A 30 Minute Project Makeover Using Continuous Integration

by

J L Gray
Gordon McGregor
Verilab, Inc.
Agenda

• Motivation
• Selecting a CI Server
• Setup
• Our Problem, Our Solution
Agenda

- Motivation
- Selecting a CI Server
- Setup
- Our Problem, Our Solution
Scenarios

• You make a check-in, but…
  - Did you commit everything?
  - Did something break when you merged code?
  - Did someone else break the build first?

• You check out a clean build that doesn’t work…
  - Is it broken for anyone else?
  - Which check-in broke the build?
What if...

- You knew the pass/fail status of every check-in?
- You knew how stable a particular build target has been over time?
- You were notified instantly when someone checked in code that broke the build?
Solution: Continuous Integration

- Run regressions each time a check-in is made
- Report exact details of regression failures
- Identify who caused the problem in the first place
Basic Requirement 1

• HEAD of build should always work
• If HEAD isn’t working, the primary goal should be to make it work

• How does that make you feel?
Basic Requirement 2

- Simulation run script must return non-zero exit status upon failure.
Basic Requirement 3

• There is no basic requirement 3... that’s it!
Objections to CI

- Takes a lot of licenses
- Too much time to debug failures
- Takes too long to run
- Too hard to set up
- Now I can’t check in my unfinished/broken code…
- Requires IT/Management approval
Objections Addressed

Objection

• Takes a lot of licenses
• Too much time to debug failures
• Takes too long to run
• Too hard to set up
• Now I can’t check in my unfinished/broken code…
• Requires IT/Management approval

Resolution

• Limit license use
• Easier to debug incremental failures
• Limit to 10-15 minutes
• You didn’t read our paper, did you?
• Use a branch
• Not if you use Jenkins!
Agenda

• Motivation
• Selecting a CI Server
• Making the Case
• Setup
• Conclusion
CI with Jenkins

www.jenkins-ci.org

“That was easy!”

Jenkins

= easy
Agenda

- Motivation
- Selecting a CI Server
- Setup
- Our Problem, Our Solution
Hello, Jenkins...

**Build Queue**
No builds in the queue.

**Build Executor Status**

<table>
<thead>
<tr>
<th>#</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Idle</td>
</tr>
<tr>
<td>2</td>
<td>Idle</td>
</tr>
</tbody>
</table>

Legend: RSS for all, RSS for failures, RSS for just latest builds
Create a New Project

- **Build a free-style software project**
  This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build system, and this can be even used for something other than software build.

- **Build a maven2/3 project**
  Build a maven2 project. Jenkins takes advantage of your POM files and drastically reduces the configuration.

- **Build multi-configuration project**
  Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.

- **Monitor an external job**
  This type of job allows you to record the execution of a process run outside Jenkins, even on a remote machine. This is designed so that you can use Jenkins as a dashboard of your existing automation system. See the documentation for more details.

- **Copy existing Job**
  Copy from

---

Gray/McGregor, Verilab, Inc. 16 of N
Freestyle Build

Jenkins » DVCon 2012

Job name: UVM_Rampup

Build a free-style software project
This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build system, and this can be even used for something other than software build.

Build a maven2/3 project
Build a maven2 project. Jenkins takes advantage of your POM files and drastically reduces the configuration.

Build multi-configuration project
Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.

Monitor an external job
This type of job allows you to record the execution of a process run outside Jenkins, even on a remote machine. This is designed so that you can use Jenkins as a dashboard of your existing automation system. See the documentation for more details.

Copy existing Job
Copy from:

OK
SCM Configuration

Advanced Project Options

Source Code Management

- CVS
- Git

- Repositories
- Repository URL: /sysadm/git/i2c_uvm_proj.git

- Branches to build
- BranchSpecifier (blank for default):

- Repository browser: (Auto)

- None
- Subversion

Build Triggers
- Build after other projects are built
- Trigger builds remotely (e.g., from scripts)

Save
Polling and Build Execution

Do you really mean "every minute" when you say "* * * * *"? Perhaps you meant "0 * * * *

Execute shell

Command:
```
cd i2c_master_slave_core_proj/tb;
./runsim;
```

See [the list of available environment variables](#)
JUnit Configuration

Post-build Actions

- Aggregate downstream test results
- Archive the artifacts
- Build other projects
- Publish JUnit test result report

Test report XMLs

```
i2c_master_slave_core_proj/tb/results/*.xml
```

Filesset 'includes' setting that specifies the generated raw XML report files, such as 'myproject/target/test-reports/*.xml'. Basedir of the filesset is the workspace root.

