Clustering and Performance Testing on Amazon Web Services (AWS)

March 2018

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DISCLAIMER: This report is prepared with the intention to provide information on expected baseline performance from Joget Workflow. Although best efforts have been made to conduct an unbiased test, there are many factors involved and the results cannot be guaranteed in different environments. The reader of this report uses all information in this report at his/her own risk, and Joget Inc shall in no case be liable for any loss resulting from the use of this report.

1. Executive Summary

1.1) Introduction

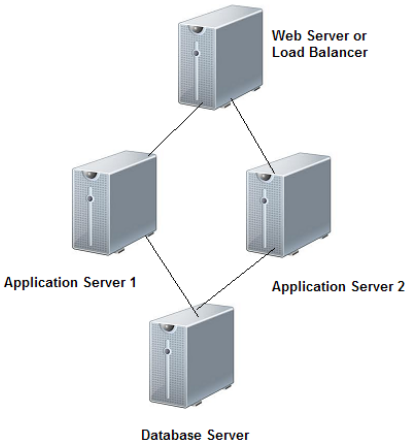
Joget Workflow is a modern application development platform to build enterprise web apps and automate business processes on the Cloud and Mobile. Designed to be easy to use, Joget Workflow allows coders and non-coders to build applications and automate business processes with little or no coding.

This document is intended to describe and analyze the results of performance tests on a clustered deployment of Joget Workflow on Amazon Web Services (AWS).

1.2) Test Environment

The tests were conducted on Amazon Web Services (AWS), specifically using the Elastic Compute Cloud (EC2). AWS offered great flexibility in allowing servers and clients to be created and scaled up as required.

The architecture of the clustered deployment is similar to the following diagram:



The test was conducted using the following product versions:

Joget: Joget Workflow Cloud Edition 6.0.1
OS: Ubuntu 16.04 LTS
Java: OpenJDK 8u151
Web Application Server: Apache Tomcat 8.5.23
Database: MySQL 5.7
Web Server/Load Balancer: Nginx Web Server
Load Testing Tool: Apache JMeter 3

To establish the baseline performance, a basic test app was used which consists of:

1. 1 process with 3 activities and 1 deadline
2. 1 form
3. 1 datalist
4. 1 userview containing menu pages to run the process and display the datalist and inbox

Using a think time of 10 seconds with random deviation of 3 seconds, the test script used covers the following app usage:

1. View Login Page
2. Submit Login Form
3. View Inbox
4. View New Request Form
5. Get CSRF Token
6. Submit New Request Form
7. Logout

Tests were carried out for the following:

1. 100 concurrent users on 1 node (c5.large)
2. 250 concurrent users on 1 node (c5.large)
3. 500 concurrent users on 1 node (c5.large)
4. 750 concurrent users on 1 node (c5.large)
5. 1000 concurrent users on 1 node (c5.large)
6. 2000 concurrent users on 2 nodes (c5.large)
7. 3000 concurrent users on 3 nodes (c5.large)
8. 5000 concurrent users on 1 node (c5.4xlarge)
9. 5000 concurrent users on 1 node (c5.9xlarge)
10. 5000 concurrent users on 1 node with 3 Tomcat instances (c5.18xlarge)

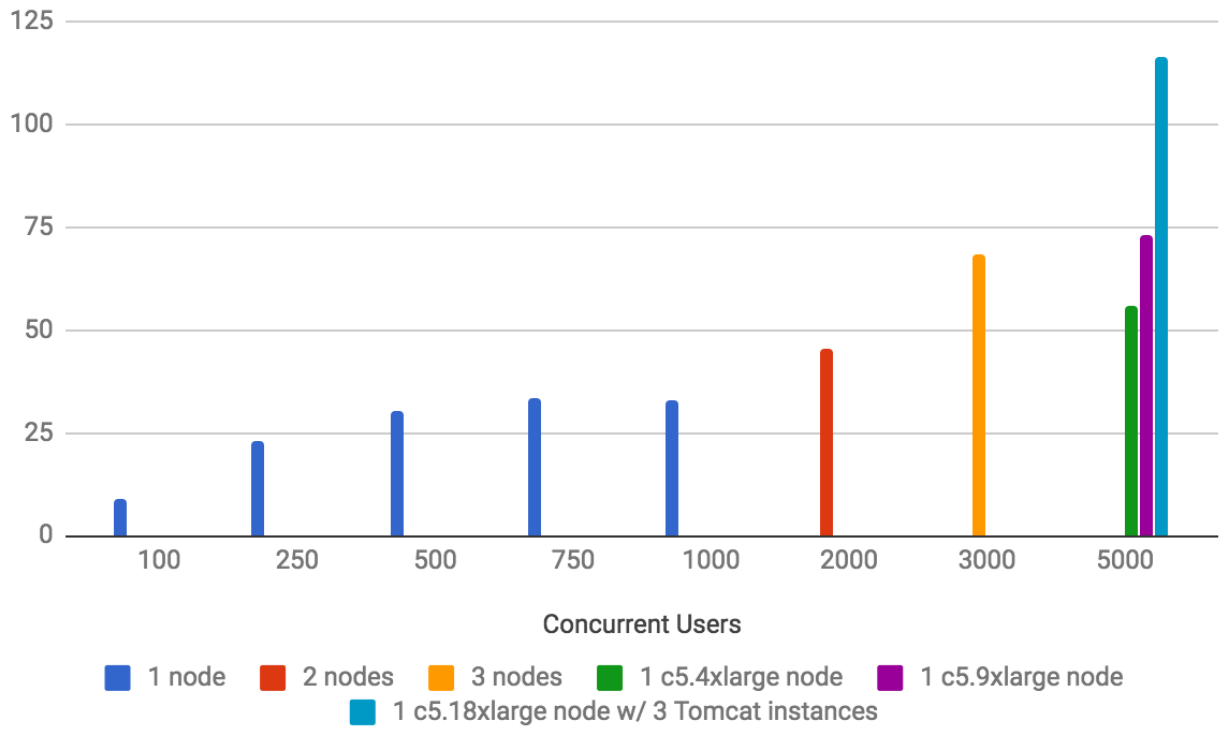
For each test, the JMeter summary results were collected. Once all the results were collected, the throughput (requests per second) and average response times were compared and analyzed.

1.3) Summary of Results

Throughput

The results are summarized in the table and graph below:

Throughput (Request/Second)						
Concurrent Users	1 node	2 nodes	3 nodes	1 c5.4xlarge node	1 c5.9xlarge node	1 c5.18xlarge node w/ 3 Tomcat instances
100	9.1					
250	22.81					
500	30.36					
750	33.65					
1000	32.88					
2000		45.28				
3000			68.61			
5000				56.12	72.91	116.65



In terms of throughput, a single c5.large node (2 vCPU, 4GB RAM) maxed out at about 33 requests per second at 750 concurrent users. When the concurrent users increased to 1000, the throughput remains about the same.

When scaling out (adding nodes to the cluster), the throughput seems to improve linearly as can be seen by the throughput graph i.e. 45 requests per second for a 2 node cluster at 2000 concurrent

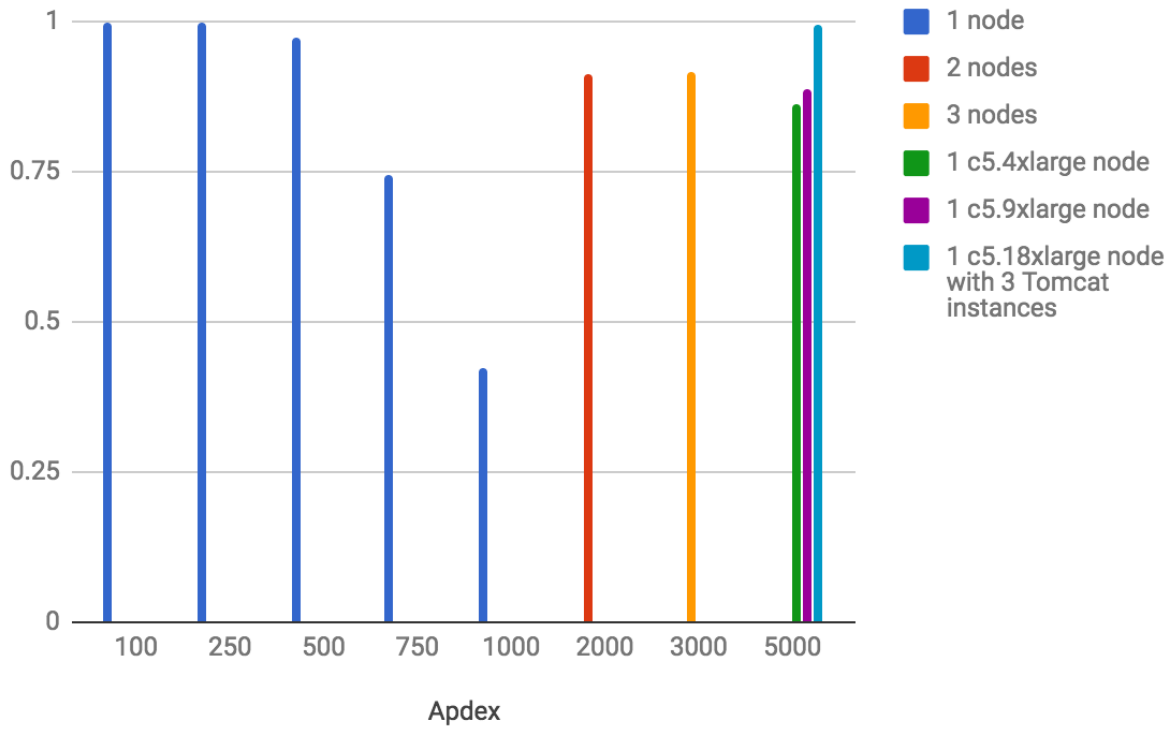
users, and 68 requests per second for a 3 node cluster to handle 3000 concurrent users.

The single c5.18xlarge (72 vCPU, 144GB RAM) node with 3 Tomcat instances handled 116 requests per second.

Application Performance Index (APDEX)

The results are summarized in the table and graph below:

APDEX (Application Performance Index)						
Apdex	1 node	2 nodes	3 nodes	1 c5.4xlarge node	1 c5.9xlarge node	1 c5.18xlarge node with 3 Tomcat instances
100	1					
250	1					
500	0.972					
750	0.746					
1000	0.423					
2000		0.911				
3000			0.918			
5000				0.864	0.887	0.995



For a single c5.large node (2 vCPU, 4GB RAM), the Apdex dropped once it reached 1000 concurrent users. As before, scaling out by adding nodes did maintain an acceptable an Apdex value. The single c5.18xlarge (72 vCPU, 144GB RAM) node with 3 Tomcat instances was able to achieve a 0.995 Apdex value with 5000 concurrent users.

1.4) Conclusion and Recommendations

From the results it can be seen that for a basic baseline app, a single modestly spec-ed c5.large server (2 vCPU, 4GB RAM) can handle 500 concurrent users with acceptable response times. The tests also show that scaling out horizontally (adding nodes to a cluster), supports an almost linear increase in concurrent users. Performing vertical scaling can also improve performance, as demonstrated in the use of the increasingly powerful EC2 instance types.

With emphasis on performance optimization at the platform level, Joget Workflow incurs low overhead when running apps. This has been the case since v4, and has even been improved upon in v6. If there are any specific bottlenecks, it would usually be at the application level. At the application level, there are various guidelines and best practices that are available in the Performance Optimization and Scalability Tips article in the Joget Workflow Knowledge Base. v6 also provides the Performance Analyzer, and introduces easy to use caching capabilities as described in Performance Improvement with Userview Caching.

For large deployments that support large numbers of concurrent users, it is important that the environment is tuned and optimized e.g. Java VM tuning, app server tuning, database optimization, as per the Deployment Best Practices article.

It is important to note that as Joget is a platform and not directly an end-user app, the scalability and performance would depend on potentially many factors:

1. Total number of users
2. Maximum expected concurrent users
3. Number of apps running on the platform
4. Complexity of each of the apps
5. Amount of data generated in each app
6. Network infrastructure

The recommended deployment architecture would very much depend on the environment and usage. Perhaps some things to be considered:

1. How many total and concurrent users are there? Will this grow in future?
2. In the current environment, is the current infrastructure sufficient for the load? Would it be possible to increase the server resources?
3. If the needs outgrow one server node, it might be time to consider implementing clustering and/or load balancing.
4. Another possible approach could be to partition the apps. Are there specific apps that incur the highest load? Maybe it might be appropriate to separate apps into different servers.

