Reflections on an 18-Month Federal DevOps Transformation

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A Bit About Me...

- **2001** Started working agile projects
  - Exclusively commercial sector
  - Held almost every role, but project management fit best

- **2009** First DevOps transformation work
  - First work with Federal Government (DISA)
  - Served as agile & process re-engineering SME

- **2013** Started my current engagement
  - Large, Highly-Visible Office in Commerce Department
  - Solidify agile practices; initiate release automation/DevOps
Obligatory DevOps Definition

• DevOps is the natural extension of 15 years of agile thinking

• DevOps is primarily about:
  – Communication/Collaboration
  – Automation

• Advent of tools enables organizations to become DevOps:
  – Cloud Technology
  – Puppet / Ansible / Chef
• Businesses Demand **Change**
  – Fast time to market
  – Innovation
  – Differentiation

• Businesses Need **Stability**
  – Perfect up-Time
  – High quality
  – Bullet-proof security

These two demands are necessary, but cause conflict using traditional delivery mechanisms!
DevOps in Federal Sector

Head of IT → Dev

Procurement → Dev

Policy → Ops

Unions & Contractors → Contractors
The Organization

- Large Federal Office
- Forward-thinking CIO
  - commercial background
  - history of innovation
- Leadership that already worked well with each other
- 170 Internal/External Systems
  - 140 Legacy
  - 30 NextGen
The Situation

- NextGen pressure to deliver
- Highly visible outages
- Manual CM
- No central source repos
- Silo’d organization
- Various methodologies/technologies
The Team

• Small Digital Services team
  – 7 cross-functional team members
  – 1 Government PM

• Strong Leadership Support

• Access to All Layers of Organization

• Flexible Contract Vehicle!
Initial Engagement Objectives

• Create CICM Platform
  – Leverage 100% Open Source Software
  – Enable external user access

• Migrate 3 NextGen Programs onto CICM
  – Institute CM
  – Automated builds
  – Automated Deploys
  – Nightly testing

• Support Agile Practices
  – Training/Mentoring
  – Documented best practices

• Prepare for Rollout to all NextGen

Our Plan
• Months 1-3
  • setup CICM
  • migrate systems

• Months 4-6
  • document learning
  • “harden” mechanisms
Our Planned Approach to DevOps Transformation

- Continuous Delivery
- DevOps Practices
- Application Release Automation (ARA)
- Agile Development
- Configuration Management

We want to get here > then solidify things!
The Initial Platform

**Subversion**
Version control system that manages files and directories and tracks changes made to them over time.

**Jenkins**
Continuous Integration (CI) tool that automates and manages building and testing of software.

**Nexus Sonatype**
Repository Management tool stores binary software components used during development, build and deployment.

**SonarQube**
Reporting Dashboard that publishes Continuous Inspection metrics gathered during build and analysis of software.
How the Platform Worked

NextGen

Delivery Teams

Commit

Commit

Checkout

Checkout

Dependencies

Artifacts

Deploy

Shell

Test

Selenium

Publish

SIT

FQT

PVT

PROD

CICM Platform

SIT
Early Transformation

- Migrated 3 large programs
- Modernized CM practices
- Automated builds & SIT deployments
- Proof-of-concept Selenium testing
- Focused teams on Sonar metrics
- Passed several internal audits
- Established initial development standards
- Starting include more organizations in the effort

Showed the organization that this was actually possible. Confidence was building!
Early Problems

• No two projects looked the same

• Operations not participating in automation

• Deployments not addressing middleware, system or DB

• Test organization in “analysis paralysis” on test tools

• Audit organization not convinced of robust traceability

• Procurement saying automation demands out-of-scope
The “Perfect Storm” Upsets our Path

- Increasing rumors of “silver bullet” solution on CICM project
- Two upgrade-related outages on critical Legacy system costing millions
- Demands from business for more focus on Legacy vice NextGen
- Pressure from Congress to move faster on NextGen
- CIO desire to eliminate license costs
A Critical Decision Point...

- Option #1 - Stay the Course
  - Continue focus on NextGen
  - Spend 3-6 months “hardening gains”
  - Preparing for enterprise use

- OR -

- Option #2 - Full Steam Ahead
  - Expand focus to include Legacy
  - Defer “hardening” in favor of onboarding
  - “Build the plane as we fly”

What do you think they chose to do?
Going into Battle!

New objectives included:

• Begin migration of all projects onto new platform
• Assess their viability for automation
• Ensure limited deployment-related issues
• Fix problems with testing
• Sunset IBM Rational Suite
• Support new operations puppet initiative

Oh Yeah, and...

