Quality in Architecture-Centric Engineering

- INCOSE 2011 -

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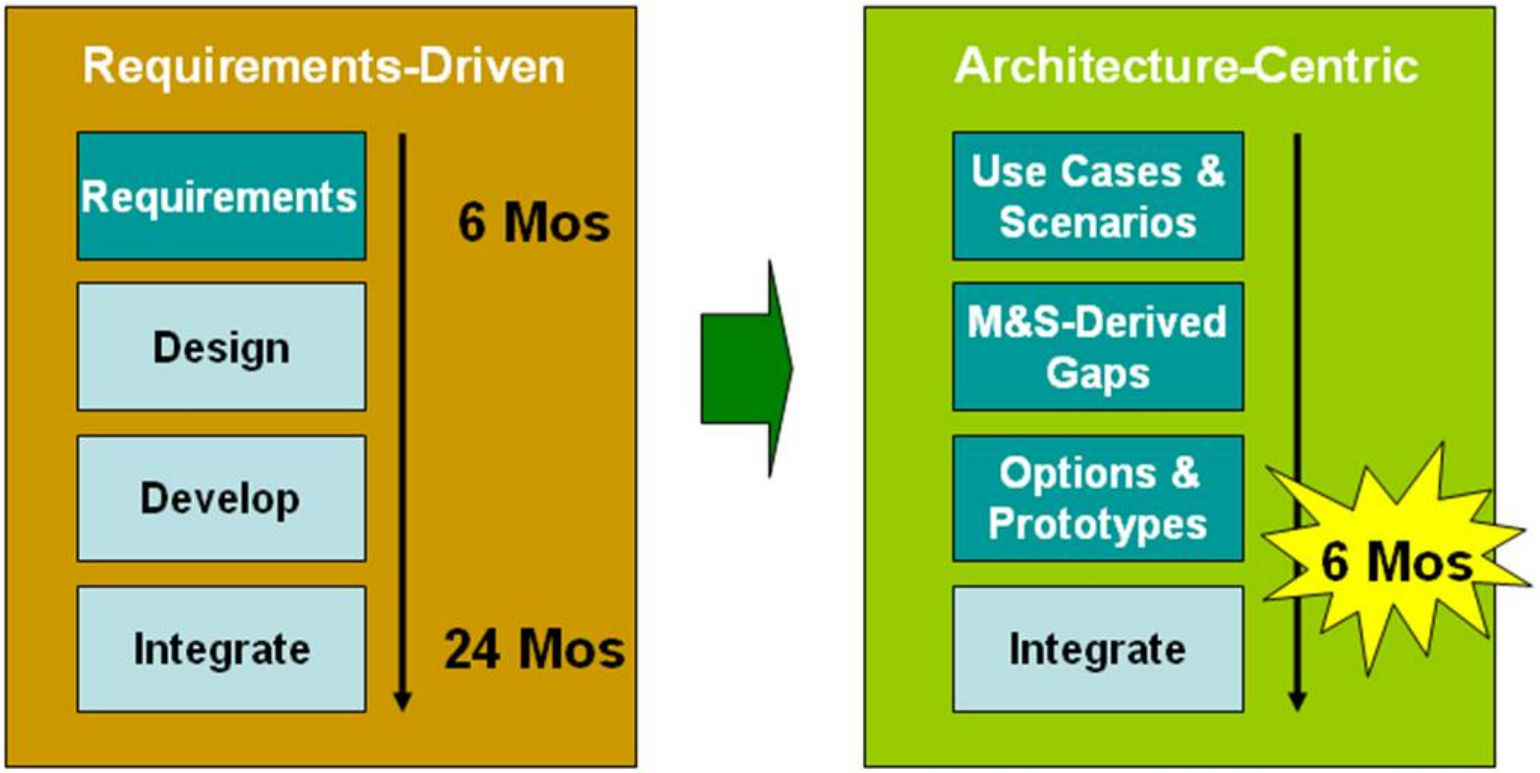
Overview

- Overview of ACE
- Scenarios and Performance Measures Using an Example
- Applied Solutions
- Lessons-Learned and Path Forward

