Workflow in Jenkins

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#jenkinsconf

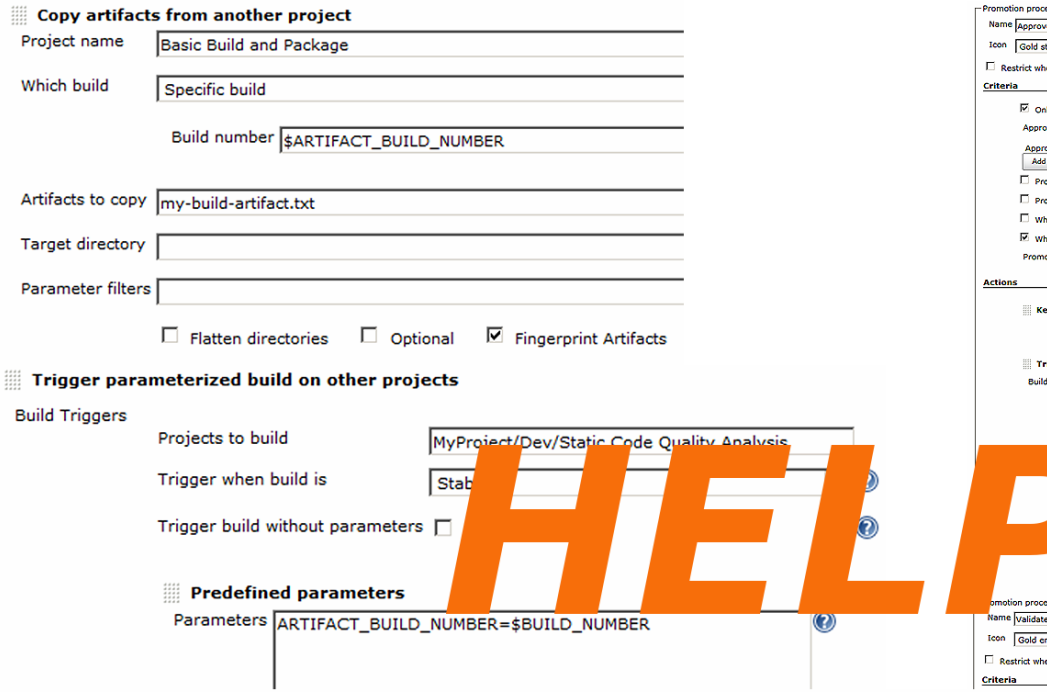
What people are trying to do

- continuous deployment in stages
- run part of build with a temporary server
- blue/green deployment with auto commit/abort
- parallel tests with automatic sharding
- retrying validated merges
- “matrix” builds with per-combination history
- automatic per-branch jobs (à la Literate plugin)
- submit tasks to batch job system
- crazy stuff mentioned in Scalability Summit

