Large-Scale Automation with Jenkins

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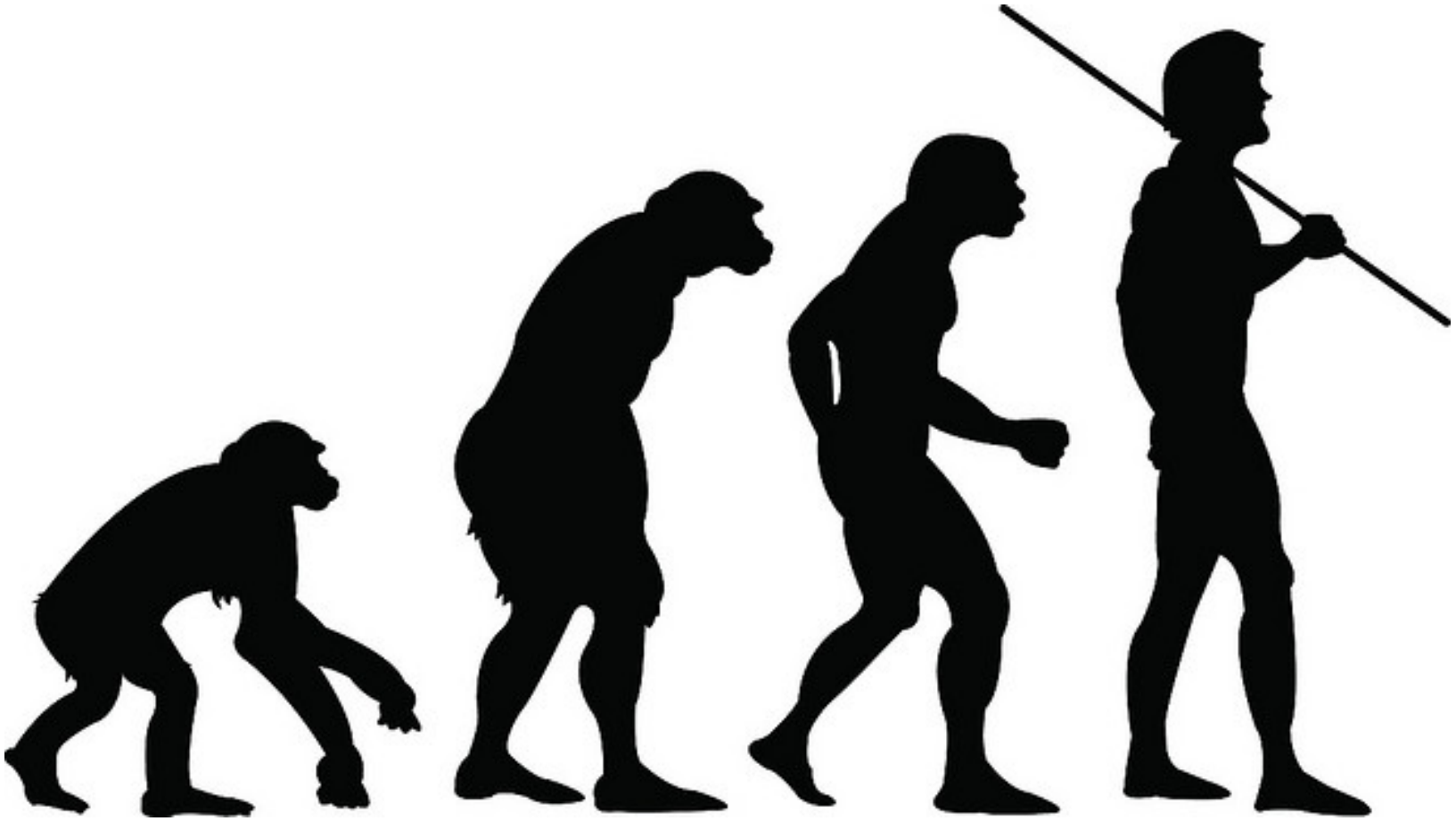
Have you met Jenkins?

