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Taking Hudson to the Next Level

from CI to CD

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Hudson Development Team
Sept 30, 2014

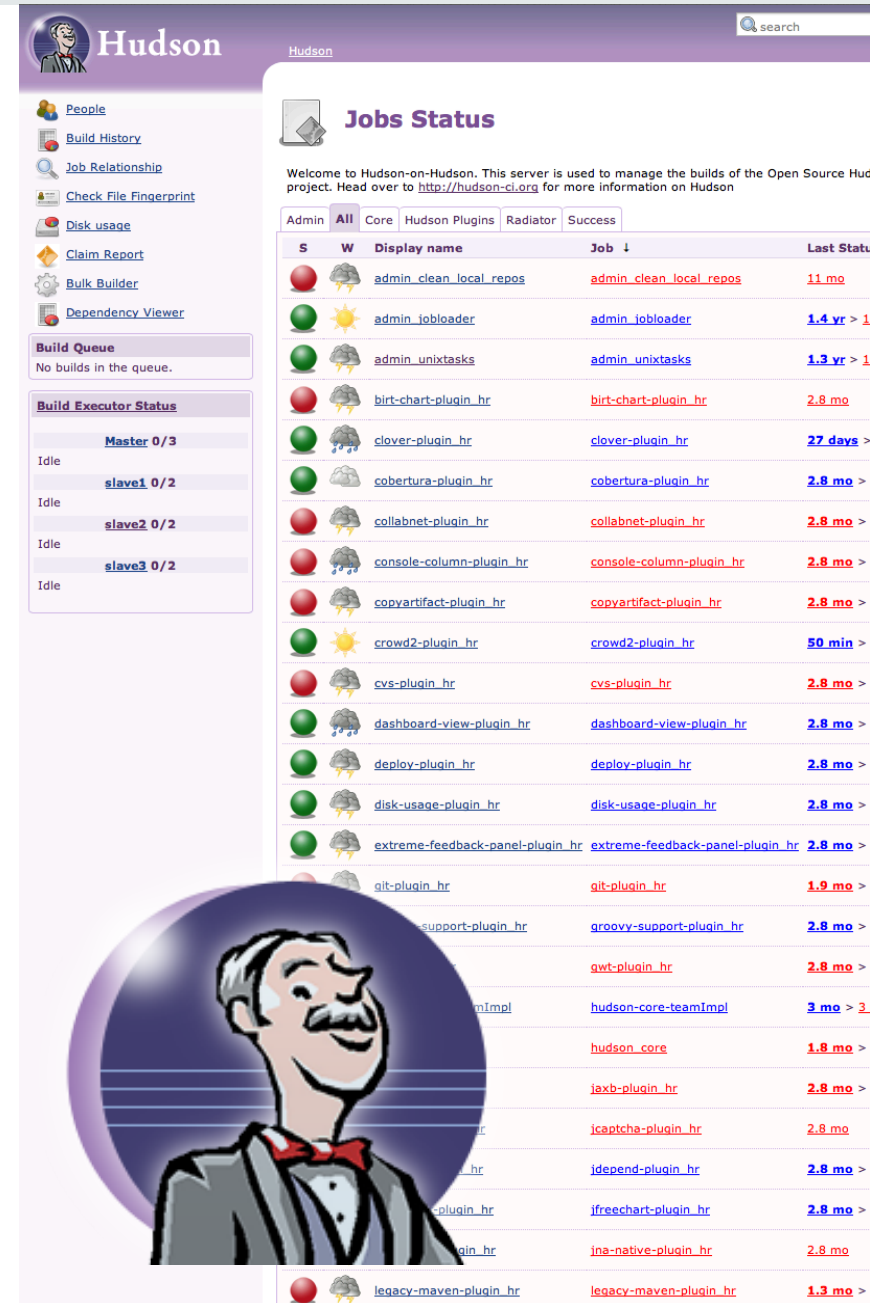
CREATE THE FUTURE

rogram Agenda

- 1 ➤ Hudson in a nutshell
- 2 ➤ Latest changes in Hudson
- 3 ➤ Hudson for continuous delivery
- 4 ➤ Case studies - Hudson @ Oracle



Hudson in a Nutshell



Hudson

Jobs Status

Welcome to Hudson-on-Hudson. This server is used to manage the builds of the Open Source Hudson project. Head over to <http://hudson-ci.org> for more information on Hudson

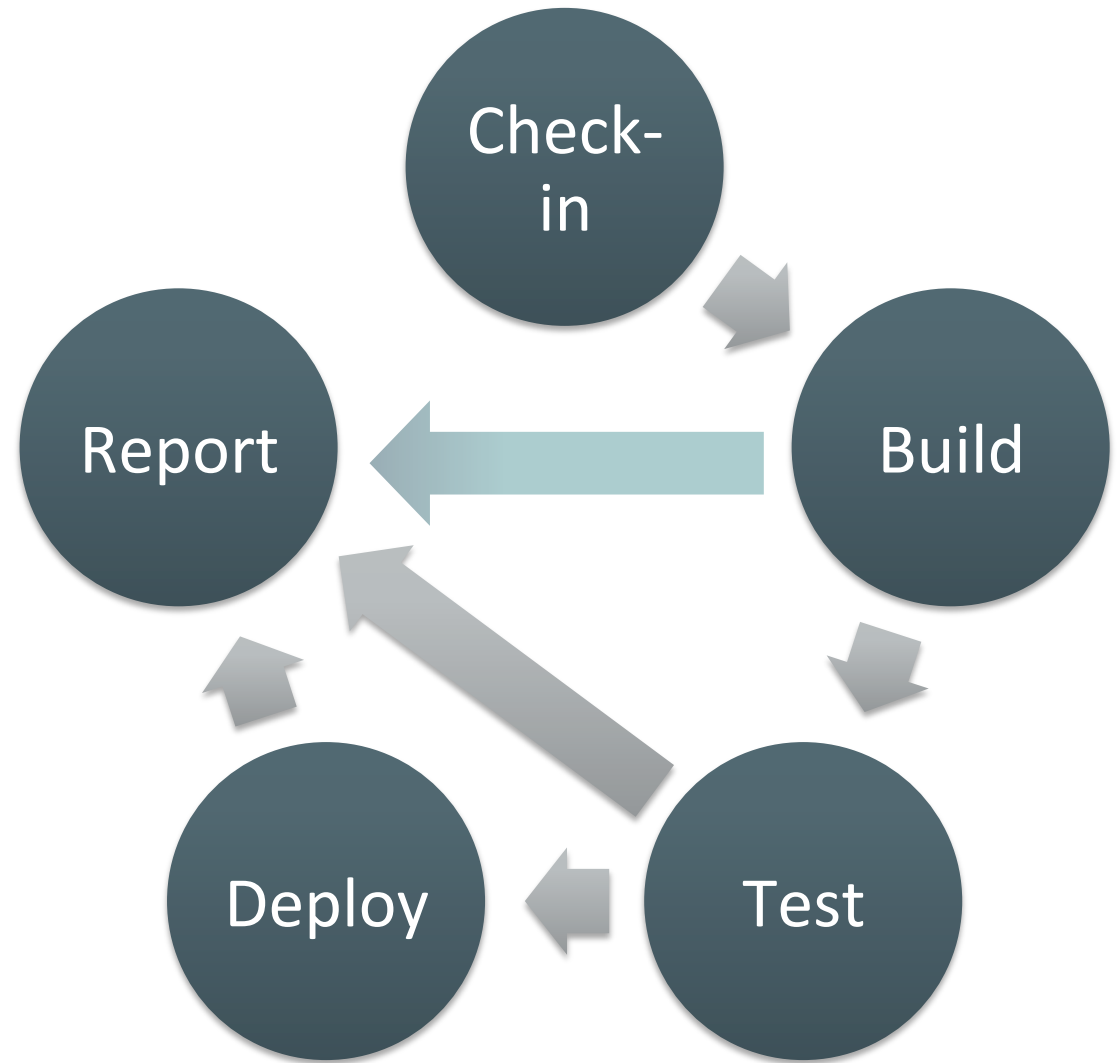
Admin **All** Core Hudson Plugins Radiator Success

S	W	Display name	Job ↓	Last Status
🔴	☁️	admin_clean_local_repos	admin_clean_local_repos	11 mo
🟢	☀️	admin_jobloader	admin_jobloader	1.4 yr > 1
🟢	☁️	admin_unixtasks	admin_unixtasks	1.3 yr > 1
🔴	☁️	birt-chart-plugin_hr	birt-chart-plugin_hr	2.8 mo
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🔴	☁️	git-plugin_hr	git-plugin_hr	1.9 mo >
🔴	☁️	groovy-support-plugin_hr	groovy-support-plugin_hr	2.8 mo >
🔴	☁️	gwt-plugin_hr	gwt-plugin_hr	2.8 mo >
🔴	☁️	hudson-core-teamImpl	hudson-core-teamImpl	3 mo > 3
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🔴	☁️	jfreechart-plugin_hr	jfreechart-plugin_hr	2.8 mo >
🔴	☁️	jna-native-plugin_hr	jna-native-plugin_hr	2.8 mo >
🔴	☁️	legacy-maven-plugin_hr	legacy-maven-plugin_hr	1.3 mo >

Hudson in a Nutshell

Continuous Integration Server

- Manage the essential flow of a modern development env.
- Heterogeneous technologies and operating systems
- Extensible



Hudson in a Nutshell

Has all the Right Bits for Continuous Integration


- Runs automatically
 - SCM: GIT, SVN, CVS, Perforce...
 - Builds: Maven, Ant, scripts...
 - Testing: Junit, Selenium, Abbot...
 - Deployment: app servers, web...
- Feedback
 - Email, IM, RSS, Lava Lamp...
- Analysis
 - Clover, Sonar, PMD...

