



A Minority Woman-Owned Hubzone-certified Small Business

Agile & DevOps To Improve Product Development Flow

2017 FedCASIC Presentation

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Intro to Harmonia Holdings Group, LLC

- Small, Minority/Woman-owned HUBZone Qualified
- Founded in 2006
- Appraised at CMMI Level 3 (CMMI-DEV ML3) for Agile
- ISO 9001:2008 for Quality Management
- ISO 20000-1:2011 for IT Service Management
- ISO 27001:2013 for Information Security Management System

Awards

- 2016: *Abraham Lincoln Honor Awards, USDA AMS*
- 2016: *USDA AMS Administrator's Award*
- 2015: *CEO is Finalist for Ernst & Young Entrepreneur of Year*
- 2015: *Woman-Owned Business Contractor of Year, USDA FSA*
- 2015: *HUBZone Contractor of Year, USDA FSIS*
- 2014: *CEO is among Fed 100*
- 2014: *Fast 50 Pan Asian American Biz*
- 2013: *CTO of the Year, Golden Bridge, CA*
- 2013: *Biz Silver Award, Tech Exec of the Year*
- 2013 & 2007: *Tibbetts Award*
- 2013: *Featured in Forbes*
- 2009-2016: *Inc. 5000 Fastest Growing*

Offices



Industry Trends

1. DevOps
2. Scaled Agile for multiple teams (SAFe)
3. Visualization of DevOps workflows
4. DevOps for Large Scale Databases
5. DevSecOps
6. Behavior Driven Development (BDD)

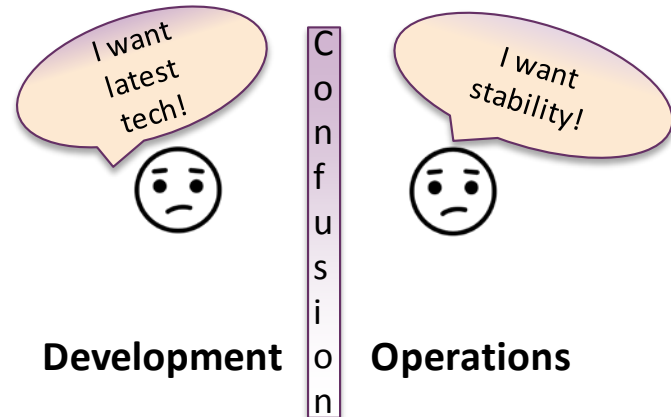
DevOps leads to:

- 30x more frequent production deployments
- 200x faster production deployment lead time
- 60x higher change success rate for production deployments
- 168x faster Mean Time To Restore Service

- 2016 State of DevOps Report

What Problems is DevOps Trying to Solve

- Agile team releases 4 weeks and Ops releases every 6 months
- More releases = More production failures
- More releases = More security vulnerabilities
- Developers are from Venus and Operations are from Mars



How DevOps Tries to Solve the Problems

1. **Replace smart sysadmins with brilliant automation engineers**
 - **Continuous Deployment (CD)**
2. **Replace Configuration Management staff with automated versioning & rollback**
3. **Continuous monitoring (CM)**
4. **Massive automated testing**
5. **Huge culture shift**
6. **End of separate Development vs Operations & Maintenance (O&M) contracts**

Aligning Large Organizations with Agile/ DevOps

What Agile is for teams, SAFe is for organizations!

SAFe is an approach to harness the power of Agile and Lean at the program level and above

