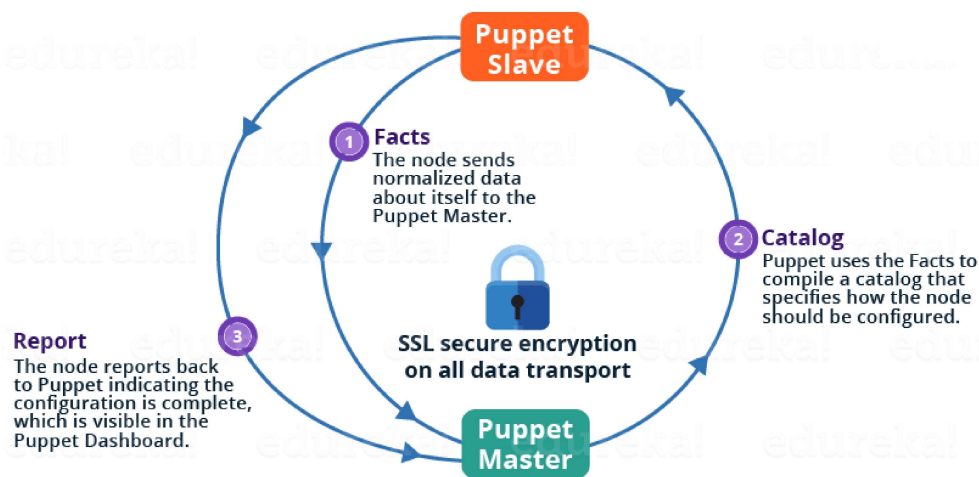


Experiment No : 10

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

Theory :

Puppet is a configuration management technology to manage the infrastructure on physical or virtual machines. It is an open-source software configuration management tool developed using Ruby which helps in managing complex infrastructure on the fly. This tutorial will help in understanding the building blocks of Puppet and how it works in an infrastructure environment. All the examples and code snippets used in this tutorial are tested. The working code snippets can be simply used in any Puppet setup by changing the current defined names and variables.



Puppet Master is the key mechanism which handles all the configuration related stuff. It applies the configuration to nodes using the Puppet agent.

Puppet Agents are the actual working machines which are managed by the Puppet master. They have the Puppet agent daemon service running inside them.

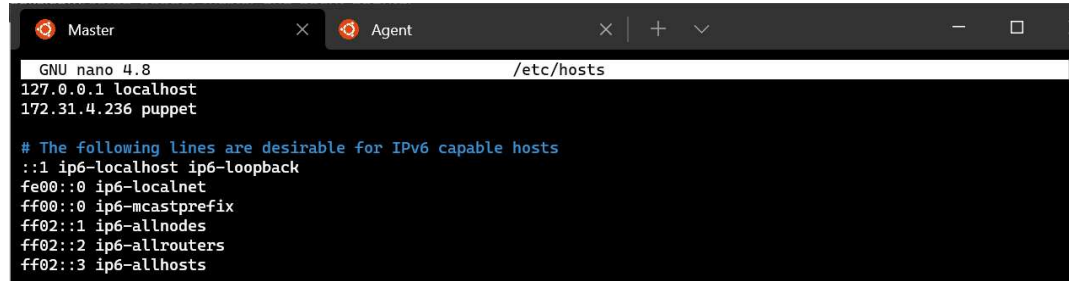
This is the repo where all nodes and server-related configurations are saved and pulled when required.

Facts are the details related to the node or the master machine, which are basically used for analyzing the current status of any node. On the basis of facts, changes are done on any target machine. There are pre-defined and custom facts in Puppet.

All the manifest files or configuration which are written in Puppet are first converted to a compiled format called catalog and later those catalogs are applied on the target machine.

Procedure :**1) Add correct hostnames and IP addresses of puppet master in /etc/hosts file.**

```
sudo nano /etc/hosts
```

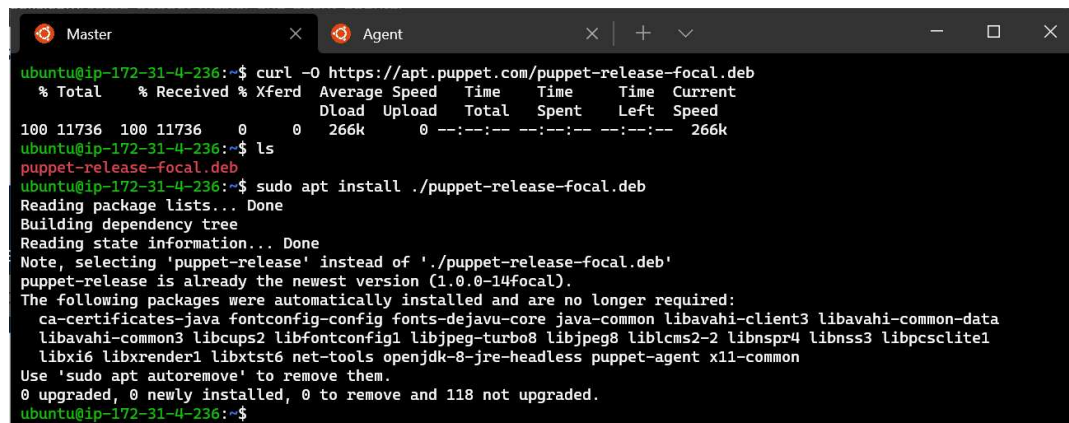


```
GNU nano 4.8 /etc/hosts
127.0.0.1 localhost
172.31.4.236 puppet

# 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
```

