Agenda

- Continuous Integration (CI)
  - What is it?
  - What are the benefits?
  - Continuous Build Systems
- Jenkins
  - What is it?
  - Where does it fit in?
  - Why should I use it?
  - What can it do?
  - How does it work?
  - Where is it used?
  - How can I get started?
- Putting it all together
- Conclusion
- References

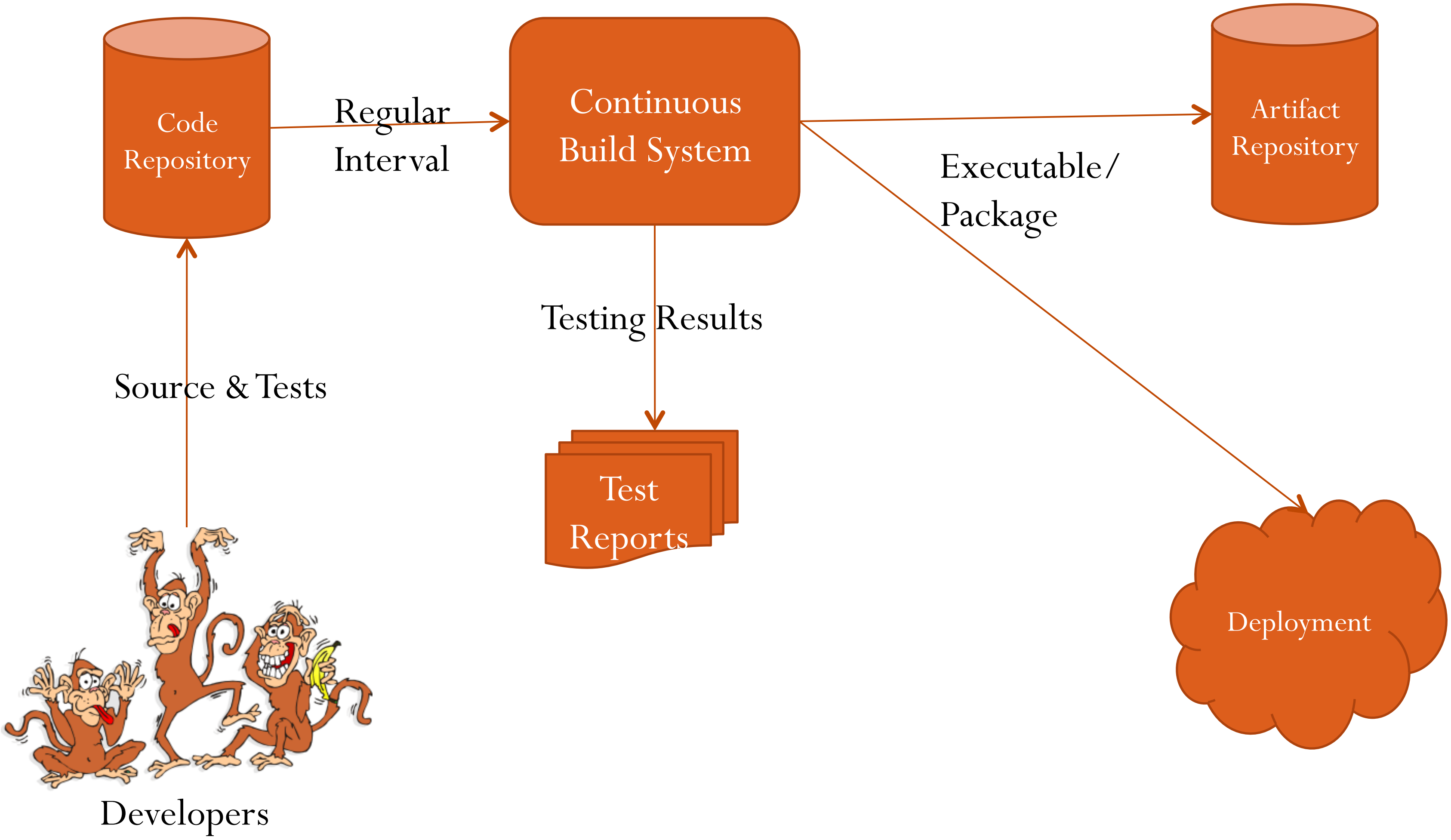
CI - Defined

- "Continuous Integration is a software development practice where members of a team integrate their work frequently, usually each person integrates at least daily - leading to multiple integrations per day. Each integration is verified by an automated build (including test) to detect integration errors as quickly as possible" – Martin Fowler

