Space and Missile Systems Center

US Space Force
Digital Engineering Ecosystem

Panel Discussion

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Objectives

"*You will help define our warfighting culture, build the Space Force as the first digital service, and lay the foundation of a service that is innovative and can go fast in order to stay ahead of a significant and growing threat.*"

- **Gen Raymond, USAFA graduation, 18 Apr 2020**

"*No team should create its own tech stack in the future. It should be available enterprise-wide, based on an enterprise reference architecture, with all tools necessary for program success.*

- **Dr. Roper, Take the Red Pill, 15 Sep 2020**

Digital Engineering Ecosystem Goals

- **Establish a cloud-based, multi-level security, remotely accessible ecosystem, providing model-based tools to engineer complex all-domain integrated capabilities**

- **Empower data-driven development and operation of enterprise capabilities through real-time access to authoritative data, linked across models and programs**

- **Enable rapid acquisition, parallel industry development, and high-rate production to keep pace with threats, technology, and innovation opportunities**

**A Digital Engineering Ecosystem is essential to speed innovation and rapid acquisition**

- ## Stand-up USSF Digital Ecosystem
  - Provide integrated authoritative data to engineer complex all domain capabilities
  - Establish cloud-based, multi-level, remotely accessible ecosystem
  - Leverage demonstrated GBSD and ABMS successes
  - Collaborate with CloudOne & PlatformOne for Digital Engineering as a Service (DEaaS)
    - Containerization & Infrastructure as Code
    - Common, portable, scalable tools and apps
  - Integrate/interface seamlessly with other USAF & DoD efforts

- ## Use DE Flagship Programs to test the corners/seams of the Ecosystem
  - Fighting SATCOM & PATS – ABMS
    - Multi-layer, multi-domain integrated definition
    - US/Commercial/Allied standards/interfaces
  - Evolved Strategic SATCOM – NC3
    - Integration within the NC3 DE Enterprise
  - Combat Bus – USSF Ecosystem
    - LEO Proliferated, MEO/GEO HVA, Deep Space Highly Maneuverable
    - Enable large scale production of multiple vendors simultaneously
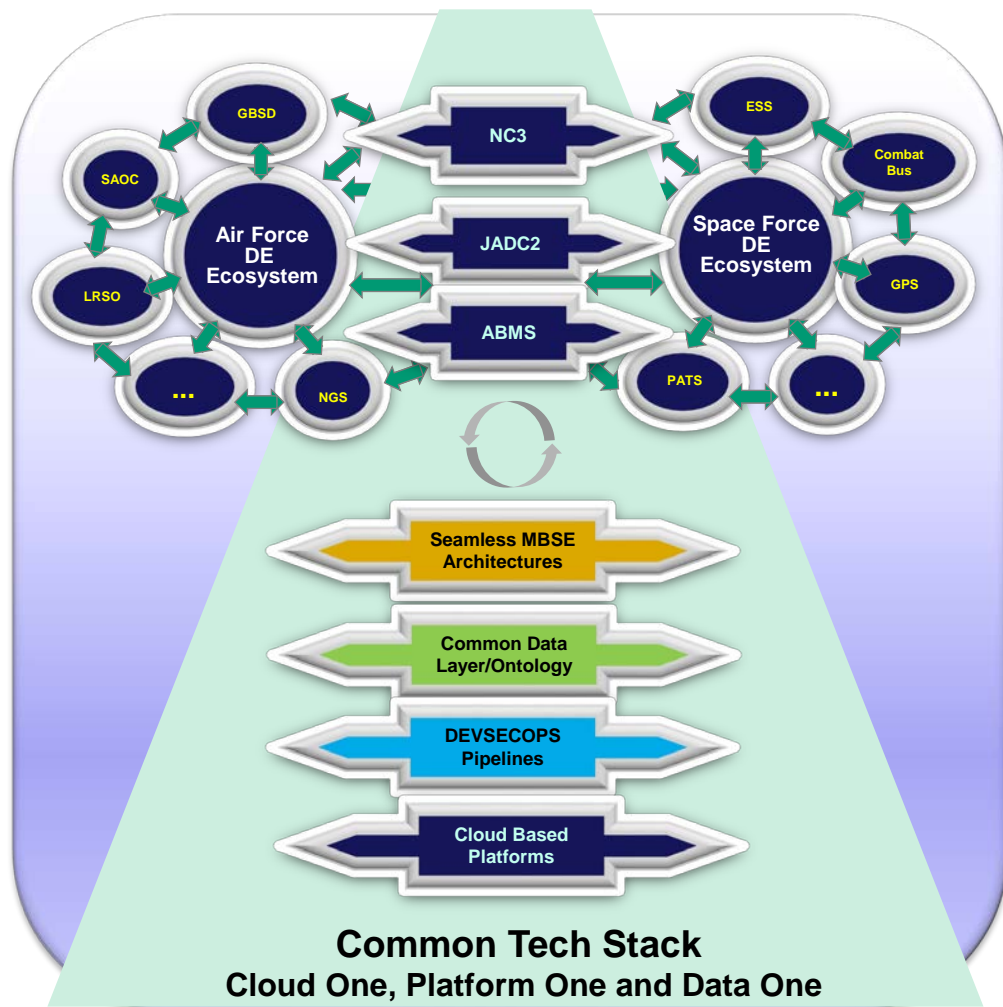
Approach

