Performance testing meets The Cloud

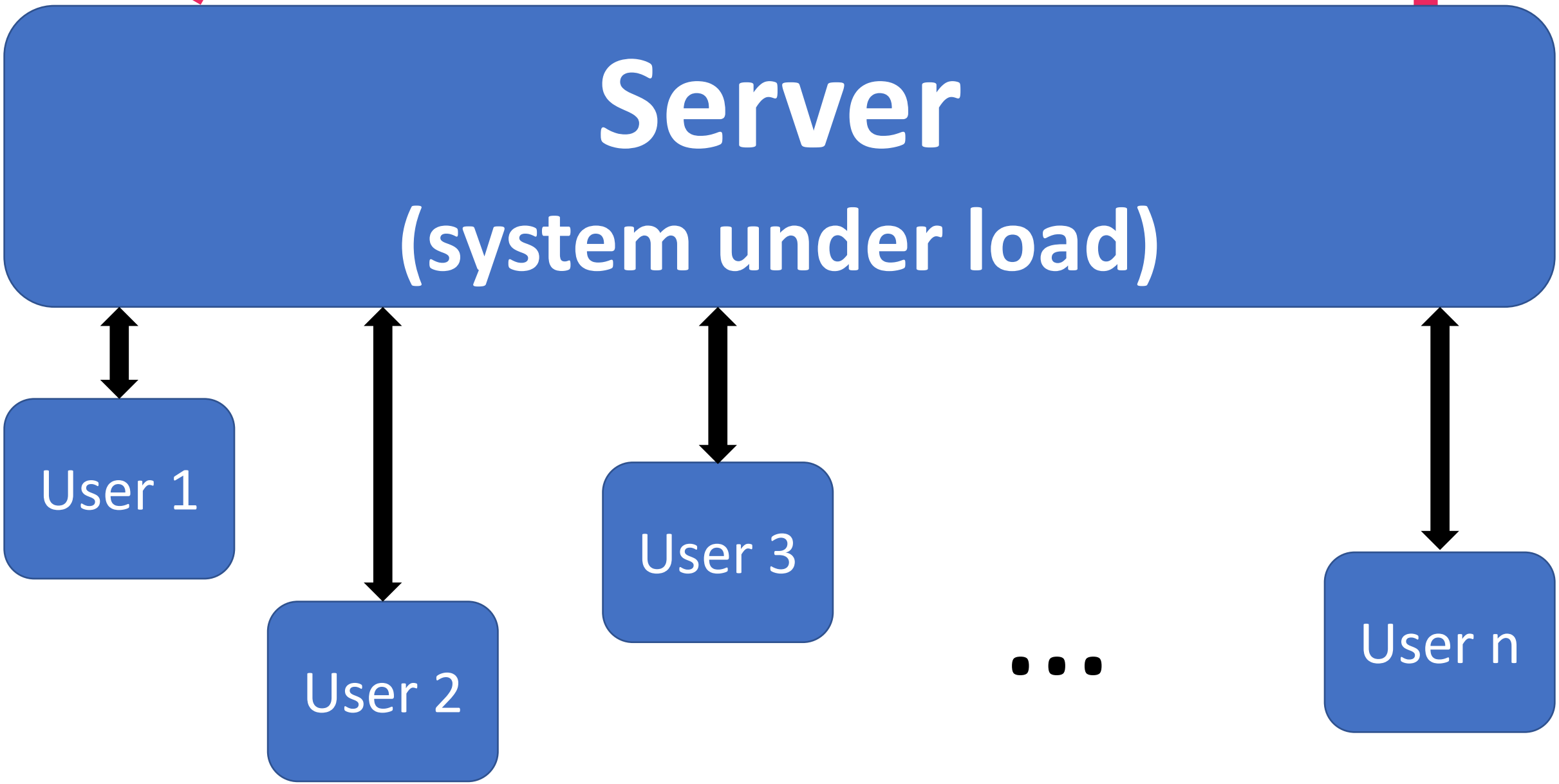
ITea&Coffee

What is Performance Testing?

Wiki:

a **testing practice** performed to
determine **how a system performs**
in terms of **responsiveness and stability**
under a **particular workload**