Hudson in a Nutshell

The Project

- Mature Technology Project at the Eclipse Foundation
www.eclipse.org/hudson || www.hudson-ci.org
 - Hudson Core is EPL licensed
 - Plug-ins mixed licenses; usually MIT
- Current release 3.2.1 (Sept 2014)
 - Project plan available @ Eclipse
 - <http://projects.eclipse.org/projects/technology.hudson>
- Open (non-Eclipse) plug-in community, GitHub, java.net etc.

What's been Happening in Hudson?



Hudson

People

Build History

Job Relationship

Check File Fingerprint

Disk usage

Claim Report

Bulk Builder

Dependency Viewer

Build Queue

No builds in the queue.

Build Executor Status

Master 0/3

Idle

slave1 0/2

Idle

slave2 0/2

Idle

slave3 0/2

Idle

Jobs Status

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		gwt-plugin_hr	gwt-plugin_hr	2.8 mo >
		hudson-core-teamimpl	hudson-core-teamimpl	3 mo > 3
		hudson_core	hudson_core	1.8 mo >
		jaxb-plugin_hr	jaxb-plugin_hr	2.8 mo >
		jcaptcha-plugin_hr	jcaptcha-plugin_hr	2.8 mo
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		legacy-maven-plugin_hr	legacy-maven-plugin_hr	1.3 mo >



From CI for an Individual / Small Team

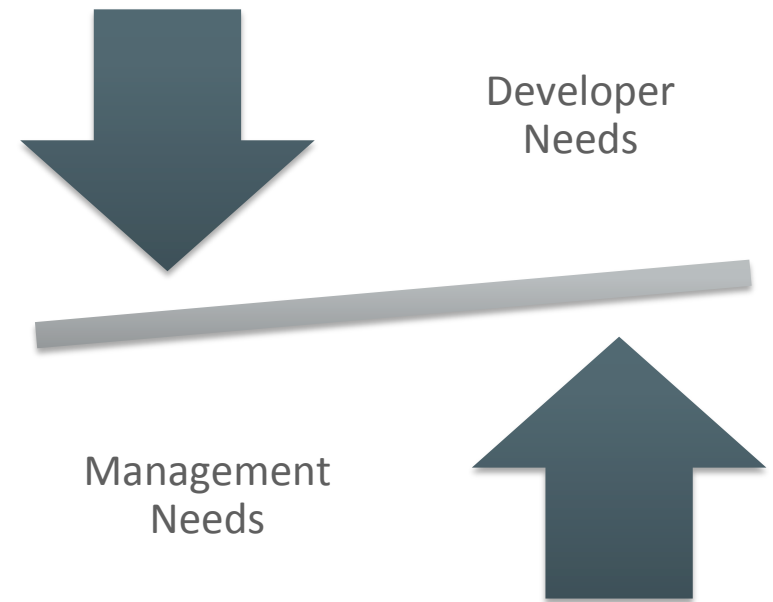
What Matters?

- Saving Time
- Agility
- Flexibility

To CD in the Enterprise

What Matters?

- Manageability
- Security
- Performance and Scalability
- Visibility
- Legal / IP



Hudson – Embracing the Enterprise

Core Theme to make Hudson more Enterprise Friendly

- IP – Hudson 3.0 cleaned up and documented all deps.
 - 109 libraries reduced to 85
 - LGPL and unprovenanced libraries removed / replaced
- Plug-in management
 - Switchable Update Centers and initial setup capabilities
- More complex pipelines
 - Cascading templates

3.0

Hudson – Address Scalability

Hudson 3.1 – Yet More...

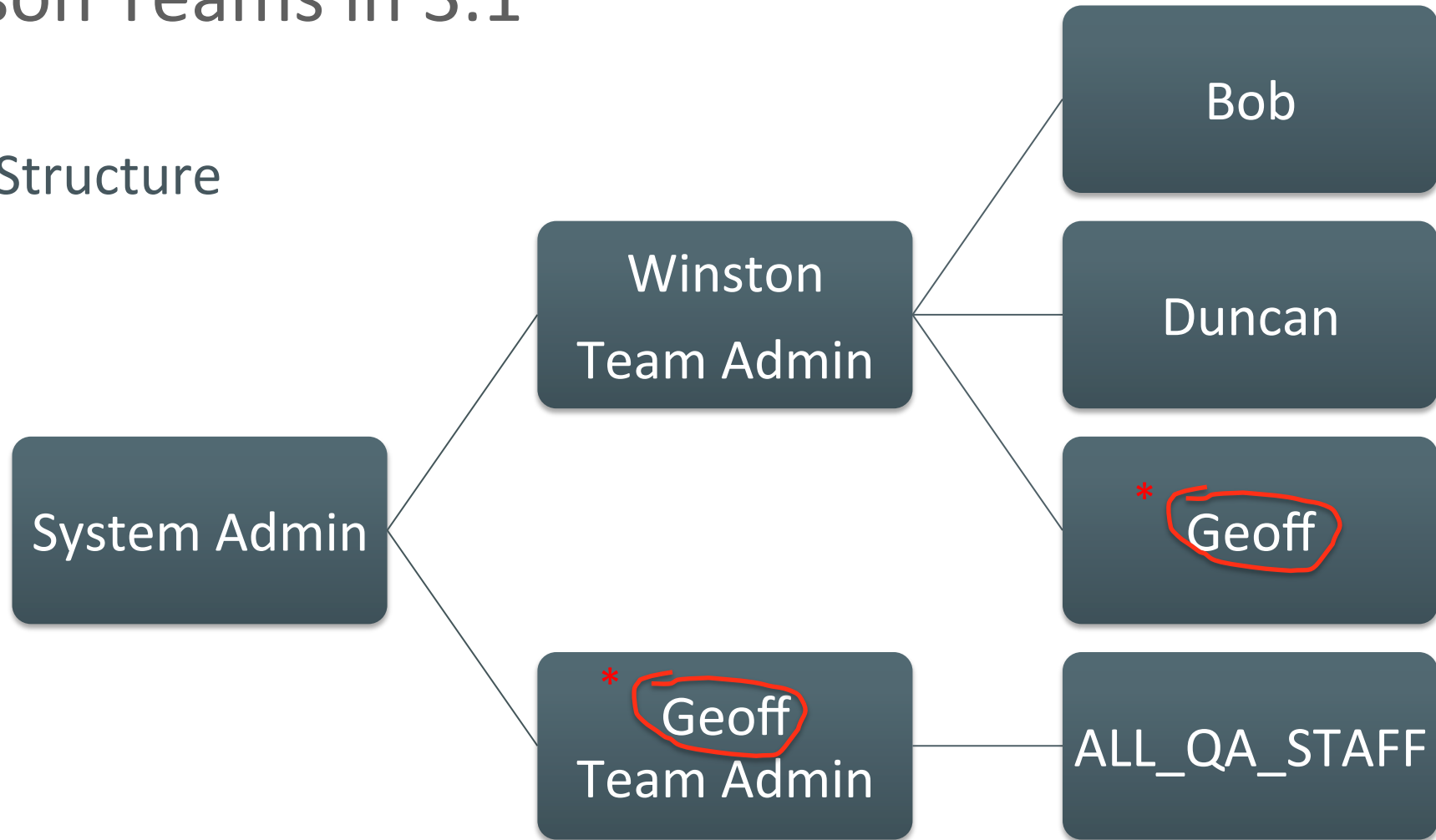
- Big memory optimization exercise
 - Can reduce required heap by between 50-75% for the same set of jobs
 - The more builds the bigger the savings
- Team Concept
 - Allowing sandboxed use of a single infrastructure

3.1

	Hudson 3.0	Hudson 3.1
Max Heap	1024	512
Used Heap	360	118
Used Permgen	54	52
Builds in memory	62,000	0

