



Enterprise Cloud Strategy

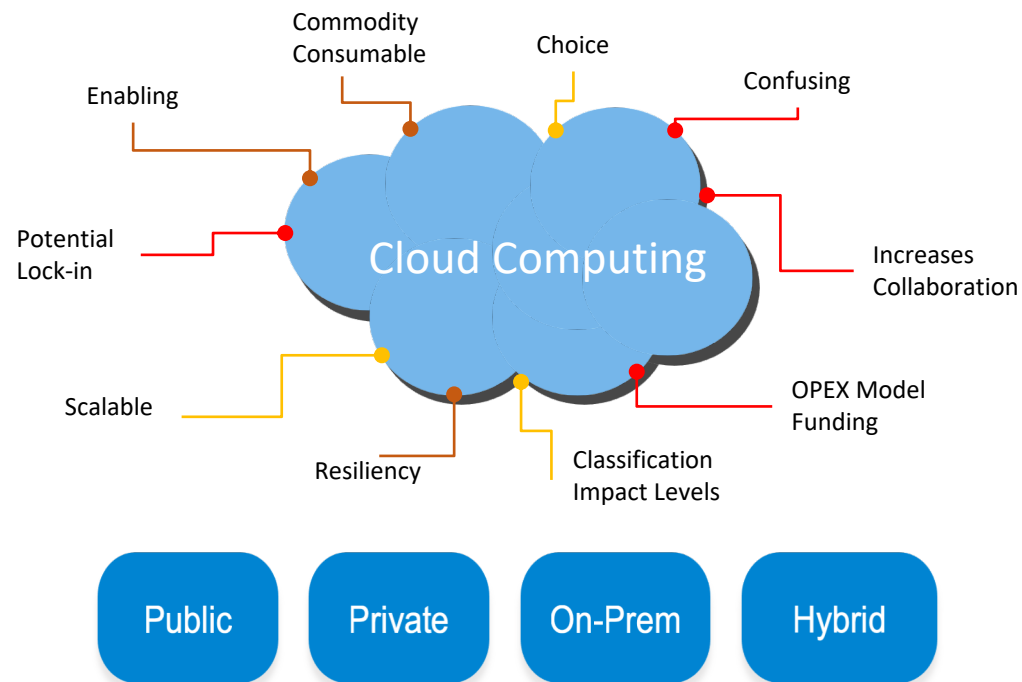
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What do you think of the cloud?



NIST 800-145

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a **shared pool of configurable computing resources** (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

GOVERNMENT USE OF CLOUD

A blank canvas for new programs to begin rapid development
A Delivery Model for enabling new forms of rapid service delivery
A confusing place without an established strategy

80% OF THE NEEDED SOLUTION

Government Reference Architectures should include 80% reuse across solution space (multi-cloud)

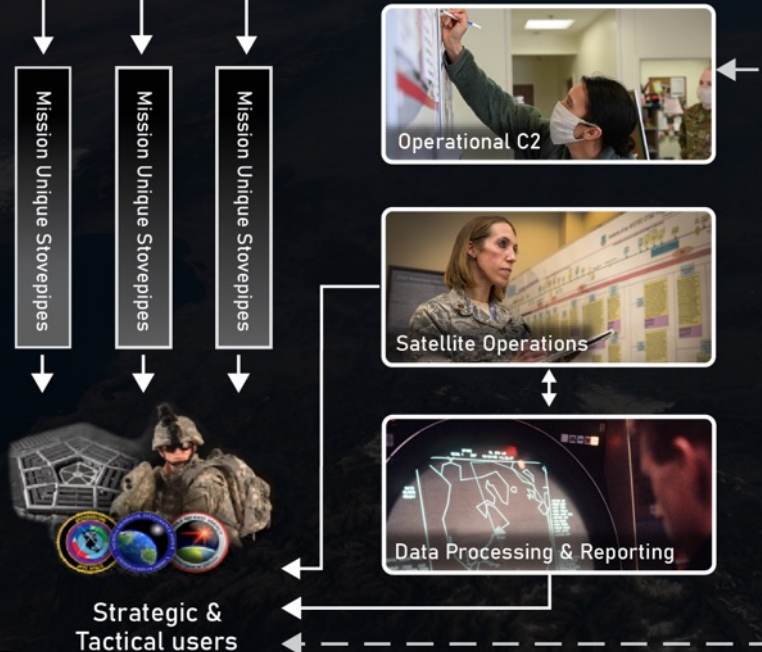
THE CHALLENGE

Effective use of the cloud requires understanding of many things from technology to contract mechanisms

The Cloud can be enabling but an abundance of choices can leave teams wondering what should I do with the cloud?...what is the best way to use clouds?