Architecture-Centric Engineering

- Current methods of user elicitation (natural language, interviews, etc.) are not adequate in obtaining quality requirements and results
- ACE is a scenario-driven lifecycle that applies repeatable processes for static, dynamic, an behavioral modeling to derive requirements and performance targets from enterprise scenarios

Significance of Architecture-Centric Engineering (ACE)

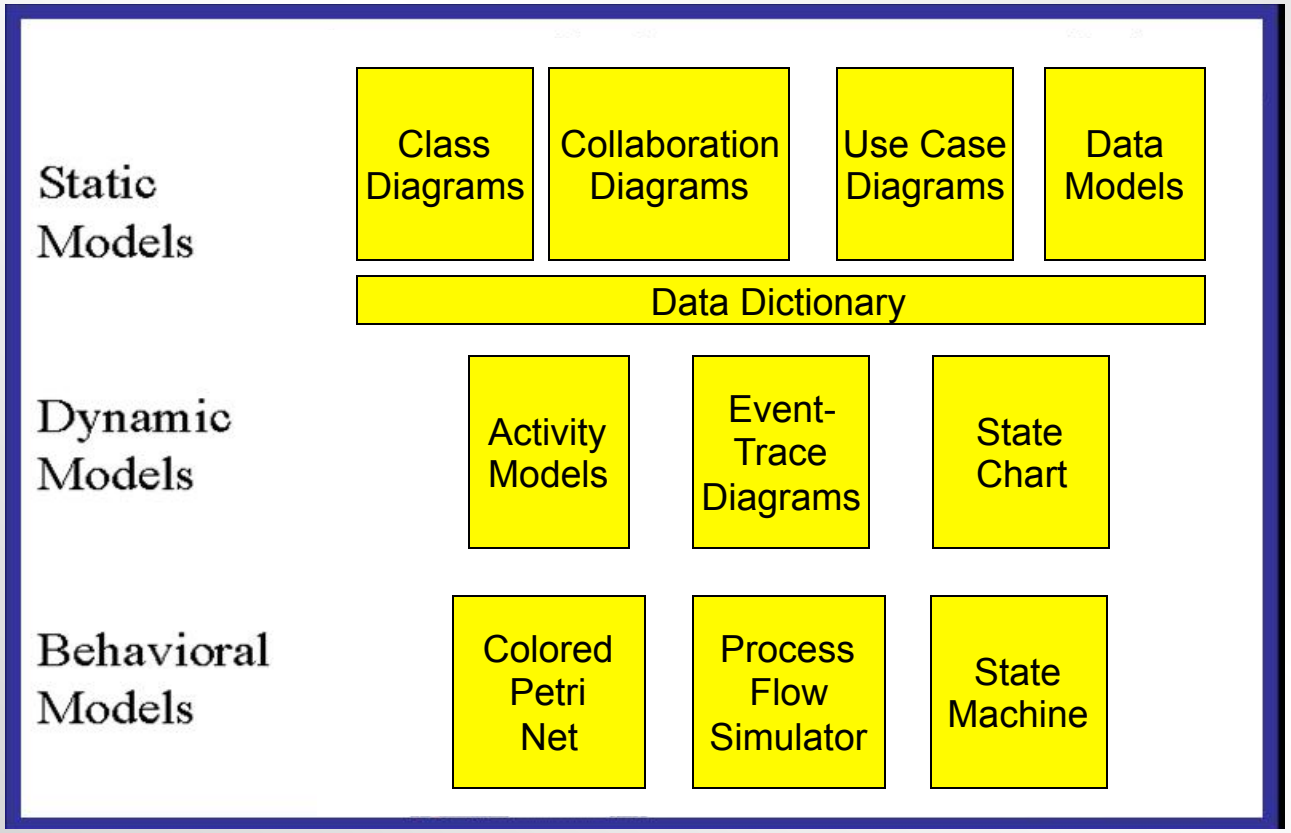


Waterfall timelines are sensitive to user and stakeholder Understanding of CONOPS

Rapid capability insertion against capability gaps provides basis to Evolve CONOPs

