Agile + DevOps WEST

A TECHWELL EVENT

AD6

DevOps Practices
10:30 AM

AD6 - DevOpsing Your Greenfield: Cultivating New Growth

Presented by:

Richard Mills

Coveros

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Richard Mills

Richard Mills has more than 25 years of experience in software engineering with a concentration on pragmatic software process and tools. Rich has a specific focus in Agile development methods and is passionate about DevOps, Continuous Integration, and Continuous Delivery. As the Solution Lead for DevOps at Coveros, Rich is dedicated to helping customers build software better, faster and more securely by coaching and mentoring in Agile development methodologies, automating software delivery (builds, tests, and deployment) and integrating strong security measures into development techniques. He has spent his career working in the areas of static and dynamic software analysis tools, configuration management, and continuous integration. Rich currently works as a Technical Manager with Coveros and has been with the company since 2010, spending most of his time engaged with customers. He is an alumnus of Bucknell University where he earned a BSEG in Computer Engineering.

DevOpsing Your Greenfield: Cultivating New Growth

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Who is this guy?

- Me: Mad-Software-Developer turned Mad-Software-Engineer turned DevOps-Solution-Architect. Pragmatist. Particular focus on tools and automation. CI, CD, DevOps … what's next?
  - PS: Thanks for inventing the term "DevOps" to describe what I like to do.
- Pays my bills: Coveros helps organizations accelerate the delivery of secure, reliable software using agile methods.
  - Agile transformations, development, and testing
  - DevOps implementations
  - Training courses in Agile, DevOps, Application Security
- Keeps me intrigued: SecureCI
  - Open-source DevOps product
  - Integrated CI/CD stack with security flavor

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Agility. Security. Delivered.

SecureCI

Why is he here?

- Open your mind about most important aspects of "new" DevOps
- Share some of my experiences (and failures)
- Give you a reference to walk away with

- NOT: Explain fundamentals of DevOps (or Agile)
- NOT: Sell you on DevOps (or Agile)

Somewhere in our DevOps dreams...

Typical DevOps Transformation

- Frequently a fire-fighting effort
- Find the most important thing, improve it
- You have something concrete to start with, so you just start fixing it.

Greenfield DevOps

- Wide open options
- No obvious path
- Nothing to grab onto yet, so nothing to "fix" and no clear direction to follow

It can seem like an overwhelming boulder, at times.

Good news: no baggage

You have ONE job

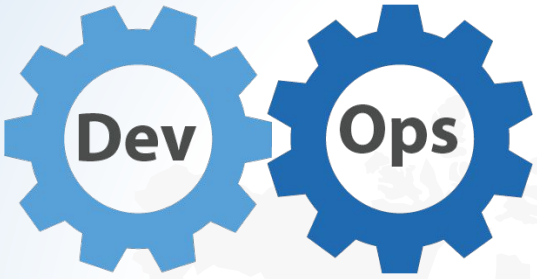
- Don't blow it
- You have a clean slate
- Don’t create your own dumpster fire

We want fire *proofing*, not fire *starting*.

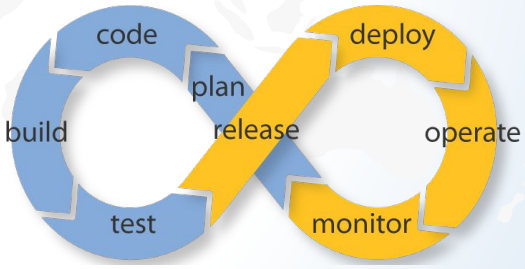
General Agenda

- DevOps baseline – picking the seeds
- Greenfield approach – planting the seeds
- Important aspects for cultivating growth
  - Organization structure and mission
  - Infrastructure and tools
  - Pipeline design with delivery and branching model
  - Integrating with your architecture
  - Testing and quality analysis

Each of these could be multi-hour topics.



DevOps – picking the seeds

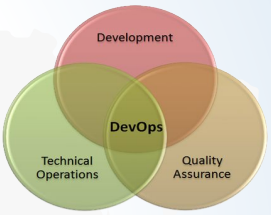


The Many Things of DevOps

Notice that not many of these are PURELY the responsibility of one person or even team

Industry Views on DevOps

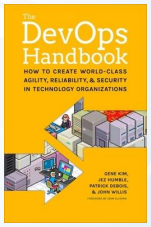
"DevOps (a portmanteau of "development" and "operations") is a software development method that stresses communication, collaboration and integration between software developers and Information Technology (IT) professionals." – Wikipedia



The Three Ways - made popular by Gene Kim, et. al. in *The Phoenix Project*

- Rapid flow to deliver value (left to right)
- Rapid feedback (right to left)
- Continuous experimentation and learning

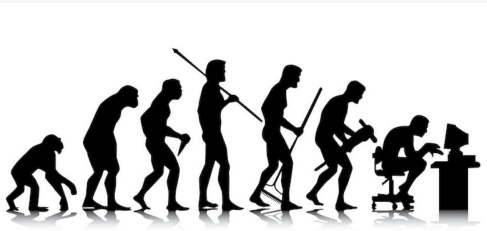
C.A.L.M.S. - developed by John Willis and Damon Edwards and added to by Jez Humble to describe DevOps (Culture, Automation, Lean, Metrics, Sharing)



Point: DevOps is more than just automation and 20 deploys per day

Ok, But What Do **WE** Actually Mean by DevOps?

- DevOps is the natural evolution of Agile: how to get working software into the hands of the people who need it rapidly and reliably
  - Who? Developers, Product Owners, ultimately users
  - When? Now!
    - Seriously … within weeks we can measure delivery with "minutes"
  - How? Team structure, processes, automation, tools



- Extension of Agile
  - Focus on value delivery
  - Common sense
  - Enable developers to be creative and do great work

- Work with developers to integrate system architecture with deployment architecture
  - Absolutely makes things easier and work better
  - Examples: metrics, testing, health, scaling

Elements for Success

- Three key elements:
  - Communication/Team Integration
  - Automation of process with tools
  - TESTING ← I'll hammer on this later

Making It Real

My take:

- Deliver working software through pipeline
- Insert quality gates to break builds
- Use Agile approach and work directly with developers
- Don't be afraid to break things, especially early on

Why DevOps?

- Why not?
- More importantly: why for YOU?
- Extension of Agile (but doesn't necessarily NEED agile). Agile needs DevOps, but not necessarily vice-versa.
- Benefits
  - Efficient - let computers do what they're good at, quickly
  - Consistent - always get the same result, dev to prod
  - Repeatable and reliable releases
  - Collective ownership

Greenfield Approach – Planting the Seeds

So ... Where do we actually start?

It's actually pretty easy:

1. Create a team
2. Set up some infrastructure and tools
3. Build a pipeline
4. Establish quality gates
5. Iterate

Ok, It's a little harder than that...

