

#### February 28 – March 1, 2012

#### A 30 Minute Project Makeover Using Continuous Integration

by JL Gray Gordon McGregor Verilab, Inc.

verlab



# 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



# Agenda

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



#### Hello, Jenkins...

000			DVCon 2012 [Jenkins]			
Jenkins				🔍 search	(?	) jlgray   log ou
Jenkins » DVCon 2012						ENABLE AUTO REFRE
New Job						Zadd description
Reople	All <b>DVCon 20</b>	12 +				
Build History	s w	Name ↓	Last Success	Last Failure	Last Duration	
Edit View	NO 🌾	UVM Rampup	20 hr ( <u>#15</u> )	2 days 11 hr ( <u>#8</u> )	26 sec	$\mathbf{\Sigma}$
O Delete View	Icon: <u>S M</u> L		Legen	d 🔊 RSS for all 🔊 RSS fo	or failures 🔝 RSS for	just latest builds
Manage Jenkins My Views						
Build Queue						
No builds in the queue.						
Build Executor Status	3					
# Status						
1 Idle 2 Idle						

Help us localize this page

Page generated: Feb 25, 2012 4:52:37 PM Jenkins ver. 1.451



#### **Create a New Project**

000	New Job [Jenkins]
Jenkins	🔍 search 🕐 jlgray   log out
Jenkins » DVCon 2012	
쓸 <u>New Job</u>	Job name
Reople           Build History	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.
S <u>Edit View</u> Delete View	Build a maven2/3 project Build a maven2 project. Jenkins takes advantage of your POM files and drastically reduces the configuration.
Manage Jenkins	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.
Build Queue No builds in the queue.	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.
Build Executor Status	
#     Status       1     Idle       2     Idle	Copy existing Job Copy from
Help us localize this page	Page generated: Feb 25, 2012 4:53:24 PM Jenkins ver. 1.451



#### **Freestyle Build**

000	New Job [Jenkins]
Jenkins	🔍 search 🕐 jlgray   log out
Jenkins » DVCon 2012	
쓸 <u>New Job</u>	Job name UVM Rampup
Reople	Build a free-style software project
Build History	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.
Edit View	Build a maven2/3 project
O Delete View	Build a maven2 project. Jenkins takes advantage of your POM files and drastically reduces the configuration.
Manage Jenkins	Build multi-configuration project
A My Views	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
Build Queue No builds in the queue.	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 <u>the documentation for</u>
Build Executor Status	more details.
# Status	Copy existing Job
1 Idle	Copy from
2 Idle	ΟΚ
Help us localize this page	Page generated: Feb 25, 2012 4:53:24 PM Jenkins ver. 1.451



#### **Configure Project**

000		UVM Rampup Config [Jenkins]	M
Jenkins		Search	🕐 jlgray   log out
Jenkins » DVCon 2012 » UVM Rampu	Þ		
Back to Dashboard	Project name	UVM Rampup	
Q Status	Description		
Changes			
Workspace			
Build Now		Preview	
O Delete Project	Discard Old Buil	ds	Ø
2 Configure	Trac website		0
Git Polling Log	This build is par	ameterized	0
Build History (trend)	Disable Build (N	o new builds will be executed until the project is re-enabled.)	
Build History         (trend)           #15         Feb 24, 2012 8:04:03 PM	Execute concurr	ent builds if necessary	0
#13 <u>Feb 23, 2012 5:37:04 AM</u>	Advanced Project	Options	
#13 Feb 23, 2012 5:34:04 AM			Advanced
#12 Feb 23, 2012 5:31:07 AM	Source Code Mana	gement	
#11 Feb 23, 2012 5:26:05 AM	⊖ cvs		
#10 Feb 23, 2012 5:24:14 AM	<ul> <li>Git</li> <li>Repositories</li> </ul>		
#9 Feb 23, 2012 5:16:22 AM	Repositories	Repository URL /sysadm/git/i2c_uvm_proj.git	
#8 Feb 23, 2012 5:14:56 AM			Advanced
#7 Feb 23, 2012 4:15:05 AM	Save		
#6 Feb 23, 2012 3:57:07 AM	Sare		



#### **SCM Configuration**

000	UVM Rampup Config [Jenkins]
#14 Feb 23, 2012 5:37:04 AM	Advanced Project Options
#13 Feb 23, 2012 5:34:04 AM	Advanced
🥥 #12 Feb 23, 2012 5:31:07 AM	Source Code Management
#11 Feb 23, 2012 5:26:05 AM	⊖ cvs
🥥 #10 Feb 23, 2012 5:24:14 AM	• Git
🥥 #9 <u>Feb 23, 2012 5:16:22 AM</u>	Repositories Repository URL /sysadm/git/i2c_uvm_proj.git
#8 Feb 23, 2012 5:14:56 AM	Advanced
#7 Feb 23, 2012 4:15:05 AM	Delete Repository
#6 Feb 23, 2012 3:57:07 AM	Add
#5 Feb 23, 2012 3:54:41 AM	
#4 Feb 23, 2012 3:32:40 AM	Branches to build Branch Specifier (blank for default): **
#3 Feb 16, 2012 4:40:28 PM	Delete Branch
#2 Feb 15, 2012 10:32:56 PM	Add
#1 Feb 15, 2012 10:30:39 PM	Advanced
RSS for all RSS for failures	Repository browser (Auto)
	None
	Subversion
	Build Triggers
	Build after other projects are built
	Trigger builds remotely (e.g., from scripts)
	Save

Gray/McGregor, Verilab, Inc.