Research and Creation of ACE Principles

Artifact Examples



- Different bands enable improved technique as alternative to natural language
- Transition between levels of abstraction helps transform requirements to design
- Behavior models provide benchmark for comparative analyses based on measures

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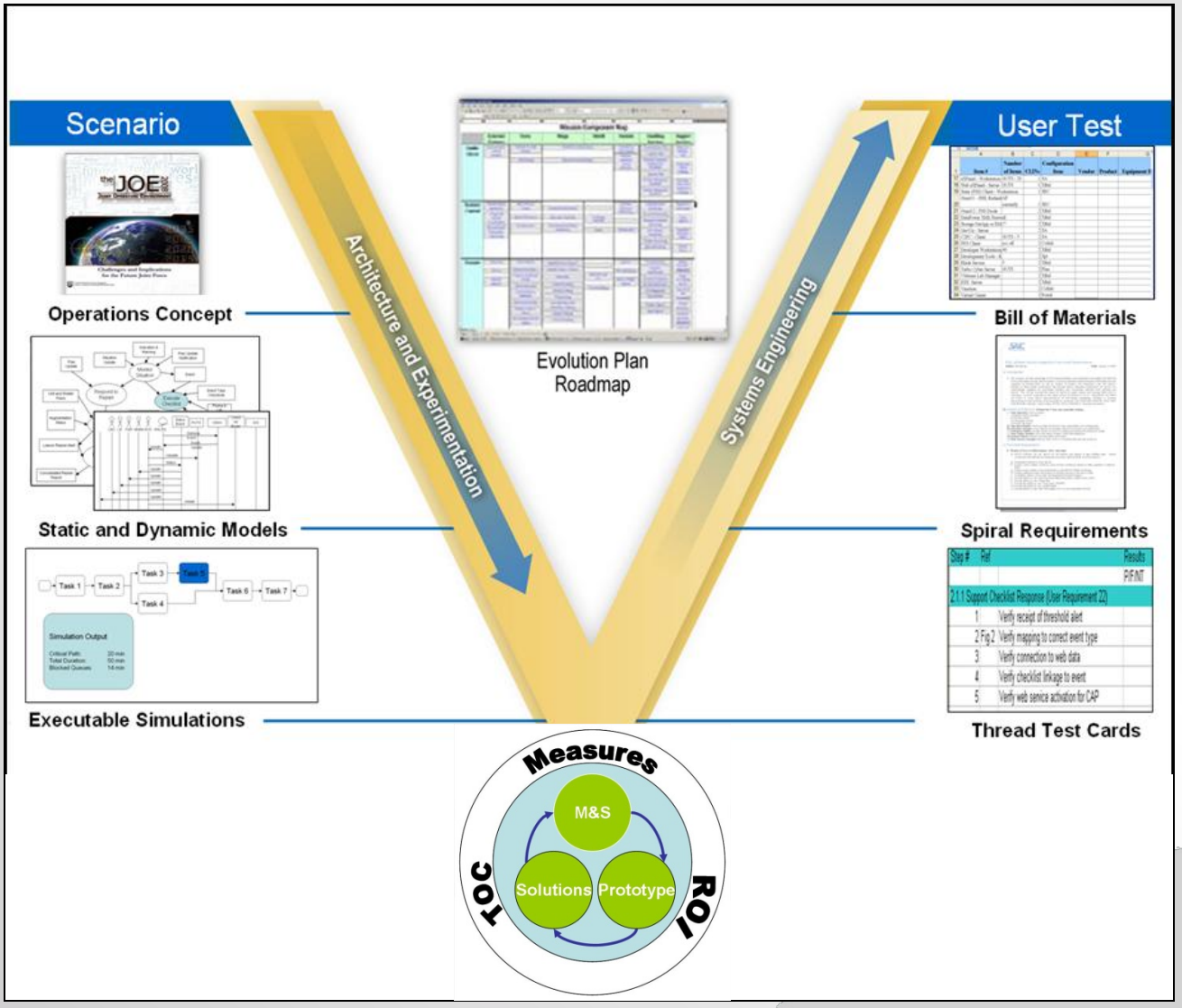
ACE Adapted Engineering 'V'



