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Discovering Agile SE Process Fundamentals at INCOSE

Presented to:

INCOSE Southern Arizona Chapter and

University of Arizona Student Chapter

23-Feb-2016

Rick Dove, INCOSE Fellow
Chair: Agile Systems & Systems Engineering WG

NOTE: This meeting will be recorded

Discovering Agile SE Process Fundamentals at INCOSE, with Review of 2015 Enchantment Chapter Operations

Abstract: This talk will brief fundamental architecture and design principles underlying any system or process that would be agile – able to deal effectively with operational environments that are unpredictable, uncertain, risky, variable, and evolving. He will brief the INCOSE project that is discovering Agile System Engineering Life Cycle Model fundamentals in fifteen 3-day workshops in the US and Europe, which is analyzing agile SE processes of many kinds for underlying agile-enabling principles. Preliminary findings from the four 2015 workshops will be discussed, an intro to the Agile Systems & Systems Engineering working group will be provided, and a 2015 Enchantment Chapter operations and experiments will be briefly reviewed.

Bio: Rick has entrepreneurial founder and management experience in all C-level positions, and has dispatched a variety of interim executive problem-solving and program-management assignments in established organizations.

He was Co-Principal Investigator on the 1991 Lehigh study funded by the US Department of Defense that introduced the concepts of agile systems and enterprises, and led the subsequent DARPA-funded collaborative research during the nineties that established basic system fundamentals for agile systems of all kinds.

He is an INCOSE Fellow, 2015 president of the INCOSE Enchantment Chapter (New Mexico), and chairs the INCOSE working groups for Agile Systems and Systems Engineering, and for System Security Engineering. He is CEO/CTO of Paradigm Shift International, an applied research firm specializing in agile systems concepts and education, and leads agile self-organizing system security research and development on US DHS and OSD funded projects.

Rick is an adjunct professor at Stevens Institute of Technology, where he develops and teaches basic and advanced graduate courses in agile systems and systems engineering. He holds a BSEE from Carnegie Mellon University.

Agenda

Architecture and design principles for agility

Intro to Agile Systems & SE working group

ASELCM project and preliminary findings

39 discussion slides – max 40 minutes hopefully

Collaboration on chapter operating practices afterwards?

News:

- **Enchantment Chapter Oct/Nov 2-day 8-topic workshop at NM Tech in Socorro.**
- **Enchantment has archive of recorded Chapter Meetings at: www.incose.org/ChaptersGroups/Chapters/ChapterSites/enchantment/library-and-resources**
- **Sign up for Enchantment Chapter meeting announcements "info list": mlcompt@sandia.gov**
- **Sign up for Agile Systems and SE WG announcements: rick.dove@parshift.com**

Fundamentals of Agility in Systems and Engineering Processes

The UURVE Environment Drives Need for Agility
for both agile systems and agile systems engineering

Agile systems have effective situational response options, under:

- **Unpredictability: randomness among unknowable possibilities.**
- **Uncertainty: randomness among known possibilities with unknowable probabilities.**
- **Risk: randomness among known possibilities with knowable probabilities.**
- **Variation: randomness among knowable variables and knowable variance ranges.**
- **Evolution: gradual (relatively) successive developments.**

But agility doesn't occur unless someone actively:

- **is aware that a situation warrants a response**
- **has options appropriate for a response**
- **selects and affects an appropriate response**

Minds-on hands-on full and timely engagement.

How We Know What We Are Talking About

Darwin didn't have a model of evolution that he tried to prove or force fit. He observed, and asked, "What's going on here and how does it work?"

From that he iterated on model refinement until he could find no exceptions and could make effective predictions. That's science, not conjecture, not a kinda good idea, not opinion.

Similarly…

We analyzed hundreds of real-world systems that exhibited agility, asked how they did that, and converged on a model that fit the facts. No conjecture, no kinda good idea, no opinion.

Agile System History Perspective

Agile manufacturing systems - 1991

Agile enterprise Systems - 1992

Agile CCRP C2 - 1996

Software development – 2001 (with predecessor work, e.g., Spiral, etc)

Military as agile enterprise - 2013

Systems engineering becomes a focus - 2015

Webster Sets the Context

Agile: adjective.

1) quick and well coordinated in movement; nimble.

2) active, lively.

3) marked by an ability to think quickly; mentally acute or aware.

Agility: noun.

Agile Manifesto authors are upset with the noun usage of *Agile,* which refers to a family of software development procedures that have little to do with agility, by their now-vocal reckoning.

Dave Thomas. 2014. Agile is dead (long live agility).
http://pragdave.me/blog/2014/03/04/time-to-kill-agile/

Andy Hunt. 2015. An Experiment: The GROWS Method.
www.infoq.com/articles/grows-method-experiment

American Football is Agility in Action

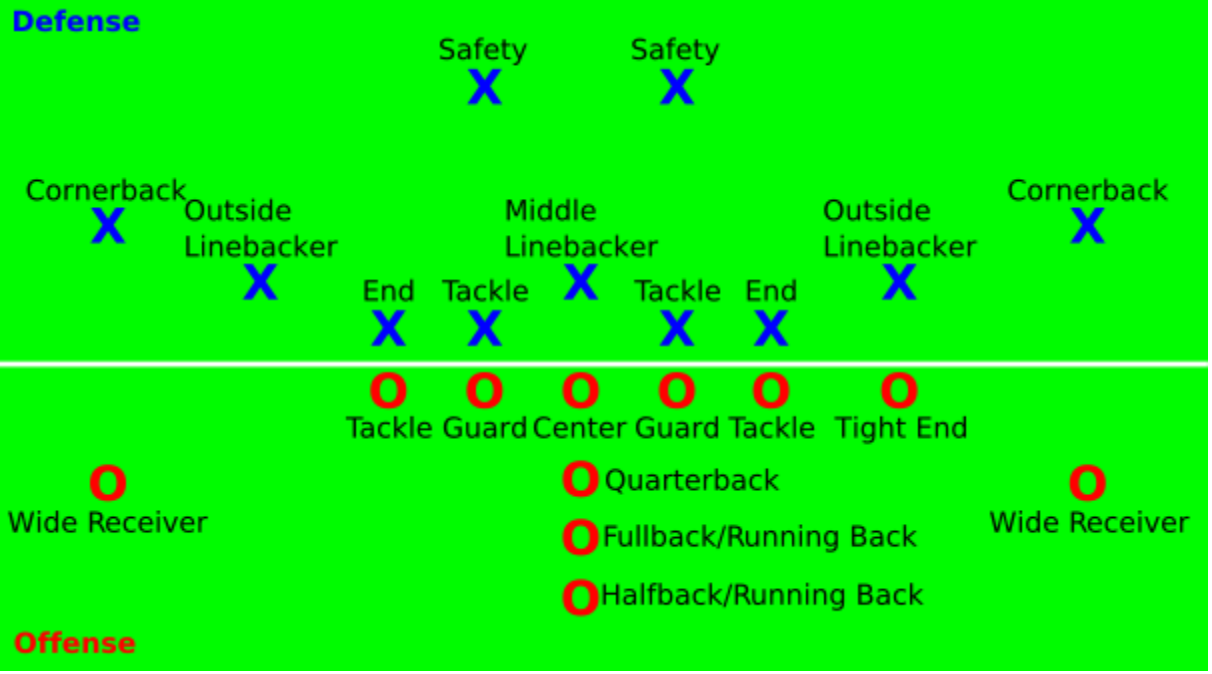
Operational Environment

- **Unpredictability (injury)**
- **Uncertainty (composition of opposing team on game day)**
- **Risk (impaired team-work day)**
- **Variation (weather)**
- **Evolution (team competencies)**

Dynamic game situations require certain response capabilities, e.g.

- **Creating a tailored game plan for each game**
- **Improving opponent-evaluation accuracy**
- **Migrating pre to post salary cap rule, and now concussion concerns**
- **Modifying game plan strategy, replacing Troy Polamalu (Steelers)**
- **Correcting on-field competitive mismatch in specific position**
- **Varying defense-offence competitive strength balance**
- **Expansion/contraction range of player-position depth of 2-4 minimum**
- **Reconfiguring mix of 11-on-field frequently**

Performance quality is determined
by degree of engagement of every team member at every moment



American Football

http://football.about.com/od/footballpositions/Football_Positions.htm

11 players on field per side

Offensive positions:
8 with some pairs
Defensive positions:
6 with many pairs
Special teams positions:
7 with some multiples