CI – What does it really mean?

- At a regular frequency (ideally at every commit), the system is:
  - Integrated
    - All changes up until that point are combined into the project
  - Built
    - The code is compiled into an executable or package
  - Tested
    - Automated test suites are run
  - Archived
    - Versioned and stored so it can be distributed as is, if desired
  - Deployed
    - Loaded onto a system where the developers can interact with it

CI - Workflow


Code Repository
Regular Interval
Continuous Build System
Artifact Repository
Executable/ Package
Testing Results
Source & Tests
Test Reports
Deployment
Developers

CI – Benefits

- Immediate bug detection
- No integration step in the lifecycle
- A deployable system at any given point
- Record of evolution of the project

CI – The tools

- Code Repositories
  - SVN, Mercurial, Git
- Continuous Build Systems
  - **Jenkins**, Bamboo, Cruise Control
- Test Frameworks
  - JUnit,Cucumber, CppUnit
- Artifact Repositories
  - Nexus, Artifactory, Archiva

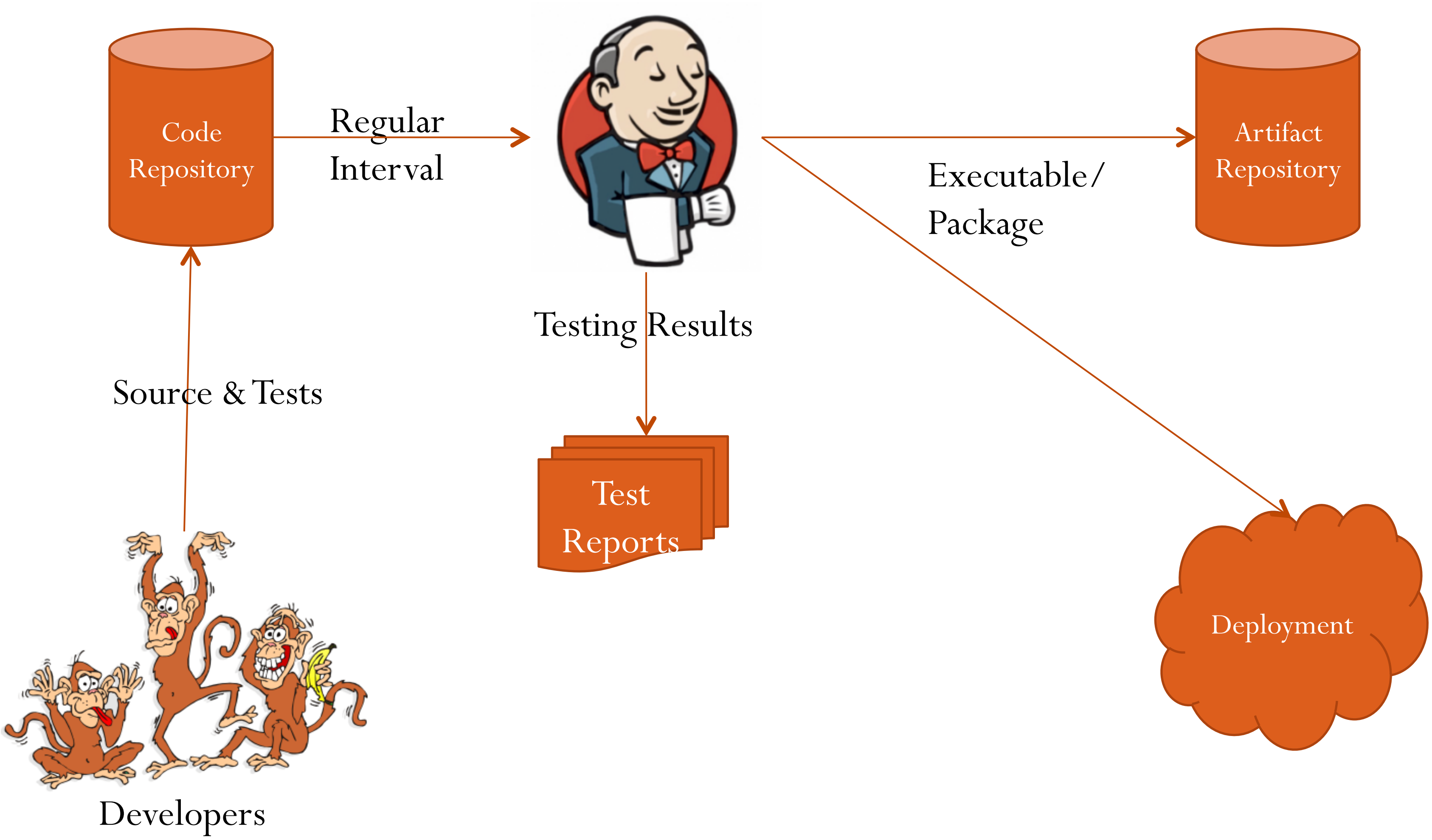
Jenkins

- Branched from Hudson
- Java based Continuous Build System
- Runs in servlet container
  - Glassfish, Tomcat
- Supported by over 400 plugins
  - SCM, Testing, Notifications, Reporting, Artifact Saving, Triggers, External Integration
- Under development since 2005
- http://jenkins-ci.org/

Jenkins - History

- 2005 - Hudson was first release by Kohsuke Kawaguchi of Sun Microsystems
- 2010 – Oracle bought Sun Microsystems
  - Due to a naming dispute, Hudson was renamed to Jenkins