- Downstroke creates Fully Discovered 'as-is' and 'to-be' Baselines
- Upstroke realizes Enterprise Solution
- Apex defines Engineering Choices against Performance Measures

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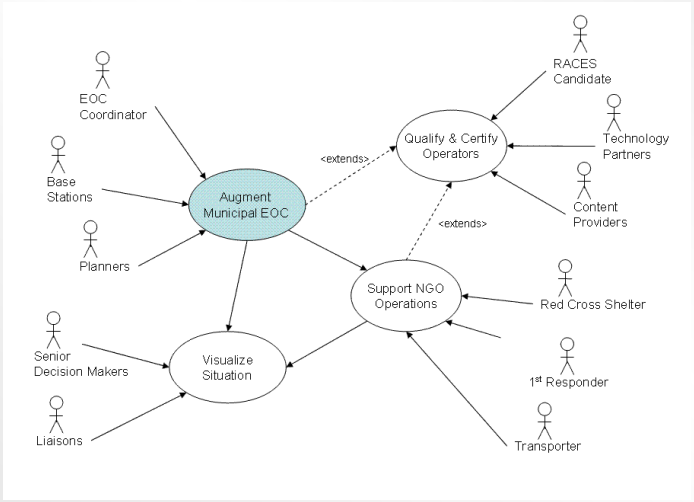
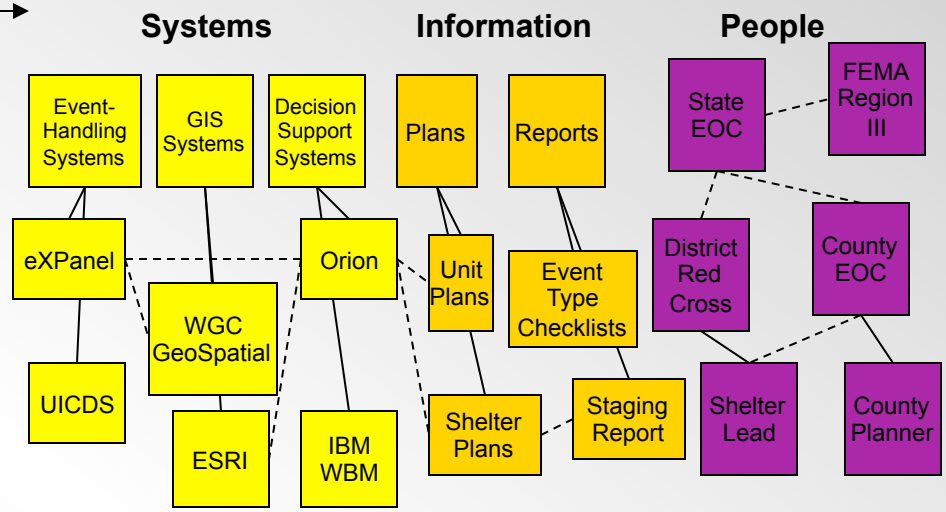
Example – Catastrophic Evacuation (CATEVAC) Scenario