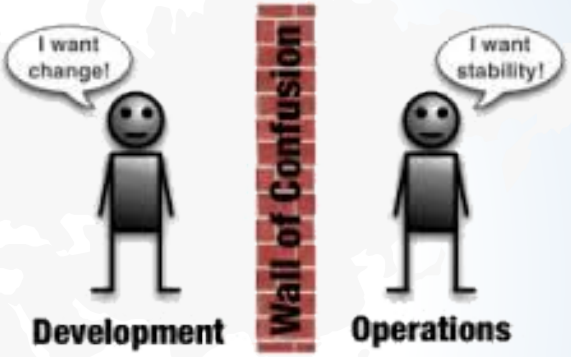
Most Important: Iterate!

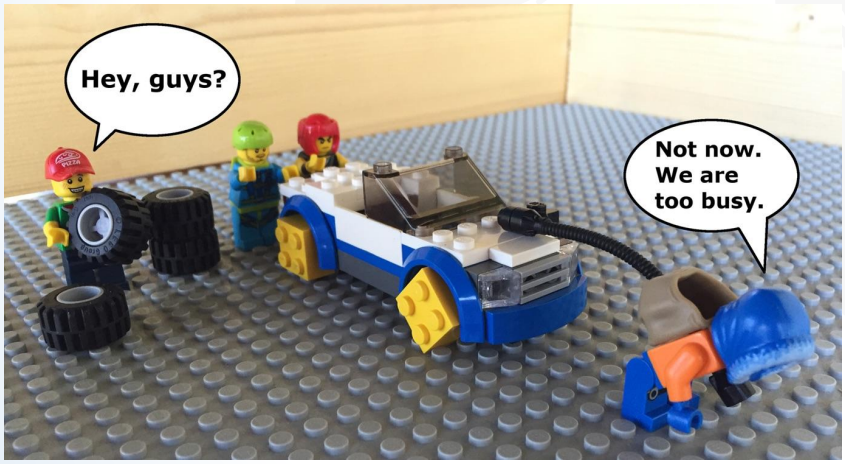
- Don't solve everything at once (breadth first)
- Don't even solve one thing all the way (depth first)
- Get the most important things functional, then improve over time
- Start left, build toward the right. Most important first.
- Don't paint yourself into a corner, but don't over-engineer
  - Wait until you know what you need for things that are easy to rework
  - Caveat: beware things that are immensely hard to re-work.
- Start with the simplest thing that could work

Remember: DevOps is about delivering value, not just making things cool.

Avoid DevOps Anti-Patterns

- Beware the inevitable wall of confusion
- Don't get stuck doing dumb things "because that's the way we've always done it."

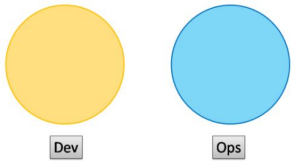




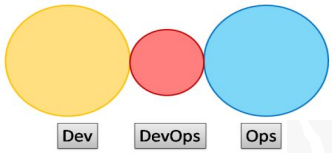
Team structure and mission

Avoid DevOps Team Anti-Patterns

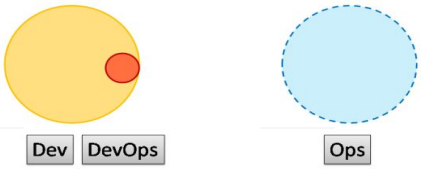
- Separate silos



- Dev, Ops, DevOps silos



- No Ops

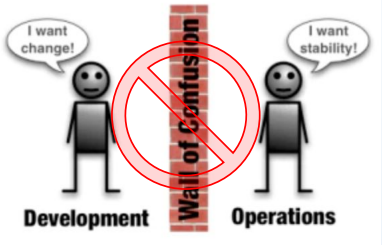


http://web.devopstopologies.com/

Successful DevOps Organizational Structures

Build the right relationships between the people with shared success goals.

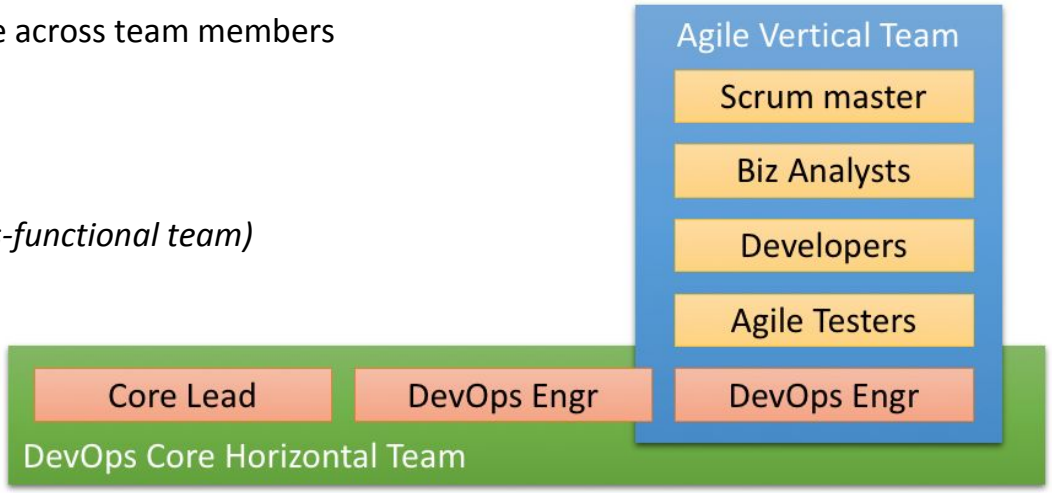
- Ideal: Cross functional teams with Dev, Ops & QA
  - Shared goals and values
  - Collaborative
  - Unified processes and tooling
- Maybe: DevOps as a service
  - Smaller teams/orgs
  - Transitional situations
- Sometimes: Embedded Ops
  - Suitable for single web-based product