TODAY'S CHALLENGES

- Stove-Piped Systems
- Aging Infrastructure
- Proliferating Capacity Demand
- Limited Commercial Access
- Limited Coalition Partnerships
- Stove-Piped SatOps Training



CROSS-MISSION GROUND & COMMUNICATIONS

TOMORROW'S RESILIENT ENTERPRISE GROUND AND COMMUNICATIONS



- Interoperable Enterprise Capabilities
- Resilient & Modern Infrastructure
- Expanded & Diverse Network Capacity
- Access to Commercial Innovations
- Robust Coalition Partnerships
- Efficient & Streamlined SatOps Training

Operational View - 1

Rev
1.0



Enterprise Ground Services view of Hybrid Cloud

Enterprise Ground Services is based on a hybrid cloud strategy. By this we mean that we have multiple abstraction layers that allow the enterprise to be infrastructure provider agnostic. This allows the enterprise to scale and move workloads between on-prem and government cloud infrastructure environments freely for multiple activities (Development, Integration & Test, Operations) at multiple classification levels with minimal additional work by Mission Partners (MP) and Development Partners (DP).

Why is this necessary ?

RESILIENCY THROUGH CHOICE

Resiliency through choice is not the wild wild west but deliberate decisions that enables the enterprise to:

- Prevent vendor lock-in by promoting competition and targeted strategic options (CHOICE) at multiple layers
- Surge capabilities in times of demand and conflict.
- Respond to an ever-changing threat environment.
- Complicate adversary decision making calculus.
- Accelerate adoption of integrated DCO-S capabilities.
- Accelerate adoption of automation, machine learning, and artificial intelligence technologies.
- Accelerate onboarding of non-traditionals & industry to capitalize on new capabilities.
- Optimize workloads based on ROI, cost and risk postures.
- Support both legacy and new space missions desired capabilities.
- Transition away from historical stovepipes.



2015 Architectural Landscape

- Early pictorial of the landscape used to communicate to the USSF the broad spectrum of market segmentation and challenges for the space enterprise
- Even at this point leadership was hesitant in tackling all these trade spaces in ground service development and the space enterprise