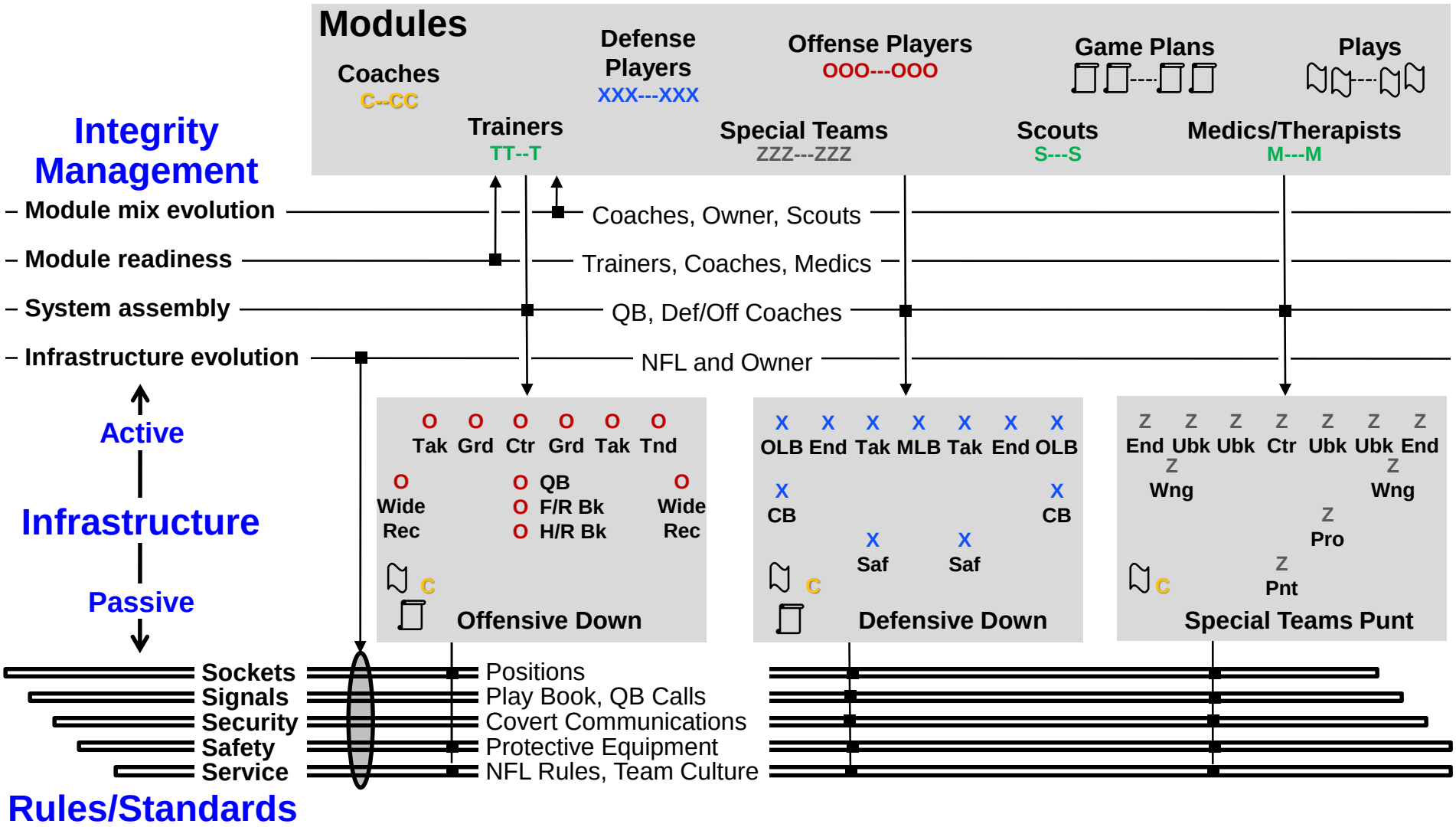
Adaptation is an immediate, appropriate, different response in functionality. This can only occur if functional resources can be added, modified, or reconfigured quickly. A good sports team has more players than it fields at any one time, so that the coach can mix and match the players' skill-sets according to the opposition, the situation, and real-time developments.

Reconfiguring a sports team with different players during game time doesn't work, though, if players bring their own rules with them. The players all know the rules of the game and they all know their team's playbook. The coach exercises a drag-and-drop, plug-and-play operational strategy enabled by an actively managed team-system structure. Complex system behaviors arise from the interactions of simple rules. Were this not the case, it would be impossible to sustain complex behavior in the face of increased opportunities for failure.

Fundamental Agile Architecture Pattern (AAP)

Drag-and-drop modules in a plug-and-play infrastructure

Details in www.parshift.com/s/140630IS14-AgileSystemsEngineering-Part1&2.pdf



Agile Architecture Pattern in Text Form

Game-Time Drag-and-Drop Resources

- **Defensive Players, Offensive players, Special teams players**
- **Coaches, Trainers, Scouts, Medics/Therapists**
- **Play Book Plays**
- **Game Plan Elements**

Active Infrastructure Sustainability-Responsibilities

- **Module Mix Evolution: Coaches, owners, scouts**
- **Modules Readiness: Trainers, coaches, medics/therapists**
- **System Assembly: Quarter back, defensive/offensive coaches**
- **Infrastructure Evolution: NFL rules, team culture**

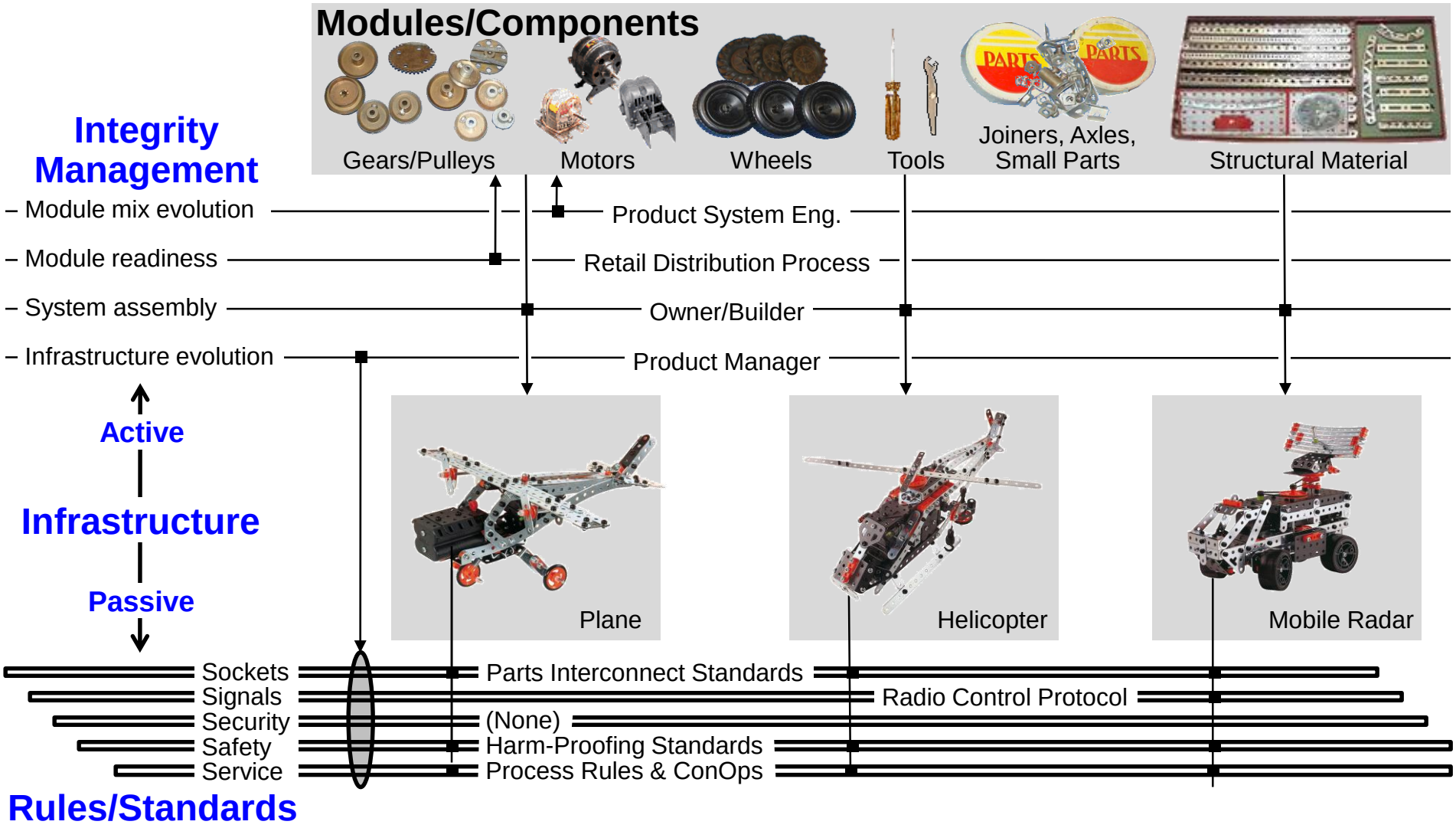
Plug-and-Play Rules in Passive Infrastructure

- **Sockets: Play positions**
- **Signals: Play book, QB calls**
- **Security: Covert communications**
- **Safety: Protective equipment**
- **Service: (ConOps) NFL rules, team culture**

Notional Concept: Agile Architecture Pattern (AAP)

System Response-Construction Kit

Details in www.parshift.com/s/140630IS14-AgileSystemsEngineering-Part1&2.pdf



Process Agility is Sustained by Four Active-Engagement Responsibilities

Module Mix Evolution Responsibility:

- **Timely awareness of new/pending needs.**
- **Effective modification/augmentation of drag-and-drop asset modules.**

Module Readiness Responsibility:

- **Effective maintenance of modules ready for use when needed.**

Response-System Assembly Responsibility:

- **Effective configuration/reconfiguration of response-system modules.**

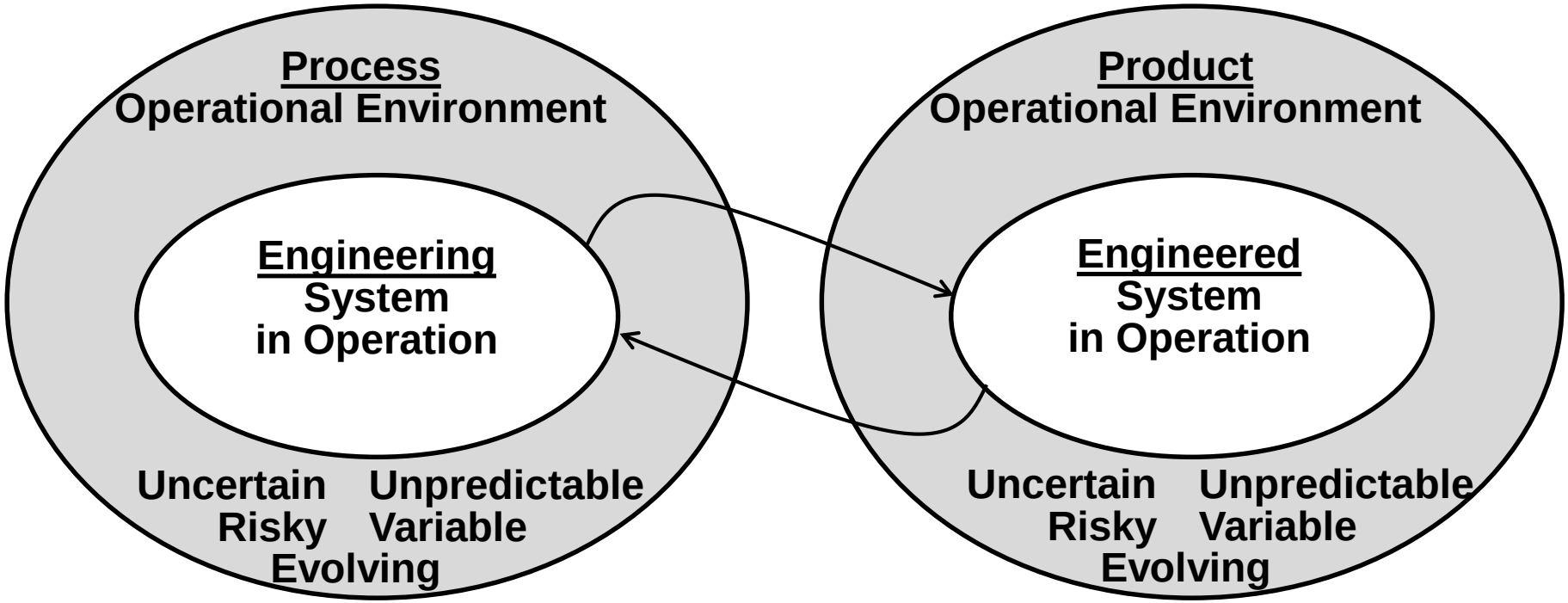
Infrastructure Evolution Responsibility:

- **Effective modification/augmentation of plug-and-play interface rules.**
- **Effective modification/augmentation of Concept of Agile Operations.**


Lean will straighten it out


Agile
will roll
with it.