2) Download PuppetLabs repository for Ubuntu and install Puppet master on the server.

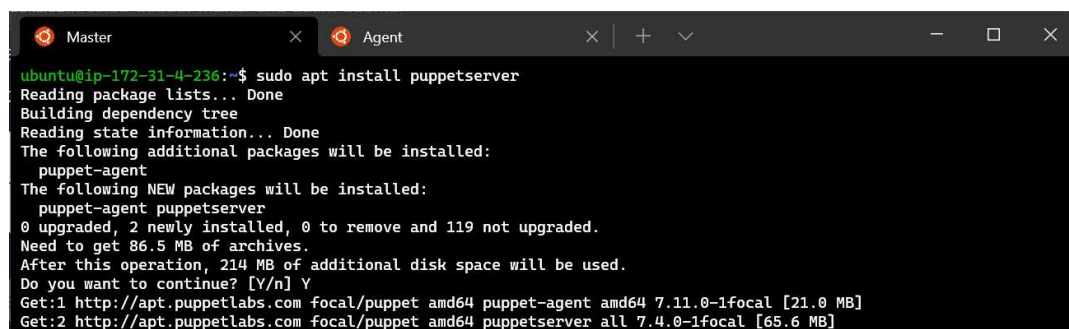
```
sudo apt update
curl -O https://apt.puppet.com/puppet-release-focal.deb
sudo apt install ./puppet-release-focal.deb
```



```
ubuntu@ip-172-31-4-236:~$ curl -O https://apt.puppet.com/puppet-release-focal.deb
% Total % Received % Xferd Average Speed Time Time Time Current
Dload Upload Total Spent Left Speed
100 11736 100 11736 0 0 266k 0 --:--:-- --:--:-- --:--:-- 266k
ubuntu@ip-172-31-4-236:~$ ls
puppet-release-focal.deb
ubuntu@ip-172-31-4-236:~$ sudo apt install ./puppet-release-focal.deb
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'puppet-release' instead of './puppet-release-focal.deb'
puppet-release is already the newest version (1.0.0-14focal).
The following packages were automatically installed and are no longer required:
ca-certificates-java fontconfig-config fonts-dejavu-core java-common libavahi-client3 libavahi-common-data
libavahi-common3 libcups2 libfontconfig1 libjpeg-turbo8 libjpeg8 liblcms2-2 libnspr4 libnss3 libpcsclite1
libxi6 libxrender1 libxtst6 net-tools openjdk-8-jre-headless puppet-agent x11-common
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 118 not upgraded.
ubuntu@ip-172-31-4-236:~$
```

3) Update apt index and install puppet master

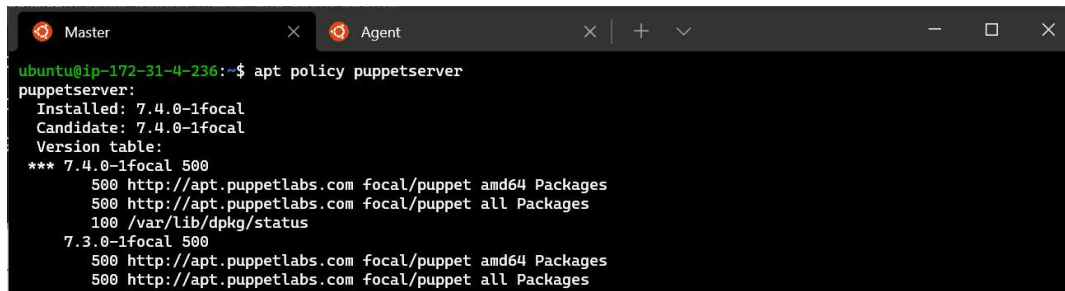
```
sudo apt update
sudo apt install puppetserver
```



```
ubuntu@ip-172-31-4-236:~$ sudo apt install puppetserver
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
puppet-agent
The following NEW packages will be installed:
puppet-agent puppetserver
0 upgraded, 2 newly installed, 0 to remove and 119 not upgraded.
Need to get 86.5 MB of archives.
After this operation, 214 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://apt.puppetlabs.com focal/puppet amd64 puppet-agent amd64 7.11.0-1focal [21.0 MB]
Get:2 http://apt.puppetlabs.com focal/puppet amd64 puppetserver all 7.4.0-1focal [65.6 MB]
```