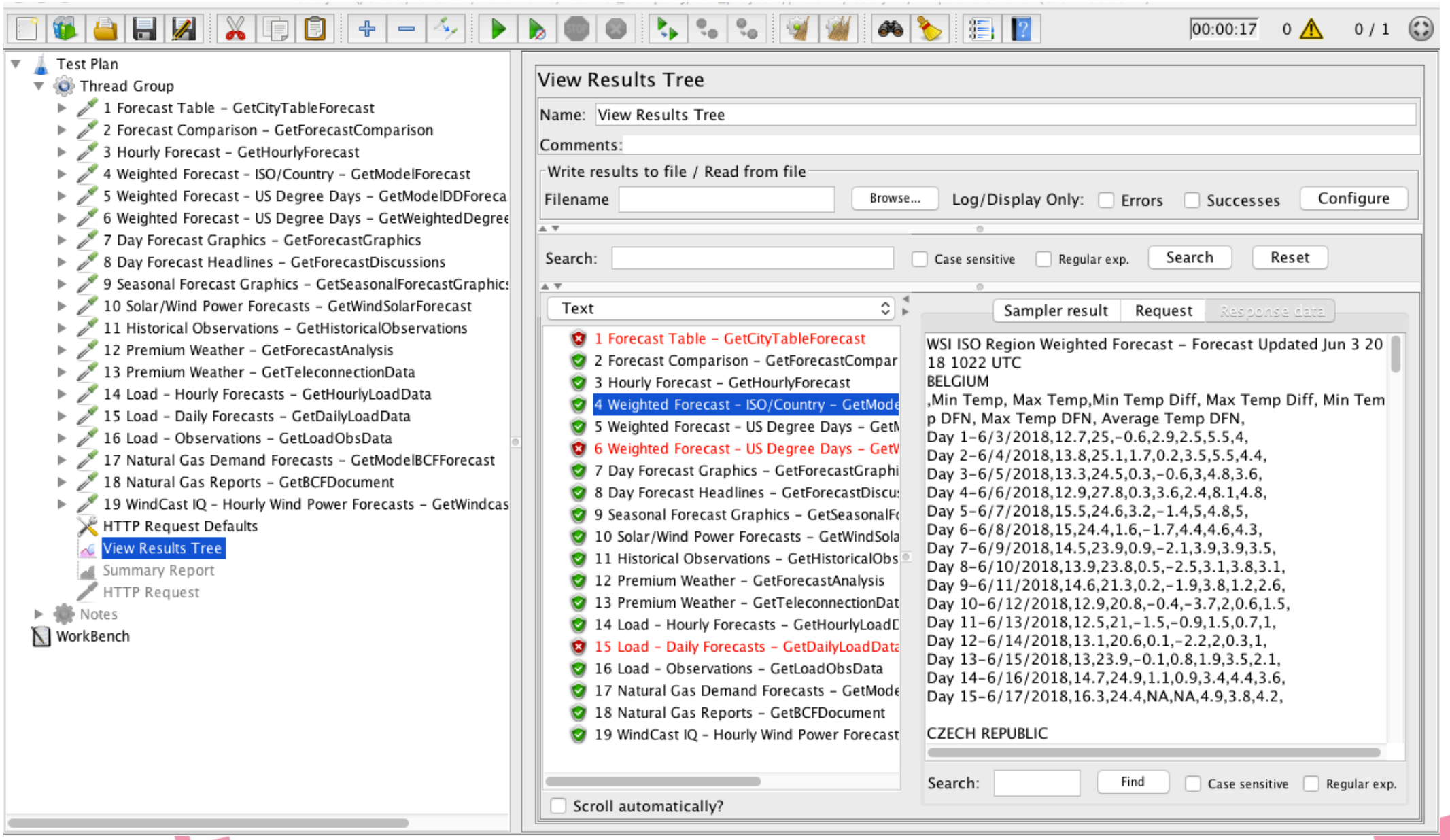
https://en.wikipedia.org/wiki/Software_performance_testing


Server
(system under load)
User 1
User 2
User 3
...
User n

Performance testing: best practices

- Users are different - i.e. sending unique (not hardcoded) requests
- Users are geographically distributed – so should be the test
- Performance testing should be done regularly

Emulate real users - JMeter



JMeter Pros:

- Easy to start with
- Collects performance metrics and generates pretty reports
- Scripts to generate unique requests on the go (Groovy, BeanShell, etc.)
- Active community and plenty of extensions for non-trivial tasks
- Allows distributed testing - ***important***

However – when JMeter run “single handed”:

- No geographical diversity – all requests coming from the same region (throughput limitation)

- Limited abilities of a single instance to generate load (memory issues)