Horizontal DevOps Guild

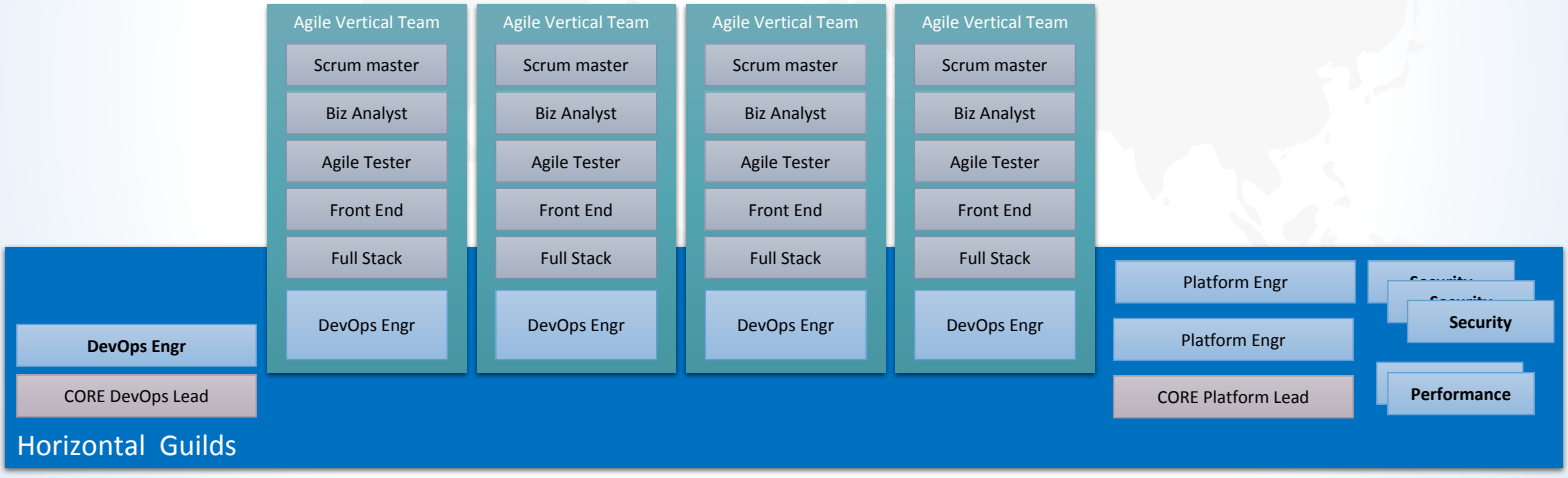
- Group of DevOps professionals working together to solve cross-team DevOps problems
- Guild members in-team are focused on team-specific problems
- Dedicated guild members support cross-team needs
- Guild establishes cross-team standards and shared success
- Important: share knowledge across team members

Cross-team function (vs. cross-functional team)



Example DevOps Guild and Team Structure

Our team organization on a 50-ish person development project



Finding the Right DevOps Members

- A good DevOps person ...
  - ... Is a Developer
  - ... Is a Tester
  - ... Knows about system administration
  - ... Has strong attention to detail
  - ... Has high standards for quality
  - ... Knows how to solve problems
  - ... Good at making things work

- Has experience and skills with build tools (maven, gradle, npm), test tools (junit, testNG, Selenium), database programming (sql, no-sql), CI build servers (Jenkins, Travis), operating systems (Linux, Windows), software installation/configuration (nginx, tomcat, databases), CM automation tools (chef, puppet, ansible), scripting (python, groovy, ruby), cloud systems (AWS, Google, Azure), virtualization and containerization (virtualbox, vmware, docker), and many, many other buzzwords (REST, HTTP, SSL, API, UI, e2e)

DevOps Charter and Mission

Support Agile development and enable rapid delivery of working, validated software in a micro-service-based architecture through team collaboration and automation. This accomplishes the following goals:

- Establish confidence in change
- Use automation to enforce continuous quality assessment throughout the development and delivery process
- Leverage industry standards to maximize integration of toolsets
- Enable localized feature changes that go through series of quality gates as they move closer to production

The Core DevOps Team is a collection of shared core DevOps architects integrated with a set of dedicated DevOps engineers assigned to each of the Agile development teams. The DevOps team is also closely aligned with the Operational Platform team in that the DevOps platform is based largely on the operational platform for the application.

DevOps Guild Responsibilities

The Core DevOps team is responsible for the following:

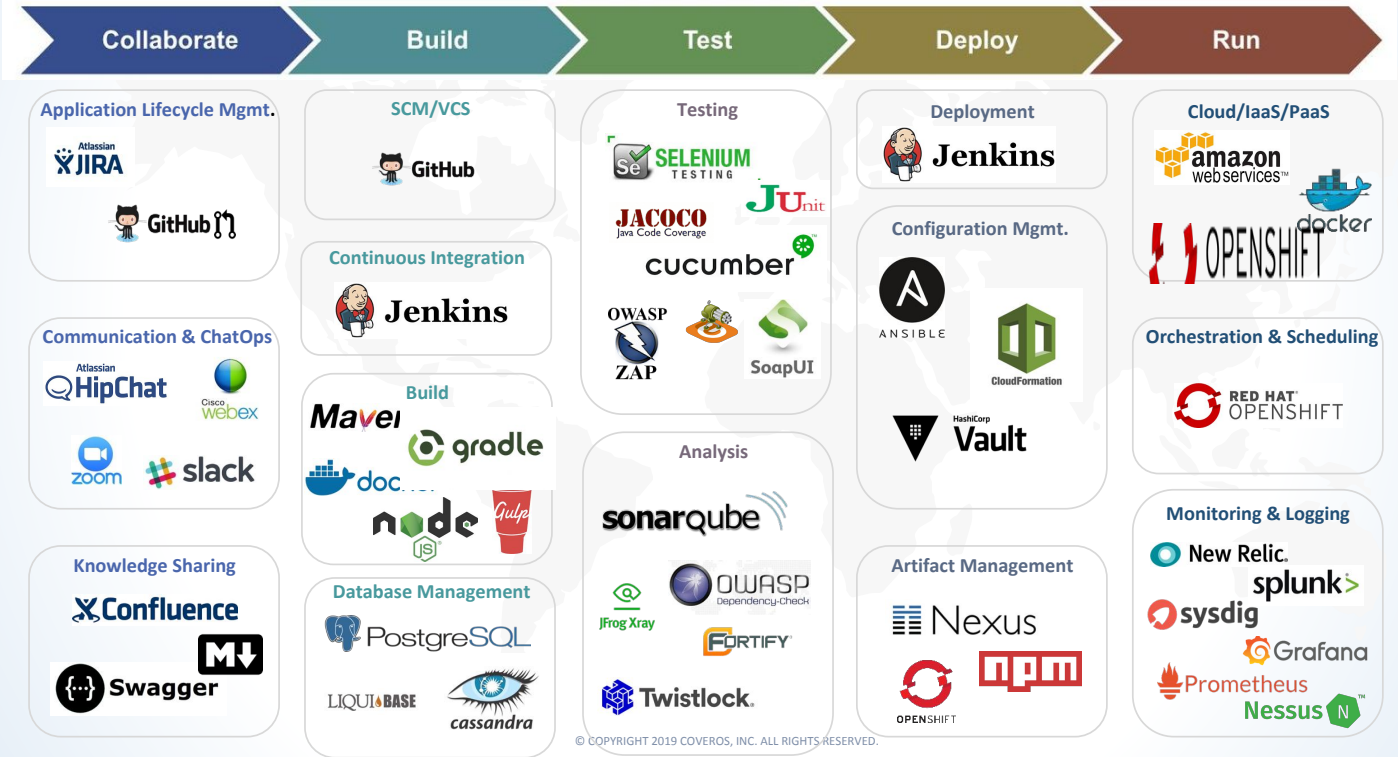
- Maintaining the **shared DevOps platform** infrastructure (Jenkins, Sonar, Nexus, etc.)
- **Establishing standards** for build and delivery of application source code
- **Providing guidance and support** for the application development teams

