



Capability Innovation Model for Software-Intensive Systems

Nickolas Guertin, P.E.

Senior Software Systems Engineer

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213

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Speed of Capability vs. Sustainment of Fixed Performance

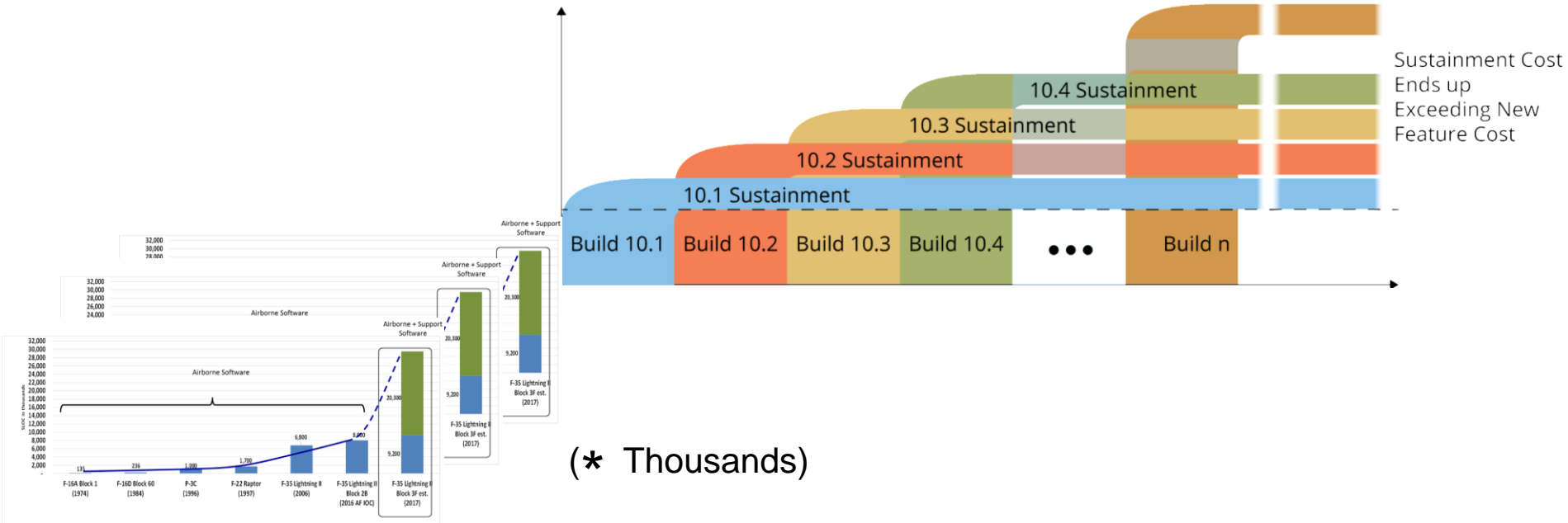
The U.S. DoD is the envy of all nations, but ...

- Near-peer competitors are progressing faster than we change
 - e.g., COTS tools & building blocks are available to all
- New threats are vexing in key warfare areas



- To move faster, we need a different approach
- The environment is ripe with opportunities for new approaches

Stand-alone System of Systems Model for Sustainment Drives Cost and Limits Performance



We need to develop the capacity to change how we create value at pace with the world

Adaptive Enemies/Ubiquitous Technology



Beyond 2020

New environments need new methods

- Architectural & DevOps advances increase quality & tempo

Deploy modular capability to a flexible environment

- Capabilities packaged in modules
- Delivered using modern commercial architectures
- Any user, any time

Improve Cyber Resiliency

Reduce risk & cost of integration

Rapid/continuous delivery (think weekly)