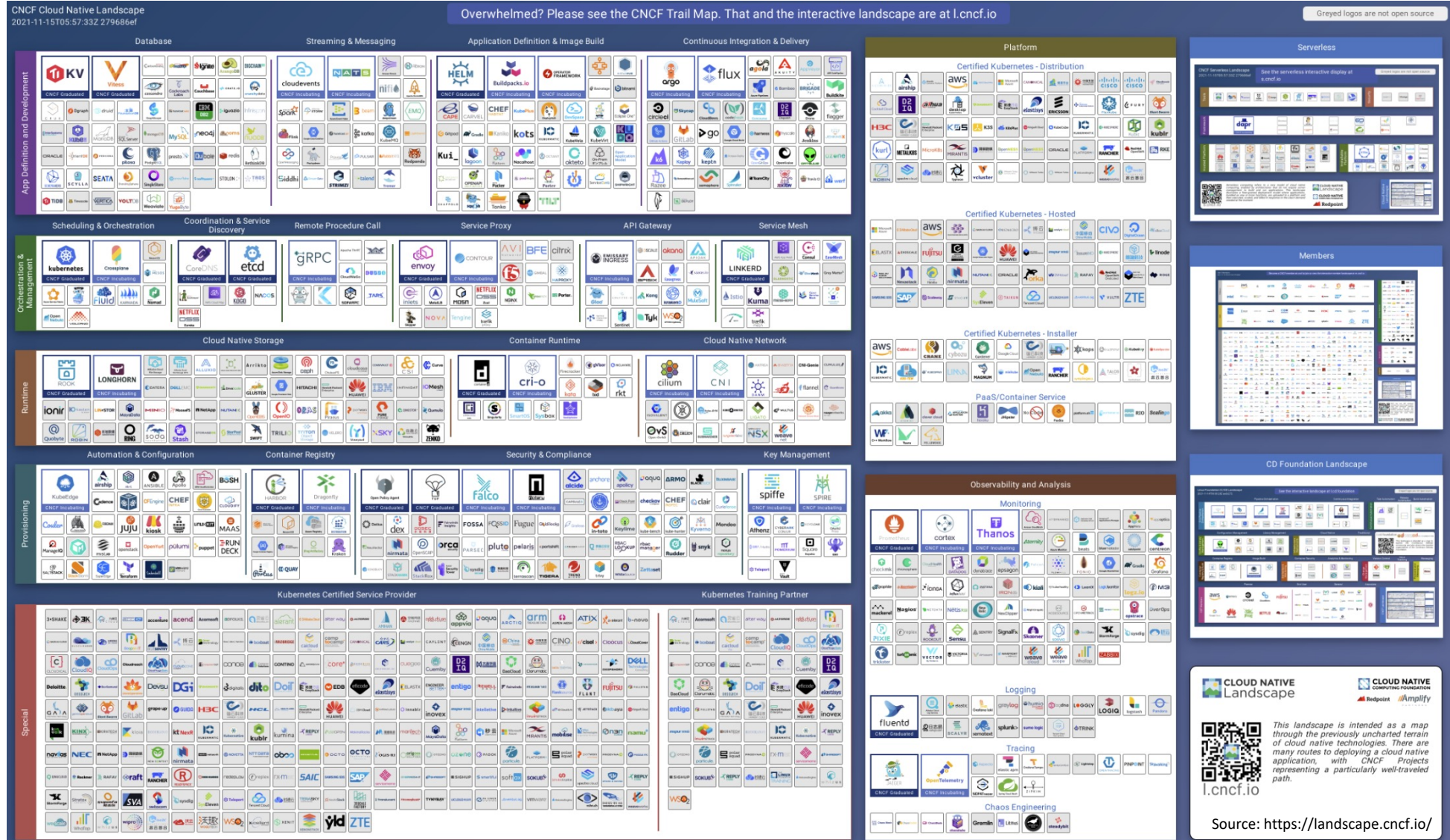


2021 Cloud Native Landscape

Obviously, this did not get any easier with time

Likely much of this map does not actively apply to ECX missions

