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RT16 Experience Accelerator: Year 1 Summary

By
Doug Bodner, Alice Squires, Jon Wade & the RT16 Team

NDIA Annual Systems Engineering Conference
October 24, 2011
Hyatt Regency Mission Bay
San Diego, CA
www.sercuarc.org

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Agenda

Welcome!	**Please Sign Roster**	
Overview	**Jon Wade**	1:00pm
Competencies & Aha Moments	**Alice Squires**	1:30pm
Architecture	**Doug Bodner**	2:00pm
Experience Design	**Alice Squires**	2:20pm
Break		2:45pm
Design Tools & Dialog Creation	**Jon Wade**	3:15pm
System Dynamics Simulation	**Doug Bodner**	3:35pm
Demo	**Jon Wade**	4:05pm
Discussion & Survey	**All**	4:30pm
Session Adjourned:	**Please complete survey!**	5:00pm

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Acknowledgement

This material is based upon work supported, in whole or in part, by the Defense Acquisition University through the Systems Engineering Research Center (SERC). SERC is a federally funded University Affiliated Research Center (UARC) managed by Stevens Institute of Technology in partnership with University of Southern California.

RT16 Experience Accelerator: Overview

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Experience Accelerator Team

Experience Design:

- Alice Squires – Stevens
- Jim Anthony – OSD support
- Rick Abell – consultant
- John Griffin – consultant
- John McKeown – consultant

Evaluation:

- Bill Watson, CoPI – Purdue
- Pete Dominick – Stevens
- Dick Reilly – Stevens
- Dana Ruggiero – Purdue

Technology & Tools:

- Jon Wade, PI – Stevens
- George Kamberov – Stevens
- Brent Cox – Stevens
- Vinnie Simonetti – Stevens
- Yagiz Mungan – Purdue

Simulation:

- Doug Bodner – Georgia Tech
- Pradeep Jawahar – Georgia Tech

Overview

- Motivation
- Research Activities
  - Identify critical SE competencies and maturation points
  - Create appropriate learning experiences
  - Define open architecture & technologies
  - Develop & evaluate prototype
  - Prepare for open source support
- Future Work

Motivation

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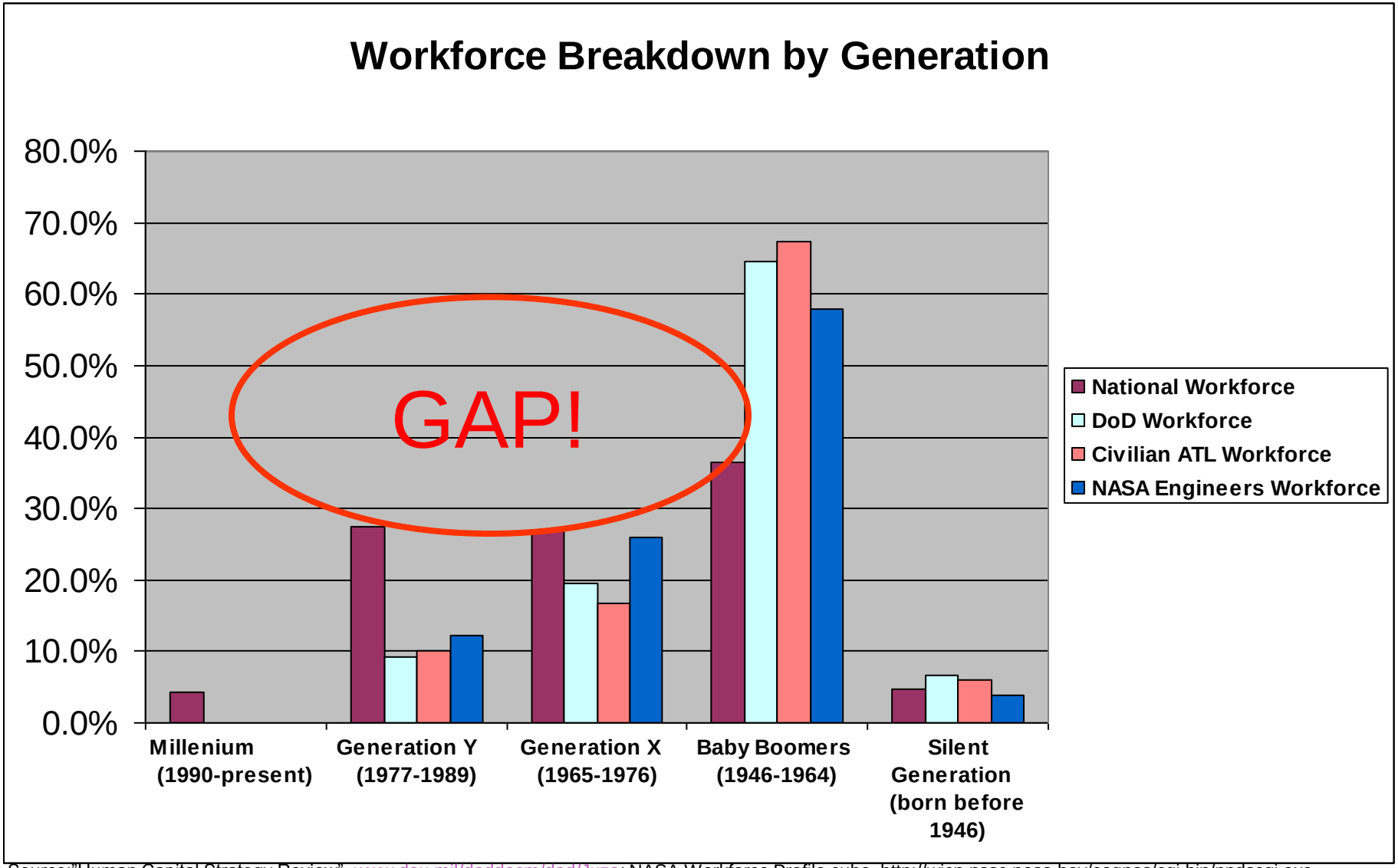
Workforce Demographics



Source:"Human Capital Strategy Review", www.dau.mil/doddacm/dod/Juza; NASA Workforce Profile cube, http://wicn.nssc.nasa.bov/cognos/cgi.bin/ppdscgi.exe

What's More Effective?

Transforming SE Development

We postulate that the new paradigm must be:

- **Integrated:** Provides an integration point of multi-disciplinary skills and a wide range of Systems Engineering knowledge in a setting that recreates the essential characteristics of the practicing environment.
- **Experience Based**: Providing accelerated learning opportunities through experience-based interactive sessions.
- **Agile:** Allowing for quality, timely development of course material that is most appropriate for the target students.
- **Time/Cost Efficient:** Compressing multi-year lifecycle experiences into a much shorter period of time.

Hypothesis

By using technology we can create a simulation that will put the learner in an experiential, emotional state and effectively compress time and greatly accelerate the learning of a systems engineer faster than would occur naturally on the job.

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Measuring Success

- Success of the SEEA prototype will be indicated with a positive result in the following areas:
  - Experienced lead program systems engineers authenticate the SEEA and provide useful feedback on areas of improvement.
  - Learners have identified that the SEEA has a significant favorable impact (e.g., per DAU course evaluation questions).
  - There is the potential for learners who successfully complete the training to be able to immediately implement lessons learned from the training experience to the job, assuming the culture allows this.
  - There is the potential for Program Systems Engineers (PSEs) to be able to perform targeted Level 3 competencies at one or more higher levels of proficiency.

Examples of Level 3 Activities (DAU, 2011)

- Acquisition Program Systems Engineer
  - —Analyzes and applies processes while integrating multiple domains (analytic or engineering specialties) at a system or systems-of-systems level.
  - —Leads and/or manages systems engineering activities, develops systems engineering plans, and leads and facilitates IPTs.
  - —Demonstrates excellence in management, leadership, communications, and briefing skills.
- Sustainment Program Systems Engineer
  - —Leads and/or manages systems engineering activities for programs supporting in-service, out-of-production systems.
  - —Analyzes and applies systems engineering processes in planning and execution of obsolescence mitigation, system upgrades and modifications, technology insertion, modernization, sustainability, reliability/maintainability improvements, etc., as appropriate.
  - —Demonstrates excellence in management, leadership, communications, and briefing skills.

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Experience Accelerator Goals

To build insights and “wisdom” and hone decision making skills by:

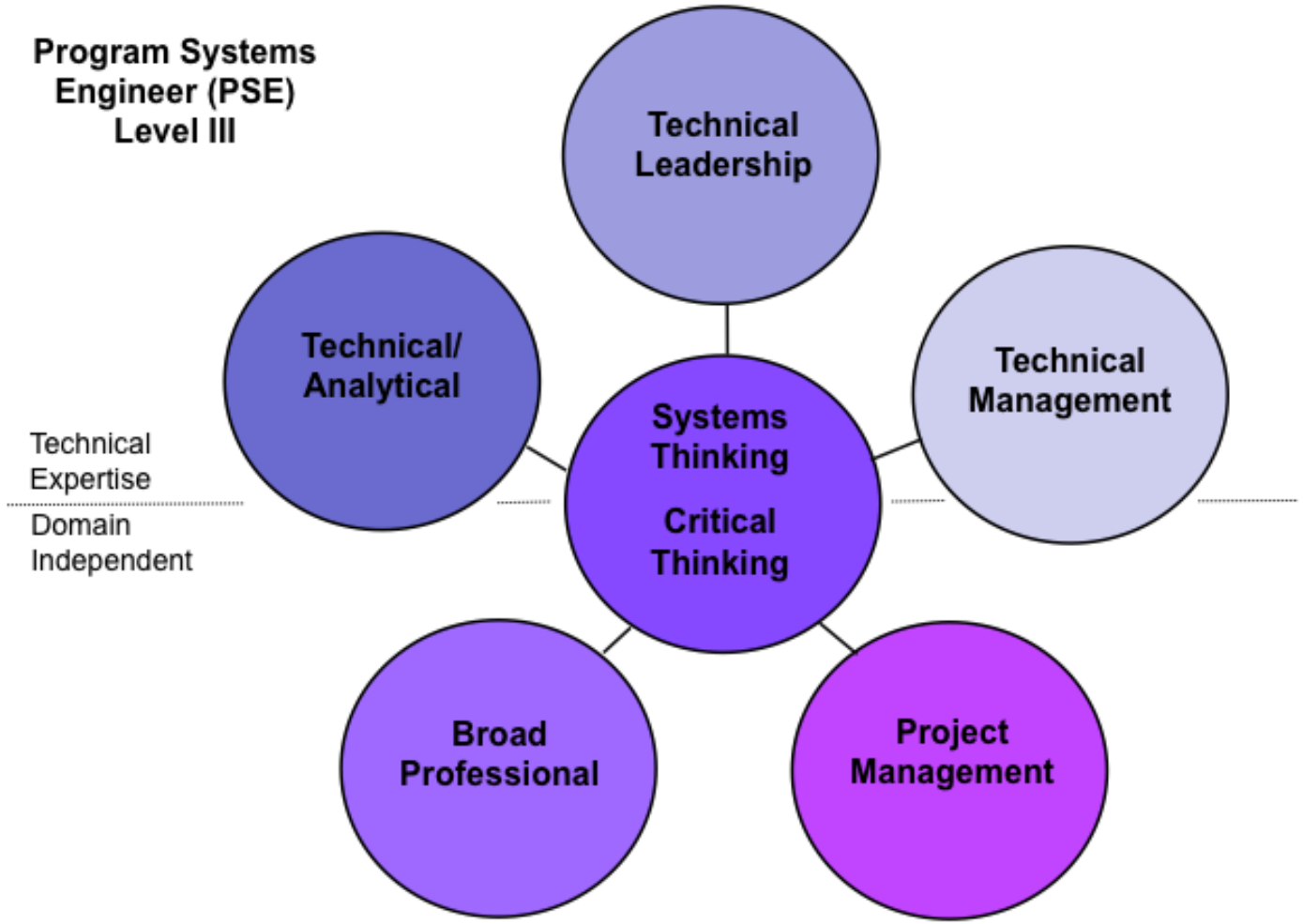
- Creating a “safe”, but realistic environment for decision making
- Exposing the participants to the “right” scenarios and problems
- Providing rapid feedback by accelerating time and experiencing the downstream consequences of the decisions made

Research Activities

Research Activities

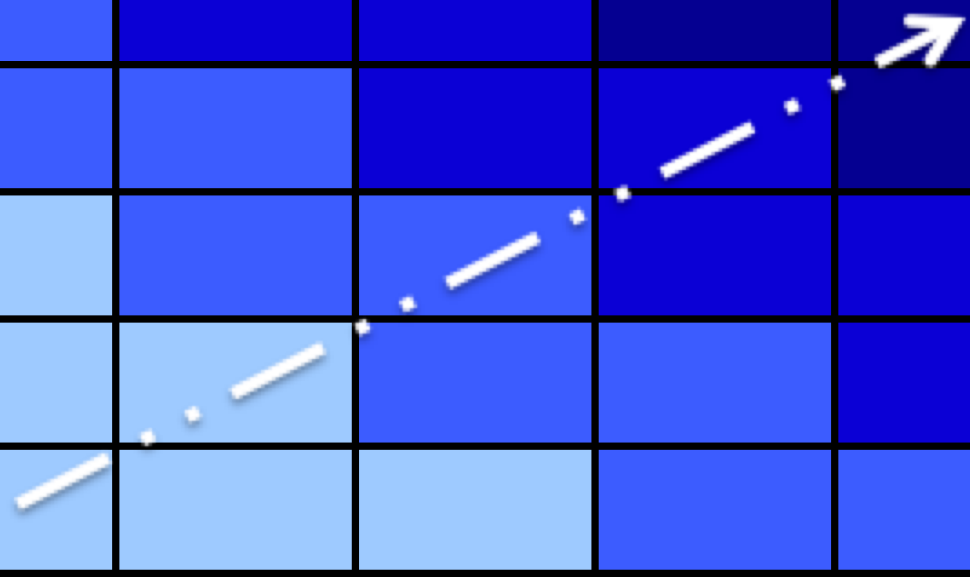
- **Identify critical SE competencies and maturation points**
- Create appropriate learning experiences
- Define open architecture & technologies
- Develop & evaluate prototype
- Prepare for open source support

Taxonomy of SE Competencies



Recommended Approach*

	Proficiency Level				
Situation Complexity	None or Aware only	Apply with guidance	Apply	Manage or Lead	Advance state of art
Exceptionally complex					
Considerably Complex					
Complex					
Somewhat complex					
Simple					



*The user can progress - over time - to increasingly more complex situations (by level) in the simulation and from beginning to advanced stages of capability and understanding in each situational context (level).

Research Activities

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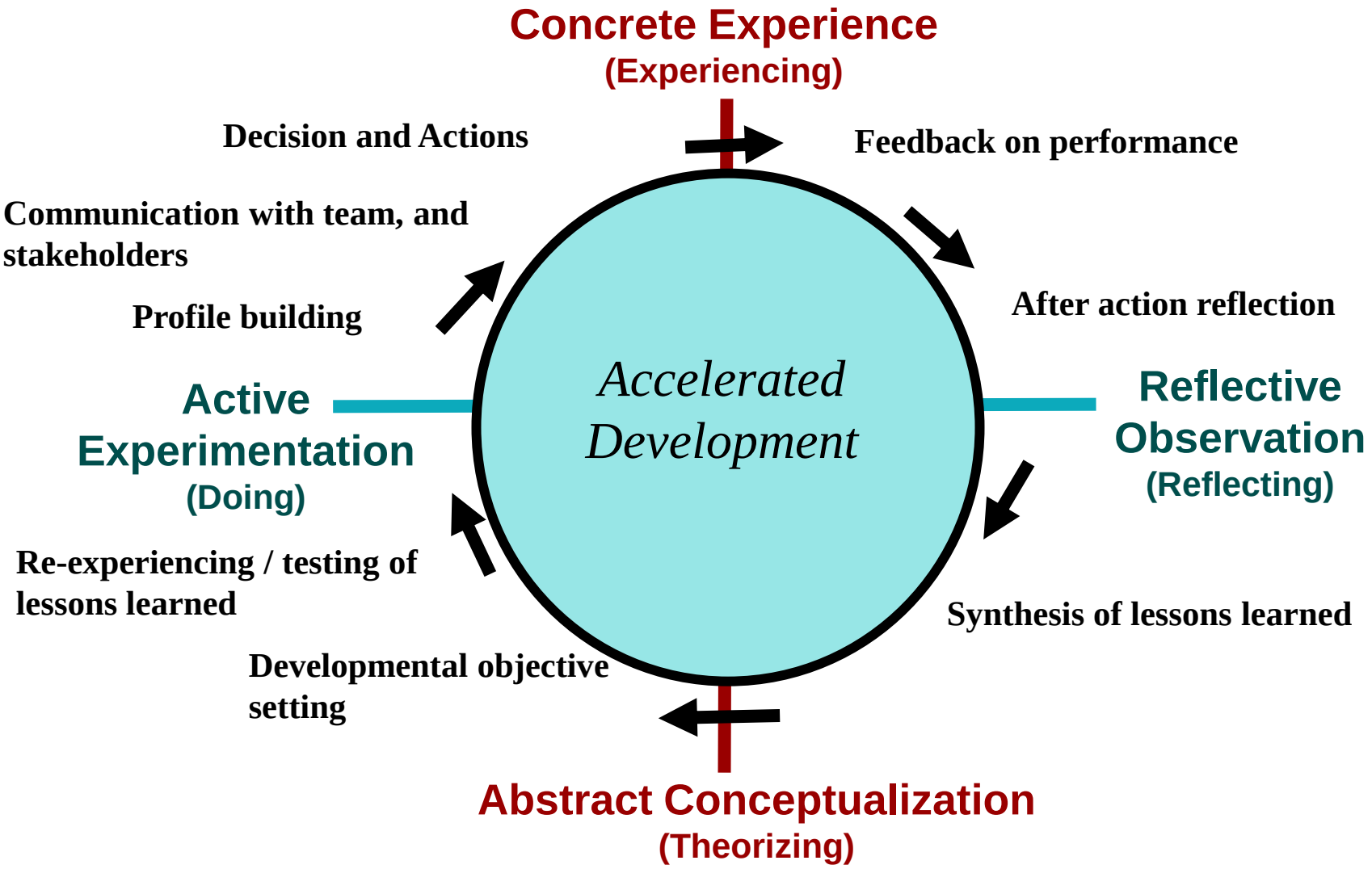
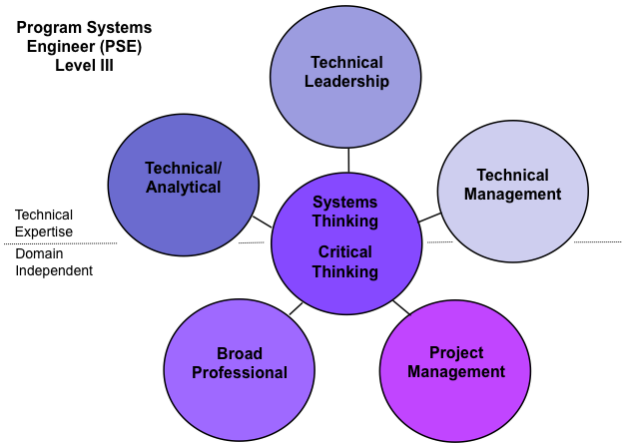
Learning Process



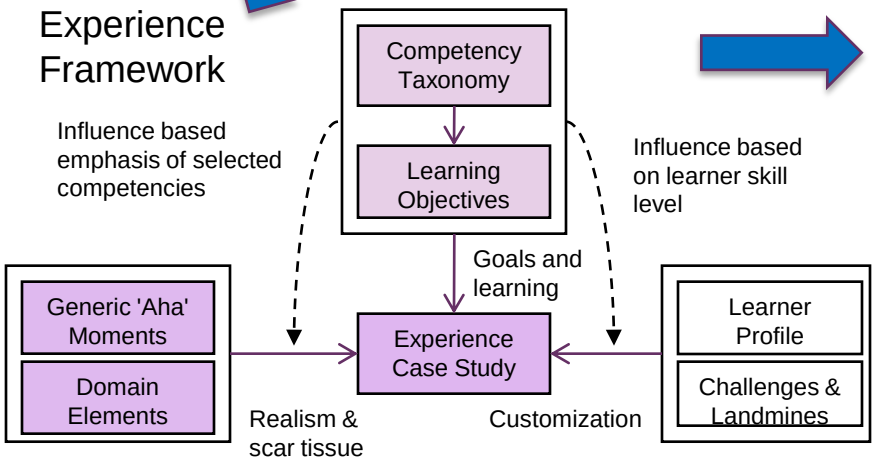
Framework and Applications

Competency Framework



- Accelerated skills
  - DoD lead systems engineers
  - Contractor systems engineers
  - IT systems engineers
  - Sustainment engineers
  - Transportation engineers

Experience Framework

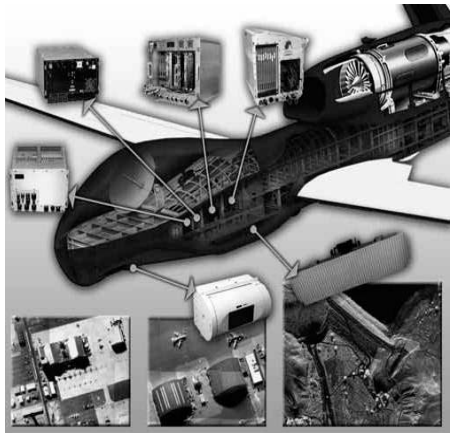


Situation Complexity	Proficiency Level: None or Aware only	Apply with guidance	Apply	Manage or Lead	Advance state of art
Exceptionally complex					
Considerably Complex					
Complex					
Somewhat complex					
Simple					

The Experience: A Day in the Life of a PSE

UAV System:

- S0 – System
- S1 – Airframe and Propulsion
- S2 – Command and Control
- S3 – Ground Support



UAV KPMs:

- Schedule
- Quality
- Range
- Cost

Phases:

- EA Introduction
  - Phase 0: New Employee Orientation
- Experience Introduction
  - Phase 1: New Assignment Orientation
- Experience Body
  - Phase 2: Pre-integration system development -> CDR
  - Phase 3: Integration -> FRR
  - Phase 4: System Field Test -> PRR
  - Phase 5: Limited Production and Deployment
  - Phase 6: Experience End
- Experience Conclusion
  - Phase 6: Reflection
- Each session = 1 day

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Challenge/Landmines & Linkages

System	Challenge	Phase	Evidence	Situation	Desired Actions	Inputs to Simulation
S2	range too short	P2	range projections	weight during development is too high	Reallocate resources - focus resources on weight reduction	Change assignment of labor within sub-system development
					Change subsystem allocation - reallocate weight from S2 to S1	Change weights
					Change system level feature - reduce expectations for range	Change range target
S1	range too short	P3	range projections	drag is higher than expected in wind tunnel testing	Reallocate resources - focus resources on drag reduction	Change assignment of labor in S1
S1, S2	schedule	P2	completion rates	productivity lower than expected	Add resources - hire additional labor	Hire new personnel
S2	schedule	P3	completion rates	more changes had to be made than anticipated	Adjust schedule	Change schedule target
S0	schedule	P3	completion rates	unexpected integration issues	Add resources - hire additional labor; purchase additional test equipment	Hire new personnel for S0; add test equipment resources
					Reallocate resources - focus on integration, get help from other areas	Change assignment of labor in S0
S2	quality	P2, P3	defect rates	software defect rate is too high	Reallocate resources - focus resources on design/code reviews	Change labor assignment

Research Activities

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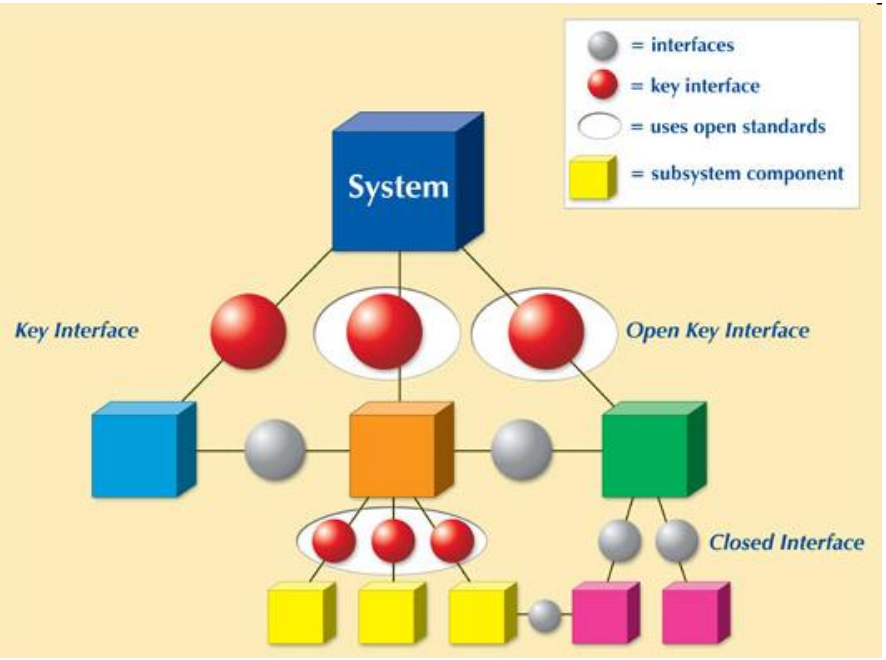
Emphasis on Open System Architecture



Principles:

1. Establish an Enabling Environment
2. Employ Modular Design Principles
3. Designate Key interfaces
4. Use Open Standards

Benefits:

- Reduced development time and overall life-cycle cost
- Ability to technology as it evolves
- Commonality and reuse of components
- Increased ability to leverage commercial investment

The Experience Accelerator's emphasis on Open System Architecture is coupled with strong preference for use Open Source Software products for implementation wherever appropriate

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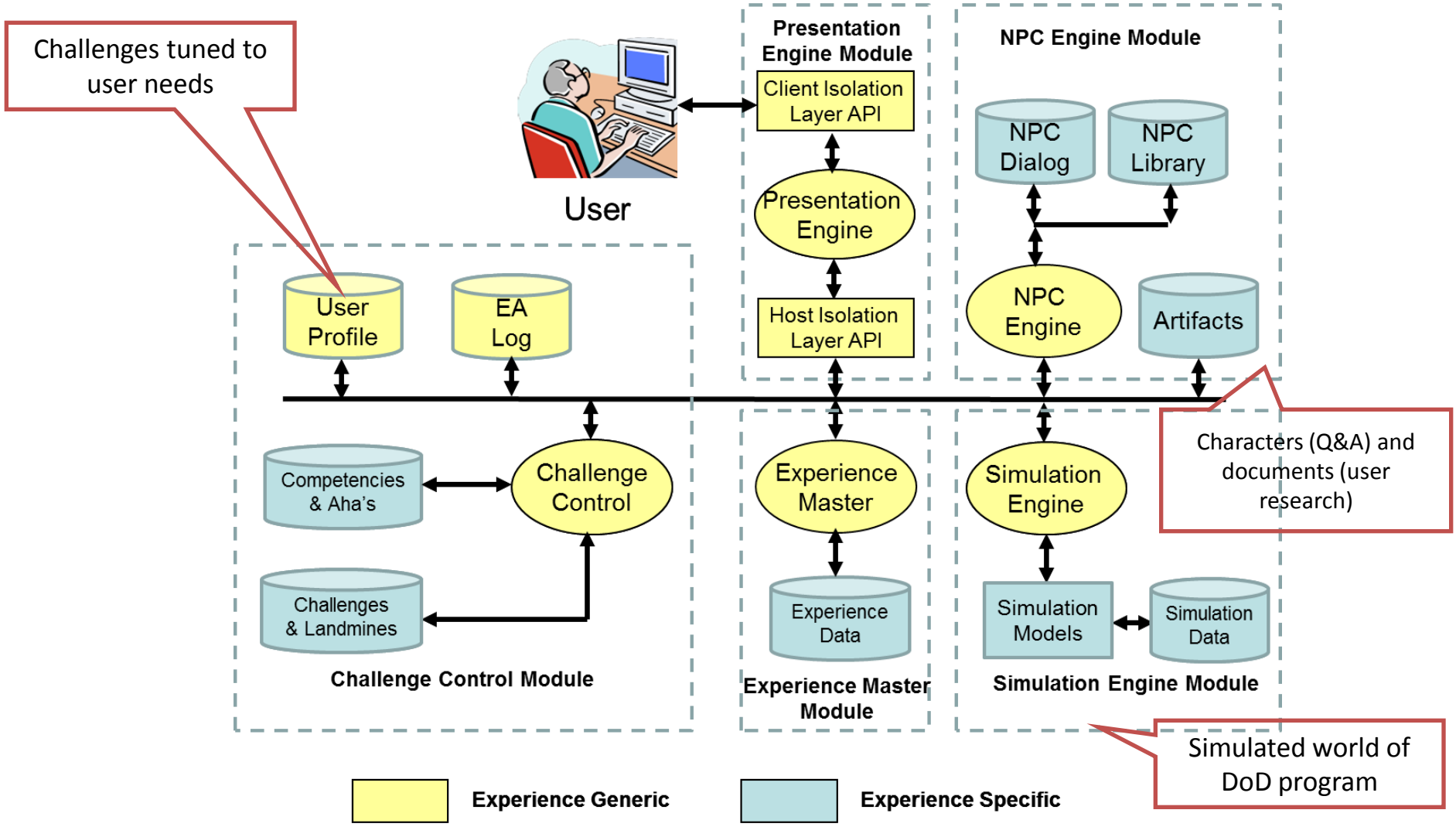
The Prototype