The Warfighters Need for Rapid, Joyous Change



Move to Modularity & All That It Means



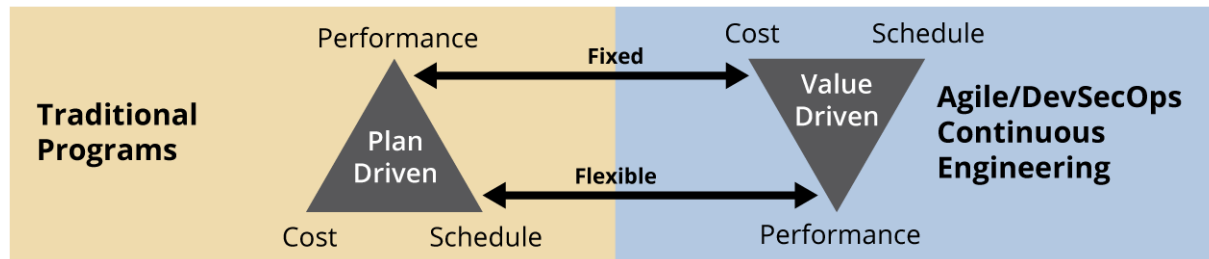
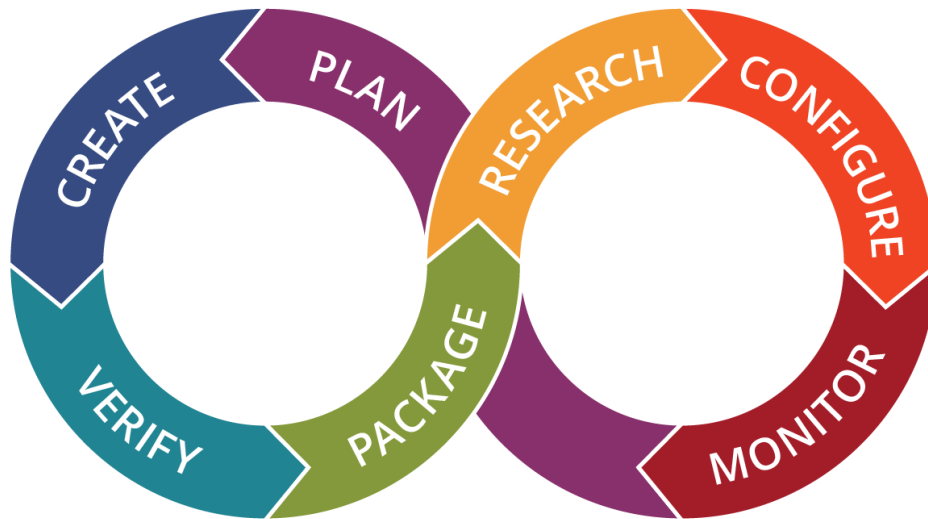
Cyber-physical products are never done

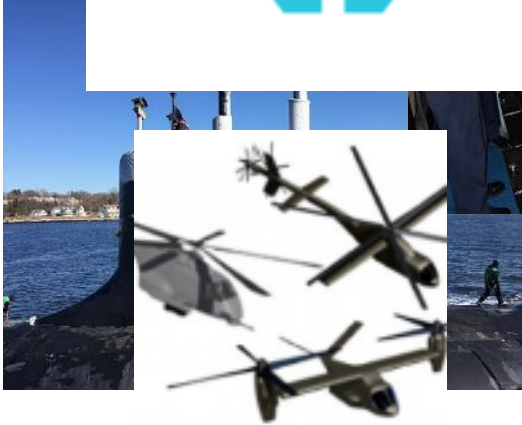
Continuous engineering & development/operations pairing

- “Sustainment” becomes Continuous Engineering
- Everything is improved throughout the lifecycle
- **The new “requirement” is stable –
be operationally relevant**
- Capability is delivered in modules, as soon as they are ready