Two different operational environments defining necessary agile counterpoint for the systems they encompass



It is counterproductive to have an agile development process if you don't have an agile product architecture

Agile SE Working Group Charter

Mission:

To identify and develop a body of knowledge that will inform systems engineering and related processes which require agile system capability.

Goal: **Fundamental SE concepts and principles supported with application examples that enable Agile Systems-Engineering processes.**

Goal: **Fundamental SE concepts and principles supported with application examples that can inform Agile Acquisition processes.**

Goal: **Fundamental SE concepts and principles supported with application examples to inform supplier design of Quick Reaction Capability (QRC).**

Goal: **Fundamental SE concepts and principles that can inform the design of Agile Systems that can respond effectively to the pace of technology, changing requirements, and user expectations.**

Notes:

- **Initial charter hasn't been changed since 2013 IW kickoff meeting.**
- **Charter will be reviewed/updated in 2016.**

Status of All Agile Systems & SE WG Projects

Webinars	Persistent
– 2012 Sep INCOSE Webinar – Agile 101: Architecture Fundamentals	Done
– 2013 Sep INCOSE Webinar – Agile 102: Requirements Fundamentals	Done
– 2014 Sep INCOSE Webinar – Agile 103: Design Fundamentals	Done
– 2015 Jan Town Hall – Agile SE Life Cycle Model Fundamentals Project	Done
– 2015 Apr Webinar – Natural-System Patterns for SEing of Agile Self Organizing Security	Done
– 2015 Sep INCOSE Webinar – Agile 104: Quality Fundamentals	Done
– 2016 Sep INCOSE Webinar – Agile 105: Operational Awareness, scheduled for 16-Sept 2015 (Dove)	WIP
Projects (Knowledge Development):	Persistent
– Agile Collaborative Knowledge Development for Working Groups, POC: Rick Dove	WIP
– Decision Guidance for Applying Agile SE, POC: Ron Lyells, Mile Coughenhour	WIP
– CAB Agile SE Priority Team IW/IS workshop facilitation, POC: Rick Dove	Ongoing
Product (Is or will be INCOSE product-publication):	Persistent
– SE Handbook Section 9.9: Agile Systems Engineering – Published in July 2015	Done
– Agile Systems Engineering Life Cycle Model Fundamentals, POC: Rick Dove	WIP
Papers, Panels, Tutorials	Persistent
– IS14 Papers: 3 papers (Rosser/Marbach/Osvalds/Lempia) and 2 by (Dove/LaBarge)	Done
– IW15 Tutorial: Modeling Agile Systems and Agile Systems Modeling (Dove/Schindell)	Done
– IS15 Paper: Do Teams Using Agile Methodology Need Modeling (Osvalds/Lempia)	Done
– IS15 Paper: Principles for Agile Development (Marbach/Rosser/Osvalds/Lempia)	Done
– IS15 Paper: Adaptive Knowledge Encoding for Agile Cybersecurity Operations (Willett/Dove)	Done
– IS15 Panel: Converging on Agile SE Priorities for INCOSE (Dove/deLamare/Kemp/Lyells/Roedler)	Done
– IS15 Tutorial: Designing Agile Systems and Agile SE Processes (Dove)	Done
– IS16 Paper: ASELCM Case Study: SSC Pacific Unmanned Systems Group (Dove/Schindel)	Submitted
– IS16 Paper: Intro to the Agile Systems Engineering Life Cycle MBSE Pattern (Schindel/Dove)	Submitted
– IS16 Paper: Adaptable Pairing as an Agile SE Knowledge Management Practice (Leroux/Dove)	Submitted
INSIGHT Publications:	Persistent
– 2014-Q2, Theme Issue: Agile-Systems Engineering & Agile Systems-Engineering	Done
– 2015-Q2, Article: Practitioner Attention to Systems Engineering Delivery of Sustainable Value	Done
– 2016-Q2, Theme Issue: Agile Security – Joint project with Agile SE working group, POC: Rick Dove	WIP
Collaborations: Pattern-Based SE WG, Complex Systems WG, Health Care WG	WIP
Sessions & Tracks at Non-INCOSE Conferences	Persistent
– 2014 Oct, NDIA SE Conference: Domain Independent Agile SE Life Cycle Model Project	Done
– 2015 Jan, ITEA El Paso Conference: INCOSE Project – Agile SE Life Cycle Model Fundamentals	Done
– 2015 Jun 16-19, ICCRTS Symposium Proceedings, Agile C2 Security Track (3 papers)	Done

Education

INCOSE Webinars: https://connect.incose.org/Library/Pages/default.aspx

Agile Systems 101 – System & Process Architecture Pattern	**Sept 2012**
Agile Systems 102 – System & Process Design Requirements	**Sept 2013**
Agile Systems 103 – System & Process Design Principles	**Sept 2014**
Agile Systems 104 – System & Process Engagement Quality	**Sept 2015**
Agile Systems 105 – System & Process Operational Awareness	**Sept 2016 (wip)**

Key IS14 Papers:

- **Fundamentals of Agile-Systems Engineering – Part 1**
- **Fundamentals of Agile Systems-Engineering – Part 2**

www.parshift.com/s/140630IS14-AgileSystemsEngineering-Part1&2.pdf

Key IS16 Papers:

- **ASELCM Case Study: SSC-Pac Unmanned Systems Group (Dove/Schindel)**
- **Agile Systems Engineering Life Cycle MBSE Pattern (Schindel/Dove)**

(links await March-30 final-submission completion)

1-day and 2-day Tutorials are available

Discovering Fundamentals of an Agile Systems Engineering Life Cycle Model (ASELCM)

4 workshops completed in 2015
5 workshops planned in 2016

The Time Has Come

INCOSE Vision 2025 Elements

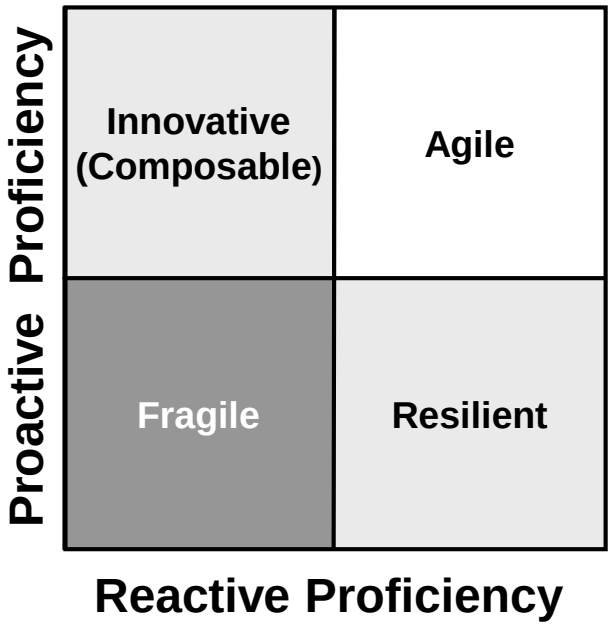
- ❑ Resilient Systems
- ❑ Composable Design
- ❑ Adaptable and Scalable Methods

Top Five INCOSE CAB Priorities:

1) SE Professional development
2) Agile/Expedited methods
3) Effective Trade Studies
4) Product lines, re-use
5) Better Value proposal for INCOSE and SE

CAB: Corporate Advisory Board

Proactive
Innovative/Composable
Creates Opportunity
Takes Preemptive Initiative



Reactive
Resilient
Seizes Opportunity
Mitigates Adverse Events

INCOSE Project: Agile SE Life Cycle Model Fundamentals

Addressing SE UURVE: Uncertainty, Unpredictability, Risk, Variation, Evolution.

Objectives – Identified/justified necessary & sufficient fundamentals:

- **That can be intuitively embraced and applied.**
- **Compatible with 15288, any agile SE process, & existing organizational cultures.**

~Fifteen 3-day "discovery" workshops in US and Europe 2015/2016/2017.

- **Workshop Hosts in defense and commercial sectors.**
- **Analyze SE processes dealing with UURVE in mixed HW/SW/FW projects.**
- **Apply action-learning to SE process challenges in need of (more) agility.**
- **Workshop Hosts must send 2 participants to 2 other-Host workshops.**

Products

1. **Case studies of each analyzed SE process.**
2. **Technical guidance report describing a generic Agile SE Life Cycle Model. The model will provide insightful support rather than supplant common agile systems-and-software SE processes.**
3. **Supplemental guidance for application and/or tailoring of SE processes contained in ISO/IEC/IEEE 15288 (potential future Annex or part of guides) and INCOSE SE Handbook.**

Strategy

With a structured analysis approach, analyze experience from employed agile SE practices in both defense and commercial SE projects that involve combined aspects of software, hardware, and wetware (management, engineering, operator, maintainer). Management includes supplier and acquirer project management aspects.