4) Confirm the installed version of Puppet:

```
apt policy puppetserver
```

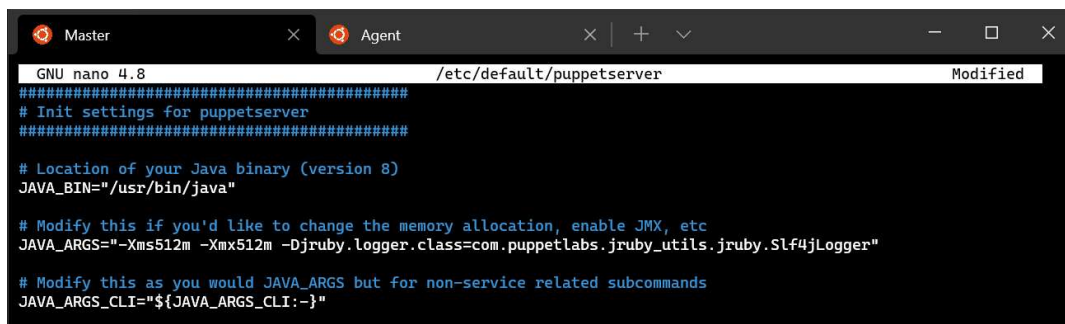


```
Master Agent
ubuntu@ip-172-31-4-236:~$ apt policy puppetserver
puppetserver:
  Installed: 7.4.0-1focal
  Candidate: 7.4.0-1focal
  Version table:
 *** 7.4.0-1focal 500
      500 http://apt.puppetlabs.com focal/puppet amd64 Packages
      500 http://apt.puppetlabs.com focal/puppet all Packages
      100 /var/lib/dpkg/status
 7.3.0-1focal 500
      500 http://apt.puppetlabs.com focal/puppet amd64 Packages
      500 http://apt.puppetlabs.com focal/puppet all Packages
```

5) Change default memory usage as per your machine type. Puppet by default need 2gb ram. To make puppet master work properly, you have to allocate half memory of your machine.

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

```
change to this in file -> JAVA_ARGS="-Xms512m -Xmx512m"
```



```
Master Agent
GNU nano 4.8 /etc/default/puppetserver Modified
#####
# 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="-Xms512m -Xmx512m -Djruby.logger.class=com.puppetlabs.jruby_utils.jruby.Slf4jLogger"

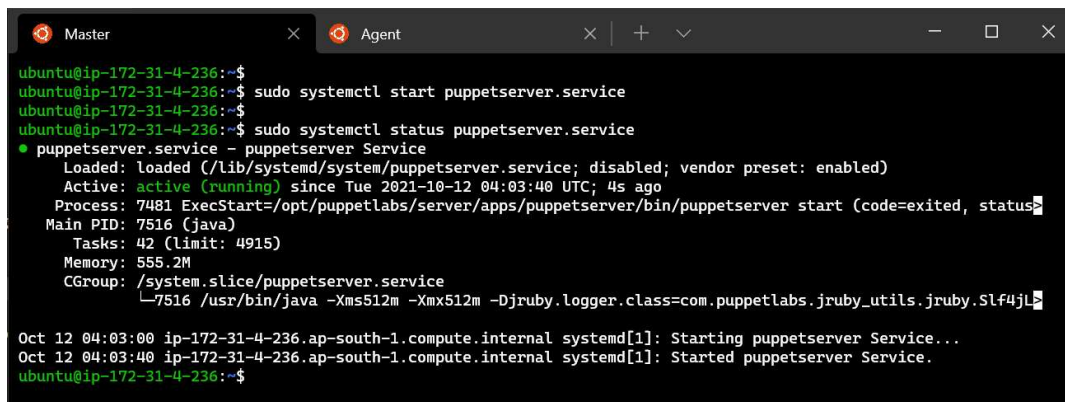
# Modify this as you would JAVA_ARGS but for non-service related subcommands
JAVA_ARGS_CLI="${JAVA_ARGS_CLI:-}"
```