Hudson Teams in 3.1

Team Structure



* A single user or group can be present in more than one team with different rights in each case

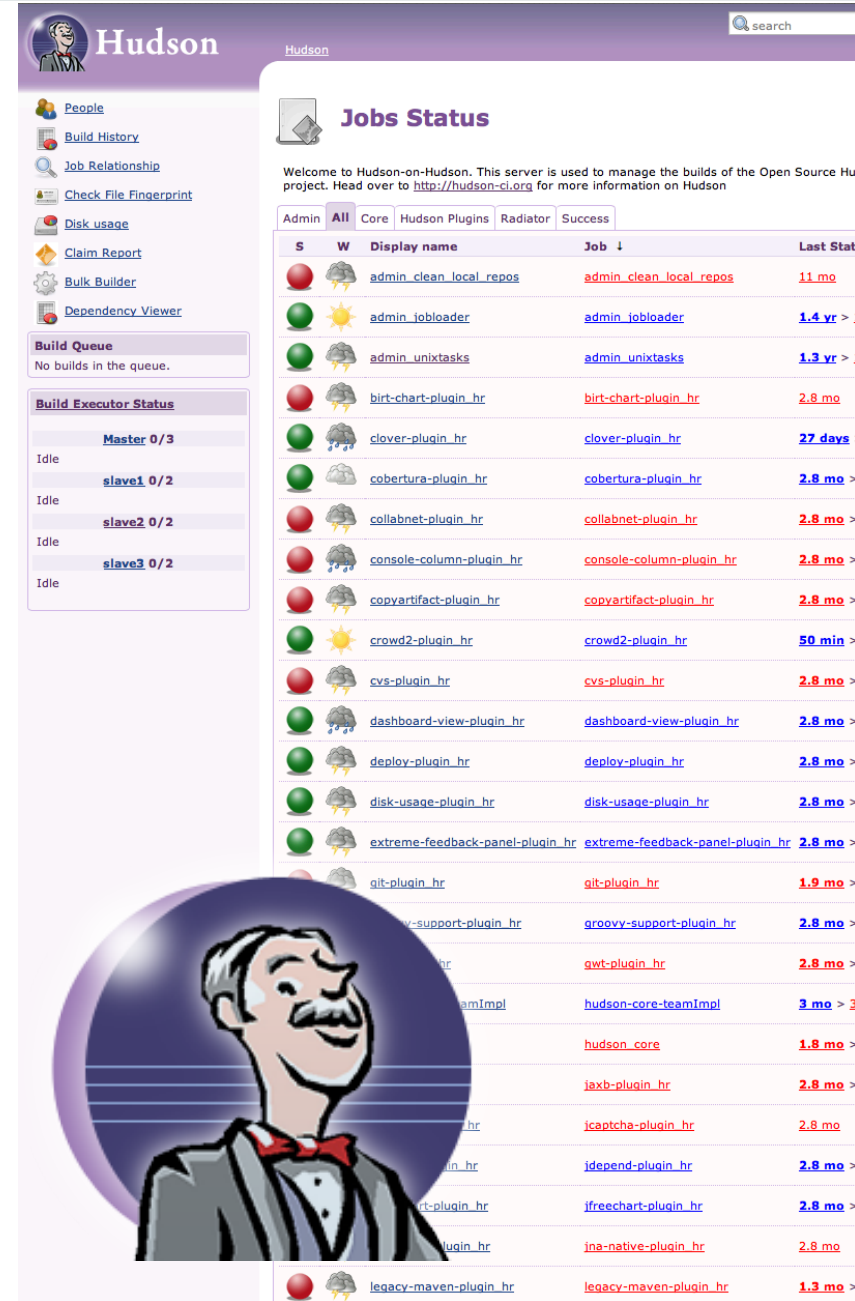
Hudson – Latest

Some Housekeeping and More...

- Team Concept
 - Per-team views
 - Per-team slaves
- Spring Upgrade (3.1.2)
 - Includes upgrade to the security layer
 - Major internal re-working
- Plugins
 - Needed reworking to support Spring changes
 - Now have multiple plugin centers

3.2

Hudson For Continuous Delivery

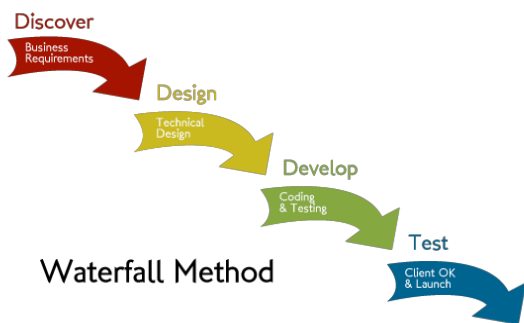


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Red	Cloudy	collabnet-plugin_hr	collabnet-plugin_hr	2.8 mo >
Red	Cloudy	console-column-plugin_hr	console-column-plugin_hr	2.8 mo >
Red	Cloudy	copyartifact-plugin_hr	copyartifact-plugin_hr	2.8 mo >
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Green	Cloudy	extreme-feedback-panel-plugin_hr	extreme-feedback-panel-plugin_hr	2.8 mo >
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Red	Cloudy	hawtio-plugin_hr	hawtio-plugin_hr	2.8 mo >
Red	Cloudy	hudson-core-teamimpl	hudson-core-teamimpl	3 mo >
Red	Cloudy	hudson_core	hudson_core	1.8 mo >
Red	Cloudy	jaxb-plugin_hr	jaxb-plugin_hr	2.8 mo >
Red	Cloudy	iceptcha-plugin_hr	iceptcha-plugin_hr	2.8 mo >
Red	Cloudy	idepend-plugin_hr	idepend-plugin_hr	2.8 mo >
Red	Cloudy	ifreechart-plugin_hr	ifreechart-plugin_hr	2.8 mo >
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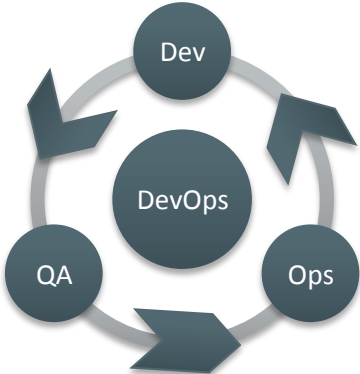
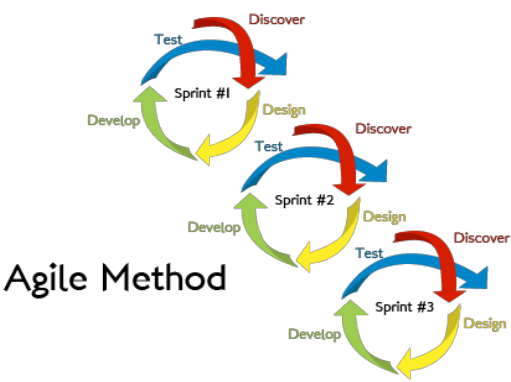
Development Lifecycle Evolution

Until 2000



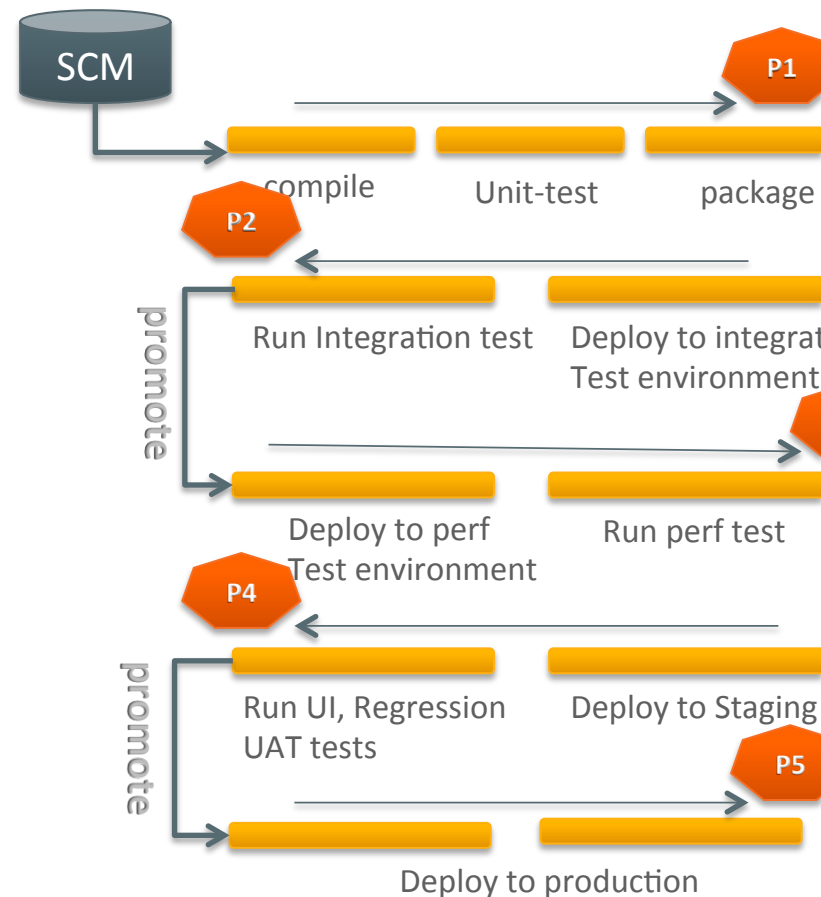
Typical turn around time is 6 months to 1 year