http://jenkins-ci.org/

x 53,000

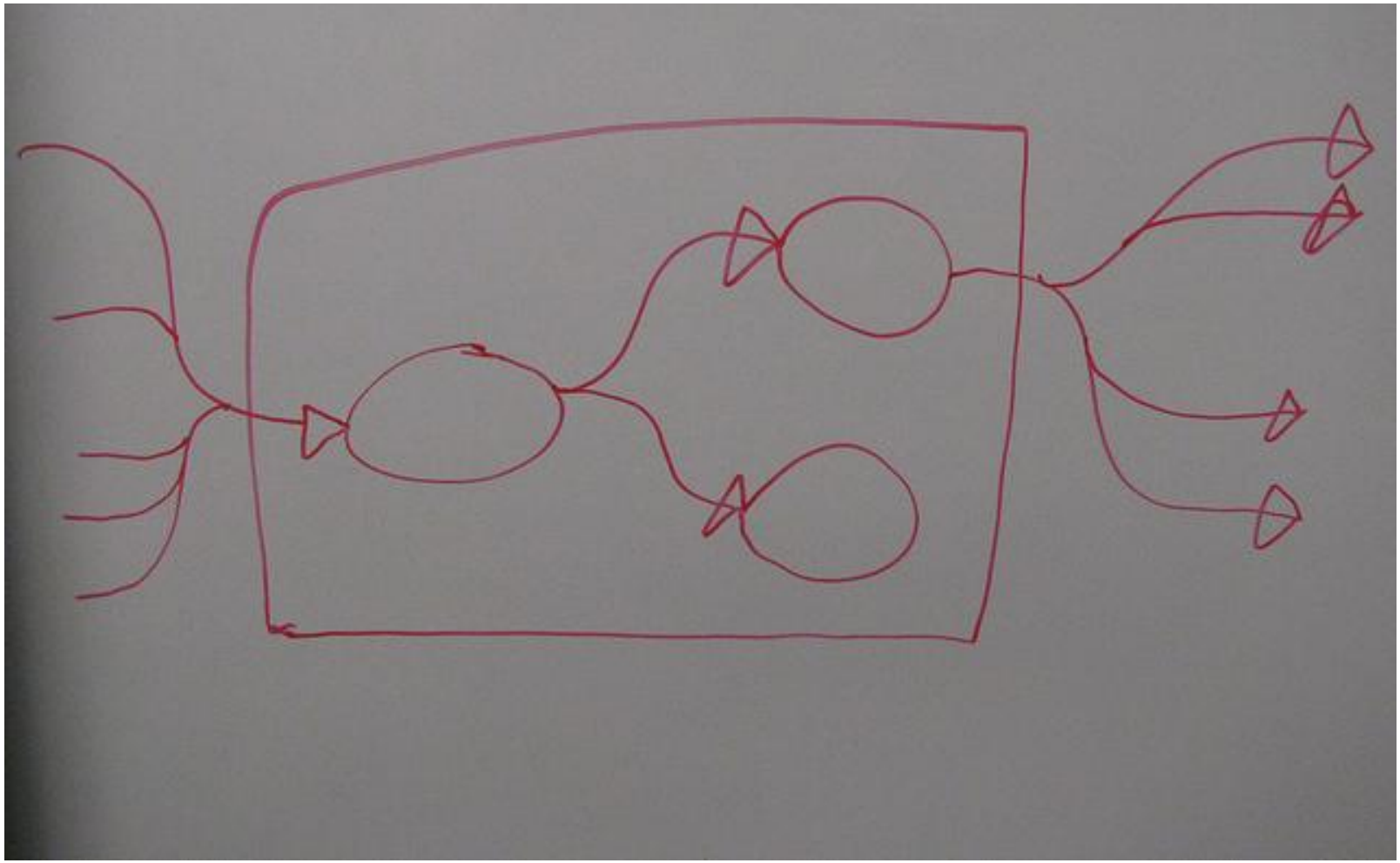
x 600

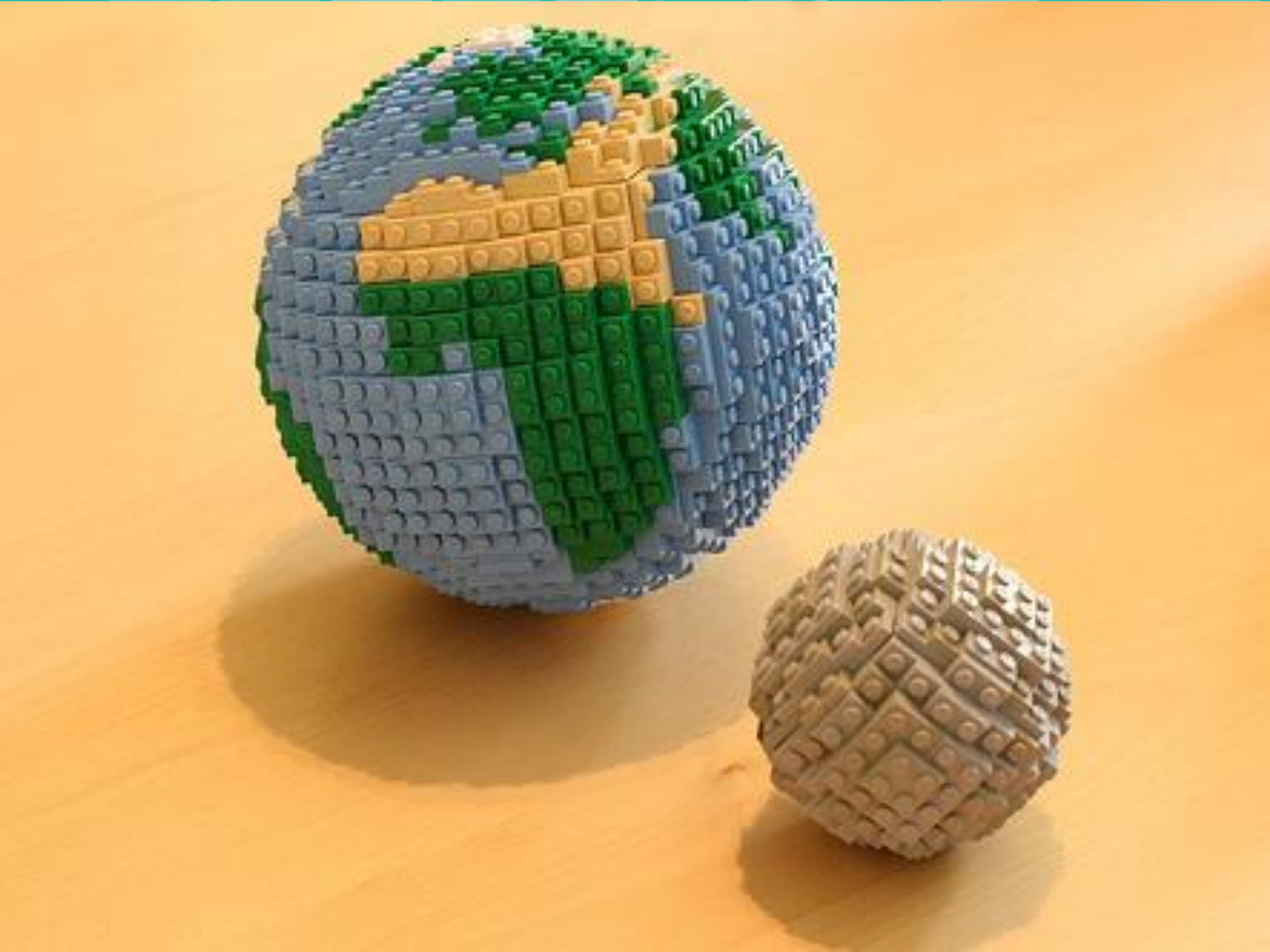
Context



http://www.flickr.com/photos/spidermandragon5/2922128673/

Workflow!





