

## **Experiment 12 - Puppet**

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Class	D15-B
Subject	DevOps Lab
LO Mapped	<p>LO1: To understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements.</p> <p>LO6: To Synthesize software configuration and provisioning using Ansible/Puppet.</p>

## **Aim:**

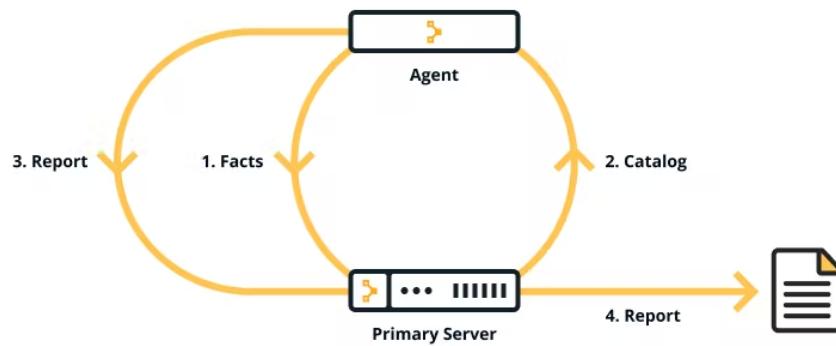
To install and Configure Pull based Software Configuration Management and provisioning tools using Puppet.

## **Introduction:**

What is Puppet?

Puppet is an open-source Software Configuration Management and Deployment tool. It's mostly used in Linux Cloud environments to automate infrastructure, management of different servers, etc.

Puppet Architecture



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Puppet uses a Master-Agent architecture in which the Master and Slave communicate through a secure encrypted channel with the help of SSL.

Puppet Master

Puppet Master is the Hub or the main node in the network of systems that handles all the configuration across systems. It is capable of applying different configurations to other nodes called Puppet Agents.

Puppet Agent

Puppet Agents are working machines in which different servers are set up for different use cases. These servers and their configurations are managed by the Puppet Master.

Use Cases

Server and Database Management

Multiple Servers and Databases can be controlled in one place using Puppet.

System Configuration

A key feature of Puppet is that multiple systems can be configured at once from the Puppet Master device.

## Networking

Due to Puppet's architecture, it can be used for secure networking and data transfer across systems.

## Container Management

Puppet makes it easy to integrate containers with existing IT infrastructure.

### 1. Create two EC2 Ubuntu instances and security group.

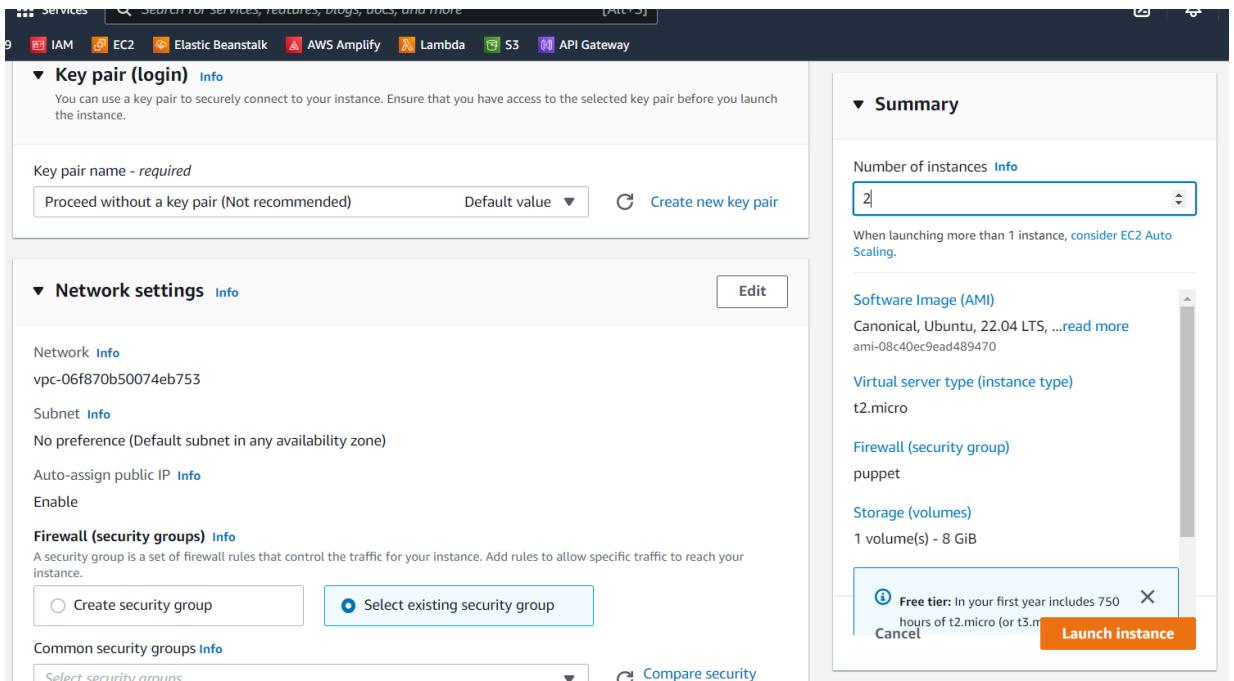
The screenshot shows the AWS Management Console interface for managing security groups. The top navigation bar includes services like Cloud9, IAM, EC2, Elastic Beanstalk, AWS Amplify, Lambda, S3, and API Gateway. The specific URL is EC2 > Security Groups > sg-0416a86730fd11551 - puppet > Edit inbound rules. The page title is "Edit inbound rules". It displays two existing rules:

Security group rule ID	Type	Protocol	Port range	Source	Description - optional
sgr-0da97c5493e50f4ab	All TCP	TCP	0 - 65535	Custom	0.0.0.0/0
sgr-0b4eb55c8d573452c	SSH	TCP	22	Custom	0.0.0.0/0

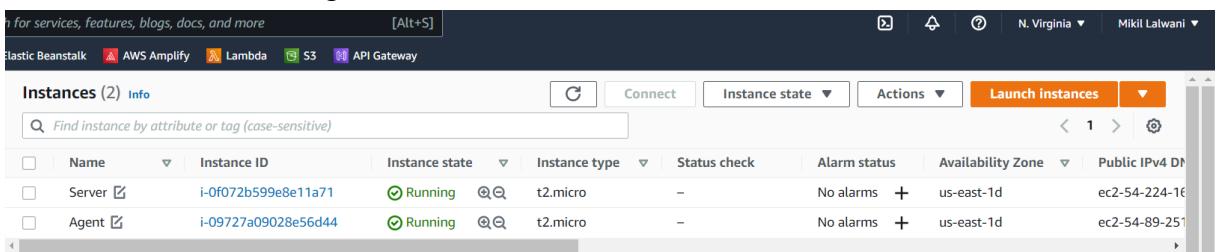
Buttons for "Add rule", "Cancel", "Preview changes", and "Save rules" are visible at the bottom.

The screenshot shows the AWS Management Console interface for launching a new EC2 instance. The top navigation bar is identical. The main area shows the "Quick Start" section with various AMI options. The "Ubuntu" option is selected, highlighted with a blue border. Below it, the "Ubuntu Server 22.04 LTS (HVM, SSD Volume Type)" details are shown, including its AMI ID (ami-08c40ec9ead489470), architecture (64-bit (x86)), and verification status (Verified provider). The "Instance type" dropdown is set to "t2.micro". On the right side, the "Summary" section shows the number of instances (2), software image (Canonical, Ubuntu, 22.04 LTS), virtual server type (t2.micro), firewall (puppet), and storage (1 volume(s) - 8 GiB). A "Launch Instance" button is prominently displayed at the bottom right.



## 2. Name them Server and Agent.



Follow instructions only on the mentioned machine(s)

1. On both master and client, Update Package List.  
sudo apt-get update -y
2. On both master and client, set up the hostname resolution.  
sudo nano /etc/hosts

Now, paste the following lines at the end of each file. These IP addresses are the Public IPv4 addresses of your instances. puppetmaster is your server and puppetclient is the client.

```
[puppet master ip] puppetmaster puppet
[puppet client ip] puppetclient
```

```

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-172-31-88-134:~$ sudo apt-get update -y
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [114 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease [99.8 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [14.1 MB]
Get:5 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe Translation-en [5652 kB]
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 c-n-f Metadata [286 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [217 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse Translation-en [112 kB]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 c-n-f Metadata [8372 B]
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [612 kB]
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [144 kB]
Get:13 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 c-n-f Metadata [8964 B]
Get:14 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [344 kB]
Get:15 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [53.5 kB]
Get:16 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [427 kB]
Get:17 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [108 kB]
Get:18 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [4404 B]
Get:19 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [7220 B]

```

```
ubuntu@ip-172-31-88-134:~$ sudo nano /etc/hosts
```

```

GNU nano 6.2
127.0.0.1 localhost

# The following lines are desirable for IPv6 capable hosts
::1 ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
ff02::3 ip6-allhosts

54.224.168.8 puppetmaster puppet
54.89.251.165 puppetclient
```

Follow these instructions only on the master machine.