2000 - 2012



Sprint cycle is typically 2 weeks to 4 weeks

2013 -

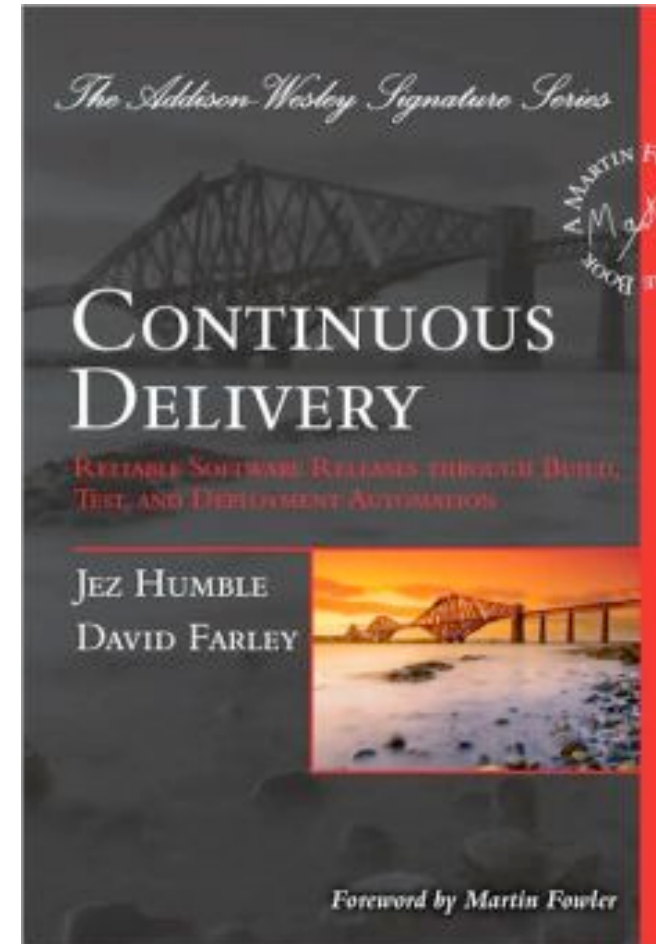


But it's More than Continuous Integration

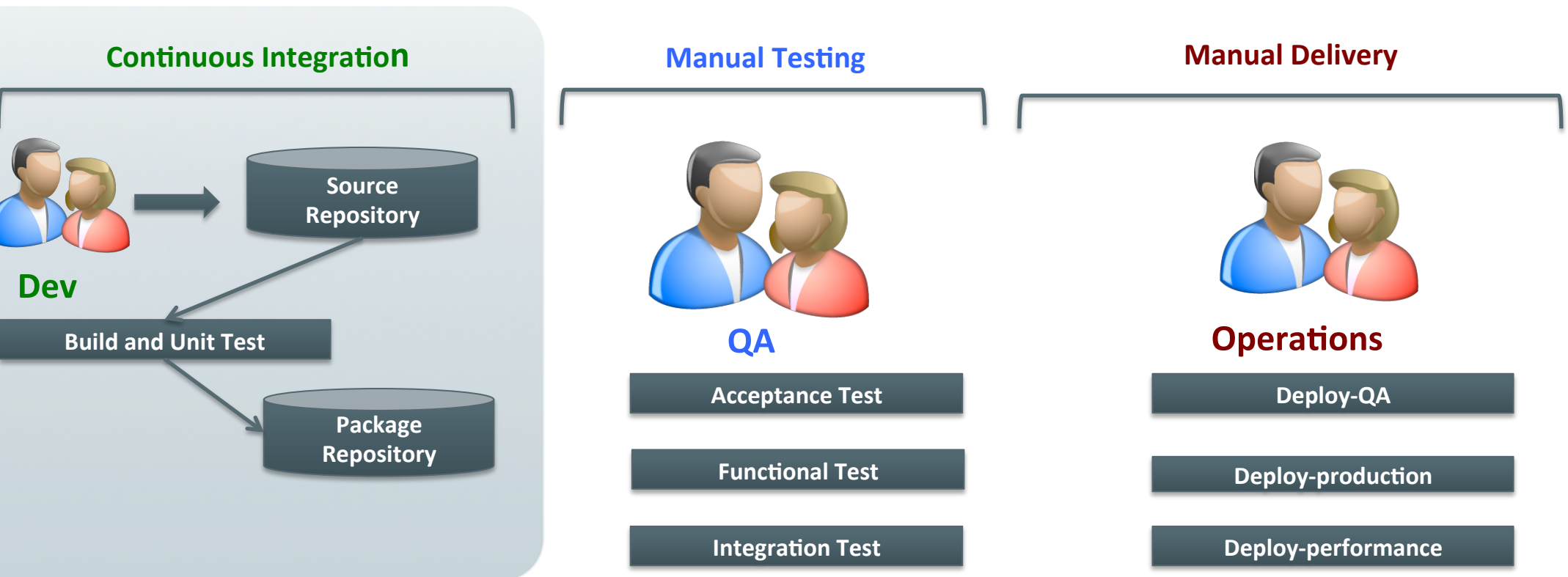
CI is but the First Step

- Continuous Delivery

- A set of **practices and principles** aimed at building, testing and releasing software faster and frequently
- Produce a **deployable-to-production** build regularly, probably on each commit.
- Every build is a **potential** release.

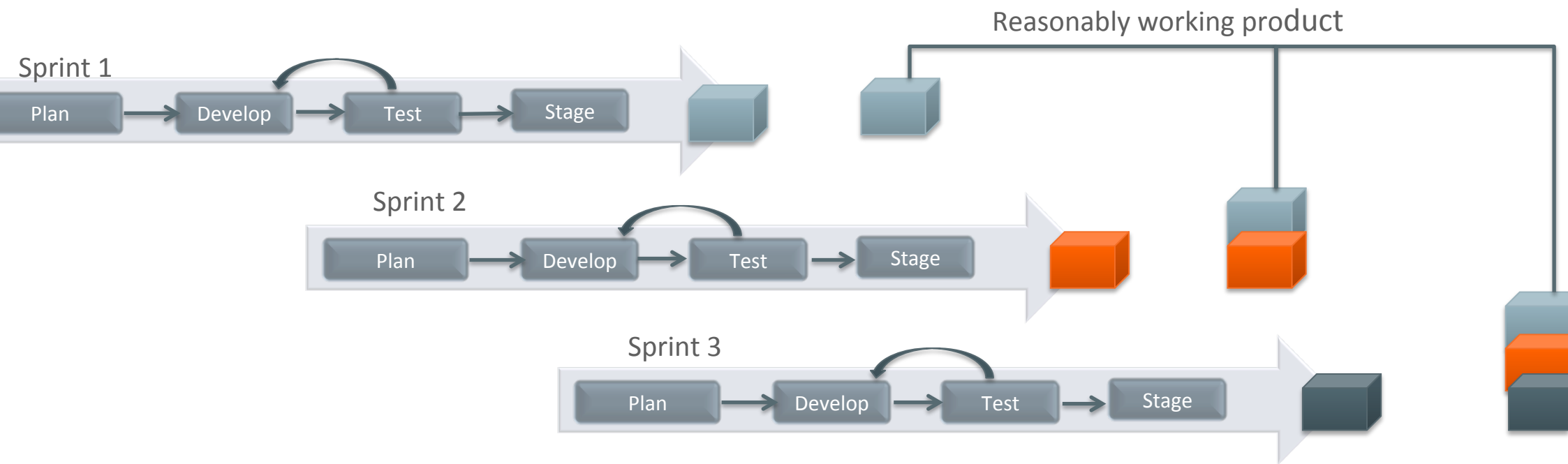
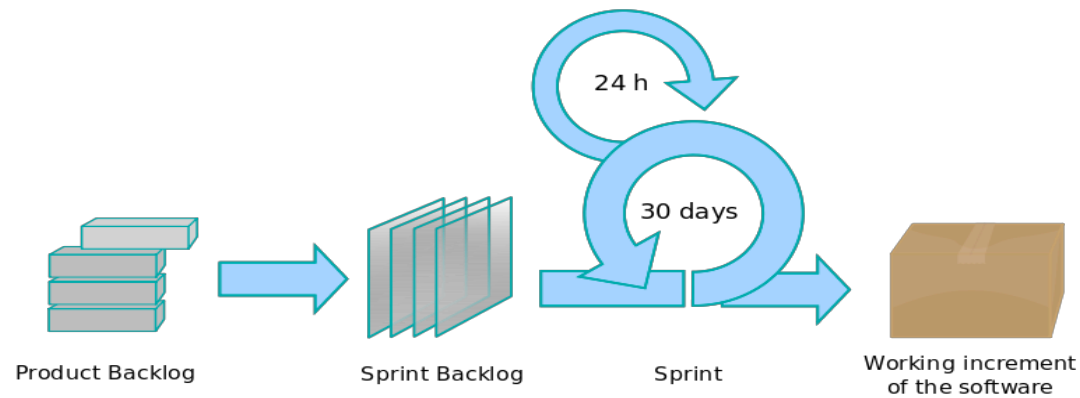