Parameterized Builds

- Plain jobs can be thought of like a procedure without any input

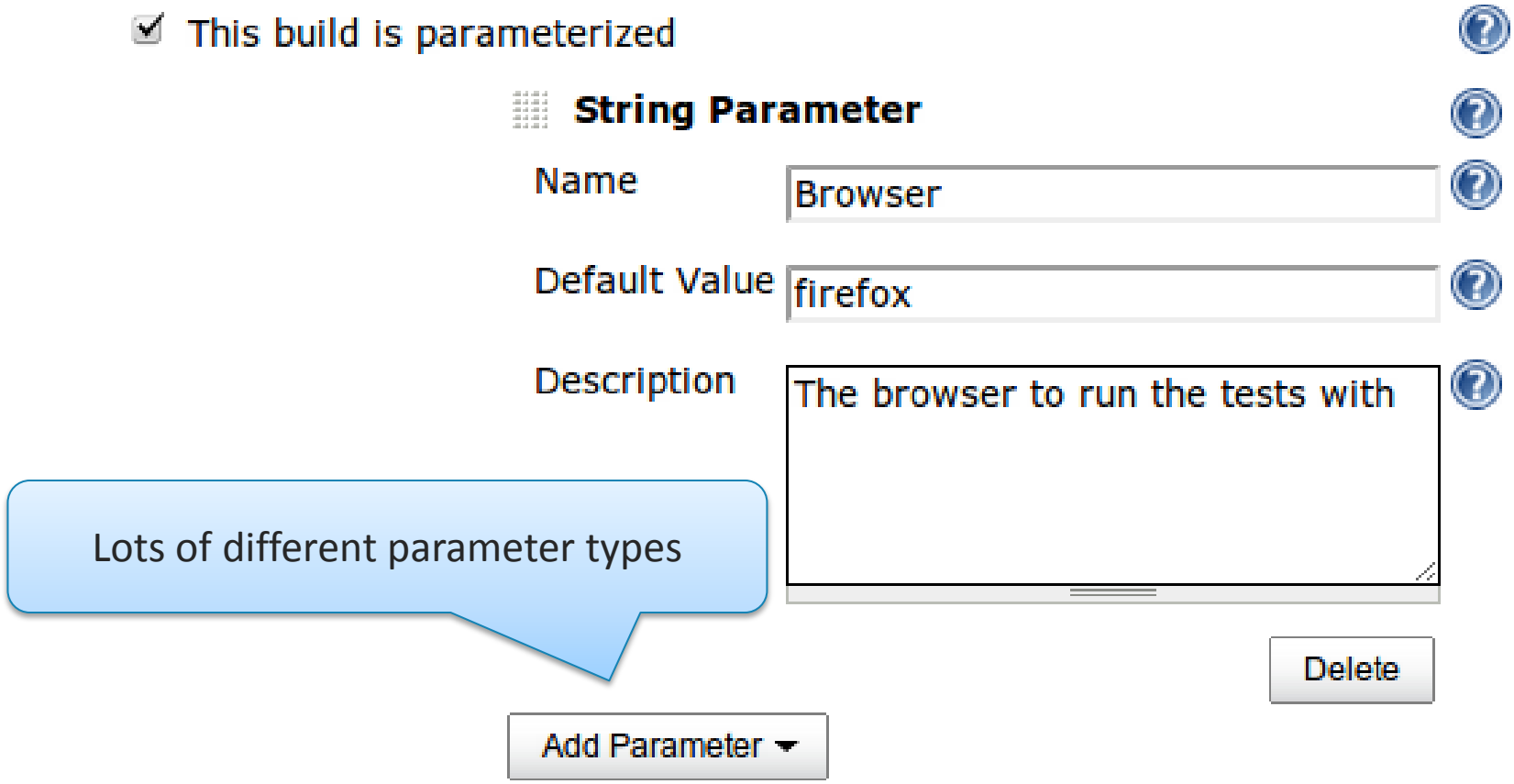
```
void buildAcmeLibrary() { … }
```

- Ability to pass parameters make it more useful

```
void buildAcmeLibrary(targetPlatform) { … }
```

Three Things You Need To Do

- #1: Define Parameters



Three Things You Need To Do

- #2: Refer to parameter values
  - As variable expansions: ${Browser}
  - As environment variables from your builds
  - Some parameter types expose data in different ways
    - File parameter