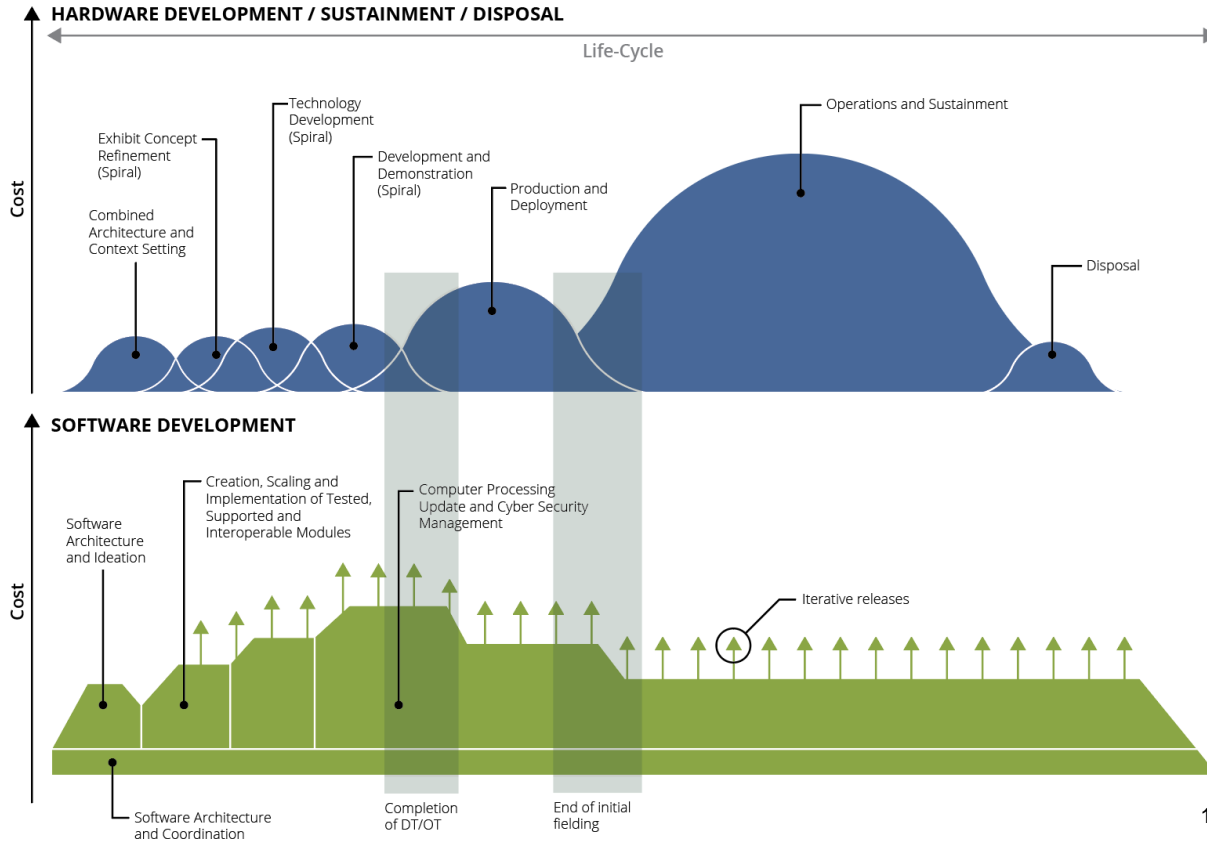
Capability Evolution and Delivery Constantly In Motion





Sustainment in the future of Military software Delivered Capability

A Blended Approach – Mixing Spiral and DevSecOps



Software is Different than Hardware,
Not All Software is the Same,
Software is Never Done¹

