Migrating Mission-Critical Applications to the Cloud in a Federal Agency

The Challenge

Federal agencies are recognizing the strategic value of moving their mission-critical applications to the cloud. Cloud and on-premises security now carry similar risks; by offloading server-side responsibility, agencies can focus more keenly on customer needs.

Migrating significant applications to the cloud requires a shift in mindset, as well as significant changes in infrastructure and application architecture.The true potential of cloud migration is realized when agencies adopt lean or agile work methodologies, which focus on velocity and quality, alongside the other changes taking place.

Modernization efforts are often encumbered by traditional, lengthy, and siloed processes that hamper results and slow down the pipeline from needs assessment to execution and results. But the complete replacement of legacy systems with cloud solutions all at once is also costly and risky.

The best way to modernize federal agencies relies on implementing changes in an iterative, agile fashion. This approach stresses agile and lean modernization methodologies that increase velocity and quality of delivery, while meeting key targets of security, minimal budget, and speed.

Continuously Available Functions = Move to the Cloud

Macro Solutions supports a federal financial regulatory agency in managing its portfolio of applications, including many that are mission-critical. The operational status of this agency aligns with the Presidential Policy Directive 40 (PPD-40) requiring federal agencies to have their primary, mission-essential functions "continuously available." This was the impetus for the agency to revisit its continuous operations program and identify approaches to make the systems supporting its mission-essential functions available without performance interruption.

The elasticity and scalability of a cloud environment provided an approach to achieve continuous operations for the agency's mission-critical systems. Prior to cloud migration, mission-critical applications followed a traditional implementation approach: systems had dedicated hardware; change management followed a standard "waterfall" systems development life cycle (SDLC); and operations were run out of on-premises data center with a remote disaster recovery site. This orientation supports a culture of prolonged delivery schedules and persistent system outages; the corresponding disaster recovery plan creates too many interdependencies.

The goal of the federal agency's senior management was to provide continuous operations for its systems and change its approach to software development and systems implementation. The new implementation plan would consist of successive waves to migrate applications to the cloud.

Cloud Migration: A Small Trial to Test for Success

Macro Solutions conducted a short DevOps engagement with the agency to setup a fully automated pipeline to build and promote a minor web application to the cloud. The established pipeline was developed with the best available open source tools. This short, risk free endeavor established the target approach for a cloud-based, continuous integration/continuous delivery (CI/CD) for the agency's applications. It also clarified the characteristics of the applications that could easily move to the cloud and highlighted the challenges of their complex counterparts.

In preparation for this transition, Macro Solutions provided technical expertise on software design and implementation and thought leadership in automating pipelines to the cloud. It also supported the agency in actually migrating applications to the cloud.

With Macro Solutions' help, the agency adopted scrum-based agile tools and techniques as their implementation approach and crafted policies to automate software delivery pipelines. They also planned to use open source technology and tools for their software stack and software development automation and chose Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) cloud platforms for software deployment targets.

With the migration work clearly defined, Macro then organized the team into agile scrums focused on application re-architecture and modernization, security and governance, and pipeline development, all with a two-week sprint cadence. A scrum-of-the-scrum provided oversight, cross-team coordination, and overall guidance.

Federal team members served as product owners, allowing agile teams to be led by the "voice of their customer." The teams incorporated research spikes to plan, evaluated tools, and validated application migration concerns. The work is still underway; the agency has plans to complete the entire roadmap by the end of 2018.

		Current State	Future State
♥	**User Experience**	• Device-specific • Simple data access • Disjointed	• Multi-device • Seamless • Contextual awareness
	Application	• Monolithic • Brittle, fragile • Limited scale	• Micro services • Stable, self-healing • Scalable
	Delivery Method	• Waterfall-based • Big Bang rollout • Risky	• Agile • Iterative • Contained risk
	Infrastructure	• Manual builds • Layered with specialization • Separation of skills and activities	• CI/CD, DevOps • *-as-code • Software-controlled • Configurable
	Security	• After-thought • Manual • Review-based	• Built into process and product • Real-time • Automated scanning and monitoring

Migration Results: Challenges Can Be Overcome With Expertise

This federal financial regulatory agency has a portfolio filled with hundreds of applications and numerous integration points and established processes. Cloud migration itself can be a significant task fraught with challenges. Macro Solutions' expertise in cloud-based critical solutions, including a deep understanding of systems architecture and agile development, has helped the agency navigate the following challenges during migration:

1. Integration points that legacy applications have with other systems. These applications have evolved in functionality over time and as their utility has evolved, they consume or share data with other systems. Migrating certain legacy applications often creates a domino effect: while getting some applications cloud-ready, integration points create dependencies that require their own specific cloud-readiness planning.

2. Limited options for PaaS migrations due to the dependency of database-stored procedures. Some complex applications are actually a collection of multiple sub-systems that might be implemented using different technologies. While some sub-systems of an application are cloud-ready, other may not be good candidates for the selected PaaS target. This may require sub-systems that are not yet cloud-ready to be implemented or integrated with core cloud systems so that the combined system may perform coherently.

3.Overwhelming options for CI/CD tool sets. It often takes significant experimentation to find the right mix of tools for the CI/CD pipeline. Many of these tools are open source with limited documentation, creating an even greater challenge for integration. Additionally, as the CI/CD pipeline changes, the governance structure for various aspects of the pipeline and the cloud infrastructure need to adjust. Support from knowledgeable cloud champions with an understanding of non-cloud pipeline management can help teams get to better solutions faster.

4.Changes to the roles of individuals supporting traditional operational datacenters. Macro Solutions provided the federal financial regulatory agency with support and solutions to migrate its applications to the cloud; Macro can also help agencies align the skill sets required to maintain the cloud pipeline. Training and providing on-going support are crucial to the success of cloud migration.

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Moving Forward With Macro Solutions

Federal agency management needed to make changes to comply with federal regulations. With Macro Solutions' use of agile methodologies and expertise in choosing and implementing cloud-based solutions, the agency is well on its way to fulfilling its goals. Its mission-critical applications will be in the cloud and will be continuously available.

Moving applications to the cloud is not only federally mandated; it's also good business practice. What can Macro help you migrate?

About Macro Solutions

Macro Solutions is a full-service IT and management consulting firm focused on assisting customers with the selection, implementation, security, integration, and maintenance of cloud-based critical business solutions using agile tools and methodologies. Founded in 2000, Macro Solutions is an established Woman-Owned Small Business (WOSB) based in Washington, DC. The Macro team has experience managing multiple concurrent contracts and tasks with Federal Civilian, Intelligence Community (IC), and Department of Defense (DoD) agencies with work across the country. The company maintains a DCAA-compliant cost and labor accounting system and a Top Secret Facility clearance.

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Certifications
CMMI Level 3 maturity for both Development and Services (#24866),
ISO certified for:
Quality (9001: 2015)
Security (27001)
Service Management (20000).

The team includes:
CISSPs
Enterprise and Cloud Architects
DevOps Engineers
PMPs
CSMs

Security
Macro Solutions supports cyber policy development, documentation, and integration for the Federal CISO (Chief Information Security Officer). This support includes integrating the NIST Policies, established in 800-53 v4, with agency standards and mission requirements. The team also maintains the integrity and security of its network/cloud environments.