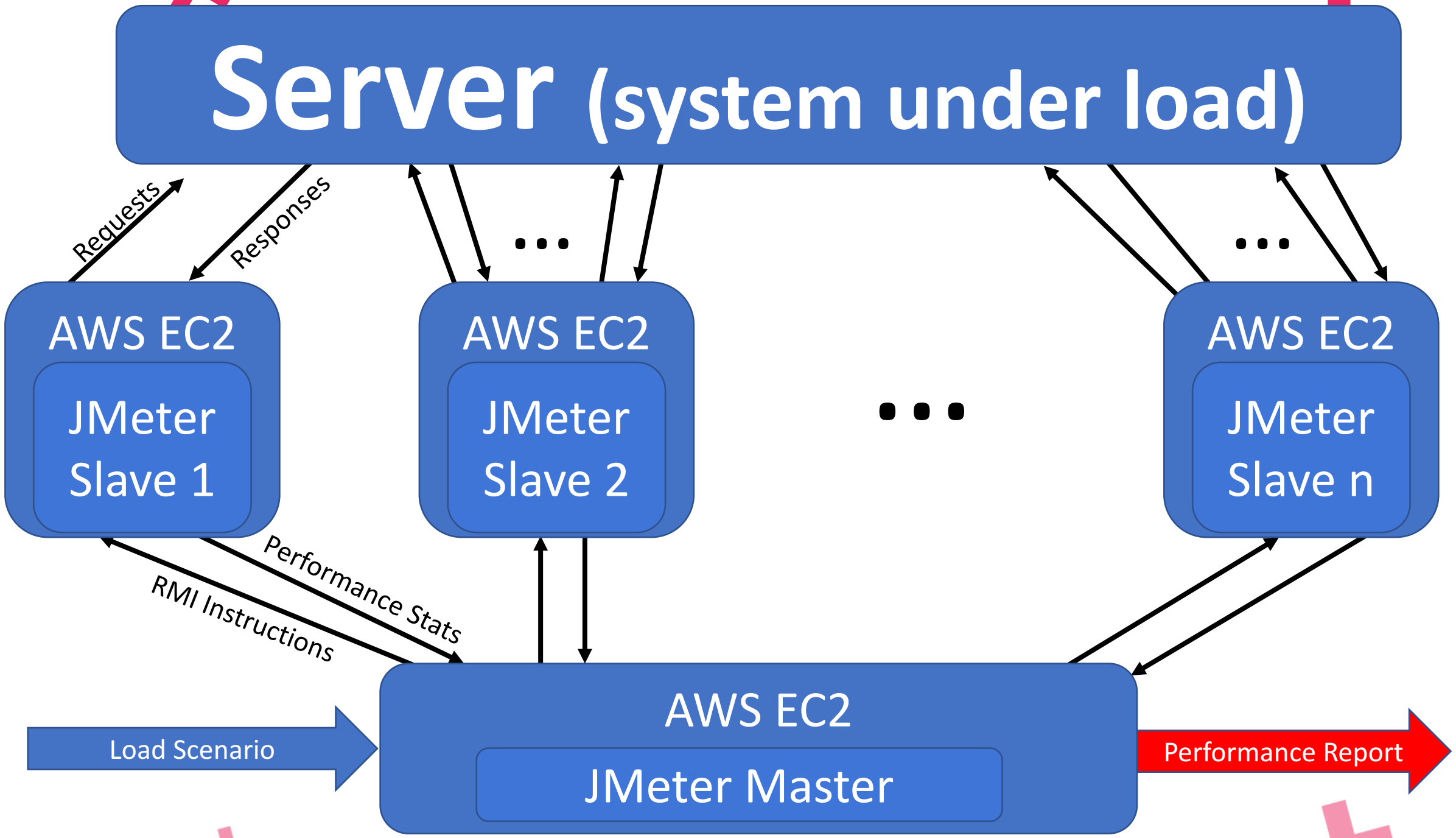
Thus:

running tests with a single JMeter instance is not a proper performance testing

Solution:

1. Set up several JMeter instances in different areas (Amazon Web Services might help)

2. Run performance tests in distributed mode


Server (system under load)
Requests
Responses
AWS EC2
JMeter Slave 1
AWS EC2
JMeter Slave 2
AWS EC2
JMeter Slave n
Performance Stats
RMI Instructions
AWS EC2
JMeter Master
Load Scenario
Performance Report

Setting up an AWS EC2 instance with JMeter:

- Set up Virtual Private Cloud;
- Set up Subnet;
- Set up Internet Gateway;
- Set up Route Table and Association;
- Set up Security Group;
- Add Key Pair;
- Start Instance with public IP;
- Install and configure JMeter (open ports, get IP).

Do that as many times as many instances you want.

Run distributed JMeter test in console:

```
jmeter -n -t load_script_name.jmx
-R 54.172.38.36,...,18.144.50.21 -l report_name.jtl
```

JMeter Dockerized:

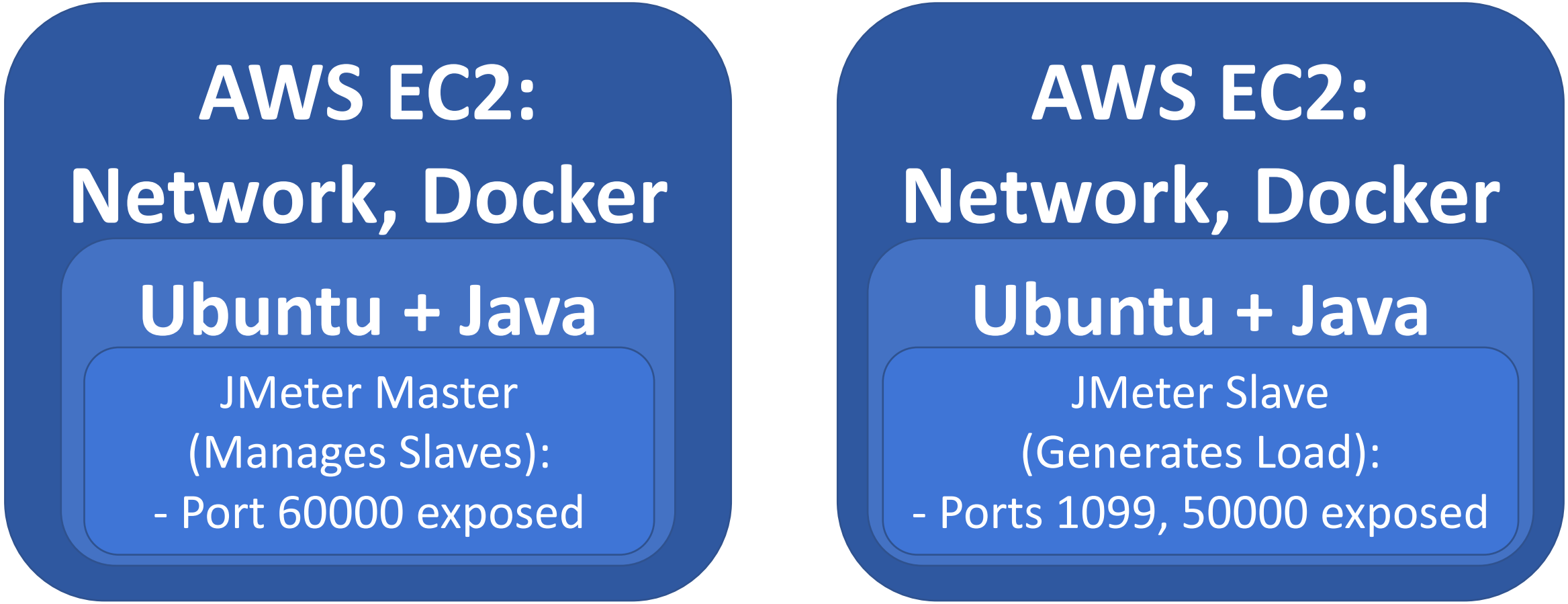
Ubuntu + Java

JMeter Master
(Manages Slaves):
- Port 60000 exposed

Ubuntu + Java

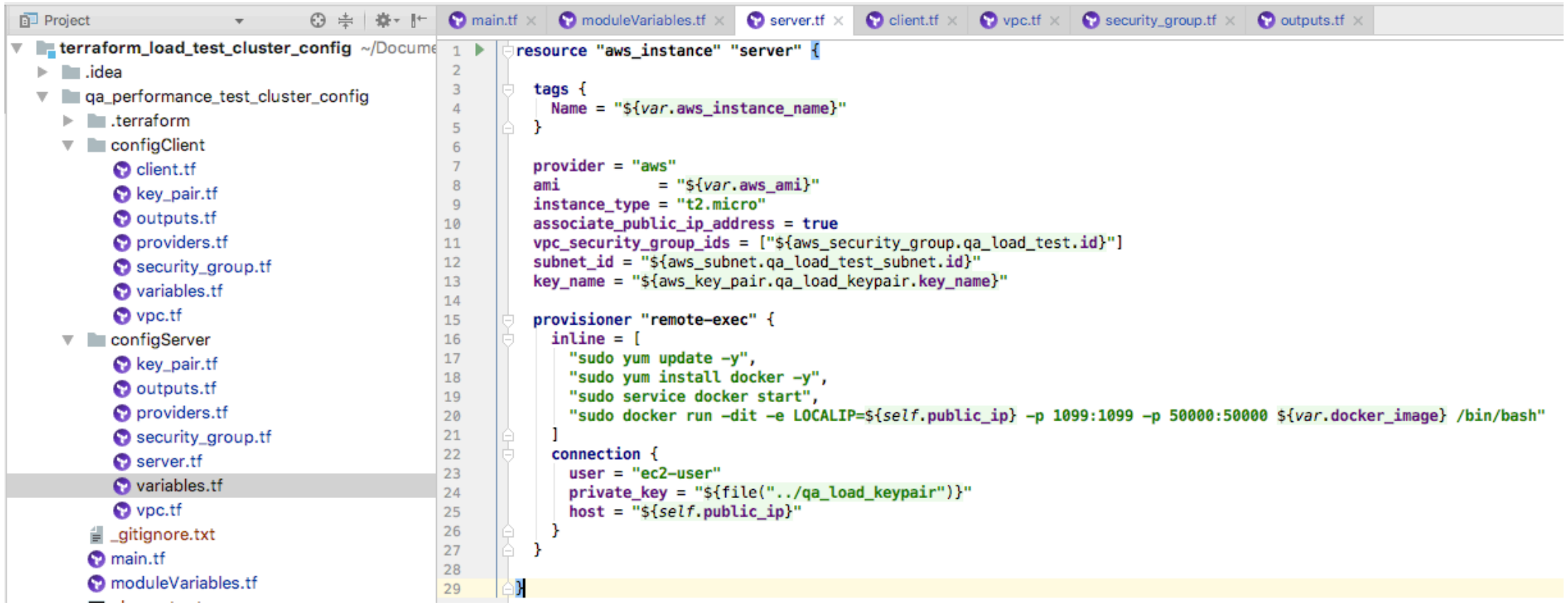
JMeter Slave
(Generates Load):
- Port 1099 exposed
- Port 50000 exposed

Dockerized JMeter on AWS:



Take automation one step further?

