



Warp Speed Testing at an Enterprise Level

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Agenda

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What are we covering in this session?

1. About us
2. About Rogue Wave
3. The problem
4. The challenge
5. The solution
6. AWS Tips
7. Jenkins plugins
8. What's next
9. Closing thoughts



What will you take away from this session?

1. Configuring Jenkins to work with AWS
2. Setting up Jenkins jobs to use AWS resources
3. Using Docker with AWS
4. Useful Jenkins Plugins
5. Using on-demand resources
6. AWS Tips
7. Potential pitfalls & limitations



About us

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Scott Mills

Technical background

- Almost 20 years designing, developing, maintain and supporting automation systems
- Application performance testing
- Application security testing ([OWASP Top 10](#))
- Automated web testing
- Build & test automation framework development and evolution utilizing Python, Jenkins, Docker and Amazon Web Services

Scott Mills

While not automating...



Andrei Juc

Technical background

- Automation framework developer
- VM to Docker migration
- Amazon Web Services migration
- Troubleshooting enthusiast
- Innovator

Andrei Juc

While not problem solving...



About Rogue Wave Software

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Innovate with Confidence

"We help software eat the world faster"

- **Our Mission:** We simplify complex software development, improve application quality and security, and shorten cycle times.
- Founded in 1989
- Global company, headquartered in Louisville, CO.
 - 400 employees, 13 offices worldwide, 53 patents.
- Our customers:
 - Automotive Software Development
 - Military and Aerospace
 - Medical Devices and Software
 - Embedded Software
 - Mobile and Communications
 - Game Development

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Rogue Wave Customers

We ensure the most critical and complex aspects of the entire software lifecycle to support strategic business goals while minimizing risk.



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- Continuous Static Code Analysis
- **Find defects early!**
- Web-based portal for reporting and analyzing results
- Ability to be built into your Continuous Integration process
- Very popular with mission critical industries
- Allows customers to meet industry standards



APPLICATION
SECURITY



STATIC CODE
ANALYSIS



CODE
REFACTORING



DYNAMIC
ANALYSIS



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The Problem

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Testing at scale

Requirements

- Reliable, repeatable and timely test results  
- Easy to reproduce/verify test results with high level of confidence 
- Scalable 
- Highly dynamic 
- Easy to maintain 

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The Challenge

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The early beginnings

Let's get physical!

- Test Lab filled with physical machines
- Maintenance nightmare
- Every machine is slightly different
 - Hard to replicate and pin down test failure causes
- "Dirty" environment
- Long execution time (18 hours per machine per run)



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Evolution started...

Virtually first steps!

- VMWare and Jenkins
- Easier to maintain
- Pooled resources
- Template functionality helps with machine continuity



Stunted growth...

The terrible twos

- Limited scalability with VMs
 - "We're giving her all she's got!"
- "Dirty" machines
- Test all the things!!



What about this Docker thing?

Docker 101

- Containerization software
- Uses resource isolation features of Linux in order to allow isolated OS's to run on a single machine at once.
- Unlike VMs, Docker containers share the host OS kernel. (Lightweight)
- Capture, store and replicate OS state
- Images and containers and Dockerfiles! Oh, my!

What about this Docker thing?

The good! 😊

- Images to share with testers and developers
- Clean machine image for every test execution
- Reliable, repeatable results
- More scalability

What about this Docker thing?

The not so good 😞

- Scalable to a point, limited # of hosts
 - CPU thermal throttling
 - Hardware degradation
- Environment overhead (Mesos)

What about this Docker thing?

But this Docker shows a LOT of promise!

- How can we reap the benefits of the system and make it scalable?
- And remember, TEST ALL THE THINGS!!!

The Solution Future!

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Introducing AWS

Resources as far as the eye can see...

- Essentially unlimited resources
- Very scalable
- No more hardware woes
- On-demand resources
- Tools
 - So many tools...

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Amazon Elastic Compute

Turning dreams into reality!

