DoD Enterprise DevSecOps Initiative & Platform One
Keynote Presentation

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One of the most critical aspects of the DevSecOps initiative is to ensure we avoid any vendor lock-in so the DoD mandated:

- **Open Container Initiative (OCI) containers** (no lock-in to containers/container runtimes/builders)
- **Cloud Native Computing Foundation (CNCF) Kubernetes compliant cluster** for container orchestration, no lock-in to orchestration options/networking/storage APIs.

Containers are **immutable** and will allow the DoD to centrally accredit and harden containers (FOSS, COTS, GOTS) (think of a true gold disk concept but that actually scale and works).

Continuous Monitoring is a critical piece of our Continuous ATO model and the Sidecar Container Security Stack (SCSS) brings those capabilities with Behavior, Zero Trust and CVE scanning.

Kubernetes will provide:

- **Resiliency**: Self-healing so containers that crash can automatically be restarted,
- **Baked-in security**: thanks to automatic injection of our Sidecar Container Security Stack (SCSS) to any K8S cluster with Zero Trust,
- **Adaptability**: containers are “Lego” blocks and can be swapped with no downtime thanks to load balancing and modern routing (A/B testing, canary release etc.),
- **Automation**: thanks to our Infrastructure as Code (IaC) and GitOps model,
- **Auto-scaling**: if load requires more of the same container, K8S will automatically scale based on compute/memory needs,
- **Abstraction layer**: ensure we don’t get locked-in to Cloud APIs or to a specific platform as K8S is managed by CNCF and dozens of products are compliant with its requirements.
Cloud Native Access Point

- Provided by a managed service by Platform One.
- Brings a full Zero Trust stack enforcing device state, user RBAC and Software Defined Perimeter/Networks based on Google BeyondCorp concepts
- Allows access to Cloud One (AWS GovCloud and soon Azure Government) and Platform One without having to go through the DISN/DoDIN
- Allows access from thick clients on BYOD, government owned devices (both mobile and desktop) while enforcing their device states by using AppGate as a zero trust client.
- Allows for VDI options for zero / thin clients
- Enables internet egress at IL5 in Dev enclaves
- Brings DMZ/Perimeter stack with break and inspect, IDS/IPS, WAF capability, full packet capture as an elastic Cloud based stack
- Brings Single Sign On with various DoD PKI options and IL2 MFA options.
- Centralizes/Aggregates logs and pushes to CSSP
Cloud Native Access Point (CNAP)

- DoDIN can be whitelisted from C2C connectivity. Endpoint origins such as required endpoints for VPN
- Thick Endpoints / Mobile
  - CSSP capability Integrated with elements of C5ISR elements of DAP stack using
  - Full log aggregation throughout all forwarding to CSSP
  - TLS break & inspect at both Palo Altos, services monitored and controlled by CSSP
  - All elements of the CNAP are
  - Only ingress point for CNAP access

Zero Client / Thin Client
- No AppGate Client, no C2C
- MFA to VDI via DoD PKI, CAC, ECA, PIV-I, etc.

Any Endpoint for Chat only
- All elements of the CNAP are monitored and controlled by CSSP services
- TLS break & inspect at both Palo Altos, (ingress and egress) with logs forwarding to CSSP
- Full log aggregation throughout all elements of DAP stack using Fluentd
- Integrated with elements of C5ISR CSSP capability

ZOA / IAP / BCAP
- Used as last resort only
  - GitOps and CAC should be leveraged to push from Dev/Test to Staging/Prod

IAP / SDP VPC
- Zeek
  - Network intrusion detection for CNAP ingress
  - Live analysis of network events
  - Custom alerting to network activities
  - Enables full packet capture

Ingress Palo Alto
- Border firewall protection
- Layer 3-7 security
- Break & inspect TLS for non AppGate destined traffic
- L7 WAF-like functionality to detect protocol anomalies and vulnerability exploits
- Only ingress point for CNAP access

Public Services VPC
- Keycloak (SSO)
  - Provides Single-Sign On (SSO)
  - SAML, OpenID, OAuth
  - LDAP / AD Integration with internal and External Identity Providers
  - MFA Auth

- IDAM VPC
  - Active Directory
    - Identity provider for SSO

- VDI VPC
  - Teradici PCoIP
    - Adheres to RBAC
    - Utilizes PCoIP protocol to prevent data exfil capabilities

- Prod VPCs
  - Management Tools
    - Logging (EFK stack)
    - SIEM
    - Configuration Management
    - Administrative Tools

- Test VPCs
  - AppsGate Pipelines
    - Central Services
    - Container Orchestration

- Staging VPCs
  - AppsGate Pipelines
    - Central Services
    - Container Orchestration

- Internet Egress for Thick & Mobile Endpoint
  - HTTPS/443 by default
  - HTTP/80 HTTPS/443 by default

- Egress for Dev VPCs and resources
- Egress for Thick Endpoints / Mobile clients connected to AppGate VPN
- Used to pull software updates and patches