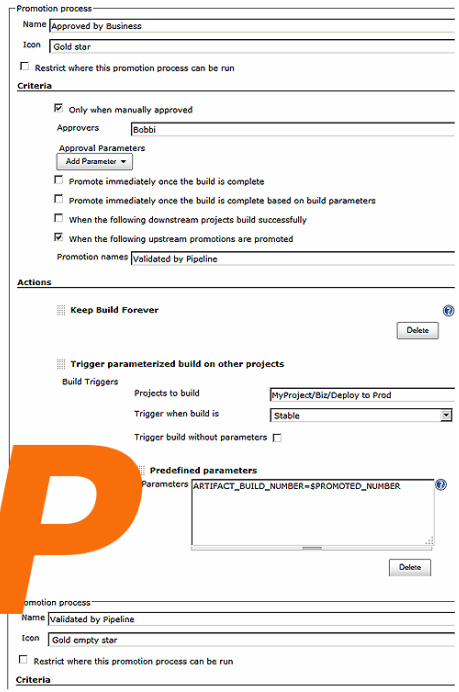
Orchestration: what we need

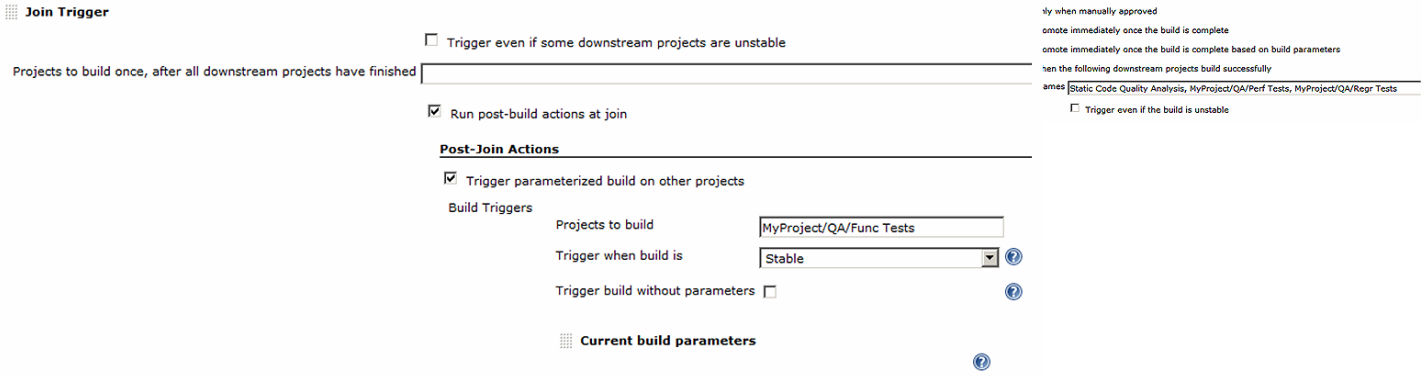
- **complex pipelines** involving multiple stages
- **non-sequential logic** such as loops and forks
- **long-running builds** must survive outages
- **interaction with humans** including pauses, input
- **restartable builds** in case of a transient error
- **reusable definitions** to avoid duplication
- **comprehensible scripts** with one clear definition

Job chaining: what we had (1/2)



HELP





Build Flow plugin: what we had (2/2)


```
b = build("upstream")
build("downstream", /*parameter*/ which: b.build.number)
```

- did have scriptability and extensibility
- did not address configuration sprawl
  - “meat” of builds still had to be in regular jobs
- disjointed view of what really ran
- no ability to survive restarts
- almost good enough but could not go further

Workflow: the one-pager


```
with.node('linux') {
    git(url: 'git://server/myapp.git')
    sh('mvn clean package')
    archive('target/myapp.war')
    stage('Test')
    parallel({
        sh('mvn -Psometests test')
    }, {
        sh('mvn -Pothertests test')
    })
    input('OK to deploy?')
    stage(value: 'Deploy', concurrency: 1)
    sh('mvn deploy')
}
```

Key features

- entire flow is one concise Groovy script
  - for-loops, try-finally, fork-join, &c.
- can restart Jenkins while flow is running
- allocate slave nodes and workspaces
  - as many as you like, when you like
- *stages* throttle concurrency of builds
- human input/approval integrated into flow
- standard project concepts: SCM, artifacts, …

Project setup

- one workflow is defined as a job
- single script for all steps
- build triggers & parameters like regular projects
- SCM, publishing, &c. all part of script
- Each build shown using regular Jenkins view
- Graphical visualizations of actual build possible
  - (not of job definition; could be too dynamic)

