Migrating a U.S. Army application to the cloud

perspecta

The AWS GovCloud, an isolated region specifically for U.S. government customers, became the first commercial cloud provider authorized to achieve this certification.

With this certification process in place, and commercial CSPs becoming certified, the Army has sought to migrate many of its key applications into the cloud. To do this, the Army turned to Perspecta for assistance with its first application move to the AWS GovCloud. Perspecta and the Army have collaborated for more than 25 years, delivering IT innovation and advanced capabilities to ensure that the Army achieves its mission.

One of the key applications Perspecta supports is the Total Ammunition Management Information System (TAMIS), which is a mission-critical, web-enabled application that manages the U.S. Army Ammunition Requirements process. Soldiers use it to forecast their ammunition requirements for training and testing operations, and to request and receive wartime ammunition worldwide.

TAMIS was selected as the Army's groundbreaking move to the AWS GovCloud. They enlisted Perspecta to migrate the TAMIS training environment as a proof-of-concept, and then upon its success, migrate TAMIS into a full production deployment in the cloud. Perspecta was tasked with proving that an Army application can transition successfully to the AWS GovCloud. Through this, the Army also wanted to ensure the development of a repeatable deployment pattern for future application movements to the cloud.

Migration to the cloud

Perspecta leverawged its repeatable Application Transformation to Cloud (AT2C) process, which can be tailored for even the most complex cloud migrations to:

- Define the measures of success and tailor the AT2C process

- Measure the application's suitability for the cloud environment

- Analyze the results to determine the best path for success

- Redesign the application architecture for the cloud environment

- Transform the application and migrate to the cloud

- Optimize the cloud environment for performance and affordability

Assessment

Perspecta performed a comprehensive application assessment, analyzing both mission and technical characteristics of the TAMIS application, confirming that it was suitable to migrate to the AWS GovCloud. The assessment consisted of architecture, application code, interfaces and security components, in order to take full advantage of cloud technologies. A critical component of the assessment was validating the security of the TAMIS system against the Risk Management Framework (RMF), which identified a number of technical issues that needed to be addressed to take full advantage of cloud technologies.

Aligning with DoD's cloud strategy

The U.S. Department of Defense (DoD) is making a strategic move of its mission support applications (apps) to the cloud. Cloud service providers include internal DoD providers such as the Defense Information Systems Agency's (DISA) milCloud, and certified commercial cloud service providers (CSPs), including Amazon Web Services (AWS) GovCloud. In working with the U.S. Army on its first program transition to the cloud, Perspecta showcased a successful application migration process, achieved an authorization to operate (ATO) and demonstrated the resiliency of apps in the AWS GovCloud.

Building on a long partnership

In 2014, DISA granted AWS provisional authority to operate its GovCloud services under DoD Cloud Security Requirements Guide (SRG) at Impact Level (IL) 4, and some services at IL5, which support handling of "controlled unclassified information."

"The Army stands to gain from a leaner infrastructure, fewer systems and greater economies of scale.

... Cloud migration can present numerous challenges. Investing in phase-driven migration enabled us to see real value in the TAMIS proof-of-concept."

–Bob Torche, U.S. Army G-3/5/7

Source: Defense Innovation Unit Experimental, https://www.diux.mil/
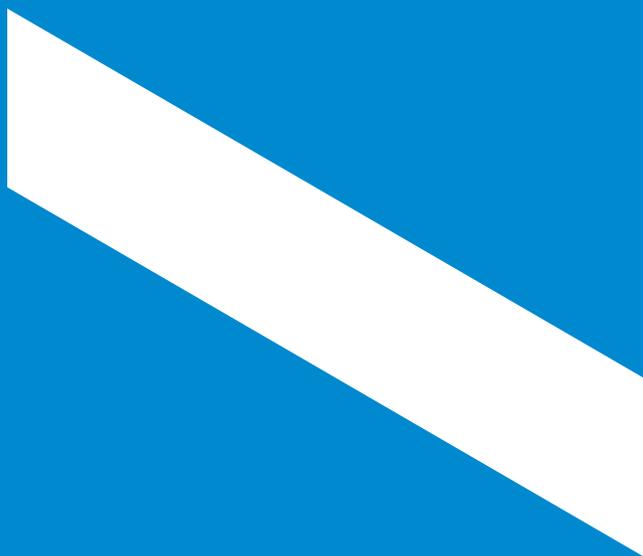
Migration plan and security assessment