Experience Accelerator Block Diagram



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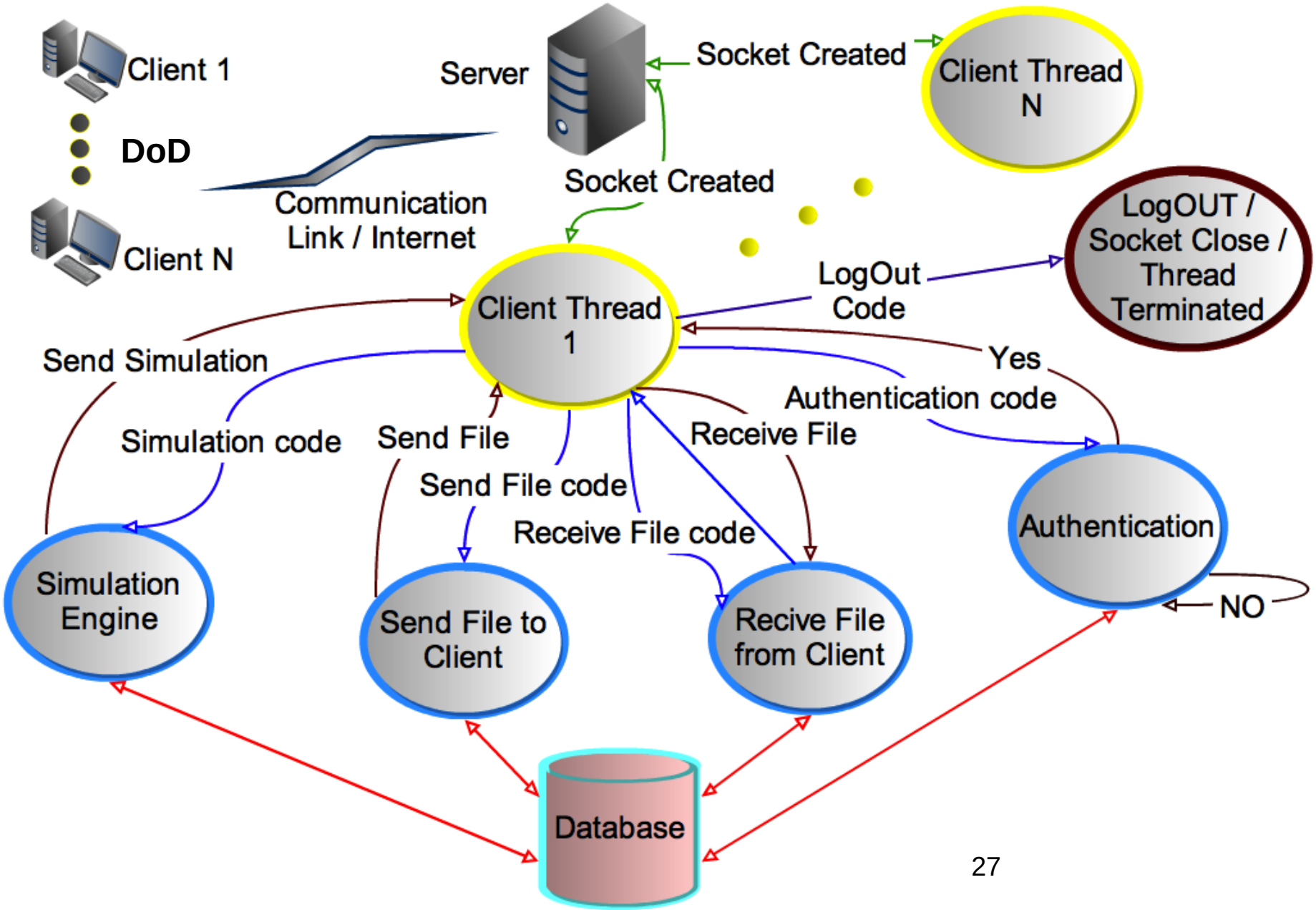
Multi-Threaded Java Server Architecture



Research Activities

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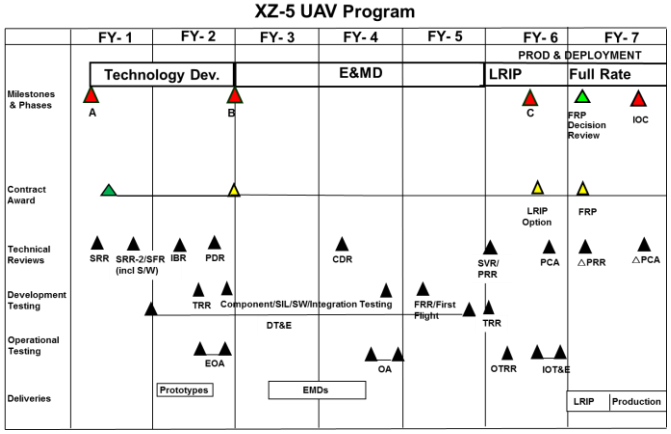
Prototype Feedback Loop

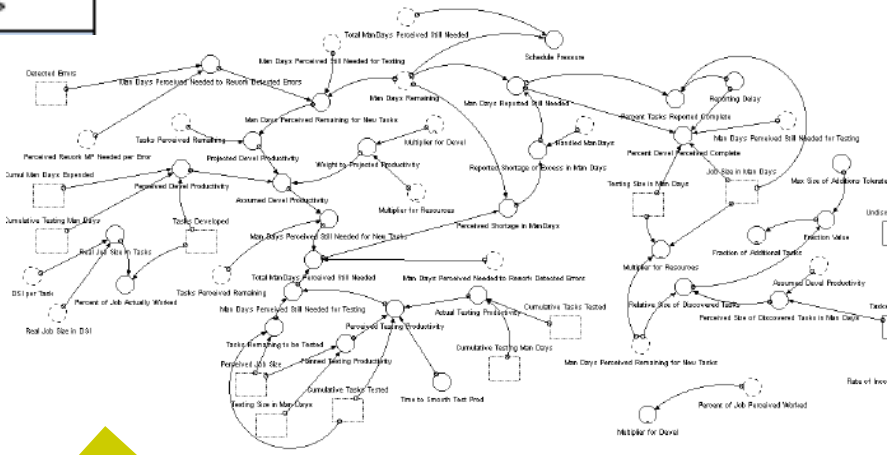
	Overall System
Schedule:	
Confidence Level to Achieve Program Schedule Goals	<H,M,L>
Actions to address issues:	
Nothing Required	◯
Add/Remove senior/junior staff (%)	Sr<xx>/Jr<xx>
Anticipate schedule extension by xx months	<xx>

Learner Recommendations



Project Impact

NPC Dialog



* From *Software Process Dynamics*, Ray Madachy

Systems Dynamics Simulations

Experience Accelerator - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Experience Accelerator

http://gameon-dev.education.purdue.edu/

Google

Experience Accelerator

Experience Accelerator

Welcome Jon Wade

Your Experience Awaits You!

Option Menu:

- UAV Experience
- Profile Update
- Logout

UAV Experience Status

New Employee Orientation----------	In progress
New Assignment Orientation----------	Incomplete
Pre-Integration System Development---	Incomplete
System Integration----------	Incomplete
System Field Test----------	Incomplete
Limited Production and Development--	Incomplete
Experience End----------	Incomplete
Reflection----------	Incomplete

- Abort

Evaluation Plan

Initial Prototype Evaluation

- SME and targeted instructor survey feedback
- Will drive prototype revisions

Final Prototype Evaluation

- Identify competency assessment tools
  - (1) Problem ID & recovery
  - (1) Systems Thinking
  - (2) System Integration

Evaluation Tool Development

- Develop operationalized definitions of competencies to be assessed
- Review research literature for relevant assessments to guide evaluation tool development.

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Prototype Evaluation

Value/Question	Preliminary, Formative	"Final", Summative
Learning Results/Outcomes		
Feedback in the EA helped me to gain insight into the simulated outcomes.	*	*
Novice systems engineers can learn valuable lessons from this experience.	*	
I took away one or more lessons learned from this experience.	*	*
Comment (group with 1st question): Provide examples of feedback you received that you found to be most helpful.	*	*
Comment (group with 2nd & 3rd): What were the most important lessons you learned from this experience? Identify up to three and list them in terms of importance.	*	*
I learned things through the Experience Accelerator that will help me establish goals for how I want to improve as a systems engineer	*	*
I learned things through the Experience Accelerator that will help a novice establish goals for how he/she wants to improve as a systems engineer	*	
I learned things through the Experience Accelerator that reinforced and or deepened my appreciation for my strengths.	*	*
I learned things through the Experience Accelerator that reinforced or deepened my recognition of my areas in need of improvement.	*	*

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Prototype Evaluation

Value/Question	Preliminary, Formative	"Final", Summative
Relevance and validity of experience to learning objectives		
The EA experience realistically represents a systems acquisition project.	*	*
The lessons learned were important for a systems engineer.	*	*
I experienced a realistic level of stress when faced with dilemmas/choices in the experience.	*	*
Comment (group with question 1): What elements of the EA experience do not realistically represent a systems acquisition project?	*	*
The simulated passage of time during the experience was realistic.	*	
The roles of the NPCs are a realistic representation of a typical systems acquisition project.	*	*
The dialogue with the NPCs is representative of a typical systems acquisition project.	*	*

Prototype Evaluation

Value/Question	Preliminary, Formative	"Final", Summative
Ability to collect metrics and evaluate success		
The Experience Accelerator allows the instructor to make a more accurate assessment of student competency as a systems engineer	**INST**	**INST**
Ability to engage and excite students		
I was intellectually engaged by the EA experience.	*	*
I was emotionally engaged by the EA experience.	*	*
The look and feel of the EA experience is pleasing.	*	

Prototype Evaluation

Value/Question	Preliminary, Formative	"Final", Summative
Difficulty/effort/learning curve to participate in an experience session.		
The simulated desktop environment was familiar and made it easier for me to understand how to interface with the EA.	*	
It is clear when I select an action that the EA has processed my selection.	*	
It is clear what options/actions are available to me.	*	
It is clear how to exit a screen.	*	
It is easy to avoid accidentally clicking on the wrong selection.	*	
The interface is easy to understand.	*	*
There was sufficient (real) time to make the necessary decisions.	*	*
General Questions		
Comment: How can the EA be improved?	*	*
Comment: What does the EA do best?	*	*
Comment: What other comments/suggestions do you have?	*	*

We could use your help….

Please complete a short survey following the presentation in order to provide feedback on the prototype.

Research Activities

- Identify critical SE competencies and maturation points
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- **Prepare for open source support**

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Release Train

- **V1 Oct: Improve first-year prototype**
  - Stabilize operation
  - Complete implementation of existing features
  - Improve interfaces to facilitate updates and modifications
  - Update for architectural conformance
- **V2 Jan: Refine first-year prototype based on evaluation feedback**
  - Desktop usability improvements
  - Improved artifacts and dialog
  - New dialog authoring tools and capabilities
- **V3 Spring: Add major new features**
  - EVM cost support
  - Non-technical conversations
  - Meeting support
  - Replay fatigue avoidance
  - Preparation for open source support

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Configuration Management

Software:

- Source control: Subversion
- Project Development, Management and Tracking: TRAC
- Hosting: Stevens' server

Content:

- Dialog files – Chat Mapper
- Integration: Dropbox, manual upload to Subversion
- Software upgrades: versioned release trains with major and minor releases

Documentation:

- Move to Wiki-site at version 2.0

(please configure the [header_logo] section in trac.ini)

{6} All Tickets By Milestone (Including closed)

(62 matches)

A more complex example to show how to make advanced reports.

milestone3

(1 match)

Ticket	Summary	Component	Status	Resolution	Version	Type	Priority	Owner	Modified
#10	Start clock time	Client	accepted		First Playable	defect	minor	vinnie.simonetti	08/28/11

First Playable

(2 matches)

Ticket	Summary	Component	Status	Resolution	Version	Type	Priority	Owner	Modified
#5	Weird folders showing up on right	UI	assigned		First Playable	defect	major	brent.cox	09/13/11
#4	Cannot Abort Experience	UI	closed	fixed	First Playable	defect	major	vinnie.simonetti	08/25/11

Code Alpha

(24 matches)

Ticket	Summary	Component	Status	Resolution	Version	Type	Priority	Owner	Modified
#44	XZ-5 Program background	Content	new			defect	major		09/21/11
#45	XZ-5 Status Charts	Content	new			defect	major		09/21/11
#46	Post-PDR status in P1?	Server	new			defect	major	Kamberov	09/21/11
#49	Status Chart resolution	Client	new			defect	major	Kamberov	09/21/11
#50	Recommendation form input not used for CDR date	Server	new			defect	major	Kamberov	09/21/11
#52	Advance to next event	Server	accepted			defect	major	vinnie.simonetti	09/23/11
#54	email received too late to read	Server	accepted			defect	major	vinnie.simonetti	09/23/11
#55	Folder names are garbled	Server	assigned			question	major	jon.wade	09/23/11
#57	Previous recomendation form brought up in Phase 2A Cycle 2	Client	assigned		First Playable	defect	major	brent.cox	09/23/11
#58	Email and voice mail archives disappear in Phase 2A Cycle 2	Server	assigned		First Playable	question	major	jon.wade	09/23/11
#59	VM notification received from Tandy in Phase 2A Cycle 2 but no VM	Server	assigned		First Playable	question	major	doug.bodner	09/23/11
#60	Date not updated on calendar	Server	new		First Playable	defect	major	Kamberov	09/21/11

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Documentation

- **Technical**
  - Concept of Operation
  - Architecture Document
  - Technology Design Document
  - System Specification
  - Deployment & Usage Guide
- **Content**
  - Experience Design Document
- **Tools**
  - Content Creation Tool & Process Guide
- **Evaluation**
  - Informal Evaluation of Experience Accelerator Prototype report
  - Plan for Formal Prototype Evaluation report
  - Experience Accelerator Evaluation report
- **Program**
  - Final Report

Future Work

Future Work: Capabilities

- Assess and improve first-year prototype to stabilize operation and produce desired learning
- Expand first-year prototype with additional capabilities
  - —Expand set of challenges and landmines
  - —Include cost objectives
  - —Enrich user profile and competencies addressed
  - —Enhance simulated world features and character interaction
  - —Add features to user desktop

Future Work: Productivity

- Improve content creation and development tools
  - —Dialog authoring
  - —Artifact creation
  - —Event descriptions and triggering
- Make Open Source Ready
  - —Documentation
  - —Source control and defect tracking
  - —Port to open development environment

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Future Work: Evaluate Efficacy

- User Feedback
  - —Develop more detailed feedback linked to competency model
  - —Create competency scores based upon simulation performance
  - —Create a Comprehensive Feedback Report that participants can save/download
- Outcomes assessment
  - —Establish outcomes assessment plan
  - —User reactions
  - —Behavior change / performance improvement measures
- Development Planning
  - —Provide Development goal setting and planning tools
  - —Create a database of development suggestions

Questions?

RT16 Experience Accelerator: Competencies and 'Aha' Moments

By
Alice Squires & the RT16 Team

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SE Competencies

SE Competency Models

In development for past few decades, but most were proprietary until the perceived need for SEs has caused industry, government and academia to collaborate and make many of these models public:

- ✓ NASA/Industry (APPEL, 2009)
- ✓ SPRDE PSE/SE (DAU, 2010)
- ✓ INCOSE (adopted INCOSE UK in 2010)
- ✓ MITRE (FFRDC) (went public, 2010)
- ✓ SE UARC Technical Leadership (2010)
- ✓ SE Experience Accelerator (2011)

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Competency Taxonomy Development

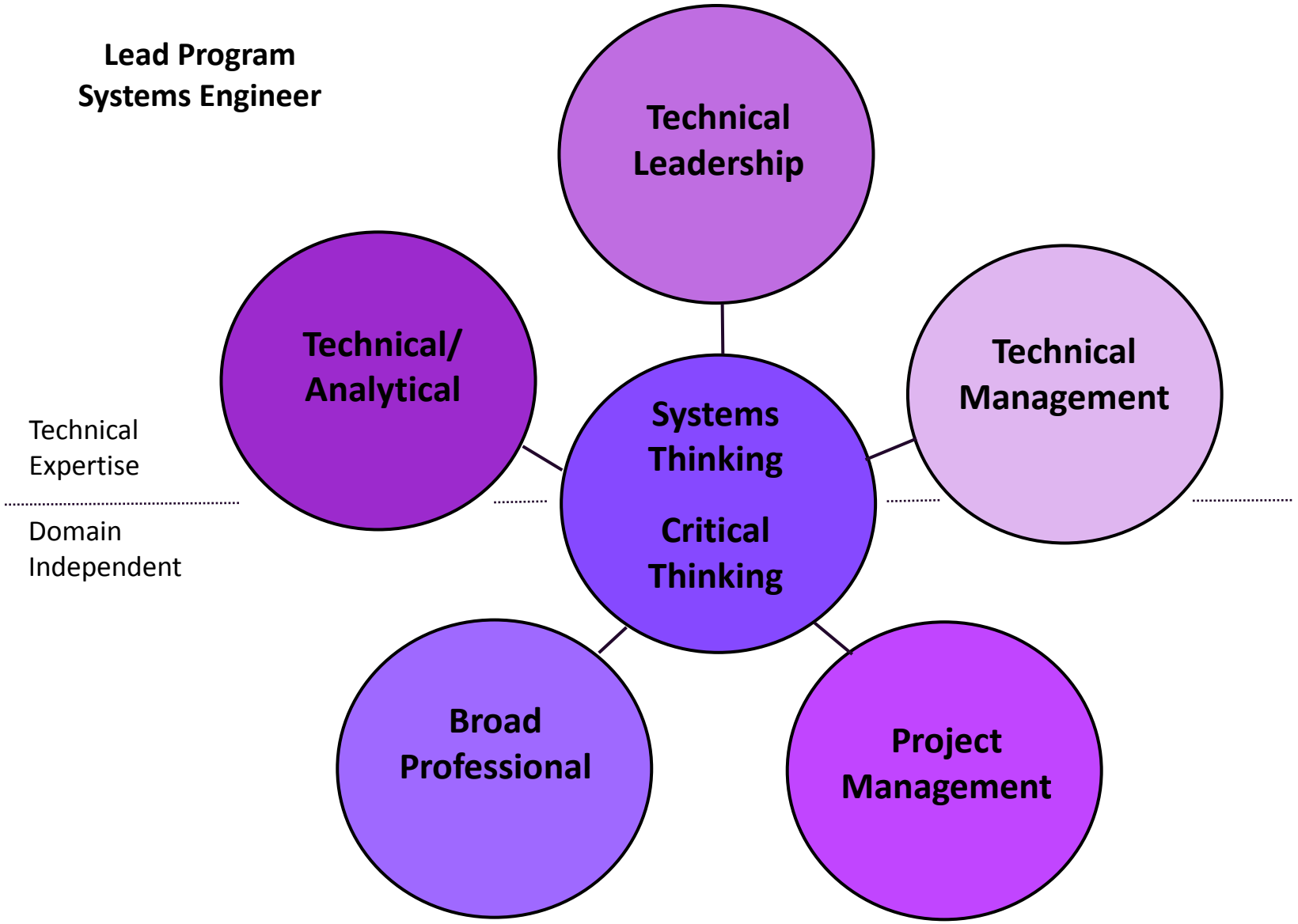
- Analysis / Integration of Multiple Competency Models
  - —SPRDE SE/PSE Competency Model
    - 3 Primary Categories: Analytical, Technical Management, Professional
    - 29 Competencies (45 Elements)
    - Proficiency Levels Defined by system complexity
  - —SE UARC Technical Leadership Competency Model
    - 12 Categories
    - 71 Competencies
  - —Systems Thinking (7 primary components), plus
    - Critical Thinking, comprised of:
      - —Strategic Thinking (from SPRDE SE/PSE model)
      - —Essential Thinking (ultimate goal)

Categorization Effort

- Competencies Sorted By:
  - —Maintaining Original Groupings and Classifications
  - —Reviewing Definitions Provided in models
    - 45 Elements defined in SPRDE SE/PSE Model
    - Each of 71 competencies defined in RT4 model
- Identified:
  - —6 Primary Areas
  - —20 Sub-categories
    - Body of Knowledge and Curriculum to Advance Systems Engineering (BKCASE) categories used
  - —87 Unique Competencies

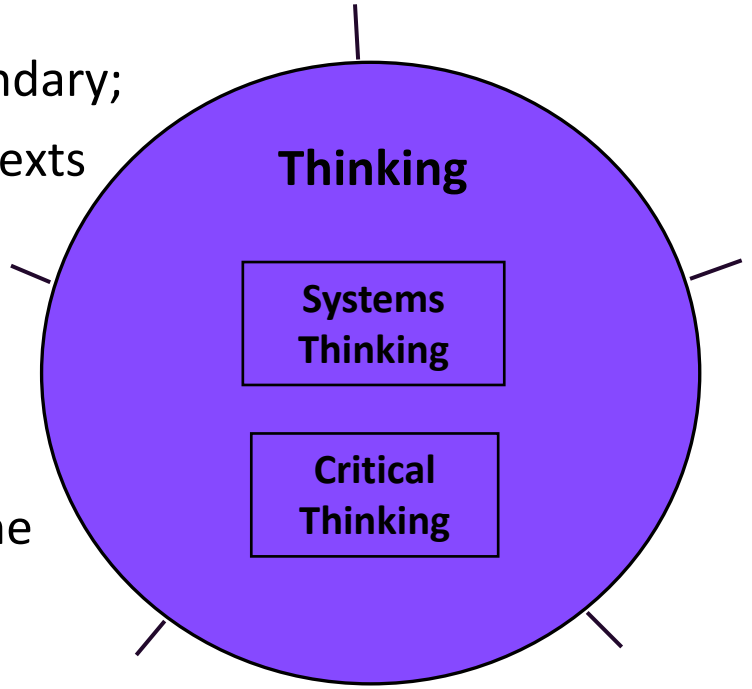
PSE Level III Competencies		
Category	**# Sub**	**# Comp**
Technical Leadership	3	9
Technical Management	5	29
Technical/Analytical	4	16
Broad/Professional	2	9
Project Management	4	22
Thinking	2	2
Grand Total	***20***	***87***

Taxonomy of SE Competencies



Hub

- Systems thinking is the ability to:
  1. Engage in abstract thinking;
  2. Incorporate multiple perspectives;
  3. Define/Develop within "fuzzy" scope/boundary;
  4. Understand [diversity of] operational contexts of the system;
  5. Identify inter- and intra- relationships and dependencies;
  6. Understand complex system behavior;
  7. Reliably predict the impact of change to the system over time.



- Critical thinking includes:
  1. Strategic Thinking (SPRDE-SE/PSE)
  2. Essential Thinking

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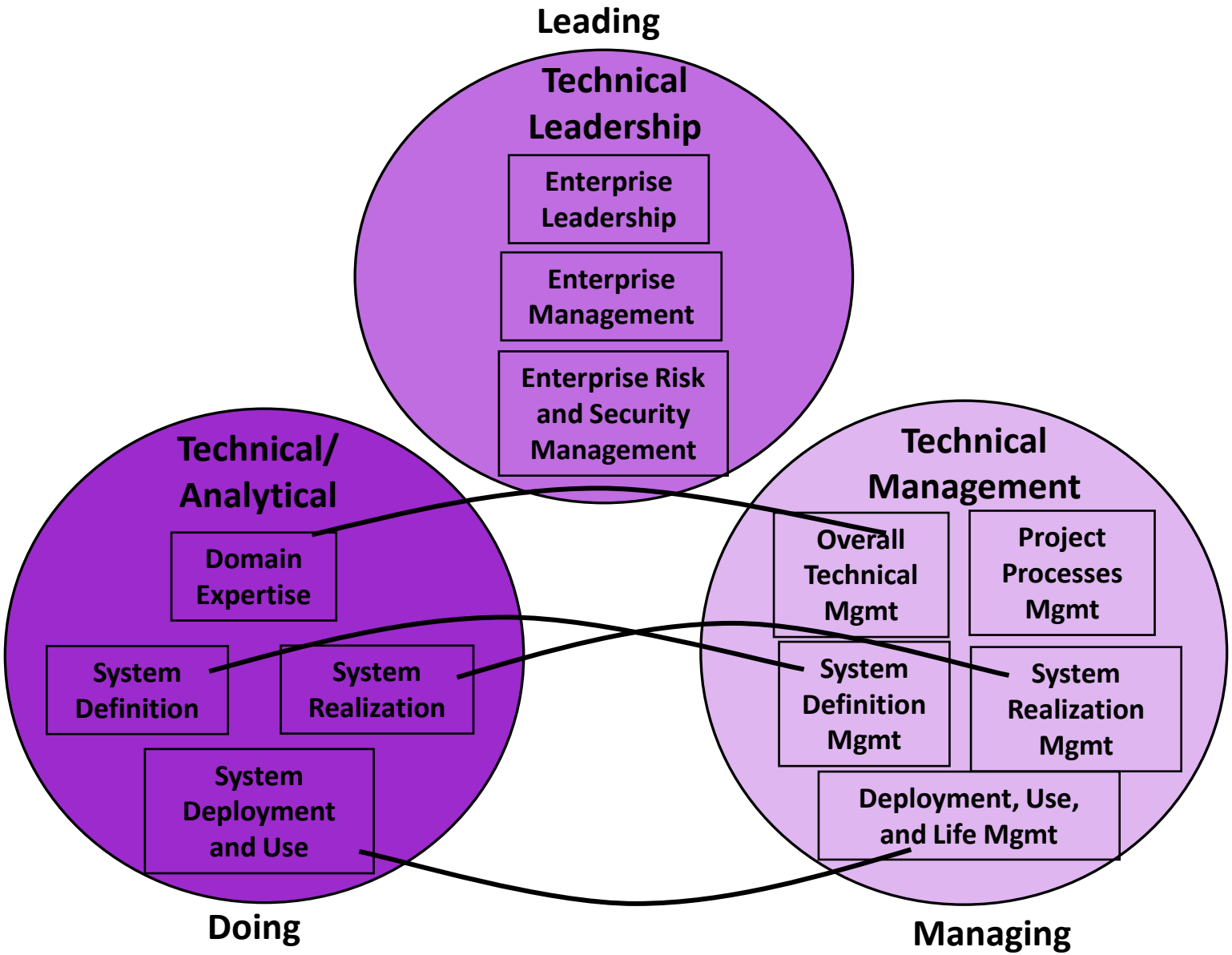
Technical Expertise



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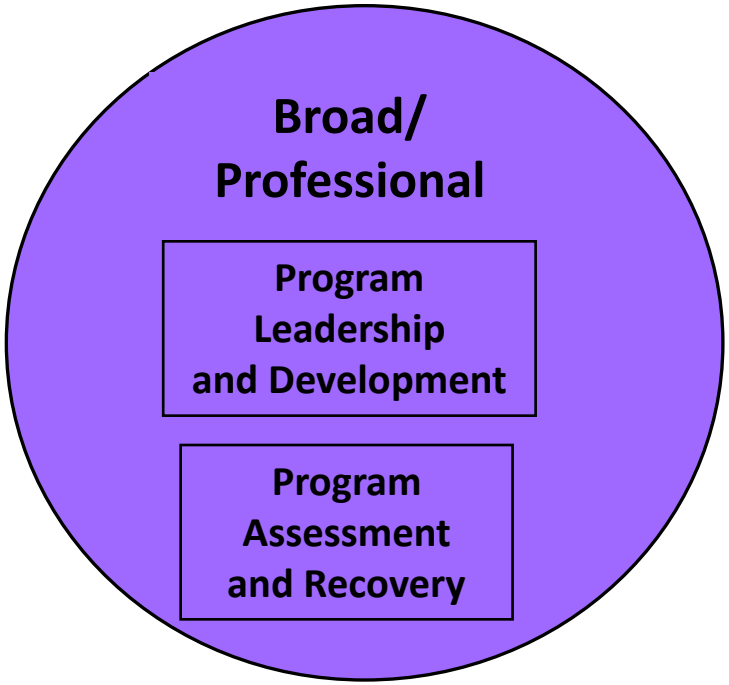
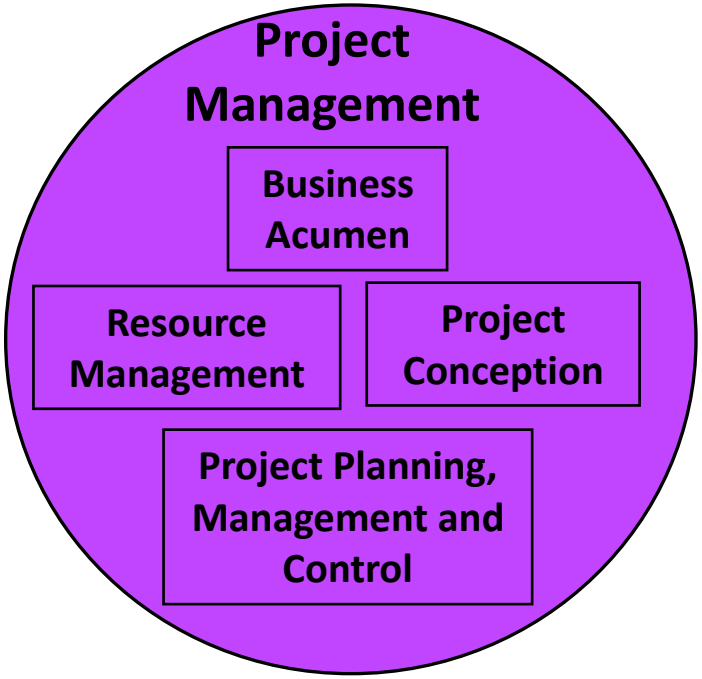
Related BKCASE Groupings