1. Defense Innovation Board, Software Acquisition Practices Study, March 2019

New Development and Operations Approaches



The Most Secure Software is updated regularly

- DevSecOps **Methods are Best Practice for Security**

From System-of-Systems to Capability Composition

- Modular Capability Composition is Main Stream

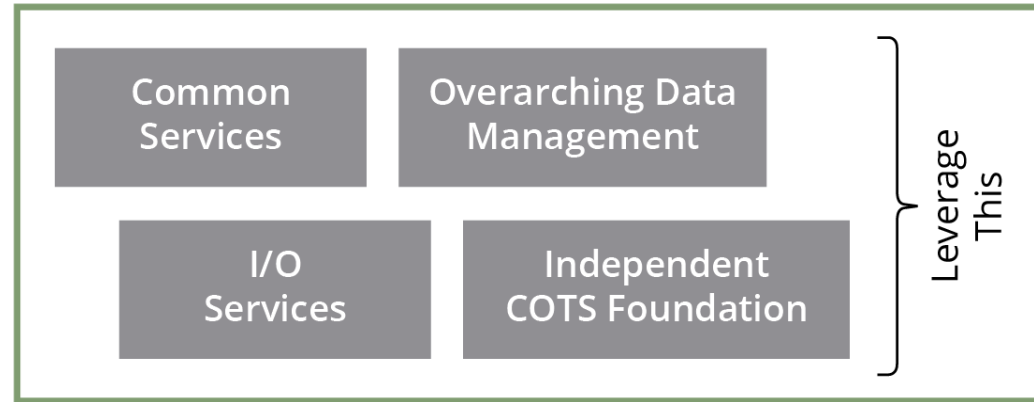
Wholesale Hardware Swap-outs No Longer Needed

- Virtualization and Containerization Alternatives

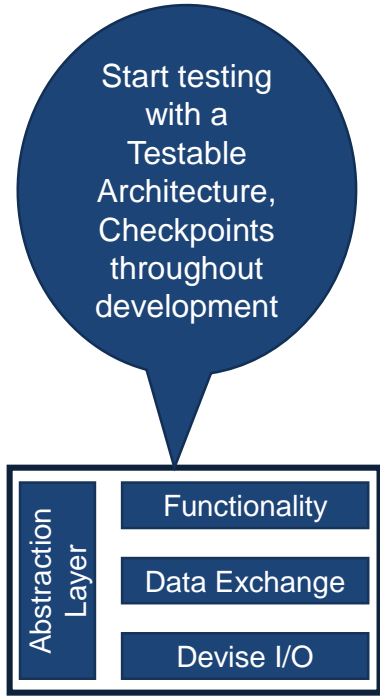
A New Architecture is Needed to Make This Happen

- Discoverable and Interoperable Modular Capabilities

Business and Organizational Impacts for Interoperable Modules



Applying Architecture to Testing

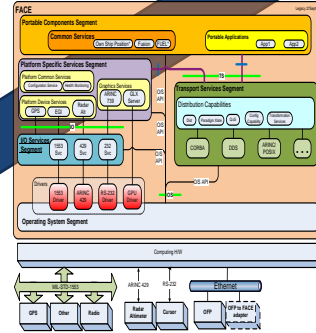


Enterprise Architecture



Establish Testable Requirements of Architecture

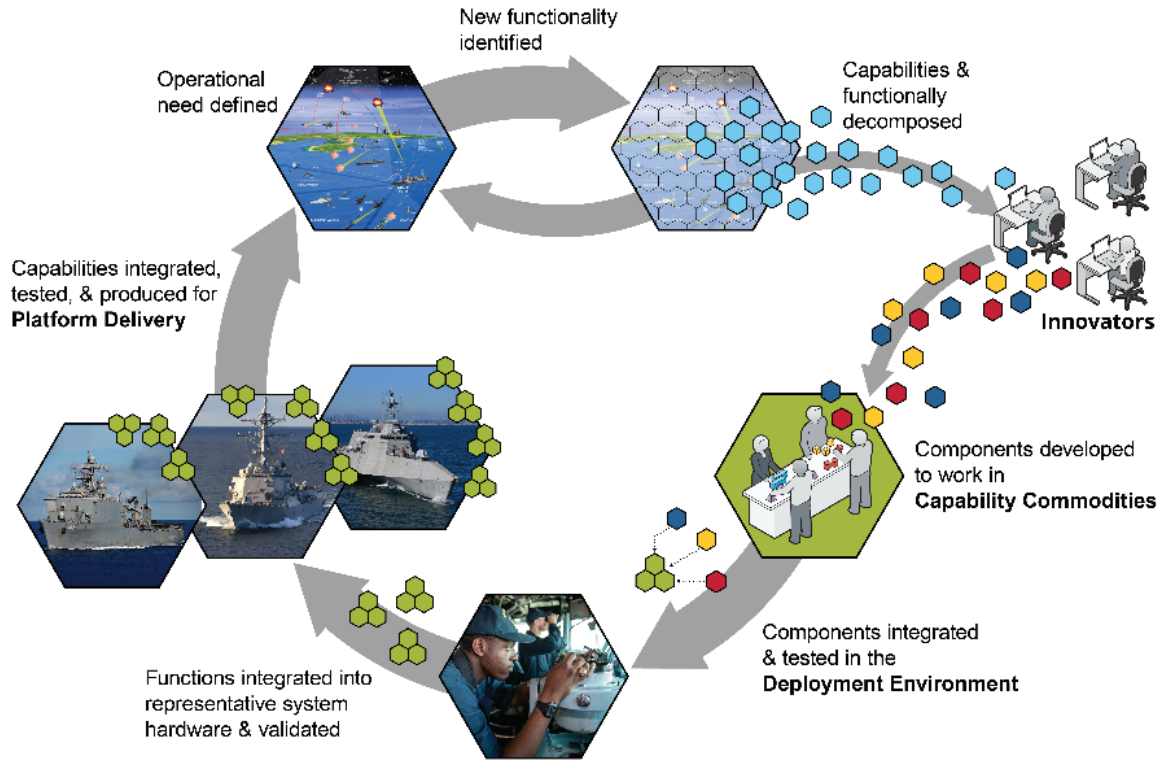
Preserve Testability in the Deployment Environment