No additional staff!!
Enhance & Extend the Platform

NextGen

OSS ALM

Legacy

Delivery Teams

Commit

OSS

ALM

Admin Features

• Automated Upgrades
• Jenkins Templates
• LDAP Groups
• Labels

Commit

Checkout

SCM MANAGER

git

50+ Jenkins Slaves

Commit

Checkout

Publish

Test

Ansible

Selenium, TestComplete, SoapUI, LoadRunner, WebInspect

Deploy

SIT

FQT

PVT

PROD

CICM Platform
Our Ansible Decision

Ansible best suited our need for application deployments:

- Agentless
- Intended for non-Developers/System Admins
- Shallower learning curve
- Provides full Orchestration
- Clean Division of Interests:
  - Engineering maintains Playbook (the “what”)
  - PSB maintains Inventory (the “where”)
  - CICM maintains Platform (the “how”)
Creating the Transformation “Playbook”

How to handle flood of projects:

• Formalize platform processes

• Sure-up agile processes

• Align organization

• Get the word out
Focus on Process

- Migration to the platform
  - Vetting Projects for “fit”
  - On-boarding

- Administration of Platform
  - Enhancement Requests
  - Frequency of Deployments

- Knowledge transfer
  - Audits
  - Internal “Certification”
Fine-Tune the Release Process

• Introduced Bundling
  – “Build Once – Deploy Anywhere” (BODA)
  – All config defined up front

• Orchestration of non-automated components
  – DB
  – Middleware
  – System

• Defined metrics to gather & retention policy
Sure-up Agile Practices

- Measurement by metrics
- Tailored best practices
- Formal training
- Focus on Testing
  - Unit Tests
  - Functional Tests
- Codified enforcement of standards
Align the Organization

- Vision Alignment
  - Quarterly Leadership
  - Monthly Stakeholder
  - Weekly Platform Team

- Metrics-Based Reviews
  - Commit Frequency
  - Unit Tests
  - Static Analysis Issues

- Project maturity scale

- Updating & Standardizing Procurement Requirements
Get the Word Out

• Marketing Campaigns
  – Newsletter
  – Platform Knowledge Center
  – DevOps Days etc.

• Education
  – Brown Bags
  – Classroom & Online Training
  – Targeted Audit Reviews

• Procurement
  – New Demands on Contractors
  – Measurable Results

Recent Innovation!

With the help of project teams and many USPTO organizations, the CICM platform continues to mature and provide increased value to the organization:

Automated Testing – The CICM team is dedicating time to working with the PVT and FTD test teams as they gain proficiency in test automation using the Test Complete and Selenium test tools. All new tests are expected to be managed by the CICM platform within the next month.

Download Code Quality Reports – CICM users can now download a PDF report on the code quality metrics for each particular project from the sonar dashboard. To do this, simply visit the project of interest and click the download to PDF button on the bottom, right-hand corner of the page.
Starting to Make Serious Impact

• 70+ projects migrated to the Platform
  – All portfolios represented
  – Heterogeneous technologies

• Clear Transition from Pilot to Enterprise
  – 1500+ Automated Builds Daily
  – 10 Projects with Ansible Deployments

• No Reported Issues with CM or Deployments from Platform

• Cutting costs moving onto Open Source Platform

But Operations Still Not Comfortable with Automated Deployments to Post-Development Environments!
A Second Perfect Storm??

- Legacy outage forces Operations to recover using Ansible
- First ever “organic” DevOps deployment occurs
- Growing pressure from Business and Engineering to leverage new automation
- Gene Kim and other thought leaders come speak about taking risks in DevOps

Permission granted to automated deployments to production!
Its been 1 Year Since That Breakthrough...

- All 170 Active Systems Under CM
- Most popular technologies supported
- Standards & best practices defined
- Application Release Automation (ARA) in place
  Production deployments aren’t continuous – but they are common!
- DevOps Culture taking root
- Production outages increasingly rare
- Organization nearly able to staff CICM roles as O&M not high-end consulting
What We Are Working on Now

Platform

- Introducing tools to mature platform
- Introduction of a Pipeline View
- Central Administration
- Self-provisioning of cloud resources
- Audit reporting
- CMDB
What We Are Working on Now

• People
  – Work with Procurement on Agile contracting
  – Continued training; focus on Government employees
  – Focused mentoring specific to functional test quality & regression

• Process
  – Reinventing release process
    • Orchestrate hybrid Puppet & Ansible deployments
    • Addressing database
  – Institutionalize metrics-based reviews (“virtual ORR”)
  – Satisfy audit & oversight requirements automatically
  – Determine “how far” we want to go towards CD
What You Should Expect on Your DevOps Journey

• DevOps Is Hard!
  – Particularly hard in Federal sector
  – Takes vision, courage & endurance
  – You’ll have to be a salesman
  – Everybody is bought in...until it impacts them

• You will have problems with:
  – Automated Testing
  – Getting Operations to take that first leap

• Contracts & outside SMEs can help, but nothing works without strong, consistent support of leadership

• You need the proper foundation before DevOps works
• What works today will NOT work tomorrow...Plan for it.
• People, Process & Tools must mature in Lockstep
• ARA with good DevOps may be the finish line for Federal Enterprises