Additionally, the embedded App Dev DevOps Engineers are responsible for the following:

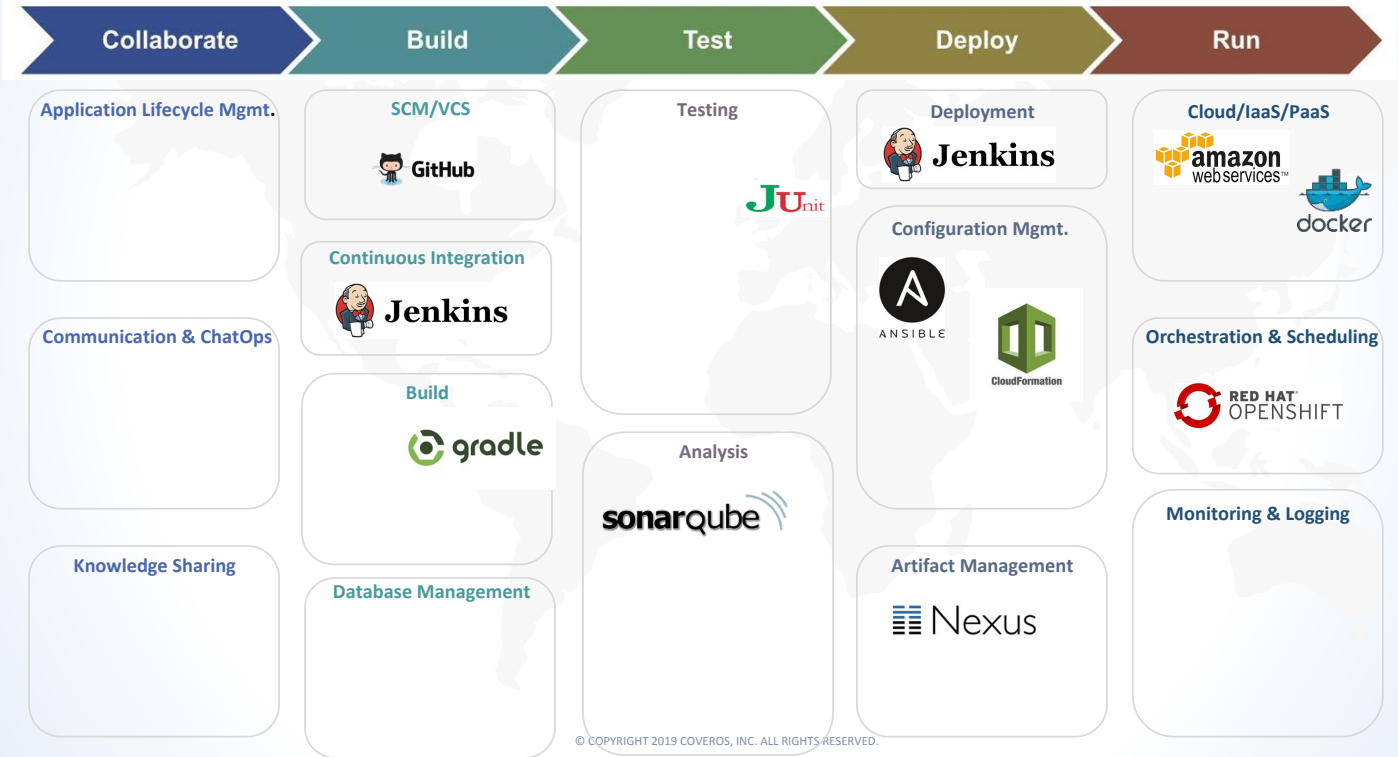
- Implementing the **automation necessary to build, test, and deploy** the application in the DevOps pipeline
- Implementing the **build scripts** necessary to support local development as well as DevOps pipeline
- Working directly with the developers, testers, and product owners to **understand requirements** necessary to build, test, and deploy the application
- Contributing to (and consuming) **standards** with Core DevOps team
- Participating in daily/weekly **cadence of App Dev** team
- Participating in daily/weekly **cadence of Core DevOps** team

Infrastructure and Tools

Tools, tools, and more tools



Let's start with LESS tools



Infrastructure Platforms

- Infrastructure: Operating Platform
  - Server platform - physical, VM, container
  - OS configuration
  - Middleware installation and configuration (java, nginx, tomcat, database, message queue, etc.)

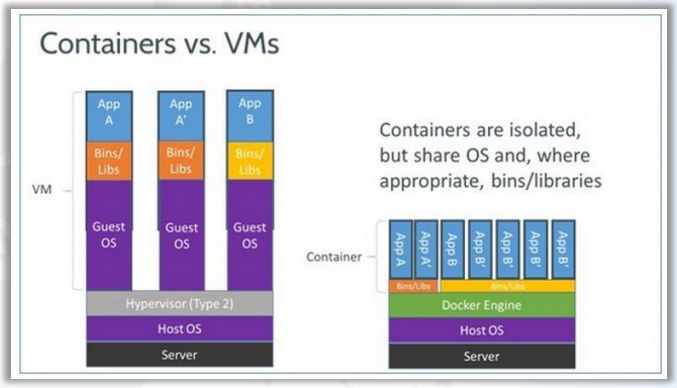
- DevOps Infrastructure: DevOps Platform
  - Build server (Jenkins)
  - Quality analysis server (SonarQube)
  - Artifact server (Nexus)
  - Source control server (Git)
  - Test server(s)? (Selenium)
  - Target environment for CI/CD builds (see: Operating Platform)

- Developer Infrastructure: local development

Operating Platform

- VMs – mainstream and the current "normal"
  - Choose your OS: Linux, Windows
  - Orchestration and CM tools: Chef, Ansible, Puppet, ...
  - Pipeline produces installable software
  - CM tool install/configure software

- Containers (e.g., Docker) are the new hip
  - Choose a smaller OS (RHEL, Alpine, Busybox)
  - Kubernetes – "which version" (e.g., Kube vs. OpenShift vs. ...)
  - Pipeline produces container images
  - Orchestration tool (Kube) deploys and configures



- To the cloud!
  - Amazon, Google, Azure ...
  - Infrastructure as a Service vs. Platform as a Service vs. completely serverless
  - Networking, Virtual Machines, Docker containers
  - This is likely to form the basis of your VM's or containers

Setting up your Platform

- Start small/easy – get something running for developers to work in
- Automate from the bottom up ← most frequent == most valuable
- Move towards dynamic environments – easily launch new ones