  - Oracle continued development of Hudson (as a branch of the original)

Jenkins – Fitting in



Why Jenkins? Flexibility!

- Jenkins is a highly configurable system by itself
- The additional community developed plugins provide even more flexibility
- By combining Jenkins with Ant, Gradle, or other Build Automation tools, the possibilities are limitless

Why Jenkins? Award winning!

- InfoWorld Bossies Award, 2011
- O'Reilly Open-Source Award, 2011
- ALM&SCM, SDTimes 100, 2010, 2011
- GlassFish Community Innovation Award 2008
- Duke's Choice Award 2008

Why Jenkins? Free/OSS

- Jenkins is released under the MIT License
- There is a large support community and thorough documentation
- It’s easy to write plugins
- Think something is wrong with it? You can fix it!

What can Jenkins do?

- Generate test reports
- Integrate with many different Version Control Systems
- Push to various artifact repositories
- Deploys directly to production or test environments
- Notify stakeholders of build status
- …and much more

How Jenkins works - Setup

- When setting up a project in Jenkins, out of the box you have the following general options:
  - Associating with a version control server
  - Triggering builds
    - Polling, Periodic, Building based on other projects
  - Execution of shell scripts, bash scripts, Ant targets, and Maven targets
  - Artifact archival
  - Publish JUnit test results and Javadocs
  - Email notifications
- As stated earlier, plugins expand the functionality even further