6) Start and enable puppetserver service

```
sudo systemctl start puppetserver.service
```

```
sudo systemctl enable puppetserver.service
```

```
systemctl status puppetserver.service
```



```
Master Agent
ubuntu@ip-172-31-4-236:~$ sudo systemctl start puppetserver.service
ubuntu@ip-172-31-4-236:~$ sudo systemctl status puppetserver.service
● puppetserver.service - puppetserver Service
   Loaded: loaded (/lib/systemd/system/puppetserver.service; disabled; vendor preset: enabled)
   Active: active (running) since Tue 2021-10-12 04:03:40 UTC; 4s ago
     Process: 7481 ExecStart=/opt/puppetlabs/server/apps/puppetserver/bin/puppetserver start (code=exited, status=0)
    Main PID: 7516 (java)
      Tasks: 42 (limit: 4915)
     Memory: 555.2M
    CGroup: /system.slice/puppetserver.service
            └─7516 /usr/bin/java -Xms512m -Xmx512m -Djruby.logger.class=com.puppetlabs.jruby_utils.jruby.Slf4jLogger

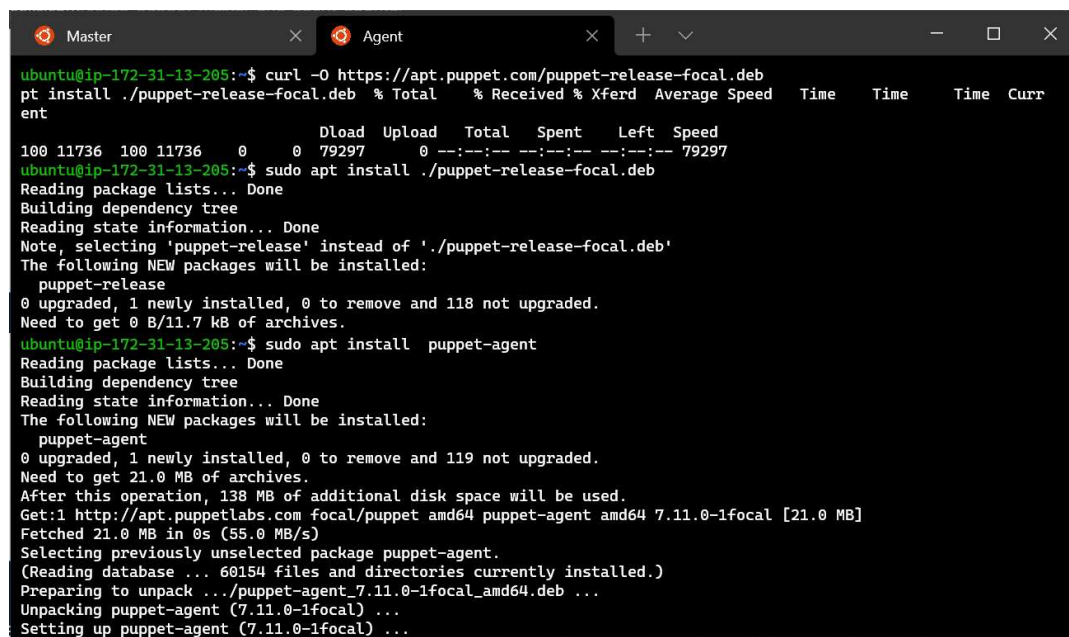
Oct 12 04:03:00 ip-172-31-4-236.ap-south-1.compute.internal systemd[1]: Starting puppetserver Service...
Oct 12 04:03:40 ip-172-31-4-236.ap-south-1.compute.internal systemd[1]: Started puppetserver Service.
ubuntu@ip-172-31-4-236:~$
```

- 7) If you have a firewall on your Ubuntu system, you need to open port 8140 which is used by the Puppet master service. Run the following commands to allow port on the firewall:

```
sudo ufw allow 8140/tcp
```

- 8) On the nodes to be automated with Puppet install puppet Agent:

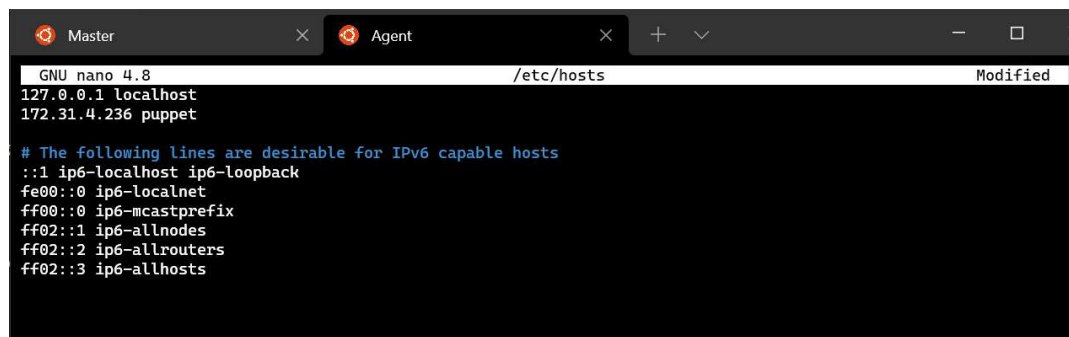
```
sudo apt update
curl -O https://apt.puppet.com/puppet-release-focal.deb
sudo apt install ./puppet-release-focal.deb
sudo apt update
sudo apt install puppet-agent
```



```
Master Agent
ubuntu@ip-172-31-13-205:~$ curl -O https://apt.puppet.com/puppet-release-focal.deb
pt install ./puppet-release-focal.deb % Total % Received % Xferd Average Speed Time Time Time Curr
ent
Dload Upload Total Spent Left Speed
100 11736 100 11736 0 0 79297 0 --:--:-- --:--:-- --:--:-- 79297
ubuntu@ip-172-31-13-205:~$ sudo apt install ./puppet-release-focal.deb
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'puppet-release' instead of './puppet-release-focal.deb'
The following NEW packages will be installed:
  puppet-release
0 upgraded, 1 newly installed, 0 to remove and 118 not upgraded.
Need to get 0 B/11.7 kB of archives.
ubuntu@ip-172-31-13-205:~$ sudo apt install puppet-agent
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  puppet-agent
0 upgraded, 1 newly installed, 0 to remove and 119 not upgraded.
Need to get 21.0 MB of archives.
After this operation, 138 MB of additional disk space will be used.
Get:1 http://apt.puppetlabs.com focal/puppet amd64 puppet-agent amd64 7.11.0-1focal [21.0 MB]
Fetched 21.0 MB in 0s (55.0 MB/s)
Selecting previously unselected package puppet-agent.
(Reading database ... 60154 files and directories currently installed.)
Preparing to unpack .../puppet-agent_7.11.0-1focal_amd64.deb ...
Unpacking puppet-agent (7.11.0-1focal) ...
Setting up puppet-agent (7.11.0-1focal) ...
```

- 9) Open the /etc/hosts file and set name for the server

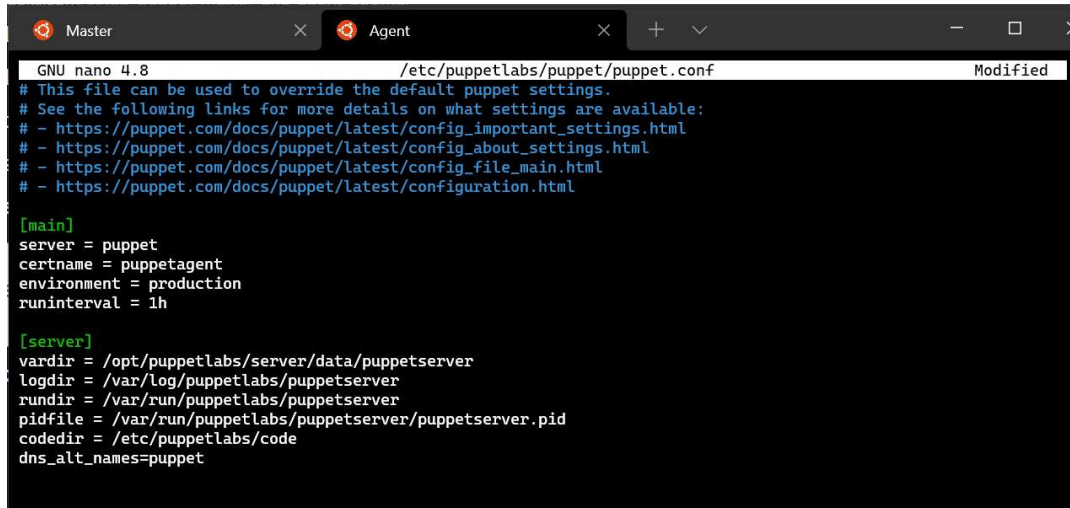
```
127.0.0.0 localhost
[master_ip] puppet
```



```
Master Agent
GNU nano 4.8 /etc/hosts Modified
127.0.0.1 localhost
172.31.4.236 puppet

# 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
```