Configure the AWS infrastructure automatically with Terraform:



Before you run the whole thing,

make sure to have:

- Valid AWS credentials in ~/.aws/credentials file
- Git, Terraform installed

In the command line,

- clone the project:

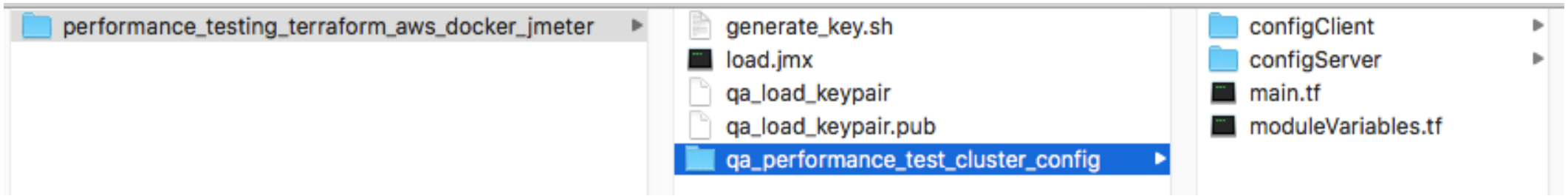
git clone https://github.com/artie-sh/performance_testing_terraform_aws_docker_jmeter.git

- enter the project folder:

cd performance_testing_terraform_aws_docker_jmeter

- generate ssh keys:

./generate_key.sh



- enter the terraform folder:

cd qa_performance_test_cluster_config

- initialize modules:

terraform init

```
Initializing modules...
- module.ireland
  Getting source "./configClient"
- module.n_virginia
  Getting source "./configServer"
- module.ohio
  Getting source "./configServer"
- module.n_california
  Getting source "./configServer"
- module.oregon
  Getting source "./configServer"
```

- plan the output:

terraform plan -out plan.output

```
  + module.oregon.aws_vpc.qa_load_test_vpc
      id:                                   <computed>
      assign_generated_ipv6_cidr_block:     "false"
      cidr_block:                           "10.0.0.0/16"
      default_network_acl_id:               <computed>
      default_route_table_id:               <computed>
      default_security_group_id:            <computed>
      dhcp_options_id:                      <computed>
      enable_classiclink:                   <computed>
      enable_classiclink_dns_support:       <computed>
      enable_dns_hostnames:                 <computed>
      enable_dns_support:                   "true"
      instance_tenancy:                     <computed>
      ipv6_association_id:                  <computed>
      ipv6_cidr_block:                      <computed>
      main_route_table_id:                  <computed>
      tags.%:                               "1"
      tags.Name:                            "qa_load_test_vpc"


Plan: 40 to add, 0 to change, 0 to destroy.

------------------------------------------------------------------------

This plan was saved to: plan.output

To perform exactly these actions, run the following command to apply:
    terraform apply "plan.output"
```

- apply the plan:

terraform apply plan.output

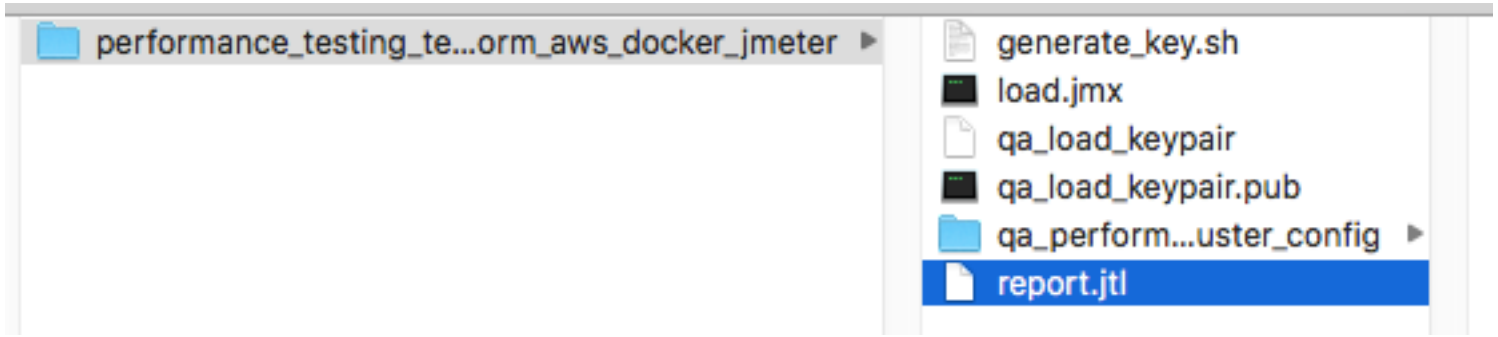
```
module.ireland.aws_instance.client (remote-exec): Creating summariser <summary>
module.ireland.aws_instance.client (remote-exec): Created the tree successfully using load.jmx
module.ireland.aws_instance.client (remote-exec): Configuring remote engine: 34.228.23.191
module.ireland.aws_instance.client (remote-exec): Configuring remote engine: 13.59.45.111
module.ireland.aws_instance.client (remote-exec): Configuring remote engine: 13.57.26.241
module.ireland.aws_instance.client (remote-exec): Configuring remote engine: 54.245.130.102
module.ireland.aws_instance.client: Still creating... (2m10s elapsed)
module.ireland.aws_instance.client (remote-exec): Starting remote engines
module.ireland.aws_instance.client (remote-exec): Starting the test @ Sun Jun 03 15:45:19 UTC 2018 (
1528040719593)
module.ireland.aws_instance.client (remote-exec): Remote engines have been started
module.ireland.aws_instance.client (remote-exec): Waiting for possible Shutdown/StopTestNow/Heapdump
 message on port 4445
module.ireland.aws_instance.client: Still creating... (2m20s elapsed)
module.ireland.aws_instance.client (remote-exec): summary +      4 in 00:00:06 =    0.7/s Avg:  1272
 Min:   777 Max:  2269 Err:     0 (0.00%) Active: 4 Started: 3 Finished: 0
module.ireland.aws_instance.client: Still creating... (2m30s elapsed)
module.ireland.aws_instance.client: Still creating... (2m40s elapsed)
module.ireland.aws_instance.client: Still creating... (2m50s elapsed)
module.ireland.aws_instance.client (remote-exec): summary +    401 in 00:00:35 =   11.4/s Avg:   198
 Min:    10 Max:  2863 Err:     0 (0.00%) Active: 4 Started: 3 Finished: 0
module.ireland.aws_instance.client (remote-exec): summary =    405 in 00:00:41 =    9.8/s Avg:   209
 Min:    10 Max:  2863 Err:     0 (0.00%)
```

- agree to accept the report file:

yes + enter

```
module.ireland.aws_instance.client: Provisioning with 'local-exec'...
module.ireland.aws_instance.client (local-exec): Executing: ["/bin/sh" "-c" "sc
The authenticity of host '34.245.212.43 (34.245.212.43)' can't be established.
ECDSA key fingerprint is SHA256:way0ldyE41fbPKVVAzr5wMozj/P0SUURBHkxGlMtqp4.
Are you sure you want to continue connecting (yes/no)? yes
```