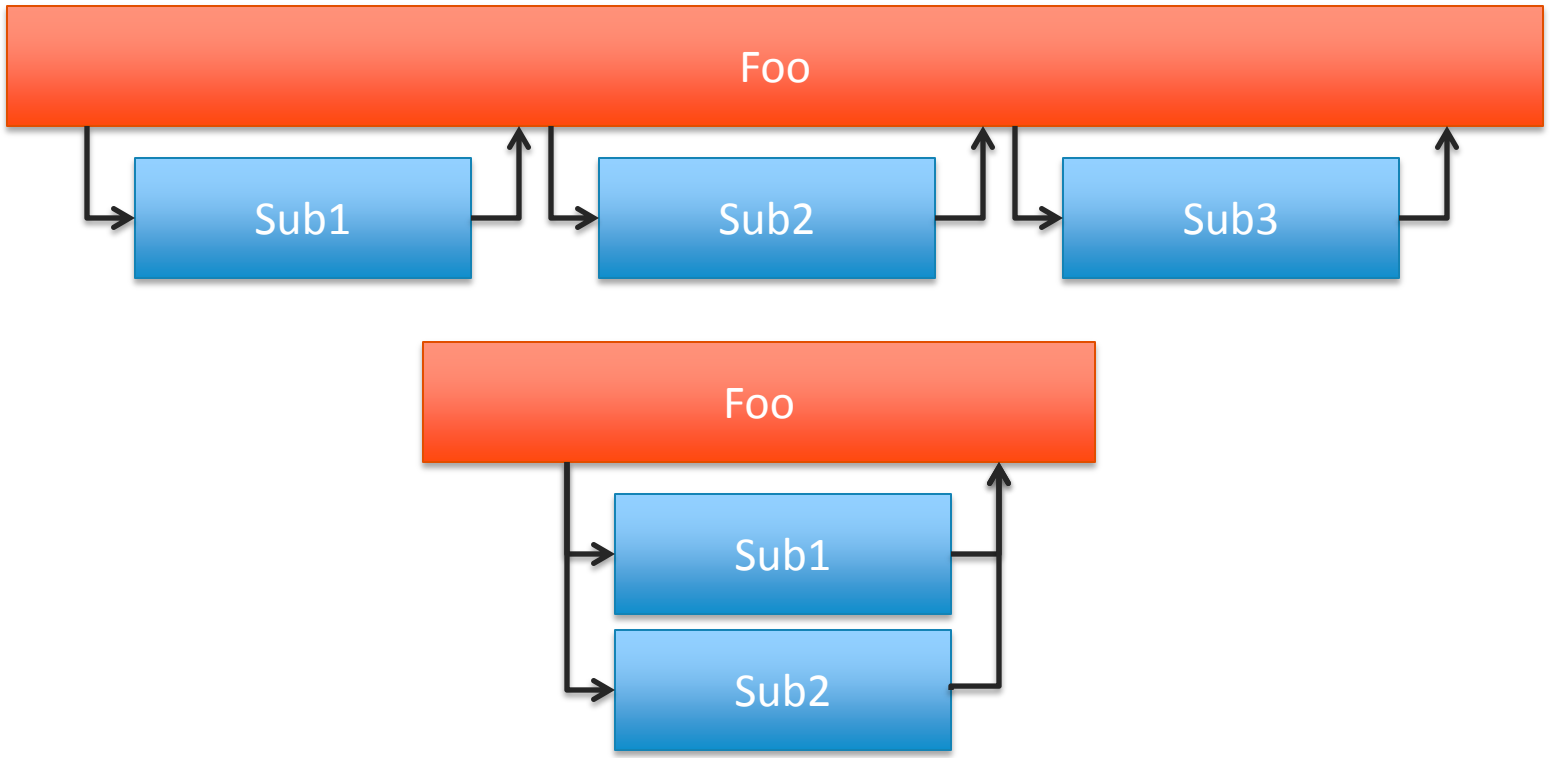
Three Things You Need To Do

- #3: Specify actual values when you run

Parameterized Trigger Plugin

https://wiki.jenkins-ci.org/display/JENKINS/Parameterized+Trigger+Plugin

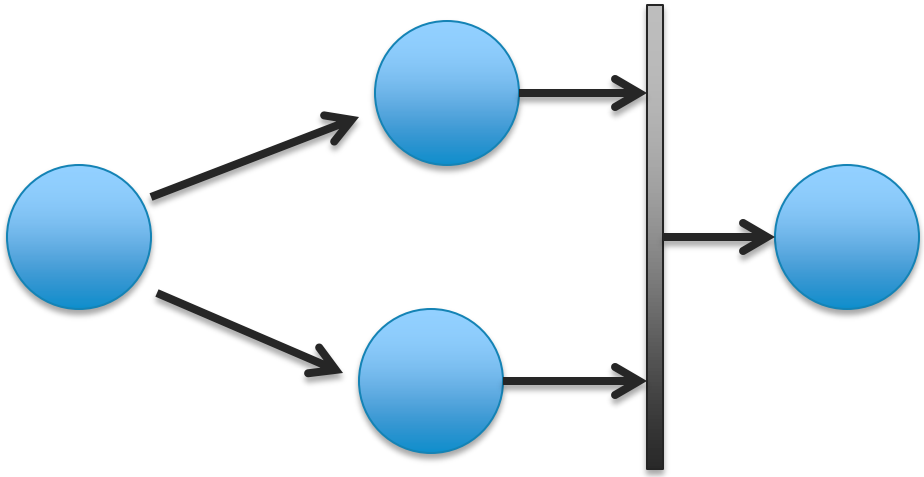
- Call other jobs (with parameters)
  - Wait for their completions (optional)