10) Edit Puppet Agent configuration file and add Master server DNS alternative names and also configure main section.



```

GNU nano 4.8 /etc/puppetlabs/puppet/puppet.conf Modified
# This file can be used to override the default puppet settings.
# See the following links for more details on what settings are available:
# - https://puppet.com/docs/puppet/latest/config_important_settings.html
# - https://puppet.com/docs/puppet/latest/config_about_settings.html
# - https://puppet.com/docs/puppet/latest/config_file_main.html
# - https://puppet.com/docs/puppet/latest/configuration.html

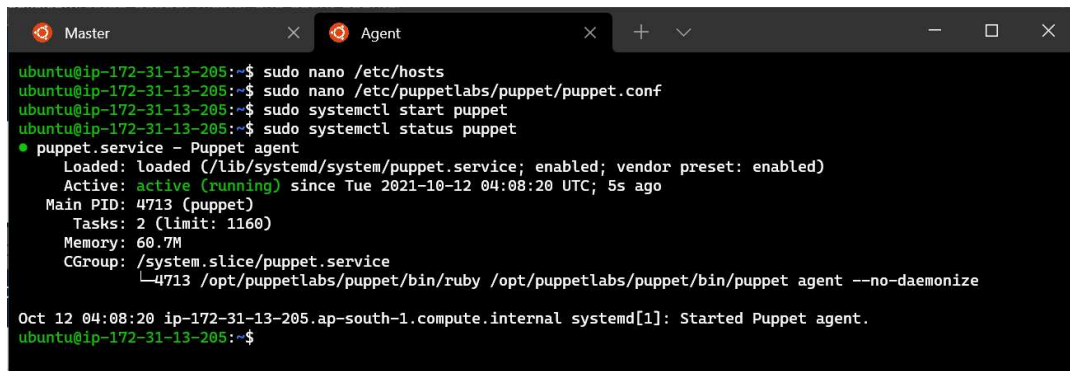
[main]
server = puppet
certname = puppetagent
environment = production
runinterval = 1h

[server]
vardir = /opt/puppetlabs/server/data/puppetserver
logdir = /var/log/puppetlabs/puppetserver
rundir = /var/run/puppetlabs/puppetserver
pidfile = /var/run/puppetlabs/puppetserver/puppetserver.pid
codedir = /etc/puppetlabs/code
dns_alt_names=puppet
  
```

11) Now start the Puppet service:

```

sudo systemctl start puppet
sudo systemctl enable puppet
sudo systemctl status puppet
  
```



```

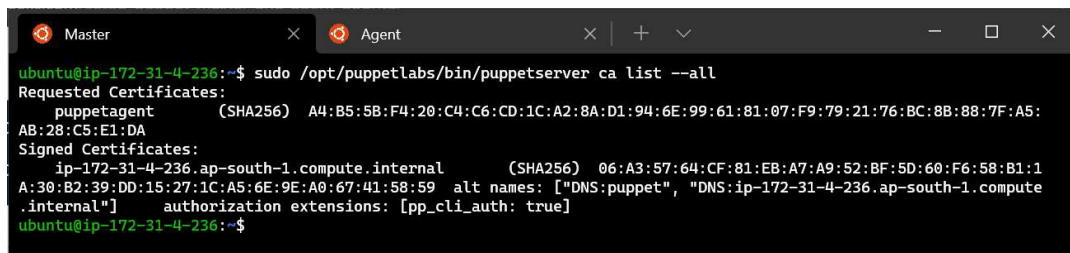
ubuntu@ip-172-31-13-205:~$ sudo nano /etc/hosts
ubuntu@ip-172-31-13-205:~$ sudo nano /etc/puppetlabs/puppet/puppet.conf
ubuntu@ip-172-31-13-205:~$ sudo systemctl start puppet
ubuntu@ip-172-31-13-205:~$ sudo systemctl status puppet
● puppet.service - Puppet agent
   Loaded: loaded (/lib/systemd/system/puppet.service; enabled; vendor preset: enabled)
   Active: active (running) since Tue 2021-10-12 04:08:20 UTC; 5s ago
     Main PID: 4713 (puppet)
        Tasks: 2 (Limit: 1160)
      Memory: 60.7M
      CGroup: /system.slice/puppet.service
              └─4713 /opt/puppetlabs/puppet/bin/ruby /opt/puppetlabs/puppet/bin/puppet agent --no-daemonize

Oct 12 04:08:20 ip-172-31-13-205.ap-south-1.compute.internal systemd[1]: Started Puppet agent.
ubuntu@ip-172-31-13-205:~$
  
```

12) On the Puppet Master Node list all the available certificates:

```

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

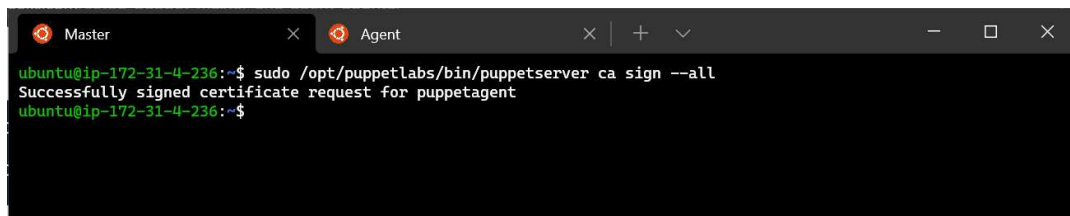