- Amazon Machine Images
- Preconfigured services, service optimized images or a blank canvas
- Elastic Container Service optimized AMIs

Resources

You are using the following Amazon EC2 resources in the US East (N. Virginia) region:

206 Running Instances	1 Elastic IPs
0 Dedicated Hosts	142 Snapshots
234 Volumes	0 Load Balancers
22 Key Pairs	14 Security Groups
0 Placement Groups	

Learn more about the latest in AWS Compute from AWS re:invent 2017 by viewing the EC2 Videos.

Create Instance

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

[Launch Instance](#)

Note: Your instances will launch in the US East (N. Virginia) region

Amazon Elastic Container Registry (ECR)

Essential part of our infrastructure!

- Docker container registry for storage and deployment
- Used everywhere in our build and test automation
- Images updated nightly with latest build
- Allows developers and testers to use the same images used in building and testing

Amazon Elastic Container Registry (ECR)

The screenshot shows the Amazon ECR console interface. On the left, there is a navigation menu with options: Amazon ECS, Clusters, Task Definitions, Amazon ECR, and Repositories (selected). The main area is titled 'Repositories' and includes buttons for 'Create repository' and 'Delete repository'. A refresh icon and a timestamp 'Last updated on September 27, 2018 2:07:18 PM (1m ago)' are visible. Below this is a search bar 'Filter by repository name' and a table of repositories. The table has columns for 'Repository name', 'Repository URI', and 'Created at'. There are 12 rows of repository data.

Repository name	Repository URI	Created at
<input type="checkbox"/> windows2016_msys2	amazonaws.com/windows2016_msys2	2018-07-26 08:43:03 -0400
<input type="checkbox"/> windows2016_mingw	amazonaws.com/windows2016_mingw	2018-07-09 12:11:08 -0400
<input type="checkbox"/> windows2016_cygwin	amazonaws.com/windows2016_cygwin	2018-06-27 09:19:51 -0400
<input type="checkbox"/> ubuntu18gcc8	amazonaws.com/ubuntu18gcc8	2018-09-05 14:15:22 -0400
<input type="checkbox"/> ubuntu18gcc7	amazonaws.com/ubuntu18gcc7	2018-09-06 08:52:40 -0400
<input type="checkbox"/> ubuntu18gcc6	amazonaws.com/ubuntu18gcc6	2018-09-05 14:00:45 -0400
<input type="checkbox"/> ubuntu18gcc5	amazonaws.com/ubuntu18gcc5	2018-09-05 13:36:43 -0400
<input type="checkbox"/> ubuntu18gcc4	amazonaws.com/ubuntu18gcc4	2018-09-05 14:43:00 -0400
<input type="checkbox"/> ubuntu18clang3.9	amazonaws.com/ubuntu18clang3.9	2018-09-07 08:38:42 -0400
<input type="checkbox"/> ubuntu18	amazonaws.com/ubuntu18	2018-06-06 15:44:46 -0400
<input type="checkbox"/> ubuntu17	amazonaws.com/ubuntu17	2017-11-27 09:41:33 -0500

Amazon Elastic Container Registry (ECR)

The screenshot shows a detailed view of image tags within an ECR repository. At the top, there is a search bar 'Filter in this page'. Below it is a table with columns for 'Image tags', 'Size (MiB)', and 'Pushed at'. Each row includes a checkbox, the tag name, a 'view all' link, the size in MiB, and the push timestamp. There are 15 rows of image tag data.