- see ***report.jtl***

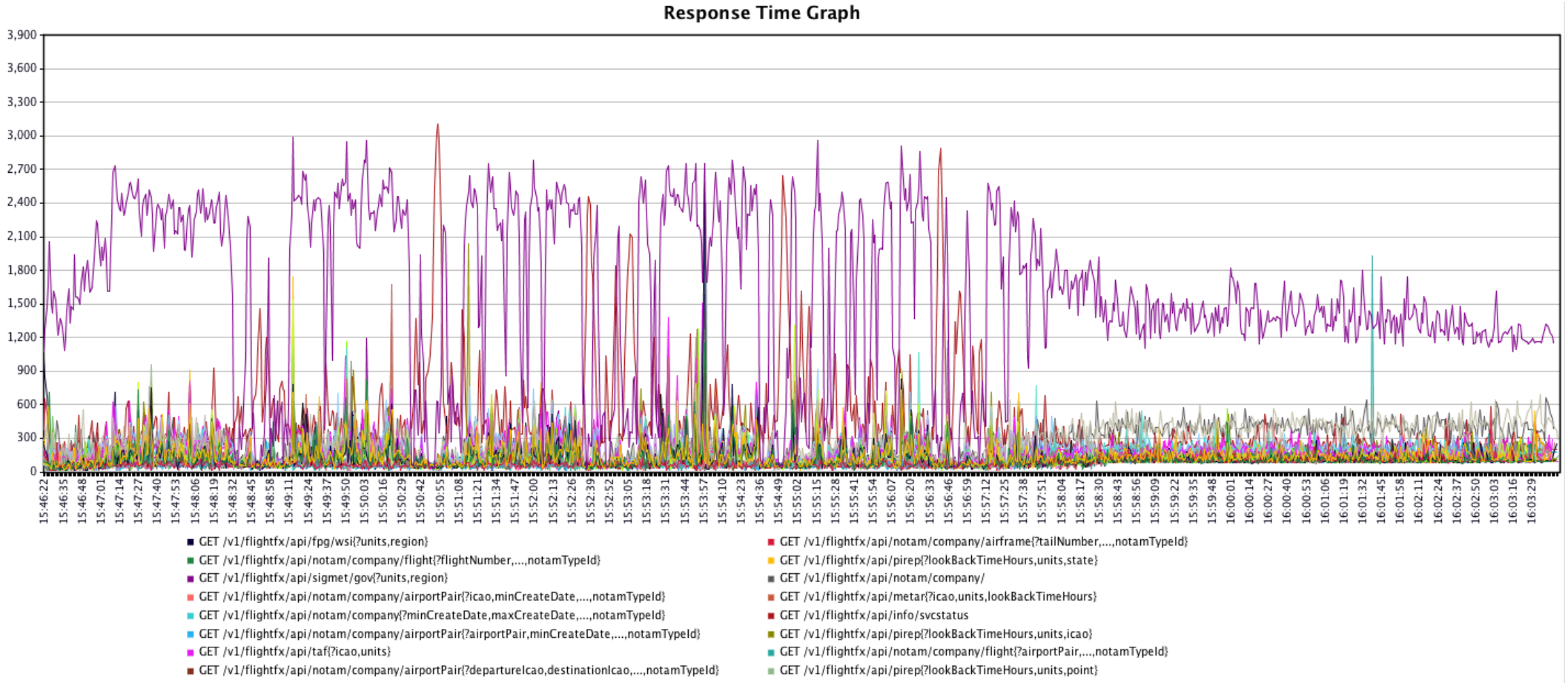


- open report in JMeter

Filename ndri/Documents/weather_company/test_projects/terraform_load_test_cluster_c Browse... Log/Display Only: Errors Successes Configure

Label	# Samples	Throughput	Average	Min	Max	Std. Dev.	Error %	Received KB/sec	Sent KB/sec	Avg. Bytes
GET /v1/flightfx//api/sigmet/wsi{?units,region}	6000	5.8/sec	108	8	3277	132.96	25.08%	1.00	1.80	177.1
GET /v1/flightfx/api/airmet{?units,fir}	6000	5.8/sec	114	8	2506	136.35	24.70%	0.98	1.55	174.1
GET /v1/flightfx/api/airmet{?units,polygon}	6000	5.8/sec	153	8	1745	151.81	24.17%	175.38	1.91	31143.1
GET /v1/flightfx/api/airmet{?units,region}	6000	5.8/sec	132	8	1913	138.40	24.92%	68.60	1.56	12148.7
GET /v1/flightfx/api/fpg/wsi{?units,polygon}	6000	5.8/sec	127	8	2559	142.53	24.92%	48.52	1.92	8598.1
GET /v1/flightfx/api/fpg/wsi{?units,region}	6000	5.7/sec	124	8	3738	146.82	25.25%	0.96	1.57	171.7
GET /v1/flightfx/api/info/svcstatus	6000	5.8/sec	589	117	3406	523.56	0.00%	1.14	1.46	201.7
GET /v1/flightfx/api/metar{?icao,units,lookBackTimeHours}	6000	5.8/sec	116	8	2204	129.56	25.03%	12.27	1.84	2174.5
GET /v1/flightfx/api/mosforecast{?icao,units}	6000	5.8/sec	113	8	2515	134.56	25.38%	25.82	1.56	4587.3
GET /v1/flightfx/api/notam/company/	6000	5.8/sec	227	8	4790	194.80	25.28%	1440.35	1.54	255774.7
GET /v1/flightfx/api/notam/company/airframe{?tailNum...	6000	5.7/sec	75	8	1041	67.72	24.78%	1.01	4.12	179.3
GET /v1/flightfx/api/notam/company/airport{?icao,minCr...	6000	5.8/sec	74	8	1064	67.61	24.52%	1.01	4.08	179.4
GET /v1/flightfx/api/notam/company/airportPair{?airport...	6000	5.8/sec	76	8	2508	85.25	25.13%	1.01	4.20	179.4
GET /v1/flightfx/api/notam/company/airportPair{?depart...	6000	5.8/sec	75	8	2437	72.71	25.07%	1.01	4.27	179.4
GET /v1/flightfx/api/notam/company/airportPair{?icao,m...	6000	5.8/sec	75	8	3017	84.30	24.52%	1.01	4.08	179.3
GET /v1/flightfx/api/notam/company/equipment{?equip...	6000	5.8/sec	75	8	1545	69.42	24.25%	1.01	4.12	179.4
GET /v1/flightfx/api/notam/company/flight{?airportPair,....	6000	5.8/sec	77	8	7441	116.01	24.93%	1.01	4.21	179.4
GET /v1/flightfx/api/notam/company/flight{?departureIc...	6000	5.8/sec	77	8	2533	77.33	24.57%	1.01	4.25	179.4
GET /v1/flightfx/api/notam/company/flight{?flightNumbe...	6000	5.8/sec	74	8	2518	73.00	25.95%	1.01	4.11	179.2
GET /v1/flightfx/api/notam/company/flight{?icao,...,nota...	6000	5.8/sec	75	8	1408	67.22	25.38%	1.01	4.09	179.2
GET /v1/flightfx/api/notam/company{?minCreateDate,m...	6000	5.7/sec	75	8	2750	76.76	24.10%	1.01	3.76	179.5
GET /v1/flightfx/api/notam/gov{?icao,units}	6000	5.8/sec	1521	8	4145	941.37	24.37%	22.44	1.55	3982.8
GET /v1/flightfx/api/pirep{?lookBackTimeHours,units,icao}	6000	5.8/sec	174	8	7422	180.87	24.77%	0.97	1.64	173.1
GET /v1/flightfx/api/pirep{?lookBackTimeHours,units,poi...	6000	5.8/sec	176	8	2966	149.33	23.93%	0.97	1.83	173.3
GET /v1/flightfx/api/pirep{?lookBackTimeHours,units,state}	6000	5.8/sec	139	8	3087	151.13	24.47%	8.04	1.63	1430.4
GET /v1/flightfx/api/pirep{?radius,lookBackTimeHours,u...	6000	5.8/sec	173	8	2914	162.51	24.92%	1.57	1.73	278.9
GET /v1/flightfx/api/sigmet/gov{?units,fir}	6000	5.8/sec	115	8	1844	133.43	24.83%	1.00	1.58	177.0
GET /v1/flightfx/api/sigmet/gov{?units,polygon}	6000	5.8/sec	113	8	3102	138.15	25.68%	1.00	1.93	176.8
GET /v1/flightfx/api/sigmet/gov{?units,region}	6000	5.8/sec	117	8	3243	151.65	25.48%	0.99	1.58	177.0
GET /v1/flightfx/api/sigmet/wsi{?units,polygon}	6000	5.8/sec	110	8	7359	154.89	24.62%	6.34	2.14	1124.0
GET /v1/flightfx/api/taf{?icao,units}	6000	5.8/sec	206	8	1723	159.42	24.08%	4.15	1.51	738.6
GET /v1/flightfx/api/vaaccloud{?units}	6000	5.8/sec	115	8	3418	139.88	25.08%	32.04	1.50	5674.8
GET /v1/flightfx/api/vaacvolcano{?units}	6000	5.8/sec	110	8	3307	134.70	24.48%	38.13	1.51	6755.8
GET /v1/flightfx/api/windsaloft{?icao,units}	6000	5.8/sec	216	8	3091	160.17	24.28%	10.46	1.55	1857.7
POST /v1/flightfx/api/notam/company	6000	5.8/sec	232	8	2402	189.73	24.83%	1445.50	8.59	257315.0
TOTAL	210000	200.7/sec	176	8	7441	333.14	24.11%	3344.77	91.79	17061.7