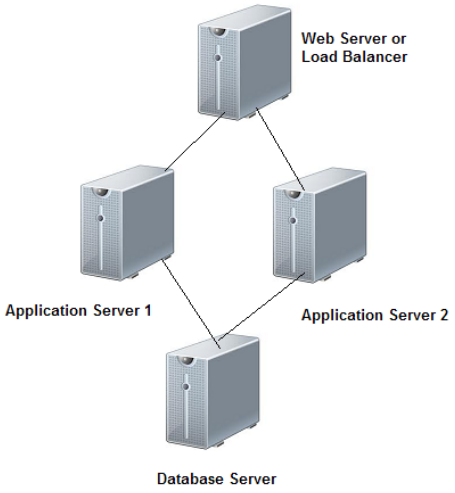
In summary, this report demonstrates the baseline performance of the Joget Workflow platform for a basic app and shows how horizontal and vertical scaling can be used to support larger deployments. Although these results can serve as a base guideline, it is recommended that performance testing and optimisations are performed based on each deployment's unique requirements, environments and usage patterns.

2. Test Environment Setup

2.1) Test Environment

The tests were conducted on Amazon Web Services (AWS), specifically using the Elastic Compute Cloud (EC2). AWS offered great flexibility in allowing servers and clients to be created and scaled up as required.

The architecture of the clustered deployment is similar to the following diagram:



Application Server

Joget: Joget Workflow Cloud Edition 6.0.1
OS: Ubuntu 16.04 LTS
Java: OpenJDK 8u151
Web Application Server: Apache Tomcat 8.5.23
EC2 Instance: c5.large

- 2 vCPU (virtual CPUs)
- 4GB RAM
- Java VM Options: -XX:MaxPermSize=256M -Xms2048M -Xmx2048M

Database Server

Database: MySQL 5.7
EC2 Instance: c5.xlarge

- 4 vCPU
- 8GB RAM
- Moderate network performance
- 1000 PIOPS

Web Server/Load Balancer

OS: Ubuntu 16.04 LTS
Web Server/Load Balancer: Nginx Web Server
EC2 Instance: c5.large:

- 2 vCPU
- 4GB RAM

Load Test Client

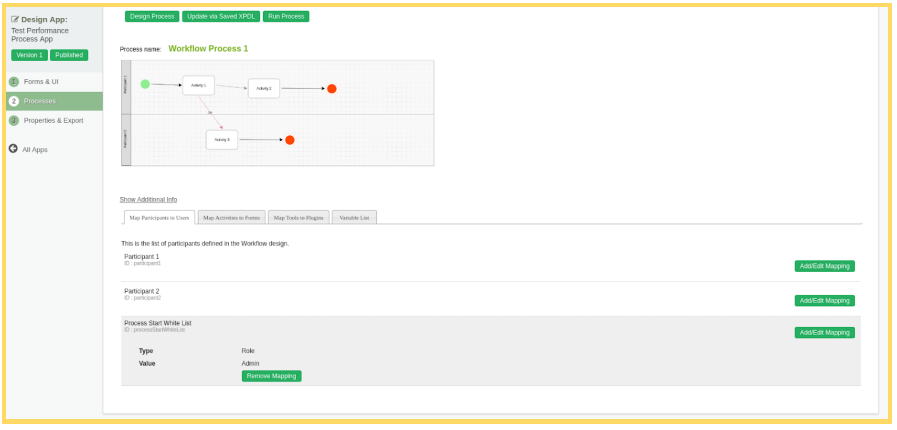
Load Testing Tool: Apache JMeter 3.0
OS: Custom Ubuntu AMI on AWS
EC2 Instance: t2.small:

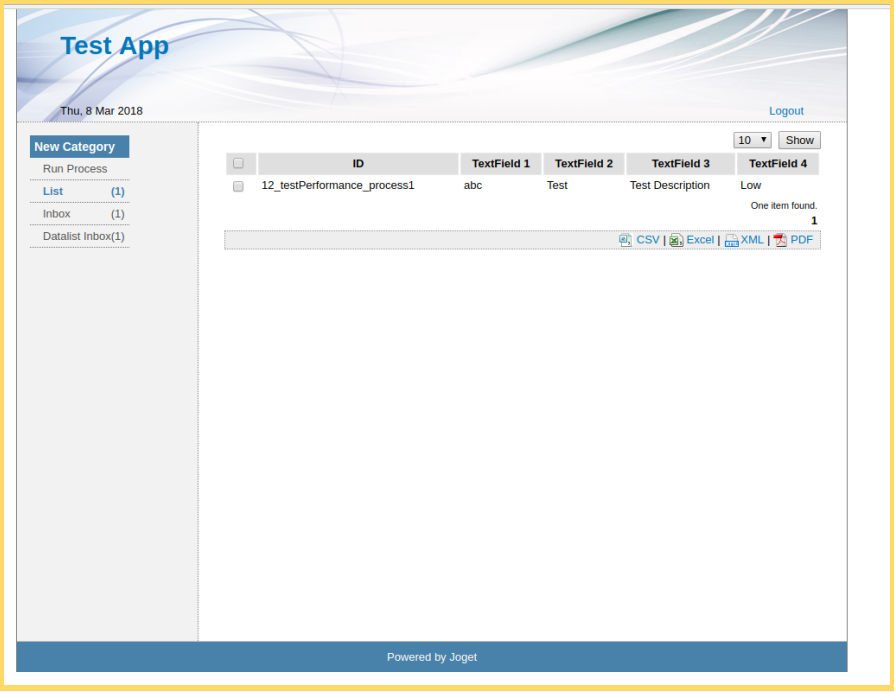
- 1 vCPU
- 2GB RAM

Test App

A basic test app was used which consists of:

1. 1 process with 3 activities and 1 deadline
2. 1 form
3. 1 datalist
4. 1 userview containing menu pages to run the process and display the datalist and inbox





Test Script

The test script used covers the following app usage:

1. View Login Page
2. Submit Login Form
3. View Inbox
4. View New Request Form
5. Get CSRF Token
6. Submit New Request Form
7. Logout

A think time of 10 seconds was used, with random deviation of 3 seconds.

Test Methodology

The load tests were executed by using the jmeter-ec2 (https://github.com/oliverlloyd/jmeter-ec2) tool, which provides an automated way of launching, running and collecting JMeter results.

Tests were carried out for the following:

1. 100 concurrent users on 1 node (c5.large)
2. 250 concurrent users on 1 node (c5.large)
3. 500 concurrent users on 1 node (c5.large)
4. 750 concurrent users on 1 node (c5.large)
5. 1000 concurrent users on 1 node (c5.large)
6. 2000 concurrent users on 2 nodes (c5.large)
7. 3000 concurrent users on 3 nodes (c5.large)
8. 5000 concurrent users on 1 node (c5.9xlarge)
9. 5000 concurrent users on 1 node with 3 Tomcat instances (c5.18xlarge)

For each test, the JMeter summary results were collected. Once all the results were collected, the throughput (requests per second) and average response times were compared and analyzed.

2.2) Setting Up the Joget Server Cluster

The following are brief descriptions of the steps used to setup the server instances:

Launch EC2 Instance

Login to the AWS Management Console and launch the appropriate EC2 instance running on Ubuntu 16.04. Once started, SSH into the server.

Install Java

```
sudo apt-get install openjdk-8-jdk
```

Install Joget

Download Linux tar.gz bundle
Extract into /opt/joget
Run setup.sh and configure to the database

Install Nginx

For the load balancer, install Nginx web server

```
sudo apt-get install nginx
```

Configure Load Balancer

For the load balancer, another section in /etc/nginx/nginx.conf has been added

```
upstream joget {
      ip_hash;
      server 172.31.31.172:8080 weight=1;
      server 172.31.30.203:8080 weight=1;
}
```

Create a new file in /etc/nignx/sites-available, named jwsite

```
sudo vim /etc/nginx/sites-available/joget
```

Add the contents

```
server {
  listen 80;
  server_name 172.31.17.170;
  underscores_in_headers on;
  client_body_buffer_size 10K;
  client_header_buffer_size 1k;
  client_max_body_size 8m;
  large_client_header_buffers 2 1k;
  location / {
      proxy_pass http://joget;
      proxy_redirect  off;
      proxy_pass_header X-CSRF-TOKEN;
      proxy_set_header   Host 172.31.17.170;
      proxy_set_header   X-Forwarded-For  $proxy_add_x_forwarded_for;
      proxy_set_header   X-NginX-Proxy true;
      proxy_read_timeout 3000;
      proxy_buffers           32 4m;
      proxy_busy_buffers_size     25m;
      proxy_buffer_size 512k;
      proxy_ignore_headers "Cache-Control" "Expires";
      proxy_max_temp_file_size 0;
      client_max_body_size        1024m;
      client_body_buffer_size     4m;
      proxy_connect_timeout 3000;
      proxy_headers_hash_max_size 512;
      proxy_send_timeout 3000;
      proxy_intercept_errors off;
  }
}
```

Note that EC2 does not support session replication, so sticky sessions need to be configured for the clustering to work properly.

Enable the new site and reload Nginx

```
sudo ln -s /etc/nginx/site-available/joget /etc/nginx/site-enabled/joget
sudo nginx -s reload
```

Configure Shared Database

To install a local MySQL (instead of RDS)

sudo apt-get install mysql-server

Configure database permissions

```
mysql -u root
```

Run the following MySQL commands to grant permissions to user **joget** and password **joget**

```
grant all privileges on jwdb.* to 'joget'@'%' identified by 'joget';
flush privileges;
quit
```

Configure MySQL to listen to database connections from remote hosts. Edit the my.cnf file with your favourite editor

```
sudo vim /etc/mysql/my.cnf
```

Comment away the bind-address directive by adding a # in front of the line

```
#bind-address = 127.0.0.1
```

Restart MySQL

```
sudo service mysql restart
```

Test remote connections. In the application server, test a remote connection to the database server **database_host**

```
mysql -h database_host -u joget -p
```

Configure Shared File Directory

Install NFS (for sharing file system)

```
sudo apt-get install portmap nfs-kernel-server nfs-common
```

Detailed instructions can be found at
http://theredblacktree.wordpress.com/2013/05/23/how-to-setup-a-amazon-aws-ec2-nfs-share/

Create new directory /opt/joget/shared/wflow to mount the shared directory and set the directory permissions

```
sudo mkdir -p /opt/joget/shared/wflow
sudo chmod 777 /opt/joget/shared/wflow
```

Mount the shared directory.

```
sudo mount -t nfs joget-server:/export/wflow /opt/joget/shared/wflow
```

Test read-write permissions to confirm that the directory sharing works.

```
echo test123 > /opt/joget/shared/wflow/test.txt
```

Optimize Java

Set appropriate Java heap settings e.g.

```
export JAVA_OPTS="-XX:MaxPermSize=256m -Xms2048M -Xmx2048M
-Dwflow.home=/opt/joget/wflow/ "
```

Optimize Tomcat

Edit server.xml and add connectors, especially maxThreads

```
   <Connector URIEncoding="UTF-8" port="8080" protocol="HTTP/1.1"
              connectionTimeout="20000" maxThreads="2000"
              redirectPort="8443" />
    <Connector port="9090" protocol="HTTP/1.1"
              connectionTimeout="20000" maxThreads="2000"
              scheme="https"
              proxyPort="443"
              redirectPort="443" />
```

Configure Linux ulimit Configuration:

```
ulimit -n 4096
```

Optimize MySQL

Create /etc/mysql/conf.d/custom.cnf containing the following and restart MySQL

```
[mysqld]
query_cache_limit=1M
query_cache_size=32M
max_allowed_packet=16M
lower_case_table_names=1
collation_server=utf8_unicode_ci
character_set_server=utf8
key_buffer_size=16M
read_buffer_size=16M
read_rnd_buffer_size=16M
max_connections=10000
```

2.3) Adding a New Joget Node

When adding a new node to the server cluster, the following steps are taken (in this sample the new node hostname will be joget-server3):

Launch New Joget Node

Launch new instance of AMI

Choose appropriate security groups (default and nfs)

Configure New Joget Node

SSH into node

Edit /etc/hosts to add node hostname, and modify joget-server IP if necessary e.g.

```
127.0.0.1 joget-server3
172.31.30.203 joget-server
```

Edit /etc/hostname to modify node hostname e.g.

```
joget-server3
```

Modify hostname e.g.

```
sudo hostname joget-server3
```

Remount NFS share (if joget-server shared directory IP was modified)

Configure Tomcat for clustering by editing server.xml. Add **jvmRoute="node03"** to the **Engine** tag.

```
<Engine name="Catalina" defaultHost="localhost" jvmRoute="node03">
```

Restart Tomcat

Add to Load Balancer

In the load balancer, edit /etc/nginx/nginx.conf to add the BalancerMember node e.g.

```
upstream joget {
      ip_hash;
      server 172.31.31.172:8080 weight=1;
      server 172.31.30.203:8080 weight=1;
      server 172.31.27.120:8080 weight=1;
}
```

then reload/restart Nginx.