- **Surveyed programs to identify Digital Engineering requirements**

- **Captured significant tool and infrastructure requirement commonality among GBSD, ABMS and SMC programs**

- **Partnered with ABMS, Cloud One and MITRE to leverage their ecosystem development**
  - **Asked MITRE Cloud One team to provide cost and schedule estimates for USSF "reuse" and augmentation of GBSD and ABMS ecosystem**
  - **Pursuing Digital Engineering as a Service (DEaaS) approach for common long-term support and ecosystem lifecycle sustainment**

- **Implementing common tech stack to link authoritative data**
  - **Common tools and infrastructure**
  - **Common data repository**
  - **Enterprise threading across separate program Virtual Private Clouds**

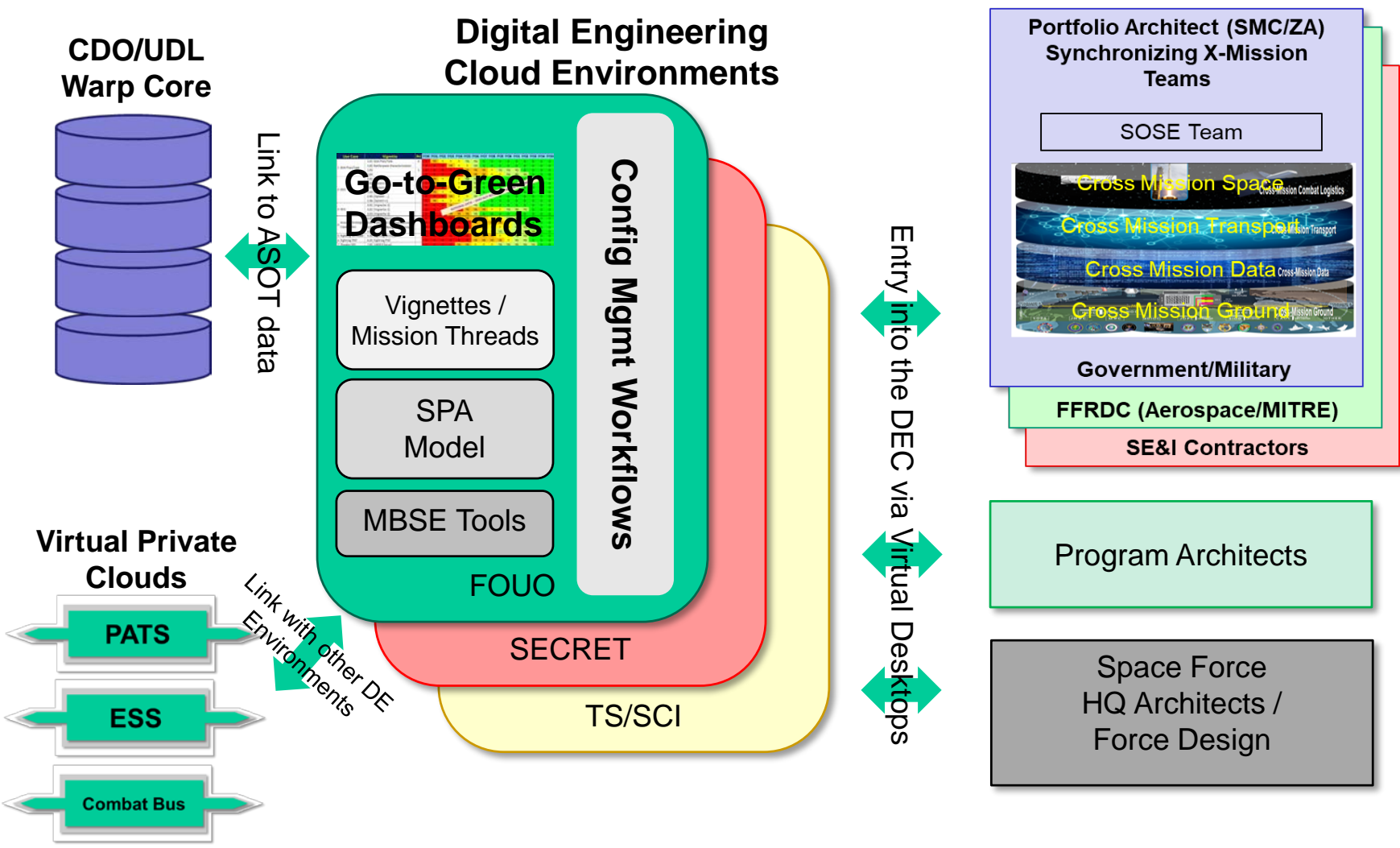# *Digital Engineering as a Service (DEaaS)*

Space Force IOC February 21

Space Force Secret Environment August 21

DE MVP-1: 30 Aug
CloudOne Dev Environment

- ABMS DE Platform on CloudOne Dev Env
- GBSD DE Platform on Fences (unclass)
- IaC and CaC Code for MVP-1
- DE Tools:
  - Cameo Teamwork Cloud and DOORS containerized
  - AFSIM (mod/sim)
- CONOPS for consuming