- **Discover and justify ("why" reasoning) common necessary and sufficient agile SE needs and reality factors, independent of what agile SE practice may be entrenched, favored, under consideration, or subsequently adopted.**
- **Discover and justify ("why" reasoning) principle-based stages, processes, and activities that satisfy the project objectives.**

With a structured synthesis approach, apply discovery and provide benefit to workshop hosts and participants with an application of accumulated learning to a relevant host opportunity or problem.

Reality check: We don't solve the Host challenge at this workshop, but we do cause actionable thought. Values to Host come from workshop preparation, thoughtful engagement in the workshop, attendance at minimum-two additional workshops, and eventual Case Study co-authored development.

Case Study - IS16 Paper

Title: Agile SE Process Features Collective Culture, Consciousness, and Conscience at SSC Pacific Unmanned Systems Group

Abstract. SPAWAR System Center Pacific (SSC) in San Diego has established an Unmanned System Integration, Test, and Experimentation (UxSITE) capability to facilitate agile development of unmanned systems.

This capability utilizes a unique agile systems engineering process with 6-month overlapping "waves" consisting of four phases: development by multiple-subcontractors, and operational management of systems architecture evolution, capability integration, and validation testing.

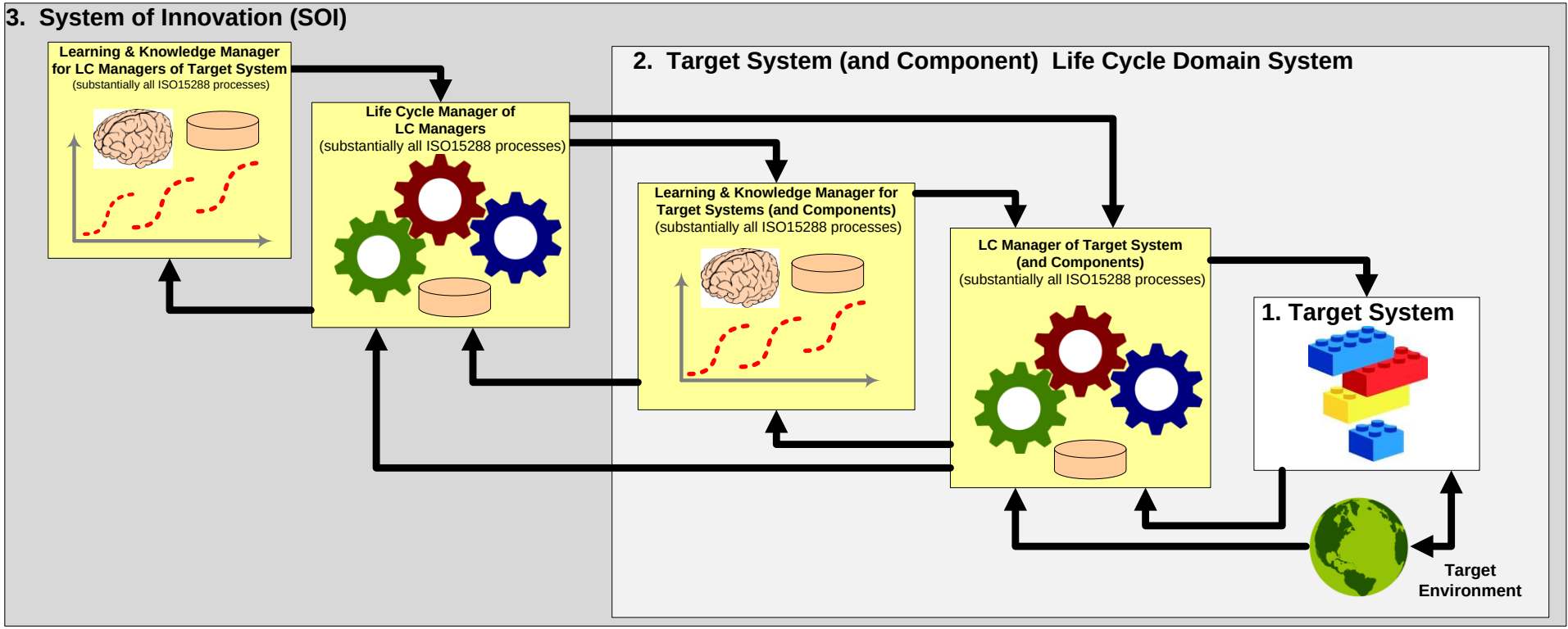
The UxSITE capability supports a portfolio of projects, and has three years of respected and effective results.

Most notably, the process puts a prime emphasis on enabling and facilitating team effectiveness by creating:

- **an embraced culture of engagement,**
- **a collective consciousness emerging from comprehensive real-time information support, and**
- **a team conscience, on a mission for the customer.**

Notable process concepts

- Common process spanning a portfolio of projects.
- Retained architecture ownership.
- Systems engineering structured as a Wave-model-inspired evolutionary process.
- Continuous integration with comprehensive regression testing.
- Clear unambiguous roles and responsibilities.
- Common culture embracing development contractors.
- Ubiquitous real-time shared awareness.
- A sense of personal mission.
- Quality-of-engagement sensitivity.
- Distributed test threads and continuous risk management.
- Comprehensive stake-holder involvement.



Notional Relationships of Systems 1, 2, and 3. (additional IS16 paper)

Squirrely Environment

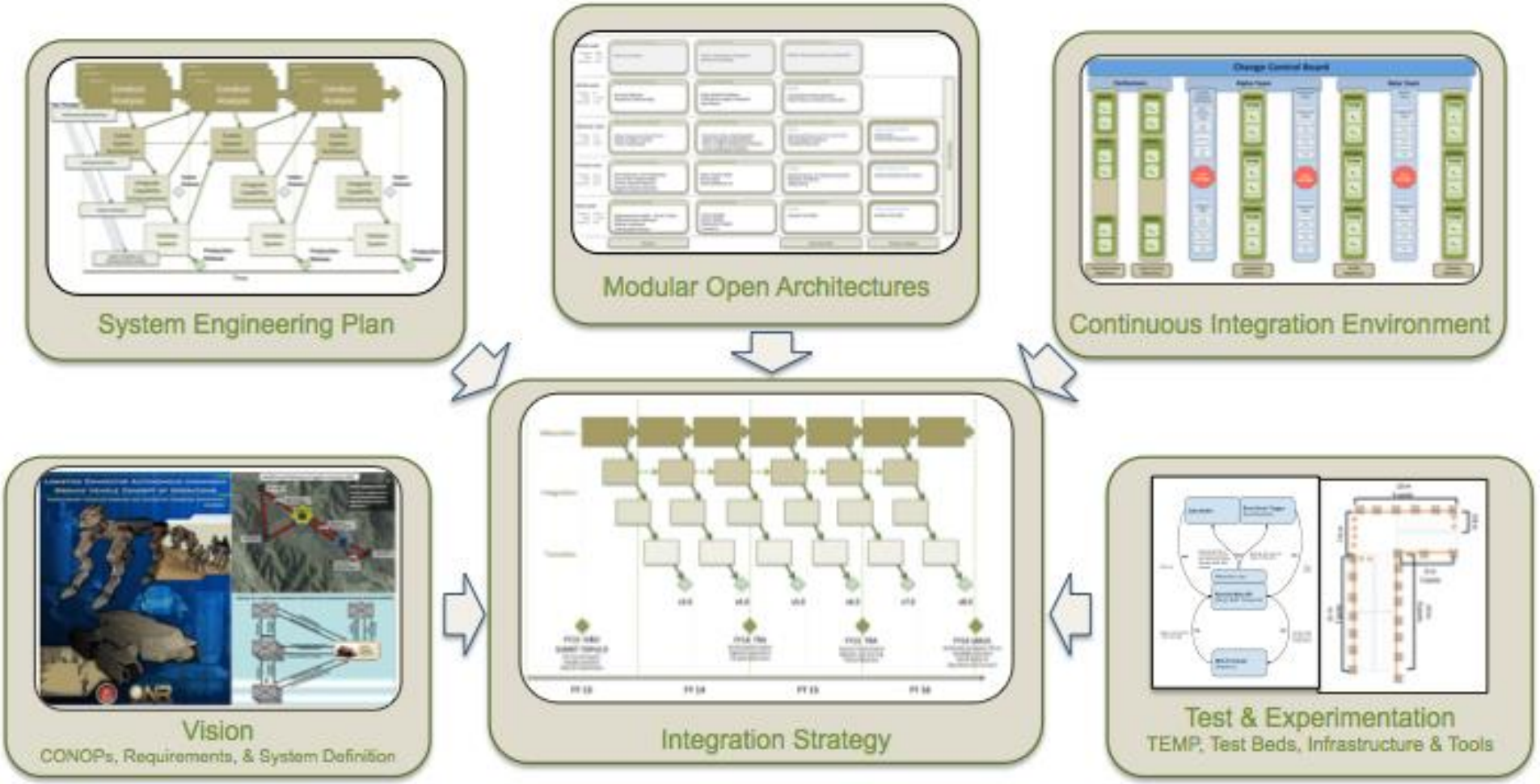
Unpredictability (unknowable situations):
- **Strategic realignment by sponsor.**
- **Changes in and/or availability of key personnel and development contractors.**

Uncertainty (randomness with unknowable probabilities):
- **Feasibility of technical approach and initial designs.**
- **Contracting issues. funding gaps, and budget short falls.**

Risk (randomness with knowable probabilities):
- **Failure to meet technical performance measures.**
- **Maturation and integration of required component technologies.**

Variation (knowable variables and variance ranges):
- **Availability of test ranges and test support, and obtaining requisite approvals.**
- **Reliability, Availability, Maintainability (RAM) of vehicle test-beds (vehicle, sensor, computing hardware, cables, connectors).**

