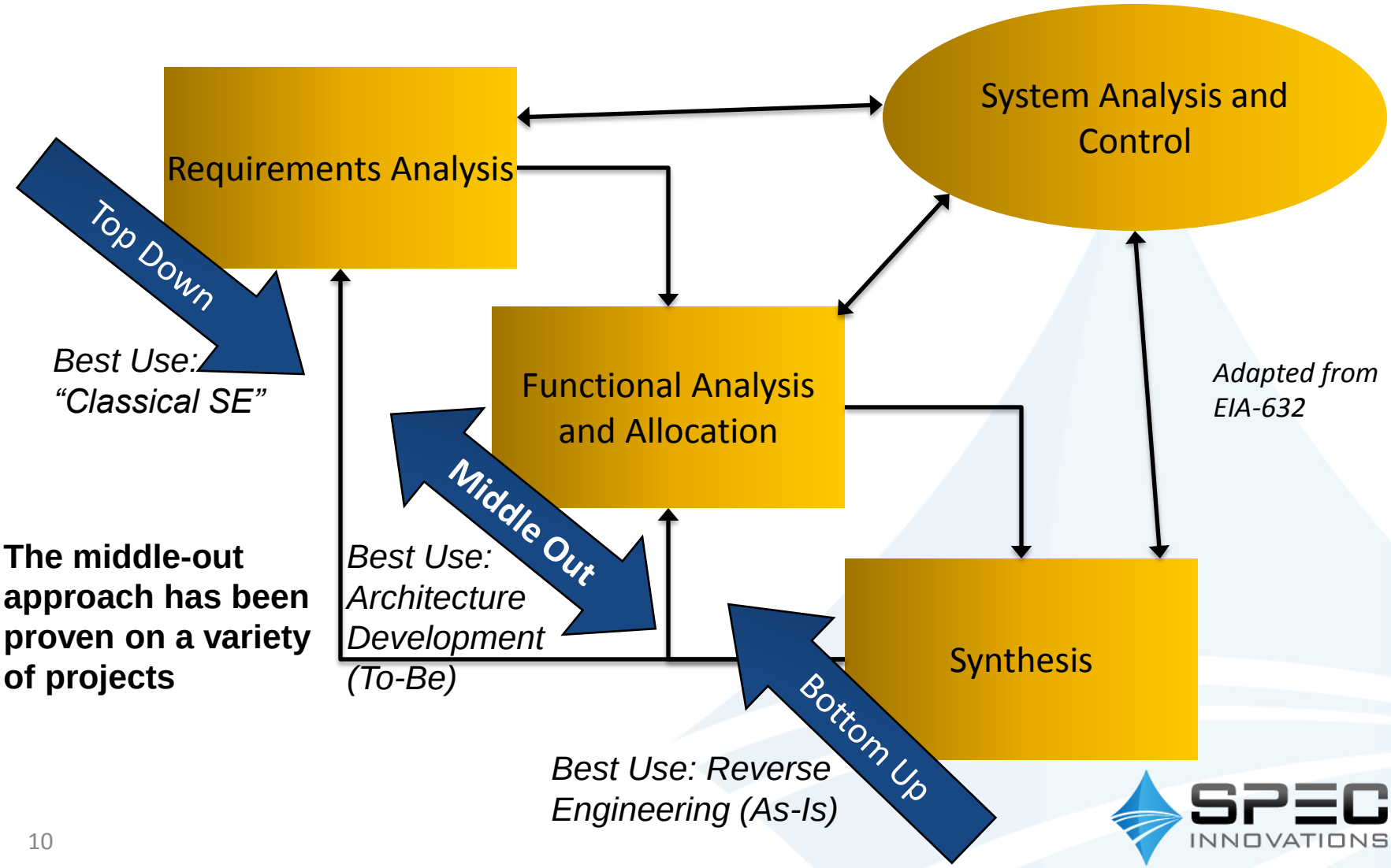
Is There Such a Thing as Agile SE?