Hudson for CI



Hudson is mostly tuned to focus on **development teams**

Typical Sprint Cycle



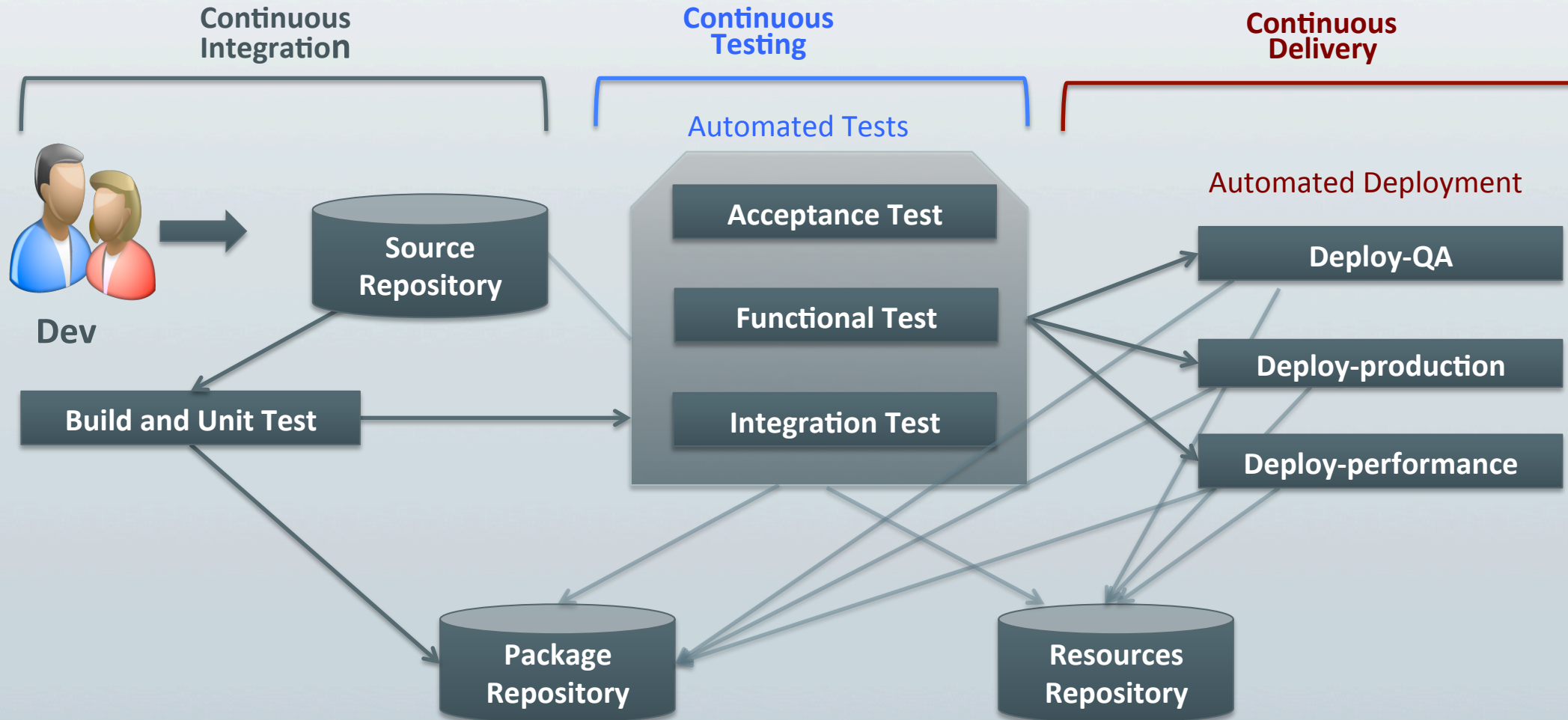
Commit to deploy



In a **Test Driven Development** build pipeline, Continuous Integration is the first step and the end result is the **Continuous Delivery**.

While **Continuous Delivery** promotes the concept of keeping your product in a deliverable state on each commit, **Continuous Deployment** takes it further. On each commit, the deliverable can be deployed to a production environment.

Moving on to Continuous Delivery



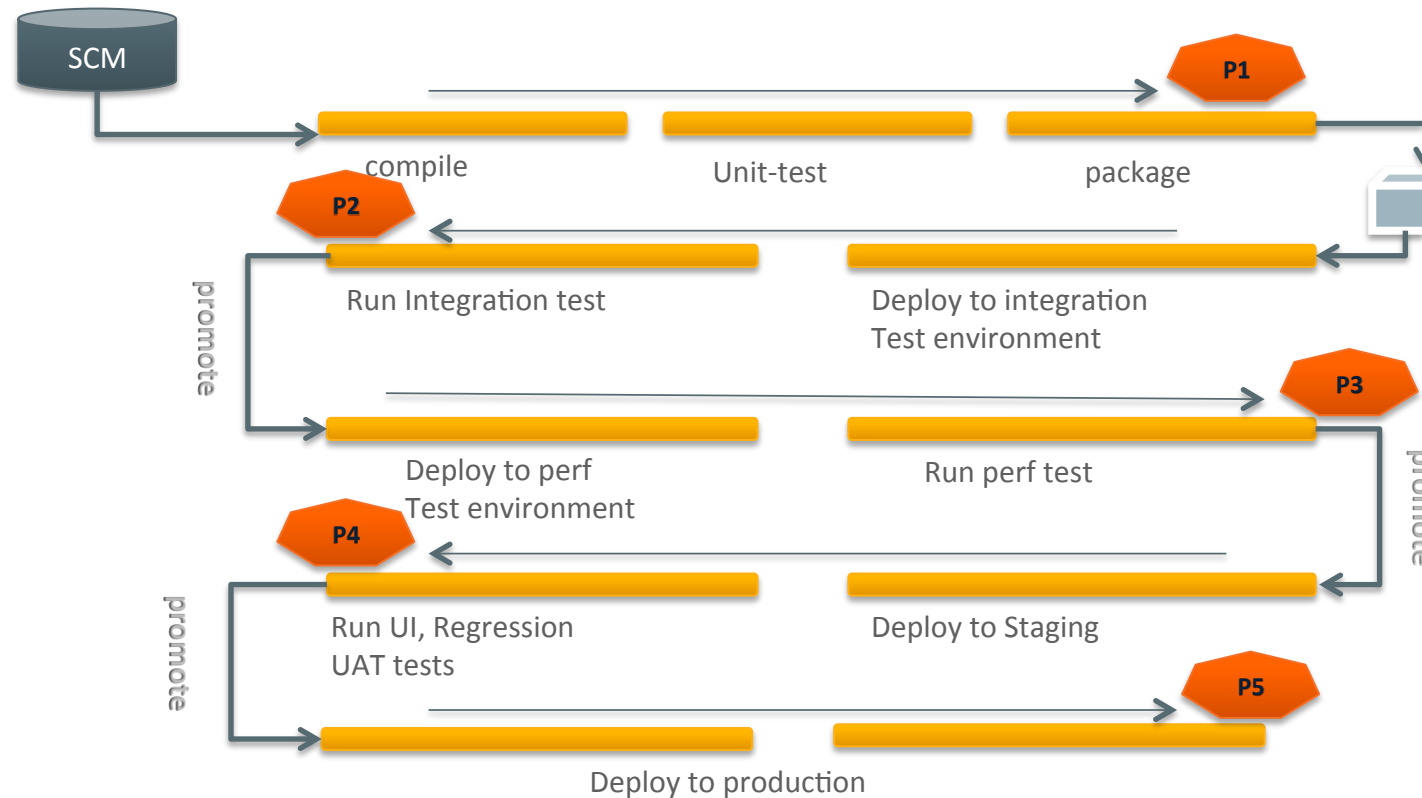
Think in terms of Build Pipeline and promotion

Commit

Build and Test

- Unit tests
- Static code coverage
- Packaging
- Integration tests
- UI tests
- Performance tests
- Regression tests
- Deployment tests (install, uninstall etc.)
- Manual exploratory tests
- Regulatory, compliance checks
- Clearance from UAT

Stage and Deploy



Team Management (3.2) for CD environment

Tenant enabled

Hudson 3.2 enables per tenant resource isolation and sharing. This Bringing the Dev-Ops (dev-qa-ops) team together, but with resource isolation to play nicely in a Continuous Delivery Environment.