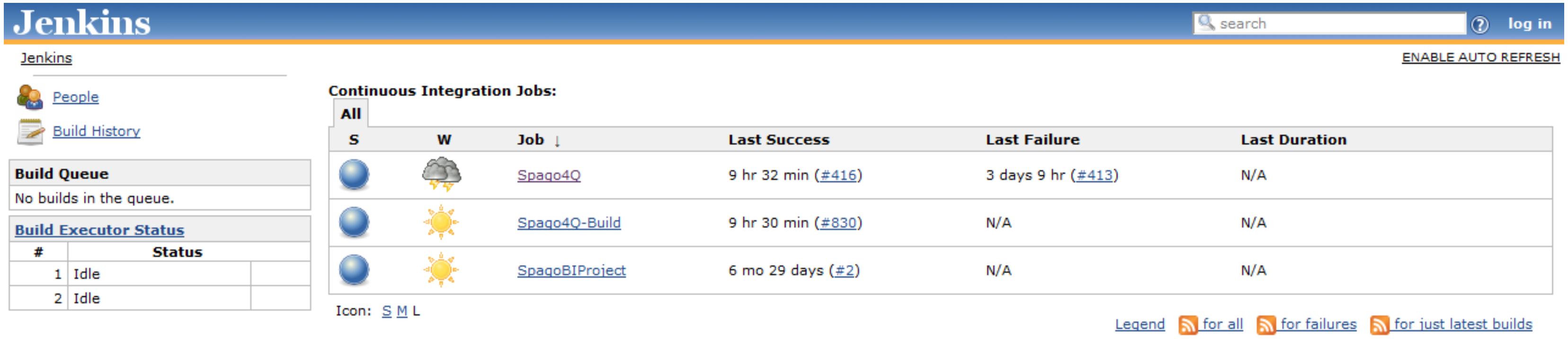
How Jenkins works - Building

- Once a project is successfully created in Jenkins, all future builds are automatic
- Building
  - Jenkins executes the build in an executer
    - By default, Jenkins gives one executer per core on the build server
  - Jenkins also has the concept of slave build servers
    - Useful for building on different architectures
    - Distribution of load

How Jenkins works - Reporting

- Jenkins comes with basic reporting features
  - Keeping track of build status
    - Last success and failure
    - "Weather" – Build trend
- These can be greatly enhanced with the use of pre-build plugins
  - Unit test coverage
  - Test result trending
  - Findbugs, Checkstyle, PMD

Jenkins by example – Main Page



Build Queue
No builds in the queue.

Build Executor Status

#	Status
1	Idle
2	Idle

Continuous Integration Jobs:

All

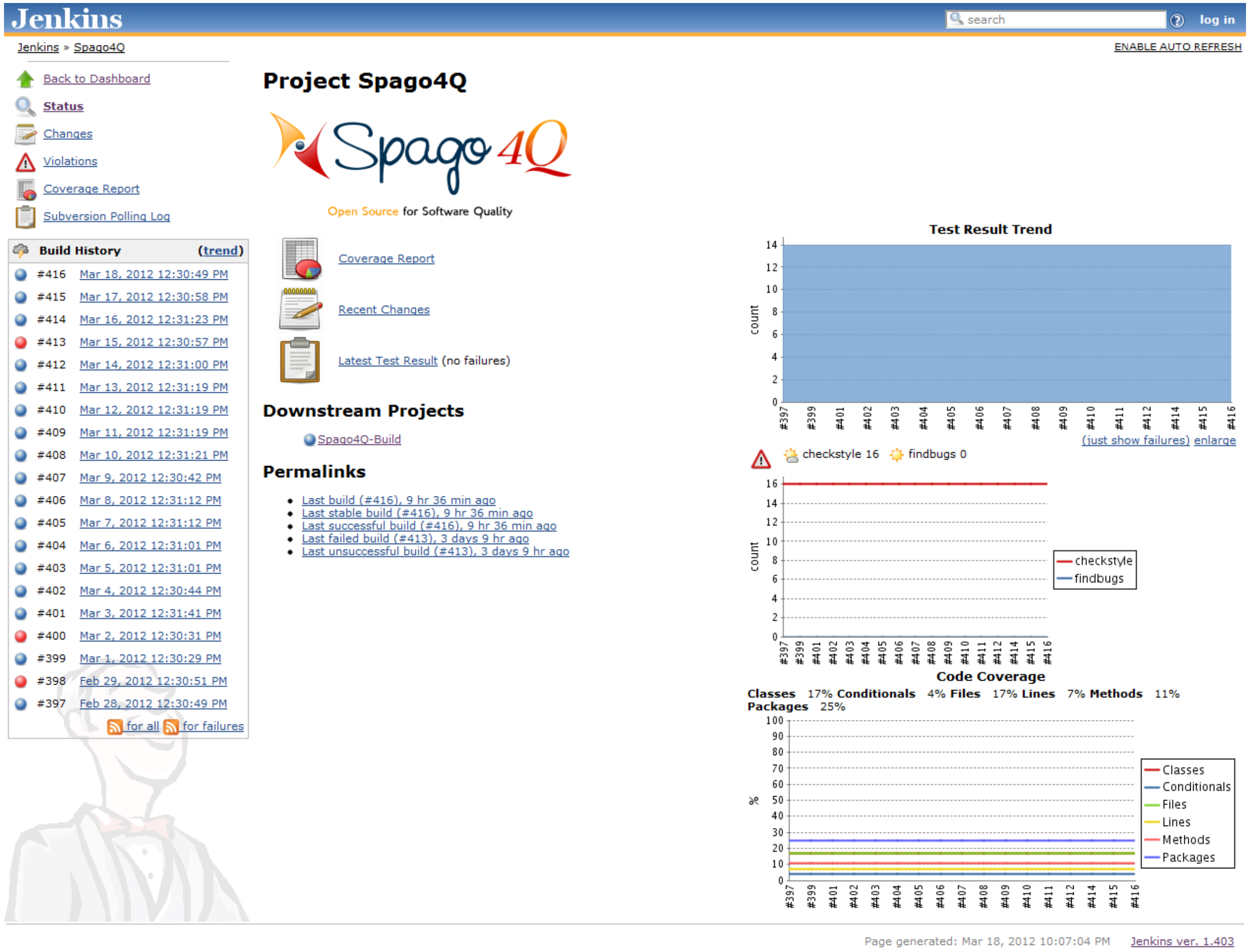
S	W	Job ↓	Last Success	Last Failure	Last Duration
●	⛈	Spago4Q	9 hr 32 min (#416)	3 days 9 hr (#413)	N/A
●	☀	Spago4Q-Build	9 hr 30 min (#830)	N/A	N/A
●	☀	SpagoBIProject	6 mo 29 days (#2)	N/A	N/A

- The main page provides a summary of the projects
- Quick view of
  - What's building ("No builds in the queue")
  - Build Executor Status (both "Idle")
  - Status of the projects

Jenkins by example – Project Status

- Project status pages provide more details about a given project
  - The status of the last several builds
  - Charting (depending on plugins)
  - Dependencies

Jenkins by example – Project Status



- Back to Dashboard
- Status
- Changes
- Violations
- Coverage Report
- Subversion Polling Log

Build History (trend)

#416	Mar 18, 2012 12:30:49 PM
#415	Mar 17, 2012 12:30:58 PM
#414	Mar 16, 2012 12:31:23 PM
#413	Mar 15, 2012 12:30:57 PM
#412	Mar 14, 2012 12:31:00 PM
#411	Mar 13, 2012 12:31:19 PM
#410	Mar 12, 2012 12:31:19 PM
#409	Mar 11, 2012 12:31:19 PM
#408	Mar 10, 2012 12:31:21 PM
#407	Mar 9, 2012 12:30:42 PM
#406	Mar 8, 2012 12:31:12 PM
#405	Mar 7, 2012 12:31:12 PM
#404	Mar 6, 2012 12:31:01 PM
#403	Mar 5, 2012 12:31:01 PM
#402	Mar 4, 2012 12:30:44 PM
#401	Mar 3, 2012 12:31:41 PM
#400	Mar 2, 2012 12:30:31 PM
#399	Mar 1, 2012 12:30:29 PM
#398	Feb 29, 2012 12:30:51 PM
#397	Feb 28, 2012 12:30:49 PM

for all for failures

Project Spago4Q

- Coverage Report
- Recent Changes
- Latest Test Result (no failures)

