Modernizing DoD Software Production

Jeff Boleng, OUSD(A&S), Special Assistant for Software Acquisition
Guidance and Advice

“We want to develop contracts to support Agile DevOps software development. Our systems need to be hardware-enabled and software-defined. Software development processes are different than traditional production, development and sustainment processes for weapons systems. We need a software color of money.”

“We have to get a lot better, faster, more agile”

“Implementation of some of the study's recommendations, such as the creation of new acquisition pathways for software and a new mechanism for authorization to operate reciprocity, are already under way.”

HON Ellen Lord, USD(A&S)

“Security is a first order consideration. We need to create a secure environment that supports DevSecOps for big defense contractors and small innovative companies.”

“Defense technological advantage today is enabled by hardware, but its capability is defined by software. There is an undeniable urgency to develop and deploy software faster, faster than our adversaries, in order to maintain strategic and tactical advantage.”

“I am committed to creating a culture of creative compliance, scaling innovation from pockets of excellence, and mainstreaming authorities provided by Congress.”

“We have to get a lot better, faster, more agile”
Guidance and Advice
Advice and Guidance

Appendix C. Recommendations

Recommendation 1: Software Factory
A key evaluation criterion in the source selection process should be the efficiency of the software factory.

The Under Secretary of Defense for Research and Engineering (USD(R&E)) should immediately task the Defense Digital Service (DDS) for the U.S. Air Force Research Laboratory’s Advanced Information, the Software Engineering Institute (SEI) funded Federal Research and Development Center (FRDC), the Software Engineering Institute (SEI) Federal Laboratory Partnership Program (FLPP), the Department of Defense (DoD) Science and Technology (ST&L), and the Army Material Command (AMC) to establish a common set of metrics to evaluate software factories. The idea is to provide a framework for software factories. The metrics will be updated and refined every 3 years.

The DoD has limited iteration development expertise. Focusing this expertise during source selection would ensure the most efficient process.

Recommendation 2: Confidence-Motivated Development
The DoD can leverage industry best practices which would include extensive development test practices for software, including unit, system, and integration.

The Defense Acquisition Decision Authority (DAMA) into the program executive officers (PEOs), the program managers (PMs), and the Joint Directors of Laboratories that are part of the DoD's software factory. The DoD can establish a set of confidence metrics that are used to govern development and maintenance of software and are published and circulated to support the decision-making process.

The Defense Acquisition Executive (DAE) and the DAMA on the Milestone Decision Authority (MSA) should include the use of confidence metrics to govern development and maintenance of software and are published and circulated to support the decision-making process.

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Chapter 5 provides additional context and Appendix A contains draft implementation plans.
DIB SWAP FOUR LINES OF EFFORT

A. Refactor statutes, regulations, and processes for software

B. Create and maintain cross-program/cross-service digital infrastructure

C. Create new paths for digital talent (especially internal talent)

D. Change the practice of how software is procured and developed
People, Platform, Process

People LOE C

Platform LOE B →

Process LOE A →

Identify Create Deploy Scale Optimize

LOE D
LOE Executive Champions

People

JOSE M. GONZALEZ
Executive Director, Human Capital Initiatives

Peter T. Ranks
Deputy Chief Information Officer for Information Enterprise (DCIO(IE))

Process

Stacy Cummings
Principal Deputy Assistant Secretary of Defense, Acquisition Enablers at United States Department of Defense
People

- Identify high performing SW development activities across Services and 4th estate
- Create a forum for sharing of best practices
  - Contracting
  - Recruiting, hiring, retaining
  - Training and education
  - Estimating
  - Project management
- NDAA-18 873/874 Agile Pilots

Kessel Run in Massachusetts
Space Camp in Colorado
BESPIN in Alabama
Rogue Blue in Nebraska
Kobyashi Maru and Section 31 in California
LevelUP in Texas
People

- Education and Training
  - Surveying available courses
  - Modernizing content
  - In search of vignettes, lessons learned and best practices
Enterprise DevSecOps
? [SecDevOps | DevSecOps | DevOpsSec] ?
DoD Enterprise DevSecOps Technology Stack (Exemplar)

- **PLAN & DEVELOP**
  - GitLab
  - JIRA
  - GitHub
- **BUILD**
  - MSBuild
  - CMake
  - Gradle
  - Maven
- **TEST**
  - cucumber
  - JUnit 5
- **SECURE**
  - Nessus
  - FORTIFY
  - Qualys
  - CONTRAST
  - Twistlock
  - Artifactory
  - Archiva
  - Nexus
- **STORE ARTIFACTS**
  - Archiva
  - Artifactory
  - Nexus
  - Maven

**CONTINUOUS INTEGRATION & CONTINUOUS DELIVERY** Orchestration

**DEPLOY & OPERATE**

**SCALE**

**MONITOR**

- splunk
- New Relic
- Nagios
- ELK Stack
- sensu
- AWS CloudWatch
- Azure
- Google Cloud Platform
- Amazon Web Services

**Container and Container Management**

- Docker
- Kubernetes
DoD Enterprise DevSecOps Architecture*

*each DoD Program can have its own instantiation of the DoD Enterprise DevSecOps Platform on any Cloud.

** can be installed with single command and deployed on any Cloud.

*** could be deployed inside an enclave or on-premises

**** gives complete visibilities of assets, security/vulnerability state etc. can be integrated to existing cybersecurity shared services.

