

# HOW NETFLIX AUTOSCALES CI

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# **WHAT DOES CI LOOK LIKE AT NETFLIX**

# JENKINS @ NETFLIX

- 35 Jenkins controllers
- ~45k job definitions
- ~600k builds per week
- 650-1500 agents
- 1-100 executors per agent

# THE SPINNAKER VIEW

- 1 Application
- 35 stacks (Controller Clusters)
- 180 Agent Clusters
- 1+ ASG per cluster
- All workloads on AWS

# **CLUSTERS AND ASGS**

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- Spinnaker calls them Server Groups
- `<Application>-<Stack>-<Detail>-v<Version>`
- `jenkins-unstable-agent-highlander-v123`

# **HOW TO PLAN FOR CI INFRASTRUCTURE**

# INFINITE RESOURCES

- Provision capacity based on known maximum load
- Multiply by a safety factor for good measure
- Monitor and change the capacity as load increases

# INFINITE PATIENCE

- Plan capacity based on median load
- Builds will sit in queue for long times

# INSTANT RESOURCES

- You will get resources as soon as you request for them
- Works well with Containerizable builds
- Not all builds can be containerized
- Does not scale well with large numbers of short-lived builds

# **AUTOSCALING**

- Set up minimum and maximum capacity
- Scale based on some metric

**WHAT METRIC TO USE**

# **SYSTEM METRICS**



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CPU/Memory/Disk IO/Network throughput

- Natively supported by cloud providers and most metrics solutions

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Scaling Policies are supported by cloud providers

# **SYSTEM METRICS**

Not very useful for CI

# QUEUE DEPTH

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Queue Depth seems adequately proportional.

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Queue Depth seems adequately proportional.  
However, it is a trailing metric.

# **AGENT UTILIZATION**

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For each agent, find [idle, busy, offline]  
executors.



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Compute utilization as  $\frac{busy + offline}{busy + offline + e}$

# **MEASURING AGENT UTILIZATION**

# AN AGENT'S ASG

When launching agents, use labels to specify the placement of the agent.



**Agent nflx-agent-unstable-i-0522989245ff3659d (Connect: `ssh -t i-0522989245ff3659d`)**

Mark this node temporarily offline

Agent is connected.

## Labels

asg:jenkins-unstable-bionic-v189 aws:test:us-east-1:jenkins-unstable-bionic-v189 **bionic** buildgroup:bionic carson.version:0.767.0 carson:true cloud:aws cluster:jenkins-unstable-bionic detail:bionic ec2.availZone:us-east-1e ec2.instanceType:m5d.xlarge ec2.region:us-east-1 env:test executors:4 iamRole:jenkinsInstanceProfile java.jvm:zulu8 java.runtime:1.8.0\_292-b10 nf.account:test **nf.app:jenkins** nflx.agent.build:569 os.arch:amd64 os.codename:bionic os.distribution:ubuntu os.name:linux os.release:18.04 stack:unstable us-east-1

# **CAPTURING METRICS**

We wrote a custom plugin that plays well with Atlas.  
You could write one for whatever your metrics capturing service is.

**AUTOSCALING**

# HOW TO AUTOSCALE

AWS offers 2 ways to scale

- Target Tracking
- Step Scaling

# WHEN TO SCALE UP

Edit scaling policy



## Conditions

**Whenever**  of  [Search all metrics](#)

**is**

**for at least**  consecutive period(s) of



# HOW TO SCALE UP

## Actions

Add	20	percent of group	when <code>jenkins.executorsUtilization</code> is between 0.65 and 0.8	
Add	40	percent of group	when <code>jenkins.executorsUtilization</code> is greater than or equal to 0.8	
<div>⊕ Add step</div>				

 [Documentation](#)

## Additional Settings

**Policy Name** jenkins-buildtest-bionic\_classic-v030-NFLX/EPIC-jenkins.executorsUtilization-GreaterThanThreshold-0.65-1-60-1620084562030

**Adjustment Step** Add instances in increments of at least 5 instance(s)

**Warmup** Instances need 600 seconds to warm up after each step

# WHEN TO SCALE DOWN

**Query**

[NAMED](#) [CUSTOM](#) [MANUAL](#)  [Help!](#)  Atlas UI

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You can manually edit queries that are too complex for Custom Mode directly in Atlas Stack Language. If the edits result in an eligible query you can optionally switch to Custom Mode.

