1. **Laboratory Exercise**
   A. **Procedure:**
   a. **Answer the following:**
   ● What is Puppet? Enlist its features.
   ● Puppet is a tool that helps you manage and automate the configuration of servers. When you use Puppet, you define the desired state of the systems in your infrastructure that you want to manage. You do this by writing infrastructure code in Puppet's Domain-Specific Language (DSL) — Puppet Code — which you can use with a wide array of devices and operating systems.
   Features:
   ● **Puppet DSL Intellisense**: Offers autocomplete and syntax highlighting for easier coding.
   ● **Linting**: Provides code quality checks to catch syntax errors and enforce best practices.
   ● **Built-in Commands**: Includes commands for resource management and supports both agent-master and standalone execution.
   ● **Cross-Platform Compatibility**: Manages Windows, Linux, and macOS systems, allowing unified management across diverse environments.
   ● **Declarative Language**: Enables you to specify the desired state of systems without detailing execution steps.
   ● **Extensive Module Ecosystem**: Features a wide array of reusable modules from Puppet Forge, fostering consistency and speed.
   ● **Reporting and Visualization**: Generates detailed reports on system states and changes, with tools for visualizing resource relationships.
   ● **Scalability**: Easily manages thousands of nodes, suitable for large infrastructures.
   ● **Integration Capabilities**: Supports APIs and can be integrated into CI/CD pipelines for automated deployment.
   ● **Security Features**: Includes role-based access control (RBAC) and encrypted data management for enhanced security.

- **Explain architecture of Puppet with a diagram.**
  Puppet uses master-slave or client-server architecture. Puppet client and server interconnected by SSL, which is a secure socket layer. It is a model-driven system.
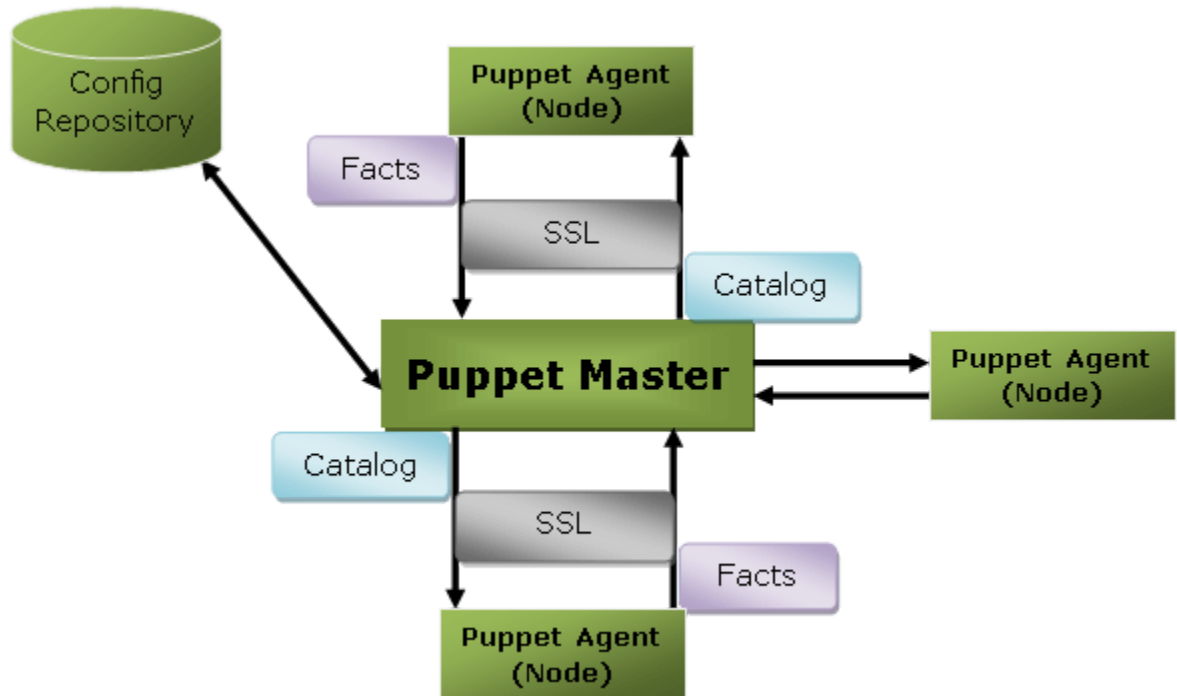
- Here, the client is referred to as a Puppet agent/slave/node, and the server is referred to as a Puppet master.
 Puppet is configured in an agent-server architecture, in which a primary server node controls configuration information for a fleet of managed agent nodes.