```

ubuntu@ip-172-31-4-236:~$ sudo /opt/puppetlabs/bin/puppetserver ca list --all
Requested Certificates:
  puppetagent (SHA256) A4:B5:5B:F4:20:C4:C6:CD:1C:A2:8A:D1:94:6E:99:61:81:07:F9:79:21:76:BC:8B:88:7F:A5:
AB:28:C5:E1:DA
Signed Certificates:
  ip-172-31-4-236.ap-south-1.compute.internal (SHA256) 06:A3:57:64:CF:81:EB:A7:A9:52:BF:5D:60:F6:58:B1:1
A:30:B2:39:DD:15:27:1C:A5:6E:9E:A0:67:41:58:59 alt names: ["DNS:puppet", "DNS:ip-172-31-4-236.ap-south-1.compute
.internal"] authorization extensions: [pp_cli_auth: true]
ubuntu@ip-172-31-4-236:~$
  
```

13) Sign any pending certificate:

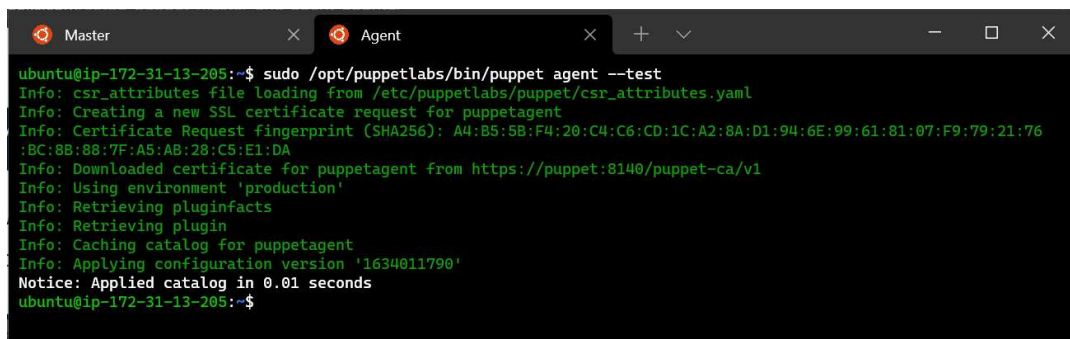
```
sudo /opt/puppetlabs/bin/puppetserver ca sign --all
```



```
Master Agent
ubuntu@ip-172-31-4-236:~$ sudo /opt/puppetlabs/bin/puppetserver ca sign --all
Successfully signed certificate request for puppetagent
ubuntu@ip-172-31-4-236:~$
```

14) The Puppet Master should now be able to communicate with agent node and to control it. Confirm by running below command on the agent:

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



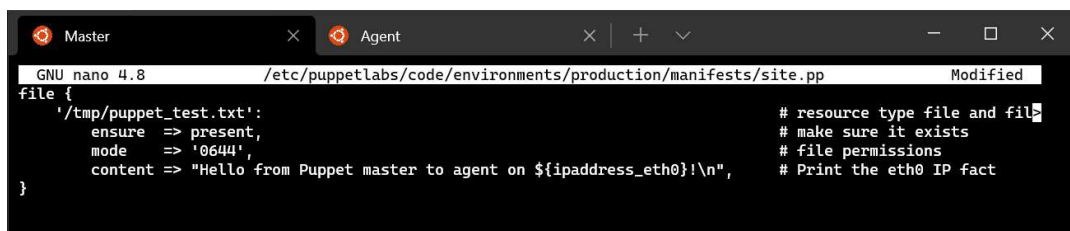
```
Master Agent
ubuntu@ip-172-31-13-205:~$ sudo /opt/puppetlabs/bin/puppet agent --test
Info: csr_attributes file loading from /etc/puppetlabs/puppet/csr_attributes.yaml
Info: Creating a new SSL certificate request for puppetagent
Info: Certificate Request fingerprint (SHA256): A4:B5:5B:F4:20:C4:C6:CD:1C:A2:8A:D1:94:6E:99:61:81:07:F9:79:21:76:BC:8B:88:7F:A5:AB:28:C5:E1:DA
Info: Downloaded certificate for puppetagent from https://puppet:8140/puppet-ca/v1
Info: Using environment 'production'
Info: Retrieving pluginfacts
Info: Retrieving plugin
Info: Caching catalog for puppetagent
Info: Applying configuration version '1634011790'
Notice: Applied catalog in 0.01 seconds
ubuntu@ip-172-31-13-205:~$
```

15) Now create a manifest file in Puppet Master