Following the assessment, Perspecta analyzed the results and established a roadmap to minimize risk and ensure TAMIS was operational as soon as possible after the migration. The roadmap included four major phases:

1. Develop a sample environment in AWS GovCloud to establish connections to the cloud access point (CAP), internet access point (IAP), Cybersecurity Service Provider (CSSP), DISA Global Content Delivery Service (GCDS) and Akamai Cloud Delivery Platform

2. Migrate the TAMIS staging environment from its legacy environment to AWS to prove TAMIS could run in the AWS GovCloud using basic cloud services — virtual private cloud, elastic cloud compute, elastic block storage and simple storage service

3. Perform a RMF Self-Assessment on the TAMIS staging environment to attain a short-term ATO and prepare for a third-party assessment

4. Migrate the TAMIS production environment and optimize operations in the cloud to take advantage of new capabilities and the AWS pricing model

Application transformation to cloud

After the assessment, Perspecta successfully moved the TAMIS training environment as-is, thereby minimizing additional rework and replicating the current shared infrastructure of firewalls and the network. After configuring the new environment and building out servers, rigorous testing began. Having successfully migrated the application to the AWS GovCloud, Perspecta re-factored/re-architected the application by completing the following re-factoring/re-architecting optimizations:

- Database tier optimization included building out a high-availability SQL server configuration. This supports high availability, continuity of operations and disaster recovery requirements and provides a fully synchronized read replica for reporting

- Application tier optimization included moving user sessions from application servers to the AWS regional service Dynamo database for session management, automating starting servers and autoscaling groups to add or remove servers based on use

- The configuration uses elastic load balancing to manage traffic and workloads across multiple availability zones to support high availability and disaster recovery requirements

- Optimization at the architecture's application and data tiers supports efficient use of compute and storage capacity to take advantage of the AWS "pay-as-you go" consumption pricing model

- The design, documentation and testing of the TAMIS training environment supports implementation, testing,

certification and accreditation of the TAMIS production environment at DoD SRG IL4

- The application was re-architected to further take advantage of cloud microservice capability

After the application re-factoring/re-architecture for cloud work had been completed, work on the TAMIS production environment began in January 2017.

With the many lessons learned and best practices now part of the Perspecta expertise, the RMF Self-Assessment was completed, and TAMIS received its ATO in August 2017. With its rapid progression, the IL 4 TAMIS production application and workloads officially went live in the AWS GovCloud environment on August 21, 2017.

The DevOps implementation

Due to frequent DoD command stakeholders' requirements changes, Perspecta continues to deliver product improvements through a DevOps approach to improve development/test cycles and release time to production. This approach has had a significant impact in reducing testing from weeks to hours, and release time from more than monthly to daily. Key factors in the improvements include:

- End to-end automation of the DevOps life cycle using the Microsoft stack, including Team Foundation Server

- Two-week sprints using Agile Scrum

- Continuous delivery best practices

- Automated testing using HPE Unified Functional Testing, HPE LoadRunner and Microsoft Test Manager

- Capture and reporting of Agile Scrum metrics

As a result of the DevOps approach, there was an immediate reduction in downtime through a rapid, continuous delivery, automated-release pipeline, and significant quality improvements were seen via defect reduction and shortened testing cycles.

Setting the stage for success

The Army and Perspecta successfully migrated the TAMIS environments to AWS GovCloud and in the process learned some key lessons for future migrations. Defense agencies moving apps to AWS can balance cost versus performance by taking advantage of the elastic features of the cloud environment. For example, the base infrastructure should be deployed on "reserved" resources, and the flexible infrastructure deployed as "on-demand," with the client paying for higher-priced, on-demand resources only when used. In addition, AWS provides the capability to implement a hardened infrastructure, but the deployment must follow the correct procedures for dedicated resources, network and security configurations, and privileged user access to actually implement it in a manner compatible with the Cloud SRG requirements.