2.4) Using the EC2 Elastic Load Balancer

It is possible to use the EC2 Elastic Load Balancer (ELB) instead of Nginx web server. To do so:

In the AWS Management Console,

Create a New Load Balancer

For Health Check, can use /jw/web/json/workflow/currentUsername

Under Description, Port Configuration, Edit Stickiness and select Enable Application Generated Cookie Stickiness with JSESSIONID

2.5) Setup Load Testing Clients

Install AWS CLI http://docs.aws.amazon.com/cli/latest/userguide/

Download and install Jmeter-EC2
https://github.com/oliverlloyd/jmeter-ec2

Set environment variables

```
export AWS_ACCESS_KEY=YOUR_ACCESS_KEY
export AWS_SECRET_KEY=YOUR_SECRET_KEY
```

Modify jmeter-ec2-master/jmeter-ec2.properties to select the AMI, Instance Type, Security Group, Keypair, Region and VPC

Configure jmeter-ec2

Run jmeter-ec2

3. Performance Test Results

3.1) 100 users 1 node

Application Server: 1 c5.large node

Database Server: 1 c5.large node with 1000 PIOPS

Client: 100 users in 1 t2.micro instance

Concurrent Users: 100 users

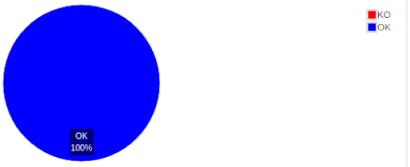
Ramp-up Time: 10s ramp-up

Think Time: 10s random delay 3s deviation

APDEX (Application Performance Index)

Apdex	T (Toleration threshold)	F (Frustration threshold)	Label
1.000	**5 sec**	**10 sec**	**Total**
1.000	5 sec	10 sec	View New Request Form
1.000	5 sec	10 sec	Get CSRF Token
1.000	5 sec	10 sec	View Inbox
1.000	5 sec	10 sec	Submit New Request Form
1.000	5 sec	10 sec	Logout
1.000	5 sec	10 sec	View Login Page
1.000	5 sec	10 sec	Submit Login Form

Requests Summary



Statistics

Label	#Samples	KO	Error %	90th pct	95th pct	99th pct	Throughput	KB/sec	Min	Max
Total	**1100**	**0**	**0.00%**	**122.00**	**154.90**	**238.88**	**9.14**	**135.23**	**1**	**644**
View New Request Form	200	0	0.00%	82.00	100.80	135.99	3.33	75.39	29	181
View Login Page	100	0	0.00%	113.00	149.25	348.59	285.71	4013.95	26	350
View Inbox	200	0	0.00%	66.00	80.95	108.94	3.33	95.42	24	117
Submit New Request Form	200	0	0.00%	186.00	224.90	323.86	3.32	62.56	73	644
Submit Login Form	100	0	0.00%	16.00	20.90	39.85	2500.00	1132.81	8	40
Logout	100	0	0.00%	25.00	35.90	332.14	300.30	2242.56	7	333
Get CSRF Token	200	0	0.00%	2.00	3.00	7.97	3.33	0.69	1	19

3.2) 250 users 1 node

Application Server: 1 c5.large node

Database Server: 1 c5.large node with 1000 PIOPS

Client: 250 users in 1 t2.micro instance

Concurrent Users: 250 users

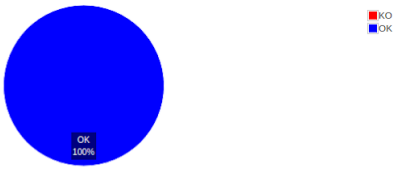
Ramp-up Time: 25s ramp-up

Think Time: 10s random delay 3s deviation

APDEX (Application Performance Index)

Apdex	T (Toleration threshold)	F (Frustration threshold)	Label
1.000	**5 sec**	**10 sec**	**Total**
1.000	5 sec	10 sec	View New Request Form
1.000	5 sec	10 sec	Get CSRF Token
1.000	5 sec	10 sec	View Inbox
1.000	5 sec	10 sec	Submit New Request Form
1.000	5 sec	10 sec	Logout
1.000	5 sec	10 sec	View Login Page
1.000	5 sec	10 sec	Submit Login Form

Requests Summary



Statistics

Label	#Samples	KO	Error %	90th pct	95th pct	99th pct	Throughput	KB/sec	Min	Max
Total	**2750**	**0**	**0.00%**	**147.00**	**191.00**	**315.29**	**22.81**	**337.93**	**1**	**937**
Get CSRF Token	500	0	0.00%	2.00	5.00	23.99	8.33	1.72	1	36
Logout	250	0	0.00%	21.90	33.00	59.88	1488.10	11028.49	6	168
Submit Login Form	250	0	0.00%	18.00	24.00	52.98	2380.95	1078.87	7	105
Submit New Request Form	500	0	0.00%	254.80	324.95	738.22	8.26	156.32	75	937
View Inbox	500	0	0.00%	110.00	137.80	220.96	8.28	237.84	19	354
View Login Page	250	0	0.00%	78.80	87.45	195.77	759.88	10675.40	22	329
View New Request Form	500	0	0.00%	113.00	132.95	208.98	4.16	94.33	27	246

3.3) 500 users 1 node

Application Server: 1 c5.large node

Database Server: 1 c5.large node with 1000 PIOPS

Client: 500 users in 1 t2.micro instance

Concurrent Users: 500 users

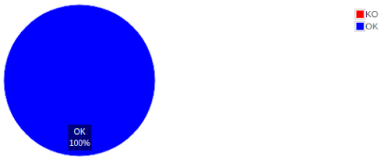
Ramp-up Time: 50s ramp-up

Think Time: 10s random delay 3s deviation

APDEX (Application Performance Index)

Apdex	T (Toleration threshold)	F (Frustration threshold)	Label
0.972	**5 sec**	**10 sec**	**Total**
0.882	5 sec	10 sec	Submit New Request Form
0.966	5 sec	10 sec	View Inbox
1.000	5 sec	10 sec	View New Request Form
1.000	5 sec	10 sec	Get CSRF Token
1.000	5 sec	10 sec	Logout
1.000	5 sec	10 sec	View Login Page
1.000	5 sec	10 sec	Submit Login Form

Requests Summary



Statistics

Label	#Samples	KO	Error %	90th pct	95th pct	99th pct	Throughput	KB/sec	Min	Max
Total	**5500**	**0**	**0.00%**	**2556.50**	**4785.35**	**9303.05**	**30.36**	**488.19**	**1**	**14831**
Get CSRF Token	1000	0	0.00%	23.00	40.00	131.85	8.33	1.72	1	1563
Logout	500	0	0.00%	508.90	1176.05	1395.63	8.31	61.52	6	3038
Submit Login Form	500	0	0.00%	23.00	40.80	77.85	8.30	3.76	6	215
Submit New Request Form	1000	0	0.00%	7736.20	9513.50	12705.62	8.25	177.14	84	14831
View Inbox	1000	0	0.00%	3781.00	5753.60	6337.50	7.89	243.18	18	6682
View Login Page	500	0	0.00%	85.00	105.90	245.98	8.27	116.21	18	444
View New Request Form	1000	0	0.00%	2734.60	2929.25	3508.88	8.32	208.10	28	4306

3.4) 750 users 1 node

Application Server: 1 c5.large node

Database Server: 1 c5.large node with 1000 PIOPS

Client: 750 users in 1 t2.micro instance

Concurrent Users: 750 users

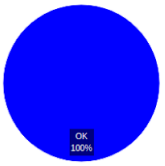
Ramp-up Time: 75s ramp-up

Think Time: 10s random delay 3s deviation

APDEX (Application Performance Index)

Apdex	T (Toleration threshold)	F (Frustration threshold)	Label
0.746	**5 sec**	**10 sec**	**Total**
0.194	5 sec	10 sec	Submit New Request Form
0.737	5 sec	10 sec	View Inbox
0.747	5 sec	10 sec	Logout
0.842	5 sec	10 sec	View New Request Form
0.955	5 sec	10 sec	Get CSRF Token
1.000	5 sec	10 sec	View Login Page
1.000	5 sec	10 sec	Submit Login Form

Requests Summary



Statistics

Label	#Samples	KO	Error %	90th pct	95th pct	99th pct	Throughput	KB/sec	Min	Max
Total	**8250**	**0**	**0.00%**	**17422.90**	**22773.10**	**30690.23**	**33.65**	**648.95**	**0**	**49744**
Get CSRF Token	1500	0	0.00%	4957.00	5380.80	5953.92	8.33	1.72	0	6175
Logout	750	0	0.00%	11207.90	11922.00	22634.34	6.14	45.43	6	35270
Submit Login Form	750	0	0.00%	1537.90	2428.30	2843.47	11.92	5.40	6	2904
Submit New Request Form	1500	0	0.00%	28364.70	31017.35	34887.58	8.10	254.89	117	49744
View Inbox	1500	0	0.00%	8130.00	8603.25	9356.91	7.84	268.80	20	11445
View Login Page	750	0	0.00%	314.10	1444.40	2378.73	11.84	166.33	18	3348
View New Request Form	1500	0	0.00%	7055.00	7297.60	7806.98	6.19	180.25	25	8762

3.5) 1000 users 1 node

Application Server: 1 c5.large node

Database Server: 1 c5.large node with 1000 PIOPS

Client: 1000 users in 1 t2.micro instance

Concurrent Users: 1000 users

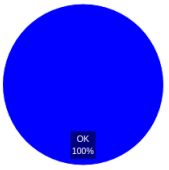
Ramp-up Time: 100s ramp-up

Think Time: 10s random delay 3s deviation

APDEX (Application Performance Index)

Apdex	T (Toleration threshold)	F (Frustration threshold)	Label
0.423	**5 sec**	**10 sec**	**Total**
0.028	5 sec	10 sec	Submit New Request Form
0.355	5 sec	10 sec	View Inbox
0.369	5 sec	10 sec	View New Request Form
0.372	5 sec	10 sec	Get CSRF Token
0.417	5 sec	10 sec	Logout
0.993	5 sec	10 sec	View Login Page
0.998	5 sec	10 sec	Submit Login Form

Requests Summary



Statistics

Label	#Samples	KO	Error %	90th pct	95th pct	99th pct	Throughput	KB/sec	Min	Max
Total	**11000**	**0**	**0.00%**	**29454.40**	**36676.10**	**51129.86**	**32.88**	**813.73**	**1**	**76405**
Get CSRF Token	2000	0	0.00%	21636.50	23058.95	24005.73	8.07	1.66	1	25201
Logout	1000	0	0.00%	36080.00	44696.35	54280.12	6.93	51.18	6	76405
Submit Login Form	1000	0	0.00%	3171.50	3582.90	4487.78	14.66	6.64	7	8220
Submit New Request Form	2000	0	0.00%	45116.70	50449.85	56567.86	7.28	386.07	121	68948
View Inbox	2000	0	0.00%	28572.80	30622.95	32537.74	7.58	277.65	21	33187
View Login Page	1000	0	0.00%	4292.30	4875.30	5015.96	15.29	214.88	19	5381
View New Request Form	2000	0	0.00%	26073.60	27138.95	29178.98	9.53	336.89	45	29873

3.6) 2000 users 2 node cluster

Load Balancer: Nginx webserver c5.large

Application Server: 2 c5.large node

Database Server: 1 c5.xlarge node with 1000 PIOPS

Client: 2000 users in 2 t2.small instances

Concurrent Users: 2000 users

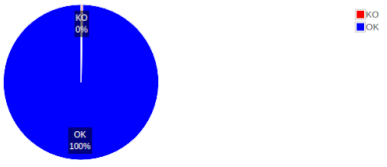
Ramp-up Time: 100s ramp-up

Think Time: 10s random delay 3s deviation

APDEX (Application Performance Index)