- Retain long standard output/error

Add build step

Save
Understanding Build Results

Project UVM Rampup

Test Result Trend

- Latest Test Result (2 failures / ≠0)

Permalinks
- Last build (#15), 21 hr ago
- Last stable build (#11), 2 days 11 hr ago
- Last successful build (#15), 21 hr ago
- Last failed build (#8), 2 days 12 hr ago
- Last unstable build (#15), 21 hr ago
- Last unsuccessful build (#15), 21 hr ago
Test Failures

Test Result

2 failures (±0)

All Failed Tests

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Duration</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;&gt;&gt; regression.program_and_read_test</td>
<td>7 sec</td>
<td>1</td>
</tr>
<tr>
<td>&gt;&gt;&gt; regression.program_and_write_test</td>
<td>50 sec</td>
<td>1</td>
</tr>
</tbody>
</table>

All Tests

<table>
<thead>
<tr>
<th>Package</th>
<th>Duration</th>
<th>Fail</th>
<th>(diff)</th>
<th>Skip</th>
<th>(diff)</th>
<th>Total</th>
<th>(diff)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(root)</td>
<td>4 min 19 sec</td>
<td>2</td>
<td></td>
<td>0</td>
<td></td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
Test Error Message

Failed

regression.program_and_read_test

Error Message

54525: uvm_test_top.tenv.sv [uvm_test_top.tenv.sv] Read Table has 1 items un-matched

Standard Output

irun: 10.20-s070: (c) Copyright 1995-2011 Cadence Design Systems, Inc.
TOOL: irun 10.20-s070: Started on Feb 24, 2012 at 20:04:24 UTC
irun
-R
-nclibdirname ./output
-uvmhome /our/.-ark-deploy/cadence-ius--10.20.23/tools/uvm-1.1
-access +c
-linedebug
-lincdir ../sv
+UVM_TESTNAME=program_and_read_test
-uselic IES:default
-timescale 1ns/100ps
-l program and read_test.log
irun: *W,BADPRF: The -linedebug option may have an adverse performance impact.

Running simulation with license features associated with mnemonic 'IES'...
Incisive_Enterprise_Simulator 10.2, 1 copy - Successful
VERILOG-XL 10.2, 1 copy - Successful
Loading snapshot worklib.top:sv .............. Done
Bug Found by SCM Change

Build #6 (Feb 23, 2012 3:57:07 AM)

Changes

1. adding some more detail to the top_env. (detail)

Started by an SCM change

Revision: dc49f0352390985a39d5cb8791df4e4460776a1c

- origin/HEAD
- origin/master
I pity the fool…
Agenda

• Motivation
• Selecting a CI Server
• Setup
• Our Problem, Our Solution
Our Problem

- Significant time wasted debugging bad check-ins
- Completion of key milestones delayed
- No project management support to force quality

- Solution couldn’t require management or IT support
Experimental Solution

• Use Jenkins
• Required Java and... that’s it!
• Built-in web server

• Basic integration with Perforce and our scripting environment for problematic regression target took ~30-45 minutes
Experimental Results

- Able to contact offending committers when problems arose without them having to know about CI
- Gradually started sharing results of CI reports with rest of engineering team and management
- Benefits quickly became evident to rest of team and management
- Additional targets added
Questions?

• Verilab website (www.verilab.com)

• J L Gray
  - jl.gray@verilab.com
  - www.coolverification.com
  - Twitter: jlgray

• Gordon McGregor
  - gordon.mcgregor@verilab.com
  - Twitter: GordonMcGregor