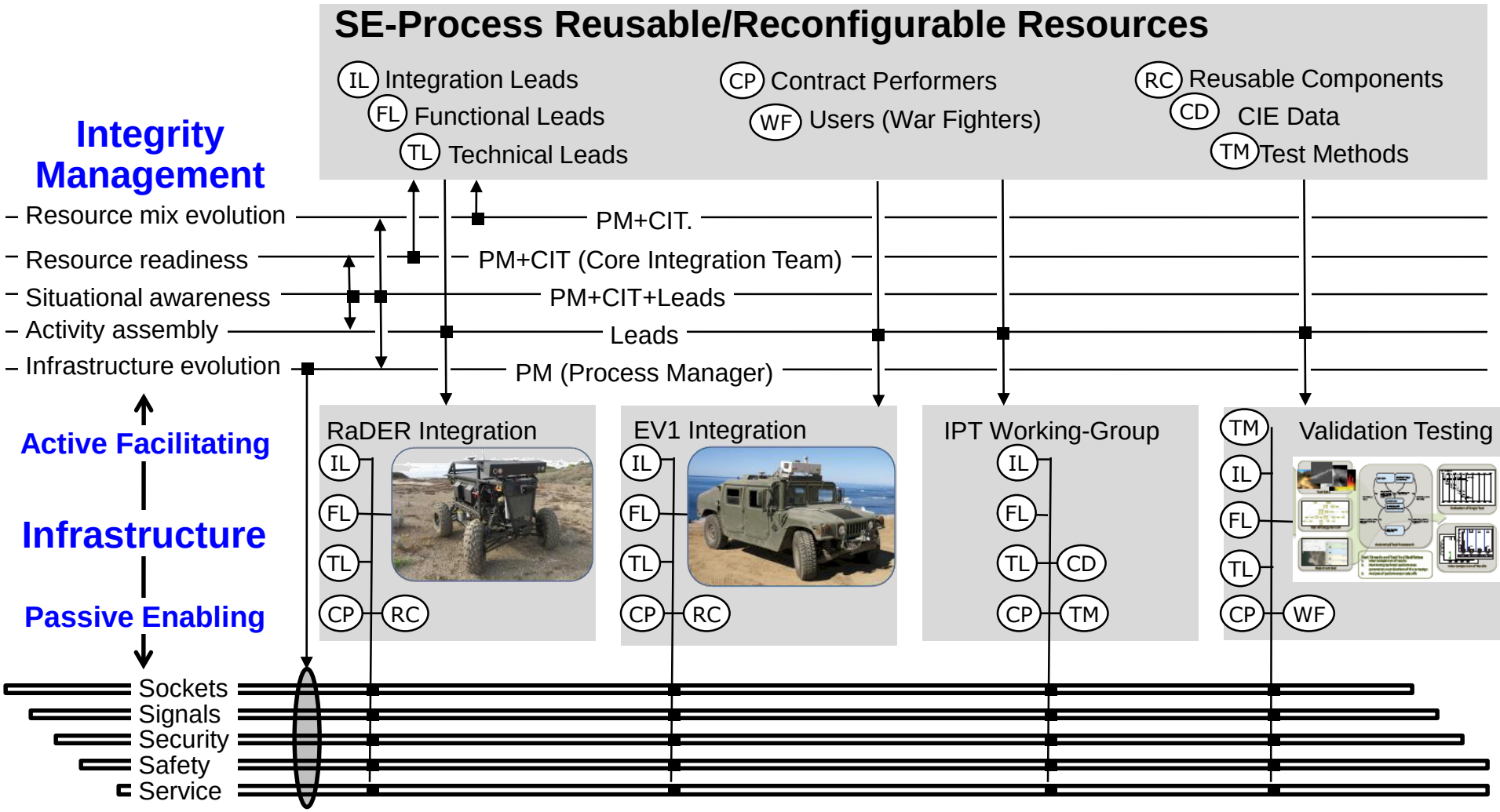
Evolution (gradual successive developments):
- **Changes in technical landscape and insertion of emerging technology.**
- **Changes in programmatic objectives and stakeholder's requirements (scope creep).**



The five elements contributing to the Integration Strategy

- Vision
- Systems Engineering Plan
- Modular Open Architecture
- Integration Test and Experimentation Master Plan
- Continuous Integration Environment

Agile-process architecture depicting four example process-activity configurations assembled from drag-and-drop assets in conformance with the rules and standards of the plug-and-play passive enabling infrastructure.



Rules/Standards

Sockets: CIE, System-1 modular architecture, Roles, Culture
Signals: Vision, Config Mgmnt Plan, Strategy Chart, System definition artifacts, CIE data, Team feedback
Security: User agreement/NDA, Config Mgmnt Plan, CIE access controls
Safety: Open process, Open communication, CIE information access
Service (SE ConOps): Vision, Culture, Integration Strategy, CIE, SE Plan, Wave model, Modular System-2 architecture

Concluding Remarks

…

Put in larger perspective, the SoS Wave Model is one of five elements that comprise the total Integration Strategy. Collectively these five elements are the face of the UxSITE* capability.

But that face doesn't reveal the heart and sole of the process, the essence of its unique identity. The power of the UxSITE* capability emerges from a core focus on team effectiveness: creating and sustaining a culture of engagement, a collective consciousness, and a shared conscience.

Nobody in the SSC-Pac Unmanned Systems Group explicitly articulated this core focus on culture, consciousness, and conscience during the three-day analysis workshop conducted there; but as outsiders trying to understand what was happening and why it was working, we could see the forest while they were describing the trees.

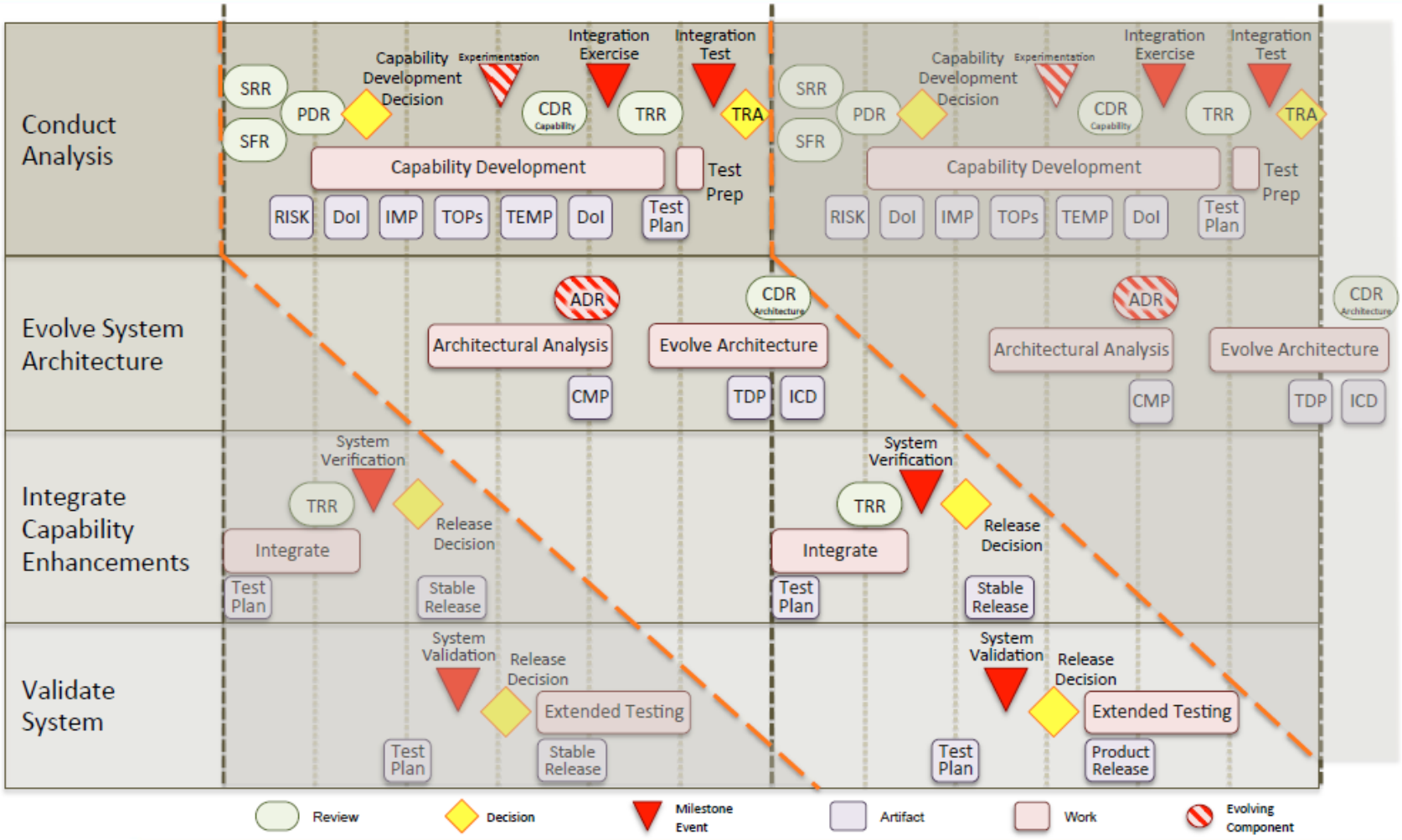
These three core concepts, as a foundation for powerful agile systems engineering capability, are not tied to the context or environment of the SSC-Pac Unmanned Systems Group. They are transportable concepts, though the soft skills currently needed for implementation may impede uptake.