- System Definition
  - Stakeholder Requirements
  - System Requirements
  - Architectural Design
  - Systems Analysis
- System Realization
  - Implementation
  - System Integration
  - System Verification
  - System Validation
- System Deployment and Use
  - System Transfer for Use or Deployment
  - Operation of the System
- System Life Management
  - System Maintenance or Logistic Support
  - System Update/Upgrade
  - System Disposal or Retirement

Domain Independent



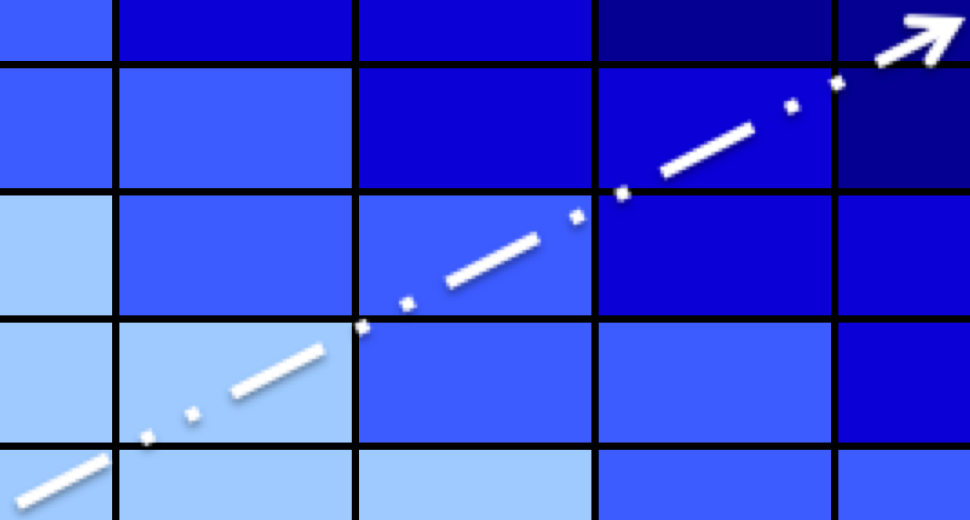


Proficiency Levels

- SPRDE-SE/PSE
  - 6 levels based on increasing complexity of system
  - No exposure, awareness, basic, intermediate, advanced, expert
- NASA/Industry
  - 4 levels based on capability
  - Participate on team, apply with some guidance, manage or lead, guide through policy
- INCOSE (UK)
  - 4 levels based on team role/responsibility
  - Awareness, supervised practicioner, practicioner, expert
- Bloom's Taxonomy
  - Six levels of demonstrated knowledge/skill
  - Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation
  - Updated Version: Remember, Understand, Apply, Analyze, Evaluate, Create

Recommended Approach*

	Proficiency Level				
Situation Complexity	None or Aware only	Apply with guidance	Apply	Manage or Lead	Advance state of art
Exceptionally complex					
Considerably Complex					
Complex					
Somewhat complex					
Simple					



*The user can progress - over time - to increasingly more complex situations (by level) in the simulation and from beginning to advanced stages of capability and understanding in each situational context (level).

‘Aha’ Moments

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'Aha' Moment Examples

- 'Aha' moments were collected through interviews conducted at INCOSE IS, NDIA SE and IEEE Systems conferences. Examples:
  - An SE was on board a plane and on this particular day of the landing, it was unusually foggy. The SE realized that his own life was on the line because the plane's navigational system had only been tested in the context of a clear day. This was a huge "aha" moment for him.
  - Another SE learned the hard way that the "best" technical solution doesn't always win. Legacy, economics and politics are extremely important. We can probably cite many examples of this.
  - Having the right mentors is key for an SE's development. Mentors provide great insights on problem solving and how to "manipulate" the system to get what you need to be successful.
  - Humans are a part of the system. When modeling the human element it's easy to model desired human behavior rather than accurate human behavior; however, the former will not provide the necessary model to support the development of a successful system.

Common Mistakes or Anti-Patterns

- Information Gathering/Sharing (examples):
  - —Looking at the data you have rather than the data you need
  - —Believing a single source of information
- Processes (examples):
  - —Cutting corners to make milestones rather than making the end date
  - —Not integrating specialists early in the process
- Decision Making (examples):
  - —Over reacting to near term issues
  - —Staking one's ego on a particular solution
- Conceptual Issues (examples):
  - —Mistaking a model for reality
  - —Underestimating your own abilities [although it helps] when others believe in you.

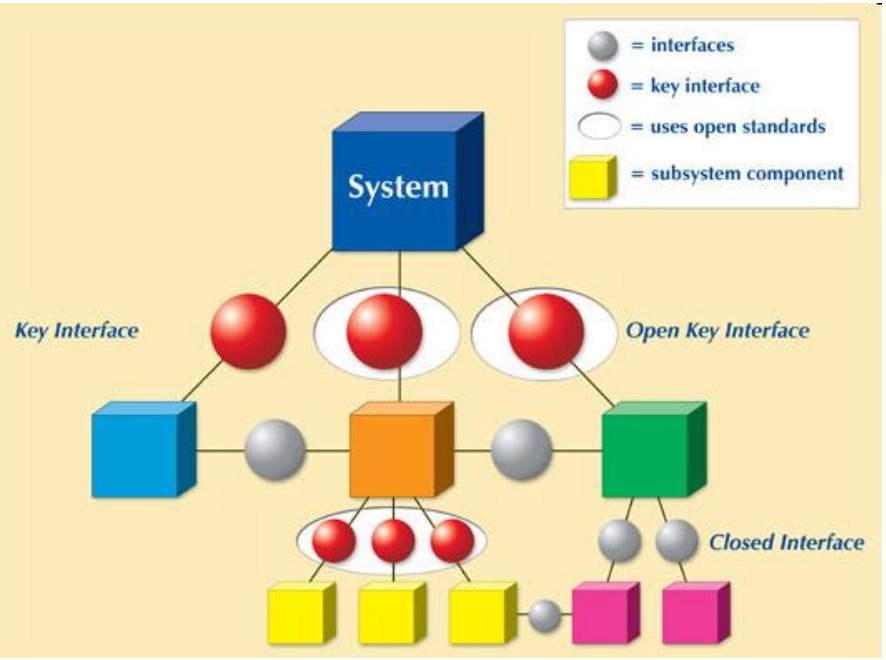
Questions?

RT16 Experience Accelerator: Architecture

By
Doug Bodner & the RT16 Team

NDIA Systems Engineering Conference Tutorial
October 24, 2011
San Diego, CA, USA
www.sercuarc.org

Open Systems Architecture



Principles:

1. Establish an Enabling Environment
2. Employ Modular Design Principles
3. Designate Key interfaces
4. Use Open Standards

Benefits:

- Reduced development time and overall life-cycle cost
- Ability to technology as it evolves
- Commonality and reuse of components
- Increased ability to leverage commercial investment

The Experience Accelerator's emphasis on Open System Architecture is coupled with strong preference for use Open Source Software products for implementation wherever appropriate

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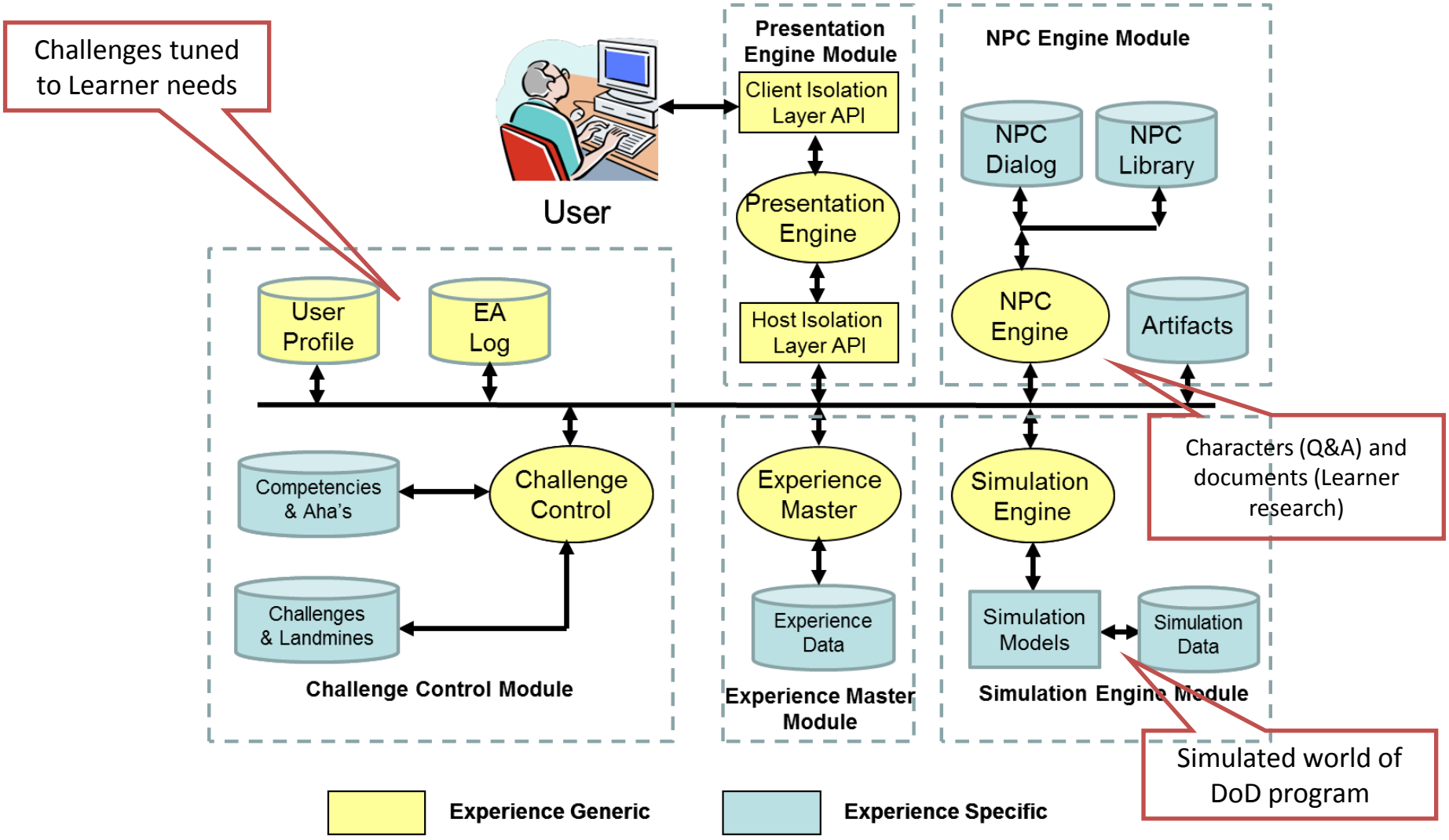
Prototype Architecture

Experience Accelerator Block Diagram

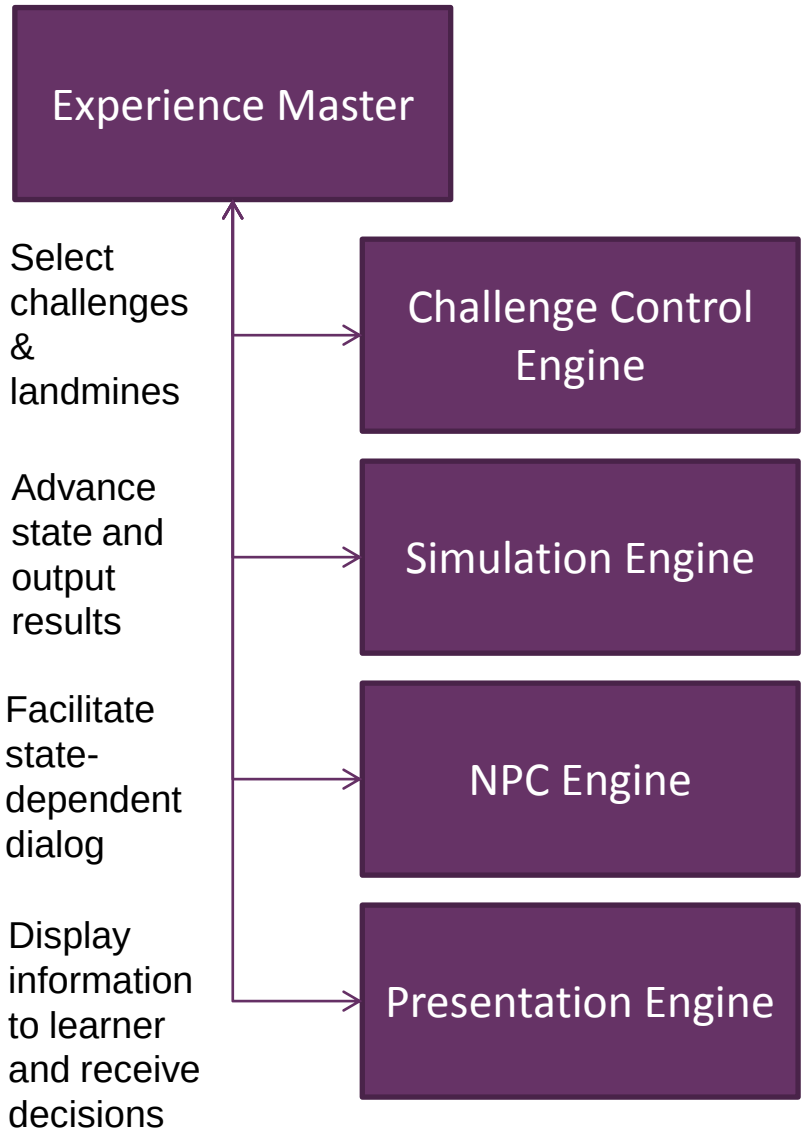


Modules

- **Experience Master**: contains the overall Experience state and provides control and sequencing for the other major EA modules.
- **Challenge Control**: contains the Learner profiles and Experience history logs and leverages these in conjunction with the competency taxonomy and 'Aha' moments to determine the appropriate challenges and landmines for each Learner.
- **Simulation Engine**: determines the future state of the system and outputs to be presented to the Learner.
- **Non-Player Characters (NPC) Engine**: represents other non-player characters in the simulation and creates and assembles the content for Learner interactions, and
- **Presentation Engine**: accepts inputs from the Learner and provides the presentation of the Experience interface to the Learner.

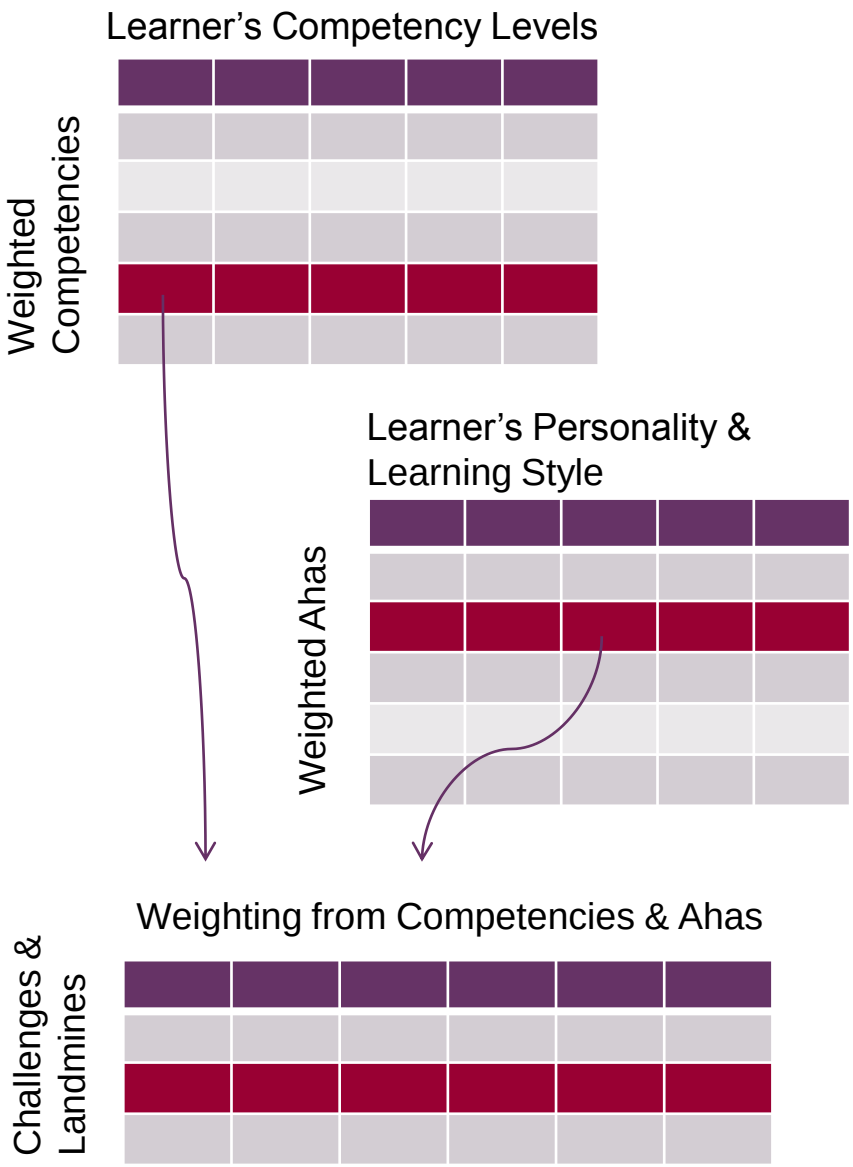
Experience Master

- Module Execution: Invokes and executes EA module in the proper sequence.
- Phase Sequencing: Uses a finite state machine to guide experience through program phases.
- State Variable Control: Calculates and updates state variables, provides them to other modules.
- Learner Input Variable Control: Stores Learner's input variables and provides them to other EA modules.
- History Logging: Logs history for playback and analysis.



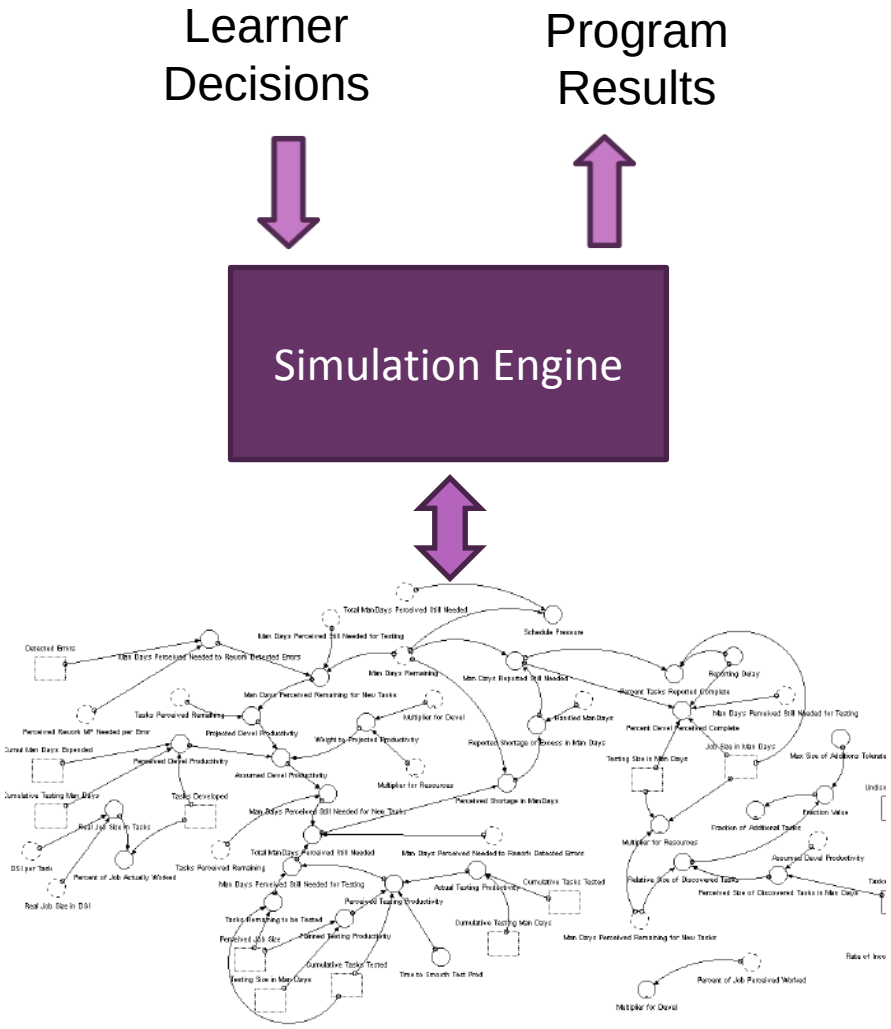
Challenge Control Engine

- Databases: Maintains databases for Learner profiles, competencies and aha principles, and challenges and landmines.
- Experience customization:
  - Selects competencies and aha principles based on Learner profile in support of particular learning goals
  - This in turn results in selection of linked challenges and landmines.



Simulation Engine

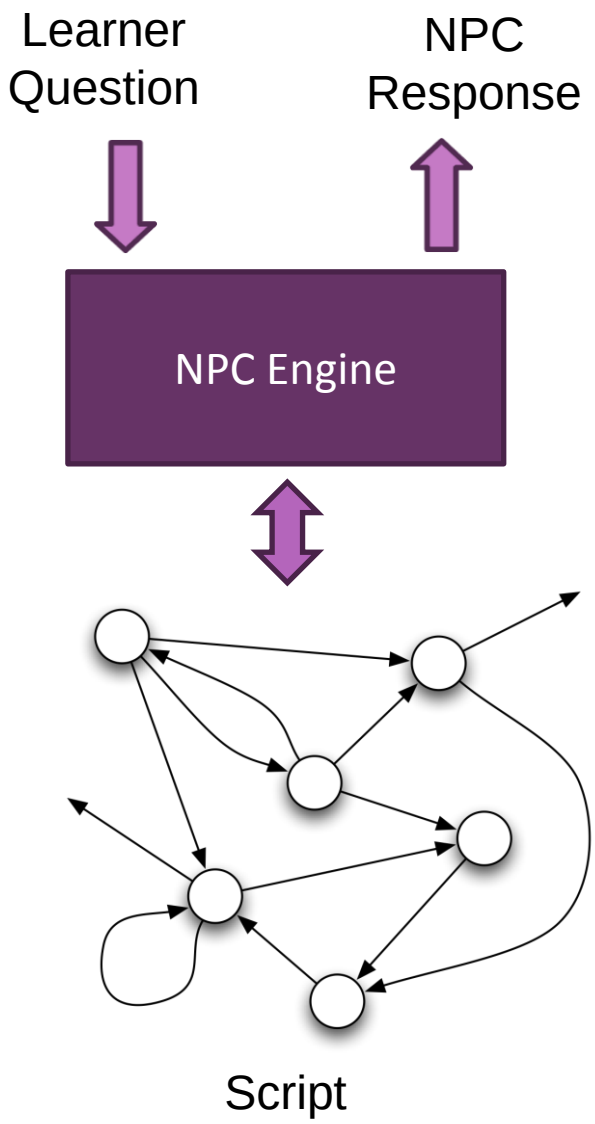
- Simulator advances program state by *n* months after learner makes decisions
- Utilizes system dynamics
  - —Continuous flow representation
- Provides performance results to learner in terms of charts
  - —KPPs/TPM
  - —Quality
  - —Progress on meeting entrance criteria for reviews (e.g., CDR)
  - —Cost (under development)



Simulation Model

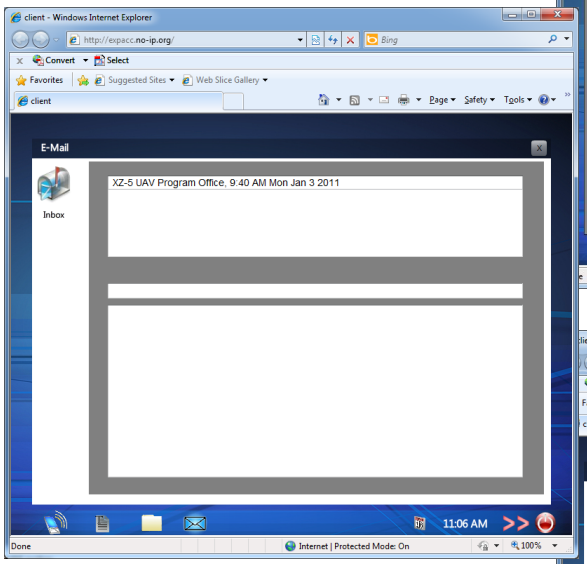
NPC Engine

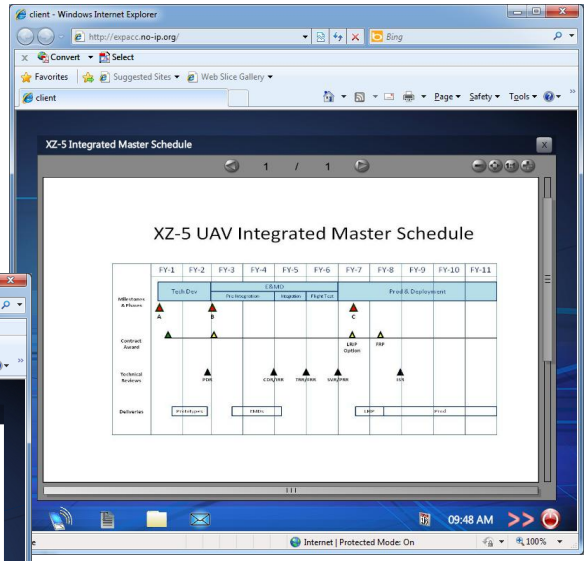
- Provides learner with opportunities to get information by asking "right questions"
- Hub and spoke dialog representation
- Engine guides conversation:
  - —Learner selects next question from a set of available
  - —Engine provides program state-dependent NPC response
  - —Learner selects next question
  - —Questions are grouped hierarchically by topic (e.g., sub-system or performance metric)

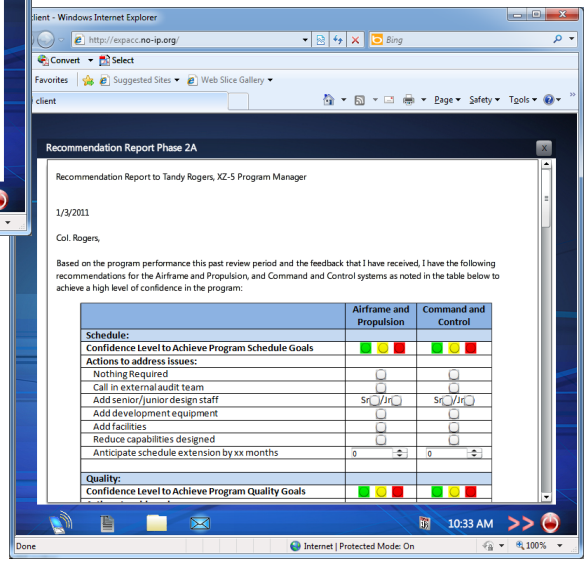


Presentation Engine

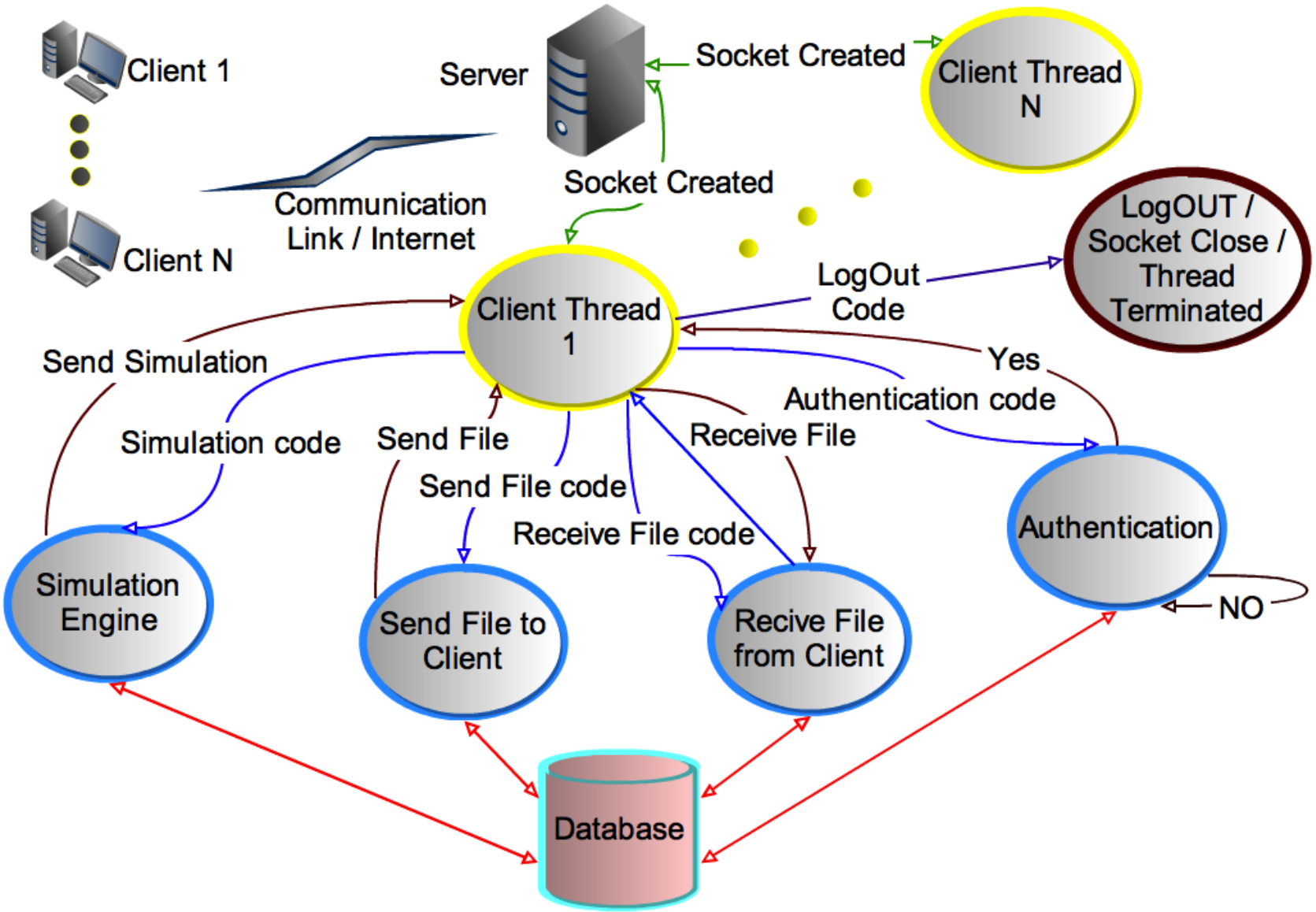
- User interface
- Virtual desktop
- Interaction functions
  - Call
  - Text
  - File Manager (reports, documents, charts, etc.)
  - E-mail
  - Appointment calendar
  - Clock







Multi-Threaded Java Server Architecture



Questions?