Server-agent communication follows this pattern:

An agent node sends facts to the primary server and requests a catalog.

1. The primary server compiles and returns the node's catalog using the sources of information the primary server has access to.
2. The agent applies the catalog to the node by checking each resource the catalog describes. If it finds resources that are not in their desired state, it makes the changes necessary to correct them. Or, in no-op mode, it assesses what changes would be needed to reconcile the catalog.
3. The agent sends a report back to the primary server.

b. **Refer the shared material and do online research to answer following:**

i. Mention steps for creating two EC2 instances with Ubuntu OS on AWS for creating master and slave machines. Attach screenshots for the same.
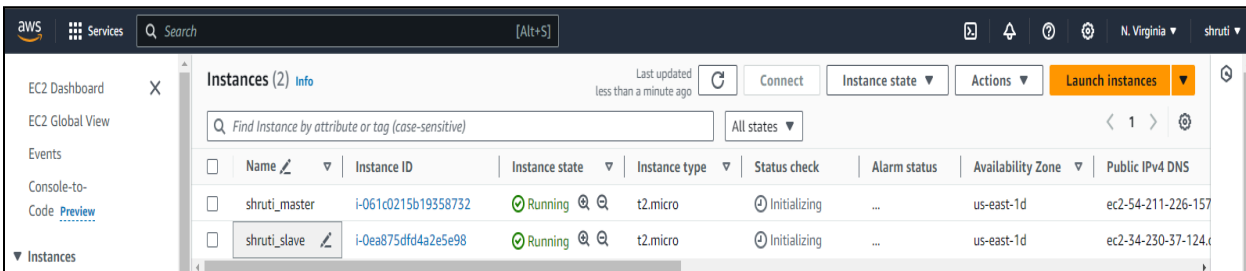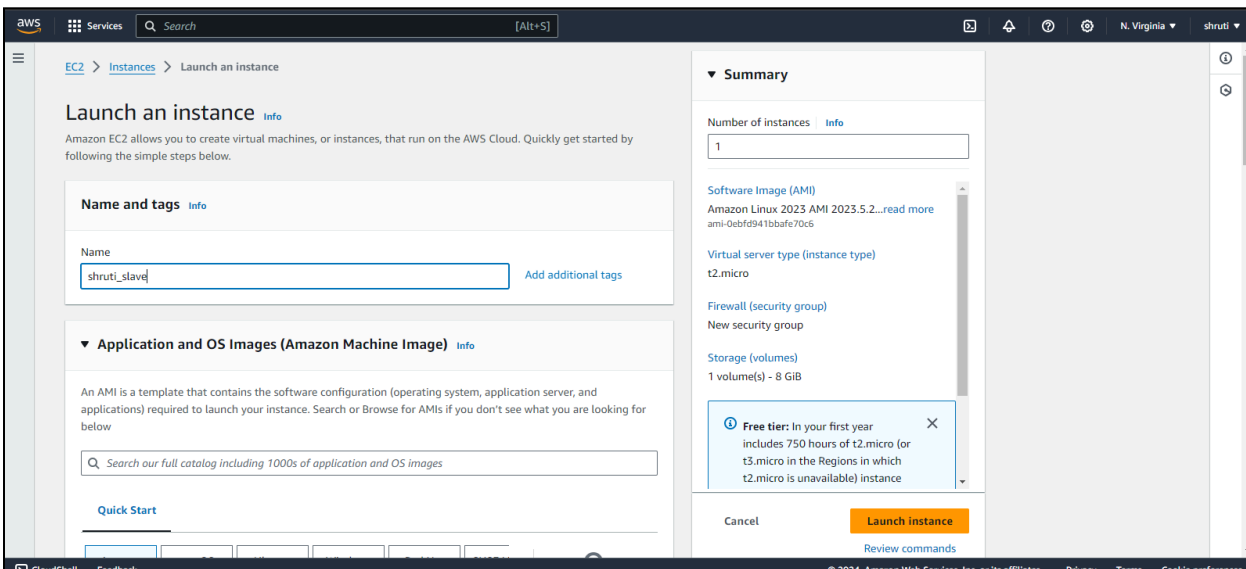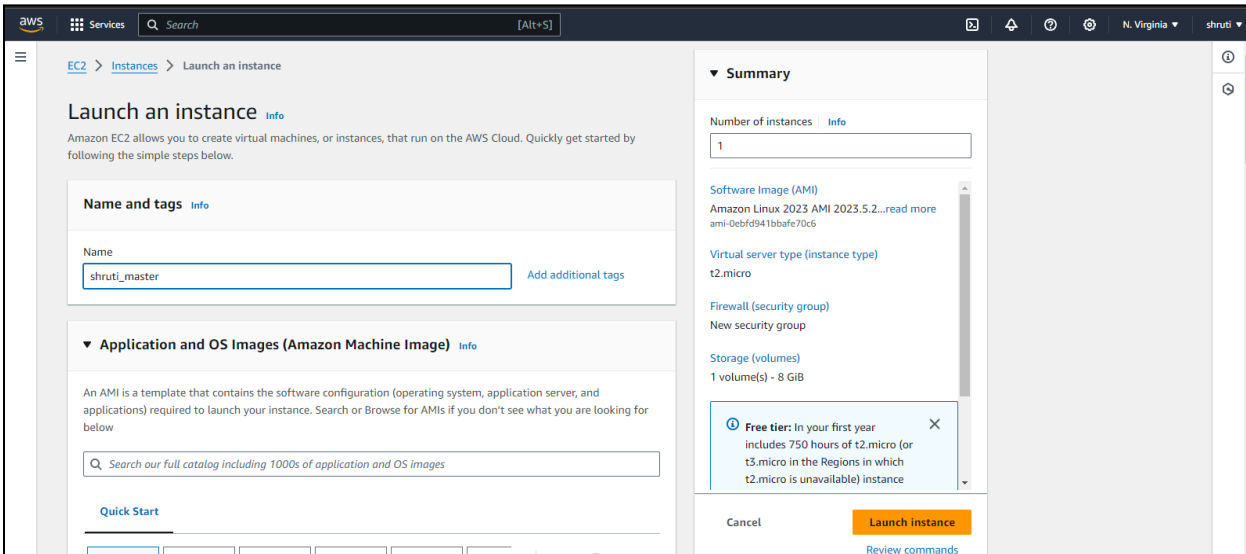
ii. Commands used to configure master and slave machines using putty.