Downstream Projects

Spago4Q-Build

Permalinks

- Last build (#416), 9 hr 36 min ago
- Last stable build (#416), 9 hr 36 min ago
- Last successful build (#416), 9 hr 36 min ago
- Last failed build (#413), 3 days 9 hr ago
- Last unsuccessful build (#413), 3 days 9 hr ago

Classes 17% Conditionals 4% Files 17% Lines 7% Methods 11% Packages 25%

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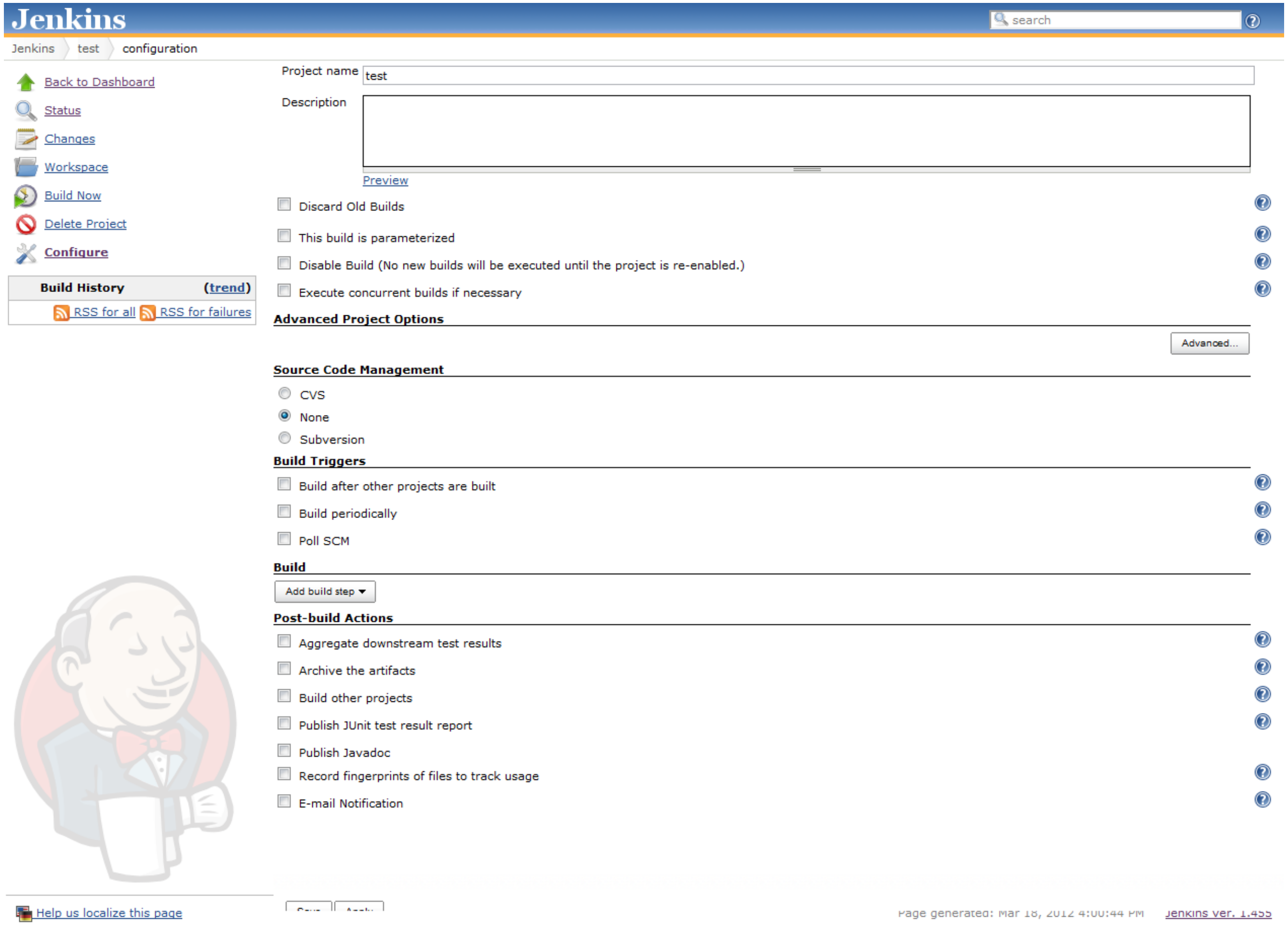
Jenkins by example – New Project