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Program Source code repository

DoD Enterprise DevSecOps Platform**

Microservices Architecture (ISTIO)

DevSecOps CI/CD pipeline**

Security Side Car Container**

Kubernetes

Optional Abstraction Layer with Red Hat OpenShift or Pivotal Container Service

Elasticsearch

Artifacts Repository**

Centralized DoD Enterprise DevSecOps Artifacts Repository Continuously Hardens Docker Public Images and Assesses Open Source Libraries

Fluentd Real-time pushes

DoD OCIO/ DISA Centralized Logs/Telemetry***

Per DoD Service for Service-wide Visibility Logs/Telemetry****

Bare-metal, GovCloud, AWS Secret, Azure Secret, mil Cloud, C2S, Jedi...***
Why is this so hard?
Program Manager

Contract and Incentives

Developer

Image source: https://psiloveyou.xyz/man-or-marionette-pinocchio-and-the-metamorphosis-of-manhood-f92f2bf099c
Where is the Operational User?
And the Feedback Loops?
Process

Adaptive Acquisition Framework
Tenets of the Defense Acquisition System
1. Simplify Acquisition Policy
2. Tailor Acquisition Approaches
3. Empower Program Managers
4. Data Driven Analysis
5. Active Risk Management
6. Emphasize Sustainment

DoDD 5000.01: The Defense Acquisition System
DoDI 5000.02: Operation of the Adaptive Acquisition Framework

Legend:
DD: Disposition Decision
OD: Outcome Determination
MDD: Material Development Decision
MS: Milestone
IOC: Initial Operational Capability
FOC: Full Operational Capability
S: Sprint
MVP: Minimum Viable Product
MVC: Minimum Viable Capability Release
R: Release
ATP: Authority to Proceed
DoD 5000 Series Policy Development Process

Revised DoD Instruction 5000.02,
Operation of the Adaptive Acquisition Framework

Current DoDI 5000.02

- CORE A&S ACQUISITION POLICY
  - Policy
  - Responsibilities
  - Procedures
  - Decision Points and Phases

- FUNCTIONAL ENCLOSURES
  - Acquisition Categories and Compliance Requirements
  - Program Management
  - Systems Engineering
  - Developmental T&E
  - Operational & Live Fire T&E
  - Life-Cycle Sustainment
  - Human Systems Integration
  - Affordability Analysis and Investment Constraints
  - Analysis of Alternatives
  - Cost Estimating and Reporting
  - Information Technology
  - Urgent Capability Acquisition
  - Cybersecurity

Revised DoD Directive 5000.01

Separated Published Functional Policies

DAU Website

- DoD Directive 5000.01
- DoD Instruction 5000.02
- DoD Instructions 5000.xx, (e.g. Pathway)
- Functional Policy Documents
- Tables (Milestone Documentation Identification Tool)
- Defense Acquisition Guidebook
  - Other Tools

USD(A&S) Initiates Formal Coordination

Comment Adjudication Complete

Document Published

USD(A&S) Signature

A&S Draft Approved

A&S Development, Internal A&S Coordination, Finalize Draft

Outreach to Industry / Recurring Meetings with Staff/Services


Pre-Signature Review, Security Release

WHS Pre-Coordination Review, Revisions, 1st Legal Review

Formal DoD Coordination, Finalizes Document for Signature

USD(A&S), Finalize for Signature
Software Acquisition Pathway – draft/pre-decisional
Software Acquisition Pathway – draft/pre-decisional
Software Acquisition Pathway – draft/pre-decisional
Notional Software Development Effort (contractor and organic), Defects, and Capabilities

- Contractor Personnel
- Organic Personnel
- Testing Personnel
- Defects Cumulative
- Capability Cumulative

Key Points:
- MVCR
- MVP
Engagement and feedback

• Engagement
  • May – US Chamber of Commerce
  • May - 16th Annual Acquisition Research Symposium
  • July - feedback session hosted by NDIA, AIA event, quarterly industry association round table
  • August – PEO forum, SW Acq Pathway wargame

• Feedback
  • Need to better describe linkage to system’s engineering process
  • How does this map to embedded software?
  • Where does developmental and operational testing fit in?
  • This will be hard to estimate cost
Software Appropriation

- Comptroller and A&S legislative proposal
- New Budget Activity (BA 8) Software & Digital Technology Pilot Programs
  - Within existing RDT&E appropriation
  - Established for each service and defense wide
  - 2 year funding
  - Available for select pilot programs in FY-21 if approved
- Pilot programs will use BA 8 as one source of funding for full lifecycle
  - Development,
  - Procurement,
  - Deployment,
  - Assurance,
  - Modifications, and
  - Continuous improvement
- A&S evaluating 12 nominated pilot programs now
Requirements

Fix schedule and cost

Allow/encourage Scope (aka Requirements) to evolve and change

Require frequent deliveries

Evaluate delivered scope/capability and quality via metrics

Start small with minimal risk

Attack highest ROI MVP first

Determine if value delivered justifies continuing

Questions and Feedback
Reference Material


AF version of the above:  https://www.milsuite.mil/book/groups/af-devsecops

Currently available hardened containers:  https://dccscr.dsop.io/dsop

DAU Community Hub:  https://www.dau.edu/community-hub
Specifically these three:
https://www.dau.edu/cop/cybersecurity/Pages/Default.aspx
https://www.dau.edu/cop/it/Pages/Default.aspx
https://www.dau.edu/cop/it/Pages/Topics/DevSecOps.aspx