The screenshot shows the Hudson 3.2 Team Management interface. At the top, there are four tabs: "Manage Teams" (highlighted in orange), "Manage Jobs", "Manage Views", and "Manage Nodes". Below these is a button "Add New Team".

The main content area shows a list of teams. The "dev" team is highlighted in orange. Below it are "ops" and "qa" teams. To the right of the "dev" team name is a "Delete Team" button.

Below the team list, the "dev" team is selected, showing its details. The title is "dev Developer Team". Below this are four tabs: "Members" (highlighted in orange), "Jobs", "Views", and "Nodes".

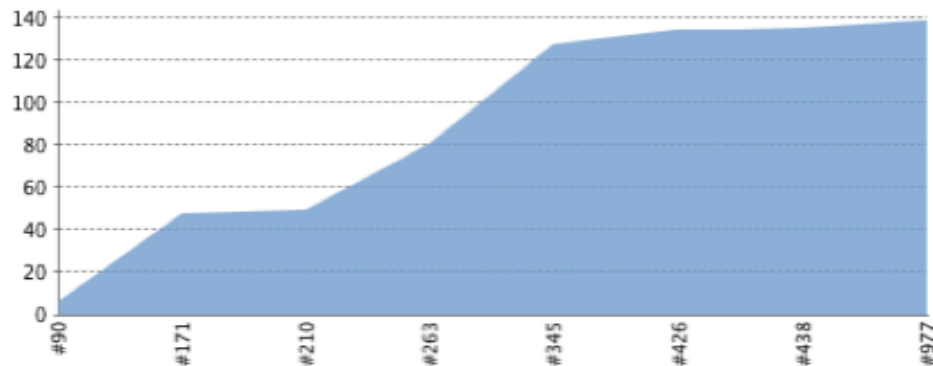
Below the tabs is a button "Add New Member".

The main content area shows a table of team members and their permissions. The table has columns for "Admin", "Job Permissions", "View Permissions", and "Node Permissions". Each of these permission columns is further divided into "Create", "Delete", and "Configure" sub-columns. The "Build" column is also present under Job Permissions. Each row represents a team member, and each cell contains a green checkmark indicating that the permission is granted. To the right of each row are icons for editing and deleting the member.

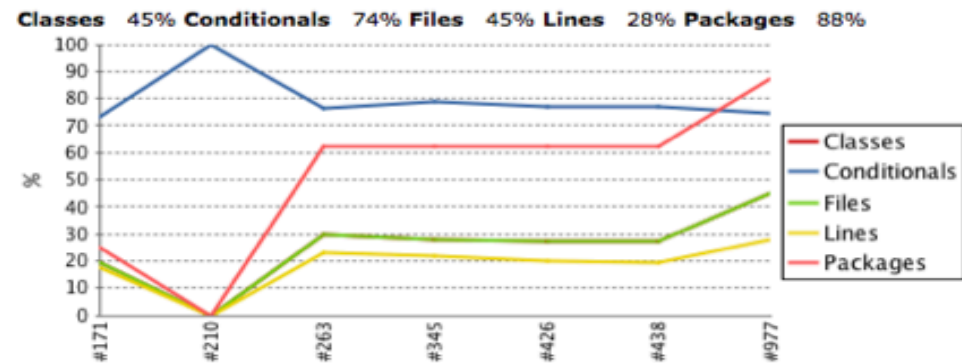
	Admin	Job Permissions				View Permissions			Node Permissions			
		Create	Delete	Configure	Build	Create	Delete	Configure	Create	Delete	Configure	
bob	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
paul		✓	✓	✓	✓							
latha		✓	✓	✓	✓							