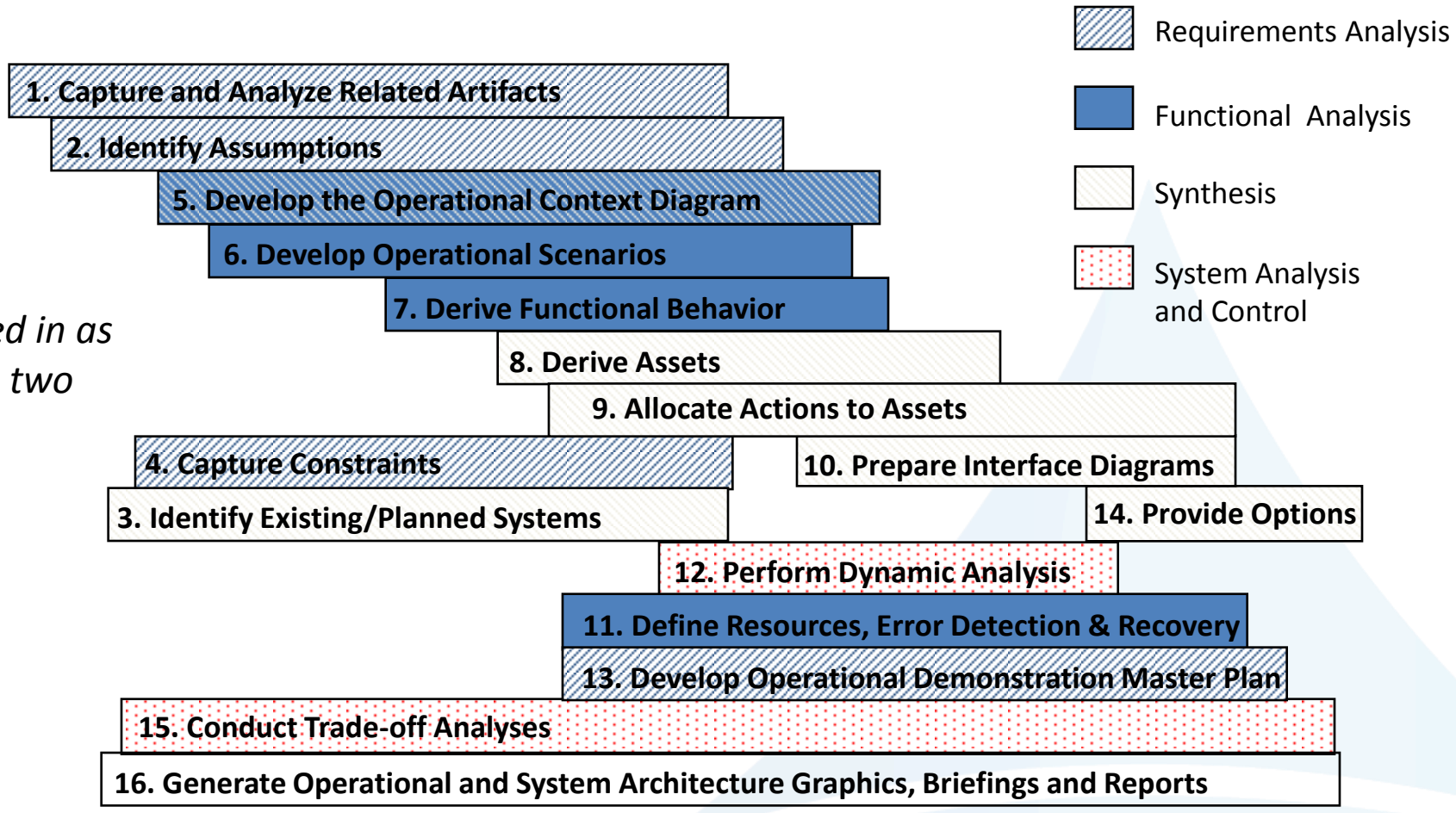
- Many people are trying to apply the Agile principles to SE
- Many forums on this subject (see LinkedIn)
- How have we done this?