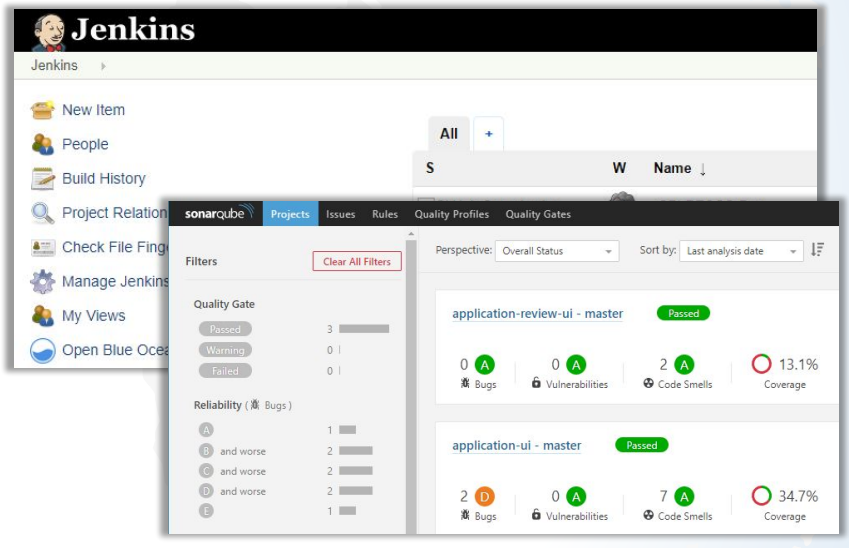
DevOps Platform

- DevOps Platform - the set of tools and environments you use
- Start with your operating platform, build from there

- Jenkins - build and pipeline orchestration tool
- SonarQube - quality analysis dashboard
- OpenShift & Docker - deployment and configuration

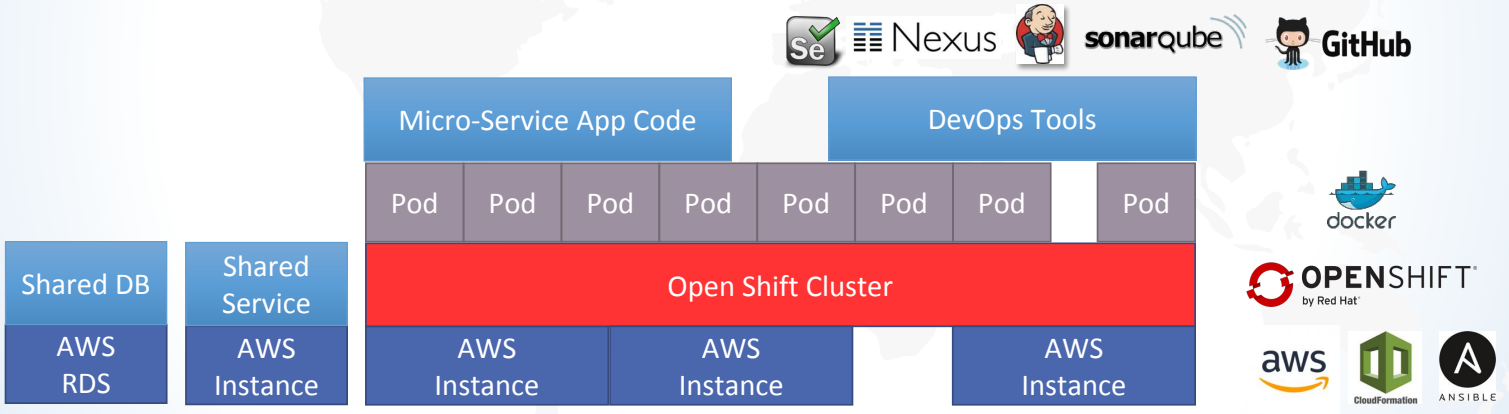
- Pick some assessment tools:
  - JUnit, Jest
  - OWASP Dependency Check
  - Selenium

- Again, start manually then move to automation



Example Platform Architecture

- Ideally, your “operating platform” and “DevOps platform” share a lot of underlying infrastructure

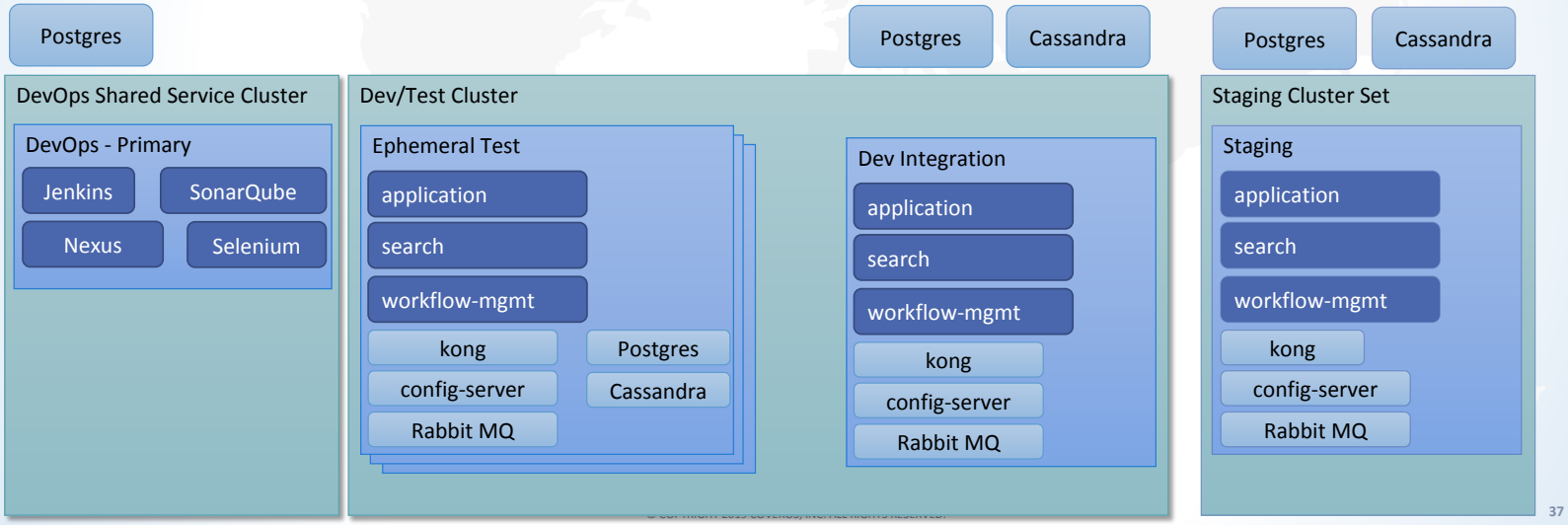


Align the Developers

- Developer Environments - align with operational platform
- Should be able to fetch code build with very little effort; well documented, highly automated
- Local deploy/test cycle should be similar to operational (e.g., VM, docker, Operating system, etc.)
- Caveat: support rapid change/build/test cycles supported by modern IDEs

Test Environments

- Why do you have them? What purpose do they serve?
- Static vs. dynamic environments
- A/B deployment patterns relate to this



Maturity: Security, Logging, Monitoring

Once you get the basics established, you'll want to start building out and make sure things continue working (foreshadowing...)