Apdex	T (Toleration threshold)	F (Frustration threshold)	Label
0.911	**5 sec**	**10 sec**	**Total**
0.720	5 sec	10 sec	Submit New Request Form
0.878	5 sec	10 sec	View Inbox
0.930	5 sec	10 sec	View New Request Form
0.963	5 sec	10 sec	View Login Page
1.000	5 sec	10 sec	Get CSRF Token
1.000	5 sec	10 sec	Logout
1.000	5 sec	10 sec	Submit Login Form

Requests Summary



Statistics

Label	#Samples	KO	Error %	90th pct	95th pct	99th pct	Throughput	KB/sec	Min	Max
Total	**22000**	**68**	**0.31%**	**5703.00**	**8529.85**	**87102.57**	**45.28**	**615.62**	**1**	**125477**
Get CSRF Token	4000	0	0.00%	11.00	31.00	63.00	11.11	2.92	1	318
Logout	2000	0	0.00%	134.00	164.00	259.98	10.91	80.93	20	3275
Submit Login Form	2000	0	0.00%	1573.60	1884.95	2378.60	16.15	9.68	49	3830
Submit New Request Form	4000	68	1.70%	78810.30	88259.95	100347.25	10.93	182.86	5	125477
View Inbox	4000	0	0.00%	6777.10	7629.70	9851.49	11.07	300.96	183	13470
View Login Page	2000	0	0.00%	4393.00	5982.80	8006.84	10.50	148.82	227	10453
View New Request Form	4000	0	0.00%	5386.40	6102.85	7793.72	13.27	258.95	276	10245

3.7) 3000 users 3 node cluster

Load Balancer: Nginx webserver c5.large

Application Server: 3 c5.large node

Database: Database Server: 1 c5.xlarge node with 1000 PIOPS

Client: 3000 users in 5 t2.small instances

Concurrent Users: 3000 users

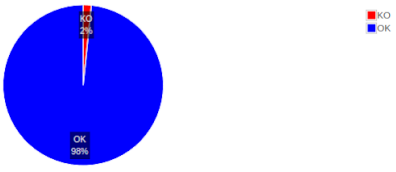
Ramp-up Time: 100s ramp-up

Think Time: 10s random delay 3s deviation

APDEX (Application Performance Index)

Apdex	T (Toleration threshold)	F (Frustration threshold)	Label
0.918	**5 sec**	**10 sec**	**Total**
0.760	5 sec	10 sec	Submit New Request Form
0.873	5 sec	10 sec	View Inbox
0.930	5 sec	10 sec	View New Request Form
0.973	5 sec	10 sec	View Login Page
1.000	5 sec	10 sec	Get CSRF Token
1.000	5 sec	10 sec	Logout
1.000	5 sec	10 sec	Submit Login Form

Requests Summary



Statistics

Label	#Samples	KO	Error %	90th pct	95th pct	99th pct	Throughput	KB/sec	Min	Max
Total	**33000**	**537**	**1.63%**	**5280.80**	**6940.70**	**51557.78**	**68.61**	**833.50**	**1**	**88637**
Get CSRF Token	6000	0	0.00%	5.00	17.00	48.99	20.00	5.38	1	198
Logout	3000	0	0.00%	97.00	125.00	193.94	12.50	92.38	20	624
Submit Login Form	3000	0	0.00%	1153.70	1438.90	1949.98	24.41	14.86	48	2901
Submit New Request Form	6000	537	8.95%	21280.70	52540.80	61762.95	16.62	237.60	5	88637
View Inbox	6000	0	0.00%	7020.30	7964.00	10272.00	19.92	487.01	198	15780
View Login Page	3000	0	0.00%	3904.70	5125.60	6808.42	15.90	225.43	233	9027
View New Request Form	6000	0	0.00%	5619.50	6447.80	8154.93	19.96	333.51	228	12445

3.8) 5000 users 1 c5.4xlarge

Application Server: 1 c5.4xlarge node

Java VM Options: -XX:MaxPermSize=512M -Xms8G -Xmx8G -XX:+UseConcMarkSweepGC

Database: Local MySQL 5.7

Client: 5000 users in 10 t2.small instances

Concurrent Users: 5000 users

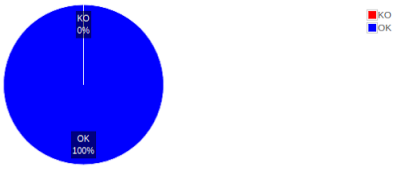
Ramp-up Time: 100s ramp-up

Think Time: 10s random delay 3s deviation

APDEX (Application Performance Index)

Apdex	T (Toleration threshold)	F (Frustration threshold)	Label
0.864	**5 sec**	**10 sec**	**Total**
0.077	5 sec	10 sec	Submit New Request Form
0.988	5 sec	10 sec	Logout
0.990	5 sec	10 sec	View Inbox
0.994	5 sec	10 sec	View New Request Form
0.996	5 sec	10 sec	Get CSRF Token
1.000	5 sec	10 sec	View Login Page
1.000	5 sec	10 sec	Submit Login Form

Requests Summary



Statistics

Label	#Samples	KO	Error %	90th pct	95th pct	99th pct	Throughput	KB/sec	Min	Max
Total	**35000**	**5**	**0.01%**	**54369.00**	**154457.55**	**326122.71**	**56.12**	**806.48**	**1**	**414901**
Get CSRF Token	5000	0	0.00%	43.00	209.55	4353.71	27.77	6.59	1	7795
Logout	5000	5	0.10%	2775.80	3205.90	6918.92	10.20	76.80	6	10323
Submit Login Form	5000	0	0.00%	11.00	23.00	45.99	41.63	24.07	5	132
Submit New Request Form	5000	0	0.00%	299300.70	344411.40	381280.88	9.93	257.25	59	414901
View Inbox	5000	0	0.00%	3287.90	3573.95	6561.95	39.50	1131.59	12	10628
View Login Page	5000	0	0.00%	22.00	29.00	58.00	41.65	588.39	12	211
View New Request Form	5000	0	0.00%	1730.90	1830.95	5553.20	39.40	928.13	18	8978

3.9) 5000 users 1 c5.9xlarge

Application Server: 1 c5.8xlarge node

Java VM Options: -XX:MaxPermSize=512M -Xms16G -Xmx16G -XX:+UseConcMarkSweepGC

Database: Local MySQL 5.7

Client: 5000 users in 10 t2.small instances

Concurrent Users: 5000 users

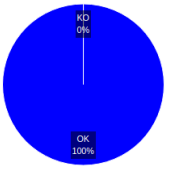
Ramp-up Time: 100s ramp-up

Think Time: 10s random delay 3s deviation

APDEX (Application Performance Index)

Apdex	T (Toleration threshold)	F (Frustration threshold)	Label
0.887	**5 sec**	**10 sec**	**Total**
0.209	5 sec	10 sec	Submit New Request Form
0.999	5 sec	10 sec	Logout
1.000	5 sec	10 sec	View New Request Form
1.000	5 sec	10 sec	Get CSRF Token
1.000	5 sec	10 sec	View Inbox
1.000	5 sec	10 sec	View Login Page
1.000	5 sec	10 sec	Submit Login Form

Requests Summary



Statistics

Label	#Samples	KO	Error %	90th pct	95th pct	99th pct	Throughput	KB/sec	Min	Max
Total	**35000**	**3**	**0.01%**	**18245.30**	**69616.95**	**176153.61**	**72.91**	**1016.91**	**1**	**221859**
Get CSRF Token	5000	0	0.00%	22.00	30.00	49.00	27.75	6.59	1	238
Logout	5000	3	0.06%	2061.30	2429.00	2917.94	13.89	104.71	6	3473
Submit Login Form	5000	0	0.00%	10.00	13.00	54.00	41.64	24.07	4	196
Submit New Request Form	5000	0	0.00%	155446.50	188723.15	217076.63	14.63	351.00	56	221859
View Inbox	5000	0	0.00%	111.00	154.95	508.97	41.18	1157.74	12	1416
View Login Page	5000	0	0.00%	19.00	26.00	75.00	41.60	587.78	11	233
View New Request Form	5000	0	0.00%	342.00	477.95	729.98	41.32	951.74	17	1003

3.10) 5000 users 1 c5.18xlarge with 3 Tomcat instances

Application Server: 1 c5.18xlarge node

Java VM Options: -XX:MaxPermSize=512M -Xms16G -Xmx16G -XX:+UseConcMarkSweepGC

Database: Local MySQL 5.7

Client: 5000 users in 10 t2.small instances

Concurrent Users: 5000 users

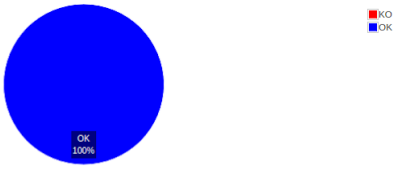
Ramp-up Time: 100s ramp-up

Think Time: 10s random delay 3s deviation

APDEX (Application Performance Index)

Apdex	T (Toleration threshold)	F (Frustration threshold)	Label
0.995	**5 sec**	**10 sec**	**Total**
0.968	5 sec	10 sec	Submit New Request Form
1.000	5 sec	10 sec	View New Request Form
1.000	5 sec	10 sec	Get CSRF Token
1.000	5 sec	10 sec	View Inbox
1.000	5 sec	10 sec	Logout
1.000	5 sec	10 sec	View Login Page
1.000	5 sec	10 sec	Submit Login Form

Requests Summary



Statistics

Label	#Samples	KO	Error %	90th pct	95th pct	99th pct	Throughput	KB/sec	Min	Max
Total	**35000**	**0**	**0.00%**	**229.00**	**437.00**	**1315.96**	**116.65**	**1770.88**	**1**	**20903**
Get CSRF Token	5000	0	0.00%	3.00	23.00	99.00	41.59	9.87	1	218
Logout	5000	0	0.00%	92.00	179.00	882.94	41.65	313.15	5	2431
Submit Login Form	5000	0	0.00%	10.00	12.00	47.99	82.92	47.94	4	297
Submit New Request Form	5000	0	0.00%	1023.90	1537.10	14747.99	35.49	1159.02	53	20903
View Inbox	5000	0	0.00%	76.00	108.00	188.00	41.54	1167.95	12	358
View Login Page	5000	0	0.00%	24.00	30.00	151.99	41.60	587.77	12	3608
View New Request Form	5000	0	0.00%	196.90	269.95	472.98	41.37	952.62	18	865

Appendix: Sample Test Output

100 users 1 node jmeter output

```
===================== START OF JMETER-EC2 TEST ================================
> [updates: every 30 seconds | running total: every 90 seconds]
>
> waiting for the test to start...to stop the test while it is running, press CTRL-C
> 00:48:03: Generate Summary Results +    251 in 00:00:30 =    8.4/s Avg:    36 Min:     8 Max:
181 Err:     0 (0.00%) Active: 100 Started: 100 Finished: 0 | host: 54.149.130.175
> 00:48:34: Generate Summary Results +    262 in 00:00:30 =    8.7/s Avg:    72 Min:     1 Max:
644 Err:     0 (0.00%) Active: 100 Started: 100 Finished: 0 | host: 54.149.130.175
> 00:49:04: Generate Summary Results +    259 in 00:00:30 =    8.7/s Avg:    31 Min:     1 Max:
167 Err:     0 (0.00%) Active: 100 Started: 100 Finished: 0 | host: 54.149.130.175
>
>
> 00:49:34: [FINAL RESULTS] total count: 1100, overall avg: 50 (ms), overall tps: 7.8 (p/sec),
recent tps: 7.7 (p/sec), errors: 0
>
================================================================== END OF JMETER-EC2 TEST
```