- open report in JMeter



- destroy infrastructure after test is done:

terraform plan -destroy -out plan.output

```
  - module.ohio.aws_vpc.qa_load_test_vpc
  - module.oregon.aws_instance.server
  - module.oregon.aws_internet_gateway.qa_load_test_internet_gateway
  - module.oregon.aws_key_pair.qa_load_keypair
  - module.oregon.aws_route_table.qa_load_test_route_table
  - module.oregon.aws_route_table_association.qa_load_test_route_table_association
  - module.oregon.aws_security_group.qa_load_test
  - module.oregon.aws_subnet.qa_load_test_subnet
  - module.oregon.aws_vpc.qa_load_test_vpc

Plan: 0 to add, 0 to change, 40 to destroy.

------------------------------------------------------------------------

This plan was saved to: plan.output
```

- apply destroy plan:

terraform apply plan.output

```
module.ireland.aws_internet_gateway.qa_load_test_internet_gateway: Still destroying... (ID: igw-ad39
module.ireland.aws_internet_gateway.qa_load_test_internet_gateway: Destruction complete after 11s
module.ireland.aws_security_group.qa_load_test: Still destroying... (ID: sg-93fcb1ee, 4m11s elapsed)
module.ireland.aws_security_group.qa_load_test: Still destroying... (ID: sg-93fcb1ee, 4m21s elapsed)
module.ireland.aws_security_group.qa_load_test: Still destroying... (ID: sg-93fcb1ee, 4m31s elapsed)
module.ireland.aws_security_group.qa_load_test: Still destroying... (ID: sg-93fcb1ee, 4m41s elapsed)
module.ireland.aws_security_group.qa_load_test: Still destroying... (ID: sg-93fcb1ee, 4m51s elapsed)
module.ireland.aws_security_group.qa_load_test: Still destroying... (ID: sg-93fcb1ee, 5m1s elapsed)
module.ireland.aws_security_group.qa_load_test: Destruction complete after 5m10s
module.ireland.aws_vpc.qa_load_test_vpc: Destroying... (ID: vpc-3966185f)
module.ireland.aws_vpc.qa_load_test_vpc: Destruction complete after 2s

Apply complete! Resources: 0 added, 0 changed, 40 destroyed.
```

Special thanks to

Yuriy Maftiyak

ITea&Coffee

ITea&Coffee

See you on our next meeting in September!

06 / 09 / 2018