Other Simple Choreography Tools

https://wiki.jenkins-ci.org/display/JENKINS/Join+Plugin

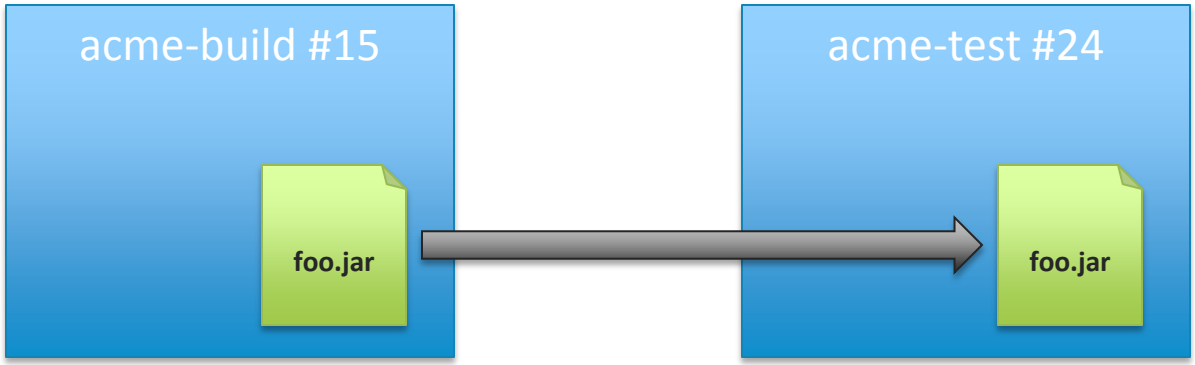
- Join Plugin



When Jobs Start Working Together…

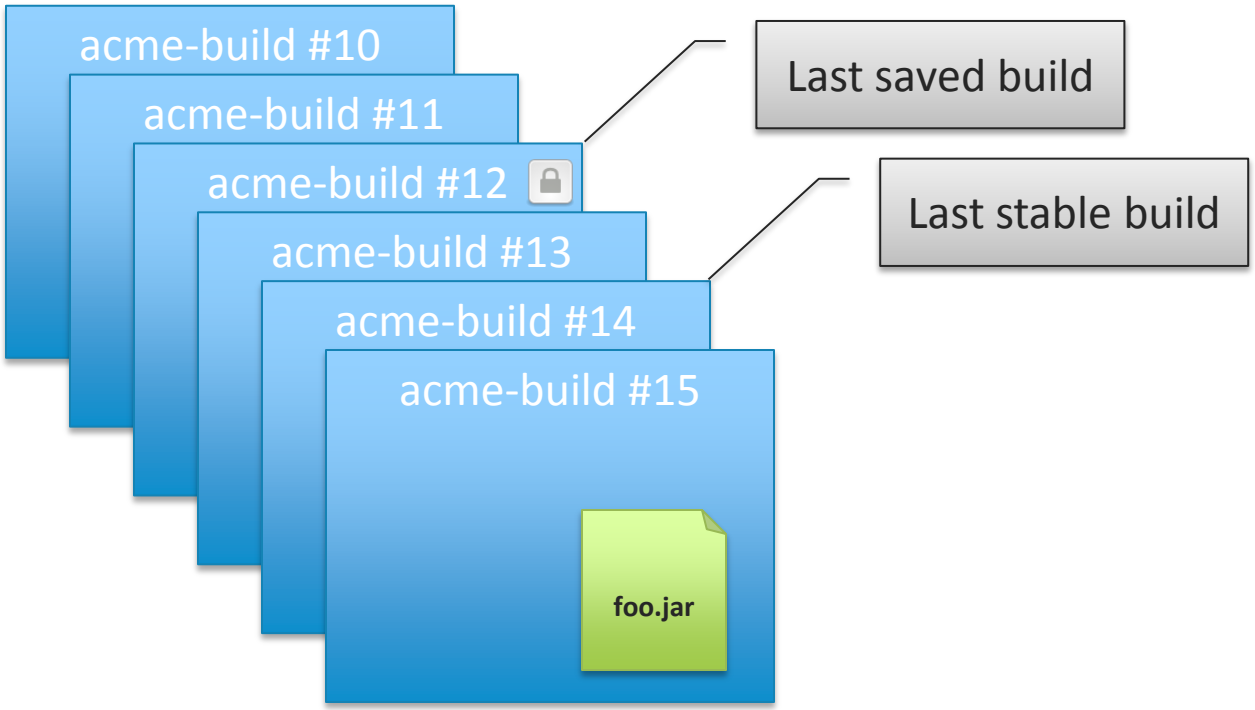
https://wiki.jenkins-ci.org/display/JENKINS/Copy+Artifact+Plugin

- Copy Artifact Plugin
  - Copy artifacts into a workspace
  - By using various criteria