2000 users 2 node cluster jmeter output

```
===================== START OF JMETER-EC2 TEST ================================
> [updates: every 30 seconds | running total: every 90 seconds]
>
> waiting for the test to start...to stop the test while it is running, press CTRL-C
> 16:44:32: Generate Summary Results +    100 in 00:00:30 =    3.3/s Avg:   291 Min:    59 Max:
438 Err:     0 (0.00%) Active: 173 Started: 173 Finished: 0 | host: 54.187.13.158
> 16:44:32: Generate Summary Results +     95 in 00:00:29 =    3.2/s Avg:   303 Min:    60 Max:
465 Err:     0 (0.00%) Active: 173 Started: 173 Finished: 0 | host: 54.201.27.231
> 16:44:32: Generate Summary Results +     98 in 00:00:29 =    3.3/s Avg:   278 Min:    58 Max:
445 Err:     0 (0.00%) Active: 172 Started: 172 Finished: 0 | host: 34.217.34.249
> 16:44:32: Generate Summary Results +     97 in 00:00:29 =    3.4/s Avg:   293 Min:    55 Max:
452 Err:     0 (0.00%) Active: 172 Started: 172 Finished: 0 | host: 54.149.245.249
> 16:44:32: Generate Summary Results +     93 in 00:00:27 =    3.4/s Avg:   300 Min:    59 Max:
480 Err:     0 (0.00%) Active: 172 Started: 172 Finished: 0 | host: 34.214.127.229
> 16:45:03: Generate Summary Results +    212 in 00:00:30 =    7.1/s Avg:   213 Min:    49 Max:
470 Err:     0 (0.00%) Active: 271 Started: 271 Finished: 0 | host: 54.187.13.158
> 16:45:03: Generate Summary Results +    213 in 00:00:30 =    7.2/s Avg:   208 Min:    50 Max:
532 Err:     0 (0.00%) Active: 271 Started: 271 Finished: 0 | host: 54.201.27.231
> 16:45:03: Generate Summary Results +    205 in 00:00:30 =    6.8/s Avg:   214 Min:    49 Max:
552 Err:     0 (0.00%) Active: 271 Started: 271 Finished: 0 | host: 34.217.34.249
> 16:45:03: Generate Summary Results +    220 in 00:00:30 =    7.4/s Avg:   211 Min:    49 Max:
582 Err:     0 (0.00%) Active: 272 Started: 272 Finished: 0 | host: 54.149.245.249
> 16:45:03: Generate Summary Results +    212 in 00:00:30 =    7.1/s Avg:   206 Min:    51 Max:
551 Err:     0 (0.00%) Active: 272 Started: 272 Finished: 0 | host: 34.214.127.229
> 16:45:33: Generate Summary Results +    325 in 00:00:30 =   10.8/s Avg:   443 Min:    58 Max:
1747 Err:     0 (0.00%) Active: 372 Started: 372 Finished: 0 | host: 54.187.13.158
> 16:45:33: Generate Summary Results +    330 in 00:00:30 =   11.0/s Avg:   434 Min:    60 Max:
1850 Err:     0 (0.00%) Active: 371 Started: 371 Finished: 0 | host: 54.201.27.231
> 16:45:33: Generate Summary Results +    321 in 00:00:30 =   10.7/s Avg:   418 Min:    58 Max:
1762 Err:     0 (0.00%) Active: 371 Started: 371 Finished: 0 | host: 34.217.34.249
> 16:45:33: Generate Summary Results +    315 in 00:00:30 =   10.5/s Avg:   416 Min:    55 Max:
1593 Err:     0 (0.00%) Active: 372 Started: 372 Finished: 0 | host: 54.149.245.249
> 16:45:33: Generate Summary Results +    319 in 00:00:30 =   10.6/s Avg:   410 Min:    56 Max:
1514 Err:     0 (0.00%) Active: 371 Started: 371 Finished: 0 | host: 34.214.127.229
```

```
> 16:46:03: Generate Summary Results +    403 in 00:00:30 =   13.5/s Avg:  2566 Min:     1 Max:
6575 Err:     1 (0.25%) Active: 400 Started: 400 Finished: 0 | host: 54.187.13.158
> 16:46:03: Generate Summary Results +    398 in 00:00:30 =   13.2/s Avg:  2557 Min:     1 Max:
6405 Err:     0 (0.00%) Active: 400 Started: 400 Finished: 0 | host: 54.201.27.231
> 16:46:03: Generate Summary Results +    410 in 00:00:30 =   13.7/s Avg:  2617 Min:     2 Max:
7483 Err:     0 (0.00%) Active: 400 Started: 400 Finished: 0 | host: 34.217.34.249
> 16:46:03: Generate Summary Results +    403 in 00:00:30 =   13.5/s Avg:  2566 Min:     1 Max:
6137 Err:     0 (0.00%) Active: 400 Started: 400 Finished: 0 | host: 54.149.245.249
> 16:46:03: Generate Summary Results +    404 in 00:00:30 =   13.5/s Avg:  2551 Min:     1 Max:
6686 Err:     1 (0.25%) Active: 400 Started: 400 Finished: 0 | host: 34.214.127.229
> 16:46:03: Generate Summary Results =   1043 in 00:02:22 =    7.3/s Avg:  1202 Min:     1 Max:
6575 Err:     1 (0.10%) | host: 54.187.13.158
> 16:46:03: Generate Summary Results =   1037 in 00:02:22 =    7.3/s Avg:  1190 Min:     1 Max:
6405 Err:     0 (0.00%) | host: 54.201.27.231
> 16:46:03: Generate Summary Results =   1036 in 00:02:22 =    7.3/s Avg:  1234 Min:     2 Max:
7483 Err:     0 (0.00%) | host: 34.217.34.249
> 16:46:03: Generate Summary Results =   1036 in 00:02:22 =    7.3/s Avg:  1197 Min:     1 Max:
6137 Err:     0 (0.00%) | host: 54.149.245.249
> 16:46:03: Generate Summary Results =   1029 in 00:02:22 =    7.3/s Avg:  1198 Min:     1 Max:
6686 Err:     1 (0.10%) | host: 34.214.127.229
>
> 16:46:03: [RUNNING TOTALS] total count: 5181, current avg: 2571 (ms), average tps: 36.5 (p/sec),
recent tps: 67.4 (p/sec), total errors: 2
>
> 16:46:33: Generate Summary Results +    405 in 00:00:30 =   13.6/s Avg:  3509 Min:     1 Max:
23072 Err:     1 (0.25%) Active: 400 Started: 400 Finished: 0 | host: 54.187.13.158
> 16:46:33: Generate Summary Results +    406 in 00:00:30 =   13.6/s Avg:  3620 Min:     1 Max:
21145 Err:     0 (0.00%) Active: 400 Started: 400 Finished: 0 | host: 54.201.27.231
> 16:46:33: Generate Summary Results +    415 in 00:00:30 =   13.7/s Avg:  3508 Min:     1 Max:
27040 Err:     2 (0.48%) Active: 400 Started: 400 Finished: 0 | host: 34.217.34.249
> 16:46:34: Generate Summary Results +    412 in 00:00:30 =   13.7/s Avg:  3385 Min:     1 Max:
14630 Err:     7 (1.70%) Active: 400 Started: 400 Finished: 0 | host: 54.149.245.249
> 16:46:34: Generate Summary Results +    416 in 00:00:30 =   13.8/s Avg:  3462 Min:     1 Max:
14006 Err:     0 (0.00%) Active: 400 Started: 400 Finished: 0 | host: 34.214.127.229
> 16:47:04: Generate Summary Results +    359 in 00:00:30 =   12.0/s Avg:  3446 Min:     1 Max:
40459 Err:     5 (1.39%) Active: 400 Started: 400 Finished: 0 | host: 54.187.13.158
> 16:47:04: Generate Summary Results +    377 in 00:00:30 =   12.5/s Avg:  3503 Min:     1 Max:
39827 Err:     5 (1.33%) Active: 400 Started: 400 Finished: 0 | host: 54.201.27.231
> 16:47:04: Generate Summary Results +    357 in 00:00:30 =   12.0/s Avg:  3274 Min:     1 Max:
26938 Err:     5 (1.40%) Active: 400 Started: 400 Finished: 0 | host: 34.217.34.249
> 16:47:04: Generate Summary Results +    360 in 00:00:30 =   11.9/s Avg:  3513 Min:     1 Max:
36919 Err:     4 (1.11%) Active: 400 Started: 400 Finished: 0 | host: 54.149.245.249
> 16:47:04: Generate Summary Results +    362 in 00:00:30 =   12.1/s Avg:  3647 Min:     1 Max:
40155 Err:     3 (0.83%) Active: 400 Started: 400 Finished: 0 | host: 34.214.127.229
> 16:47:34: Generate Summary Results +    377 in 00:00:30 =   12.6/s Avg:  4226 Min:     1 Max:
66959 Err:     3 (0.80%) Active: 400 Started: 400 Finished: 0 | host: 54.187.13.158
> 16:47:34: Generate Summary Results +    365 in 00:00:30 =   12.2/s Avg:  4120 Min:     1 Max:
63705 Err:     1 (0.27%) Active: 400 Started: 400 Finished: 0 | host: 54.201.27.231
> 16:47:34: Generate Summary Results +    389 in 00:00:30 =   13.0/s Avg:  4083 Min:     1 Max:
64743 Err:     1 (0.26%) Active: 400 Started: 400 Finished: 0 | host: 34.217.34.249
> 16:47:34: Generate Summary Results +    371 in 00:00:30 =   12.5/s Avg:  4604 Min:     1 Max:
65149 Err:     3 (0.81%) Active: 400 Started: 400 Finished: 0 | host: 54.149.245.249
> 16:47:34: Generate Summary Results +    390 in 00:00:30 =   13.0/s Avg:  4044 Min:     1 Max:
63317 Err:     1 (0.26%) Active: 400 Started: 400 Finished: 0 | host: 34.214.127.229
> 16:47:34: Generate Summary Results =   2184 in 00:03:52 =    9.4/s Avg:  2521 Min:     1 Max:
66959 Err:    10 (0.46%) | host: 54.187.13.158
> 16:47:34: Generate Summary Results =   2185 in 00:03:52 =    9.4/s Avg:  2530 Min:     1 Max:
63705 Err:     6 (0.27%) | host: 54.201.27.231
> 16:47:34: Generate Summary Results =   2197 in 00:03:52 =    9.5/s Avg:  2500 Min:     1 Max:
64743 Err:     8 (0.36%) | host: 34.217.34.249
> 16:47:34: Generate Summary Results =   2179 in 00:03:52 =    9.4/s Avg:  2573 Min:     1 Max:
65149 Err:    14 (0.64%) | host: 54.149.245.249
```