3. Download the latest Puppet Version

```
wget https://apt.puppetlabs.com/puppet6-release-focal.deb
```

```

ubuntu@ip-172-31-88-134:~$ wget https://apt.puppetlabs.com/puppet6-release-focal.deb
--2022-10-09 13:05:54-- https://apt.puppetlabs.com/puppet6-release-focal.deb
Resolving apt.puppetlabs.com (apt.puppetlabs.com)... 18.165.83.58, 18.165.83.105, 18.165.83.21, ...
Connecting to apt.puppetlabs.com (apt.puppetlabs.com)|18.165.83.58|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 11698 (11K) [application/x-debian-package]
Saving to: 'puppet6-release-focal.deb'

puppet6-release-focal.deb          100%[=====] 11.42K --.-KB/s   in 0s

2022-10-09 13:05:54 (119 MB/s) - 'puppet6-release-focal.deb' saved [11698/11698]
```

4. Once the download is complete, install the package by using dpkg

```
sudo dpkg -i puppet6-release-focal.deb
```

```

ubuntu@ip-172-31-88-134:~$ sudo dpkg -i puppet6-release-focal.deb
Selecting previously unselected package puppet6-release.
(Reading database ... 70%
```

5. Update the package repository:

```
sudo apt-get update -y
```

```
ubuntu@ip-172-31-88-134:~$ sudo apt-get update -y
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu jammy-security InRelease
Get:5 http://apt.puppetlabs.com focal InRelease [115 kB]
Get:6 http://apt.puppetlabs.com focal/puppet6 amd64 Packages [30.9 kB]
Get:7 http://apt.puppetlabs.com focal/puppet6 all Packages [10.1 kB]
Fetched 156 kB in 1s (240 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-88-134:~$
```

## 6. Install the puppet server.

```
sudo apt-get install puppetserver -y
```

```
ubuntu@ip-172-31-88-134:~$ sudo apt-get install puppetserver -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  ca-certificates-java fontconfig-config fonts-dejavu-core java-common libavahi-client3 libavahi-common-data libavahi-common3 libcups2 libfontconfig1 libjpeg-turbo8
  libjpeg8 liblcms2-2 libpcsc-lite1 libx11 libxrender1 libxtst6 net-tools openjdk-8-jre-headless puppet-agent x11-common
Suggested packages:
  default-jre cups-common liblcms2-utils pccsd libnss-mdns fonts-dejavu-extra fonts-ipafont-gothic fonts-ipafont-mincho fonts-wqy-microhei fonts-wqy-zenhei fonts-indic
The following NEW packages will be installed:
  ca-certificates-java fontconfig-config fonts-dejavu-core java-common libavahi-client3 libavahi-common-data libavahi-common3 libcups2 libfontconfig1 libjpeg-turbo8
  libjpeg8 liblcms2-2 libpcsc-lite1 libx11 libxrender1 libxtst6 net-tools openjdk-8-jre-headless puppet-agent puppetserver x11-common
0 upgraded, 21 newly installed, 0 to remove and 45 not upgraded.
Need to get 149 MB of archives.
After this operation, 361 MB of additional disk space will be used.
Get:1 http://apt.puppetlabs.com/focal/puppet6 amd64 puppet-agent amd64 6.28.0-1focal [38.0 MB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 java-common all 0.72build2 [6782 B]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 libavahi-common-data amd64 0.8-5ubuntu5 [23.9 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 libavahi-common3 amd64 0.8-5ubuntu5 [23.7 kB]
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 libavahi-client3 amd64 0.8-5ubuntu5 [28.1 kB]
```

## Configuration:

### 7. Open the puppetserver file, under which you need to change the memory size from 2GB to 300MB since we don't want it to overload our instance which has only 1 GB of RAM.

```
sudo nano /etc/default/puppetserver
```

```
#####
# Init settings for puppetserver
#####

# Location of your Java binary (version 8)
JAVA_BIN="/usr/bin/java"

# Modify this if you'd like to change the memory allocation, enable JMX, etc
JAVA_ARGS="-Xms200m -Xmx200m -Djruby.logger.class=com.puppetlabs.jruby_utils.jruby.Slf4jLogger"

# Modify this as you would JAVA_ARGS but for non-service related subcommands
JAVA_ARGS_CLI="${JAVA_ARGS_CLI:-}"

# Modify this if you'd like TrapperKeeper specific arguments
TK_ARGS=""

# These normally shouldn't need to be edited if using OS packages
USER="puppet"
GROUP="puppet"
INSTALL_DIR="/opt/puppetlabs/server/apps/puppetserver"
CONFIG="/etc/puppetlabs/puppetserver/conf.d"
```