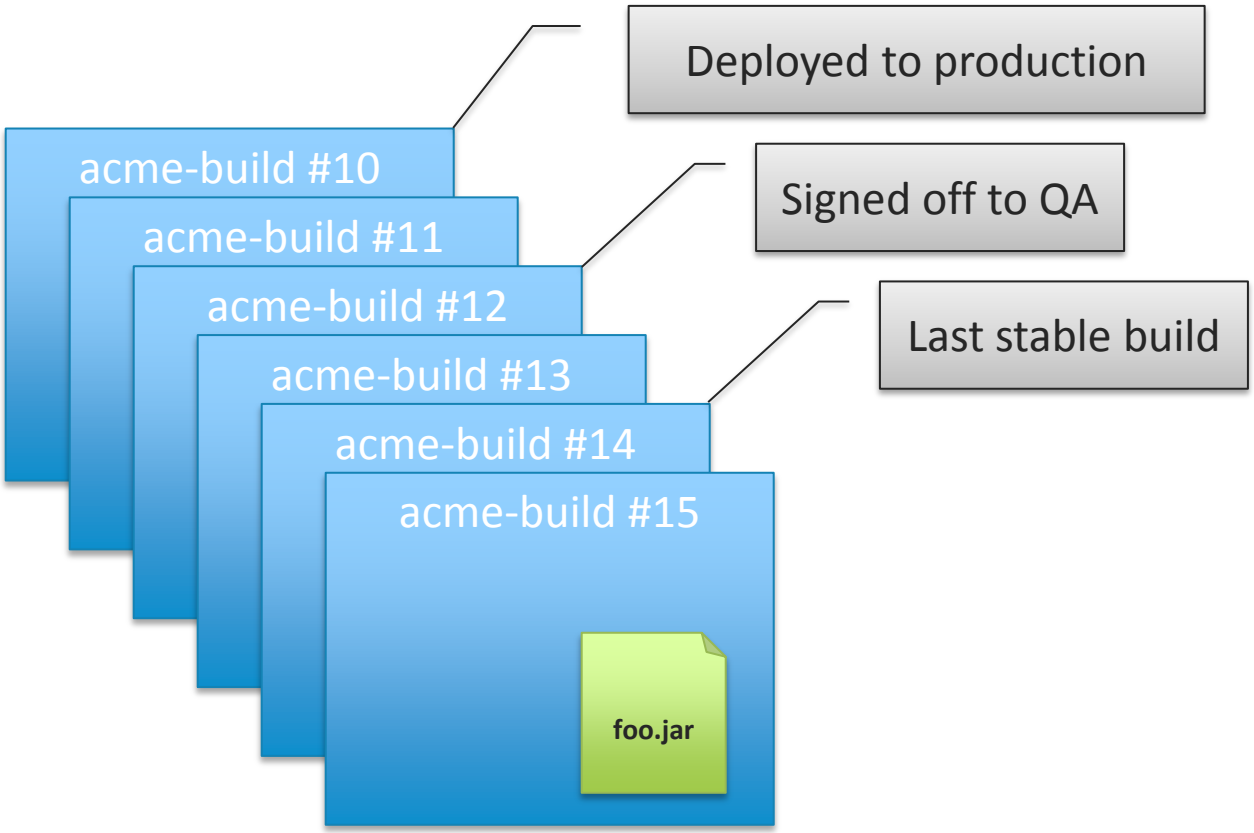
Copy Artifact vs External Repository

- Almost as if artifacts are versioned



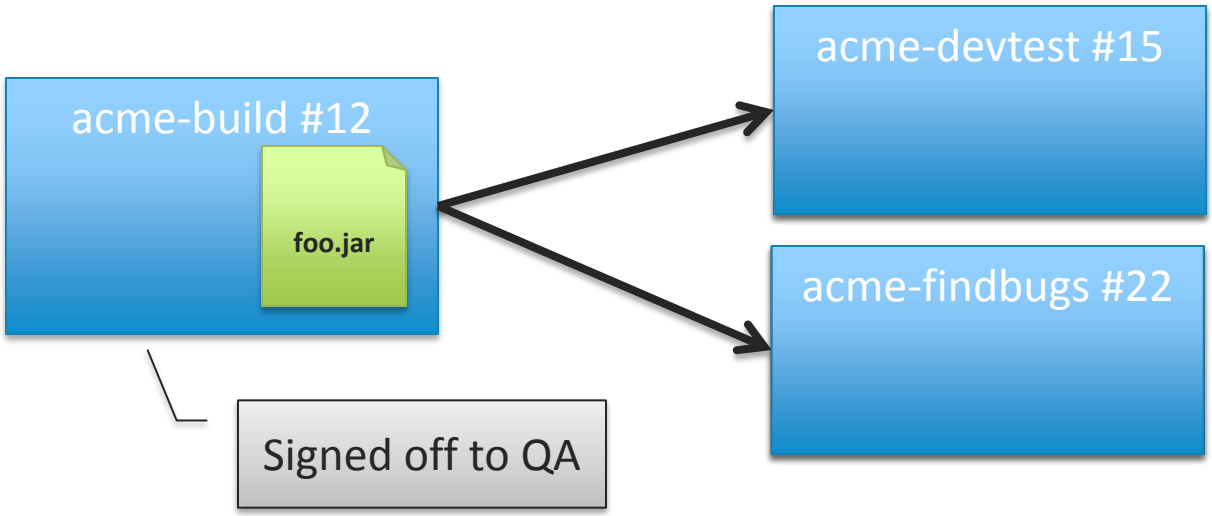
Labeling Builds Is Useful

- Especially when labels have semantics



Labeling Builds Is Useful

- More so when you automate them
- Take “Signed off to QA” label for example



Introducing Promoted Builds Plugin

https://wiki.jenkins-ci.org/display/JENKINS/Promoted+Builds+Plugin

- Promotion = act of giving a build a label
- You specify:
  - Promotion criteria
  - what happens after promotion

- Label is a nice hand-off between teams
  - It's like sausage making process

Demo

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Maven Repository Plugin

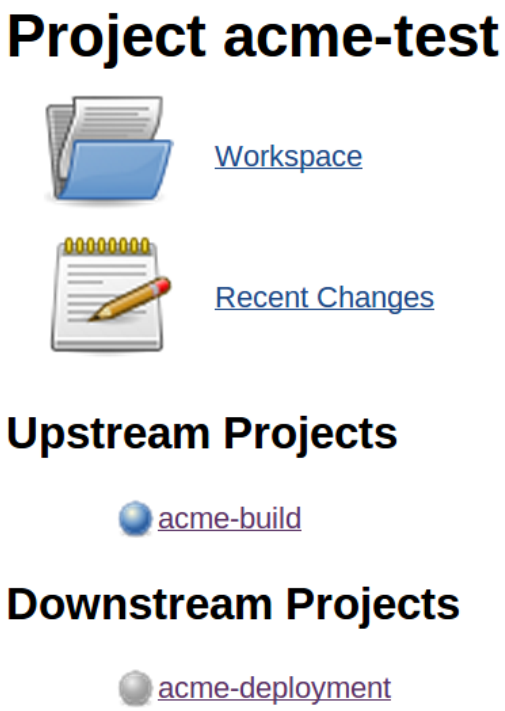
https://wiki.jenkins-ci.org/display/JENKINS/Jenkins+Maven+Repository+Server

- Virtual Maven repository
  - Expose artifacts from specific build
  - And its upstream builds