- Log collection (Logstash, Splunk)
- Monitoring tools (Nagios, Prometheus)
- Security (OpenSCAP, Zed Attack Proxy)

Apply these to

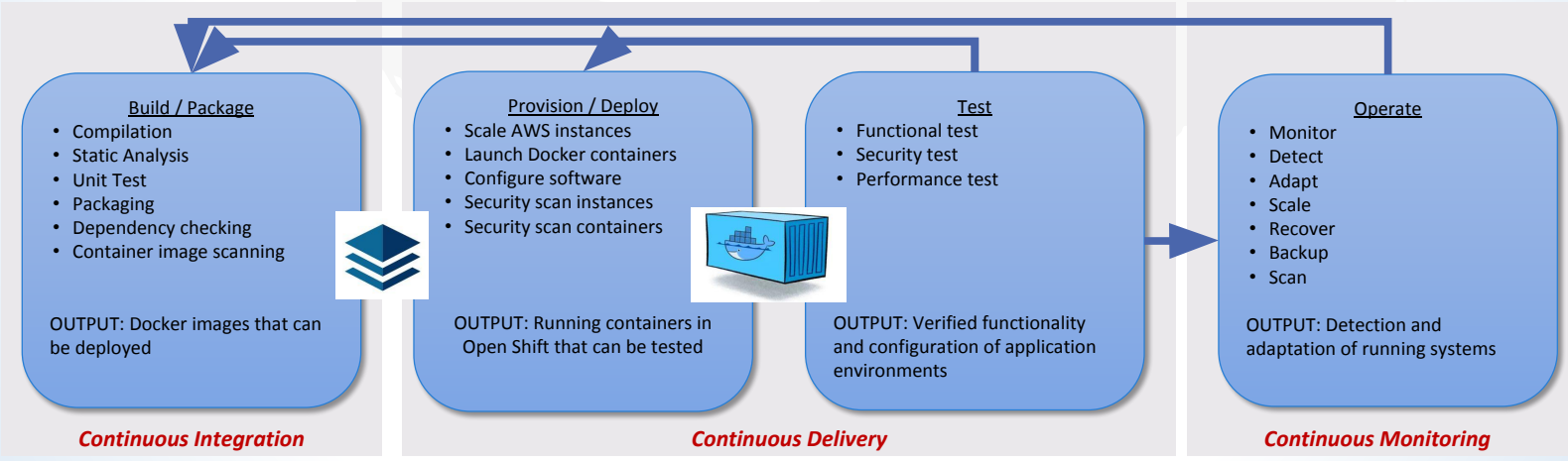
- Operating platform – keep your infrastructure available
- DevOps platform – keep your developer services available
- Application – keep your software available

Constructing the Delivery Pipeline

Stages of Delivery

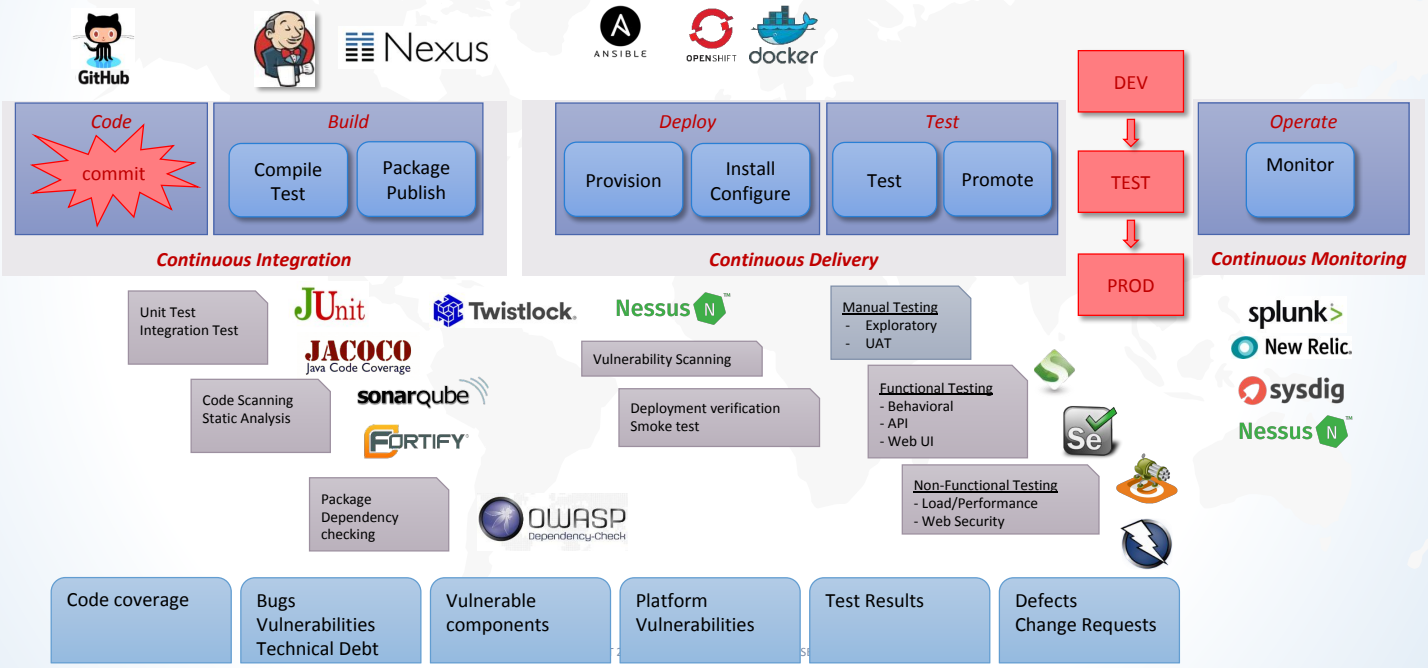
Incremental quality gates as code makes its way through the delivery pipeline

- Continuous Integration produces deployable software that is scanned and tested in isolation
- Continuous Delivery produces running software that is validated for functionality, security, performance to enable "promotion" to higher environments
- Continuous Monitoring ensures continuous secure/reliable behavior and adapts/recovers to anomalous behavior



Pipeline and Tools

Use automation and tools to continuously assess quality, performance, and security in rapid feedback loops