### 8. Start and enable the Puppet Service

```
sudo systemctl restart puppetserver
```

```
sudo systemctl enable puppetserver
```

```
ubuntu@ip-172-31-88-134:~$ sudo systemctl restart puppetserver
ubuntu@ip-172-31-88-134:~$ sudo systemctl enable puppetserver
Synchronizing state of puppetserver.service with SysV service script with /lib/systemd/systemctl-sysv-install enable puppetserver
Created symlink /etc/systemd/system/multi-user.target.wants/puppetserver.se
```

### 9. Verify the status of the service.

```
sudo systemctl status puppetserver
```

```
ubuntu@ip-172-31-88-134:~$ sudo systemctl status puppetserver
● puppetserver.service - puppetserver Service
   Loaded: loaded (/lib/systemd/system/puppetserver.service; enabled; vendor preset: enabled)
   Active: active (running) since Sun 2022-10-09 13:08:21 UTC; 18s ago
     Main PID: 4247 (java)
        Tasks: 40 (limit: 4915)
       Memory: 464.0M
          CPU: 40.168s
      CGroup: /system.slice/puppetserver.service
                 └─4247 /usr/bin/java -Xms200m -Xmx200m -Djruby.logger.class=com.puppetlabs.jruby.Slf4jLogger

Oct 09 13:07:40 ip-172-31-88-134 systemd[1]: Starting puppetserver Service...
Oct 09 13:08:21 ip-172-31-88-134 systemd[1]: Started puppetserver Service.
Oct 09 13:08:29 ip-172-31-88-134 systemd[1]: /lib/systemd/system/puppetserver.service:1: Warning: Ambiguous match for 'puppetserver' in 'puppetserver.service': found 'puppetserver.service' in '/lib/systemd/system/puppetserver.service' and 'puppetserver.service' in '/etc/systemd/system/puppetserver.service'.
Oct 09 13:08:29 ip-172-31-88-134 systemd[1]: /lib/systemd/system/puppetserver.service:1: Ambiguous match for 'puppetserver' in 'puppetserver.service': found 'puppetserver.service' in '/lib/systemd/system/puppetserver.service' and 'puppetserver.service' in '/etc/systemd/system/puppetserver.service'.
Oct 09 13:08:29 ip-172-31-88-134 systemd[1]: /lib/systemd/system/puppetserver.service:1: Ambiguous match for 'puppetserver' in 'puppetserver.service': found 'puppetserver.service' in '/lib/systemd/system/puppetserver.service' and 'puppetserver.service' in '/etc/systemd/system/puppetserver.service'.
lines 1-15/15 (END)
```

Now that our server is up and running, let's move to the client machine. Perform these commands only on the client machine.

10. Download the latest version of Puppet on the client.

```
wget https://apt.puppetlabs.com/puppet6-release-focal.deb
```

```
ubuntu@ip-172-31-89-167:~$ wget https://apt.puppetlabs.com/puppet6-release-focal.deb
--2022-10-09 13:09:04-- https://apt.puppetlabs.com/puppet6-release-focal.deb
Resolving apt.puppetlabs.com (apt.puppetlabs.com)... 99.86.224.38, 99.86.224.51, 99.86.224.126, ...
Connecting to apt.puppetlabs.com (apt.puppetlabs.com)|99.86.224.38|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 11698 (11K) [application/x-debian-package]
Saving to: 'puppet6-release-focal.deb'

puppet6-release-focal.deb          100%[=====] 146 MB/s

2022-10-09 13:09:04 (146 MB/s) - 'puppet6-release-focal.deb' saved [11698/11698]

ubuntu@ip-172-31-89-167:~$
```

11. Once the download is complete, use dpkg to install the package.

```
sudo dpkg -i puppet6-release-focal.deb
```

```
ubuntu@ip-172-31-89-167:~$ sudo dpkg -i puppet6-release-focal.deb
Selecting previously unselected package puppet6-release.
(Reading database ... 63663 files and directories currently installed.)
Preparing to unpack puppet6-release-focal.deb ...
Unpacking puppet6-release (6.0.0-22focal) ...
Setting up puppet6-release (6.0.0-22focal) ...
ubuntu@ip-172-31-89-167:~$ █
```

12. Update the package repository again.

```
sudo apt-get update -y
```

```
ubuntu@ip-172-31-89-167:~$ sudo apt-get update -y
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Get:4 http://apt.puppetlabs.com focal InRelease [115 kB]
Hit:5 http://security.ubuntu.com/ubuntu jammy-security InRelease
Get:6 http://apt.puppetlabs.com focal/puppet6 all Packages [10.1 kB]
Get:7 http://apt.puppetlabs.com focal/puppet6 amd64 Packages [30.9 kB]
Fetched 156 kB in 1s (244 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-89-167:~$
```