Challenge: visualization

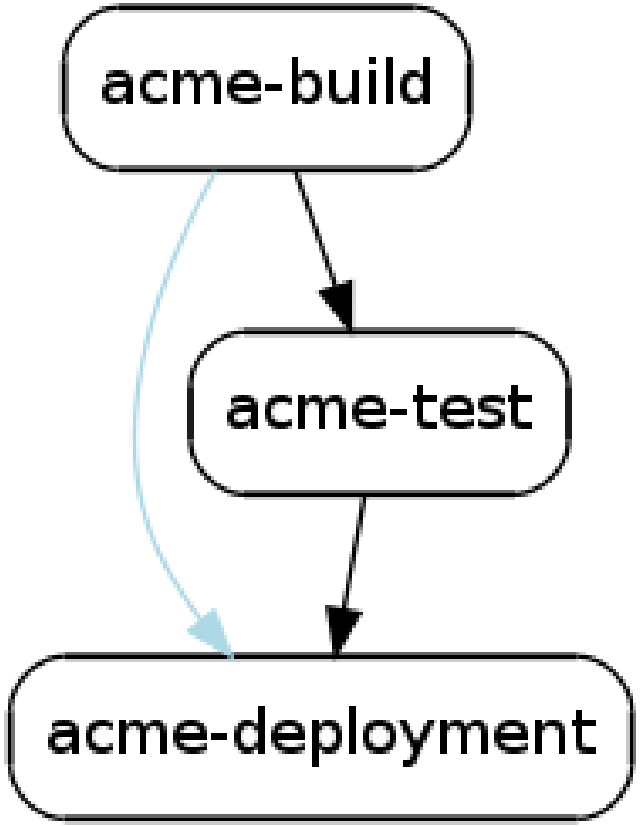
Challenge: Visualization

- Edge traversal breaks down on large workflow



Dependency Graph

https://wiki.jenkins-ci.org/display/JENKINS/Dependency+Graph+View+Plugin



Build Pipeline Plugin

https://wiki.jenkins-ci.org/display/JENKINS/Build+Pipeline+Plugin

- It shows how far each change has gone

Demo

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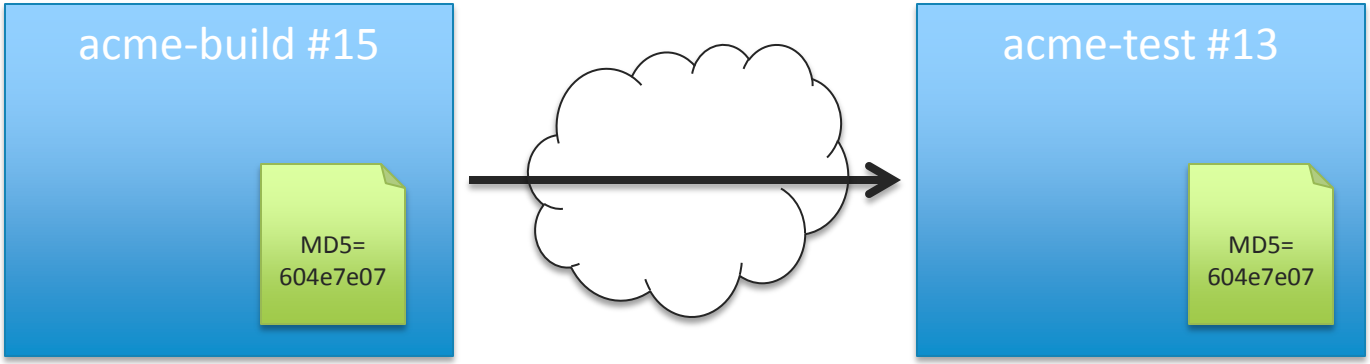
Fingerprint

- Yet another angle to look at data
- Think of it as a lifelog for a blob

Air travel	Jenkins
Airline check-in/TSA/immigration	Jobs and workflow
My going through immigration	Build #13
My travel experience	Fingerprint view

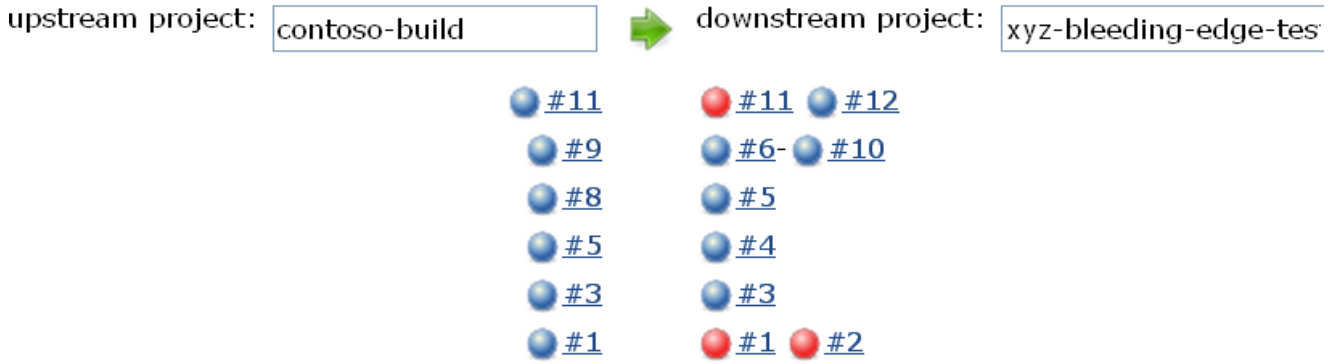
Fingerprint: Mechanism

- MD5 checksum of a file
  - Recorded against builds that it appeared
  - (And actions that were taken)



Fingerprint: Why?