Resumption of Groovy flows

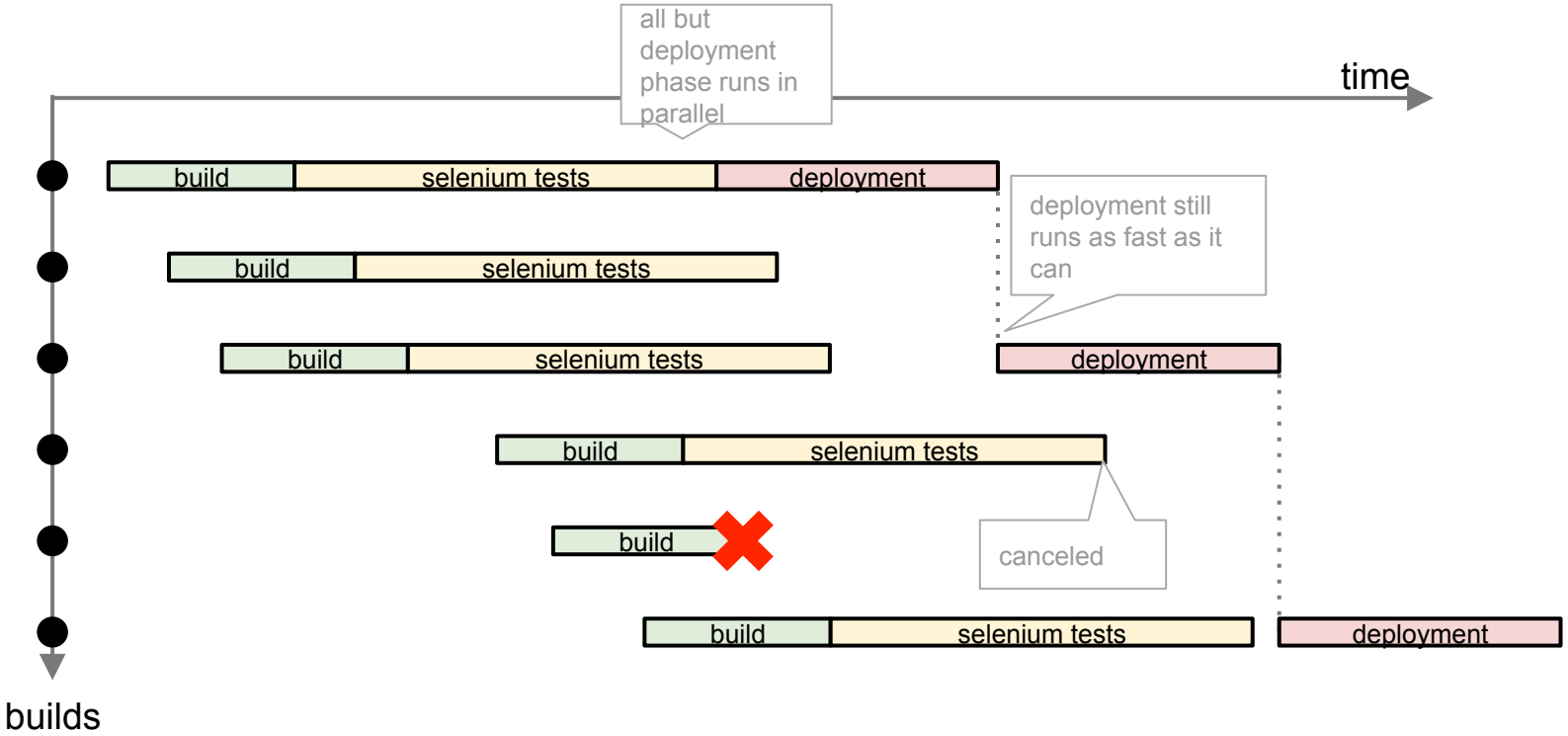
- transformed to continuation-passing style
- custom interpreter of Groovy
- state of program saved at each point
- variables serialized and restored after restart
- *pickles:* extensible object replacements
  - slaves reallocated, workspaces relocked

Resumed builds to the user

- it “just works”
- loops, methods, closures, &c.
- (serializable) local variables restored too
- shell-like steps survive restart
  - reconnection of slave, too
- Jenkins Enterprise: resume from checkpoint
  - can pick up artifacts from original build
  - no need to rerun earlier expensive steps

Stages

- special semaphore: only newest build may wait
- kudos to James Nord for the idea (in Build Flow)



Demo

simple CD pipeline

Design: overall

- suite of Jenkins plugins
  - Jenkins Enterprise may add checkpoints, &c.
- pluggable flow definition & execution engine
  - Groovy CPS is recommended choice
  - STM (proof of concept)
  - Activiti or other BPMN should be possible

Design: flows

- persistent record of execution
- directed acyclic graph of *nodes*
- some nodes represent one *step*
- others indicate block start/stop structure
- nodes may have associated metadata
  - console log fragment contributes to main log
- pluggable visualizations for different views

Design: steps

- standalone API for asynchronous build steps
- *context* serves as an identifier & callback
  - also offers logger, build, workspace, &c.
- support for block-structured steps
  - invoke body 0+ times with revised context
- standard step for “durable” shell/batch scripts
- standard steps for SCMs (git, svn, hg)
  - >1 SCM per build possible

Design: interoperability

- run on existing Jenkins slaves
  - no elastic cloud support (yet?)
- SCM plugins supported with modest changes
  - changelog, polling, commit trigger
- coming soon: existing build steps & publishers
- coming soon: trigger existing jobs
- standard build history, artifacts
- needs ongoing core changes (currently 1.568+)
  - features factored out of standard projects

Still to come

- more build steps
- workspace management
- Cancel button
- robustness, polished UI
- Groovy sandbox
- load libraries, or script from SCM
- open for contributions!

Status

- github.com/jenkinsci/workflow-plugin
- 0.1-beta-1 binaries on experimental UC
- requires Jenkins 1.568+ today
- fundamentals all work now
- aiming for 1.0 this year
- considered strategic by CloudBees

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