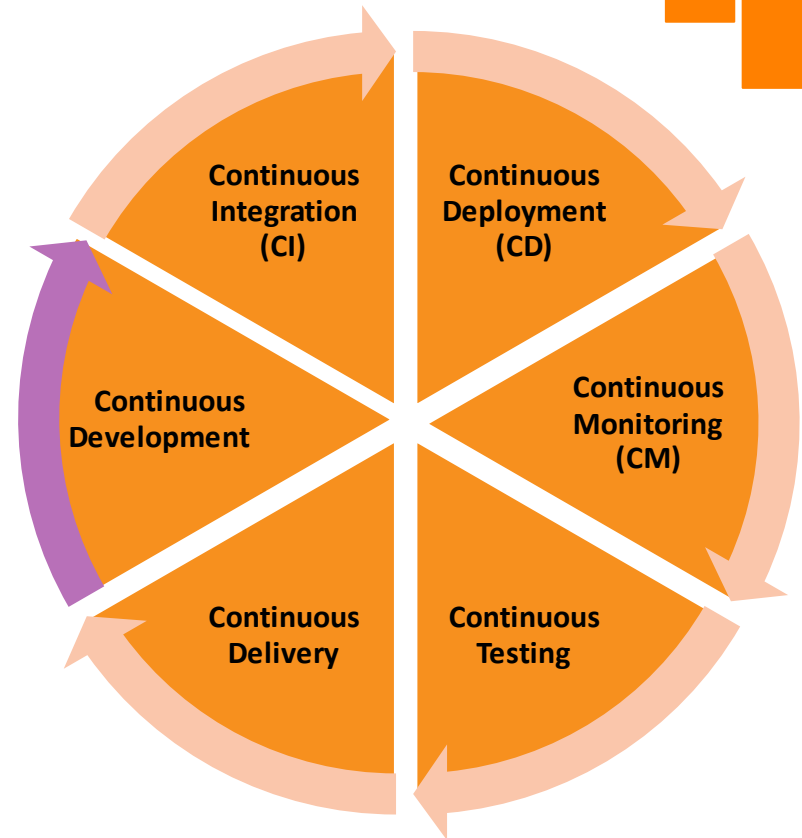


- Synchronizes alignment, collaboration and delivery of multiple teams
- Focused on the continuous flow of value through Agile Release Trains (ART)
- ART involves program increments (PI) of ~10 weeks with 5-12 teams among which objectives are distributed and dependencies are worked out

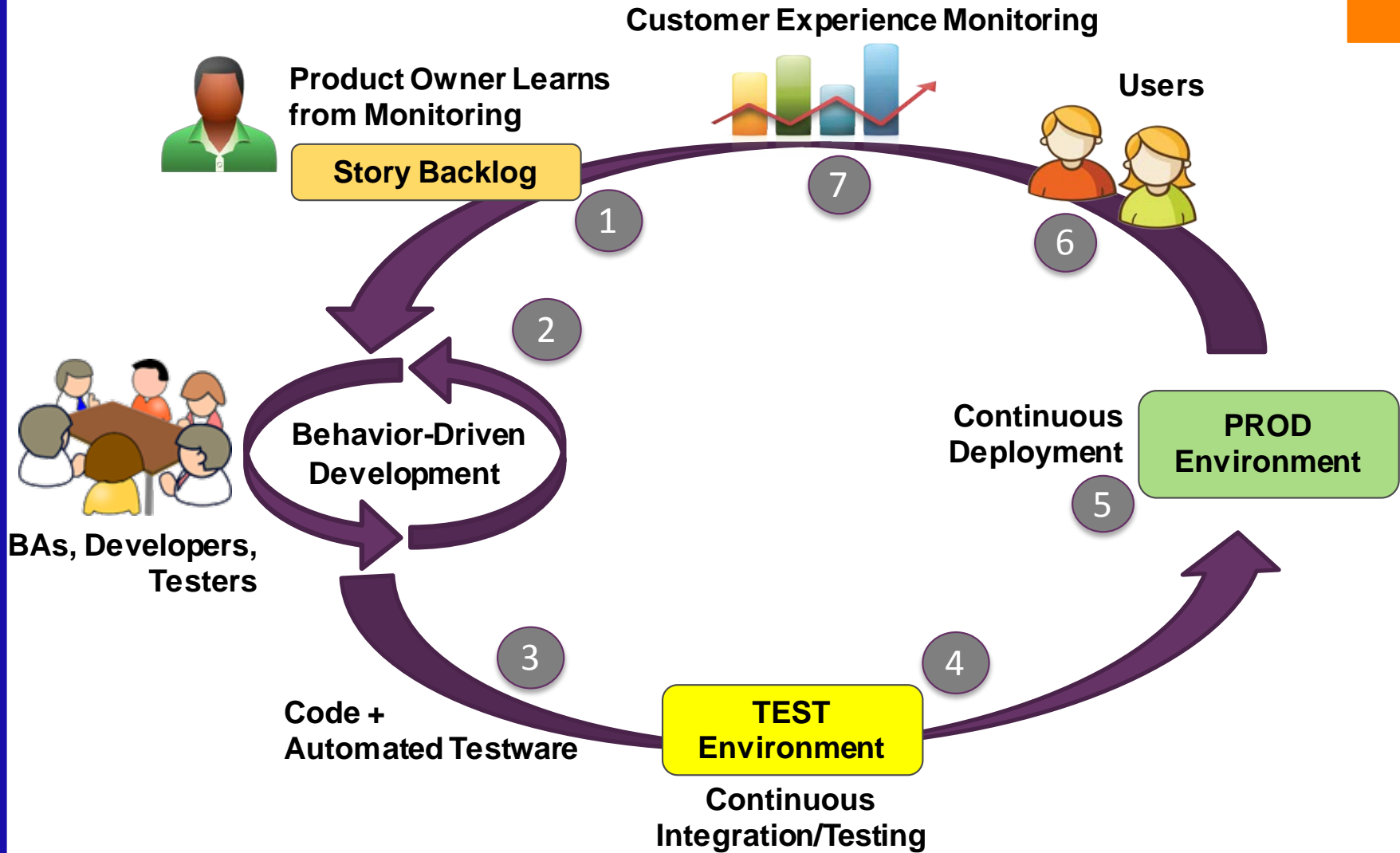
DevOps Means Different Things to Different People