***UxSITE: Unmanned System Integration, Test, and Experimentation**

SSC-Pac Unmanned Systems Group, San Diego, CA Aug 6-8, 2015

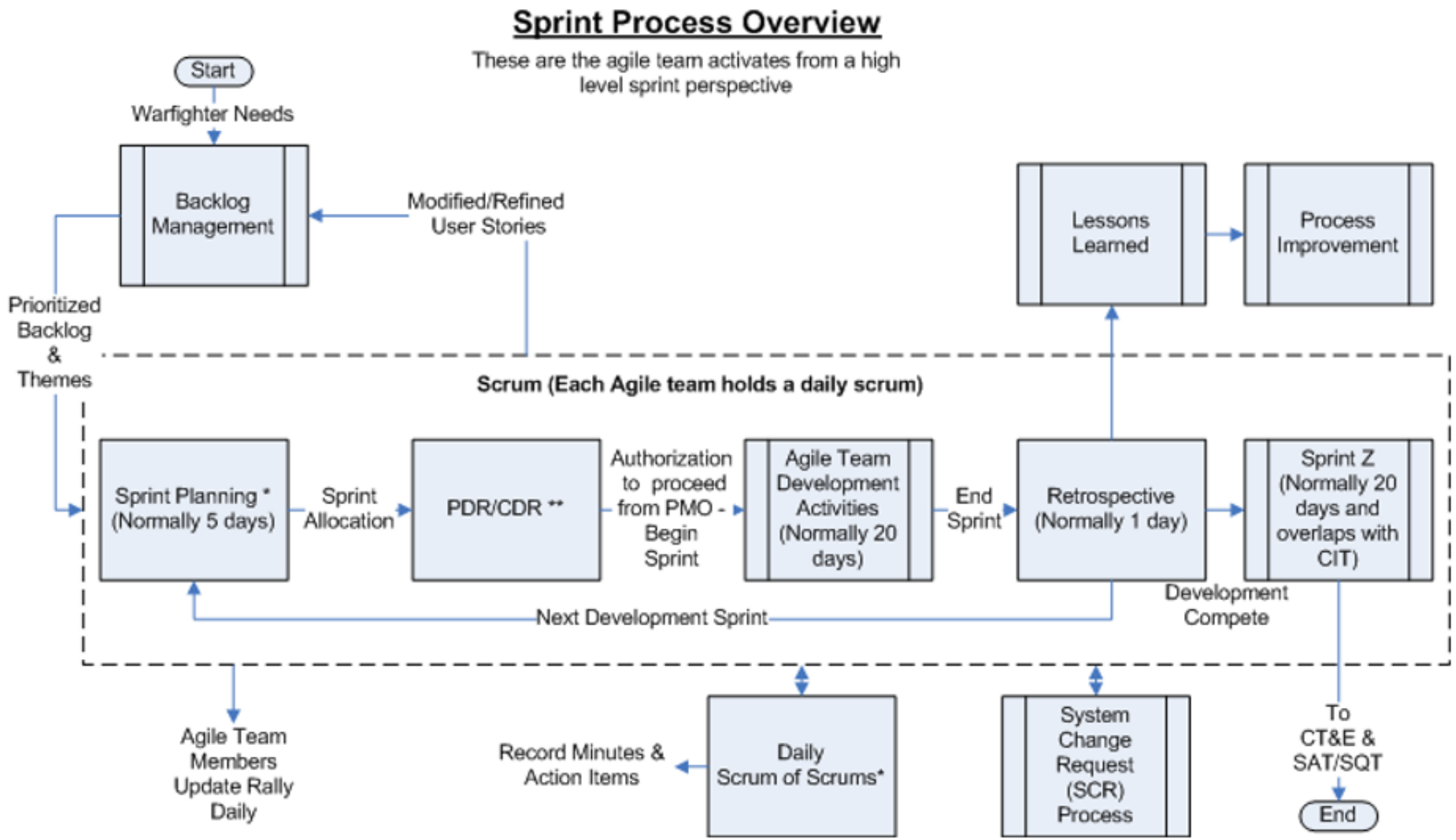
SPAWAR Systems Center PACIFIC

Integration Strategy Chart



Sprint Process Overview

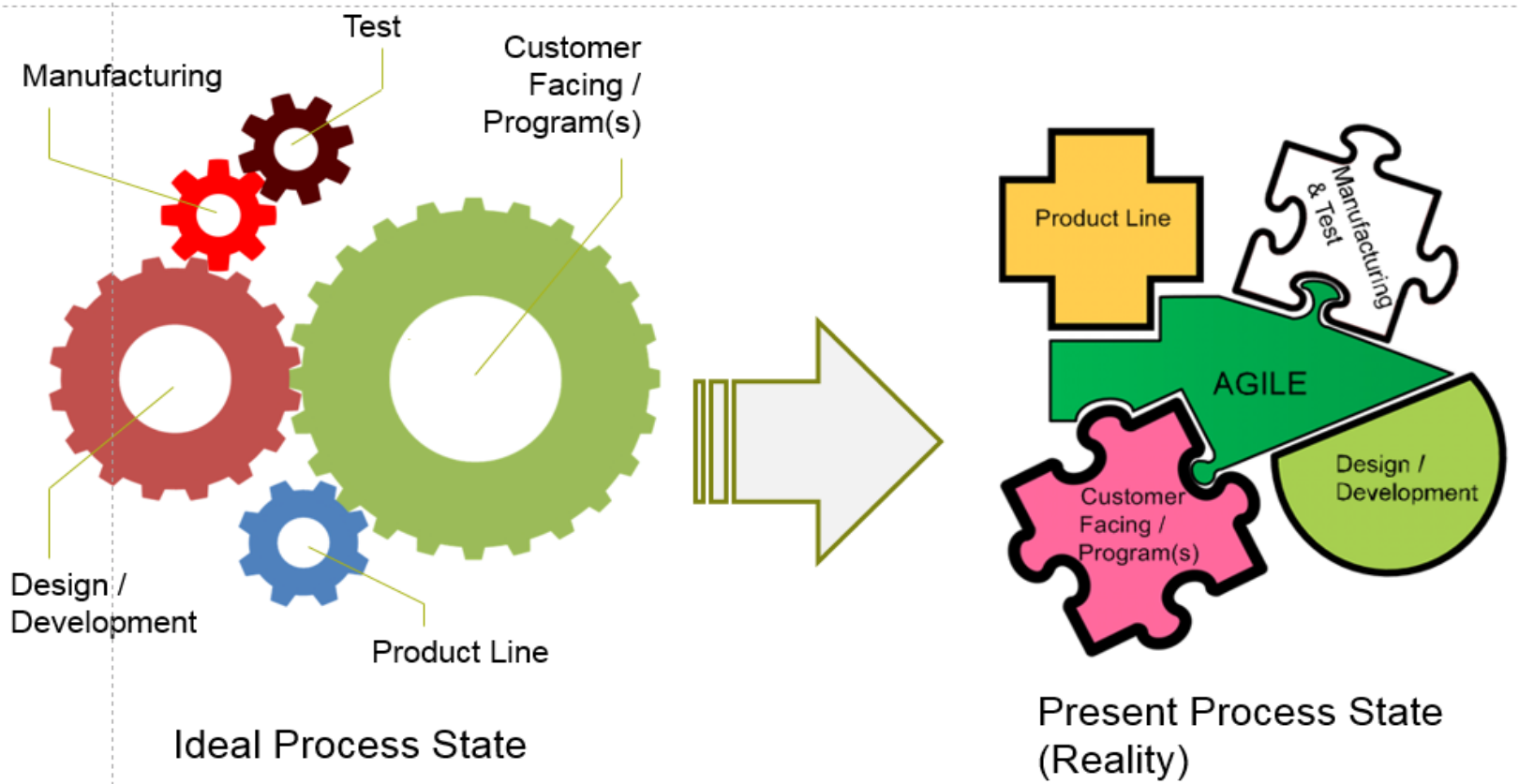
NORTHROP GRUMMAN



4 sprints per 6-mo delivery cycle

Rockwell Collins

Being agile involves building adaptable relationships to manage through UURVE….



Enables Dynamic Coupling Internally and Loose Coupling Externally

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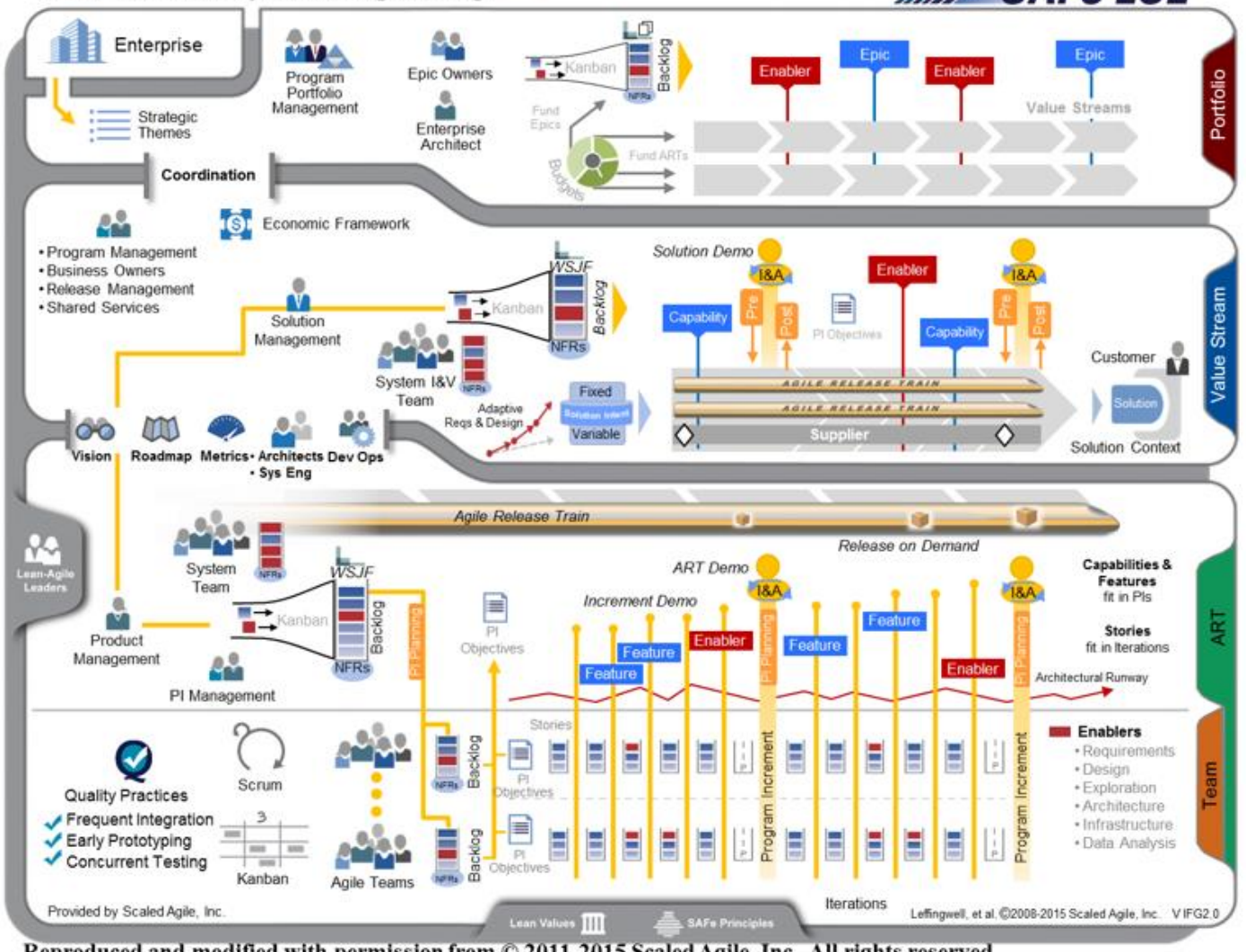
Tailored SAFe® Big Picture