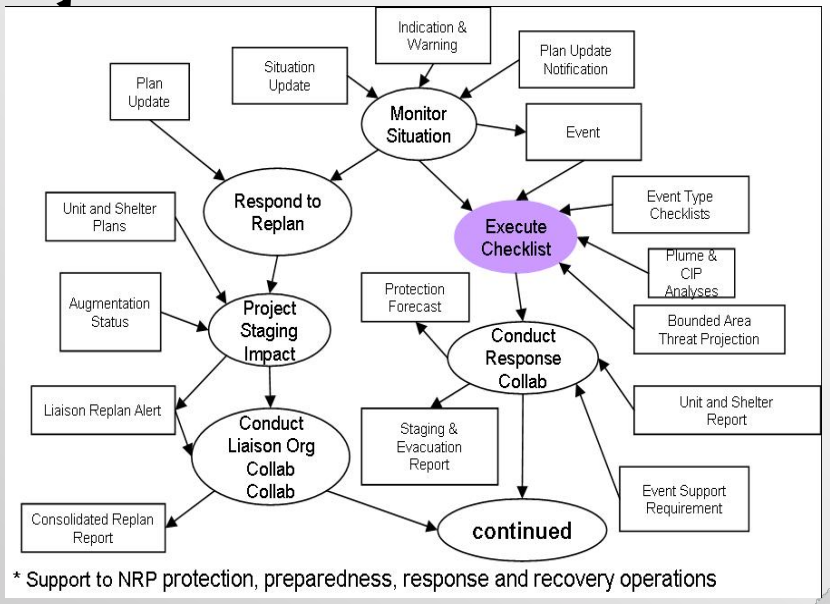
Static

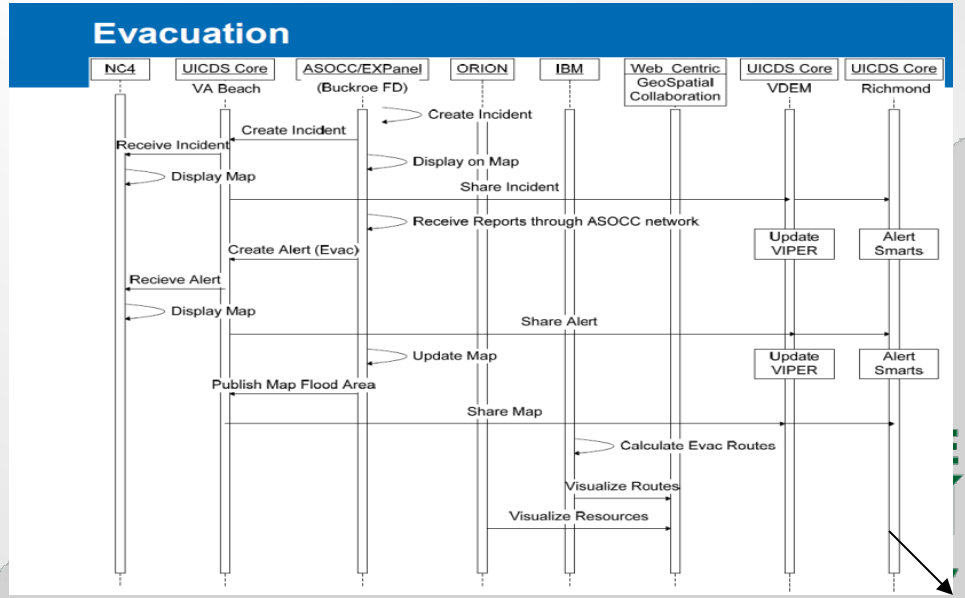
Breadth →

Depth ↓









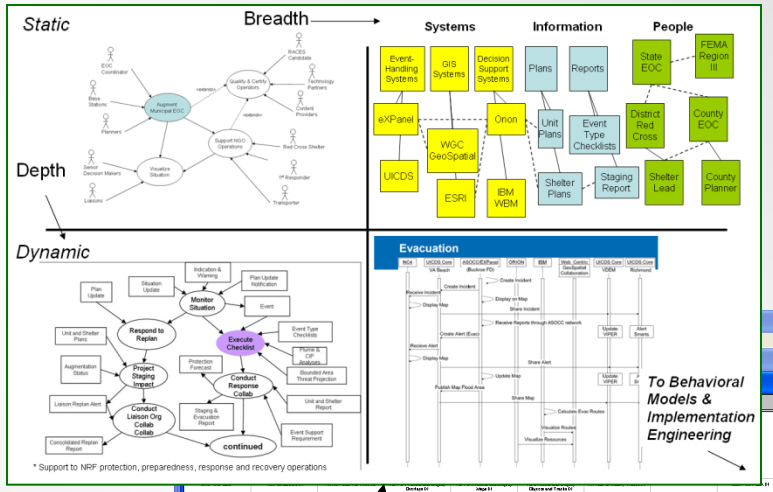
Example – Catastrophic Evacuation (CATEVAC) Scenario