DevOps =

- CI
- CI + CD + Manual Tests
- CI + CD + Automated Tests + Human Reviews
- CI + CD + CM+ Auto Deploy if 100% of Automated Tests passed
 - Deploy once a quarter
 - Deploy once a week
 - Deploy “continuously”



Harmonia's Overall DevOps Process



DevOps: Overwhelming Choices

DevOps adoption increased from 66 percent in 2015 to 74 percent in 2016

- RightScale survey

DEVELOPMENT

DevOps Tools Market Map

Source Code Management



Continuous Integration



Testing



Containers



Configuration Management



Deployment



Monitoring



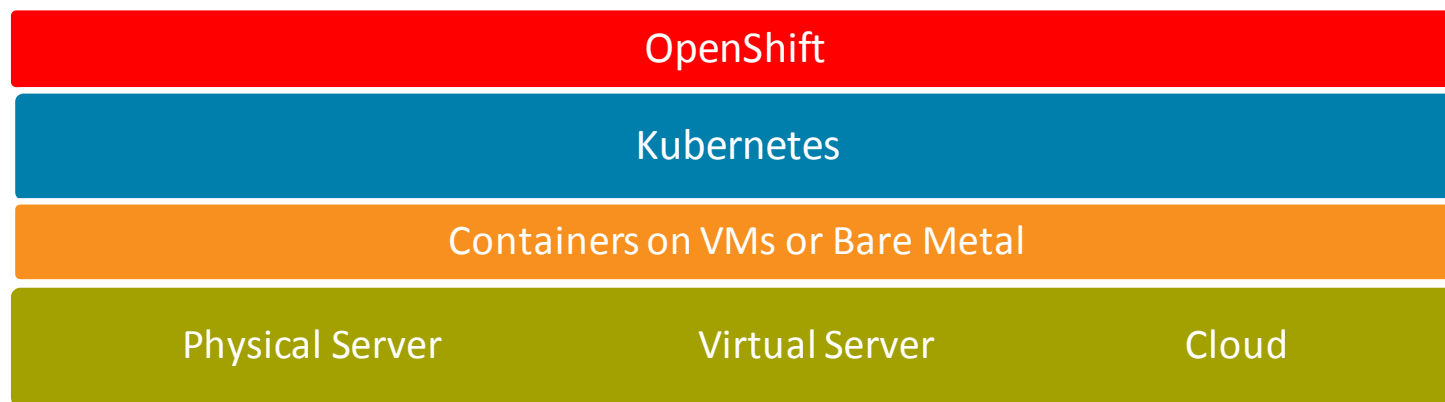
OPERATIONS

Bringing Order to Chaos

1. Use a Platform as a Service (PaaS)
2. Designing Microservices and packaging them into Containers
3. Scale and monitor using Container Orchestrator
4. Visualization of DevOps pipeline