Image tags	Size (MiB)	Pushed at
<input type="checkbox"/> idea_2018_1_6	view all 7597.25	2018-09-13 17:11:53 -0400
<input type="checkbox"/> dbmigration	view all 7769.82	2018-07-26 16:28:06 -0400
<input type="checkbox"/> base	view all 6560.35	2018-09-20 14:54:55 -0400
<input type="checkbox"/> idea_2017_1_6	view all 7379.75	2018-09-13 17:00:44 -0400
<input type="checkbox"/> idea_2016_3_8	view all 7344.44	2018-09-13 16:57:21 -0400
<input type="checkbox"/>	view all 7786.56	2018-09-26 10:00:09 -0400
<input type="checkbox"/> nightly	view all 7786.60	2018-09-26 21:45:33 -0400
<input type="checkbox"/> ci	view all 7769.47	2018-08-10 12:49:20 -0400
<input type="checkbox"/> idea_2017_2_7	view all 7406.52	2018-09-13 17:04:47 -0400
<input type="checkbox"/> idea_2017_3_5	view all 7433.57	2018-09-13 17:08:05 -0400
<input type="checkbox"/> idea_2018_2_2	view all 7555.04	2018-09-13 17:16:02 -0400
<input type="checkbox"/> RC18.2.0.1113	view all 7769.79	2018-08-17 19:32:59 -0400
<input type="checkbox"/> PR-41151_IISStatementTransformer	view all 7783.32	2018-09-24 13:57:57 -0400
<input type="checkbox"/> teamcity	view all 15782.92	2018-07-27 13:22:42 -0400
<input type="checkbox"/> RC18.2.0.1112	view all 7772.83	2018-08-15 16:54:08 -0400

Amazon Elastic Container Registry (ECR)

Accessing ECR images from our Jenkins test jobs

```
echo "Logging in to docker registry..."
export AWS_ACCESS_KEY_ID=<key>
export AWS_SECRET_ACCESS_KEY=<key>
export AWS_DEFAULT_REGION=<region>
/usr/local/bin/aws ecr get-login --no-include-email --region <region>
environment="-e SUITE_NAME=$SUITE_NAME -e RELEASE=$RELEASE -e USE_COMPILER=$CC \
-e release=$RELEASE -v /sharedbuild/sharedbuild -p 8080:8080 \
--entrypoint /sharedbuild/utils/run_scripts.sh "
docker pull <ecr-url>.amazonaws.com/$image:$build_type #For example: ubuntu18:nightly
docker run -i $environment <ecr-url>.amazonaws.com/$image:$build_type
```

A large blue rectangular graphic with the text "AWS Tips" centered in white.

AWS Tips

Mind the firehose!

AWS Offers **many** services

- Start small and work your way up.
- Sometimes it's better to stay lightweight
- AWS offers a lot of tools, all great under the right application, but some more cumbersome than needed

Keep a good balance of AMIs

Don't spend more time than necessary

- Avoid homebrew AMIs as much as possible
- Use out-of-the-box solutions for parts of the framework you don't want to maintain
- Instance snapshots are an acceptable substitute for docker

Instance type selection is important

Cheaper is not always cheaper

- Use appropriate application types
- Conduct experiments to find the best size for you
- Process intensive applications benefit from higher core count

Cattle not pets

What's good for one is good for all

- Use portable initialize scripts as much as possible to keep agile
- Always think in terms of scale

Shepherd your flock

Management of your resources

- What goes up **must** come down
- Minimize idle uptime but maximize usage of AWS hourly cycle
- Mistakes can be costly

Be prepared to maintain two systems

Some tasks are just not possible...

- Some legacy hardware may remain
- AWS only offers Linux and Windows Server AMIs
- AWS OVA to AMI Service
- AWS File Syncs

Jenkins Plugins

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Jenkins Matrix Project Plugin

Makes our testing possible

- The Configuration Matrix allows users create a multiple-axis graph of the configurations to run
- In other words, "Run each of these test suites on each of these platforms with each of these modes"
- Filters can be set to prevent some configs from running

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Jenkins Matrix Project Plugin