RT16 Experience Accelerator: Experience Design

By
Alice Squires & the RT16 Team

NDIA Annual Systems Engineering Conference
October 24, 2011
Hyatt Regency Mission Bay
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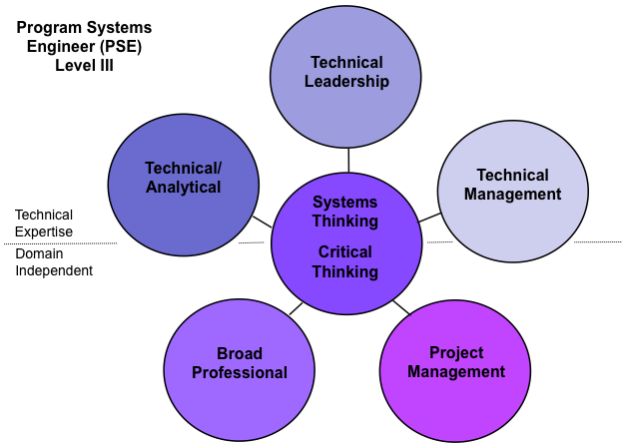
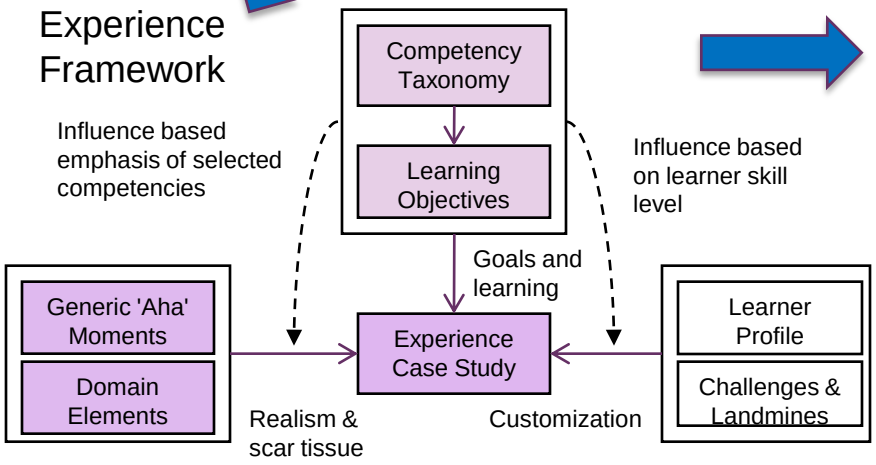
Building an Experience

Framework and Applications

Competency Framework



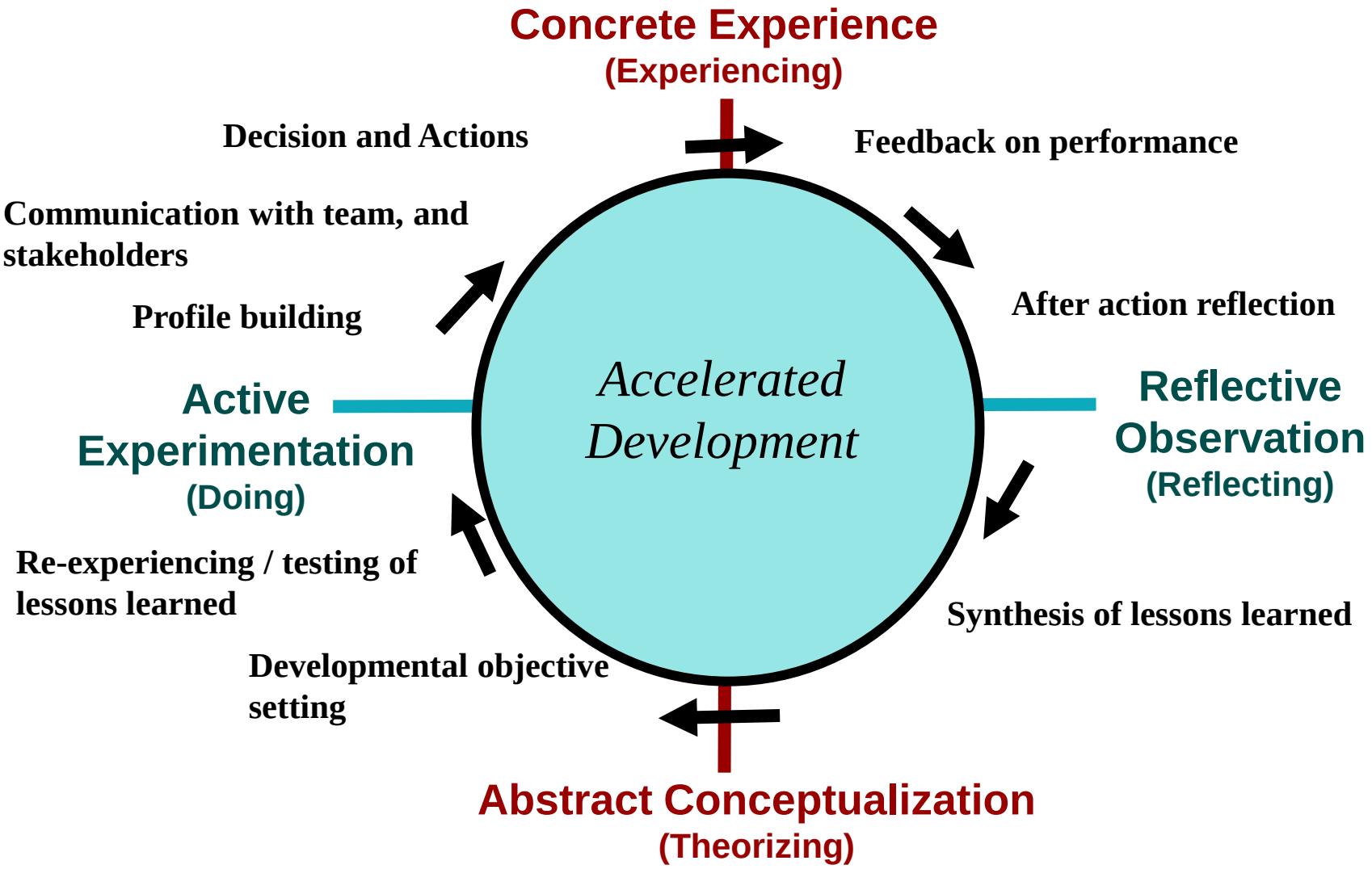
Experience Framework



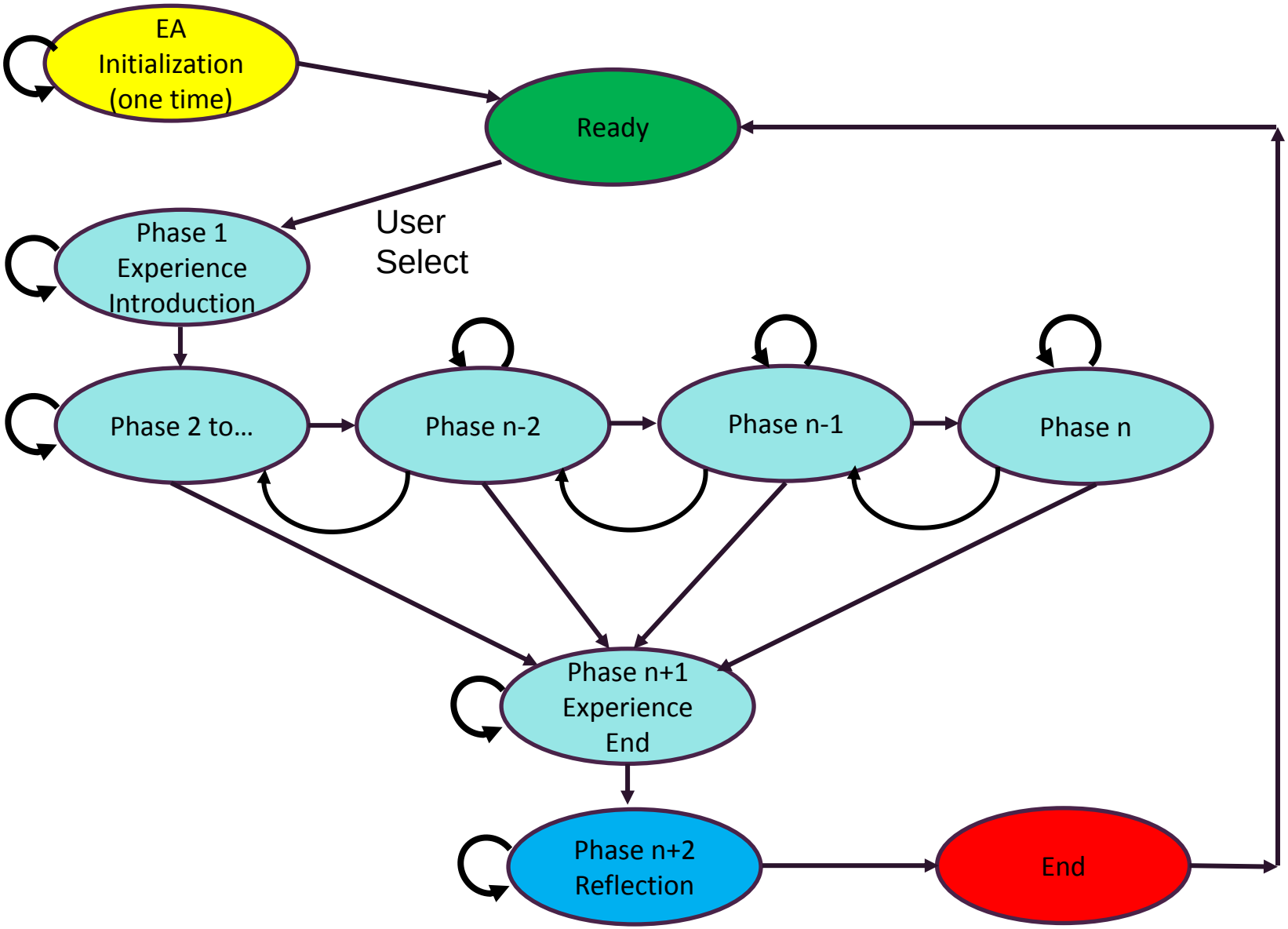
- Accelerated skills
  - DoD lead systems engineers
  - Contractor systems engineers
  - IT systems engineers
  - Sustainment engineers
  - Transportation engineers

	Proficiency Level				
Situation Complexity	None or Aware only	Apply with guidance	Apply	Manage or Lead	Advance state of art
Exceptionally complex					
Considerably Complex					
Complex					
Somewhat complex					
Simple					

Learning Process

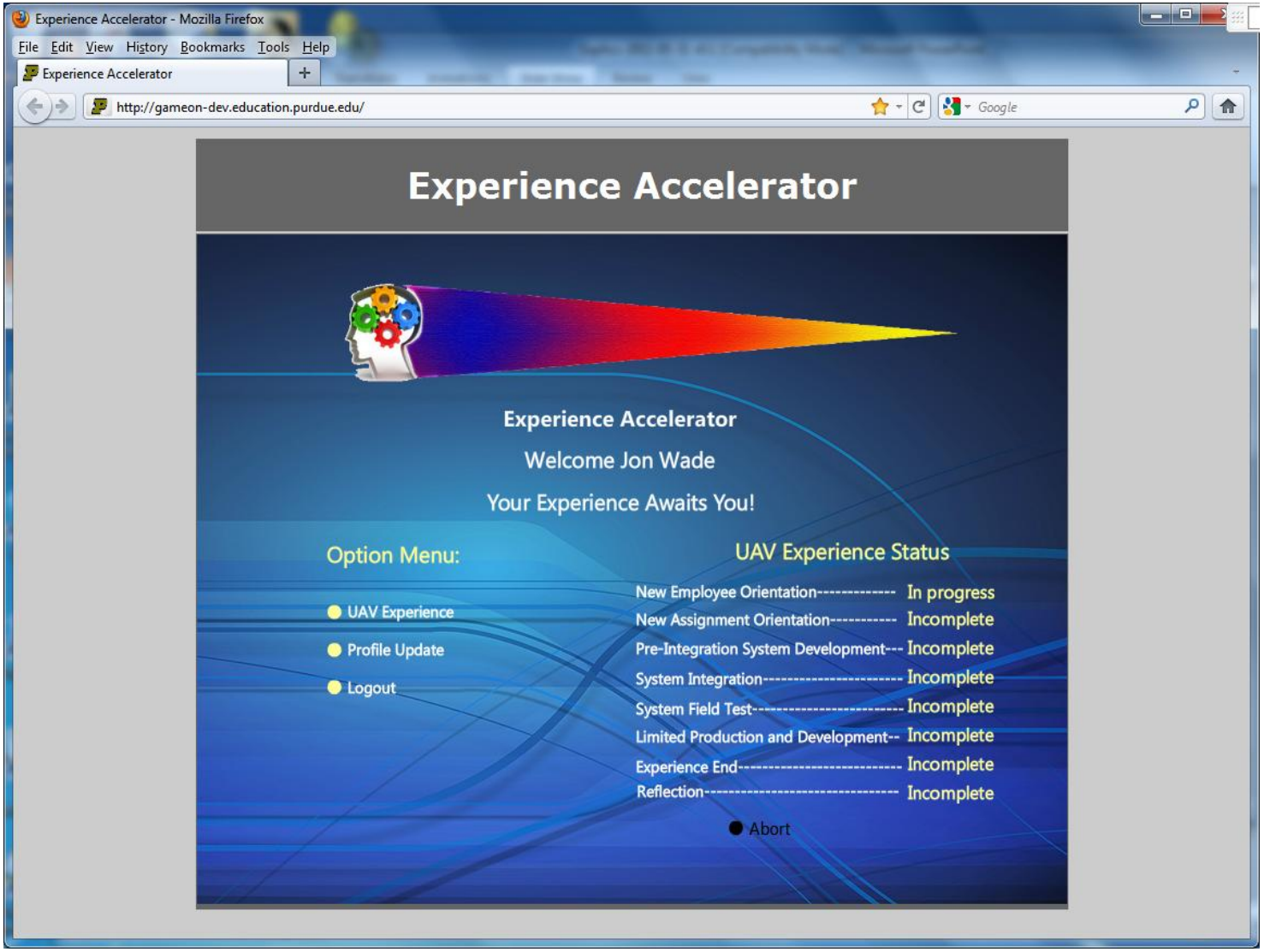


Experience Phases



UAV Experience

Welcome Screen



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Problem Solving and Recovery Approach

Use the following definitions for the rating scale:
– Not at all Confident: I have very little competence or experience.
– Somewhat Confident: I have some competence but this is an important area for me to develop.
– Confident: My competence in this area is sufficient.
– Very Confident: This is a strength for me.

Please respond to the following statements with the rating that best reflects your current confidence level in each.

	Not at all Confident	Somewhat Confident	Confident	Very Confident
1. Ensuring that people openly share knowledge and information	☐	☐	☐	☐
2. Creating a climate that enables others to feel safe raising questions or concerns	☐	☐	☐	☐
3. Proactively seeking out new information and perspectives, rather than waiting for others to raise problems or concerns	☐	☐	☐	☐
4. Remaining open to information that does not confirm your own views and assumptions (e.g. goes against the status quo or prevailing wisdom)	☐	☐	☐	☐
5. Testing your own and other's assumptions	☐	☐	☐	☐
6. Approaching problems from a systems perspective –one that recognizes independencies and relationships	☐	☐	☐	☐
7. Recognizing potentially overlooked consequences of decisions and courses of action	☐	☐	☐	☐
8. Avoiding premature closure–ensuring that problem causes and recovery options are sufficiently explored before settling on courses of action	☐	☐	☐	☐
9. Using technical proficiency to identify and solve problems	☐	☐	☐	☐
10. Changing direction based upon new knowledge and information	☐	☐	☐	☐
11. Following through to ensure that changes are implemented properly	☐	☐	☐	☐

Done

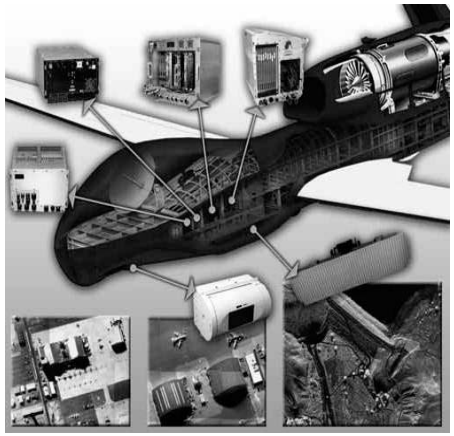
Modes of Learner Communication

- Artifacts (passive):
  - written documents
  - email
  - phone call and voicemail
  - video/audio recordings
- NPC (interactive)
  - text-message exchanges
  - conference calls
  - Web meetings
  - Physical meetings - 1/1 or in a group

The Experience: A Day in the Life of a PSE

UAV System:

- S0 – System
- S1 – Airframe and Propulsion
- S2 – Command and Control
- S3 – Ground Support



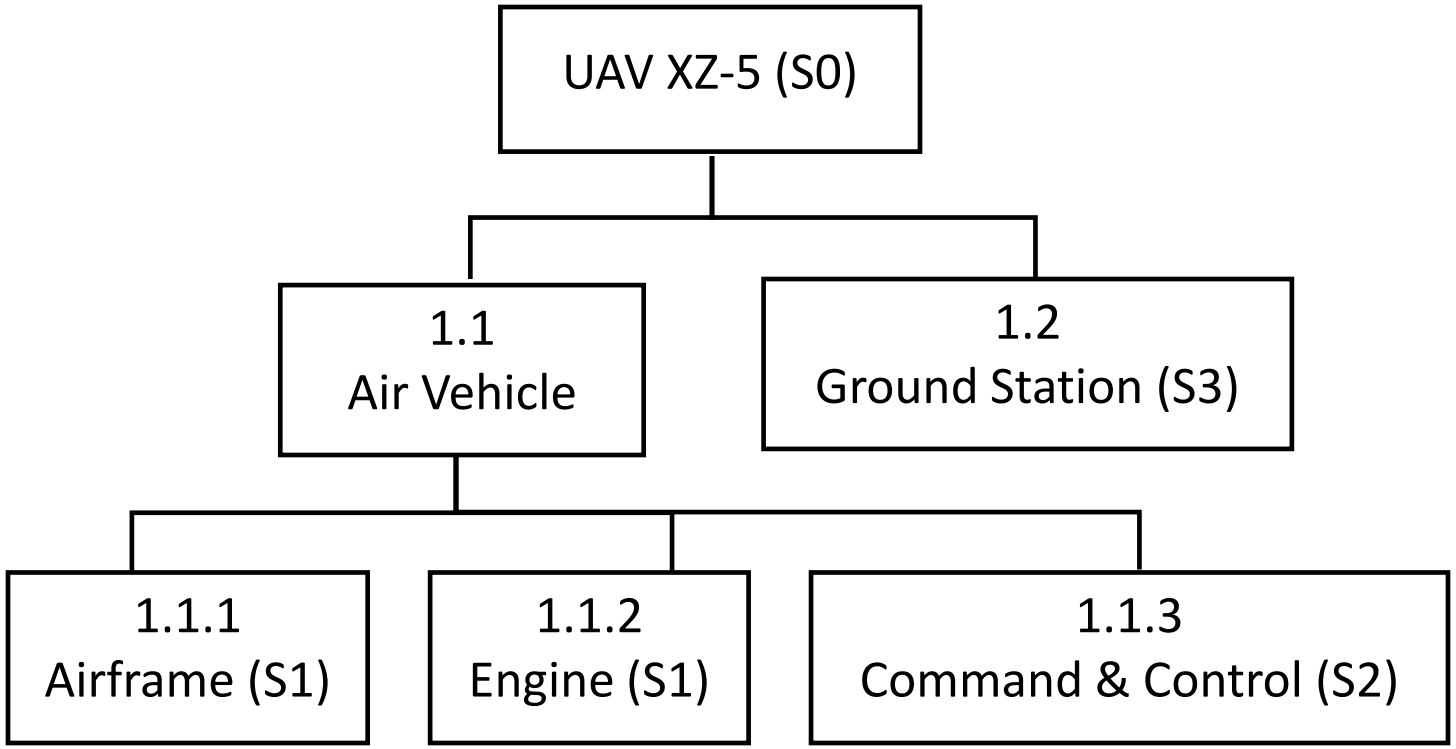
UAV KPMs:

- Schedule
- Quality
- Range
- Cost

Phases:

- EA Introduction
  - Phase 0: New Employee Orientation
- Experience Introduction
  - Phase 1: New Assignment Orientation
- Experience Body
  - Phase 2: Pre-integration system development -> CDR
  - Phase 3: Integration -> FRR
  - Phase 4: System Field Test -> PRR
  - Phase 5: Limited Production and Deployment
  - Phase 6: Experience End
- Experience Conclusion
  - Phase 6: Reflection
- Each session = 1 day

WBSID Structure



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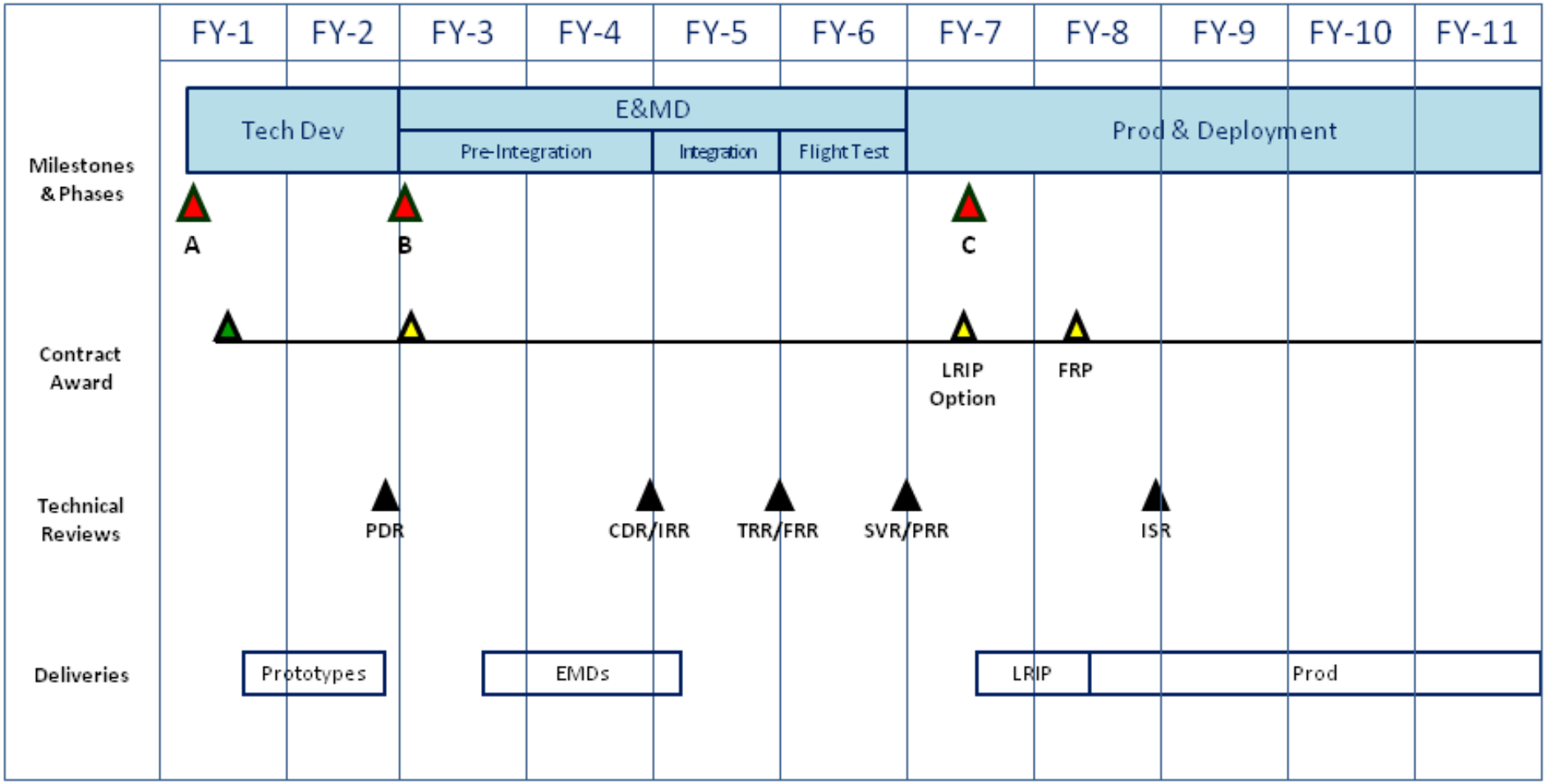
UAV XZ-5 Integrated Master Schedule



Experience Accelerator - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Experience Accelerator

http://gameon-dev.education.purdue.edu/

Experience Accelerator

Call

Tom Williams, PSE Prime

Tom Williams: *Okay.*

You: How is the quality looking to you?

Tom Williams: *It's not too bad. Of course we have a few rookie mistakes, but the quality is rapidly improving. It is about what I expect at this stage of the program.*

You: What types of problems are you seeing?

Tom Williams: *Most of the issues that I have seen have been related to poor file management. The young guys can sometimes be a bit careless with uploading their latest designs and this can cause problem downstream. I haven't seen too many analysis or real design errors.*

- Schedule
- Quality
- Capability
- Go to another system or exit...