**Query:**

```
nf.app, jenkins, :eq,  
name, jenkins.executorsUtilization, :eq, :and,  
label, aws_.*.*v\d+, :re, :and,  
(, nf.app, nf.stack, label, ), :by,  
5m, :trend,  
0.25, :lt,  
15, :rolling-count,  
14, :gt,  
$(nf.app):$(nf.stack):$(label), :legend
```

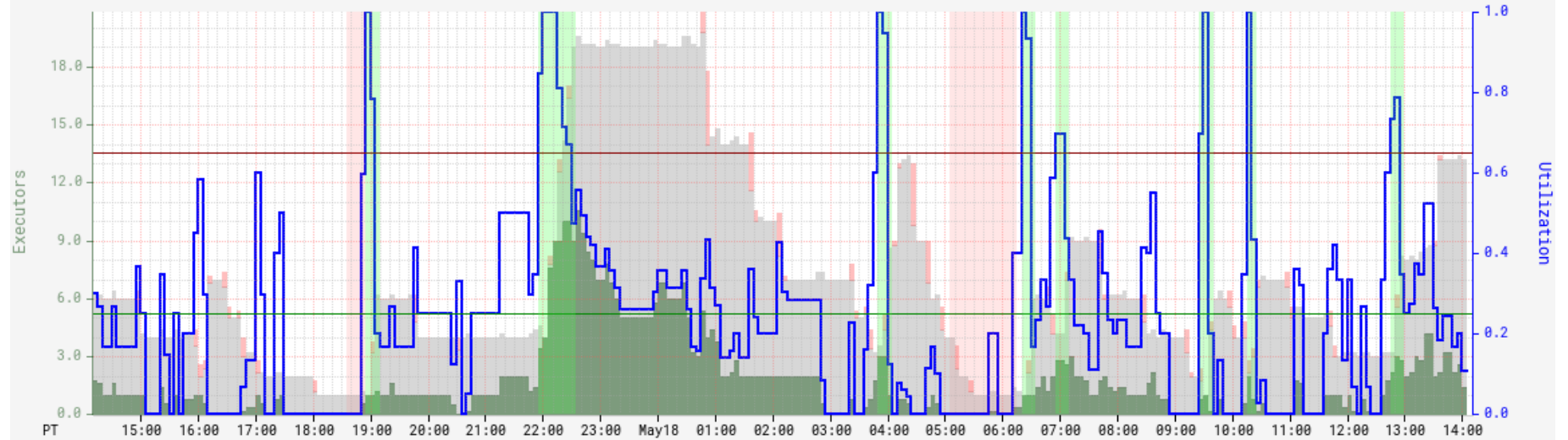
Named Query Compress Auto-break

# HOW TO SCALE DOWN

Controller	ASG	Exception	Idl	Tot	Rto	IC	TC	ZC	Count
jenkins/mce	test/us-east-1/jenkins-mce-bionic_classic-1-v020		19	20	6	6	6	6	6
	OK i-091aa9055f8dac251								
	OK i-08aeaf14573f2653d								
	OK i-04414343adb901c59								
	OK i-06a513fe9d989f10a								
	OK i-0f6e7eec07f0c3421								
	OK i-007fe724966b114bc								
	Terminate and shrink 6								

# RECAP

# Executors Utilization



## Axis 0: Executors

### busy

Max : 10.600 Min : 0.000  
Avg : 1.663 Last : 1.400  
Tot : 477.300 Cnt : 287.000

### idle

Max : 16.000 Min : 0.000  
Avg : 5.206 Last : 11.800  
Tot : 1.494k Cnt : 287.000

### offline

Max : 3.800 Min : 0.000  
Avg : 176.539m Last : 0.000  
Tot : 50.667 Cnt : 287.000

## Axis 1: Utilization

### Utilization

Max : 1.000 Min : 0.000  
Avg : 242.190m Last : 107.692m  
Tot : 69.509 Cnt : 287.000

### Scale Up Threshold

Max : 650.000m Min : 650.000m  
Avg : 650.000m Last : 650.000m  
Tot : 187.200 Cnt : 288.000

### Scale Down Threshold

Max : 250.000m Min : 250.000m  
Avg : 250.000m Last : 250.000m  
Tot : 72.000 Cnt : 288.000

### Scale Up Zone

Max : 1.000 Min : 0.000  
Avg : 97.222m Last : 0.000  
Tot : 28.000 Cnt : 288.000

### Scale Down Zone

Max : 1.000 Min : 0.000  
Avg : 62.500m Last : 0.000  
Tot : 18.000 Cnt : 288.000

Frame: 1d, End: 2021-05-18T14:15-07:00[US/Pacific], Step: 5m  
Fetch: 144ms (L: 120.0, 11.0, 8.0; D: 7.2k, 3.2k, 2.3M)

# WHAT WE LEARNT

- This improved support experience

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- This improved the experience for spiky workloads

**THANK YOU!**

[jobs.netflix.com](https://jobs.netflix.com)





# How Netflix Autoscales CI

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