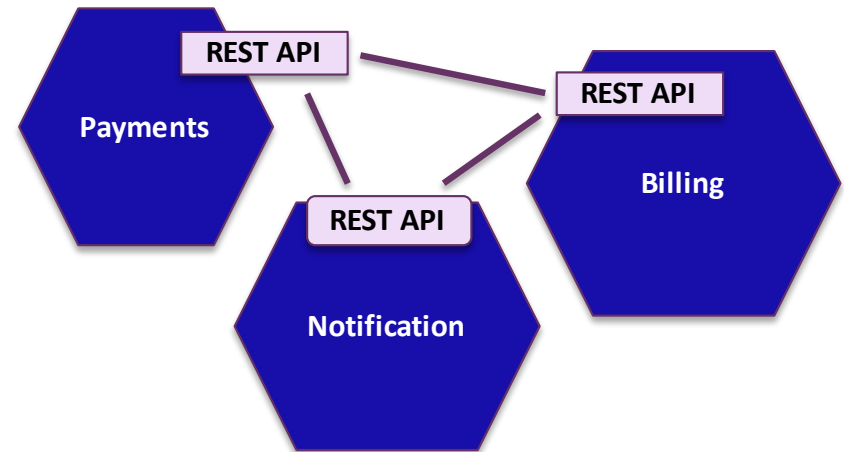
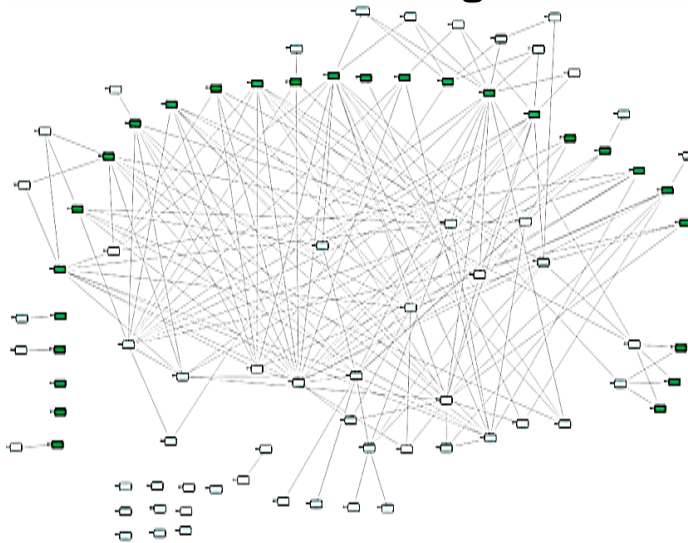
Example PaaS: OpenShift

- Self-Service Portal to create workflows
- Security enhancements over Kubernetes
- Persist data beyond container lifecycle
- Automation heavy-lifting using APIs and Ansible ecosystem



Microservices and Containers

- **Microservices are loosely coupled small autonomous services, modelled around business domain**
- **Autonomy gained by shedding data dependencies i.e. not sharing a database**
- **Ideal for containerizing**



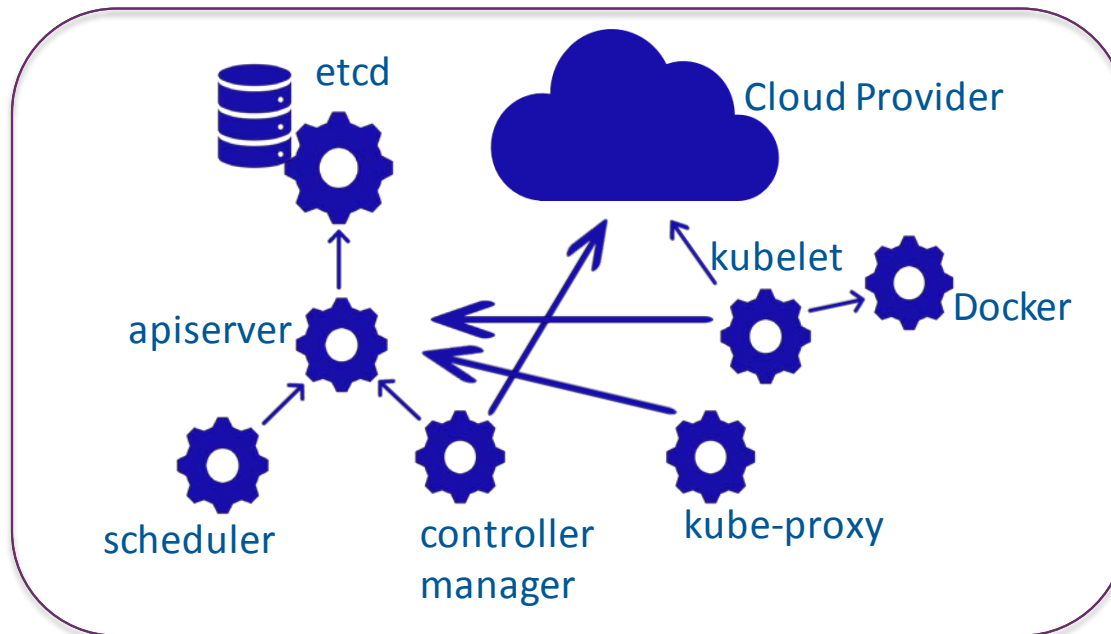
- **Containers are popular because they provide portability, standardization, scalability and better failure isolation**
- **Rather than scaling up with bigger and more powerful machines, scaling out with duplicate copies of the most used services**