Disconnect

10:33 AM

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Recommendation Form Example (Partial)

	Airframe and Propulsion	Command and Control	Ground Station, Launch/Retrieval	Overall System
Schedule:				
Confidence Level to Achieve Program Schedule Goals	<H,M,L>	<H,M,L>	<H,M,L>	<H,M,L>
Actions to address issues:				
Nothing Required	◯	◯	◯	◯
Add/Remove senior/junior staff (%)	Sr<xx>/Jr<xx>	Sr<xx>/Jr<xx>	Sr<xx>/Jr<xx>	Sr<xx>/Jr<xx>
Anticipate schedule extension by xx months	-	-	-	<xx>
Quality:				
Confidence Level to Achieve Program Quality Goals	<H,M,L>	<H,M,L>	<H,M,L>	<H,M,L>
Actions to address issues:				
Nothing Required	◯	◯	◯	◯
Add Design & Test Plan Reviews	◯	◯	-	◯
Add/Remove senior/junior test staff (%)	Sr<xx>/Jr<xx>	Sr<xx>/Jr<xx>	-	Sr<xx>/Jr<xx>
Add/Remove test systems (%)	-	-	-	◯
Review and improve human/system interface	-	-	◯	-
Review and revise training process and procedures	-	-	◯	-
Capabilities:				
Confidence Level to Achieve Program Capability Goals	<H,M,L>	<H,M,L>	-	<H,M,L>
Actions to address issues:				
Nothing Required	◯	◯	-	◯
Increase/Decrease weight allocation (lbs)	<xx>	<xx>	-	-
Increase/Decrease power allocation (kw)	<xx>	<xx>	-	-
Increase/Decrease volume allocation (ft^3))	<xx>	<xx>	-	-
Increase propulsion efficiency (%)	<xx>	-	-	-
Decrease aerodynamic drag (%)	<xx>	-	-	-

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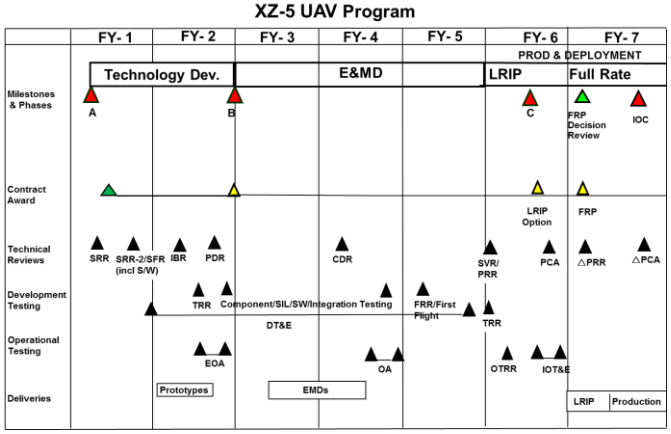
Prototype Feedback Loop

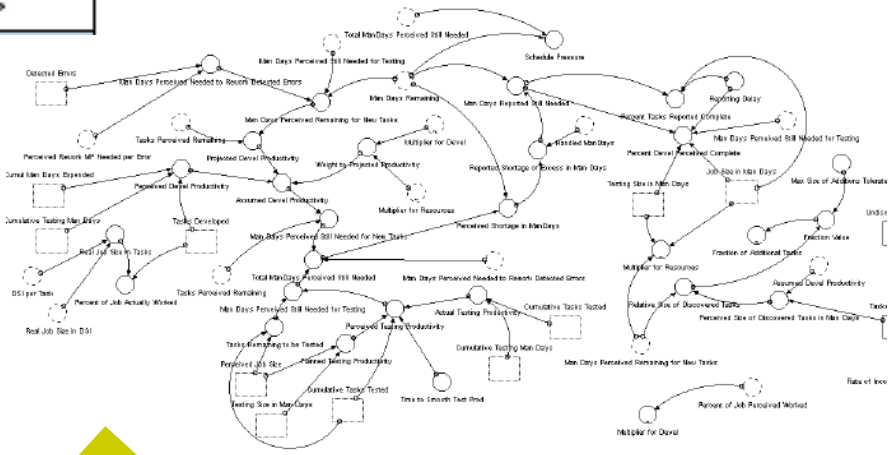
	Overall System
Schedule:	
Confidence Level to Achieve Program Schedule Goals	<H,M,L>
Actions to address issues:	
Nothing Required	◯
Add/Remove senior/junior staff (%)	Sr<xx>/Jr<xx>
Anticipate schedule extension by xx months	<xx>

Learner Recommendations



Project Impact

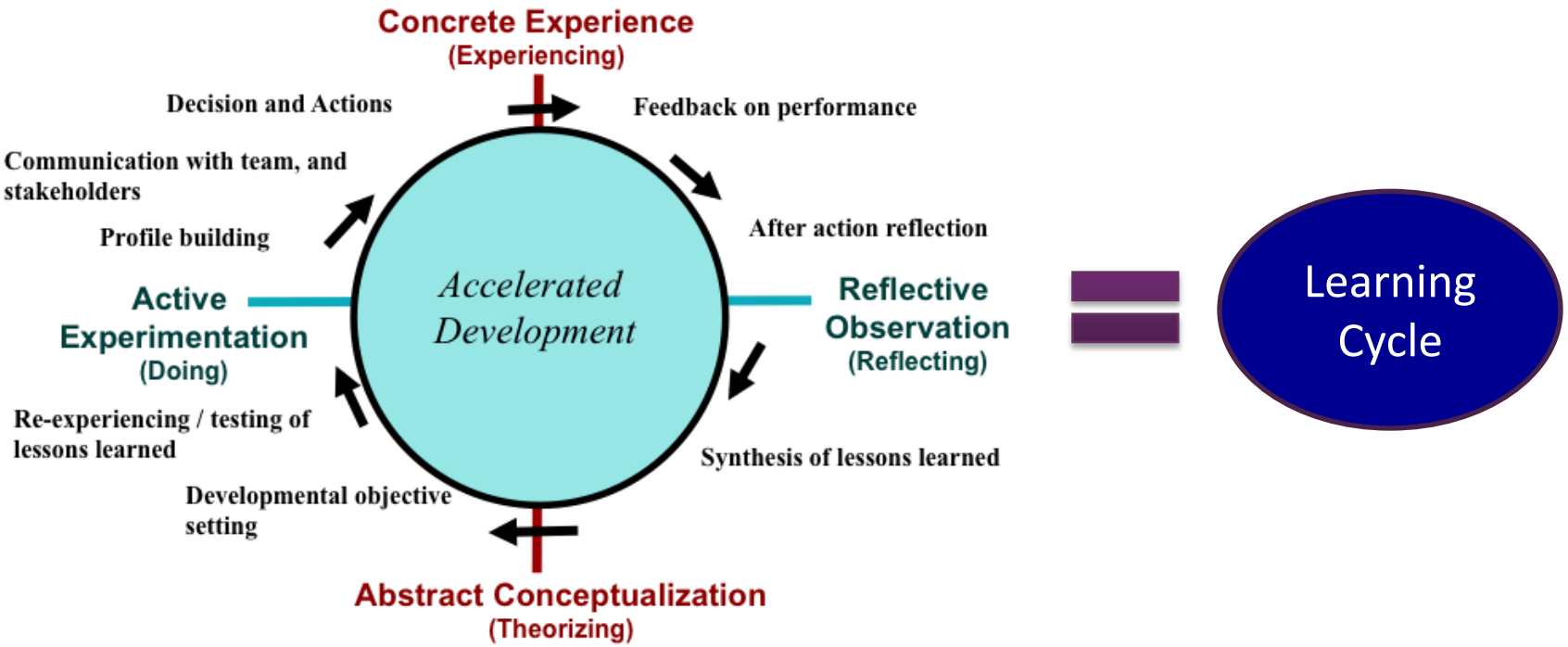
NPC Dialog



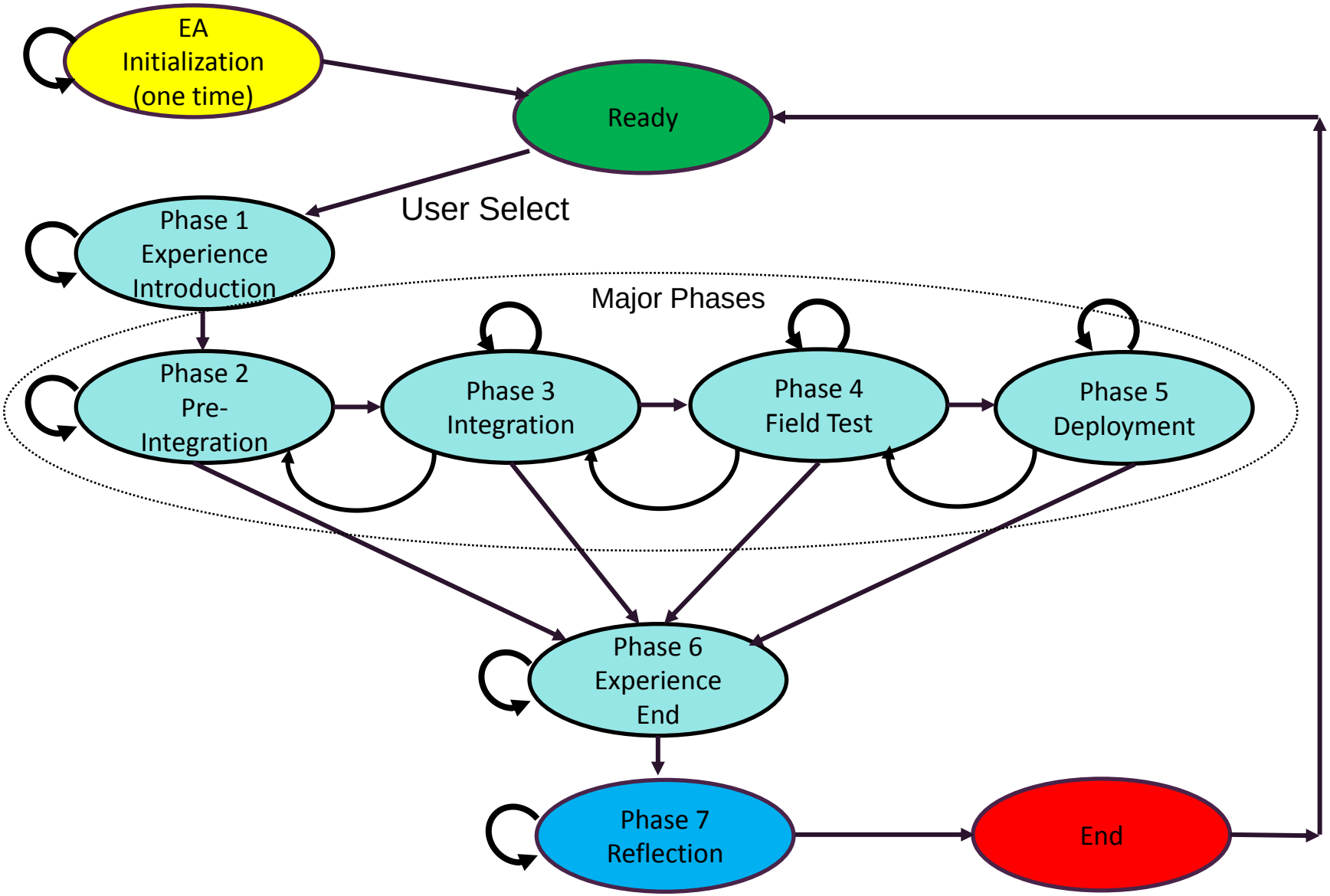
* From *Software Process Dynamics*, Ray Madachy

Systems Dynamics Simulations

Learning Process

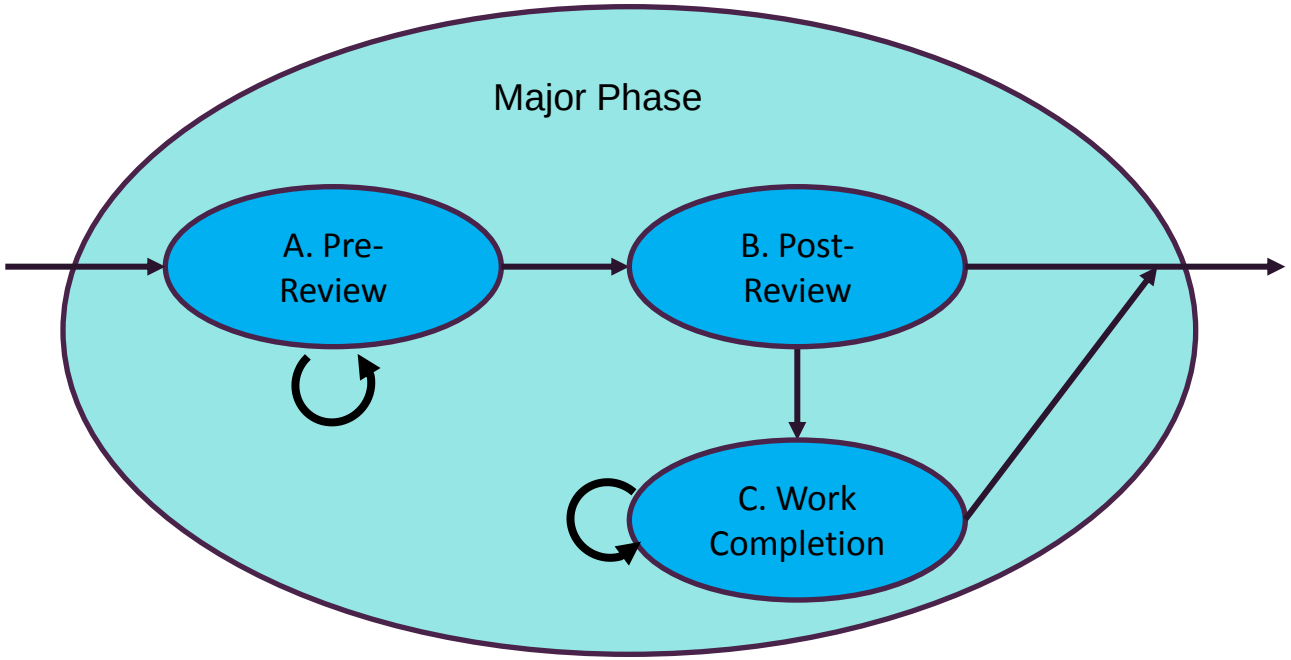


Prototype Experience Phases



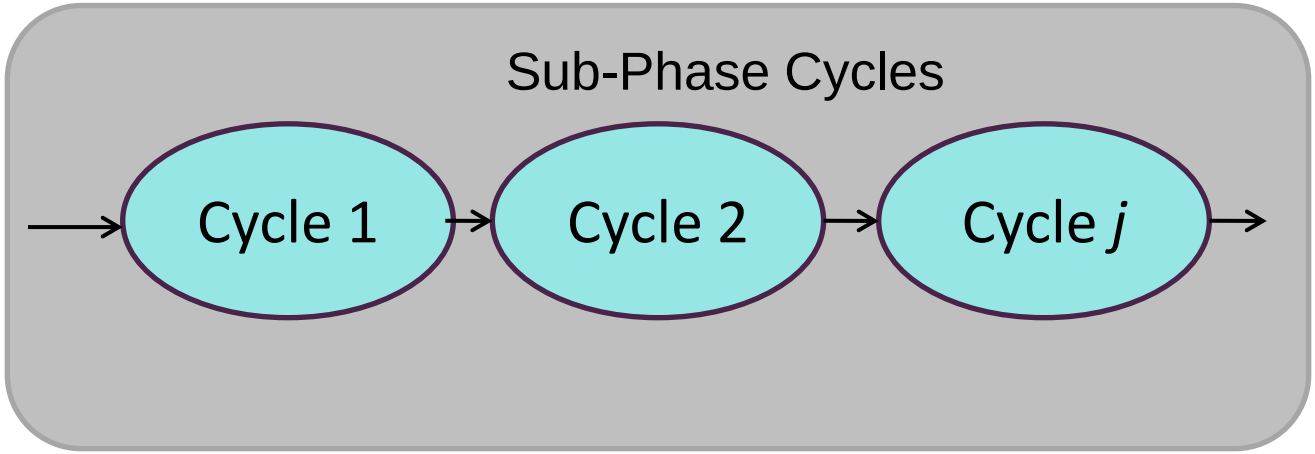
Each Major Review Phase

- Phase 2
- Phase 3
- Phase 4
- Phase 5



Sub-Phase Cycles

- Sub-Phase A: Pre-Review
- Sub-Phase C: Work Completion



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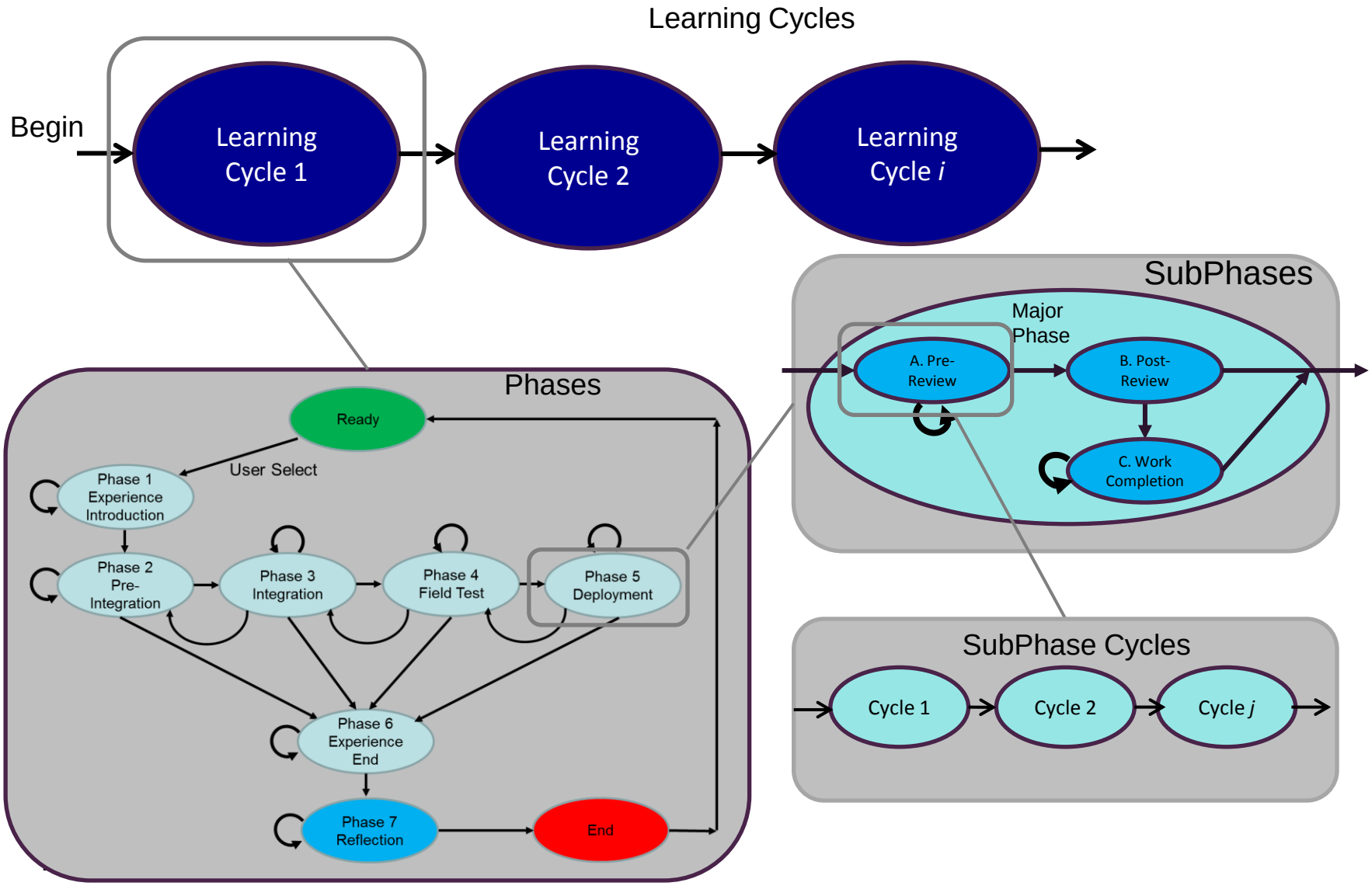
GUI Tool – Phase and Event Creator



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Join the Experience Accelerator Team!

Contact for information:

Doug Bodner
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Alice Squires
alice.squires@stevens.edu

Jon Wade, PI
jon.wade@stevens.edu


the coffee break

RT16 Experience Accelerator: Design Tools & Dialog Creation

By
Jon Wade & the RT16 Team

NDIA Annual Systems Engineering Conference
October 24, 2011
Hyatt Regency Mission Bay
San Diego, CA
www.sercuarc.org

SYSTEMS ENGINEERING Research Center

Tool/Template Opportunity Areas

- **Objectives & Experience Concept Development**
  - Learner Profile creation
  - Competencies and Aha's identification
  - Experience story boarding and conceptualization
  - Experience Phases & Time specification
- **Context**
  - Project specification
  - Project state and thresholds
  - Roles, motivations personality factors and character types
  - Review types and result options
- **Experience Events and Flow**
  - Challenges, Landmines and Levels specification -> **Events specification**
  - Challenge Control -> simulation parameter setting, event triggering
  - Evidence of Challenges and Landmines
  - Mitigating Actions & Effects
  - Relationships between Competencies/Aha's, Challenges/Landmines, Mitigating Actions & Effects
- **Reflection**
  - Feedback format
  - Scoring
- **Artifacts**
  - Background information
  - **Project reviews and status reports**
  - **Learner recommendation forms**
  - Email
  - **Dialog**
  - Mentoring
  - Evaluation feedback
- **Simulation**
  - Models construction
  - Parameter setting
- **Overall**
  - **Process and tools documentation**
  - **Artifact entry**

Features – Enhance Productivity

Dialog authoring:

- V2:
  - (1) GUI for dialog entry
  - (1) Dialog file management
  - (1) Conditionals for dialog branching
  - (1) NPC multivariable state (like/dislike, etc.)
- V3: (2) Timeout to exit dialog (?)

Graphic artifact creation:

- V2-3 (2) Templates for selected files

Event descriptions and triggering:

- V3 (2) Syntax for event specification (with automatic translation if practical)

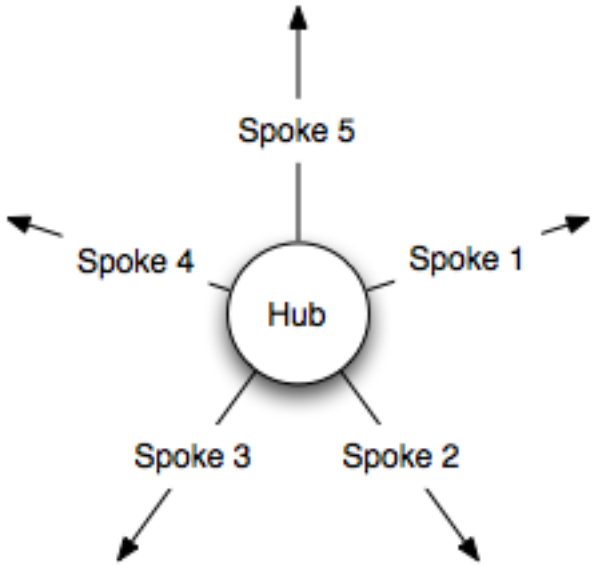
Prepare for Open Source availability

- V3 (2) Documentation of content design process

Non-Player Character (NPC) Engine

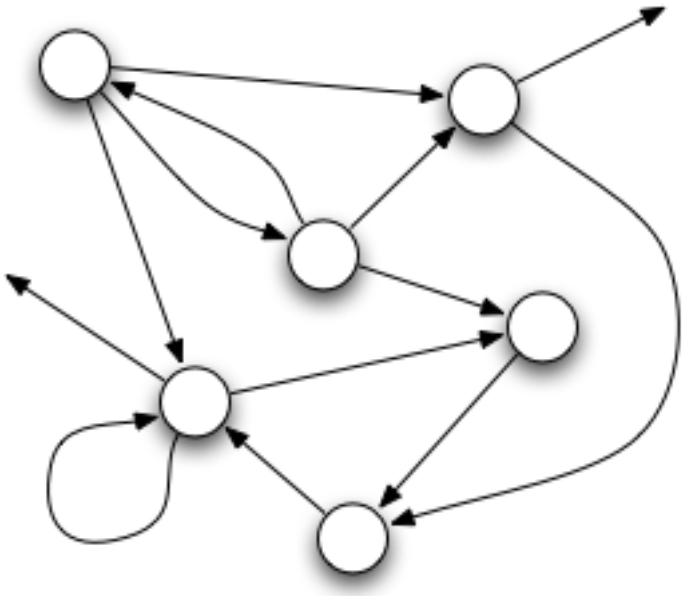
- Each NPC is an object with independent state and behavior
- NPC behavior is largely composed of Player/NPC dialogue, plus reaction to game state
  - Represents dialogue as finite-state machine (game developers call “hub-and-spoke”)
  - Reacts to game state by “registering interest” in state variables through publish & subscribe
- NPC Engine is a generalized graph-walker, holds state machines as dynamic data structures

Hub-and-Spoke Dialogue



- *Hub* is a conversation state
  - Point within a larger dialogue context
  - Associated with chunk of dialogue spoken by NPC
- *Spokes* are conversational alternatives
  - Options that move the dialogue into a new state
  - Selected by Player during conversation
  - Associated with chunk of dialogue spoken by Player
- *Conversation* is a path through hubs along spokes

How a Conversation Unfolds



- As each dialogue hub is entered…
  - NPC “speaks” an element of dialogue
  - Engine presents dialogue alternatives to Player
  - Player chooses among alternatives, “speaks” associated dialogue
  - Engine enters new dialogue hub, and cycle repeats

Emails are Conversations, Too!

- Dialogue model extensible to other communication modes, such as email
- Open “dialogue channel” to NPC through email
  - NPC Engine enumerates dialogue alternatives for current state of target NPC
  - Instead of “speaking” dialogue, Player assembles alternatives into outgoing email
  - NPC responds by assembling reply from path through dialogue graph, dictated by alternatives Player has chosen

NPC Dialogue Content Creation

- Dialogue content and NPC behavior separated from software implementing NPC Engine
- NPC dialogue created as simple text file
  - File organized into dialogue hub sections
  - Each hub holds set of next alternatives (spokes), that also specify next hub for dialogue
- NPC Engine reads text file at game initialization, encodes as data structures
- Approach enables tailoring dialogue without changes to underlying software

Dialog Tool Requirements

Allows a writer to create, test and manage non-linear dialog:

- User-friendly GUI
- Easy to construct visualized branching graphs
- Easy to define control conditions
- Conversation simulation to test results
- Custom exporters including XML (for EA Dialog Engine)
- Free or low-cost

Experience Accelerator - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Experience Accelerator

http://gameon-dev.education.purdue.edu/

Experience Accelerator

Call

Tom Williams, PSE Prime

Tom Williams: *Okay.*

You: How is the quality looking to you?

Tom Williams: *It's not too bad. Of course we have a few rookie mistakes, but the quality is rapidly improving. It is about what I expect at this stage of the program.*

You: What types of problems are you seeing?