13. Install the agent using -

```
sudo apt-get install puppet-agent -y
```

```

ubuntu@ip-172-31-89-167:~$ sudo apt-get install puppet-agent -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  puppet-agent
0 upgraded, 1 newly installed, 0 to remove and 45 not upgraded.
Need to get 38.0 MB of archives.
After this operation, 144 MB of additional disk space will be used.
Get:1 http://apt.puppetlabs.com focal/puppet6 amd64 puppet-agent amd64 6.28.0-1focal [38.0 MB]
Fetched 38.0 MB in 1s (64.5 MB/s)
Selecting previously unselected package puppet-agent.
(Reading database ... 63668 files and directories currently installed.)
Preparing to unpack .../puppet-agent_6.28.0-1focal_amd64.deb ...
Unpacking puppet-agent (6.28.0-1focal) ...
Setting up puppet-agent (6.28.0-1focal) ...
Created symlink /etc/systemd/system/multi-user.target.wants/puppet.service → /lib/systemd/system/puppet.service.
Created symlink /etc/systemd/system/multi-user.target.wants/pxp-agent.service → /lib/systemd/system/pxp-agent.service.
Removed /etc/systemd/system/multi-user.target.wants/pxp-agent.service.
Processing triggers for libc-bin (2.35-0ubuntu3.1) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

```

14. Start the puppet service and enable it -

```
sudo systemctl start puppet
```

```
sudo systemctl enable puppet
```

```
sudo systemctl status puppet
```

```

ubuntu@ip-172-31-89-167:~$ sudo systemctl start puppet
ubuntu@ip-172-31-89-167:~$ sudo systemctl enable puppet
ubuntu@ip-172-31-89-167:~$ sudo systemctl status puppet
● puppet.service - Puppet agent
   Loaded: loaded (/lib/systemd/system/puppet.service; enabled; vendor preset: enabled)
   Active: active (running) since Sun 2022-10-09 13:10:04 UTC; 20s ago
     Main PID: 2616 (puppet)
        Tasks: 2 (limit: 1143)
       Memory: 57.9M
          CPU: 5.695s
         CGroup: /system.slice/puppet.service
                   └─2616 /opt/puppetlabs/puppet/bin/ruby /opt/puppetlabs/puppet/bin/puppet agent --no-daemonize

Oct 09 13:10:04 ip-172-31-89-167 systemd[1]: Started Puppet agent.
Oct 09 13:10:05 ip-172-31-89-167 puppet-agent[2616]: Starting Puppet client version 6.28.0
ubuntu@ip-172-31-89-167:~$ 

```

Now that our server and puppet agent both are running, we can proceed to sign the Agent Certificate.

Perform these commands only on the master machine.

15. On the master node, list requested certificates

```
sudo /opt/puppetlabs/bin/puppetserver ca list
```

```

ubuntu@ip-172-31-88-134:~$ sudo /opt/puppetlabs/bin/puppetserver ca list
Requested Certificates:
  ip-172-31-89-167.ec2.internal      (SHA256)  23:8F:11:5B:4F:BB:9B:ED:07:F2:2D:59:C1:A7:AE:ED:7F:0B:DE:73:64:2A:6D:2E:05:4E:D1:DF:6D:80:02:65

```

16. Once you spot the requested certificate from the client-side, you can sign it using -

```
sudo /opt/puppetlabs/bin/puppetserver ca sign --all
```

```

ubuntu@ip-172-31-88-134:~$ sudo /opt/puppetlabs/bin/puppetserver ca sign --all
Successfully signed certificate request for ip-172-31-89-167.ec2.internal

```

17. To test the connection, you can use the following command

```
sudo /opt/puppetlabs/bin/puppet agent --test
```

```
ubuntu@ip-172-31-88-134:~$ sudo /opt/puppetlabs/bin/puppet agent --test
Info: Using environment 'production'
Info: Retrieving pluginfacts
Info: Retrieving plugin
Info: Retrieving locales
Info: Caching catalog for ip-172-31-88-134.ec2.internal
Info: Applying configuration version '1665321107'
Info: Creating state file /opt/puppetlabs/puppet/cache/state/state.yaml
Notice: Applied catalog in 0.01 seconds
ubuntu@ip-172-31-88-134:~$ █
```

If all went good, you'll get the notice of applying catalog, which means that puppet was configured properly on both machines.

### **Conclusion:**

Thus, we studied puppet, installed it on our machines and set up a master-worker cluster on it.