Commands to run on puppet Master (which is one of the EC2 instances)

- sudo apt-get update :This command will update the packages

- wget https://apt.puppetlabs.com/puppet-release-bionic.deb :This command will download the puppet folder

- sudo dpkg -i puppet-release-bionic.deb :This command will unzip the puppet folder

- sudo apt-get install puppetmaster : This command will install the puppet master
- apt policy puppetmaster : This command will verify puppet master after installation
- sudo systemctl status puppet-master.service: This command will check status of puppet master service
- sudo nano /etc/default/puppet-master: This command will fine tune some settings….

- Add this line in the puppet master file: JAVA_ARGS="-Xms512m - Xmx512m"

This command will change the memory allocation to 512MB

- sudo systemctl restart puppet-master.service : This command will restart puppet master after the recent changes
- sudo ufw allow 8140/tcp : This command will open TCP port for puppet to communicate
- sudo nano /etc/hosts : This command will open hosts file for entering master's IP address
- sudo puppet cert list : This command will show puppet agent's certificate received for signing
- sudo puppet cert sign –all : This command will sign the received certificate

Commands to run on slave node/ puppet agent (which is the other EC2 instance)

- sudo apt-get update: This command will update the packages

- wget https://apt.puppetlabs.com/puppet-release-bionic.deb This command will download the puppet folder

```
ubuntu@ip-172-31-88-8:~$ wget https://apt.puppetlabs.com/puppet-release-bionic.deb
--2024-09-27 08:28:49--  https://apt.puppetlabs.com/puppet-release-bionic.deb
Resolving apt.puppetlabs.com (apt.puppetlabs.com)... 13.249.39.19, 13.249.39.21, 13.249.39.24, ...
Connecting to apt.puppetlabs.com (apt.puppetlabs.com)|13.249.39.19|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 11520 (11K) [application/vnd.debian.binary-package]
Saving to: 'puppet-release-bionic.deb'

puppet-release-bionic.deb          100%[===================================================================================================>]  11.25K  --.-KB/s    in 0s

2024-09-27 08:28:49 (419 MB/s) - 'puppet-release-bionic.deb' saved [11520/11520]

ubuntu@ip-172-31-88-8:~$
```

- sudo dpkg -i puppet-release-bionic.deb :This command will unzip the puppet folder

```
ubuntu@ip-172-31-88-8:~$ sudo dpkg -i puppet-release-bionic.deb
Selecting previously unselected package puppet-release.
(Reading database ... 67741 files and directories currently installed.)
Preparing to unpack puppet-release-bionic.deb ...
Unpacking puppet-release (1.0.0-33bionic) ...
Setting up puppet-release (1.0.0-33bionic) ...
ubuntu@ip-172-31-88-8:~$
```

- sudo apt-get install puppet :This command will install the puppet agent

```
ubuntu@ip-172-31-88-8:~$ sudo apt-get install puppet
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  augeas-lenses augeas-tools debconf-utils facter fonts-lato javascript-common libaugeas0 libjs-jquery libruby libruby3.2 puppet-agent rake ruby ruby-augeas
  ruby-concurrent ruby-deep-merge ruby-ffi ruby-hocon ruby-net-telnet ruby-puppet-resource-api ruby-rbtree ruby-rubygems ruby-sdbm ruby-selinux ruby-semantic-puppet
  ruby-shadow ruby-sorted-set ruby-sys-filesystem ruby-thor ruby-webrick ruby-xmlrpc ruby3.2 rubygems-integration unzip virt-what zip
Suggested packages:
  augeas-doc apache2 | lighttpd | httpd hiera-eyaml ruby-msgpack ri ruby-dev bundler
The following NEW packages will be installed:
  augeas-lenses augeas-tools debconf-utils facter fonts-lato javascript-common libaugeas0 libjs-jquery libruby libruby3.2 puppet puppet-agent rake ruby ruby-augeas
  ruby-concurrent ruby-deep-merge ruby-ffi ruby-hocon ruby-net-telnet ruby-puppet-resource-api ruby-rbtree ruby-rubygems ruby-sdbm ruby-selinux ruby-semantic-puppet
  ruby-shadow ruby-sorted-set ruby-sys-filesystem ruby-thor ruby-webrick ruby-xmlrpc ruby3.2 rubygems-integration unzip virt-what zip
0 upgraded, 37 newly installed, 0 to remove and 143 not upgraded.
Need to get 12.1 MB of archives.
After this operation, 58.1 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 fonts-lato all 2.015-1 [2781 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 rubygems-integration all 1.18 [5336 B]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 rake all 13.0.6-3 [61.6 kB]
```

```
Setting up ruby-hocon (1.3.1-2) ...
Setting up ruby-ffi:amd64 (1.16.3+dfsg-1build2) ...
Setting up ruby-rubygems (3.4.20-1) ...
Setting up ruby-sorted-set (1.0.3-3) ...
Setting up ruby-puppet-resource-api (1.9.0-1) ...
Setting up ruby-sys-filesystem (1.4.4-1) ...
Setting up facter (4.3.0-2) ...
Setting up puppet-agent (8.4.0-1) ...
puppet.service is a disabled or a static unit, not starting it.
Setting up puppet (8.4.0-1) ...
Processing triggers for libc-bin (2.39-0ubuntu8.2) ...
Processing triggers for man-db (2.12.0-4build2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
```

- sudo nano /etc/hosts :This command will open hosts file for entering master's IP address

- sudo systemctl start puppet :This command will start the puppet agent
- sudo systemctl enable puppet :This command will enable the puppet agent

- sudo puppet agent --test :This command will test communication between puppet master