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> 16:47:34: Generate Summary Results =   2197 in 00:03:52 =    9.5/s Avg:  2536 Min:     1 Max:
63317 Err:     5 (0.23%) | host: 34.214.127.229
>
> 16:47:34: [RUNNING TOTALS] total count: 10942, current avg: 4215 (ms), average tps: 47.2 (p/sec),
recent tps: 63.3 (p/sec), total errors: 43
>
> 16:48:04: Generate Summary Results +    357 in 00:00:30 =   11.8/s Avg:  3678 Min:     1 Max:
87788 Err:     3 (0.84%) Active: 400 Started: 400 Finished: 0 | host: 54.187.13.158
> 16:48:04: Generate Summary Results +    387 in 00:00:30 =   12.9/s Avg:  3747 Min:     1 Max:
85797 Err:     1 (0.26%) Active: 400 Started: 400 Finished: 0 | host: 54.201.27.231
> 16:48:04: Generate Summary Results +    368 in 00:00:30 =   12.2/s Avg:  4704 Min:     1 Max:
78750 Err:     3 (0.82%) Active: 400 Started: 400 Finished: 0 | host: 34.217.34.249
> 16:48:04: Generate Summary Results +    357 in 00:00:30 =   11.9/s Avg:  5232 Min:     1 Max:
90951 Err:     5 (1.40%) Active: 400 Started: 400 Finished: 0 | host: 54.149.245.249
> 16:48:04: Generate Summary Results +    376 in 00:00:30 =   12.5/s Avg:  4961 Min:     1 Max:
86520 Err:     1 (0.27%) Active: 400 Started: 400 Finished: 0 | host: 34.214.127.229
> 16:48:34: Generate Summary Results +    344 in 00:00:30 =   11.5/s Avg:  6134 Min:     1 Max:
102451 Err:     1 (0.29%) Active: 391 Started: 400 Finished: 9 | host: 54.187.13.158
> 16:48:35: Generate Summary Results +    342 in 00:00:30 =   11.4/s Avg:  7096 Min:     1 Max:
100359 Err:     3 (0.88%) Active: 393 Started: 400 Finished: 7 | host: 54.201.27.231
> 16:48:35: Generate Summary Results +    338 in 00:00:30 =   11.3/s Avg:  4086 Min:     1 Max:
94607 Err:     2 (0.59%) Active: 391 Started: 400 Finished: 9 | host: 34.217.34.249
> 16:48:35: Generate Summary Results +    330 in 00:00:30 =   10.9/s Avg:  5995 Min:     1 Max:
99534 Err:     2 (0.61%) Active: 390 Started: 400 Finished: 10 | host: 54.149.245.249
> 16:48:35: Generate Summary Results +    347 in 00:00:30 =   11.6/s Avg:  4870 Min:     1 Max:
108374 Err:     1 (0.29%) Active: 393 Started: 400 Finished: 7 | host: 34.214.127.229
> 16:49:05: Generate Summary Results +    373 in 00:00:30 =   12.4/s Avg: 10717 Min:     1 Max:
125477 Err:     0 (0.00%) Active: 329 Started: 400 Finished: 71 | host: 54.187.13.158
> 16:49:05: Generate Summary Results +    373 in 00:00:30 =   12.3/s Avg:  8135 Min:     1 Max:
99695 Err:     0 (0.00%) Active: 333 Started: 400 Finished: 67 | host: 54.201.27.231
> 16:49:05: Generate Summary Results +    379 in 00:00:30 =   12.6/s Avg: 10177 Min:     1 Max:
125136 Err:     0 (0.00%) Active: 330 Started: 400 Finished: 70 | host: 34.217.34.249
> 16:49:05: Generate Summary Results +    356 in 00:00:30 =   12.0/s Avg: 10522 Min:     1 Max:
101427 Err:     0 (0.00%) Active: 336 Started: 400 Finished: 64 | host: 54.149.245.249
> 16:49:05: Generate Summary Results +    371 in 00:00:30 =   12.3/s Avg:  9415 Min:     1 Max:
125238 Err:     0 (0.00%) Active: 332 Started: 400 Finished: 68 | host: 34.214.127.229
> 16:49:05: Generate Summary Results =   3258 in 00:05:22 =   10.1/s Avg:  3968 Min:     1 Max:
125477 Err:    14 (0.43%) | host: 54.187.13.158
> 16:49:05: Generate Summary Results =   3287 in 00:05:22 =   10.2/s Avg:  3784 Min:     1 Max:
100359 Err:    10 (0.30%) | host: 54.201.27.231
> 16:49:05: Generate Summary Results =   3282 in 00:05:22 =   10.2/s Avg:  3797 Min:     1 Max:
125136 Err:    13 (0.40%) | host: 34.217.34.249
> 16:49:05: Generate Summary Results =   3222 in 00:05:22 =   10.0/s Avg:  4097 Min:     1 Max:
101427 Err:    21 (0.65%) | host: 54.149.245.249
> 16:49:05: Generate Summary Results =   3291 in 00:05:22 =   10.2/s Avg:  3834 Min:     1 Max:
125238 Err:     7 (0.21%) | host: 34.214.127.229
>
> 16:49:05: [RUNNING TOTALS] total count: 16340, current avg: 9793 (ms), average tps: 50.7 (p/sec),
recent tps: 61.6 (p/sec), total errors: 65
>
> 16:49:35: Generate Summary Results +    348 in 00:00:30 =   11.6/s Avg: 11797 Min:     1 Max:
118023 Err:     0 (0.00%) Active: 269 Started: 400 Finished: 131 | host: 54.187.13.158
> 16:49:35: Generate Summary Results +    349 in 00:00:30 =   11.7/s Avg: 13911 Min:     1 Max:
119552 Err:     0 (0.00%) Active: 271 Started: 400 Finished: 129 | host: 54.201.27.231
> 16:49:35: Generate Summary Results +    350 in 00:00:30 =   11.7/s Avg: 12551 Min:     1 Max:
110586 Err:     0 (0.00%) Active: 271 Started: 400 Finished: 129 | host: 34.217.34.249
> 16:49:35: Generate Summary Results +    348 in 00:00:30 =   11.6/s Avg: 13539 Min:     1 Max:
120743 Err:     0 (0.00%) Active: 280 Started: 400 Finished: 120 | host: 54.149.245.249
> 16:49:35: Generate Summary Results +    347 in 00:00:30 =   11.5/s Avg: 11942 Min:     1 Max:
119542 Err:     0 (0.00%) Active: 268 Started: 400 Finished: 132 | host: 34.214.127.229
> 16:50:05: Generate Summary Results +    305 in 00:00:30 =   10.1/s Avg:  7095 Min:     1 Max:
104544 Err:     0 (0.00%) Active: 209 Started: 400 Finished: 191 | host: 54.187.13.158
```

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> 16:50:05: Generate Summary Results +    281 in 00:00:30 =    9.4/s Avg:  5504 Min:     1 Max:
88260 Err:     0 (0.00%) Active: 208 Started: 400 Finished: 192 | host: 54.201.27.231
> 16:50:05: Generate Summary Results +    291 in 00:00:30 =    9.7/s Avg:  5770 Min:     1 Max:
91074 Err:     0 (0.00%) Active: 209 Started: 400 Finished: 191 | host: 34.217.34.249
> 16:50:05: Generate Summary Results +    302 in 00:00:30 =   10.1/s Avg:  7975 Min:     1 Max:
115685 Err:     0 (0.00%) Active: 226 Started: 400 Finished: 174 | host: 54.149.245.249
> 16:50:05: Generate Summary Results +    291 in 00:00:30 =    9.8/s Avg:  7328 Min:     1 Max:
117925 Err:     0 (0.00%) Active: 209 Started: 400 Finished: 191 | host: 34.214.127.229
> 16:50:36: Generate Summary Results +    234 in 00:00:30 =    7.8/s Avg:  1173 Min:     1 Max:
19307 Err:     1 (0.43%) Active: 131 Started: 400 Finished: 269 | host: 54.187.13.158
> 16:50:36: Generate Summary Results +    238 in 00:00:30 =    7.8/s Avg:  1815 Min:     2 Max:
22404 Err:     0 (0.00%) Active: 119 Started: 400 Finished: 281 | host: 54.201.27.231
> 16:50:36: Generate Summary Results +    242 in 00:00:30 =    8.1/s Avg:  1296 Min:     1 Max:
27846 Err:     1 (0.41%) Active: 114 Started: 400 Finished: 286 | host: 34.217.34.249
> 16:50:36: Generate Summary Results +    261 in 00:00:30 =    8.7/s Avg:  1466 Min:     1 Max:
24361 Err:     0 (0.00%) Active: 132 Started: 400 Finished: 268 | host: 54.149.245.249
> 16:50:36: Generate Summary Results +    240 in 00:00:30 =    8.0/s Avg:  1399 Min:     1 Max:
23373 Err:     0 (0.00%) Active: 112 Started: 400 Finished: 288 | host: 34.214.127.229
> 16:50:36: Generate Summary Results =   4145 in 00:06:52 =   10.1/s Avg:  4697 Min:     1 Max:
125477 Err:    15 (0.36%) | host: 54.187.13.158
> 16:50:36: Generate Summary Results =   4155 in 00:06:52 =   10.1/s Avg:  4639 Min:     1 Max:
119552 Err:    10 (0.24%) | host: 54.201.27.231
> 16:50:36: Generate Summary Results =   4165 in 00:06:52 =   10.1/s Avg:  4525 Min:     1 Max:
125136 Err:    14 (0.34%) | host: 34.217.34.249
> 16:50:36: Generate Summary Results =   4133 in 00:06:52 =   10.0/s Avg:  5009 Min:     1 Max:
120743 Err:    21 (0.51%) | host: 54.149.245.249
> 16:50:36: Generate Summary Results =   4169 in 00:06:52 =   10.1/s Avg:  4613 Min:     1 Max:
125238 Err:     7 (0.17%) | host: 34.214.127.229
>
> 16:50:36: [RUNNING TOTALS] total count: 20767, current avg: 1429 (ms), average tps: 50.4 (p/sec),
recent tps: 40.4 (p/sec), total errors: 67
>
> 16:51:06: Generate Summary Results +    144 in 00:00:30 =    4.8/s Avg:   259 Min:     1 Max:
1609 Err:     0 (0.00%) Active: 67 Started: 400 Finished: 333 | host: 54.187.13.158
> 16:51:06: Generate Summary Results +    132 in 00:00:30 =    4.4/s Avg:   272 Min:     1 Max:
1603 Err:     0 (0.00%) Active: 68 Started: 400 Finished: 332 | host: 54.201.27.231
> 16:51:06: Generate Summary Results +    135 in 00:00:31 =    4.3/s Avg:   329 Min:     1 Max:
1587 Err:     1 (0.74%) Active: 65 Started: 400 Finished: 335 | host: 34.217.34.249
> 16:51:06: Generate Summary Results +    153 in 00:00:30 =    5.1/s Avg:   352 Min:     1 Max:
1648 Err:     0 (0.00%) Active: 76 Started: 400 Finished: 324 | host: 54.149.245.249
> 16:51:06: Generate Summary Results +    122 in 00:00:30 =    4.0/s Avg:   232 Min:     1 Max:
1497 Err:     0 (0.00%) Active: 65 Started: 400 Finished: 335 | host: 34.214.127.229
> 16:51:36: Generate Summary Results +     73 in 00:00:30 =    2.4/s Avg:  1173 Min:     2 Max:
4824 Err:     0 (0.00%) Active: 38 Started: 400 Finished: 362 | host: 54.187.13.158
> 16:51:36: Generate Summary Results +     80 in 00:00:30 =    2.7/s Avg:  1305 Min:    22 Max:
5855 Err:     0 (0.00%) Active: 33 Started: 400 Finished: 367 | host: 54.201.27.231
> 16:51:36: Generate Summary Results +     72 in 00:00:29 =    2.5/s Avg:   920 Min:     2 Max:
3213 Err:     0 (0.00%) Active: 29 Started: 400 Finished: 371 | host: 34.217.34.249
> 16:51:36: Generate Summary Results +     87 in 00:00:32 =    2.7/s Avg:   895 Min:    21 Max:
5359 Err:     0 (0.00%) Active: 28 Started: 400 Finished: 372 | host: 54.149.245.249
> 16:51:36: Generate Summary Results +     79 in 00:00:31 =    2.6/s Avg:  1034 Min:     1 Max:
3275 Err:     0 (0.00%) Active: 31 Started: 400 Finished: 369 | host: 34.214.127.229
>
>
> 16:52:06: [FINAL RESULTS] total count: 22000, overall avg: 4461 (ms), overall tps: 44.3 (p/sec),
recent tps: 6.5 (p/sec), errors: 68
>
================================================================== END OF JMETER-EC2 TEST
```