- Track down where it came from
  - My component integrates to product XYZ, and a bug was reported against XYZ 3.0.5. Which build of the component did it contain?
- Cross-correlate jobs that aren't directly related



Next Step in Workflow

✓ Aggregation of results

? Aggregation of definitions

Build Flow Plugin

https://wiki.jenkins-ci.org/display/JENKINS/Build+Flow+Plugin

- Groovy DSL for kicking builds
  - High-level primitives
  - Ability to define abstractions

```
b = build("acme-build")
guard {
        parallel (
                { build("acme-test1", param1:b.number) },
                { build("acme-test2", param1:b.number) }
        )
} rescue {
        build("acme-teardown")
}
```

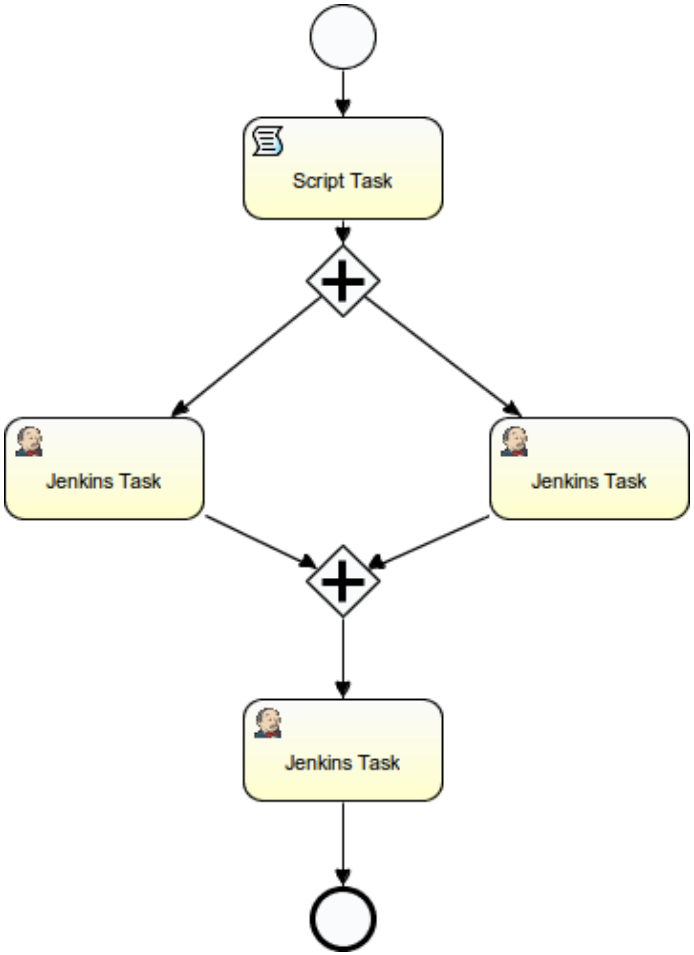
Demo

CloudBees

Jenkow Plugin

https://wiki.jenkins-ci.org/display/JENKINS/Jenkow+Plugin

- Embed BPMN workflow engine in Jenkins
  - Timeout, fork, join, …
- Workflow is version controlled in Git
  - Push to Jenkins to load them up



Demo

CloudBees

Next Step in Workflow

✓ Choreography defined in one place

? Everything defined in one place

Job DSL Plugin

https://wiki.jenkins-ci.org/display/JENKINS/Job+DSL+Plugin

- Groovy DSL for defining jobs

```
def project = "jenkinsci/jenkins"
def branchApi = new URL("https://api.github.com/repos/${project}/branches")
def branches = new JsonSlurper().parse(branchApi.newReader())
branches.each { b ->
    job {
        name "${project}-${b.name}".replaceAll('/','-')
        scm {
            git("git://github.com/${project}.git", b.name)
        }
        steps {
            maven("install")
        }
    }
}
```

Or More Likely…

- Take Existing Job, Make Adjustments

```
def project = "jenkinsci/jenkins"
def branchApi = new URL("https://api.github.com/repos/${project}/branches")
def branches = new JsonSlurper().parse(branchApi.newReader())
branches.each { b ->
    job {
        using "jenkins-build"
        name "${project}-${b.name}".replaceAll('/','-')
        scm {
            git("git://github.com/${project}.git", b.name)
        }
    }
}
```

Job DSL Plugin

- You can go down to XML definitions
- The program itself executes as Jenkins job
  - Control over when it executes
  - Store definitions in VCS

Or just a bit of Perl/Python/Ruby scripts

- Programmatically CRUD jobs

```
$ ssh jenkins get-job foo   \
| sed -e 's/old.gitserver.com/new.gitserver.com/g’   \
| ssh jenkins update-job foo
```

Templates (in Jenkins Enterprise by CloudBees)

http://www.cloudbees.com/jenkins-enterprise-by-cloudbees-overview.cb

- Share some traits with Job DSL
  - Define job once, generate many variations
  - Update definition, and reflect it everywhere
- But different
  - Templates are defined in GUI, not in a program
  - Individual variations are manually updated by users

Conclusion

- Lots of useful building blocks for automating even more
  - That means many people are doing this
- Take your automation to the next level

Multi-Configuration Project

- You often do the same thing with slight variations
  - Compile C++ code for different platforms
  - Test with different browsers
  - Or more generally, think of it as

```
for (x in [a,b,c]) {
  for (y in [d,e,f]) {
    doSomethingWith(x,y,...);
  }
}
```

Model

- Define axes
  - One axis ≈ one for loop
- Choose from pre-defined types of Axis
  - Generic axis: arbitrary values exposed as environment variables
  - Slave axis: pick slaves by their names or their labels
    - e.g., linux, solaris, and windows
  - JDK axis

Multi-Configuration Project Gimmicks

- Filtering
  - Otherwise combinations increase exponentially
  - Not all combinations make sense
  - Use boolean expression to trim down the size

```
(label==“windows”).implies(browser==“iexplore”) &&
(label==“mac”).implies(browser==“safari”)
```

  - Or tell Jenkins to cut the workload to N%
    - Jenkins will thin out the combinations by itself

Demo

CloudBees