CD Best Practice: Monitor Quality Metrics Trend

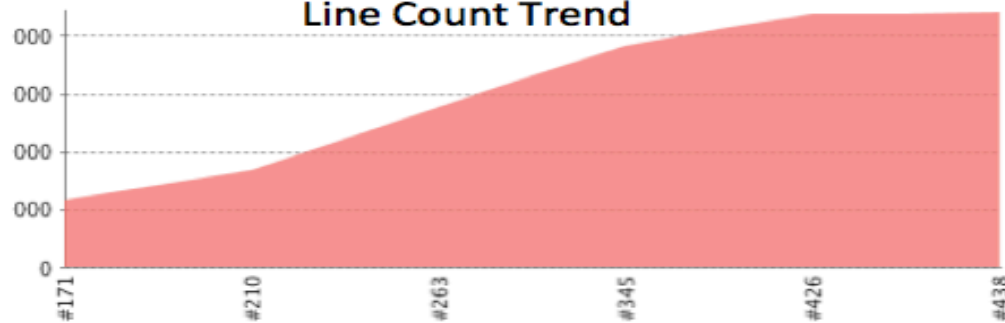
Tests Result Trend



Code Coverage Trend

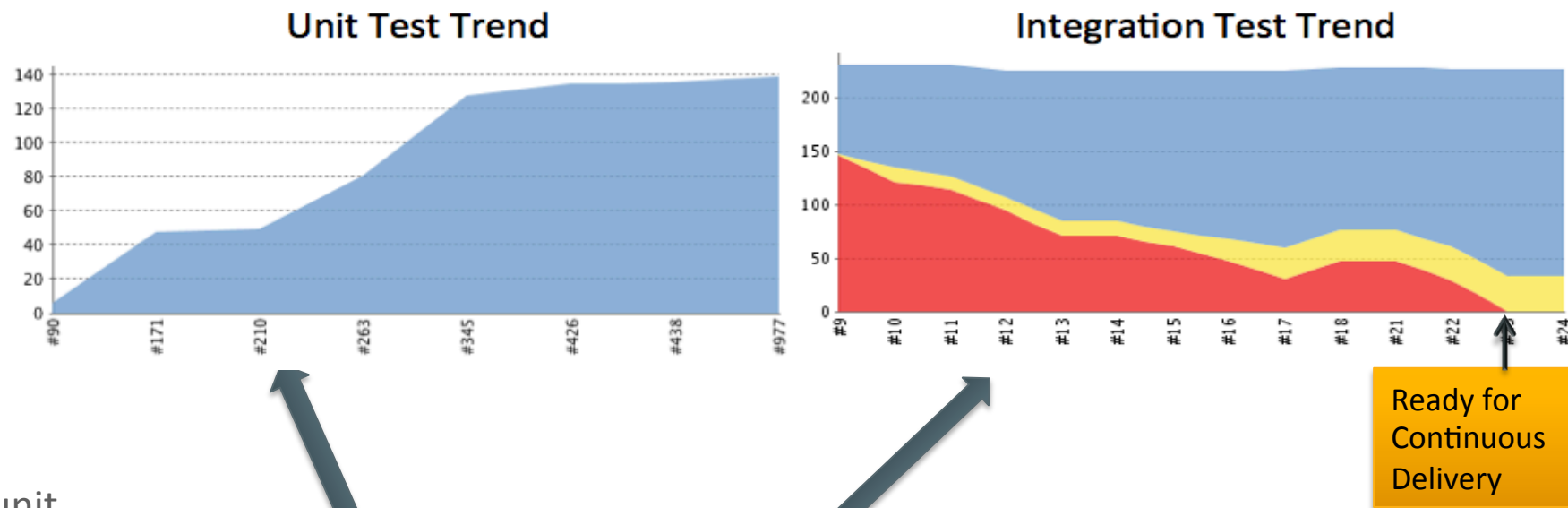


Line Count Trend

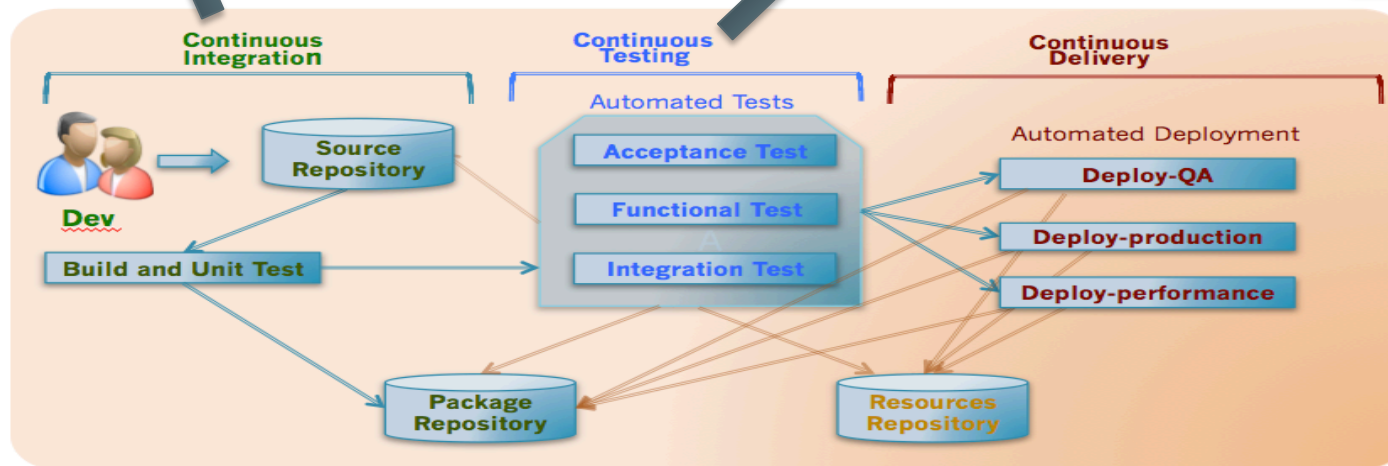


Code quality measurement is important in Continuous delivery.
Improves the confidence of the product being in a deliverable state.

CD Best practice: Monitor Test Trends



CI build, the unit tests should never fail. During the initial stage of the project, the integration test may be in flux.



Choosing Plugins for the Practicing of CD

http://wiki.eclipse.org/Hudson-ci#Hudson_Plugins

Maintain a Single SCM

This principle encourages the project team to use SCM to maintain their source code. Hudson supports various SCM systems.

99% of Hudson users use one of

Git
CVS
SVN
Perforce
Clearcase
Mercurial

Hudson supports ~20 additional SCM which are used by less than 1% of the users

Automate the Build

Automating the build using a single tool is a key principle of a CI build. Hudson supports various build tools.

99% of Hudson users use one of

- Ant
- maven
- gradle
- MSBuild
- Nant
- Rake

Hudson supports ~40 additional build tools which are used by less than 1% of the users

Make your build self-testing

CI build is not about catching errors, it's about catching errors more quickly and efficiently. Hudson supports various testing frameworks via Plugins.

99% of Hudson users use one of

- jUnit
- nUnit
- Selenium
- CppUnit
- TestNg
- xUnit

Hudson supports ~10 additional Unit Test Frameworks which are used by less than 1% of the users

Make your build self-testing (Code Coverage)

Self testing is best achieved if there is uniform code coverage. Hudson supports various Code Coverage Tools via Plugins

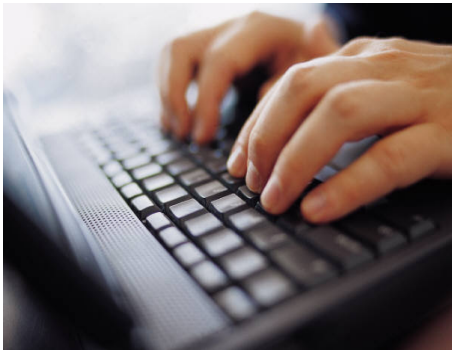
99% of Hudson users use one of

- Clover
- Cobertura
- Emma
- Serenity
- Sonar
- NCover

Hudson supports ~2 additional Code Coverage which are used by less than 1% of the users

Practicing Continuous Delivery using Hudson

https://wiki.eclipse.org/File:Practicing_continuous_delivery_using_hudson.pdf



Commit

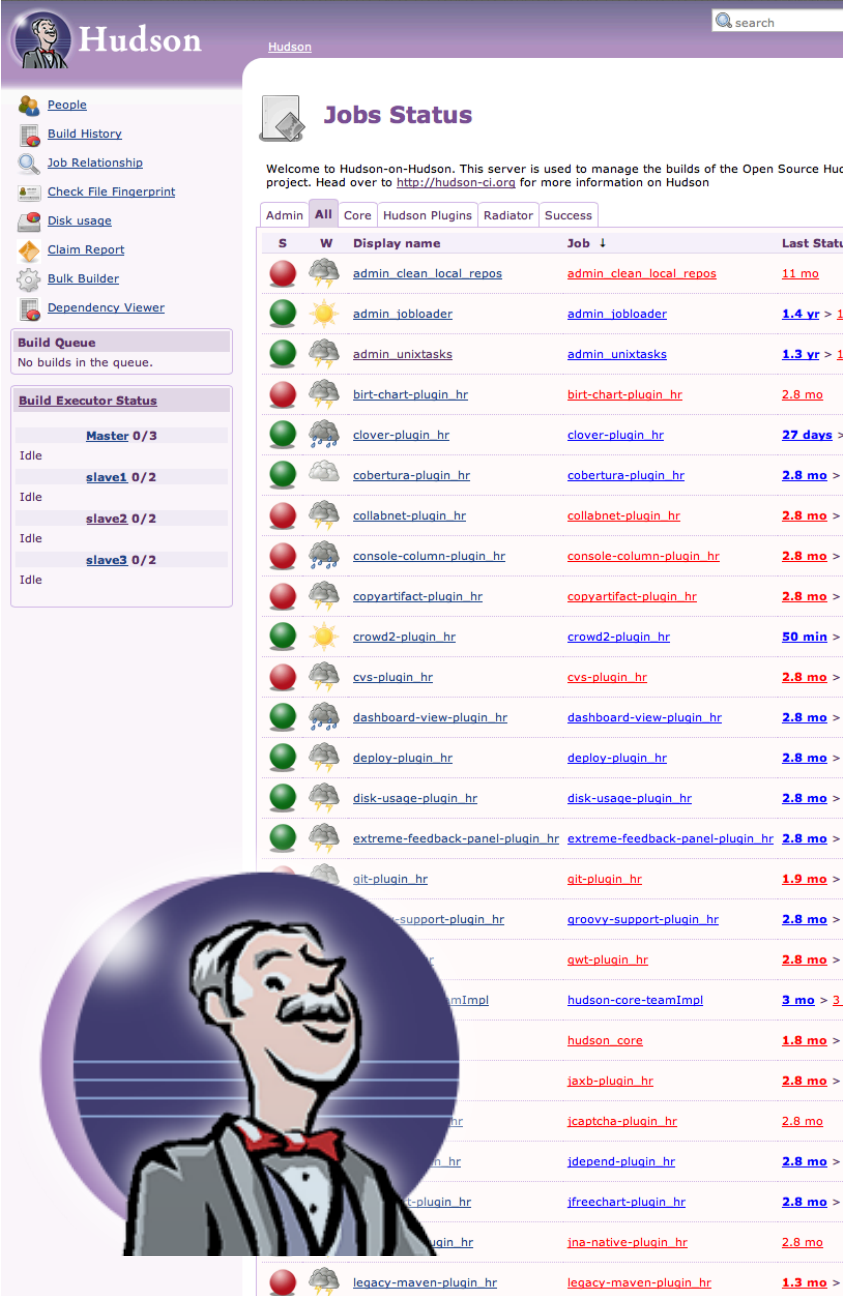


Build Magic



Production
Ready

Case Study – Developer Cloud Service



The screenshot displays the Hudson web interface. On the left, a sidebar contains navigation links: People, Build History, Job Relationship, Check File Fingerprint, Disk usage, Claim Report, Bulk Builder, and Dependency Viewer. Below these are sections for 'Build Queue' (showing 'No builds in the queue.') and 'Build Executor Status' (listing Master 0/3 and three slave nodes: slave1 0/2, slave2 0/2, and slave3 0/2, all in an 'Idle' state).

The main area is titled 'Jobs Status' and includes a welcome message and a search bar. It features a table with tabs for Admin, All, Core, Hudson Plugins, Radiator, and Success. The 'All' tab is selected, showing a list of jobs with columns for status (S), weather icon (W), display name, job ID, and last status. A large, semi-transparent circular avatar of a man with a mustache and a bow tie is overlaid on the bottom right of the jobs list.