SAFe® for Lean Systems Engineering

SAFe LSE



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WIP Characterizations (Subject to Change)

SSC-Pac
- Proven process success
- Product portfolio architecture leveraging reusable resources
- Driven by quality of results over process dogma/conformance (evolve process as necessary)
- Explicit awareness and management of cooperative engagement behavior (team culture)
- Explicit real-time knowledge management and assimilation (team consciousness)
- Explicit focus on delivering meaningful value to customers (team conscience)

NGC
- Proven process success
- Mitigation of uncontrolled System-of-System environment (12 independent systems change at will)
- Real-time re-prioritization of 6-month deliverable objectives (as security imperatives occur randomly and frequently with immediate attention required)
- Explicit partner (customer) risk allocation and task prioritization
- Explicit Scrum-of-Scrum management (multiple Scrum teams)
- Explicit DevOps integration
- Explicit environmental awareness & mitigation responsibilities (look ahead on pending resource obsolescence, and pending security issues)

RC
- Proven partial-process success, still evolving integrated process agility
- Product Line architecture and engineering
- Explicit infrastructure with reusable resources for combined HW/SW/FW development
- Explicit focus on stake-holder relationship facilitation & management
- Explicit continuous market alertness and awareness

Lockheed
- Early partial-process success, still evolving general process agility
- SAFe tailored for Lockheed project portfolio and contract nature
- Appreciation of constraints imposed on SAFe proprietary IP utilization
- Appreciation of information debt in addition to technical debt
- Appreciation of need for management engagement
- Explicit ASE assimilation in a cooperative defense acquisition environment

Emerging Project Sensemaking

Push vs Pull

A very key lesson we learned at the SSC-Pac workshop was the power of a "pull" approach. Chris Scrapper designed his process to fit his problem. He didn't come to the party with Scrum or Wave in his pocket.

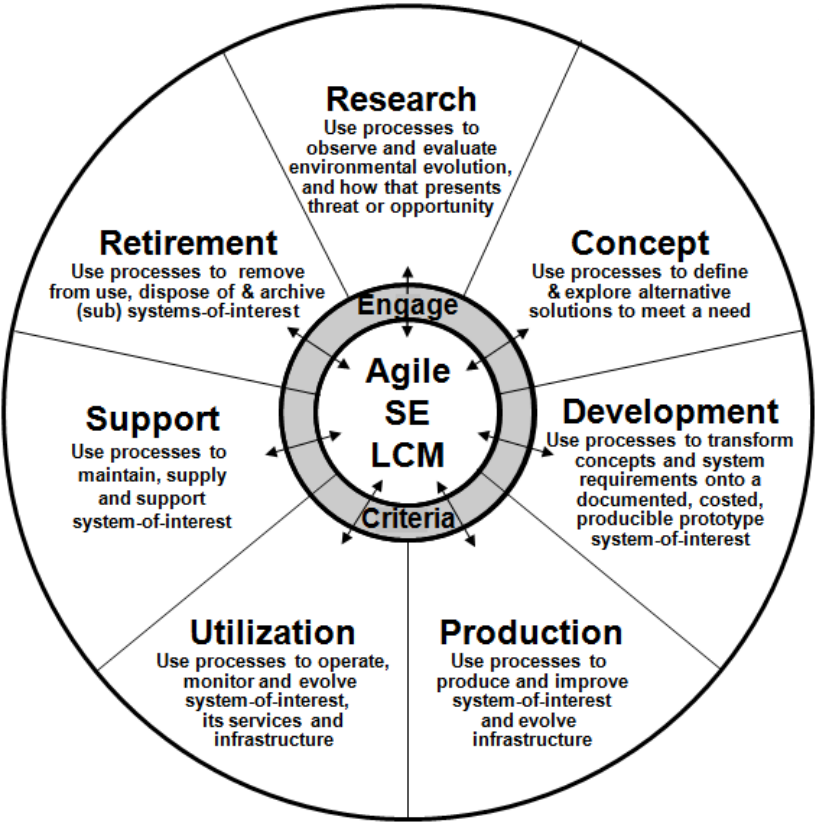
Agile SE concepts should be pulled into practice by a need to solve recognized SE problems, rather than pushed into practice by a belief that they must be better than current practice. One thing this means: don't start with Scrum in mind as a solution, ready to force fit it to the engineering and management environments.

Instead, understand your problem environment, relative to UURVE issues, in terms your engineering and management people can relate to. Then identify the intent and nature of solution concepts needed to address the issues. Then and only then examine the ready-made practices for conceptual bits and pieces of usefulness.

In other words, develop your requirements before choosing a solution. With a clear understanding of the fundamental and true requirements, an agile SE approach can be incrementally introduced and evolved to fit the culture, the business, and the engineering environment.

"I can't speak for other companies, but we at GEHC are 95% push, and not very tactfully. Kelly says the other companies he consults with have the same issue."

Agile System Engineering Life Cycle Model (ASELCM)



Agile systems seek to last "forever" in a constant state of evolution, so: the agile SE process is dominated by the Utilization stage.

Agile SE is much more than the front part of the V. This is a main reason why an agile S1 is required.

DevOps is beginning to recognize and address this, integrating all stages under a single team.

Agile S2/S3 SE is perpetually extending S1 life.

 # 2015 Host Sites Completed: 4
 # 2016 Host Sites Planned: 5

2016 WIP Candidates: Ford, GM, Alstom, UK MoD, General Dynamics, Microsoft (TBD), Healthcare devices (TBD), Spiral process (TBD)

In Context

Prior Work

The current 10 RRS principles appear to reflect necessary and sufficient fundamental concepts to implement an AAP architecture for reconfigurable (class 1 agility) systems.

The process that converged on these ten principles began with a hypothesis of six (or so) concepts borrowed from object oriented software-system thinking.

Analysis of 100s of agility-demonstrating systems then attempted to confirm, augment, and refine the initial hypothesis, to reflect what was and is observed in "nature".

This has been going on since the early 90s. Convergence on ten principles was achieved in the mid-90s, with continuous refinement and augmentation of their nature since. No new principles have been revealed, and refinement simply reflects deeper understanding and better articulation of each of the ten RRS principles.

Current Work

Seeking the underlying principles for agile SE processes, which are reconfiguring (class 2 agility) systems, did not begin with an explicit hypothesis of initial concepts, as the earlier work did. However, the search for principles is inherently influenced by knowledge of so-called agile software development processes, to the extent that agility appears enabled (though not articulated) by these software-development processes.

A year of thinking on the current work, with four discovery workshops completed (in more depth than prior work), is suggesting an initial hypothesis of principles that can now be explicitly articulated and investigated for confirmation, augmentation, and refinement.

The current work has foundation in, and dependence on, the prior work. Class 2 systems (current work) must have an underlying Agile Architecture Pattern, as Class 1 systems do. This enables agility fundamentally in both classes. And the 10 RRS principles also prevail in both classes – at the enabling reconfigurable level.

But the reconfiguring Class 2 systems have a higher level of additional principles associated with self-organizing operational behavior. In the Systems Engineering Process context, they are inherently complex, soft, systems-of-systems that exhibit emergent behavior.

This bonding of class 2 to class 1 systems argues for symmetry and fractal-like expression of a Class 2 principle framework relative to class 1 – to facilitate comprehension and cognitive coherence.

Confirmed: Agility Enabling RRS Principles

Reusable

- **Encapsulated modules (loosely coupled black-box units)**
- **Facilitated interfacing (easy module insertion/removal)**
- **Facilitated re-use (support for finding/deploying appropriate modules)**

Reconfigurable

- **Peer-peer interaction (direct communication w/o intermediaries)**
- **Deferred commitment (decisions & fixed bindings at last responsible moment)**
- **Distributed control and information (decisions at point of maximum knowledge)**
- **Self organization (relationships and interactions negotiable)**

Scalable

- **Evolving infrastructure standards (module interface and interaction change)**
- **Redundancy and diversity (duplicate and diverse module populations)**
- **Elastic capacity (module populations and functional capacity variable)**

2016 Initial Working Hypothesis (subject to change): Agility Operational-Behavior Principles

(to be confirmed/denied/augmented in discovery workshops)

Monitoring (observe, orient)

- **External awareness (proactive alertness)**
- **Internal awareness (proactive alertness)**
- **Sense making (risk analysis, trade space analysis)**

Mitigating (decide, act)