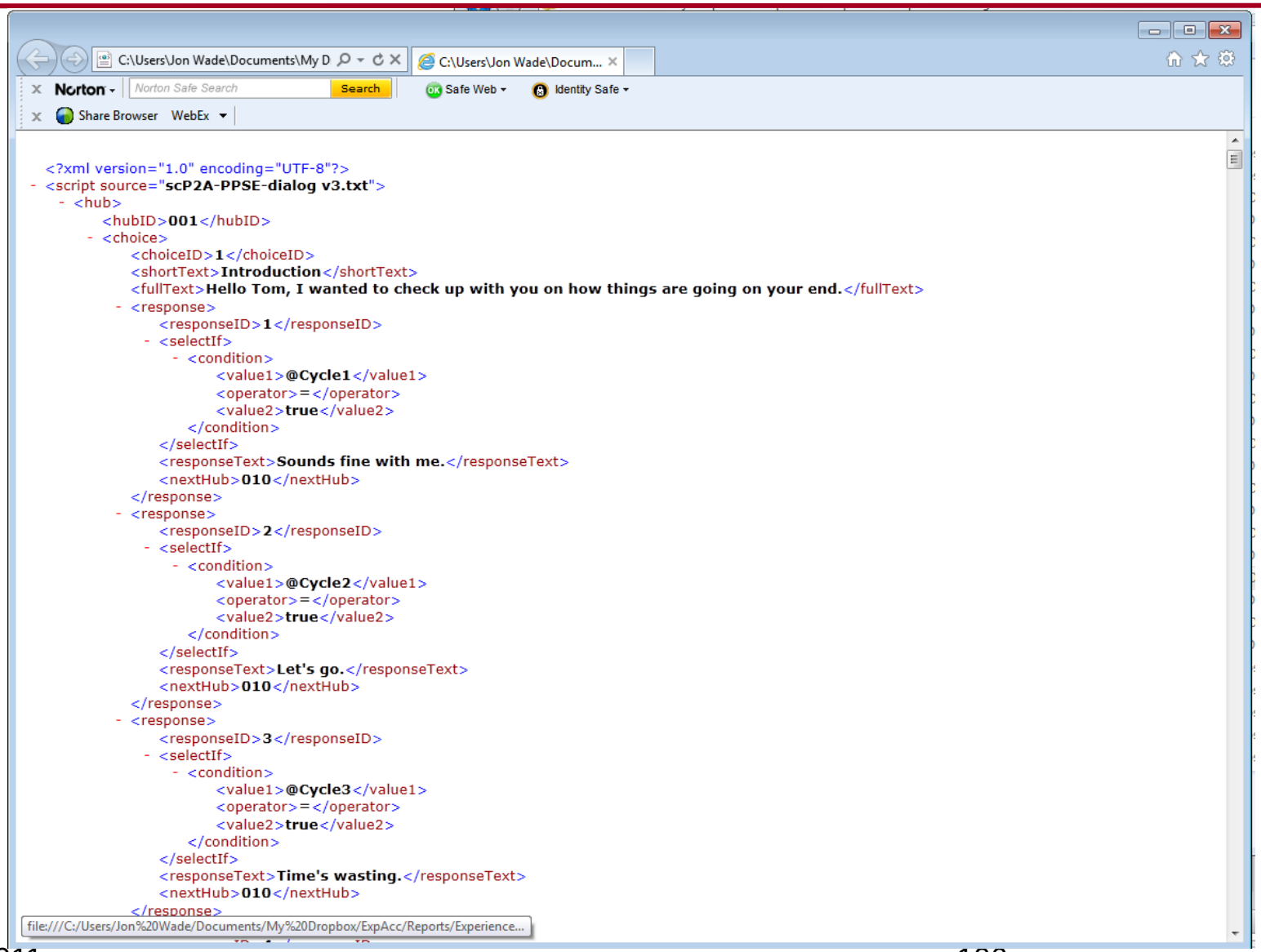
Tom Williams: *Most of the issues that I have seen have been related to poor file management. The young guys can sometimes be a bit careless with uploading their latest designs and this can cause problem downstream. I haven't seen too many analysis or real design errors.*

- Schedule
- Quality
- Capability
- Go to another system or exit...

Disconnect

10:33 AM

Dialog Engine Input XML



```
<?xml version="1.0" encoding="UTF-8"?>
- <script source="scP2A-PPSE-dialog v3.txt">
  - <hub>
      <hubID>001</hubID>
    - <choice>
        <choiceID>1</choiceID>
        <shortText>Introduction</shortText>
        <fullText>Hello Tom, I wanted to check up with you on how things are going on your end.</fullText>
      - <response>
          <responseID>1</responseID>
        - <selectIf>
          - <condition>
              <value1>@Cycle1</value1>
              <operator>=</operator>
              <value2>true</value2>
            </condition>
          </selectIf>
          <responseText>Sounds fine with me.</responseText>
          <nextHub>010</nextHub>
        </response>
      - <response>
          <responseID>2</responseID>
        - <selectIf>
          - <condition>
              <value1>@Cycle2</value1>
              <operator>=</operator>
              <value2>true</value2>
            </condition>
          </selectIf>
          <responseText>Let's go.</responseText>
          <nextHub>010</nextHub>
        </response>
      - <response>
          <responseID>3</responseID>
        - <selectIf>
          - <condition>
              <value1>@Cycle3</value1>
              <operator>=</operator>
              <value2>true</value2>
            </condition>
          </selectIf>
          <responseText>Time's wasting.</responseText>
          <nextHub>010</nextHub>
        </response>
```

SYSTEMS ENGINEERING
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Content Creator Input

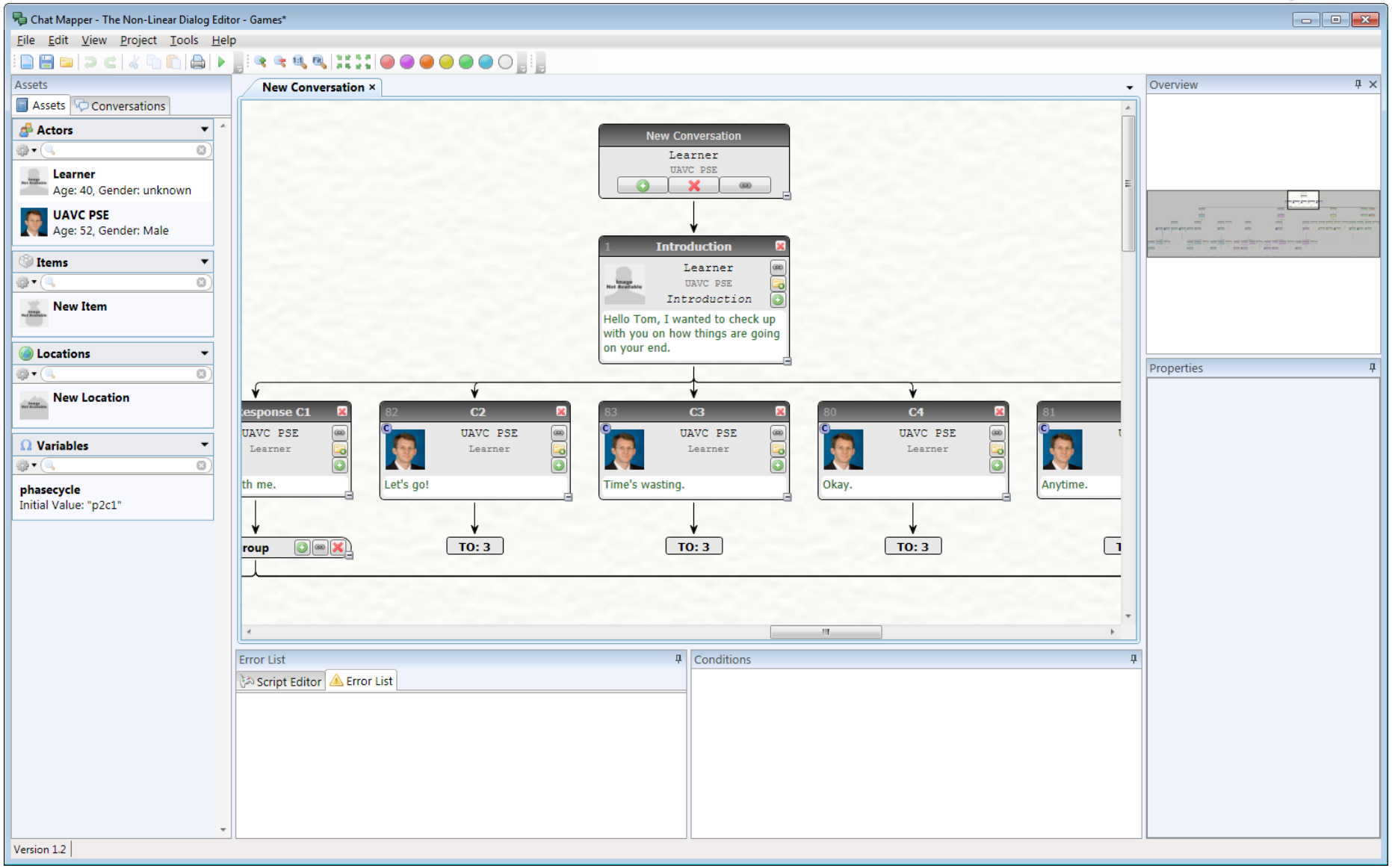
scP2A-PPSE-dialog v3 - Notepad

File Edit Format View Help

```
# User - Govt PSE (A) with Prime PSE (B)
# Background: The Prime PSE is a manager who is just ramping up on the project.
# Variables: @Cycle1, @Cycle2, @Cycle3, @Cycle4, @Cycle5, @Cycle6
#            @status[i, j, k]  - not currently used

#_____________________________________________
#
# Greetings
#_____________________________________________

[s001]
Choice: 1
ShortText: Introduction
FullText: Hello Tom, I wanted to check up with you on how things are going on your end.
 * Response: 1
SelectIf: @Cycle1 = true;
ResponseText: Sounds fine with me.
NextHub: h010

 * Response: 2
SelectIf: @Cycle2 = true;
ResponseText: Let's go.
NextHub: h010

 * Response: 3
SelectIf: @Cycle3 = true;
ResponseText: Time's wasting.
NextHub: h010

 * Response: 4
SelectIf: @Cycle4 = true;
ResponseText: Okay.
NextHub: h010

 * Response: 5
SelectIf: @Cycle5 = true;
ResponseText: Anytime.
NextHub: h010


#_____________________________________________
#
# System Choices
#_____________________________________________

[h010]
Choice: 1
ShortText: Airframe and Propulsion status
FullText: I'd like to discuss the Airframe and Propulsion systems.
 * Response: 1
ResponseText: Okay.
NextHub: h100

Choice: 2
ShortText: Command and Control status
FullText: I'd like to hear your thoughts on the Command and Control systems.
 * Response: 1
ResponseText: What would you like to know?
NextHub: h200

Choice: 3
ShortText: Ground Station Launch/Retrieval
```

Chat Mapper Demo

GUI Tool – Chat Mapper



Event XML Source Code

File Edit Format View Help

```
<?xml version="1.0" encoding="utf-8" ?>
<scenario name="Phase2A" startTime="Tue Jan 3 09:00:00 GMT-0500 2011">

        <exitConditions>
                <condition type="Simulation" argument="Positive" target="3" />
                <condition type="Simulation" argument="CriticalBreach" target="6" />
        </exitConditions>

        <contacts>
                <contact inphase="true"calendarname="T. Rogers"title="PM"fullname="Col. Tandy Rogers"dialoguenumber="1"displayName="PM">pm</contact>
                <contact inphase="true"calendarname="T. Williams"title="PSE Prime"fullname="Tom Williams"dialoguenumber="2"displayName="Prime
PSE">primepse</contact>
                <contact inphase="false"calendarname="D. Masters"title="Ex-PSE"fullname="Dale Masters"dialoguenumber="1"displayName="Previous
PSE">prevpse</contact>
                <contact inphase="false"calendarname="L. Jackson"title="Gov. Test Rep."fullname="Linda Jackson"dialoguenumber="1"displayName="Gov. Test
Rep.">govtest</contact>
                <contact inphase="false"calendarname="C. Wilson"title="Mentor"fullname="Chris
Wilson"dialoguenumber="1"displayName="Mentor">mentor</contact>
                <contact inphase="false"calendarname="Rossman"title="DAU HR manager"fullname="Jeff Rossman"dialoguenumber="1"displayname="Mr.
Rossman">rossman</contact>
        </contacts>

        <events>
                <email id="0" time="Tue Jan 3 09:40:30 GMT-0500 2011"  sender="XZ-5 UAV Program Office" subject="XZ-5 UAV Status and IMS update"
                message="
@userName@:

An updated copy of the XZ-5 UAV Program status and IMS is available in your folder for your review.

Carla Riggins
Administrator, XZ-5 UAV IT
" />
                <email id="1" time="Tue Jul 3 10:40:30 GMT-0500 2011"  sender="XZ-5 UAV Program Office" subject="XZ-5 UAV Status and IMS update"
                message="
@userName@:

An updated copy of the XZ-5 UAV Program status and IMS is available in your folder for your review.

Carla Riggins
Administrator, XZ-5 UAV IT
" />
                <email id="2" time="Tue Jan 3 10:40:30 GMT-0500 2012"  sender="XZ-5 UAV Program Office" subject="XZ-5 UAV Status and IMS update"
                message="
@userName@:

An updated copy of the XZ-5 UAV Program status and IMS is available in your folder for your review.

Carla Riggins
Administrator, XZ-5 UAV IT
" />
                <email id="3" time="Tue Jul 3 10:40:30 GMT-0500 2012"  sender="XZ-5 UAV Program Office" subject="XZ-5 UAV Status and IMS update"
                message="
@userName@:

An updated copy of the XZ-5 UAV Program status and IMS is available in your folder for your review.

Carla Riggins
Administrator, XZ-5 UAV IT
" />

                <email id="4" time="" onSimEvent="CriticalBreach" sender="Col. Tandy Rogers" subject="XZ-5 UAV Program Termination"
                message="
@userName@:

Unfortunately, due to non-performance I have heard that the XZ-5 UAV Program is being cancelled. We should be receiving an official announcement shortly.
You will need to contact Chris Wilson to determine your next assignment.

Col. Tandy Rogers
Former Program Manager, XZ-5 UAV Program
```

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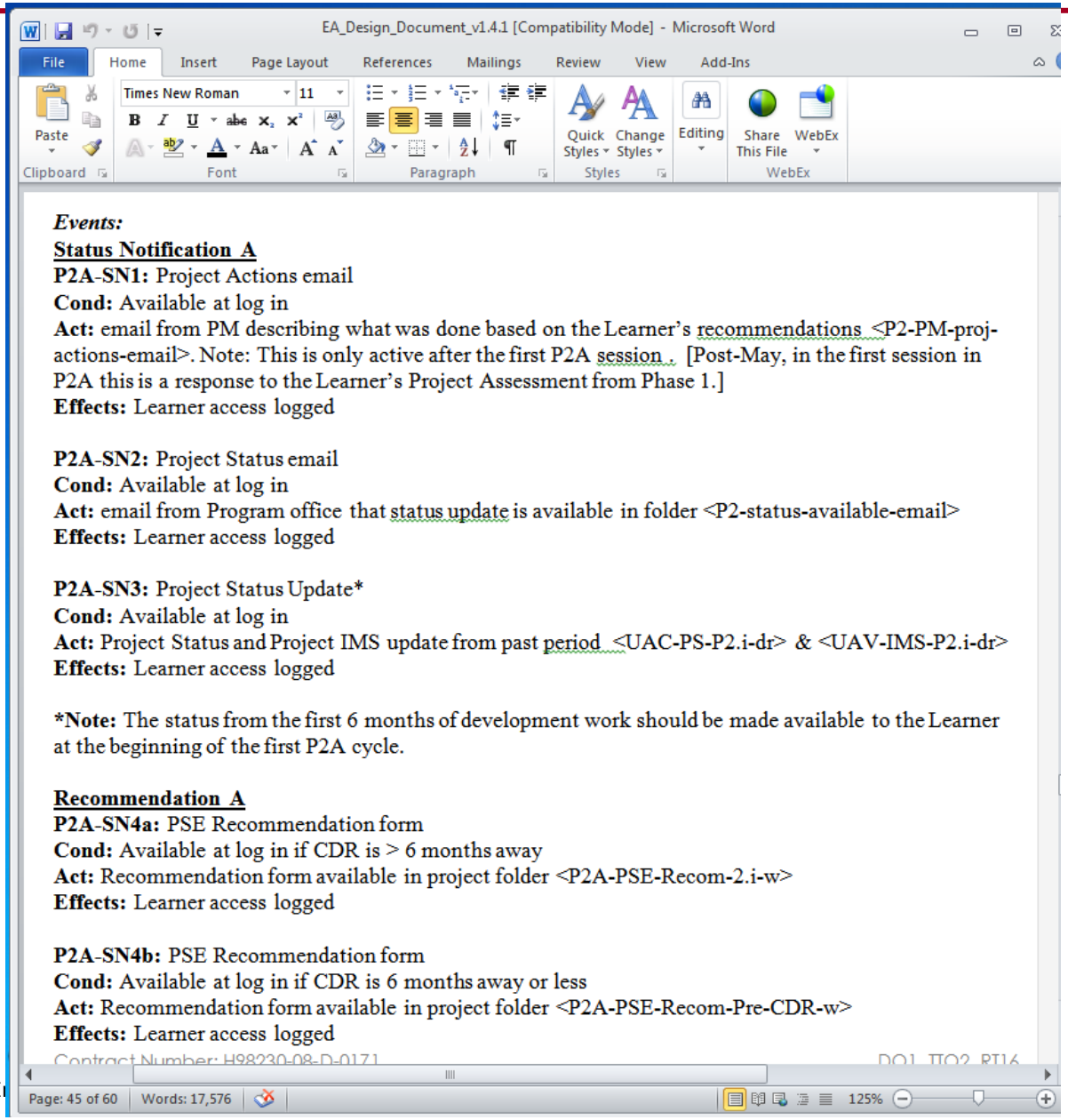
Event Specification



Events:

Status Notification_A

P2A-SN1: Project Actions email
Cond: Available at log in
Act: email from PM describing what was done based on the Learner's recommendations <P2-PM-proj-actions-email>. Note: This is only active after the first P2A session . [Post-May, in the first session in P2A this is a response to the Learner's Project Assessment from Phase 1.]
Effects: Learner access logged

P2A-SN2: Project Status email
Cond: Available at log in
Act: email from Program office that status update is available in folder <P2-status-available-email>
Effects: Learner access logged

P2A-SN3: Project Status Update*
Cond: Available at log in
Act: Project Status and Project IMS update from past period <UAC-PS-P2.i-dr> & <UAV-IMS-P2.i-dr>
Effects: Learner access logged

***Note:** The status from the first 6 months of development work should be made available to the Learner at the beginning of the first P2A cycle.

Recommendation_A

P2A-SN4a: PSE Recommendation form
Cond: Available at log in if CDR is > 6 months away
Act: Recommendation form available in project folder <P2A-PSE-Recom-2.i-w>
Effects: Learner access logged

P2A-SN4b: PSE Recommendation form
Cond: Available at log in if CDR is 6 months away or less
Act: Recommendation form available in project folder <P2A-PSE-Recom-Pre-CDR-w>
Effects: Learner access logged

Contract Number: H98230-08-D-0171 DO1 TO2 RT16

SYSTEMS ENGINEERING
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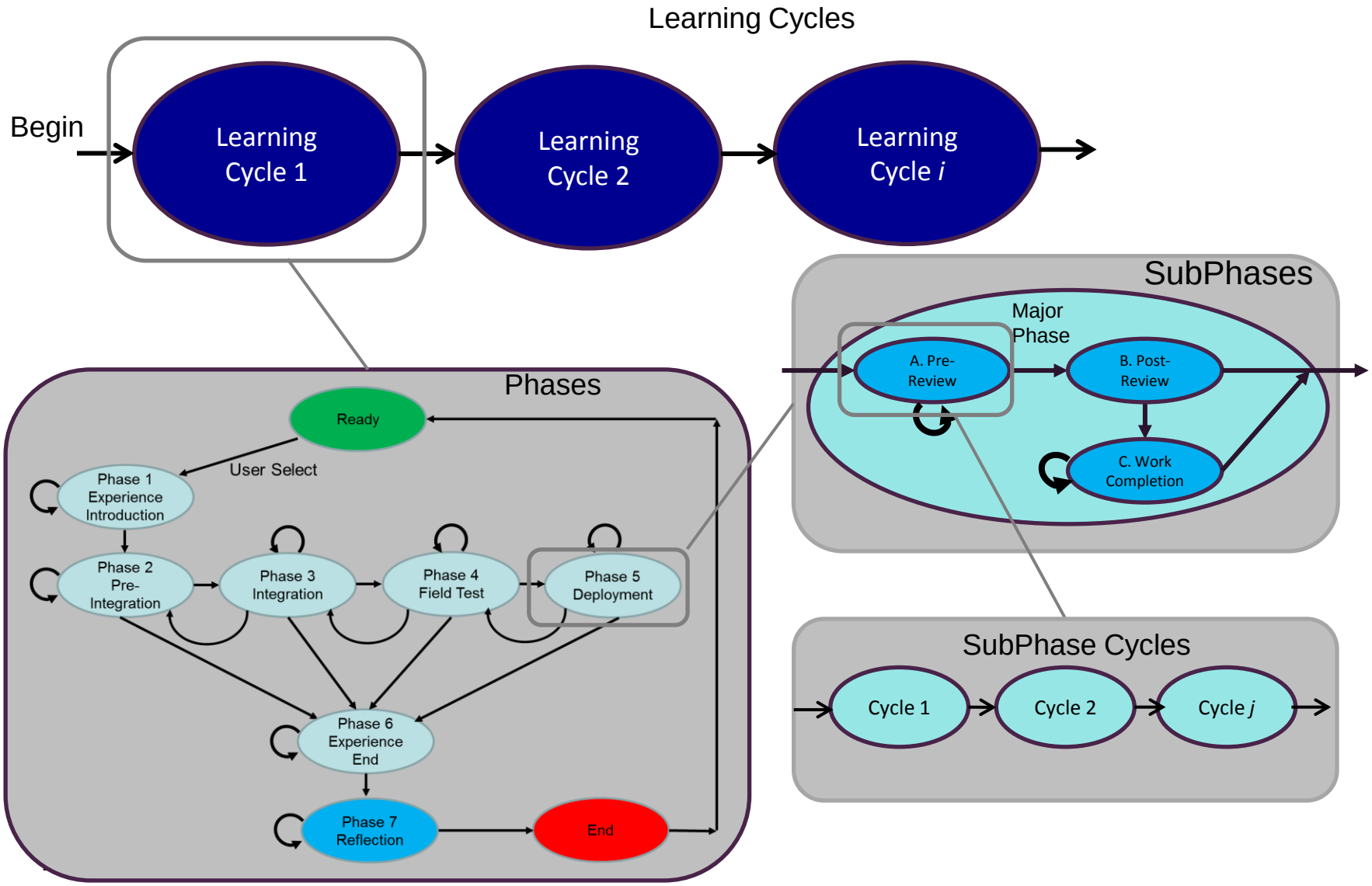
GUI Tool – Phase and Event Creator



Artifact Entry

- Today:
  - Designer saves file in DropBox
  - Designer tells technical staff to load it into the design
  - File is moved to the correct location or handcoded
  - System is recompiled or linked
  - Designer is notified of the change
  - Designer tests changes
- Future:
  - Designer opens artifact entry client
  - Designer saves file into system sandbox
  - Designer tests changes

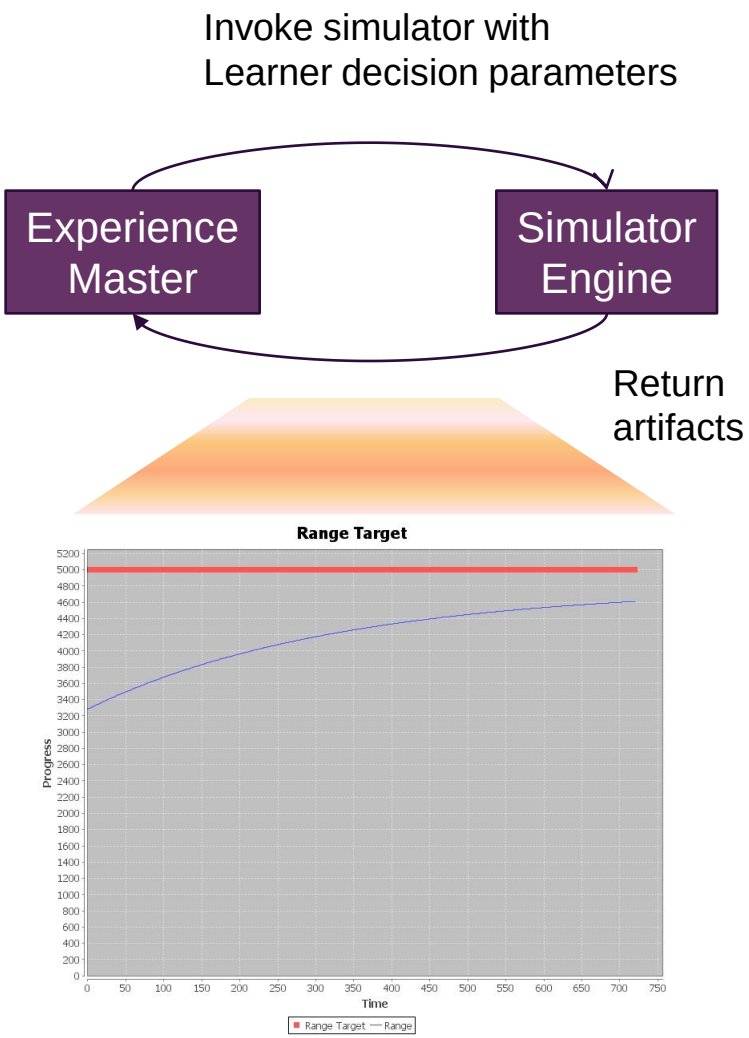
Questions?

RT16 Experience Accelerator: System Dynamics Simulation

By
Doug Bodner & the RT16 Team

NDIA Systems Engineering Conference Tutorial
October 24, 2011
San Diego, CA, USA
www.sercuarc.org

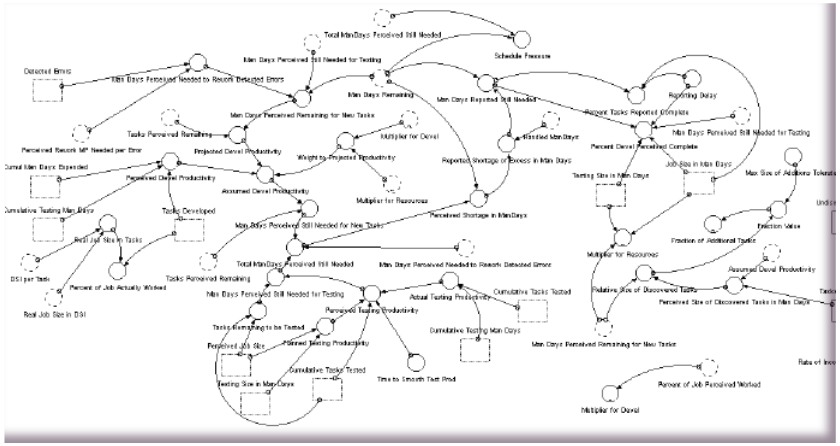
Simulator Function



- Advance program state after Learner decisions
  - Decisions from "a day in the life of a systems engineer"
- Simulate program progress based on Learner decisions and existing program characteristics
  - Typically a 3-6 month time advance
- Provide results back to Learner via status charts (artifacts)

Simulation Technology

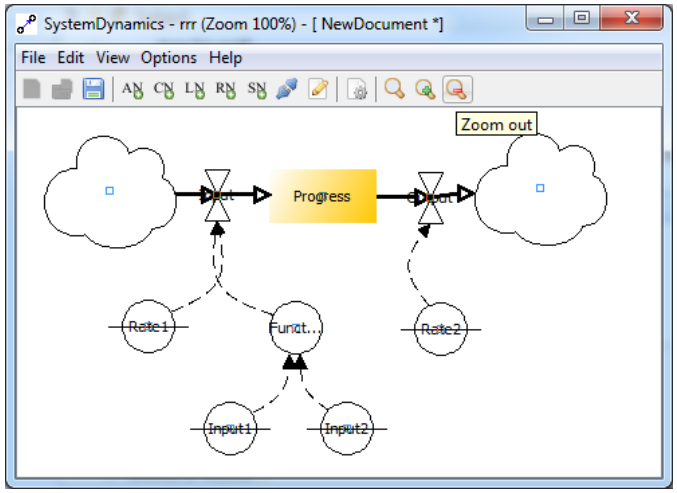
- Select open source simulation technology
  - —System dynamics paradigm
- Modify as needed
  - —Address limitations
  - —Provide extensions relevant to systems engineering
- Develop model content
  - —Align with experience content

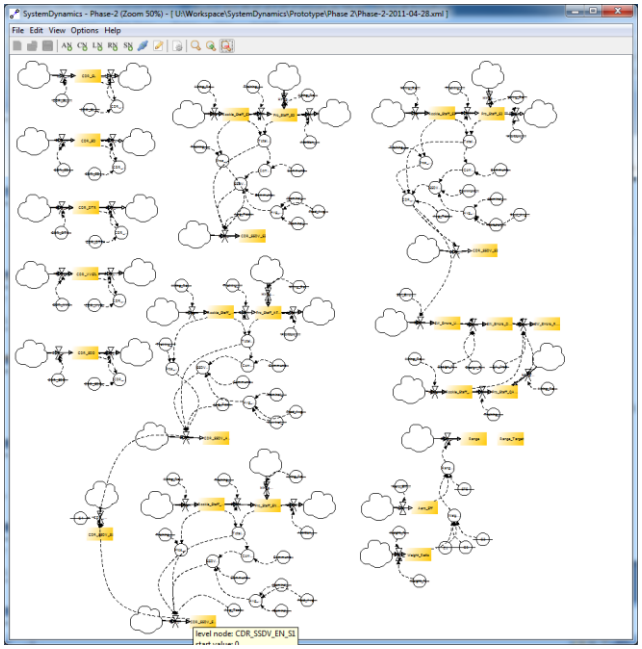


* From *Software Process Dynamics*, Ray Madachy

- Continuous state and flow models
- Non-linear effects and feedback loops
- Used to model project management applications