```
sudo nano /etc/puppet/code/environments/production/manifests/site.pp
```

16) Add following line in site.pp

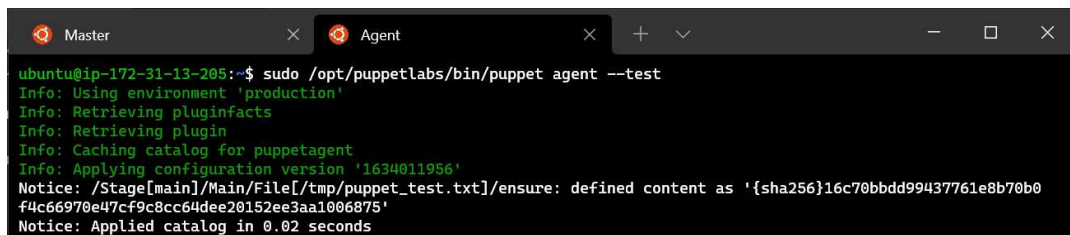
```
file {
  '/tmp/puppet_test.txt':
    ensure => present,           # resource type file and filename
    mode   => '0644',           # make sure it exists
    content => "Hello from Puppet master to agent on ${ipaddress_eth0}!\n", # file permissions
                                           # Print the eth0 IP fact
}
```



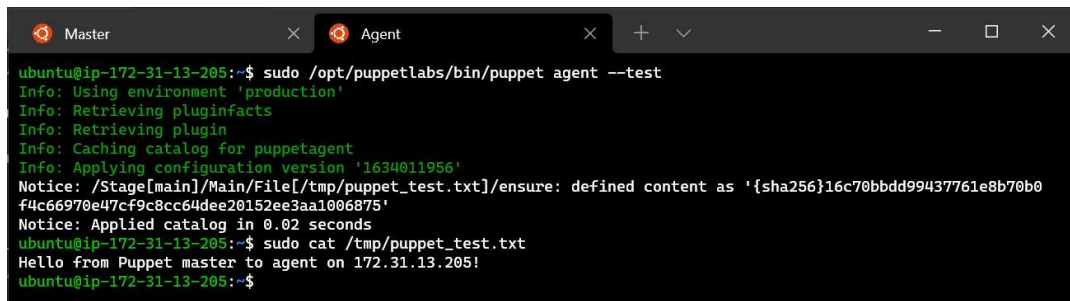
```
Master Agent
GNU nano 4.8 /etc/puppetlabs/code/environments/production/manifests/site.pp Modified
file {
  '/tmp/puppet_test.txt':
    ensure => present,           # resource type file and filename
    mode   => '0644',           # make sure it exists
    content => "Hello from Puppet master to agent on ${ipaddress_eth0}!\n", # file permissions
                                           # Print the eth0 IP fact
}
```


17) Now go to Puppet Agent machine and pull the manifest from master.

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

A terminal window with two tabs: 'Master' and 'Agent'. The 'Agent' tab is active, showing the output of the command 'sudo /opt/puppetlabs/bin/puppet agent --test'. The output includes information about the environment, plugin facts, and the application of a catalog.

```
ubuntu@ip-172-31-13-205:~$ sudo /opt/puppetlabs/bin/puppet agent --test
Info: Using environment 'production'
Info: Retrieving pluginfacts
Info: Retrieving plugin
Info: Caching catalog for puppetagent
Info: Applying configuration version '1634011956'
Notice: /Stage[main]/Main/File[/tmp/puppet_test.txt]/ensure: defined content as '{sha256}16c70bbdd99437761e8b70b0f4c66970e47cf9c8cc64dee20152ee3aa1006875'
Notice: Applied catalog in 0.02 seconds
```

18) See the output in file /tmp/puppet_test.txtA terminal window with two tabs: 'Master' and 'Agent'. The 'Agent' tab is active, showing the output of the command 'sudo /opt/puppetlabs/bin/puppet agent --test'. The output includes information about the environment, plugin facts, and the application of a catalog. Below this, the command 'sudo cat /tmp/puppet_test.txt' is executed, showing the contents of the file.

```
ubuntu@ip-172-31-13-205:~$ sudo /opt/puppetlabs/bin/puppet agent --test
Info: Using environment 'production'
Info: Retrieving pluginfacts
Info: Retrieving plugin
Info: Caching catalog for puppetagent
Info: Applying configuration version '1634011956'
Notice: /Stage[main]/Main/File[/tmp/puppet_test.txt]/ensure: defined content as '{sha256}16c70bbdd99437761e8b70b0f4c66970e47cf9c8cc64dee20152ee3aa1006875'
Notice: Applied catalog in 0.02 seconds
ubuntu@ip-172-31-13-205:~$ sudo cat /tmp/puppet_test.txt
Hello from Puppet master to agent on 172.31.13.205!
ubuntu@ip-172-31-13-205:~$
```

We have now Configured Pull based Software Configuration Management and provisioning tools using Puppet.

Conclusion :

Puppet does more than automate system administration. It changes the human workflow, and enables developers and system administrators to work together. Programmers can write, test, and launch applications without waiting on Ops staff to deliver the resources needed. Thus, we have successfully configured Pull based Software Configuration Management and provisioning tools using Puppet.