3000 users 3 node cluster jmeter output

```
===================== START OF JMETER-EC2 TEST ================================
> [updates: every 30 seconds | running total: every 90 seconds]
>
> waiting for the test to start...to stop the test while it is running, press CTRL-C
> 17:30:33: Generate Summary Results +    114 in 00:00:27 =    4.2/s Avg:   300 Min:    62 Max:
421 Err:     0 (0.00%) Active: 214 Started: 214 Finished: 0 | host: 54.187.225.25
> 17:30:33: Generate Summary Results +    122 in 00:00:29 =    4.1/s Avg:   292 Min:    54 Max:
418 Err:     0 (0.00%) Active: 215 Started: 215 Finished: 0 | host: 54.218.56.183
> 17:30:33: Generate Summary Results +    120 in 00:00:30 =    4.0/s Avg:   292 Min:    55 Max:
429 Err:     0 (0.00%) Active: 215 Started: 215 Finished: 0 | host: 54.68.253.182
> 17:30:33: Generate Summary Results +    117 in 00:00:30 =    4.0/s Avg:   297 Min:    54 Max:
417 Err:     0 (0.00%) Active: 214 Started: 214 Finished: 0 | host: 52.43.170.99
> 17:30:33: Generate Summary Results +    115 in 00:00:30 =    3.8/s Avg:   299 Min:    59 Max:
435 Err:     0 (0.00%) Active: 215 Started: 215 Finished: 0 | host: 52.24.108.238
> 17:30:33: Generate Summary Results +    122 in 00:00:29 =    4.2/s Avg:   297 Min:    55 Max:
438 Err:     0 (0.00%) Active: 215 Started: 215 Finished: 0 | host: 54.201.227.245
> 17:31:03: Generate Summary Results +    267 in 00:00:30 =    8.9/s Avg:   227 Min:    52 Max:
590 Err:     0 (0.00%) Active: 339 Started: 339 Finished: 0 | host: 54.187.225.25
> 17:31:03: Generate Summary Results +    261 in 00:00:30 =    8.7/s Avg:   234 Min:    48 Max:
651 Err:     0 (0.00%) Active: 339 Started: 339 Finished: 0 | host: 54.218.56.183
> 17:31:03: Generate Summary Results +    268 in 00:00:30 =    9.0/s Avg:   227 Min:    51 Max:
677 Err:     0 (0.00%) Active: 338 Started: 338 Finished: 0 | host: 54.68.253.182
> 17:31:03: Generate Summary Results +    262 in 00:00:30 =    8.7/s Avg:   218 Min:    53 Max:
623 Err:     0 (0.00%) Active: 339 Started: 339 Finished: 0 | host: 52.43.170.99
> 17:31:04: Generate Summary Results +    270 in 00:00:30 =    9.1/s Avg:   229 Min:    50 Max:
614 Err:     0 (0.00%) Active: 338 Started: 338 Finished: 0 | host: 52.24.108.238
> 17:31:04: Generate Summary Results +    276 in 00:00:30 =    9.2/s Avg:   233 Min:    53 Max:
740 Err:     0 (0.00%) Active: 340 Started: 340 Finished: 0 | host: 54.201.227.245
> 17:31:34: Generate Summary Results +    406 in 00:00:30 =   13.5/s Avg:   479 Min:    63 Max:
1540 Err:     0 (0.00%) Active: 463 Started: 463 Finished: 0 | host: 54.187.225.25
> 17:31:34: Generate Summary Results +    400 in 00:00:30 =   13.3/s Avg:   459 Min:    57 Max:
1808 Err:     0 (0.00%) Active: 463 Started: 463 Finished: 0 | host: 54.218.56.183
> 17:31:34: Generate Summary Results +    409 in 00:00:30 =   13.6/s Avg:   497 Min:    67 Max:
1691 Err:     0 (0.00%) Active: 463 Started: 463 Finished: 0 | host: 54.68.253.182
> 17:31:34: Generate Summary Results +    416 in 00:00:30 =   13.9/s Avg:   485 Min:    65 Max:
1542 Err:     0 (0.00%) Active: 463 Started: 463 Finished: 0 | host: 52.43.170.99
> 17:31:34: Generate Summary Results +    403 in 00:00:30 =   13.4/s Avg:   467 Min:    16 Max:
1648 Err:     0 (0.00%) Active: 463 Started: 463 Finished: 0 | host: 52.24.108.238
> 17:31:34: Generate Summary Results +    386 in 00:00:30 =   12.9/s Avg:   468 Min:    67 Max:
1612 Err:     0 (0.00%) Active: 464 Started: 464 Finished: 0 | host: 54.201.227.245
> 17:32:04: Generate Summary Results +    523 in 00:00:30 =   17.4/s Avg:  1976 Min:     1 Max:
6179 Err:     0 (0.00%) Active: 500 Started: 500 Finished: 0 | host: 54.187.225.25
> 17:32:04: Generate Summary Results +    516 in 00:00:30 =   17.2/s Avg:  1988 Min:     1 Max:
6414 Err:     0 (0.00%) Active: 500 Started: 500 Finished: 0 | host: 54.218.56.183
> 17:32:04: Generate Summary Results +    526 in 00:00:30 =   17.5/s Avg:  1934 Min:     1 Max:
6631 Err:     1 (0.19%) Active: 500 Started: 500 Finished: 0 | host: 54.68.253.182
> 17:32:04: Generate Summary Results +    506 in 00:00:30 =   16.9/s Avg:  1920 Min:     1 Max:
5151 Err:     1 (0.20%) Active: 500 Started: 500 Finished: 0 | host: 52.43.170.99
> 17:32:04: Generate Summary Results +    510 in 00:00:30 =   17.0/s Avg:  1955 Min:     1 Max:
6192 Err:     0 (0.00%) Active: 500 Started: 500 Finished: 0 | host: 52.24.108.238
> 17:32:04: Generate Summary Results +    512 in 00:00:30 =   17.1/s Avg:  1945 Min:     1 Max:
6544 Err:     1 (0.20%) Active: 500 Started: 500 Finished: 0 | host: 54.201.227.245
> 17:32:04: Generate Summary Results =   1312 in 00:02:22 =    9.2/s Avg:  1009 Min:     1 Max:
6179 Err:     0 (0.00%) | host: 54.187.225.25
> 17:32:04: Generate Summary Results =   1302 in 00:02:22 =    9.2/s Avg:  1004 Min:     1 Max:
6414 Err:     0 (0.00%) | host: 54.218.56.183
> 17:32:04: Generate Summary Results =   1324 in 00:02:22 =    9.3/s Avg:   994 Min:     1 Max:
6631 Err:     1 (0.08%) | host: 54.68.253.182
```

```
> 17:32:04: Generate Summary Results =   1302 in 00:02:22 =    9.2/s Avg:   972 Min:     1 Max:
5151 Err:     1 (0.08%) | host: 52.43.170.99
> 17:32:04: Generate Summary Results =   1300 in 00:02:22 =    9.2/s Avg:   986 Min:     1 Max:
6192 Err:     0 (0.00%) | host: 52.24.108.238
> 17:32:04: Generate Summary Results =   1297 in 00:02:22 =    9.1/s Avg:   985 Min:     1 Max:
6544 Err:     1 (0.08%) | host: 54.201.227.245
>
> 17:32:04: [RUNNING TOTALS] total count: 7837, current avg: 1953 (ms), average tps: 55.2 (p/sec),
recent tps: 103.1 (p/sec), total errors: 3
>
> 17:32:34: Generate Summary Results +    551 in 00:00:30 =   18.4/s Avg:  2418 Min:     1 Max:
10103 Err:     8 (1.45%) Active: 500 Started: 500 Finished: 0 | host: 54.187.225.25
> 17:32:34: Generate Summary Results +    539 in 00:00:30 =   18.0/s Avg:  2371 Min:     1 Max:
9519 Err:    13 (2.41%) Active: 500 Started: 500 Finished: 0 | host: 54.218.56.183
> 17:32:34: Generate Summary Results +    546 in 00:00:30 =   18.2/s Avg:  2352 Min:     1 Max:
10636 Err:    13 (2.38%) Active: 500 Started: 500 Finished: 0 | host: 54.68.253.182
> 17:32:34: Generate Summary Results +    541 in 00:00:30 =   18.1/s Avg:  2365 Min:     1 Max:
9027 Err:    10 (1.85%) Active: 500 Started: 500 Finished: 0 | host: 52.43.170.99
> 17:32:34: Generate Summary Results +    544 in 00:00:30 =   18.1/s Avg:  2424 Min:     1 Max:
8720 Err:    13 (2.39%) Active: 500 Started: 500 Finished: 0 | host: 52.24.108.238
> 17:32:35: Generate Summary Results +    545 in 00:00:30 =   18.1/s Avg:  2447 Min:     1 Max:
10758 Err:     8 (1.47%) Active: 500 Started: 500 Finished: 0 | host: 54.201.227.245
> 17:33:05: Generate Summary Results +    478 in 00:00:30 =   16.0/s Avg:  3783 Min:     1 Max:
23385 Err:    12 (2.51%) Active: 500 Started: 500 Finished: 0 | host: 54.187.225.25
> 17:33:05: Generate Summary Results +    478 in 00:00:30 =   15.9/s Avg:  3554 Min:     1 Max:
25024 Err:    10 (2.09%) Active: 500 Started: 500 Finished: 0 | host: 54.218.56.183
> 17:33:05: Generate Summary Results +    483 in 00:00:30 =   16.1/s Avg:  3820 Min:     1 Max:
19665 Err:    18 (3.73%) Active: 500 Started: 500 Finished: 0 | host: 54.68.253.182
> 17:33:05: Generate Summary Results +    491 in 00:00:30 =   16.3/s Avg:  3715 Min:     1 Max:
19126 Err:    23 (4.68%) Active: 500 Started: 500 Finished: 0 | host: 52.43.170.99
> 17:33:05: Generate Summary Results +    468 in 00:00:30 =   15.6/s Avg:  3730 Min:     1 Max:
20873 Err:    20 (4.27%) Active: 500 Started: 500 Finished: 0 | host: 52.24.108.238
> 17:33:05: Generate Summary Results +    476 in 00:00:30 =   16.0/s Avg:  3701 Min:     1 Max:
27253 Err:    10 (2.10%) Active: 500 Started: 500 Finished: 0 | host: 54.201.227.245
> 17:33:35: Generate Summary Results +    520 in 00:00:30 =   17.3/s Avg:  4390 Min:     1 Max:
47393 Err:    15 (2.88%) Active: 500 Started: 500 Finished: 0 | host: 54.187.225.25
> 17:33:35: Generate Summary Results +    525 in 00:00:30 =   17.6/s Avg:  4499 Min:     1 Max:
46339 Err:    26 (4.95%) Active: 500 Started: 500 Finished: 0 | host: 54.218.56.183
> 17:33:35: Generate Summary Results +    509 in 00:00:30 =   17.0/s Avg:  4148 Min:     1 Max:
50784 Err:    18 (3.54%) Active: 500 Started: 500 Finished: 0 | host: 54.68.253.182
> 17:33:35: Generate Summary Results +    520 in 00:00:30 =   17.3/s Avg:  4237 Min:     1 Max:
35920 Err:    13 (2.50%) Active: 500 Started: 500 Finished: 0 | host: 52.43.170.99
> 17:33:35: Generate Summary Results +    515 in 00:00:30 =   17.1/s Avg:  4151 Min:     1 Max:
42855 Err:    14 (2.72%) Active: 500 Started: 500 Finished: 0 | host: 52.24.108.238
> 17:33:35: Generate Summary Results +    516 in 00:00:30 =   17.2/s Avg:  4319 Min:     1 Max:
36610 Err:    18 (3.49%) Active: 500 Started: 500 Finished: 0 | host: 54.201.227.245
> 17:33:35: Generate Summary Results =   2861 in 00:03:52 =   12.3/s Avg:  2358 Min:     1 Max:
47393 Err:    35 (1.22%) | host: 54.187.225.25
> 17:33:35: Generate Summary Results =   2844 in 00:03:52 =   12.3/s Avg:  2337 Min:     1 Max:
46339 Err:    49 (1.72%) | host: 54.218.56.183
> 17:33:35: Generate Summary Results =   2862 in 00:03:52 =   12.3/s Avg:  2291 Min:     1 Max:
50784 Err:    50 (1.75%) | host: 54.68.253.182
> 17:33:35: Generate Summary Results =   2854 in 00:03:52 =   12.3/s Avg:  2303 Min:     1 Max:
35920 Err:    47 (1.65%) | host: 52.43.170.99
> 17:33:35: Generate Summary Results =   2827 in 00:03:52 =   12.2/s Avg:  2294 Min:     1 Max:
42855 Err:    47 (1.66%) | host: 52.24.108.238
> 17:33:35: Generate Summary Results =   2834 in 00:03:52 =   12.2/s Avg:  2329 Min:     1 Max:
36610 Err:    37 (1.31%) | host: 54.201.227.245
>
> 17:33:35: [RUNNING TOTALS] total count: 17082, current avg: 4290 (ms), average tps: 73.6 (p/sec),
recent tps: 103.5 (p/sec), total errors: 265
>
```