- DEaaS Business Model for long-term sustainment

DEaaS-2: 30 Nov
DE Platform (IL5) Tool Expansion

- ATO for IL5 on C1 Prod
- GBSD DE Platform integration with Siemens Teamcenter
- IaC and CaC code for MVP-2
- DE Tools:
  - Cameo Teamwork Cloud and DOORS containerized
  - AFSIM (mod/sim)
  - Jira, Confluence and Bitbucket
- Additional AF Programs leverage DEaaS

DEaaS-3: Feb 2021
DE Platform (IL5) Optimization

- Performance based analysis
- Cyber Threat analysis and mitigation implementation
- Established Program Office for DEaaS Enterprise Service
- Push Cyber Hardened Containerized DE tools to Iron Bank
- DE Tools:
  - Cameo Teamwork Cloud, Sparx EA, and DOORS containerized
  - AFSIM (mod/sim)
  - MATLAB
  - PLM (Siemens Teamcenter)
  - Jira, Confluence and Bitbucket

DEaaS-4: August 2021
DE Platform (IL6)

- Deploy DEaaS Env on Secret Enclave
- IaC/CaC code for Secret Deployment
- DE Tools:
  - Cameo Teamwork Cloud, Sparx EA, and DOORS containerized
  - AFSIM
  - PLM (Siemens Teamcenter)
  - MATLAB
  - Jira, Confluence and Bitbucket
- Cross Domain Solution (CDS) employed
- Executable plan for CloudOne IL6 and Fences TS