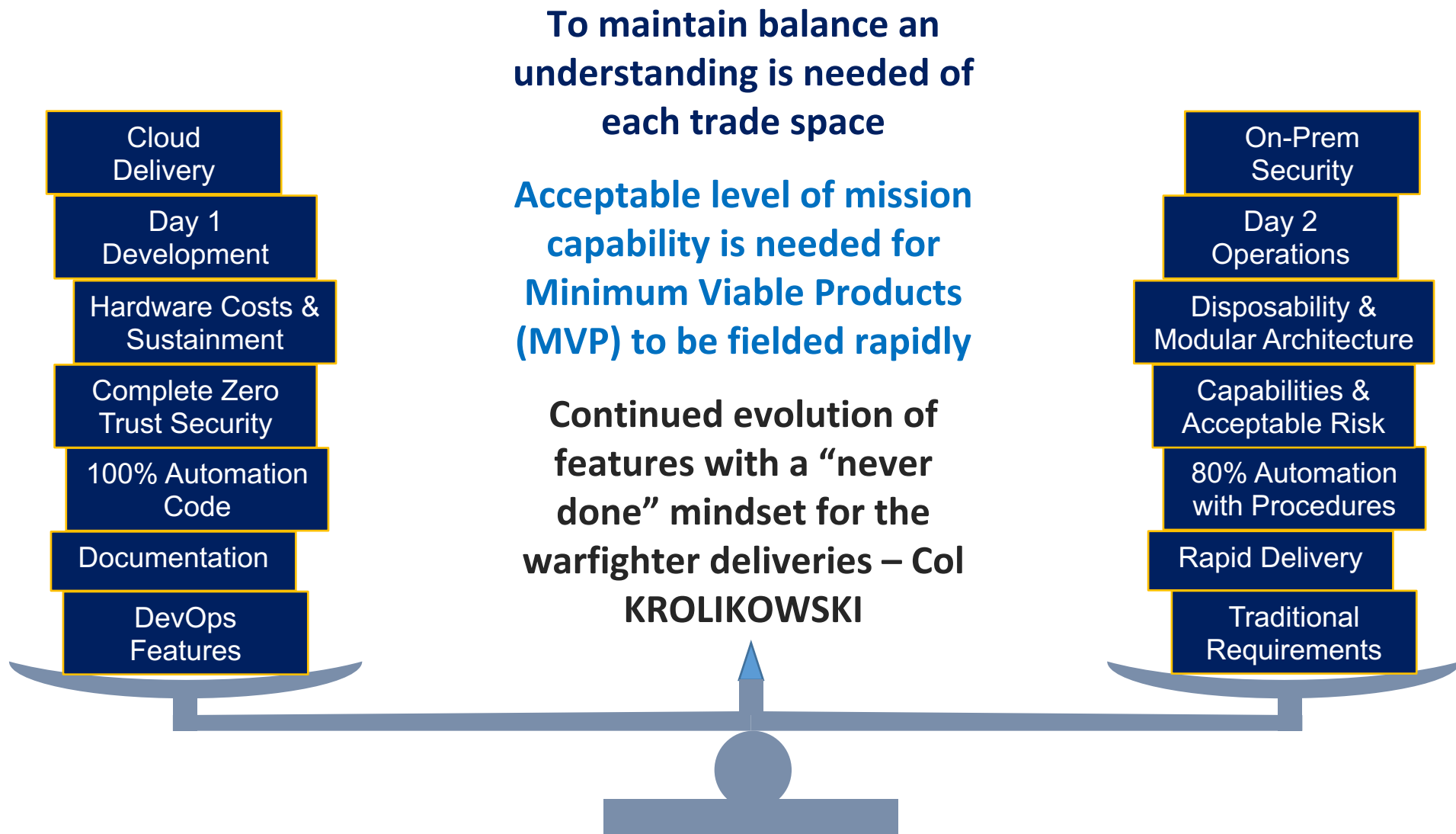
Government is using a smaller subset of these products



The best chance of understanding this landscape is working with those in industry who live here