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Case Study: Oracle Developer Cloud Service

Development Platform provided as a Service

Application Lifecycle Management

Team Management



**Source Control
Management**



Issue Tracking



**Hudson Continuous
Integration**



Wiki Collaborati

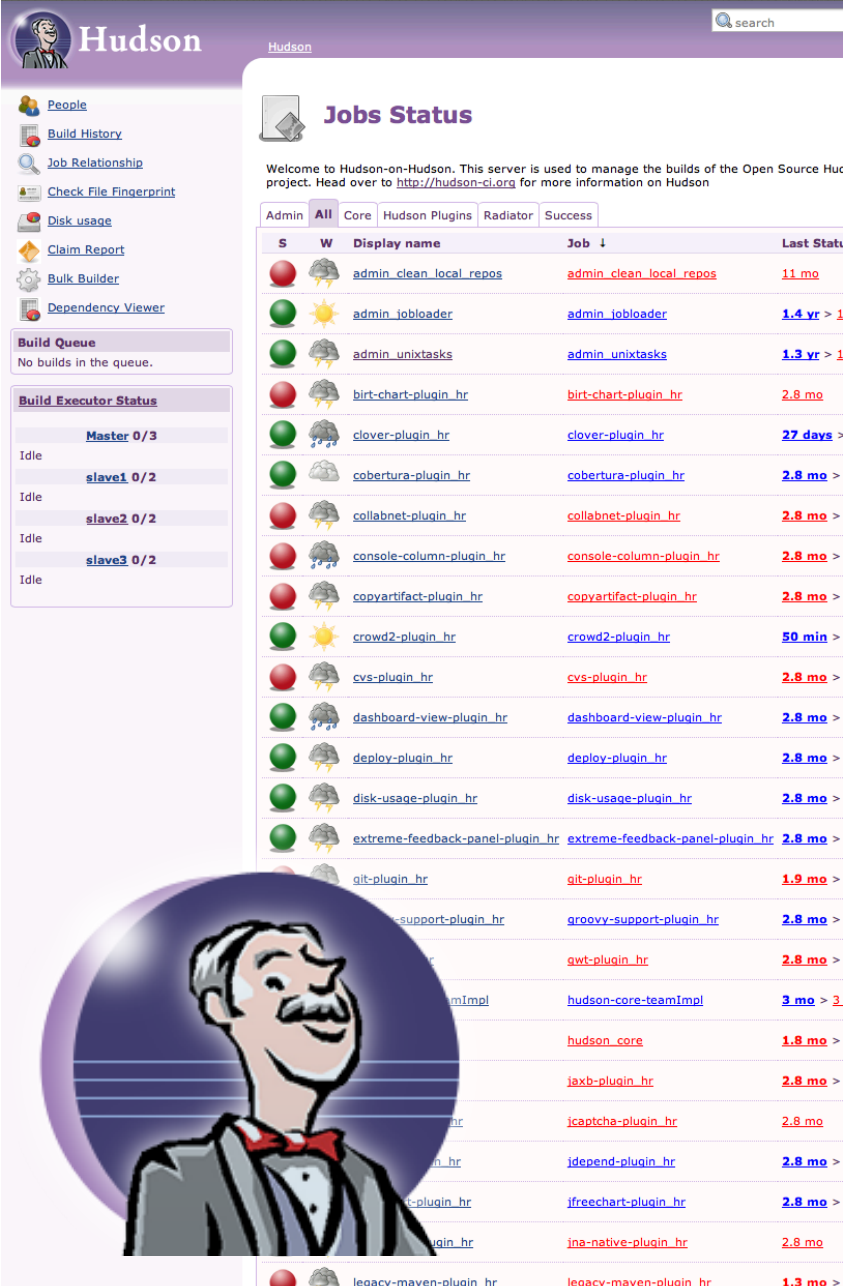
Oracle Developer Cloud Service

Hudson 3.2 - Stability and Density in Multi-tenancy

- ODCS Projects organized by Hudson Teams
 - Single Hudson Master per Tenant
- Memory and Stability Improvements
 - Stability improves predictability
 - Removed regular Master restart scripts
 - 75% savings on Heap allocation per master
 - One order of magnitude more tenants per hardware allocation
- On-demand provisioning of Hudson Slaves



Case Study - Delivering Oracle Fusion Middleware with Hudson



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●	☀	cobertura-plugin_hr	cobertura-plugin_hr	2.8 mo >
●	☀	collabnet-plugin_hr	collabnet-plugin_hr	2.8 mo >
●	☀	console-column-plugin_hr	console-column-plugin_hr	2.8 mo >
●	☀	copyartifact-plugin_hr	copyartifact-plugin_hr	2.8 mo >
●	☀	crowd2-plugin_hr	crowd2-plugin_hr	50 min >
●	☀	cvs-plugin_hr	cvs-plugin_hr	2.8 mo >
●	☀	dashboard-view-plugin_hr	dashboard-view-plugin_hr	2.8 mo >
●	☀	deploy-plugin_hr	deploy-plugin_hr	2.8 mo >
●	☀	disk-usage-plugin_hr	disk-usage-plugin_hr	2.8 mo >
●	☀	extreme-feedback-panel-plugin_hr	extreme-feedback-panel-plugin_hr	2.8 mo >
●	☀	git-plugin_hr	git-plugin_hr	1.9 mo >
●	☀	groovy-support-plugin_hr	groovy-support-plugin_hr	2.8 mo >
●	☀	gwt-plugin_hr	gwt-plugin_hr	2.8 mo >
●	☀	hudson-core-teamImpl	hudson-core-teamImpl	3 mo > 3
●	☀	hudson_core	hudson_core	1.8 mo >
●	☀	jaxb-plugin_hr	jaxb-plugin_hr	2.8 mo >
●	☀	jcaptcha-plugin_hr	jcaptcha-plugin_hr	2.8 mo >
●	☀	idepend-plugin_hr	idepend-plugin_hr	2.8 mo >
●	☀	ifreechart-plugin_hr	ifreechart-plugin_hr	2.8 mo >
●	☀	ina-native-plugin_hr	ina-native-plugin_hr	2.8 mo >
●	☀	legacy-maven-plugin_hr	legacy-maven-plugin_hr	1.3 mo >

Solving a Problem

Oracle's development org is big – very big (and heterogeneous)

- Mix of SCMs
- Mix of build methodology
- Mix of testing, quality and security tools
- Multiple bug, task and requirement systems
- Mix of deliverables
- Infrastructure!

Huge complexity in release promotion and consumption

Fortunately Hudson gives us common ground and the adaptability we need

- But it needs a little help...

Meeting Challenges of CD at Scale

Core activities need to be managed centrally

- Pushing new plugins / maintaining local plugin center
- Tracking plugin usage by job and plugin version
- SSH key management across Hudson executors and SCM systems
- Management of local tools installation
- Managing the recipes for Hudson slave machines

Security

- In our case, a single SSO system used across the farm
- Organization specific policies for control and sharing

Hudson at Scale

The numbers

- 87 Hudson masters (allocated by organizations within development)
- ~1200 slaves
- More than 25,000 jobs

Coordinated by "Carson" message bus

- Manages event driven continuous delivery pipeline
- Bus handles ~ 1,000,000 messages / week
- Manages retry in case of infrastructure failure
- Provides management UI and additional reporting on pipelines



Overview



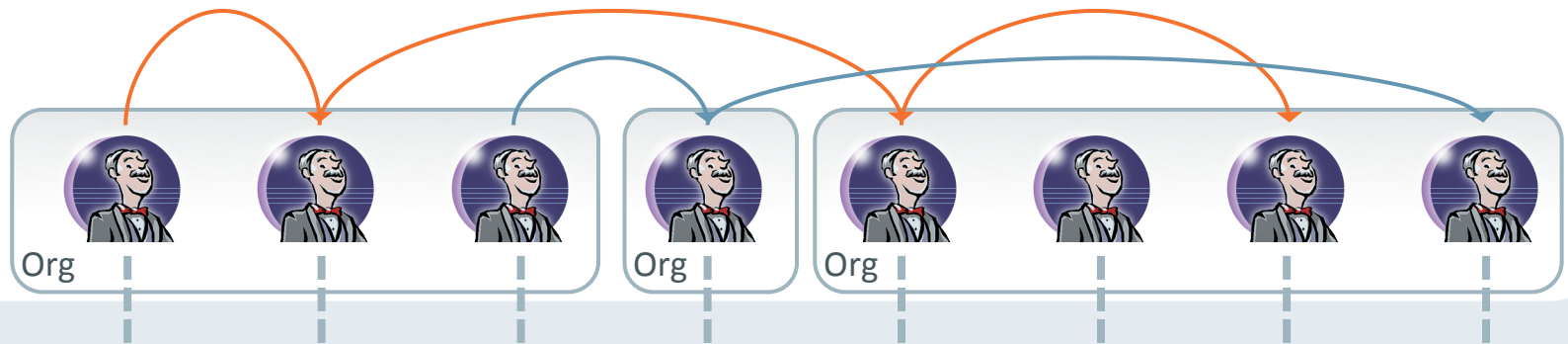
Plugins
artifactory

Executor Recipes



HTTP Management Interface & REST APIs

Orchestration



Configuration
 git

Identity

Executors
 nimbus

Storage

artifactory

Shared Resources

What's Next for Hudson?

3.3 And Beyond?

- We're thinking about
 - Modernizing the UI
 - ...
- What about You?
 - Join the Birds-of-a-Feather Session @ 7PM right here!



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