Automated Testable Product Architecture

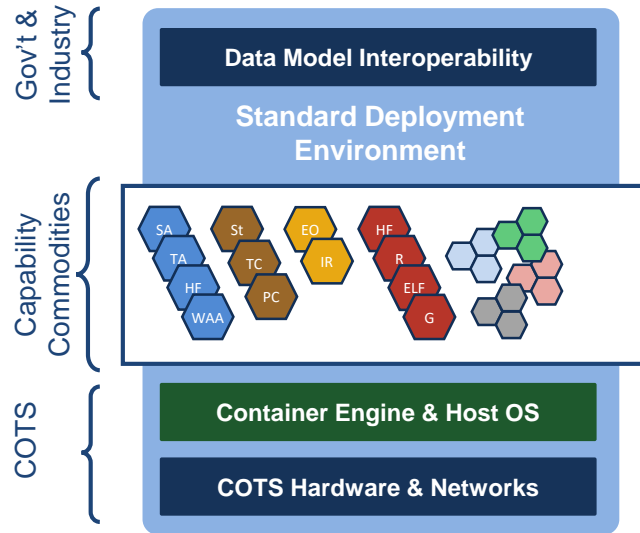
Start testing with a Testable system, the game is over.

Business and Organizational Impacts for Modularity



Where Can the Sustainment Community Grow Into

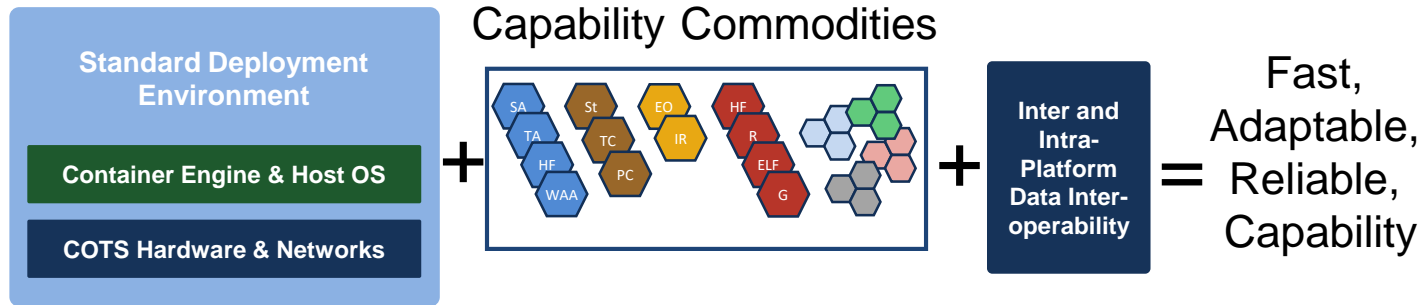
Government organizations to lead the creation and evolution of the capability, & innovation environment