Project name: test

Description:

□ Discard Old Builds

□ This build is parameterized

□ Disable Build (No new builds will be executed until the project is re-enabled.)

□ Execute concurrent builds if necessary

Advanced Project Options

Source Code Management

○ CVS

● None

○ Subversion

Build Triggers

□ Build after other projects are built

□ Build periodically

□ Poll SCM

Build

Post-build Actions

□ Aggregate downstream test results

□ Archive the artifacts

□ Build other projects

□ Publish JUnit test result report

□ Publish Javadoc

□ Record fingerprints of files to track usage

□ E-mail Notification

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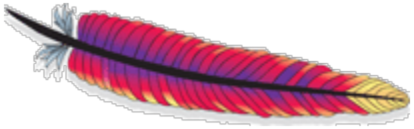
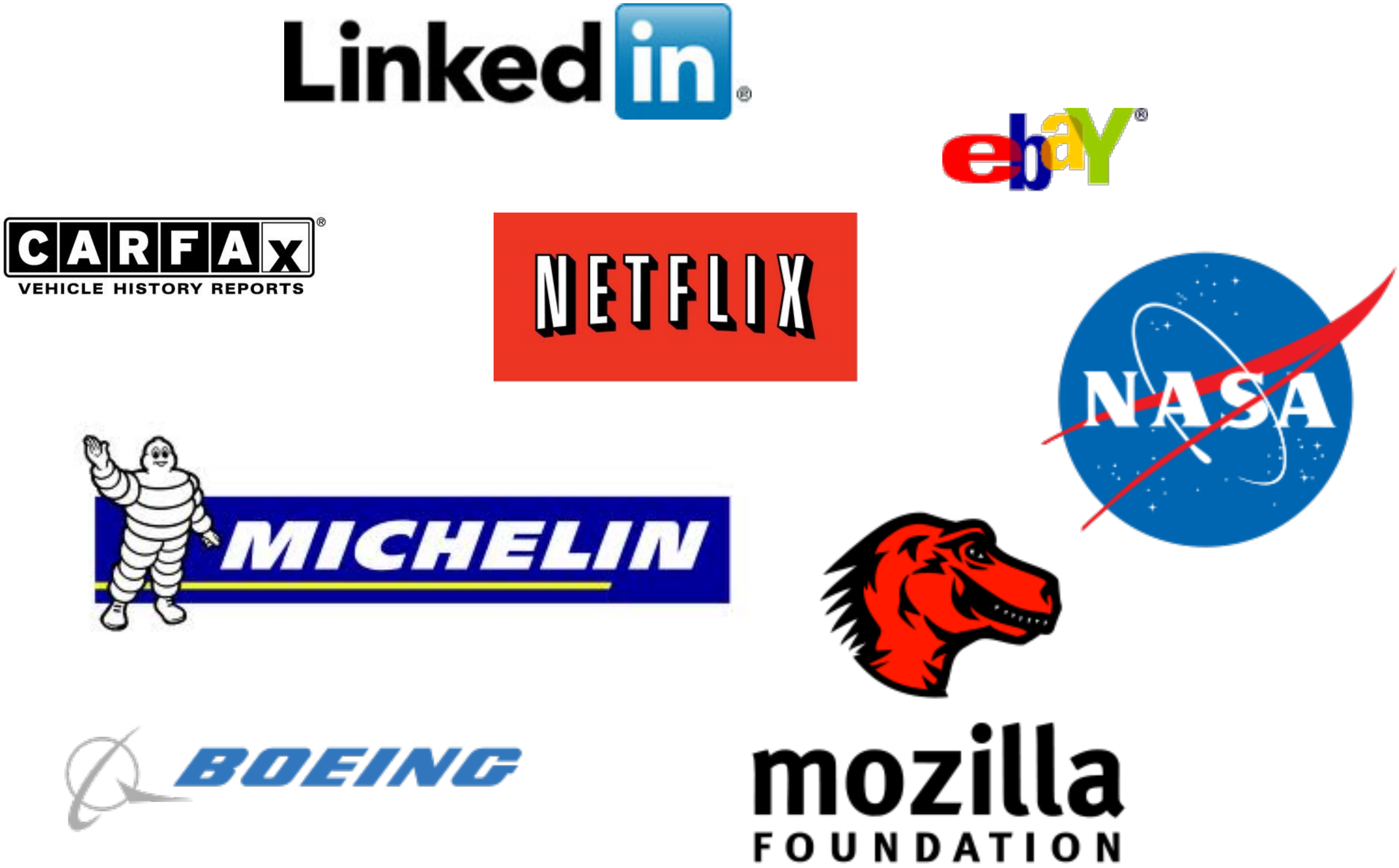
Enhancing Jenkins