Finding the Right Balance



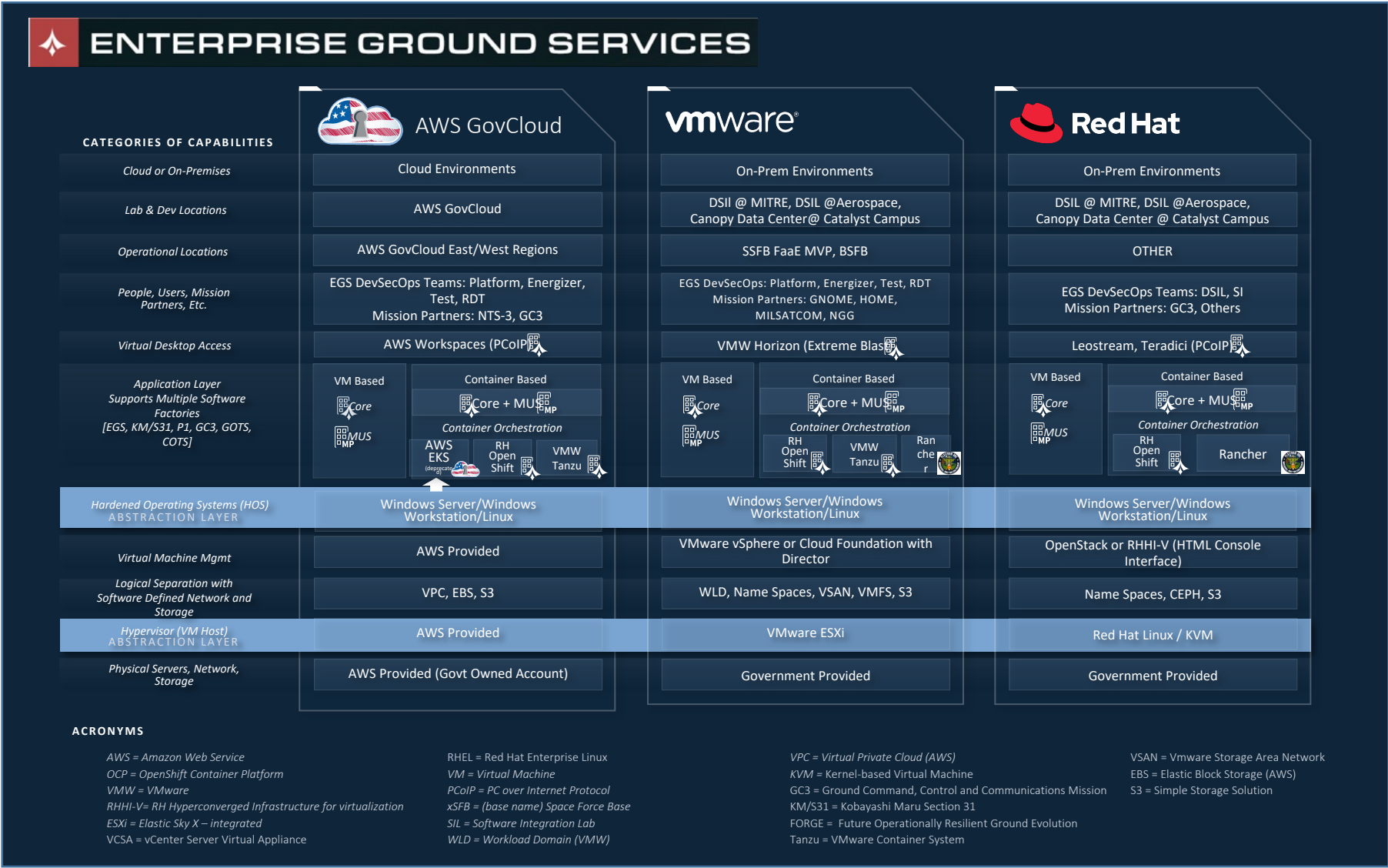


EGS Views on Abstraction Layers

Common abstractions layers in the cloud include Operating Systems at the Virtual Machine (VM) layer for traditional lift and shift (good)

Above the OS we have containers often docker based with Kubernetes (K8) management and orchestration (better)

Helm Charts help you define, install, and upgrade even the most complex K8 applications (best)





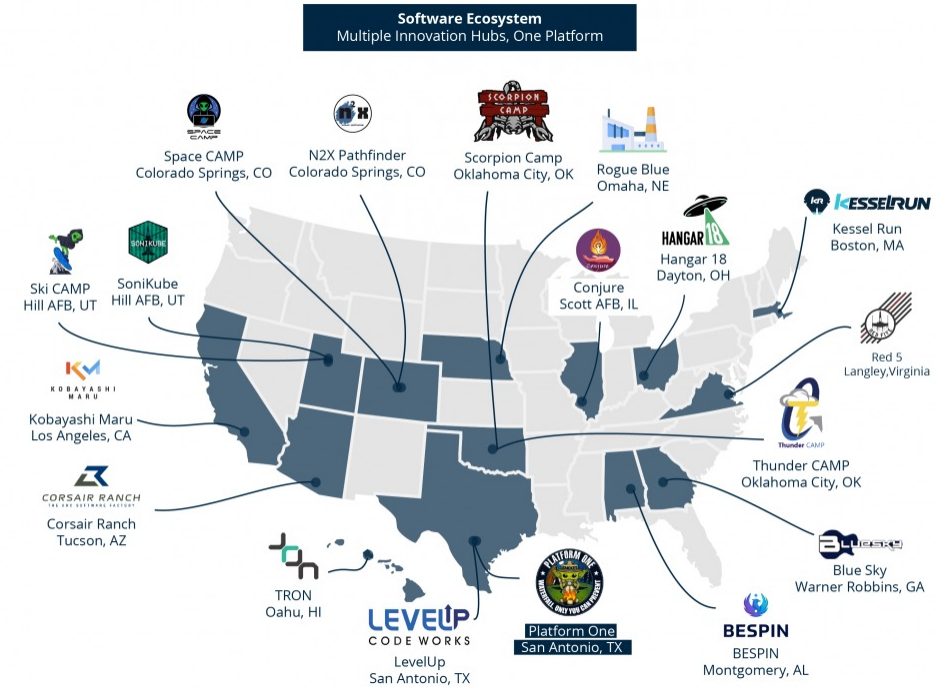
Reference Architectures and Design Patterns