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> 17:34:05: Generate Summary Results +    519 in 00:00:30 =   17.3/s Avg:  2558 Min:     1 Max:
53686 Err:    15 (2.89%) Active: 500 Started: 500 Finished: 0 | host: 54.187.225.25
> 17:34:05: Generate Summary Results +    560 in 00:00:30 =   18.7/s Avg:  2733 Min:     1 Max:
52274 Err:     7 (1.25%) Active: 500 Started: 500 Finished: 0 | host: 54.218.56.183
> 17:34:05: Generate Summary Results +    544 in 00:00:30 =   18.1/s Avg:  3504 Min:     1 Max:
64236 Err:    19 (3.49%) Active: 500 Started: 500 Finished: 0 | host: 54.68.253.182
> 17:34:05: Generate Summary Results +    523 in 00:00:30 =   17.5/s Avg:  3014 Min:     1 Max:
63579 Err:    18 (3.44%) Active: 500 Started: 500 Finished: 0 | host: 52.43.170.99
> 17:34:05: Generate Summary Results +    546 in 00:00:30 =   18.2/s Avg:  3479 Min:     1 Max:
62042 Err:    15 (2.75%) Active: 499 Started: 500 Finished: 1 | host: 52.24.108.238
> 17:34:06: Generate Summary Results +    548 in 00:00:30 =   18.3/s Avg:  3051 Min:     1 Max:
54620 Err:    19 (3.47%) Active: 500 Started: 500 Finished: 0 | host: 54.201.227.245
> 17:34:36: Generate Summary Results +    496 in 00:00:30 =   16.5/s Avg:  4568 Min:     1 Max:
59317 Err:    24 (4.84%) Active: 490 Started: 500 Finished: 10 | host: 54.187.225.25
> 17:34:36: Generate Summary Results +    494 in 00:00:30 =   16.4/s Avg:  3475 Min:     1 Max:
60982 Err:    14 (2.83%) Active: 484 Started: 500 Finished: 16 | host: 54.218.56.183
> 17:34:36: Generate Summary Results +    490 in 00:00:30 =   16.3/s Avg:  3265 Min:     1 Max:
55581 Err:    15 (3.06%) Active: 486 Started: 500 Finished: 14 | host: 54.68.253.182
> 17:34:36: Generate Summary Results +    478 in 00:00:30 =   15.9/s Avg:  3499 Min:     1 Max:
75103 Err:    17 (3.56%) Active: 482 Started: 500 Finished: 18 | host: 52.43.170.99
> 17:34:36: Generate Summary Results +    483 in 00:00:30 =   16.1/s Avg:  3803 Min:     1 Max:
68063 Err:    20 (4.14%) Active: 484 Started: 500 Finished: 16 | host: 52.24.108.238
> 17:34:36: Generate Summary Results +    503 in 00:00:30 =   16.7/s Avg:  3580 Min:     1 Max:
73369 Err:    13 (2.58%) Active: 482 Started: 500 Finished: 18 | host: 54.201.227.245
> 17:35:06: Generate Summary Results +    536 in 00:00:30 =   17.9/s Avg:  2724 Min:     1 Max:
63465 Err:     2 (0.37%) Active: 401 Started: 500 Finished: 99 | host: 54.187.225.25
> 17:35:06: Generate Summary Results +    527 in 00:00:30 =   17.6/s Avg:  3013 Min:     1 Max:
76214 Err:     4 (0.76%) Active: 401 Started: 500 Finished: 99 | host: 54.218.56.183
> 17:35:06: Generate Summary Results +    523 in 00:00:30 =   17.5/s Avg:  3176 Min:     1 Max:
74750 Err:     8 (1.53%) Active: 402 Started: 500 Finished: 98 | host: 54.68.253.182
> 17:35:06: Generate Summary Results +    513 in 00:00:30 =   17.2/s Avg:  4468 Min:     1 Max:
83894 Err:     5 (0.97%) Active: 406 Started: 500 Finished: 94 | host: 52.43.170.99
> 17:35:06: Generate Summary Results +    524 in 00:00:30 =   17.5/s Avg:  4063 Min:     1 Max:
77883 Err:     5 (0.95%) Active: 401 Started: 500 Finished: 99 | host: 52.24.108.238
> 17:35:06: Generate Summary Results +    518 in 00:00:30 =   17.2/s Avg:  3293 Min:     1 Max:
88637 Err:     1 (0.19%) Active: 403 Started: 500 Finished: 97 | host: 54.201.227.245
> 17:35:06: Generate Summary Results =   4412 in 00:05:22 =   13.7/s Avg:  2675 Min:     1 Max:
63465 Err:    76 (1.72%) | host: 54.187.225.25
> 17:35:06: Generate Summary Results =   4425 in 00:05:22 =   13.7/s Avg:  2595 Min:     1 Max:
76214 Err:    74 (1.67%) | host: 54.218.56.183
> 17:35:06: Generate Summary Results =   4419 in 00:05:22 =   13.7/s Avg:  2653 Min:     1 Max:
74750 Err:    92 (2.08%) | host: 54.68.253.182
> 17:35:06: Generate Summary Results =   4368 in 00:05:22 =   13.6/s Avg:  2773 Min:     1 Max:
83894 Err:    87 (1.99%) | host: 52.43.170.99
> 17:35:06: Generate Summary Results =   4380 in 00:05:22 =   13.6/s Avg:  2820 Min:     1 Max:
77883 Err:    87 (1.99%) | host: 52.24.108.238
> 17:35:06: Generate Summary Results =   4403 in 00:05:22 =   13.7/s Avg:  2675 Min:     1 Max:
88637 Err:    70 (1.59%) | host: 54.201.227.245
>
> 17:35:06: [RUNNING TOTALS] total count: 26407, current avg: 3456 (ms), average tps: 82.0 (p/sec),
recent tps: 104.9 (p/sec), total errors: 486
>
> 17:35:36: Generate Summary Results +    458 in 00:00:30 =   15.3/s Avg:  3939 Min:     1 Max:
61943 Err:     2 (0.44%) Active: 294 Started: 500 Finished: 206 | host: 54.187.225.25
> 17:35:36: Generate Summary Results +    455 in 00:00:30 =   15.1/s Avg:  3882 Min:     1 Max:
66237 Err:     8 (1.76%) Active: 292 Started: 500 Finished: 208 | host: 54.218.56.183
> 17:35:36: Generate Summary Results +    465 in 00:00:30 =   15.5/s Avg:  4829 Min:     1 Max:
82972 Err:     4 (0.86%) Active: 294 Started: 500 Finished: 206 | host: 54.68.253.182
> 17:35:36: Generate Summary Results +    469 in 00:00:30 =   15.6/s Avg:  5012 Min:     1 Max:
74087 Err:     3 (0.64%) Active: 290 Started: 500 Finished: 210 | host: 52.43.170.99
> 17:35:36: Generate Summary Results +    468 in 00:00:30 =   15.5/s Avg:  4162 Min:     1 Max:
76841 Err:     4 (0.85%) Active: 292 Started: 500 Finished: 208 | host: 52.24.108.238
```

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> 17:35:37: Generate Summary Results +    468 in 00:00:30 =   15.7/s Avg:  3819 Min:     1 Max:
63738 Err:     2 (0.43%) Active: 294 Started: 500 Finished: 206 | host: 54.201.227.245
> 17:36:07: Generate Summary Results +    331 in 00:00:30 =   11.0/s Avg:   276 Min:     1 Max:
3145 Err:     5 (1.51%) Active: 180 Started: 500 Finished: 320 | host: 54.187.225.25
> 17:36:07: Generate Summary Results +    328 in 00:00:30 =   10.8/s Avg:   282 Min:     1 Max:
2243 Err:     3 (0.91%) Active: 176 Started: 500 Finished: 324 | host: 54.218.56.183
> 17:36:07: Generate Summary Results +    347 in 00:00:30 =   11.5/s Avg:   255 Min:     1 Max:
2025 Err:     4 (1.15%) Active: 165 Started: 500 Finished: 335 | host: 54.68.253.182
> 17:36:07: Generate Summary Results +    346 in 00:00:30 =   11.5/s Avg:   275 Min:     1 Max:
2106 Err:     3 (0.87%) Active: 182 Started: 500 Finished: 318 | host: 52.43.170.99
> 17:36:07: Generate Summary Results +    327 in 00:00:30 =   11.0/s Avg:   317 Min:     1 Max:
2506 Err:     3 (0.92%) Active: 190 Started: 500 Finished: 310 | host: 52.24.108.238
> 17:36:07: Generate Summary Results +    335 in 00:00:30 =   11.2/s Avg:   309 Min:     1 Max:
2758 Err:     2 (0.60%) Active: 182 Started: 500 Finished: 318 | host: 54.201.227.245
> 17:36:37: Generate Summary Results +    209 in 00:00:30 =    7.0/s Avg:   180 Min:     1 Max:
1317 Err:     2 (0.96%) Active: 64 Started: 500 Finished: 436 | host: 54.187.225.25
> 17:36:37: Generate Summary Results +    201 in 00:00:30 =    6.7/s Avg:   157 Min:     1 Max:
1242 Err:     0 (0.00%) Active: 65 Started: 500 Finished: 435 | host: 54.218.56.183
> 17:36:37: Generate Summary Results +    189 in 00:00:30 =    6.3/s Avg:   170 Min:     1 Max:
1251 Err:     0 (0.00%) Active: 54 Started: 500 Finished: 446 | host: 54.68.253.182
> 17:36:37: Generate Summary Results +    200 in 00:00:31 =    6.5/s Avg:   193 Min:     1 Max:
1384 Err:     2 (1.00%) Active: 79 Started: 500 Finished: 421 | host: 52.43.170.99
> 17:36:37: Generate Summary Results +    218 in 00:00:30 =    7.2/s Avg:   176 Min:     1 Max:
1192 Err:     1 (0.46%) Active: 71 Started: 500 Finished: 429 | host: 52.24.108.238
> 17:36:37: Generate Summary Results +    203 in 00:00:31 =    6.6/s Avg:   152 Min:     1 Max:
1148 Err:     3 (1.48%) Active: 61 Started: 500 Finished: 439 | host: 54.201.227.245
> 17:36:37: Generate Summary Results =   5410 in 00:06:52 =   13.1/s Avg:  2539 Min:     1 Max:
63465 Err:    85 (1.57%) | host: 54.187.225.25
> 17:36:37: Generate Summary Results =   5409 in 00:06:52 =   13.1/s Avg:  2472 Min:     1 Max:
76214 Err:    85 (1.57%) | host: 54.218.56.183
> 17:36:37: Generate Summary Results =   5420 in 00:06:52 =   13.2/s Avg:  2600 Min:     1 Max:
82972 Err:   100 (1.85%) | host: 54.68.253.182
> 17:36:37: Generate Summary Results =   5383 in 00:06:52 =   13.1/s Avg:  2712 Min:     1 Max:
83894 Err:    95 (1.76%) | host: 52.43.170.99
> 17:36:37: Generate Summary Results =   5393 in 00:06:52 =   13.1/s Avg:  2677 Min:     1 Max:
77883 Err:    95 (1.76%) | host: 52.24.108.238
> 17:36:37: Generate Summary Results =   5409 in 00:06:53 =   13.1/s Avg:  2533 Min:     1 Max:
88637 Err:    77 (1.42%) | host: 54.201.227.245
>
> 17:36:37: [RUNNING TOTALS] total count: 32424, current avg: 171 (ms), average tps: 78.7 (p/sec),
recent tps: 40.3 (p/sec), total errors: 537
>
> 17:37:07: Generate Summary Results +     67 in 00:00:32 =    2.1/s Avg:   366 Min:     2 Max:
1240 Err:     0 (0.00%) Active: 23 Started: 500 Finished: 477 | host: 54.187.225.25
> 17:37:07: Generate Summary Results +     71 in 00:00:30 =    2.4/s Avg:   365 Min:     1 Max:
1221 Err:     0 (0.00%) Active: 21 Started: 500 Finished: 479 | host: 54.218.56.183
> 17:37:07: Generate Summary Results +     58 in 00:00:31 =    1.9/s Avg:   420 Min:     2 Max:
1211 Err:     0 (0.00%) Active: 22 Started: 500 Finished: 478 | host: 54.68.253.182
> 17:37:07: Generate Summary Results +     88 in 00:00:31 =    2.8/s Avg:   388 Min:     1 Max:
1404 Err:     0 (0.00%) Active: 28 Started: 500 Finished: 472 | host: 52.43.170.99
> 17:37:07: Generate Summary Results +     82 in 00:00:30 =    2.8/s Avg:   398 Min:     1 Max:
1234 Err:     0 (0.00%) Active: 25 Started: 500 Finished: 475 | host: 52.24.108.238
> 17:37:08: Generate Summary Results +     66 in 00:00:30 =    2.2/s Avg:   326 Min:     1 Max:
1107 Err:     0 (0.00%) Active: 24 Started: 500 Finished: 476 | host: 54.201.227.245
>
> 17:37:38: [FINAL RESULTS] total count: 33000, overall avg: 2548 (ms), overall tps: 70.1 (p/sec),
recent tps: 7.2 (p/sec), errors: 537
>
================================================================== END OF JMETER-EC2 TEST
```