Configuration Management and Version Control

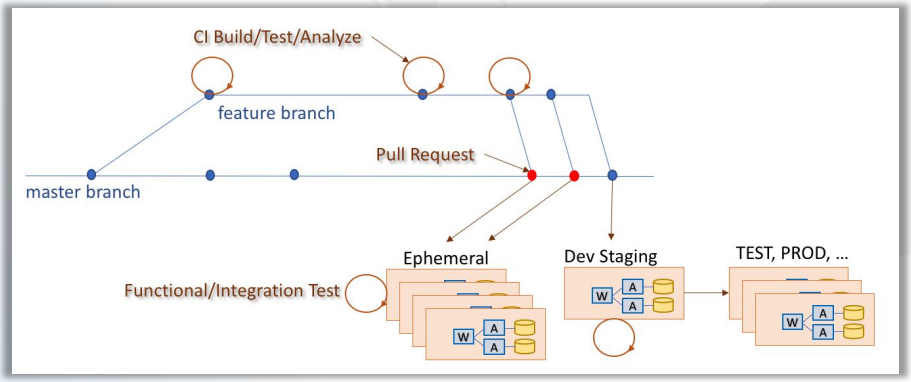
"Version control everything"

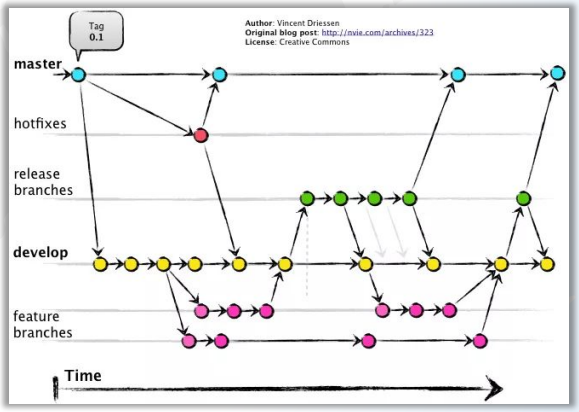
- Application code
  - No brainer, but need branching and build pattern
- DevOps automation code
  - This is software. How will you build/test/release it? Branching?
  - Maturity model: start simple, eventually need a "pipeline for your pipeline"
- Infrastructure as code
  - Provisioning – scripted creation of infrastructure
  - Configuration – servers, network, storage

Your CM process will define your delivery process

Branching Strategy

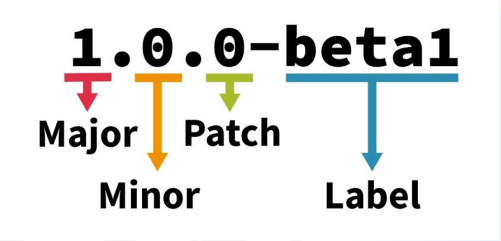
- Strive for "main line" development
  - Use short, small feature branches for isolated changes
  - Consider Github Flow (**very simple**), Git Flow (complex)
  - Avoid "parallel release development" at all costs
- What problems does branching cause vs. solve?
- Align with your delivery pipeline





Side Bar: Versioning … do you need it?

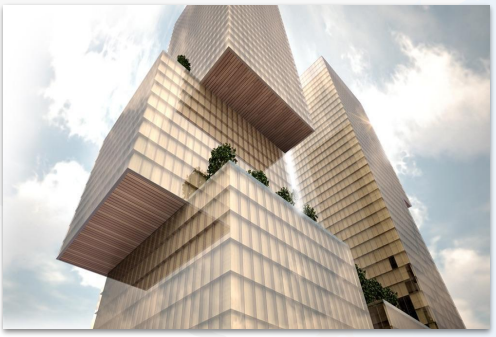
- Is your app a multi-version beast, or simple end-of-the line single deployment?
- Keep it simple, (stupid)
- Semantic versioning vs. unique identifier
  - Integrate version control identifiers with deployed code



- All software elements need a traceable identifier
  - Source Code -> Deployable Package -> Running Software
- Very few deployable applications need linear versioning
  - Does it matter if it's 1.2.3 or 20180317 or a3e78b19d?
- Component libraries with APIs frequently need identifiable, increasing versions
  - my-util:1.2.3 vs. 1.3.9 with different capabilities that link to your code interfaces

Integrating with Software Architecture

- Not all software lends itself to easy build, test, and deployment
- Work directly with software architecture and development teams
- Software must support
  - Rapid build
  - Automated test (controllability, observability)
  - Data initialization
  - Installation/configuration
  - Monitoring/metrics
- Standards and "Definition of Done" should reflect this
- Development stories aren't complete until all these things work



Maturity: Data DevOps

- How do you capture and test your "Data" process?
- Provisioning databases with initial users, schemas, permissions
- Initializing with tables, users, schemas
- Initializing test data
- Scrubbing sensitive test data
- ETL/data manipulation code

Often the hardest / "weirdest" part

Techniques

- Scripts to initialize blank DB
- Start with "pave over database" restoration in the beginning
- Schema versioning: Liquibase/Flyway to manage DB schema definition
- Security pitfall: "administrative" permissions needed
  - Partition "application" CRUD from "administrative" DevOps users

Testing and Quality Analysis

Your efforts in DevOps will fail without proper automated testing and assessment that is fully integrated into the pipeline.

Goals for Testing in DevOps

- Keep software in continuous working state
- Establish confidence in change
- Force teams to ***build quality in*** (and agree it's important)
- Avoid creating too much technical debt too early

*Important: everywhere I say "**Quality**" I mean "**Quality, Security, Performance, and all the other –ilities**" you can think of for your software.*

Put Some Effort into a Test Strategy

- Determine what you want to do, who's going to do it, how it's going to tie into the pipeline
  - Developers
  - Engineers in Test
  - Business Analysts
- Establish standards for quality, security, performance, etc.
- Define the skills you will need on the team to succeed
- Heavy focus on automation
  - CAN'T succeed without automation
  - You cannot automate EVERYTHING

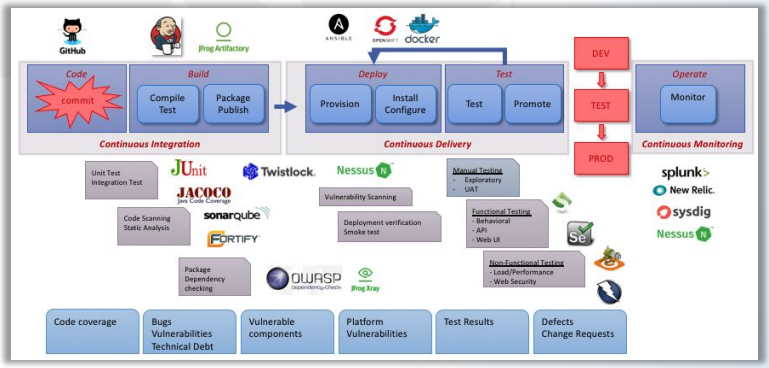
- Developer tests vs. "other" person tests
  - Who? Consider roles and who can do it.
  - Agile Test Engineer - automation, frameworks, close alignment with DevOps
  - BA/Scrum Master - test definition, creation, exploratory testing
  - Developers - technical tests