☐ Includes Space System Requirements

Common Tools and Infrastructure Augmented for Space Force to Speed Stand-up in FY21

Space Starts Here

Portfolio Architect utilizing DE

CDO/UDL Warp Core

Digital Engineering Cloud Environments

Link to ASOT data

Go-to-Green Dashboards

Vignettes / Mission Threads

SPA Model

MBSE Tools

Config Mgmt Workflows

FOUO

SECRET

TS/SCI

Virtual Private Clouds

Link with other DE Environments

PATS

ESS

Combat Bus

Entry into the DEC via Virtual Desktops

Portfolio Architect (SMC/ZA) Synchronizing X-Mission Teams

SOSE Team

Cross Mission Space · Cross-Mission Combat Logistics
Cross Mission Transport · Cross-Mission Transport
Cross Mission Data · Cross-Mission Data
Cross Mission Ground · Cross-Mission Ground

Government/Military

FFRDC (Aerospace/MITRE)

SE&I Contractors

Program Architects

Space Force HQ Architects / Force Design

Digital Workflows key to Efficiency

Develop Workflows in the Digital Engineering Ecosystem to execute standard processes in an automated way

- **The workflows will be created as Business Process Models in MBSE tools**

- **Workflows show the events, activities, outputs (artifacts), decisions (gateways), connections and the participants displayed in swim-lanes**

- **Approval by DE Governance Board (Chartered by Engineer Council) for Engineering activities**
  - **Workflows for other functional areas (i.e. contracting or finance) would be approved by their leadership**

- **Agile Techniques will be used to develop the workflows (sprints, backlogs, user stories, etc)**

- **Utilize BPMN/BPEL to create and implement workflows**
  - **Business Process Model and Notation: Define the Process**
  - **Business Process Execution Language: Implement the Process**
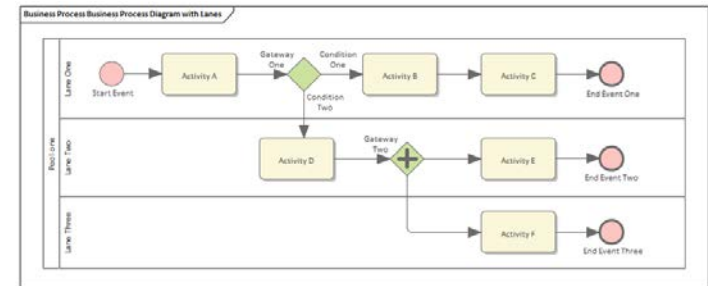
Example from Sparx Ex Index
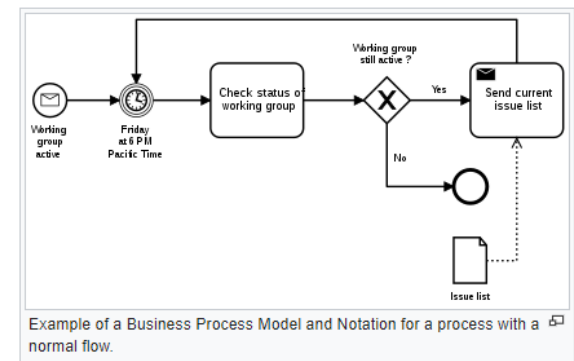
Example of a Business Process Model and Notation for a process with a normal flow.

Example from Wikipedia

Concluding Remarks

- **The Space Force is fully committed to digital transformation**

- **We are partnered with the Air Force Digital Campaign to develop common, collaborative ecosystems on a common tech stack**

- **We need your help to transform the culture and workforce to adopt and support digital engineering across the system lifecycle**

- **We look forward to your participation in the ecosystem through our Space Force Acquisition Programs**

<u>Digital Engineering Ecosystem Points of Contact:</u>

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