Container Orchestration: Kubernetes (K8S)

How to manage and scale containerized microservices based applications?

- Manage container lifecycle and health checks
- Enable security and scale
- Optimal utilization by placing containers based on their resource requirements and other constraints



Note: Kubernetes architecture diagram is from Red Hat Kubernetes 101 blog

Visualization of DevOps Pipeline Example: Hygieia



Source: <http://www.capitalone.io/blog/hygieia-making-sense-out-of-your-devops-tools/>

DevOps for Large Scale Databases

Apply DevOps principles to the database releases

- Put Database scripts into the source control
- Create differential pre-deployment and post-deployment workflows per application release
- Major schema changes are thoroughly tested using A/B or Green/Yellow testing
- Incremental call to scripts, rollback scripts are readily available and tested prior to the release

Case in point: Harmonia maintains more than 400 databases of 5 kinds: Informix, IBM DB2, Oracle, MS SQL Server, IBM IDMS in the production environment, consisting of close to a Petabyte of data, 29 data marts and running 15,000 ETL procedures. Overall 240,000 reports are generated daily for 13,000 users.

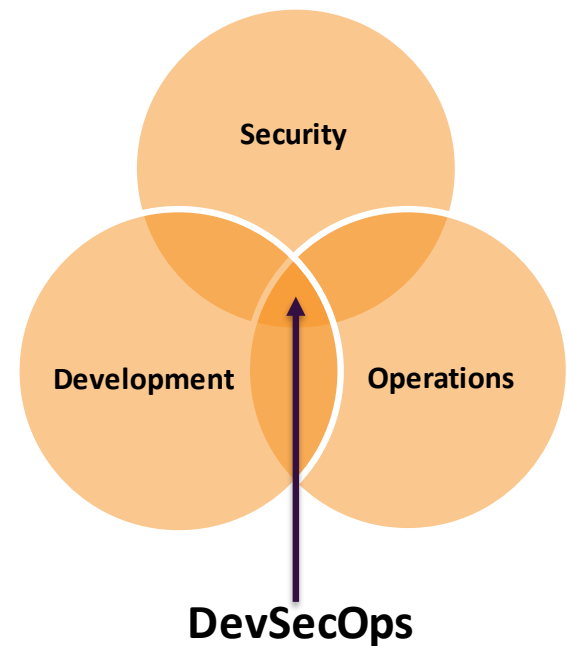
DevSecOps

Redefining Security in DevOps context - safely distributing security decisions at speed and scale

Control mechanisms to validate and audit code - security as code

Continuous Scan and Detection - everyone is responsible for security

Cultural Shift required - Failing the build if the audit fails



Approaches that Help DevSecOps

▪ Application Security Controls

- Validate inputs (SQL, ORM, LDAP, XML, XPath, Code injections), Access control (weak authentication, session management), Cross Site Scripting (XSS), ...

▪ Secure Coding Practices

- Scope, Buffer overflows, Sensitive data management, error handling, following compiler specs, incorporating code coverage and static code analysis tools, continuous scans, ...

▪ Security Algorithm Standards

- Security standards defined by NIST and NSA (such as FISMA 2002, FIPS 140-2, Special Publications), NIAP protection profiles, ...