Quality Gates are Critical

Quality gates ensure that bad code cannot make it through the pipeline

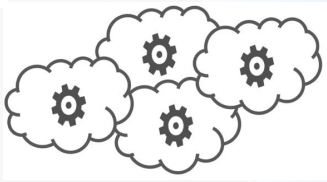
- Static analysis - set gates early; avoid tech debt
  - Standards: style, bugs, vulnerabilities (which standards not as important as following them)
  - 3rd party dependency analysis - vulnerabilities, licensing
- Testing phases
  - Pre-deployment testing - unit, component, mocking
  - Post-deployment functional testing - services, integration, databases, etc.
  - Non-functional testing - security, performance, reliability, availability
- Code Review
  - Tie to branching process (Github pull requests)
  - Small feature branches help this

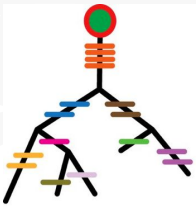
Start left, move right (quickly)



Things that complicate testing and automation

- Micro-services – which versions work with each other?
- Parallel product versions – which versions of tests?
- Hardware (mobile) – simulated or real devices?
- Non-virtual environments – difficult to recreate





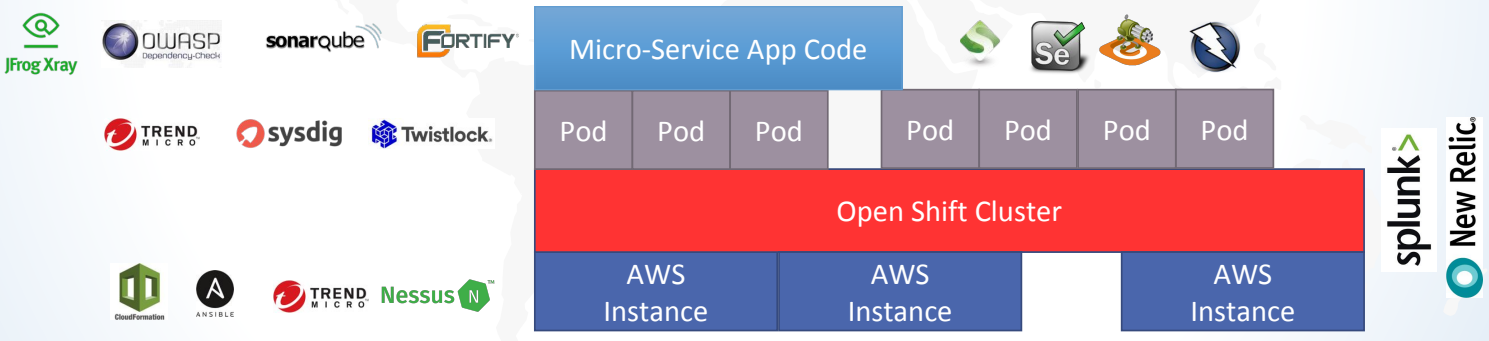
Getting Started with DevOps Testing

Create ONE of each test and make sure it gets executed by the DevOps pipeline continuously

- Cover each test level
  - Unit
  - UI
  - API
  - Security
- Once the test framework is in place, it removes the barrier and enables test writing
- Pitfall: initially, your test results will be all over the place. You will realize the need for a "quality dashboard"

Maturity: Assessment tools and layers

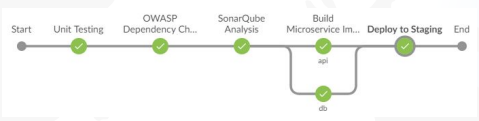
- As usual: tools help assess and enforce quality
- As you add tools, they will align to different layers of your architecture



Greenfield DevOps: Grow!

Start Small, Make It Work

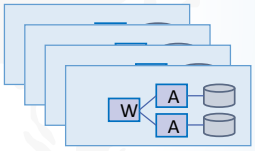
- Launch basic DevOps tools (Jenkins, Sonar, Nexus, Git)
- Setup basic CI builds
  - Developers use same gradle/npm build scripts as the pipeline
- Create some quality gates
  - SonarQube static analysis
  - Unit testing
  - Code coverage (maybe)
- Create a test environment (by hand, if need be)
- Initialize deployment automation
  - Docker deploy, Ansible installation
  - Developers use same (similar) local deployment

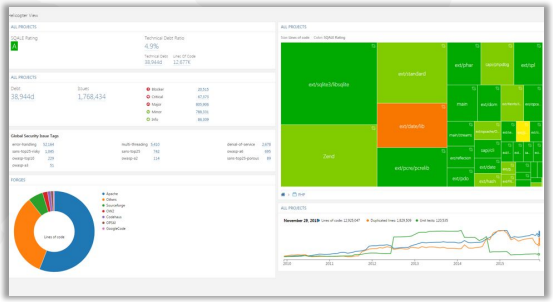


All this can be done in days or weeks with the right people

Iterate to the next level

- Establish a branching process for the developers with code-review on merge
- Set up multi-branch builds in the pipeline
- Measure code coverage with your unit tests (establish metrics and standards)
- Automate installation of your operating platform (dynamic environments)
- Deploy for after every build
- Execute UI or API tests in the pipeline





DevOps Maturity Evolution

Everything will improve with age

- Application code: master/feature branches, static code checks, unit tests, functional tests, integration tests
- DevOps code: one version, multiple versions, scale, devops test environment
- Platform code: manual, automate, replicate, scale, monitor
- Team: learn, tune, improve

Don’t forget to build a solid team!

- Build a strong integrated team of Dev, Ops, and QA
- Strong problem solvers
- ”Can do” attitude
- Don’t put barriers in front of them

A field needs farmers ...

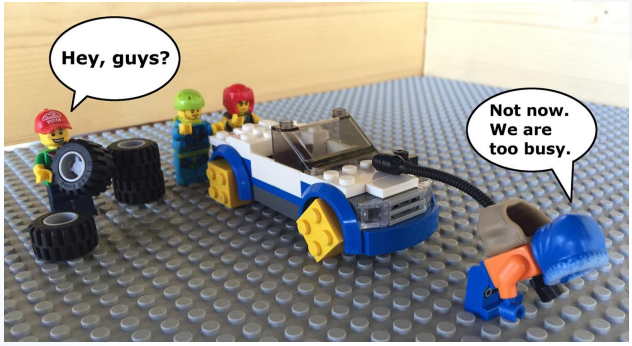
Generating Value

Remember, the main goal of DevOps is to deliver working code to the people who need it

- Prioritize what the developers need first
- Get software in front of stakeholders ASAP

Keep it real

- Don’t get hung up on making things perfect at first
- Establish quality gates to **avoid** (too much) **technical debt**



Questions?

Thank you!

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https://www.coveros.com/services/devops/

Checklist for getting started

Do you have each of these?

- Version control and branching
- Standards (style, design, metrics, coverage)
- Platform infrastructure
- DevOps tools
  - Jenkins
  - Sonar
  - Nexus
  - Git
- Build automation
- Test automation
- Deployment automation
- Dashboards