Configuration Matrix		auto-engine	classic
defectdetection	ubuntu18gcc4		
	ubuntu18gcc5		
	ubuntu18gcc6		
	ubuntu18gcc7		
	ubuntu18gcc8		
	ubuntu18clang3.9		
	ubuntu18clang4		
	ubuntu18clang5		
	ubuntu16		
	ubuntu14		
kwadmin	ubuntu18gcc4		
	ubuntu18gcc5		
	ubuntu18gcc6		
	ubuntu18gcc7		
	ubuntu18gcc8		
	ubuntu18clang3.9		
	ubuntu18clang4		
	ubuntu18clang5		

- All tests passed
- Some tests failed
- Failure within the configuration
- Not run

Jenkins Matrix Project Plugin

Matrix Combinations Parameter Plugin

Multi-configuration project Scripts_Matrix_Windows_Cygwin_Reduced

This build requires parameters:

RELEASE

build_type

testplan

SUITE_NAME	gcc8.1.0	clang5.0.1
defectdetection	<input type="checkbox"/>	<input type="checkbox"/>
kwadmin	<input type="checkbox"/>	<input type="checkbox"/>
kwbuildproject	<input type="checkbox"/>	<input checked="" type="checkbox"/>
kwbuildprojectMD5	<input type="checkbox"/>	<input type="checkbox"/>
kwcc	<input type="checkbox"/>	<input type="checkbox"/>
kwcc.Metrics	<input type="checkbox"/>	<input type="checkbox"/>
kwcc.ParseErrors	<input type="checkbox"/>	<input type="checkbox"/>
kwcheck	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
kwcheck.converted	<input type="checkbox"/>	<input checked="" type="checkbox"/>
kwinject	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
kwlef	<input type="checkbox"/>	<input checked="" type="checkbox"/>
kwlinker	<input type="checkbox"/>	<input type="checkbox"/>
kwservice	<input type="checkbox"/>	<input type="checkbox"/>
kwwrap	<input type="checkbox"/>	<input type="checkbox"/>

Select: GCC 8.1.0 - Clang 6.0.1 - Successful - Unstable - Failed - All - None

guid

branch

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Matrix Combinations Parameter Plugin

By combination filter

Name

Combination filter

By combination filter

Name

Combination filter

By build result

Name

Only combinations run exactly

Results to check SUCCESS UNSTABLE FAILURE NOT_BUILT ABORTED

By build result

Name

Only combinations run exactly

Results to check SUCCESS UNSTABLE FAILURE NOT_BUILT ABORTED

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EC2 Plugin

Description: Test Runner

AMI ID: ami-*****

Instance Type: C4Large

EBS Optimized:

Monitoring:

Availability Zone: us-east-1d

Use Spot Instance

Security group names: default

Remote FS root: /space/jenkins

Remote user: ec2-user

AMI Type: unix

Root command prefix:

Slave command prefix:

Remote ssh port: 22

Labels: ECS-C4XL-TestRunner

Usage: Use this node as much as possible

Idle termination time: -\$

Init script: #/bin/bash

```
# Make Workspace
echo "Making jenkins workspace..."
```

Provision via Build Cloud

Provision via Scripts Cloud

- Test Runner (ami-*****)
- Test Image Builder (ami-*****)
- Job Runner (ami-*****)
- OSS Builder (ami-51h*****)**
- Windows Server 1709 (ami-*****)
- Base Windows 2016 (ami-*****)
- Test Runner Extra Storage (ami-*****)
- Test Runner Preinstall Linux (ami-*****)
- Build Windows 2008 (ami-*****)

EC2 Plugin

Summary: 299

Status: 169 of 182 executors

What's Next

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AWS is much more

This is just the tip of the iceberg

- AWS offers enough services to allow for full system migration
- Can be used for more than just development and R&D
- Marketing, customer services, support and interactions

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More OS Support?

The selection is great, but could be better

- OSX Support
- AIX and Solaris
- "Delayed" Windows releases



Closing Thoughts

Closing Thoughts

Always be improving

- Invest in your automation infrastructure
- Look for opportunities to evolve
- "There's a plugin for that"
- AWS does cost \$\$\$

Questions?

Contact Us!

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