- By developing Reference Architectures via Digital Engineering, Digital Twins, the Cloud Mobility Issue becomes less impactful to end users
- Design patterns using SYSML/UML design tools, Use Case definitions and deploy via Infrastructure as code (IaC) tested in IL2/4 clouds before promotion to higher classifications
- Test these design patterns and code in multiple cloud environments
 - Ansible and Terraform code often used to level set each cloud
 - Example: AWS, Azure, OCI, Google
- Use common languages and methods such as Ansible, JSON, YAML or other control script languages
- Use HELM and similar processes to enable container portability



Becoming Ready for the Cloud

- Most have figured out how to shift from hardware servers to virtual machines
 - This is no real challenge anymore
- There is a greater challenge to reduce even further into micro services and containers
 - Programs should focus on containerization and Kubernetes migration
- Develop an initiative with milestones on legacy capability transition to containers
 - You should have one application containerized at the time of this presentation and understand that process
- Utilize USSF and USAF Software Factories for assistance in the approach
 - Don't go it alone
- Use the established CI/CD pipelines in these SW Factories
 - Kobayashi Maru and Platform One are two of the enterprise software factories that should be highly considered for these migrations



Where To Find KM

<https://www.linkedin.com/company/kobayashi-maru/>

#kobayashimaru

smc.ecxc.workflow@us.af.mil

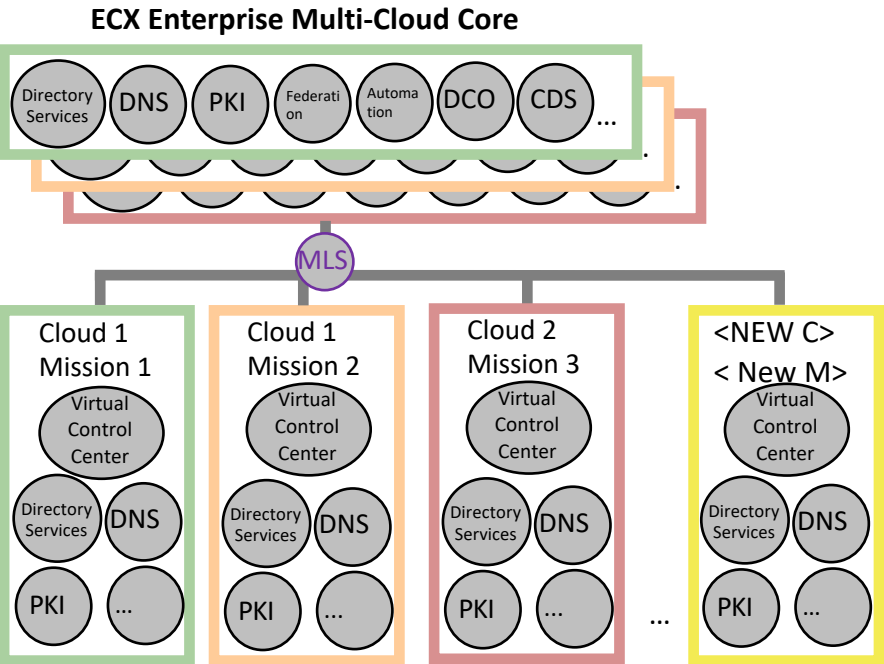
<https://software.af.mil/software-factories/>



The Enterprise Core Multi-Cloud Strategy

- Enterprise Core will utilize MeshONE-T and other ECX Cloud initiatives to stand up a new Multi-Classification, Multi-Cloud Ecosystem for Cross Mission Ground to enable the data plane across the ECX
 - Requires NEW Task Order that will encompass all ECX missions enabling access to multiple clouds at needed classifications and locations accessible by ECX mission domains
- **All environments – while severable – are linked via network and common classification**
 - Enables resiliency and diversity in ground needed to win wars that extend into space
 - Enables workload mobility from one cloud to another (on-prem and community or hosted)