We Focus on a Middle-Out Process



The middle-out approach has been proven on a variety of projects

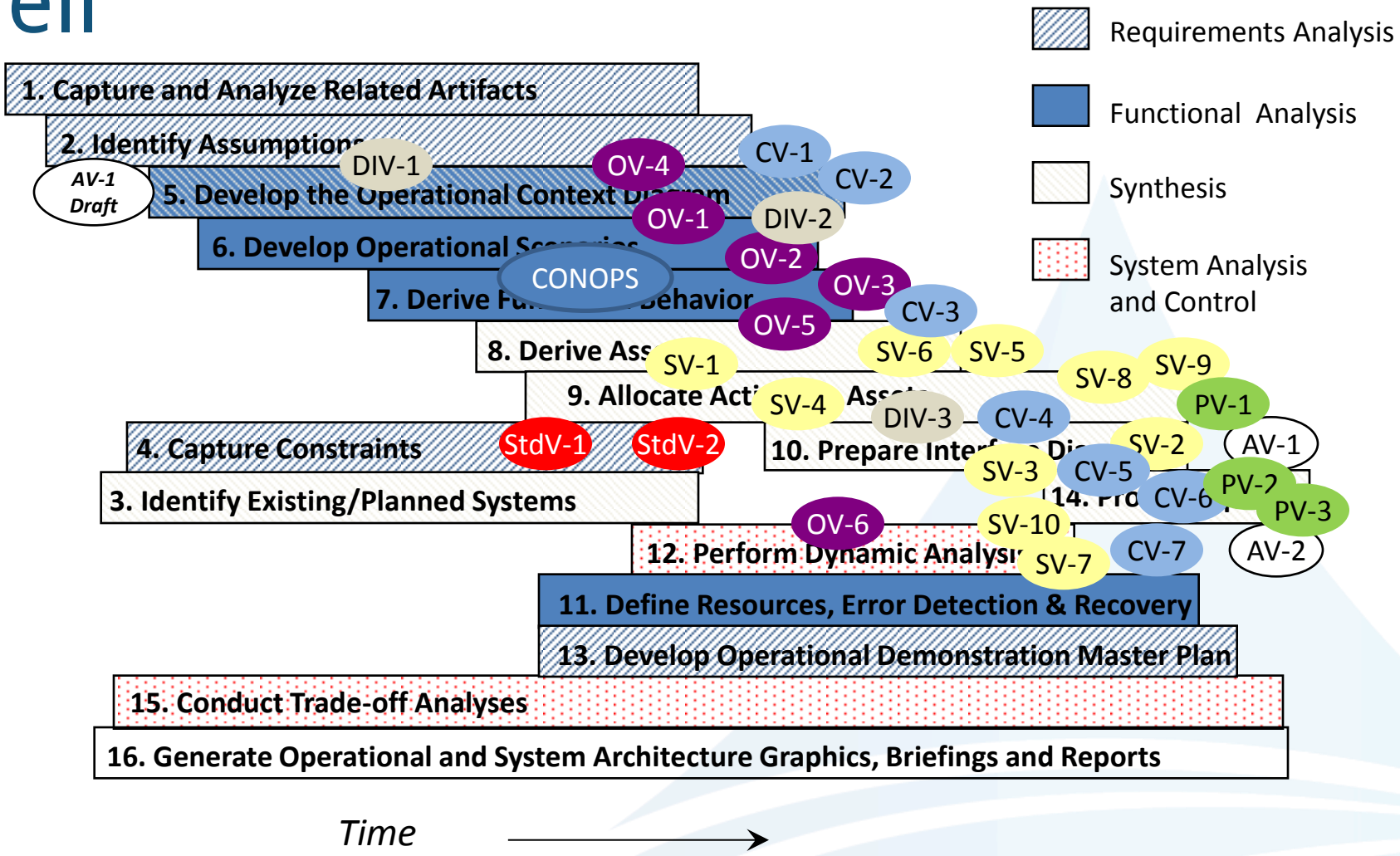
Middle-Out Timeline



Can be executed in as little as two weeks

Originally developed to support ACTDs in the 1990s

Agile Architecture Development as Well



Fits with DoD requirements

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What Lessons from Agile Make Sense to Apply to Systems Engineering?

- Individuals and interactions over processes and tools
  - However, you need to apply a process for repeatability and tools to capture the information
- Working ~~software~~ (design) over comprehensive documentation
  - Implies MBSE with simulation
- Customer collaboration over contract negotiation
  - Need to work better as a Government-Contractor team
- Responding to change over following a plan
  - Need flexibility in the SOW and deliverables to make this work
  - Implies CPFF or T&M?

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Summary

- Agile is the latest buzzword for something we have been trying to do for decades
- The problem really comes from people being inflexible and suspicious of each other
- A measure of trust is needed to actually improve the situation

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