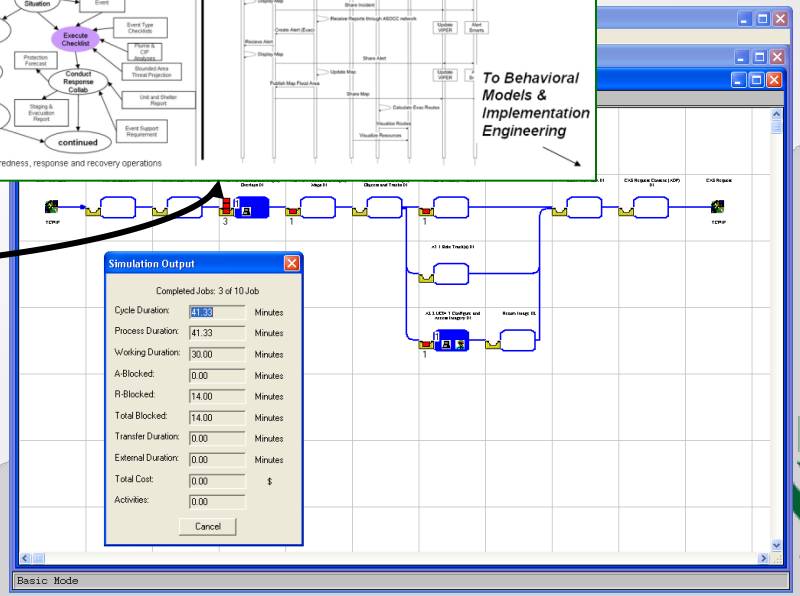
- Requirement:

  Threshold: Handle 10 support requests per hour from command centers who support evacuation

  Objective: Handle 20 support requests per hour

- Executable Architecture & Workflow:

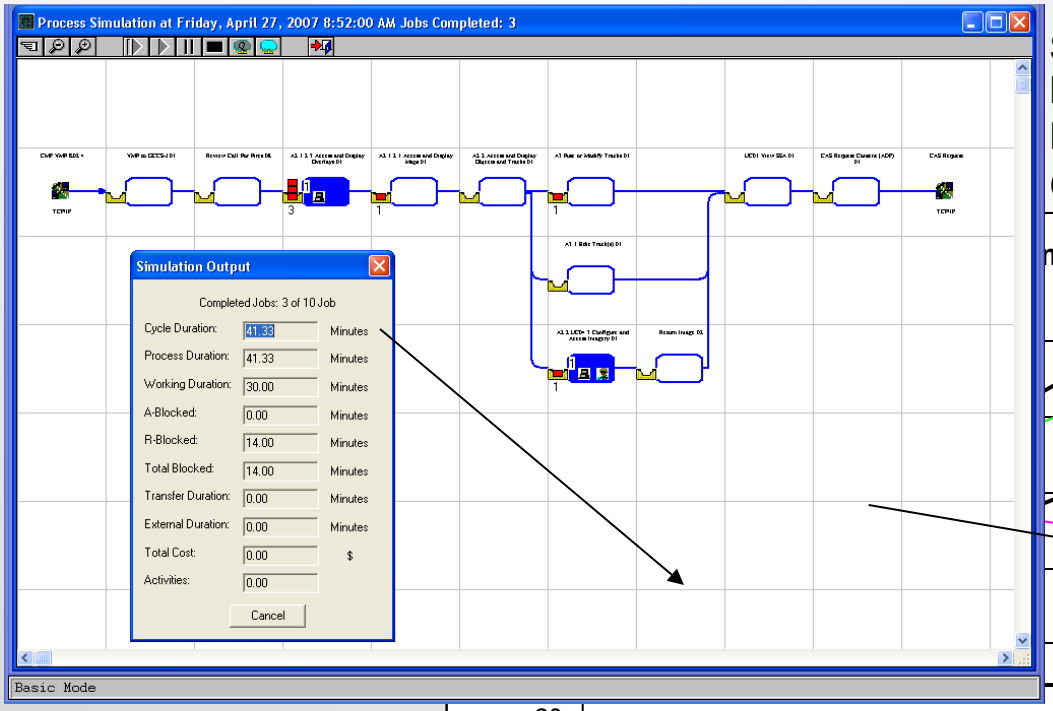




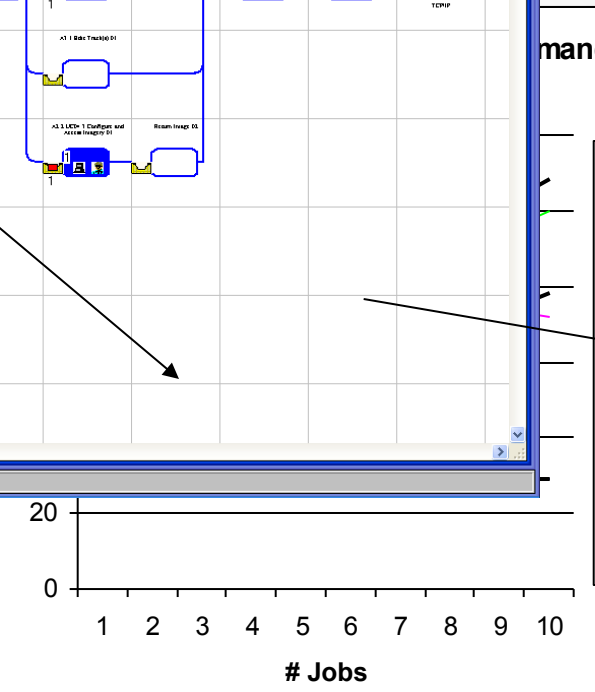
QUID Identifier digitally connects requirement to Event Trace(s)

Example – Catastrophic Evacuation (CATEVAC) Scenario

Objective Run – 20 Requests/Hour;
QUID Links Scenario Run to Requirement



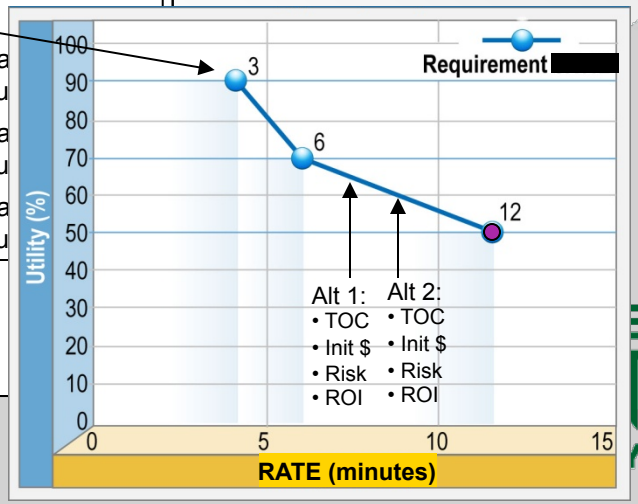
Sustainable Baseline Performance @ 5 Requests/Hour



Quantitative Probe:

- Max resource for min bottleneck baseline run
- Resources used; set resource constraint
- Increase token rate for objective & threshold
- Fixed resource for sustainable increased rate alternatives

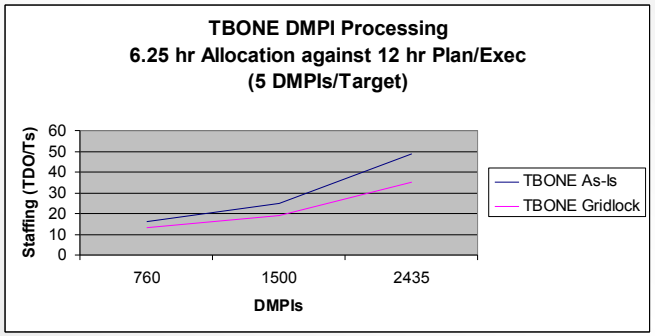
Required, Baseline & Alternative Performance