#### **Polling and Build Execution**

UVM Rampup Config [Jenki	ns]
--------------------------	-----

Build Triggers		
	her projects are built	
	s remotely (e.g., from scripts)	
Build periodi		
Poll SCM		
Schedule	* * * *	
	Do you really mean "every minute" when you say "* * * * * ?? Perl	haps you meant "0 * * *
Build	Do you really mean "every minute" when you say "* * * * * ?? Perl	haps you meant "0 * * *
	A *"	
Execute she	A *"	haps you meant "0 * * *
Command cd :	<pre>     *"      *"      .2c_master_slave_core_proj/tb; </pre>	
Execute she	<pre>*" </pre>	



#### **JUnit Configuration**

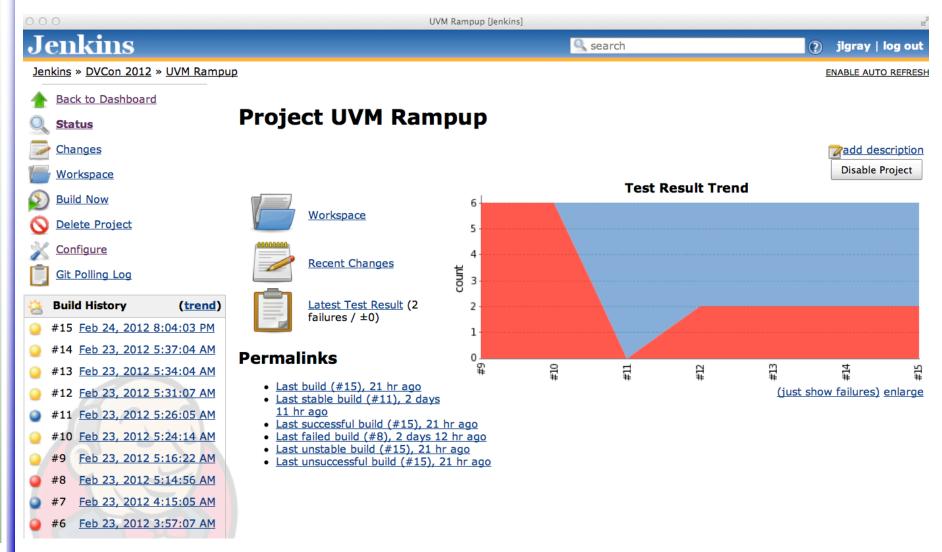
000	UVM Rampup Config [Jenkins]	R <sub>0</sub>
	./runsim;	
	See the list of available environment variables	
	Delet	te
	Add build step -	
	Post-build Actions	
	Aggregate downstream test results	
	Archive the artifacts	(2)
	Build other projects	
	Publish JUnit test result report	0
	Test report XMLs i2c_master_slave_core_proj/tb/results/*.xml	
C SN	Fileset 'includes' setting that specifies the generated raw XML report files, such as 'myproject/target/test-reports/*.> Basedir of the fileset is the workspace root.	kml'.
	Retain long standard output/error	2
	Publish Javadoc	
	Record fingerprints of files to track usage	0
	Git Publisher	
	E-mail Notification	(2)
	Save	
	Save	

Help us localize this page

Page generated: Feb 25, 2012 4:59:42 PM Jenkins ver. 1.451



#### **Understanding Build Results**





#### **Test Failures**

000	UVM Rampup #15 Test R	esults [Jenkins]						1
Jenkins		🔍 search				2	) jlgray	log out
Jenkins » DVCon 2012 » UVM Rar	npup » #15 » Test Results						ENABLE AU	TO REFRES
A Back to Project								
Q Status	Test Result							
Changes	2 failures (±0)							
Console Output							6 t <u>Took 4 m</u> i	ests (±0)
Edit Build Information								escription
History	All Falled Tasks							
Polling Log	All Failed Tests							
Git Build Data	Test Name						Duration	Age
No Tags	>>> regression.program and read test						7 se	c <u>1</u>
Test Result	>>> regression.program and write test						50 se	c <u>1</u>
	All Tests							
	Package	Duration	Fail	(diff)	Skip	(diff)	Total	(diff)
		4 min 19 sec	2			0		6