Loose coupling makes it easy to plug-in or unplug from the Core



IMPACT LEVEL	INFORMATION SENSITIVITY	SECURITY CONTROLS	LOCATION	OFF-PREMISES CONNECTIVITY	SEPARATION	PERSONNEL REQUIREMENTS
2	PUBLIC or Non-critical Mission Information	FedRAMP v2 Moderate	US / US outlying areas or DoD on-premises	Internet	Virtual / Logical PUBLIC COMMUNITY	National Agency Check and Inquiries (NACI)
4	CUI or Non-CUI Non-Critical Mission Information Non-National Security Systems	Level 2 + CUI Specific Tailored Set	US / US outlying areas or DoD on-premises	NIPRNet via CAP	Virtual / Logical Limited "Public" Community Strong Virtual Separation Between Tenant Systems & Information	US Persons ADP-1 Single Scope Background Investigation (SSBI)
5	Higher Sensitivity CUI Mission Critical Information National Security Systems	Level 4 + NSS & CUI-Specific Tailored Set	US / US outlying areas or DoD on-premises	NIPRNet via CAP	Virtual / Logical FEDERAL GOV. COMMUNITY Dedicated Multi-Tenant Infrastructure Physically Separate from Non-Federal Systems Strong Virtual Separation Between Tenant Systems & Information	ADP-2 National Agency Check with Law and Credit (NACLC) Non-Disclosure Agreement (NDA)
6	Classified SECRET National Security Systems	Level 5 + Classified Overlay	US / US outlying areas or DoD on-premises CLEARED / CLASSIFIED FACILITIES	SIPRNET DIRECT With DoD SIPRNet Enclave Connection Approval	Virtual / Logical FEDERAL GOV. COMMUNITY Dedicated Multi-Tenant Infrastructure Physically Separate from Non-Federal and Unclassified Systems Strong Virtual Separation Between Tenant Systems & Information	US Citizens w/ Favorably Adjudicated SSBI & SECRET Clearance NDA

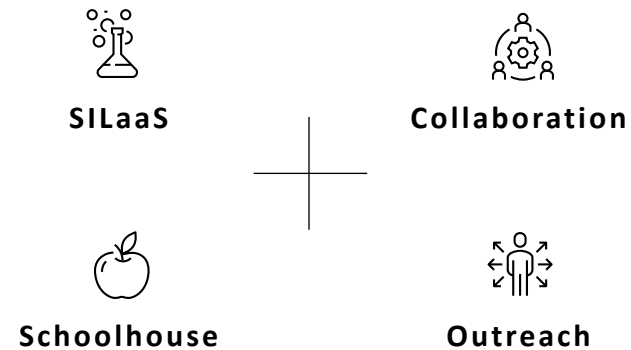
DISA Cloud Computing Security Requirements Summary



Canopy Software Integration Lab: Enabling the Ground Enterprise



Canopy, a new SSC/ECXG collaboration center, exists to transform satellite operations by providing an innovation ecosystem to assess and transition technology to operational utility for the space enterprise through four focus areas...



The synergy created by these interactions will allow direct feedback from our most important customers, our warfighters... **together we will inform smarter, better, technology development.** We are making this investment because we recognize the importance of our partners, and we are dedicated to their success because we understand it is also our own.



Using Cross Mission Ground Accelerators - Canopy

Canopy is a Government Owned Technical Baselines - Open Ecosystem

- Meant to serve all Cross Mission Ground
- A place for industry to partner with ECX teams and other missions in ECX

SIL [Service Integration Lab] as a Service (SILaaS)

- Hybrid Multi-Cloud Multi-Tenant Based Architecture (Demonstratable)
- Automated Tenant Workload Mobility
- Tenant Transparent Environment Deltas
- Simulated and Live Contact Capable
- Automated Multi-Classification Deployment, Promotion and Software Assurance Pipelines (In Progress)

Recent accomplishments

- Selection of Enterprise Backup Solution through competitive demonstration and integration of products
- Selection of Enterprise Access Cross Domain Solution (CDS) for Multi-Classification single pane of glass Virtual Desktop



Contact Information

Thank you!

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SIL Partnerships

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