System Dynamics Modeling





- Stocks and flows
  - Stocks accumulate numerical values representing a variable of interest (e.g., weight or range)
  - Flows govern how stock variables change over time
  - Continuous
- Rates of change
  - Flows are based on equations
  - Lags, delays and feedback loops can be incorporated (non-linear effects)
- Auxiliary functions
  - Modularity of equations

Open Source Trade-offs

Benefits

- Access to underlying source code
- Extensibility
- Open source user community
- Integration with other software (e.g., experience master, open source graphics)
- Free license

Drawbacks

- Limited functionality as compared to commercial products
- Lack of user interaction
- Lack of persistent data storage in between model runs
- Lack of randomization
- Lack of multi-paradigm support (e.g., discrete-event and agent-based)

Technology Development Work

- Math modeling features
- Learner interaction (changing variables and parameters)
- Persistent storage between runs (text files currently, migration to database)
- Randomization
- Discrete effects

SYSTEMS ENGINEERING
Research Center

Program Features Modeled

- System and sub-systems
- Labor and skill levels
  - —Experienced vs. inexperienced
- Productivity
- Training
- Attrition
- Communication overhead
- Brooks Law (adding staff may incur short-term productivity shortfall)
- Costs incurred
- Task/requirements creep

Program Model Details (1/2)

- Phase 2 – Pre-Integration
  - Air vehicle sub-system design
  - Command and control sub-system design
  - Ground station sub-system design
  - System architecture design
  - CDR Entrance criteria progress
  - Software quality for Command & Control sub-system
- Phase 3 – Integration
  - Sub-system integration
  - Overall system integration
  - Software quality for Command & Control sub-system
  - FRR Entrance criteria progress

Program Model Details (2/2)

- Phase 4 – Flight Testing
  - —PRR entrance criteria progress
  - —Test resources
  - —Flight tests
- Phase 5 – Limited Production and Deployment
  - —Cost per vehicle
  - —Cost per ground station
  - —Number of vehicles and ground stations deployed over time

Entrance Criteria (1/2)

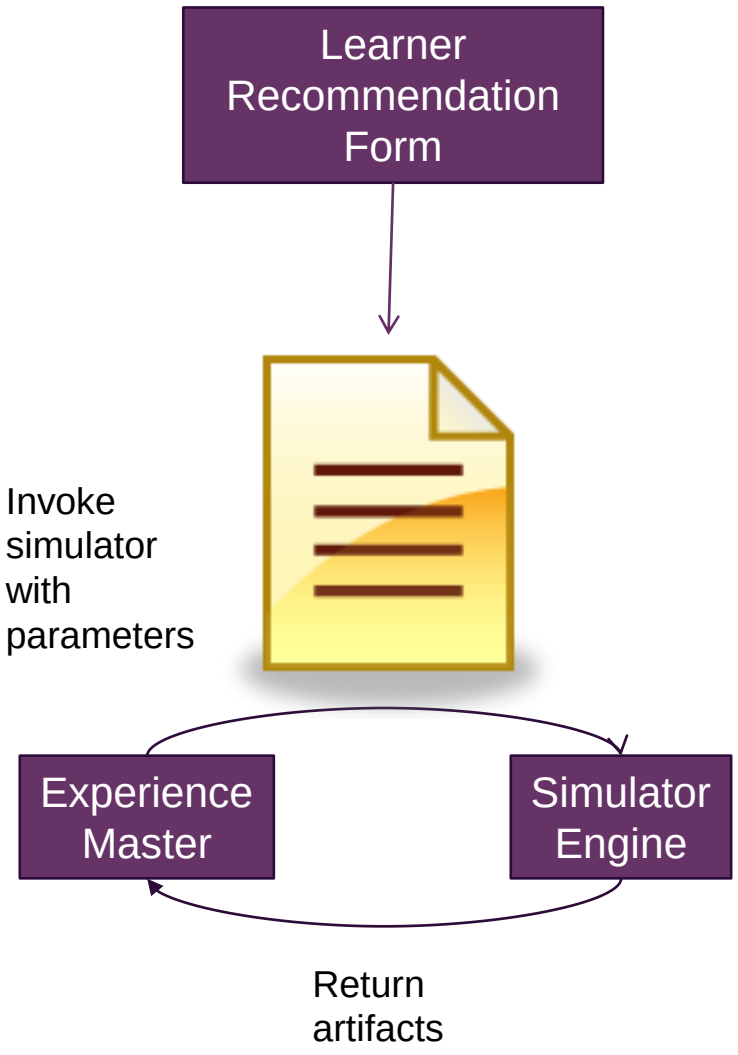
- Taken from Defense Acquisition University recommended set, tailored for air vehicles
- Most important review meetings and associated criteria selected, based on subject matter expert recommendations
- Pre Critical Design Review
  - Detailed Test Requirements
  - Engineering Drawings
  - Software Design Description
  - Structural Loads Released
  - Sub-System Design and Verification
  - V&V of System Integration Lab

Entrance Criteria (2/2)

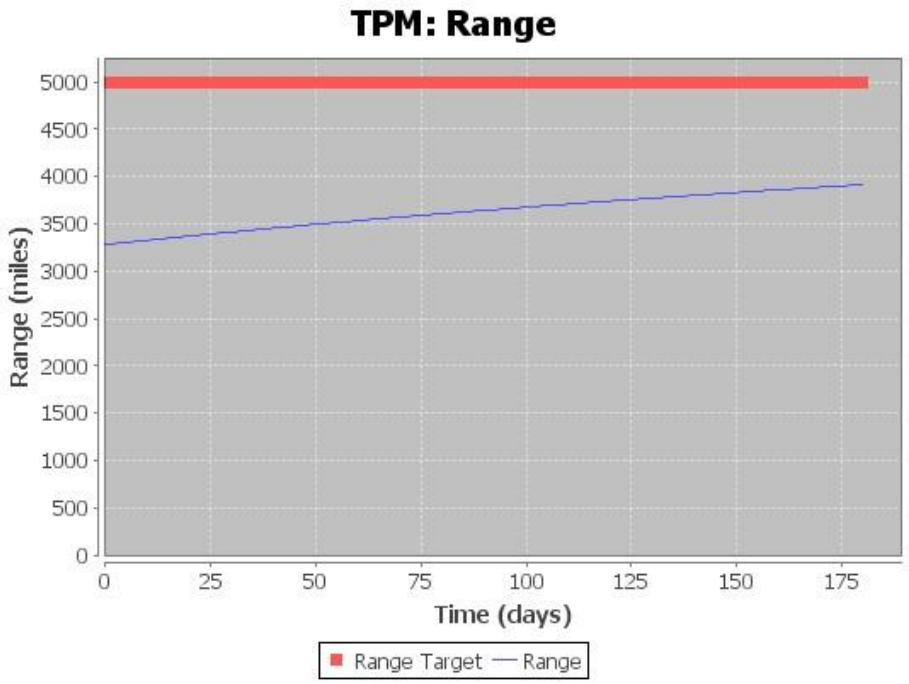
- Pre Flight Readiness Review
  - Airframe/Engine Certified for Flight
  - Airworthiness Certification Milestones
  - Flight Critical Software Demonstrated and Verified
  - Ground Vibration Testing
  - Safety of Flight Certified
  - Software Safety of Flight Testing
  - Structural Static Testing
  - Test Cards Completed
- Pre Production Readiness Review
  - Airworthiness Certification Milestones
  - Affordability Demonstrated
  - Drawings
  - Production Facilities
  - Production Line Demonstrated
  - Production Personnel Trained

Learner Interaction – Controls

- Text file for Learner input parameters
- Add-Design-Jr-Staff (S1 Air)
- Add-Design-Sr-Staff (S1 Air)
- Add-Design-Jr-Staff (S1 Engine)
- Add-Design-Sr-Staff (S1 Engine)
- Add-Design-Jr-Staff (S2)
- Add-Design-Sr-Staff (S2)
- Add-Test-Jr-Staff (S2)
- Add-Test-Sr-Staff (S2)
- Add-Design-Jr-Staff (S3)
- Add-Design-Sr-Staff (S3)
- Review-Design (S2)
- Reduce-Capabilities-Designed (S0)

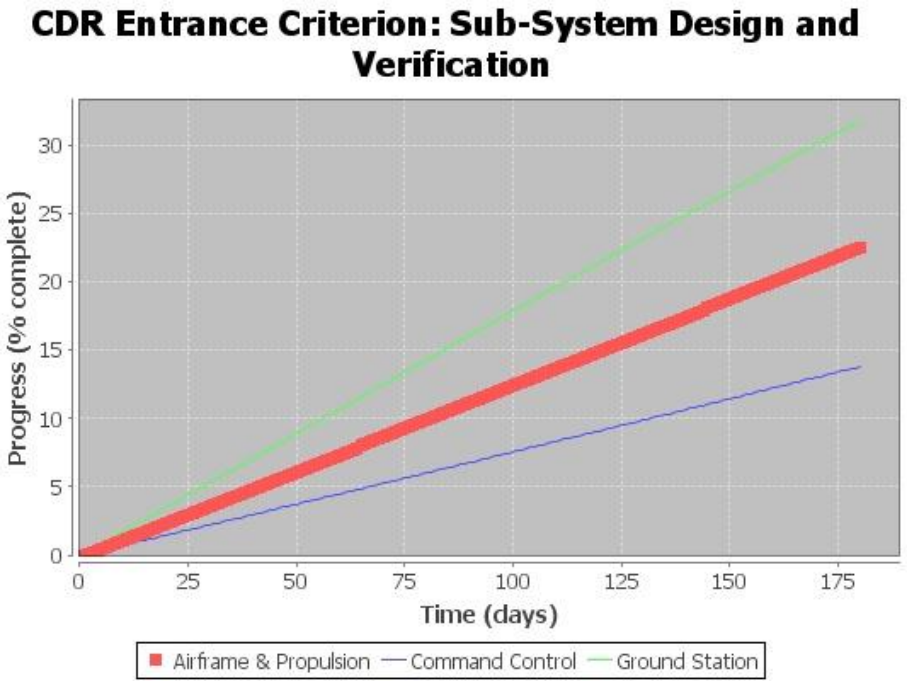


KPP/TPM Chart for Range



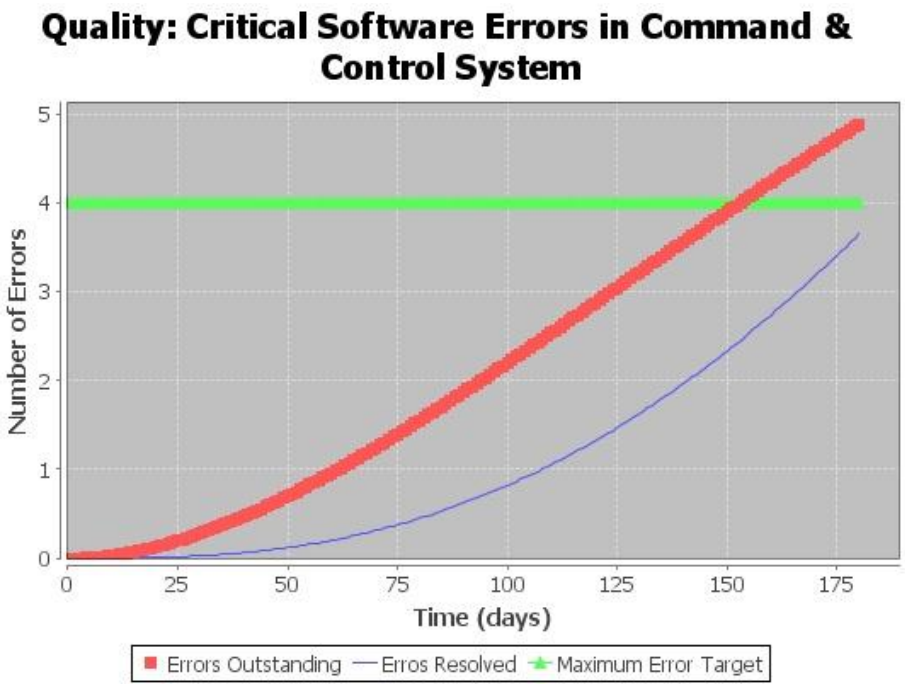
- Causes for deficiencies in range vs. range target?
  - —Weight allocation
  - —Aerodynamic efficiency
  - —SPC
- Investigating
  - —Reports
  - —Questions to NPCs
- Resolution
  - —Staffing changes
  - —Weight re-allocation

CDR Entrance Criterion Chart



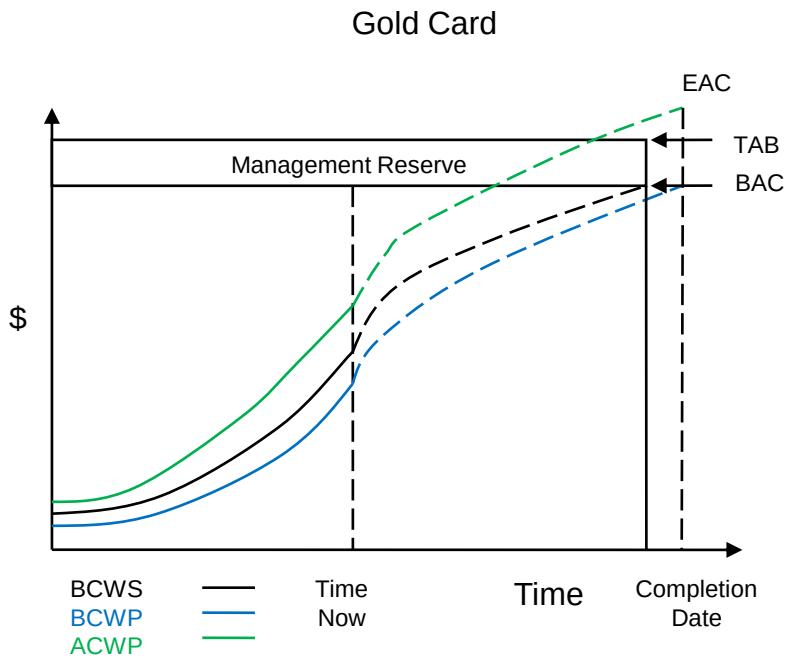
- Causes for deficiencies in progress of Command & Control sub-system?
  - Lack of staffing
  - Lack of experienced staff
  - Lack of design reviews
- Investigating
  - Reports
  - Questions to NPCs
- Resolution
  - Increase staff
  - Increase experienced staff
  - Have more design reviews

Software Quality Chart



- Causes for overage in errors?
  - Lack of experienced staff
  - Lack of design reviews
- Investigating
  - Reports
  - Questions to NPCs
- Resolution
  - Increase staff
  - Increase experienced staff
  - Have more design reviews

EVM Cost Chart



- Earned value management (EVM)
- EVM Gold Card
- Cost accruals vs. budgeted (scheduled and actual)
- Productivity and unit costs
- How to respond to cost overruns
- Under development

Validation

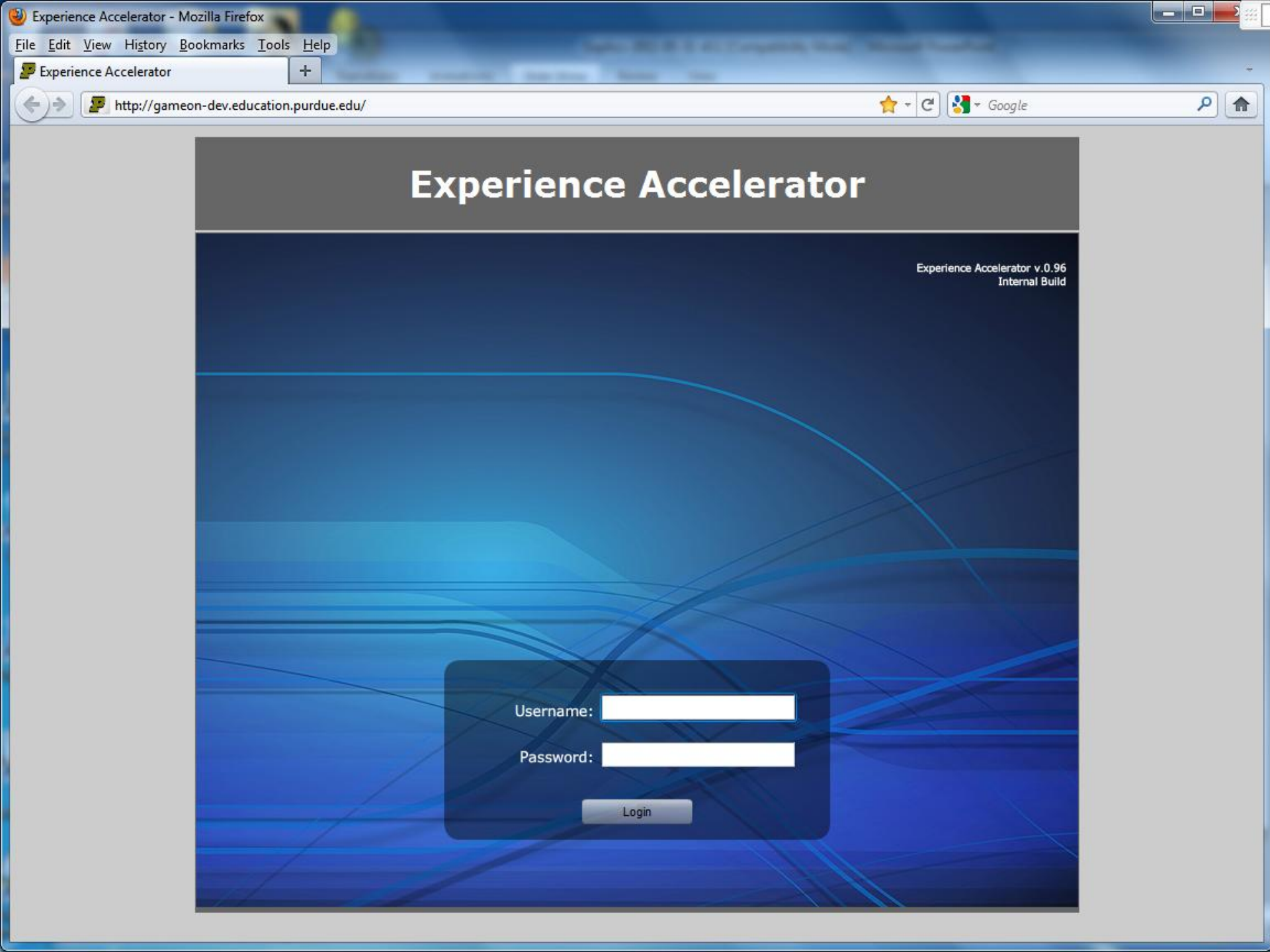
- Authenticity as compared to similar acquisition programs
- Not based on a single case study
- Based on the experiences of three subject matter experts
- Validation via interaction with subject matter experts and users of the Experience Accelerator

Questions?

RT16 Experience Accelerator: Demo

By
Jon Wade & the RT16 Team

NDIA Annual Systems Engineering Conference
October 24, 2011
Hyatt Regency Mission Bay
San Diego, CA
www.sercuarc.org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Experience Accelerator v.0.96
Internal Build
Username:
Password:
Login

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Google

Experience Accelerator

Experience Accelerator

Welcome Jon Wade

Your Experience Awaits You!

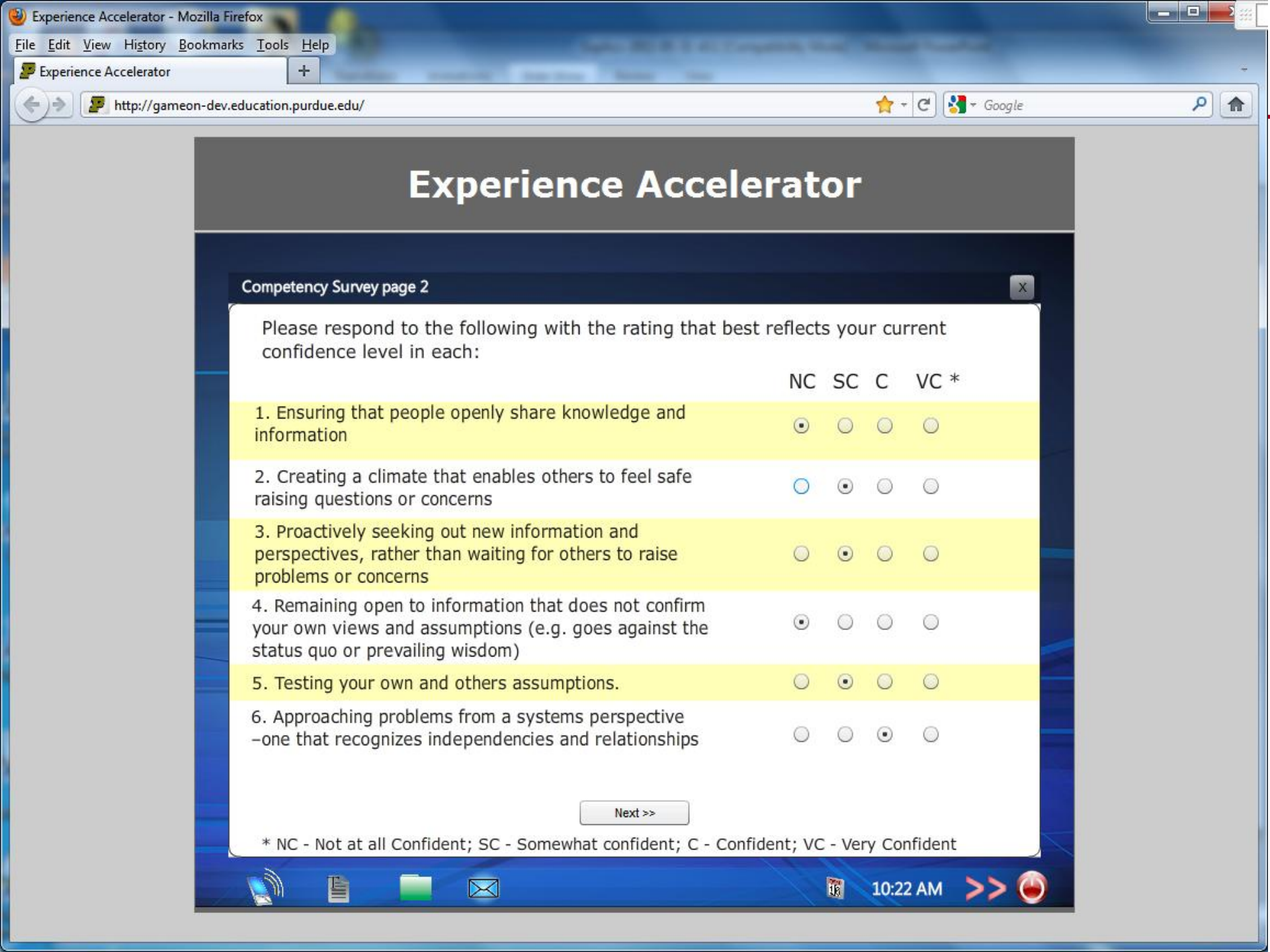
Option Menu:

- UAV Experience
- Profile Update
- Logout

UAV Experience Status

New Employee Orientation----------	In progress
New Assignment Orientation----------	Incomplete
Pre-Integration System Development---	Incomplete
System Integration----------	Incomplete
System Field Test----------	Incomplete
Limited Production and Development--	Incomplete
Experience End----------	Incomplete
Reflection----------	Incomplete

- Abort


Experience Accelerator - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Experience Accelerator
http://gameon-dev.education.purdue.edu/
Google
Experience Accelerator
Competency Survey page 2
X
Please respond to the following with the rating that best reflects your current confidence level in each:
NC SC C VC *
1. Ensuring that people openly share knowledge and information
2. Creating a climate that enables others to feel safe raising questions or concerns
3. Proactively seeking out new information and perspectives, rather than waiting for others to raise problems or concerns
4. Remaining open to information that does not confirm your own views and assumptions (e.g. goes against the status quo or prevailing wisdom)
5. Testing your own and others assumptions.
6. Approaching problems from a systems perspective –one that recognizes independencies and relationships
Next >>
* NC - Not at all Confident; SC - Somewhat confident; C - Confident; VC - Very Confident
10:22 AM

Experience Accelerator

UAV Background

autonomy to perform a wider variety of missions. And these activities are the most challenging. Figure 1 provides on example for Global Hawk showing the tight "packaging" that must take place involving sensor systems, avionics, airframe structure, etc. Electronic interference as well as thermal issues must be accounted when arranging these systems. More broadly, the requirements and constraints of these sub-systems must be managed by the UAV systems engineer to ensure that hard-to-solve interferences and constraint violations between sub-systems do not occur. The managing of the overall requirements for the UAV must also be done carefully—if the requirements grow, so do the requirements of the sub-systems, and interactions that were never envisioned may develop.

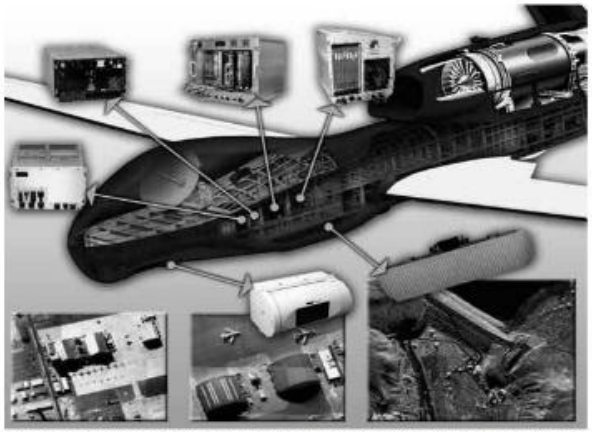


Fig. 1: Cutaway of Global Hawk Showing Integrated Sensor Suite Locations[1]

In addition, in almost all cases, UAVs must interact with other battlefield systems in order to

Return to Options Screen

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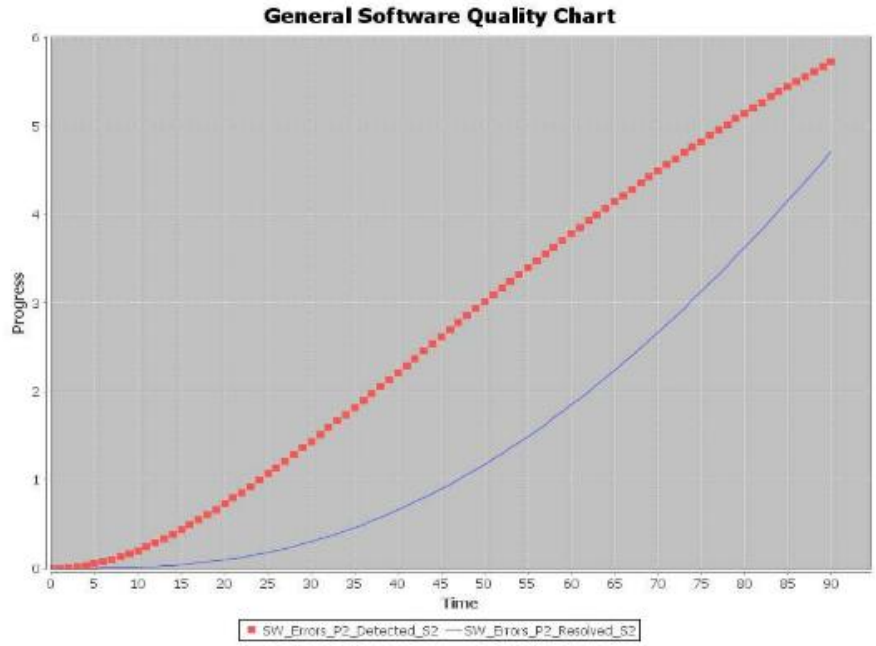
Post-PDR Status

3 / 9



Return to Options Screen

11:02 AM

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Experience Accelerator

Call

Tom Williams, PSE Prime

Tom Williams: *Okay.*

You: How is the quality looking to you?