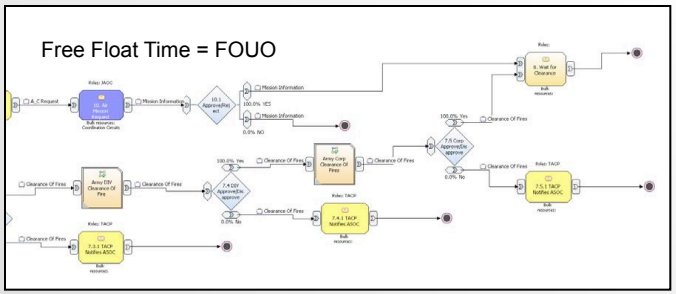
Simulation:
Current "as is" can only handle 5 requests per hour
Implementing option 2> almost to threshold of 10
Implementing option 1> cheaper but not to threshold

Applied Solutions

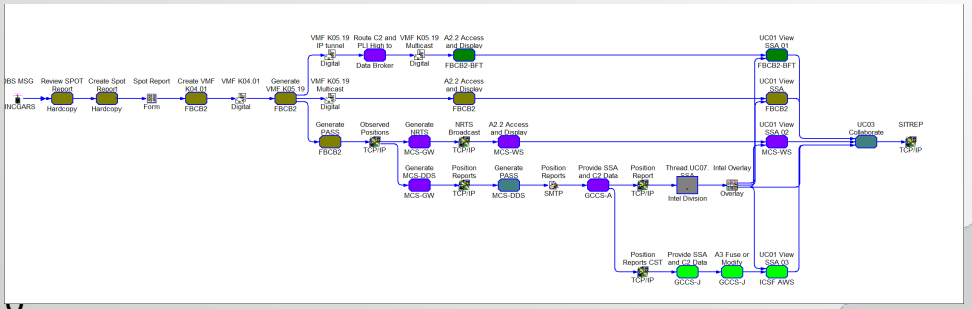
Air & Space Operations Center (AOC) WS – Targeting Improvement Spiral



Joint Forces Command (JFCOM) - Joint Close Air Support (JCAS) Study



Net-Enabled C2 (NECC) – Air Support Analysis



From: Baxter Brent D Civ 517 SMXS/MXDEA [mailto:Brent.Baxter@HILL.af.mil]
Sent: Wed 12/12/2007 6:17 PM
To: Jacobson, Christopher P.
Subject: General session speaker invitation to address the Systems and Software Technology conference

Mr. Jacobson,

I am the technical program manager for the Systems and Software Technology Conference (SSTC). I recently received an email from Dr. Margret Myers, OSD/NII and from Mr. Roger Loeb, IBM, proposing you and your work in creating a formal architecture principles and UML modeling to the DoDAF architecture as a good potential fit for our forum this next year.

Based on their recommendations, I would like to explore the possibility of including you as one of our general session speaker at this year's conference. SSTC 2008 will be held Tuesday, 29 April – Friday, 2 May at the Las Vegas Hilton Hotel. Our general sessions that I am currently looking for potential speaker are the opening and closing sessions which would begin at 1:00 pm on the 29th for the opening session and beginning 11:45am on Friday 2 May for the closing session.

. Attendance at SSTC is expected to exceed 2200 attendees. Our theme for the conference is "Technology: Tipping the Balance" with the intent of the theme being to explore technologies that give our war fighters a battle field advantage. More information about SSTC is available on our website at: www.sstc-online.org

If your schedule would permit your ability to be a part of our program, I would like to explore the possibly further with you.

Brent

Brent Baxter
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SSTC Technical Conference Manager

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Lessons Learned and Path Forward

Lessons Learned

- ACE provides decision making and engineering artifacts that support compression of delivery time-lines
- Using ACE models tied directly to requirements allows for direct SRS creation from models
- ACE allows for simulation of “to be” options from “as is” scenarios to create optimal solution for given problem

Path Forward

- Extend ACE engineering principles to Federal Governance Framework (i.e. curriculum at DAU)
- Extend model-driven architecture to leading tool providers (e.g. IBM)

Additional Information

- Chris Jacobson – chrjacob@us.ibm.com

- Achieving Interoperability for Critical IT and Communication Systems, Artech House Publishers
  - http://www.amazon.com/Achieving-Interoperability-Critical-Communication-Systems/dp/1596933895

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QUESTIONS?