Help us localize this page

Page generated: Feb 25, 2012 5:22:31 PM Jenkins ver. 1.451

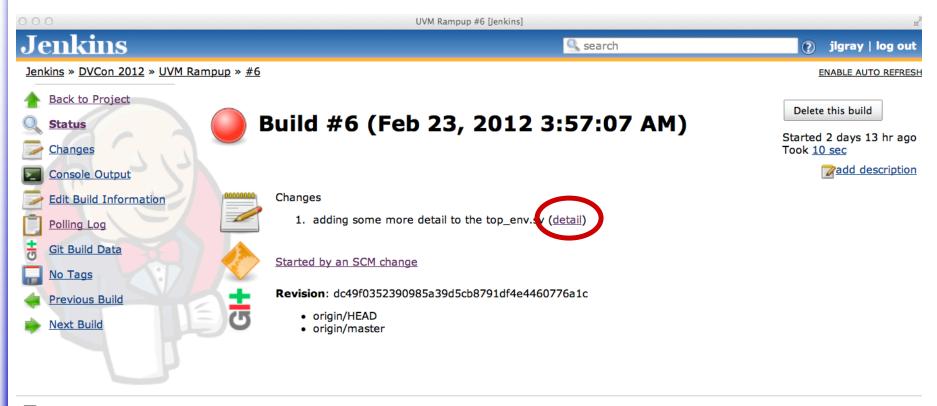


#### **Test Error Message**

000	UVM Rampup #15 test - program_and_read_test [Jenkins]	H <sub>2</sub>
Jenkins	Search	⑦ jlgray   log out
Jenkins » DVCon 2012 » UVM	Rampup » #15 » Test Results » (root) » regression » program and read test	ENABLE AUTO REFRESH
<ul> <li><u>Back to Project</u></li> <li><u>Status</u></li> <li><u>Changes</u></li> </ul>	Failed regression.program_and_read_test	
Console Output Edit Build Information History		Failing for the past 1 build (Since <u>) #15</u> ) <u>Took 7 sec.</u> Madd description
Polling Log         Git Build Data         No Tags	Error Message 54525: uvm_test_top.tenv.sb [uvm_test_top.tenv.sb] Read Table has Standard Output	1 items un-matched
Test Result Previous Build	<pre>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-ius10.20.23/tools/uvm-1.1 -access +c -linedebug -incdir/sv +UVM_TESTNAME=program_and_read_test -uselic IES:default -timescale lns/100ps -l program_and_read_test.log irun: *W,BADPRF: The -linedebug option may have an adverse performance in </pre>	mpact.
	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	

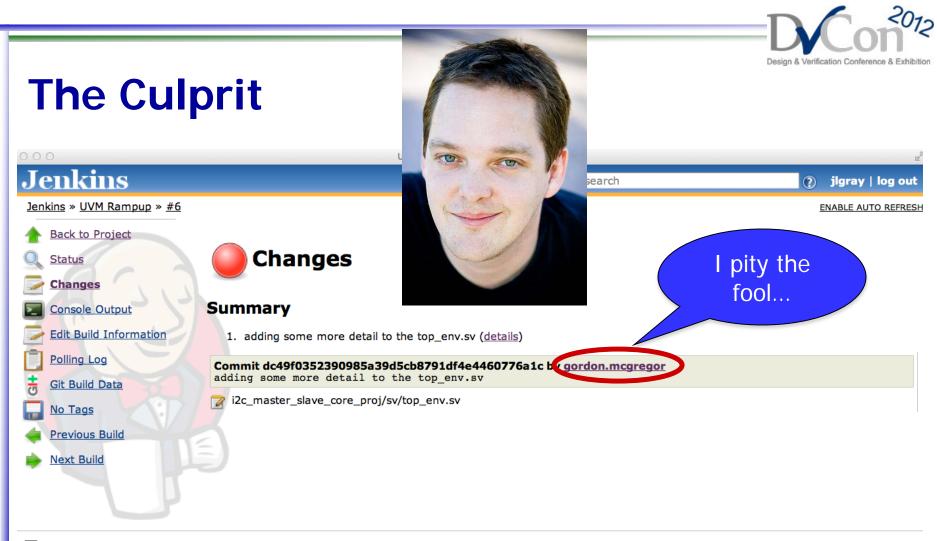


#### **Bug Found by SCM Change**



🔚 Help us localize this page

Page generated: Feb 25, 2012 5:25:57 PM Jenkins ver. 1.451



Help us localize this page

Page generated: Feb 25, 2012 5:36:51 PM Jenkins ver. 1.451



# 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 (<u>www.verilab.com</u>)
- JL Gray
  - jl.gray@verilab.com
  - www.coolverification.com
  - Twitter: jlgray
- Gordon McGregor
  - gordon.mcgregor@verilab.com
  - Twitter: GordonMcGregor