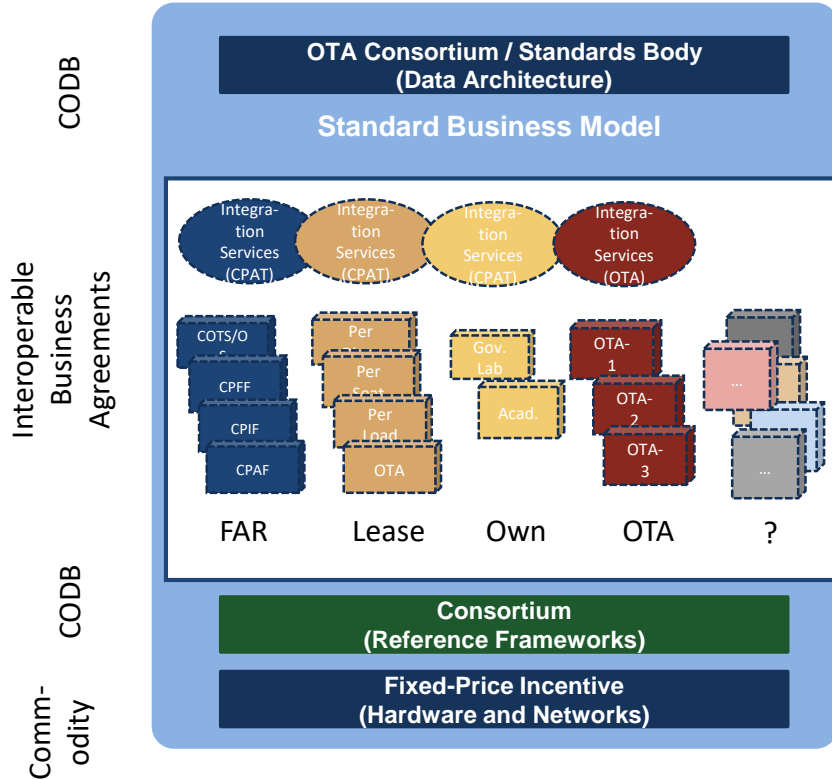
- Design in inherent portability
- Create Solutions to integration complexity
- Nurture Data Architectures for interoperability
- Embrace expanded number of developers
- Methods to manage variation of reuse/COTS
- Access to state-of-the-art cyber-physical solutions

It is happening all around us
Aviation
Automotive
Oil & gas
We are not alone ...

Interoperability at the Module Level, at Scale



Remuneration Models that Reward Innovation



- Continuous Engineering
- Chaotic Delivery
- Environment Evolution
- Organization Impacts
- New Business Models

Open Software Platforms are Enterprise Assets



Apply management focus on the things that create business value

1. Business Architecture
2. Infrastructure as a Service / Platform as a Service – Critical Corporate Assets
3. Managed by the Owner (with lots of inputs and collaboration)
4. Cross-Functional (not platform dependent)

Stand buy for heavy seas; organizational change takes years

- New financial architecture & business relationships take time
- Turn resistors into owners through engagement
- Solve incremental conformance & certification barriers

Open Acquisition Strategy



Government is the “business integrator”

- Frameworks/Data Architectures
- Platforms
- Integration
- Capabilities



21st-Century IP strategy: Targeted rights to share

- Facilitate and reward innovation
- Modules can be replaced risk- prudently

Adapt and Redefine



Apply Continuous Engineering practices

Decompose Capabilities into modular components

Reuse where possible and appropriate

Use automated testing extensively

Adapt the development lifecycle and have T&E community set the architecture rules

Outcomes



- Adopt the technical and business models that are proven to deliver better outcomes
- Craft capabilities that are durable, self-healing, & interoperable
- Upgrading of capability in the field at the speed of need
- Don't let the train leave the station without you – use today's actions to prepare the statement community for the future. Collaborate and coordinate actions as an enterprise.