- Jenkins plugin system can enable a wide range of features including (but certainly not limited to)
  - SCM
    - Mercurial, Git, Subversion
  - Testing
    - Selenium, Windmill, TestLink
  - Notifications
    - IRC, Twitter, Jabber
  - Reporting
    - Doxygen, PMD, Findbugs
  - Artifact Saving
    - Artifactory, Amazon S3, SCP
  - Triggers
    - Jabber, Directory Watchers
  - External Integration
    - GitHub, Bugzilla, JIRA
  - And most importantly – The CI Game
    - A points based game where developers compete against each other to develop the most stable, well-tested code

Who uses Jenkins?





Running Jenkins yourself

- Jenkins is packaged as a WAR, so you can drop it into whichever servlet container you prefer to use
- Jenkins comes pre-packaged with a servlet if you just want a light-weight implementation
- Native/Supported packages exist for
  - Windows
  - Ubuntu/Debian
  - Redhat/Fedora/CentOS
  - Mac OSX
  - openSUSE
  - FreeBSD
  - OpenBSD
  - Solaris/OpenIndiana
  - Gentoo

Running Jenkins yourself – Updates

- Jenkins has two release lines
  - Standard releases
    - Weekly bug fixes and features
  - Long-Term Support releases
    - Updates about every 3 months
    - Uses a "Stable but older" version from the standard release line
    - Changes are limited to backported, well-tested modifications

Letting someone else run Jenkins

- There are also cloud-based solutions that can provide a Jenkins instance
  - Cloudbees - http://www.cloudbees.com/
  - ShiningPanda - https://www.shiningpanda.com/

Tying it into Agile

- For an Agile team, Jenkins provides everything needed for a robust continuous build system
- Jenkins supports Agile principles by constantly providing access to working copies of software
- Jenkins' extensibility allows the system to adapt to many different pre-existing environments

Putting it all together

- While an integral part of a CI system, Jenkins is by no means the only component
- In order for a CI system to function, a common repository for the codebase needs to exist
- A database of artifacts needs to exist, so deliveries can be made at past iterations
- The last step in a CI process is the deployment of the components built
- …and none of this matters if the developers don't use the system; procedures need to ensure the system is used as intended

Conclusion

- Continuous integration is a necessity on complex projects due to the benefits it provides regarding early detection of problems
- A good continuous build system should be flexible enough to fit into pre-existing development environments and provide all the features a team expects from such a system
- Jenkins, a continuous build system, can be an integral part of any continuous integration system due to it's core feature set and extensibility through a plugin system

References

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