Secure Coding

sonarqube Dashboards Issues Measures Rules Quality Profiles Quality Gates Christopher R. Eagan

★ **SAPPHIRE**

Issues Measures Code

April 5, 2017 11:32 AM Version 0.11.0-SNAPSHOT

Quality Gate Failed

15 Bugs > 0 2 Vulnerabilities > 0

Bugs & Vulnerabilities

<p>15^C</p> <p>Bugs</p>	<p>2^C</p> <p>Vulnerabilities</p>
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Leak Period: since 0.10.0-SNAPSHOT started a month ago

<p>4</p> <p>New Bugs</p>	<p>0</p> <p>New Vulnerabilities</p>
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Code Smells

<p>17d^A</p> <p>Debt</p> <p><small>started 2 years ago</small></p>	<p>684</p> <p>Code Smells</p>	<p>1d</p> <p>New Debt</p>	<p>35</p> <p>New Code Smells</p>
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Coverage

<p>53.6%</p> <p>Coverage</p>	<p>392</p> <p>Unit Tests</p>
<p>63.5%</p> <p>Coverage on 622 New Lines to Cover</p>	

Duplications

<p>75.6%</p> <p>Duplications</p>	<p>246</p> <p>Duplicated Blocks</p>
<p>2.1%</p> <p>Duplications on 4.4k New Lines</p>	

Service-oriented application which is designed to intelligently share information produced or collected at multiple large data centers, with very restrictive communication channels (low bandwidth networks)

233k

Lines of Code

Web 207k

Java 23k

JavaScript 3.5k

Quality Gate
SAPPHIRE way

Quality Profiles

- (Java) Sonar way
- (JavaScript) Sonar way
- (Web) Sonar way

- Home
- Continuous integration
- Issues
- Sources
- Developer connection

Key
com.harmonia.sapphire:sapphire-parent

Events All

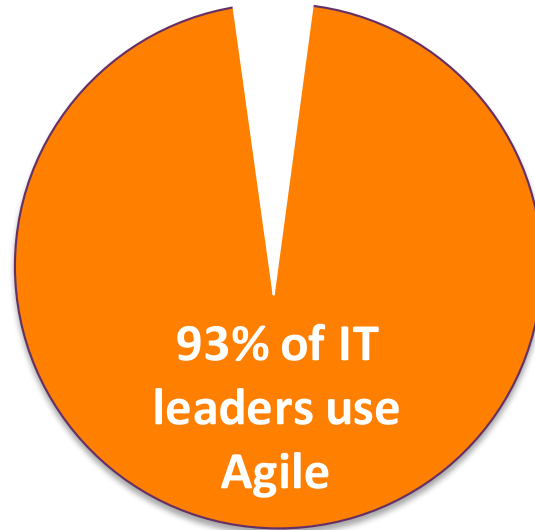
- Version: 0.11.0-SNAPSHOT April 5, 2017
- Version: 0.10.0-SNAPSHOT March 3, 2017
- Version: 0.9.0-SNAPSHOT January 24, 2017
- Version: 0.8.0-SNAPSHOT November 22, 2016
- Version: 0.7.0-SNAPSHOT October 19, 2016

Show All

SonarQube™ technology is powered by SonarSource SA

Version 6.1 - LGPL v3 - Community - Documentation - Get Support - Plugins - Web API

Today's Testing Dilemma



BUT:

- Only 42% have good test tools
- And even fewer, 39%, even have a test method that fits Agile

Source: World Quality Report 2014-2015; Sixth Edition; Capgemini, HP, Sogeti

Behavior Driven Development (BDD)

- An application is designed by describing how it behaves with the end-user
- Uses simple domain specific language (DSL) having natural language constructs (English-like sentences) to express behavior and expected outcomes, and to define acceptance criteria in *feature* files

Implementation by Harmonia for Department of States for Bureau of International Narcotics & Law Enforcement (INL) resulted in 50% increase in efficiency to introduce new feature

BEFORE: Duration = 2 sprints

Define
User
Story

Sprint #N:
Develop Code

AccTest
- Manual

Sprint #N+1 (or later!!):
Develop Test Automation Code

AccTest
- Auto

**AFTER: With BDD: Duration = 1 sprint,
a 50% Time Savings**

Define
User
Story

Sprint #M:
Develop
Feature Files

Sprint #M+1:
Develop
Automation
Code

AT -
Auto

Sprint #N:
Develop Code

Time →

Q&A

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