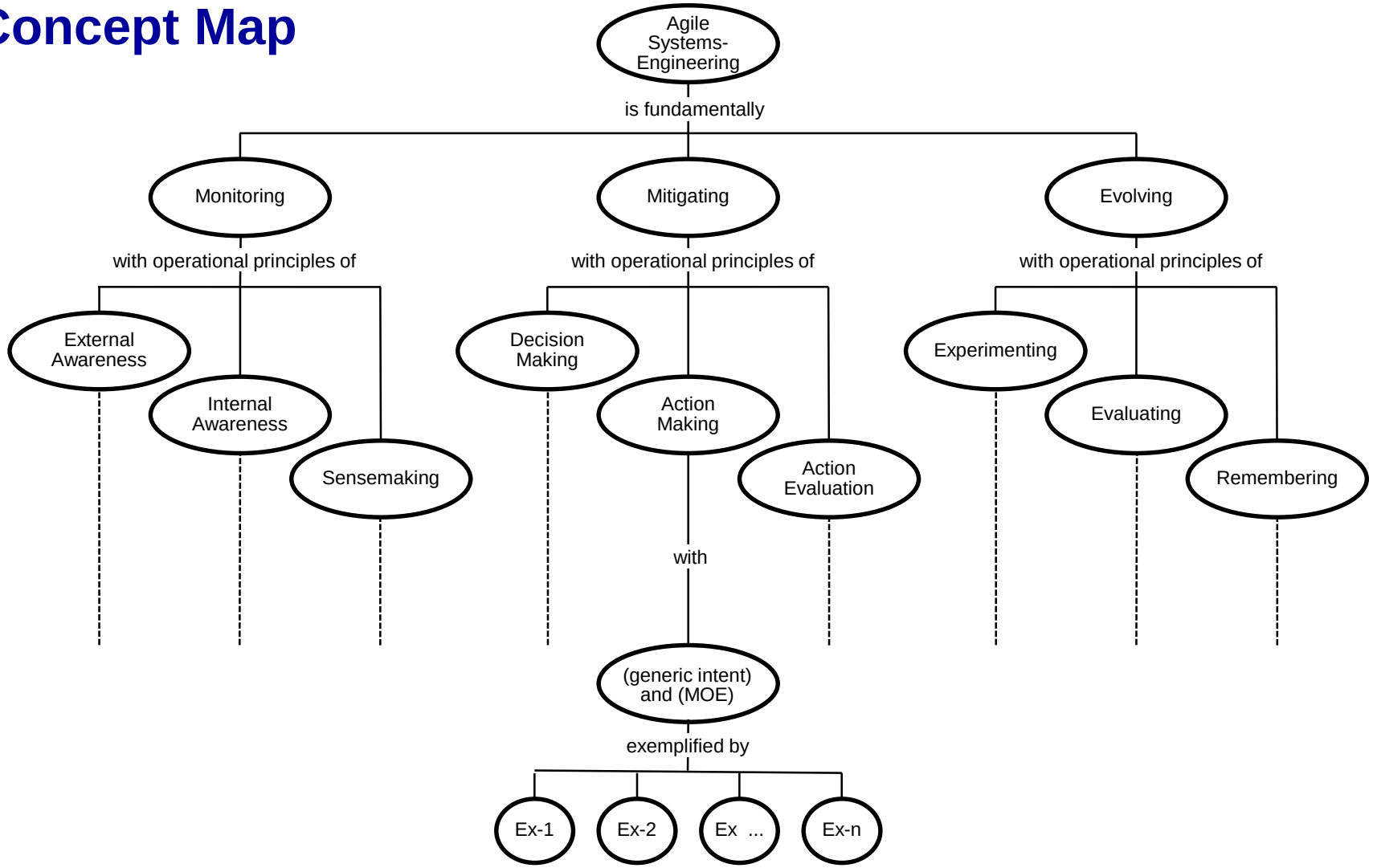
- **Decision making (timely, informed)**
- **Action making (invoke/configure process activity to address the situation)**
- **Action evaluation (V&V)**

Evolving (improves above with more knowledge and better capability)

- **Experimentation (variations on process ConOps)**
- **Evaluation (internal and external judgement)**
- **Memory (current process ConOps)**

Natural selection: replication with variation in competition.
(A ubiquitous algorithm with no driving purpose, the essence of real learning)

WIP Concept Map



Q&A Time

All ASELCM hosting information documents are available here:

www.parshift.com/ASELCM/Home.html

or here:

https://connect.incose.org/ProgramsProjects/aselcm/Pages/Home.aspx

INCOSE Connect – Programs & Projects Tab – select ASECLM

Download this presentation from File Library at:
https://incose.pgimeet.com/GlobalmeetThree (now only)

or from
www.parshift.com/s/160223.pdf

fini

2015 Enchantment Chapter and Student Chapter Operations (intended to trigger collaborative discussion)

INCOSE Southern Arizona Chapter and

University of Arizona Student Chapter

23-Feb-2016

Rick Dove, INCOSE Fellow
Director and Past President: New Mexico Enchantment Chapter

Enchantment Chapter Strategic "Reputation" Goals

Goal 1: Recognized as the Regional Voice of SE.
Intent: Effective member and Chapter involvement with regional organizations.
Status: Successful engagement with White Sands Missile Range and New Mexico Tech on activities planned for 2016.

Goal 2: THE Go-To Place for Professional Development.
Intent: Exposure to SME's on the theory and practice of leading SE concepts.
Status: Well received meeting speakers, topics, and tutorials.

Goal 3: Member-Rewarding Activities.
Intent: Member-attracting projects and workshops that engage Chapter members.
Status: We're working on it—with a 2-day SE workshop event for Fall of 2016 at New Mexico Tech in Socorro.

Goal 4: Reliable and Effective Chapter:
Intent: Develop and execute goal-achievement Strategic and Operational Plans.
Status: The Board feels good about 2015 achievement here, and expects to win the INCOSE Chapter Gold Award for 2015.

But what the members think is our measure of effectiveness.

So we ask them: what do you think about our plans and achievement?

2015 Operations and Experiments

Notable 2015 Operations:

- Revitalized UTEP Student Chapter
- Ten good-draw speakers and topics at monthly meetings
- Two social events with good draw
- Two tutorials with good draw
- Board recruitment of two new young directors
- Bylaws updated
- Computer purchased for web-meeting stability
- INCOSE President David Long at April Board meeting
- New Chapter website went live
- Recordings of meeting presentations in website Library
- Quarterly Newsletter maintained on schedule
- INCOSE Chapter Gold Award for 2014 performance

Notable 2015 Experiments:

- Scheduled attention to Chapter strategic goals
- Active outreach effort with White Sands and NM Tech
- Joint Chapter meetings with three different Chapters: SAZ, CAZ, and Colorado
- Newsletter added a regular Working Group feature
- SEP Certification training-opportunities promoted
- Monthly meeting presentations with speaker picture and Things to Think About.
- Board meeting effectiveness with read-aheads and minute-to-minute topic schedule
- New Mexico Tech to host and co-sponsor 2-day regional event in Socorro Fall 2016
- Failed 2015 starts for two Chapter Projects, but learned a bit

Enchantment Chapter - Website Meeting Archive

Slides and Recordings available here for download (by anyone).

This library page contains speaker presentations and other meeting materials for the most recent five years. Newsletters and Tutorials are located separately.

February 8th, 2016 – Towards a New Paradigm for Management of Complex Engineering Projects: An SoS Framework
Jin Zhu, Ph.D. candidate, Florida International University

January 13, 2016 – Systems Integration – What Are We Waiting For?
Jim Armstrong, CSEP, Industry Professor, Stevens Institute of Technology

December 4, 2015 – Holiday Social Event - Teaming with Contractors
Paul Mann (SES), White Sands Missile Range

November 11, 2015 – A Complexity Primer for Systems Engineers
Jimmie McEver, John Hopkins University, Applied Physics Laboratory

October 14, 2015 – Phoenix Sky Harbor Terminal 3 Modernization
Jennifer L. Maples, Aviation Superintendent, Phoenix Sky Harbor

September 9, 2015 – Agile 104: Quality Fundamentals - The Art of Systems Engineering
Rick Dove, Paradigm Shift International

August 12, 2015 – Agile System Modeling and Lifecycle Engineering with Object-Process Methodology
Dov Dorie, Massachusetts Institute of Technology and Technion, Israel Institute of Technology

July 8, 2015 – Summer Social Event - Tour of Sandia Tram
Chapter-Hosted Networking

June 10, 2015 – Systems Engineering for Software Intensive Projects using Agile Methods
Larri Rosser, Raytheon Intelligence, Information & Services, Sr. Principal SE

May 13, 2015 – NDIA: A Place for Systems Engineers to Move the Needle
Dr. Beth Wilson, Raytheon Company, Senior Principal Engineering Fellow

April 8, 2015 – Design Thinking: What is it and What Does it Mean for Systems Engineering?
Clifford A. Whitcomb, Ph.D. Professor and Chair, Systems Engineering Department, Naval Postgraduate School

March 12, 2015 – Lean Systems Engineering Using the Scaled Agile Framework (SAFe)
Harry Koehnemann, Director of Technology, 321 Gang

March 11, 2015 – Evolutionary Systems Engineering for Unmanned Systems at SPAWAR
Chris Scrapper, SPAWAR System Center Pacific Unmanned Systems Group

February 11, 2015 – When "Yes" is the Wrong Answer (best paper award at IS14)
Andy Pickard, Rolls Royce

…etc …

SOARizona Chapter Officer's Interests

Marshall Mattingly: growth in outreach by the chapter to more companies and industries in the area.

Stephanie Chiesi: growth in collaboration with the student division, adding diversity to our active chapter membership, and increasing participation in speaking events and conference attendance.

Jeff Wright: increase participation, visibility, and engagement.

Barry Fowler: progress toward being a professional Systems Engineering resource for the community via improved member participation, networking opportunities, and outreach.

Eric Thompson: would like to see growth in chapter participation in meetings and other opportunities

Generally similar to Enchantment Chapter Goals and Intents

2014-2015 Officers

Daniel Chen

Co-President

danielchen@email.arizona.edu

Tareq Alsalem

Co-President

tqalsalem@email.arizona.edu

Matthew Kelpien

Vice President

mkelpien@email.arizona.edu

Nathan Mills

Treasurer

nmills@email.arizona.edu

Erika Balbas

Secretary

ebalbas1@email.arizona.edu

Dawn Binder

Social Chair

dawnbinder@email.arizona.edu

Michael O'Brien

Faculty Advisor

mikeazobrien@email.arizona.edu

Kyle Glenn

Conference Chair

kyleglenn@email.arizona.edu

Discussion?

- **Enchantment Chapter Oct/Nov 2-day 8-topic workshop at NM Tech in Socorro.**
- **Enchantment has archive of recorded Chapter Meetings at: www.incose.org/ChaptersGroups/Chapters/ChapterSites/enchantment/library-and-resources**
- **Request "info list" for Enchantment Chapter meeting announcements from: Mary Compton at mlcompt@sandia.gov**