- Internet
  - HTTPS & HTTP by default

- Egress Palo Alto
  - Border firewall protection
  - Layer 3-7 security
  - Break & inspect TLS
  - Only egress for internet traffic

- C5ISR CSSP VPCs
  - Vulnerability Scanning
  - Configuration Management
  - Incident Management & Response
  - User Monitoring / Insider Threat
  - Intrusion Prevention / Detection
  - Log Aggregation, Analysis, & NOC/SOC
  - INFOCON / CPCON Notification

- Log Data – aggregated to EFK stack
- Management VPC for all VPCs throughout CNAP
- Turnkey Service Mesh (ISTIO) architecture
- ISTIO side car proxy, baked-in security, with visibility across containers, by default, without any developer interaction or code change

Benefits:
- API Management, service discovery, authentication…
- Dynamic request routing for A/B testing, gradual rollouts, canary releases, resilience, observability, retries, circuit breakers and fault injection
- Layer 7 Load balancing
- Zero Trust model: East/West Traffic Whitelisting, ACL, RBAC…
- TLS encryption by default, Key management, signing…
The “Infrastructure as Code” concept is a critical DevSecOps ingredient to ensure that production environments do not drift from development/testing environments. No human should make changes in production environments. Changes should only be made in source code and redeployed by the CI/CD pipeline.

- No drift between environments, whether classified/disconnected/Cloud/on-premise,
- Immutable,
- Replicable,
- Automated,
- No human in production environments: reduces attack surface (disable SSH etc.), insider threat and configuration drifts,
- Everything is code: including playbooks, networking, tests, configuration etc.
What is GitOps?

Based on Infrastructure as Code concepts, makes Git the single source of truth of the desired state of your Infrastructure, Platform and Applications.

Benefits:

- Everything is code: infrastructure, networking, configuration, sealed secrets etc.
- Auditability & Compliance
- Consistent deployments and rollback (no drifts between environment)
- Configuration Management enforcement
- Disaster Recovery
- Baked-in security: Kubernetes clusters **pulls** from Git. CI/CD won’t have access to production clusters. Removing human from production environments
  - Declarative manifests and playbooks

Options:

- Argo CD, Flux as FOSS. Projects are merging into a single FOSS and be part of CNCF.
Continuous Authorization

Traditional Authorization Approach

Authorize System

- System Development and Testing
- Assess System's Security Controls
- Authorize System
- Operate System

Continuous Authorization Approach

Authorize Platform, Process, Team

- Authorize the Platform
- Authorize the DevSecOps Process
- Authorize the Team

- Teams that Run the Platform
- Teams that Create, Build, Secure and Operate the Software Product

Industry Average Performance*

(Traditional Development Approach)

- Deployment Frequency: 30-180 days
- Lead Time for Changes: 30-180 days
- Time to Restore Service: 7-30 days
- Change Failure Rate: 46-60%

Industry Elite DevSecOps Performance

- Deployment Frequency: Multiple/day
- Lead Time for Changes: < 1 day
- Time to Restore Service: < 1 hour
- Change Failure Rate: 0-15%

cATO Performance Targets*

- Deployment Frequency: Multiple/day
- Lead Time for Changes: < 1 day
- Time to Restore Service: < 1 hour
- Change Failure Rate: 0-15%

cATO – Continuously Pen Test, SAST/DAST testing, Continuously Manage Risk, Continuous Monitoring, Continuous Security Control Validation, Continuous Risk Determination, & Continuous Reporting

Continuous Authorization: Overview

1: Authorize the Platform
- Software Factory
- Hardened Artifacts with ATO
- Reciprocity
- Standard Hosting Environment
- With Inherited Controls
- DoD Enterprise DevSecOps
- Reference Design MVP
- Continuous Monitoring Tools
  - Sidecar Container Security Stack
  - Managed Service

2: Authorize the Process
- Feedback Loops
- Control gates, exit criteria, artifacts
- CI/CD Pipeline
- Continuous Monitoring Operations

3: Authorize the Team
- Teams that Run the Platform
- Teams that Create, Build and Operate the Software
- DevSecOps Culture
  - First Way: Flow
  - Second Way: Feedback
  - Third Way: Continual Learning & Experimentation

Test & Evaluation
Continuous Risk Monitoring
Continuous Risk Determination

Key points:

- Move away from snapshot in time towards auto-generated content displayed in a dashboard showing risk posture in real-time
- Extensive utilization of SW reuse, reciprocity, & inheritance from underlying infrastructure, platform, SW Factory, and authorized-to-use functional components
- CI/CD security findings that exceed the risk threshold trigger an event to involve ISSM, assessor or AO then put on the backlog for remediation scheduling in future sprint
- Continuous validation of security configuration hardening and implementation of controls
- Use of IaC to create a consistent, secure, and repeatable instance of application support infrastructure
- Execution of SW Product within a secure authorized Platform based on the DoD CIO Enterprise DevSecOps Reference Design

Through the execution of these practices, the SW Product has been through an automatic risk determination based on the AO’s prescribed risk tolerance resulting in the SW Product automatically authorized for use

Result: continuous risk analysis, risk determination, and authorization
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Thank You!

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