Tom Williams: *It's not too bad. Of course we have a few rookie mistakes, but the quality is rapidly improving. It is about what I expect at this stage of the program.*

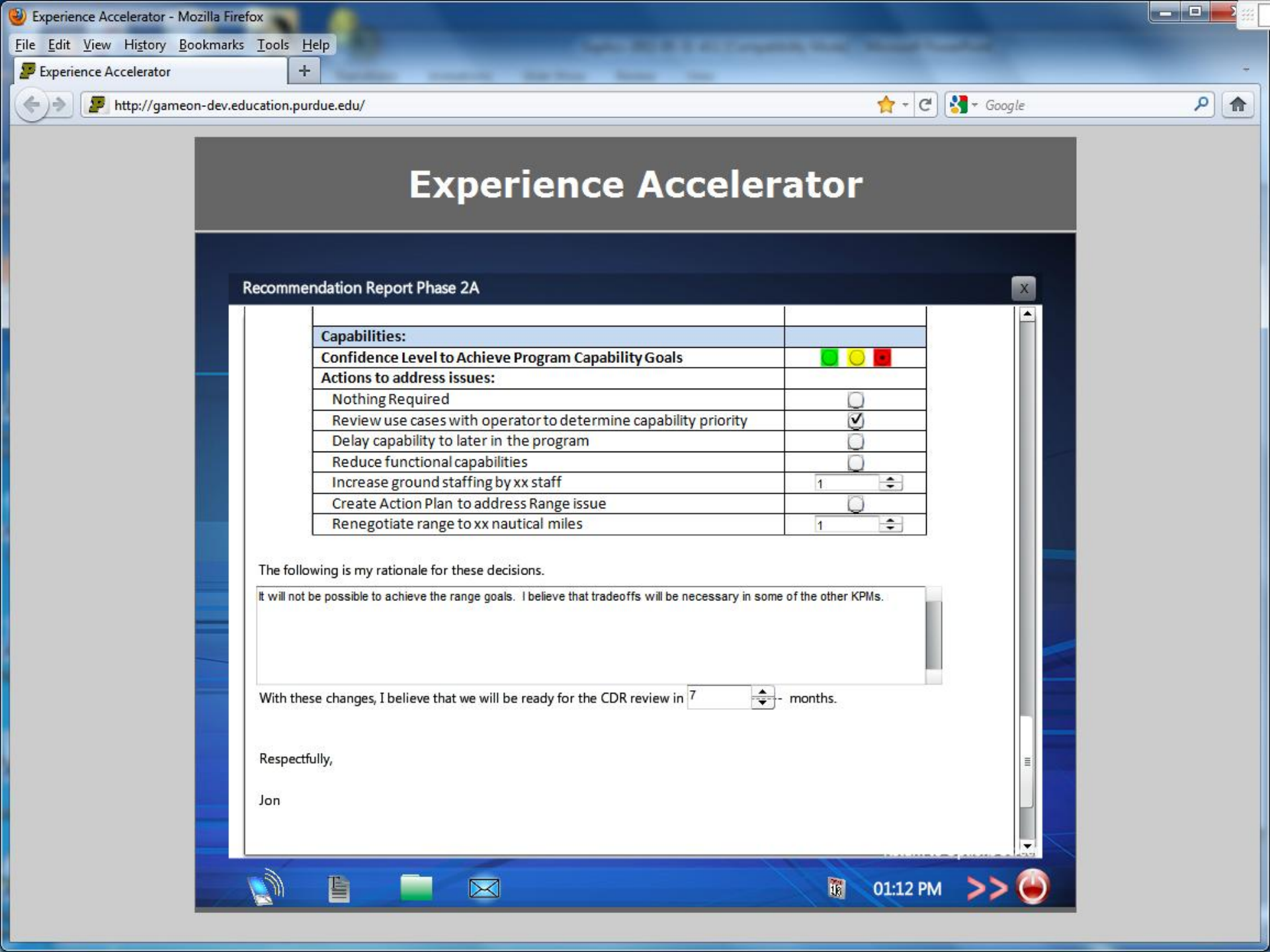
You: What types of problems are you seeing?

Tom Williams: *Most of the issues that I have seen have been related to poor file management. The young guys can sometimes be a bit careless with uploading their latest designs and this can cause problem downstream. I haven't seen too many analysis or real design errors.*

- Schedule
- Quality
- Capability
- Go to another system or exit...

Disconnect

10:33 AM


Experience Accelerator - Mozilla Firefox
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http://gameon-dev.education.purdue.edu/
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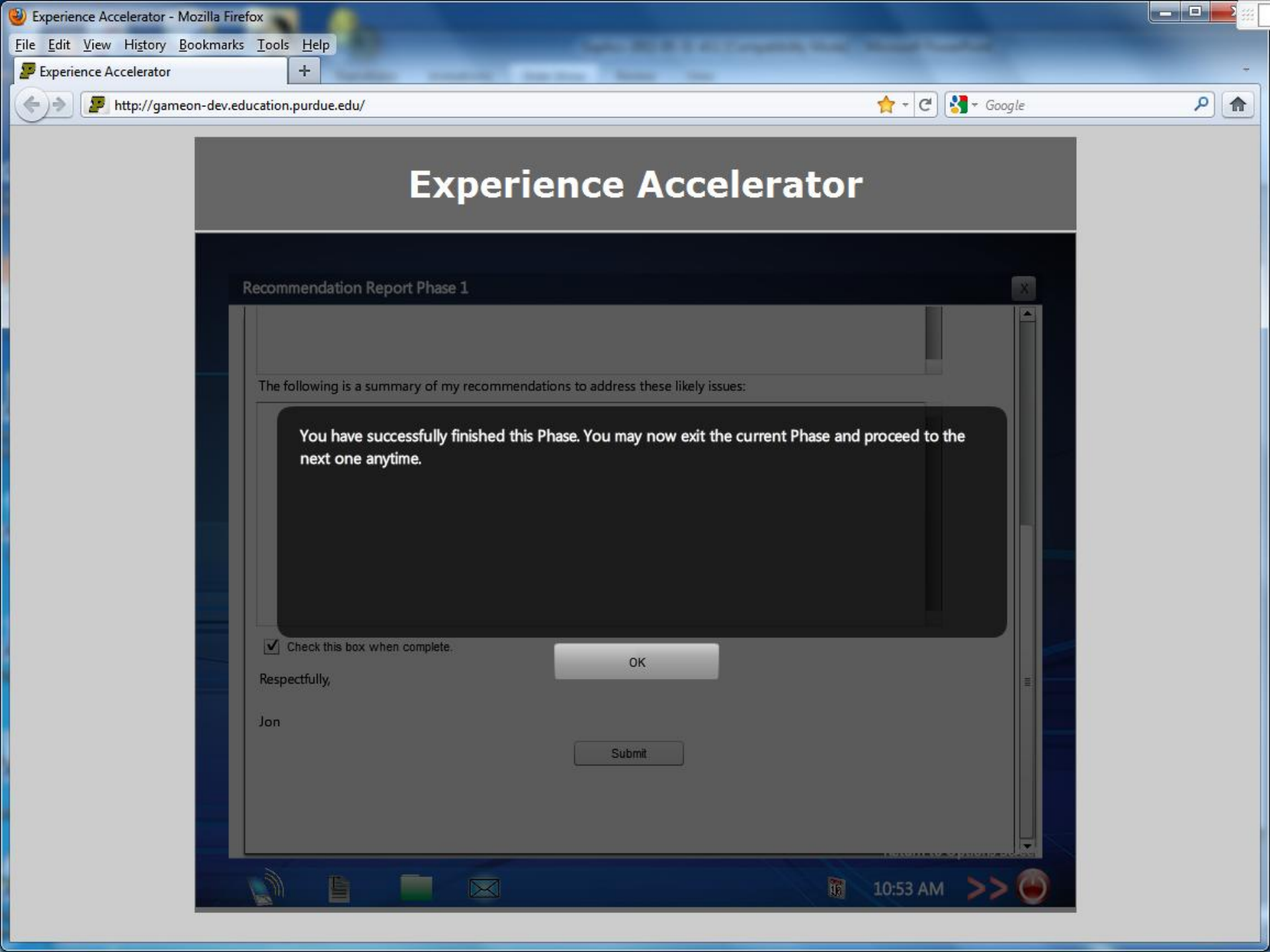
Experience Accelerator
Recommendation Report Phase 2A
X
Capabilities:
Confidence Level to Achieve Program Capability Goals
Actions to address issues:
Nothing Required
Review use cases with operator to determine capability priority
Delay capability to later in the program
Reduce functional capabilities
Increase ground staffing by xx staff
1
Create Action Plan to address Range issue
Renegotiate range to xx nautical miles
1
The following is my rationale for these decisions.
It will not be possible to achieve the range goals. I believe that tradeoffs will be necessary in some of the other KPMs.
With these changes, I believe that we will be ready for the CDR review in 7 - months.
Respectfully,
Jon
01:12 PM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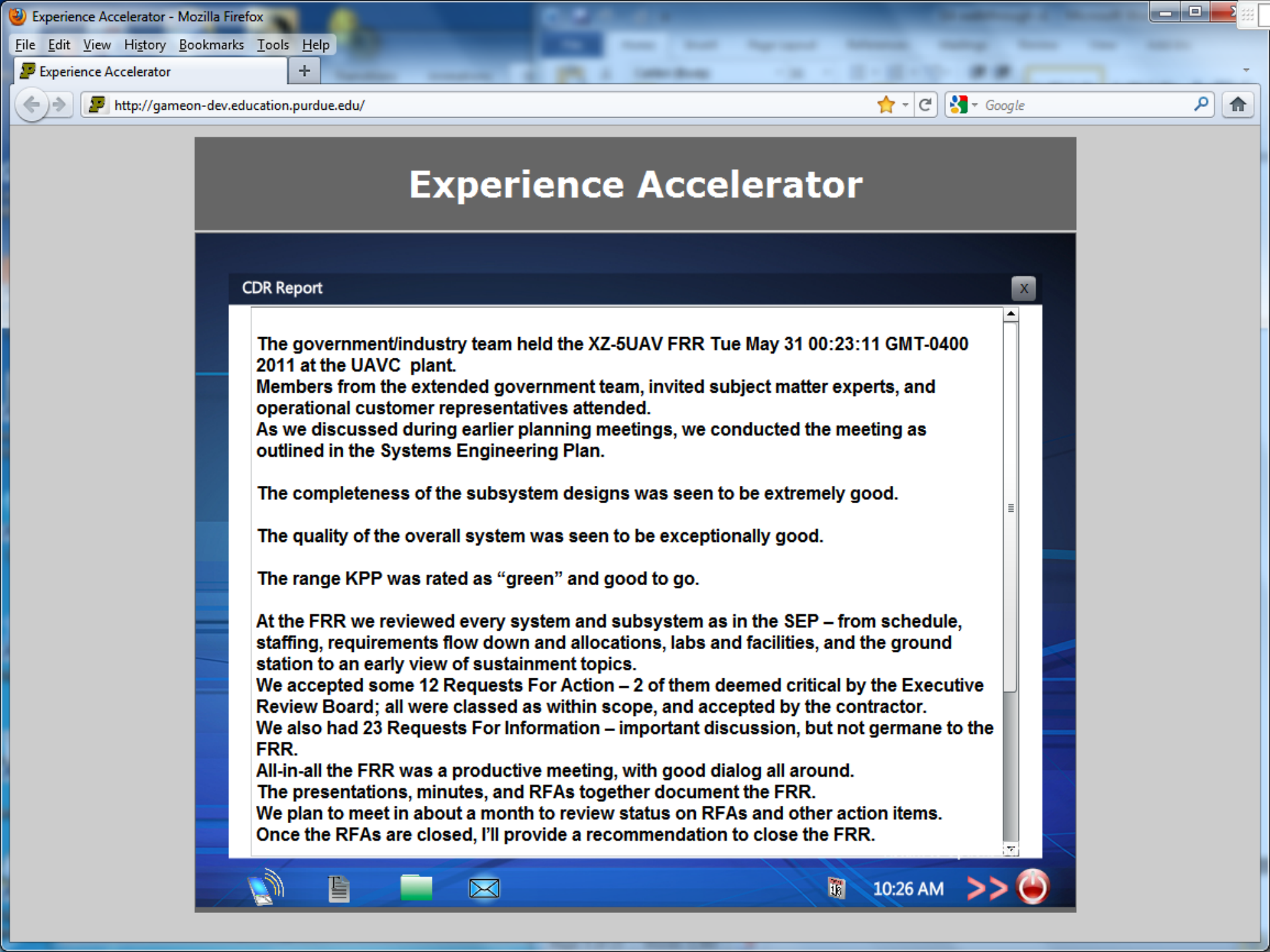
Experience Accelerator
Recommendation Report Phase 1
The following is a summary of my recommendations to address these likely issues:
You have successfully finished this Phase. You may now exit the current Phase and proceed to the next one anytime.
Check this box when complete.
OK
Respectfully,
Jon
Submit
10:53 AM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Google
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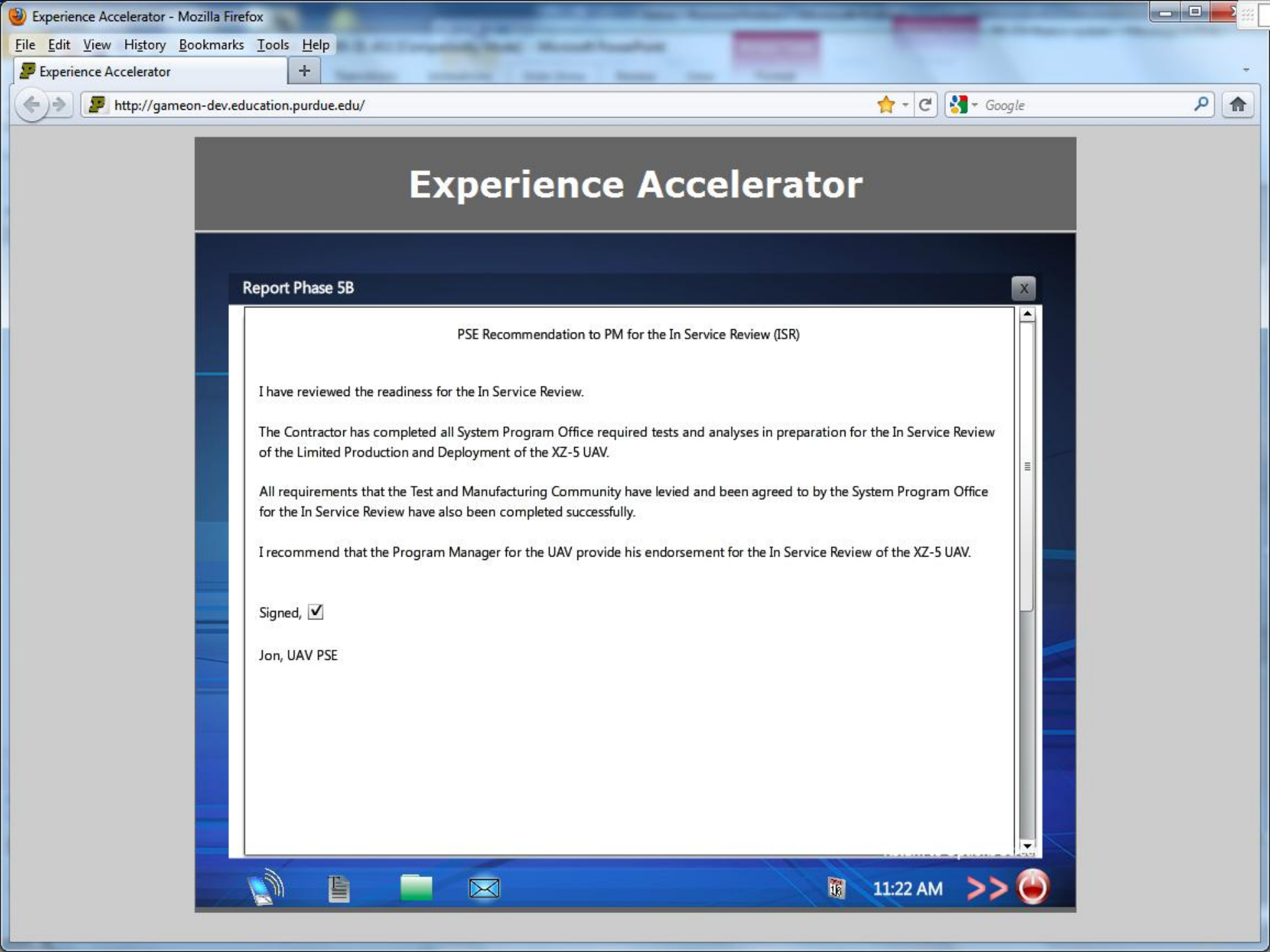
CDR Report
X
The government/industry team held the XZ-5UAV FRR Tue May 31 00:23:11 GMT-0400 2011 at the UAVC plant.
Members from the extended government team, invited subject matter experts, and operational customer representatives attended.
As we discussed during earlier planning meetings, we conducted the meeting as outlined in the Systems Engineering Plan.
The completeness of the subsystem designs was seen to be extremely good.
The quality of the overall system was seen to be exceptionally good.
The range KPP was rated as "green" and good to go.
At the FRR we reviewed every system and subsystem as in the SEP – from schedule, staffing, requirements flow down and allocations, labs and facilities, and the ground station to an early view of sustainment topics.
We accepted some 12 Requests For Action – 2 of them deemed critical by the Executive Review Board; all were classed as within scope, and accepted by the contractor.
We also had 23 Requests For Information – important discussion, but not germane to the FRR.
All-in-all the FRR was a productive meeting, with good dialog all around.
The presentations, minutes, and RFAs together document the FRR.
We plan to meet in about a month to review status on RFAs and other action items.
Once the RFAs are closed, I'll provide a recommendation to close the FRR.
10:26 AM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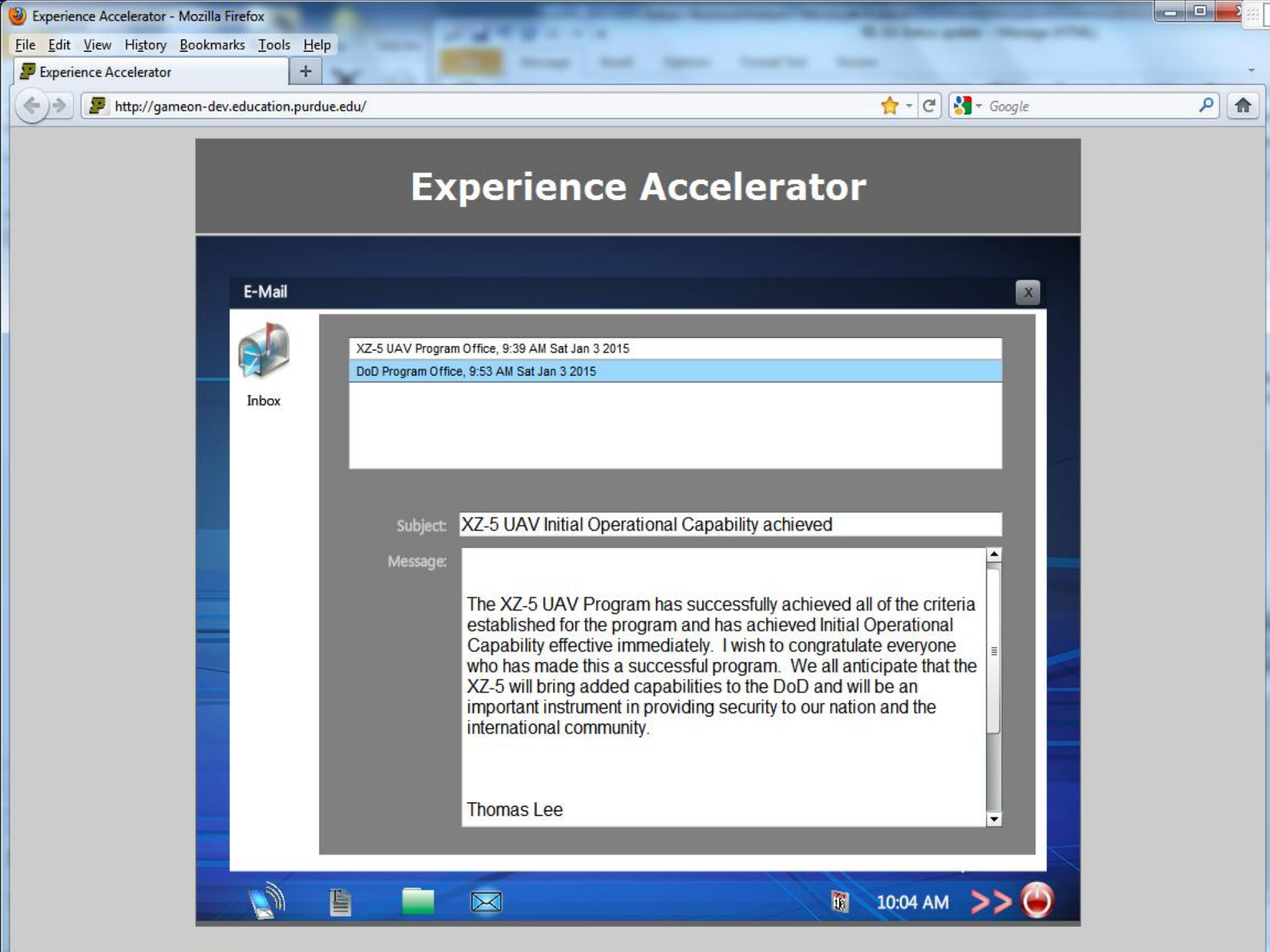
Report Phase 5B
X
PSE Recommendation to PM for the In Service Review (ISR)
I have reviewed the readiness for the In Service Review.
The Contractor has completed all System Program Office required tests and analyses in preparation for the In Service Review of the Limited Production and Deployment of the XZ-5 UAV.
All requirements that the Test and Manufacturing Community have levied and been agreed to by the System Program Office for the In Service Review have also been completed successfully.
I recommend that the Program Manager for the UAV provide his endorsement for the In Service Review of the XZ-5 UAV.
Signed, ☑
Jon, UAV PSE
11:22 AM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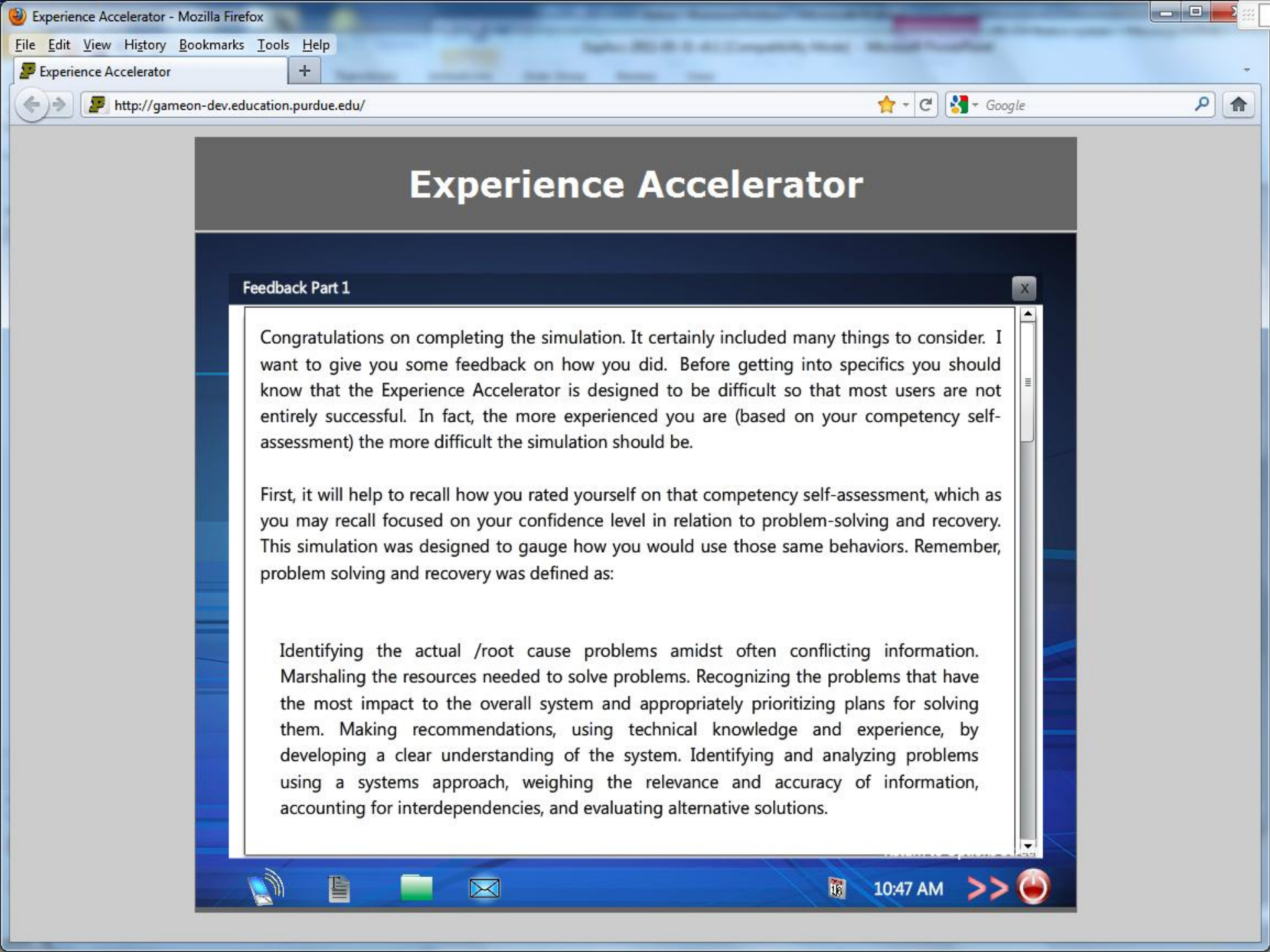
Experience Accelerator
E-Mail
X
Inbox
XZ-5 UAV Program Office, 9:39 AM Sat Jan 3 2015
DoD Program Office, 9:53 AM Sat Jan 3 2015
Subject:
XZ-5 UAV Initial Operational Capability achieved
Message:
The XZ-5 UAV Program has successfully achieved all of the criteria established for the program and has achieved Initial Operational Capability effective immediately. I wish to congratulate everyone who has made this a successful program. We all anticipate that the XZ-5 will bring added capabilities to the DoD and will be an important instrument in providing security to our nation and the international community.
Thomas Lee
10:04 AM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Feedback Part 1
X
Congratulations on completing the simulation. It certainly included many things to consider. I want to give you some feedback on how you did. Before getting into specifics you should know that the Experience Accelerator is designed to be difficult so that most users are not entirely successful. In fact, the more experienced you are (based on your competency self-assessment) the more difficult the simulation should be.
First, it will help to recall how you rated yourself on that competency self-assessment, which as you may recall focused on your confidence level in relation to problem-solving and recovery. This simulation was designed to gauge how you would use those same behaviors. Remember, problem solving and recovery was defined as:
Identifying the actual /root cause problems amidst often conflicting information. Marshaling the resources needed to solve problems. Recognizing the problems that have the most impact to the overall system and appropriately prioritizing plans for solving them. Making recommendations, using technical knowledge and experience, by developing a clear understanding of the system. Identifying and analyzing problems using a systems approach, weighing the relevance and accuracy of information, accounting for interdependencies, and evaluating alternative solutions.
10:47 AM

Questions?

RT16 Experience Accelerator: Discussion & Survey

By
the RT16 Team

NDIA Annual Systems Engineering Conference
October 24, 2011
Hyatt Regency Mission Bay
San Diego, CA
www.sercuarc.org

SYSTEMS ENGINEERING
Research Center

SEEA Prototype Development Questionnaire (1 of 2)

1. Please indicate your level of agreement to the following statements:

	Strongly Agree	Agree	Somewhat Agree	Undecided	Somewhat Disagree	Disagree	Strongly Disagree
The SEEA is useful for my students/employees/peers.	❍	❍	❍	❍	❍	❍	❍
The look and feel of the SEEA is appealing to me.	❍	❍	❍	❍	❍	❍	❍

2. Please indicate the level of importance of each to the success of the project:

	Very Important	Important	Somewhat Important	Undecided	Somewhat Trivial	Trivial	Very Trivial
Competencies	❍	❍	❍	❍	❍	❍	❍
Architecture	❍	❍	❍	❍	❍	❍	❍
Experience design	❍	❍	❍	❍	❍	❍	❍
Design tools	❍	❍	❍	❍	❍	❍	❍
Systems dynamics	❍	❍	❍	❍	❍	❍	❍
Assessment/evaluation	❍	❍	❍	❍	❍	❍	❍
_____	❍	❍	❍	❍	❍	❍	❍
_____	❍	❍	❍	❍	❍	❍	❍

SYSTEMS ENGINEERING Research Center

SEEA Prototype Development Questionnaire (2 of 2)

3. Please indicate the level of support demonstrated for the targeted features:

	Strongly Supported	Supported	Somewhat Supported	Undecided	Somewhat Lacking in Support	Not Well Supported	Not at all Supported
Competencies	❍	❍	❍	❍	❍	❍	❍
Architecture	❍	❍	❍	❍	❍	❍	❍
Experience design	❍	❍	❍	❍	❍	❍	❍
Design tools	❍	❍	❍	❍	❍	❍	❍
Systems dynamics	❍	❍	❍	❍	❍	❍	❍
Assessment/evaluation	❍	❍	❍	❍	❍	❍	❍
_____	❍	❍	❍	❍	❍	❍	❍
_____	❍	❍	❍	❍	❍	❍	❍

4. If I could change one thing about the SEEA, I would:

5. The best thing about the SEEA prototype is:

6. I am interested in being contacted about participating in:

The SEEA pilot	❍ Yes	❍ No	
SEEA open source development	❍ Yes	❍ No	**Contact Name:** _____
Contributing tools/technology	❍ Yes	❍ No	**Contact Email:** _____

Questions?

SYSTEMS ENGINEERING
Research Center

Join the Experience Accelerator Team!

Contact for information:

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