

**DEPARTMENT OF
INFORMATION TECHNOLOGY**

DEVOPS LAB

LABORATORY MANUAL



SIES GRADUATE SCHOOL OF TECHNOLOGY
PLOT 1-C, D & E, SECTOR V, NERUL, NAVI MUMBAI-400 706

VISION OF THE INSTITUTE

To be a center of excellence in Engineering Education committed towards Socio-Economic Advancement of the country.

MISSION OF THE INSTITUTE

1. To impart advanced knowledge in Engineering and Technology.
2. To transform young minds towards professional competence by inculcating values and developing skills.
3. To promote research and ensure continuous value addition among students and employees.
4. To strengthen association with industry, research organizations and alumni to enhance knowledge on current technologies.
5. To promote next generation technocracy and nurture entrepreneurial culture for social-economic growth.

VISION OF THE DEPARTMENT

To develop IT professionals for accomplishment of industrial & societal needs through quality education.

MISSION OF THE DEPARTMENT

1. To impart advanced knowledge and develop skills in Information Technology and allied fields.
2. To enhance professional competence by inculcating values and ethics.
3. To upgrade technical skills and also encourage research culture.
4. To extend industry and alumni association for knowledge enhancement.
5. To nurture entrepreneurial talent and contribute towards socio-economic growth.

COURSE OUTCOMES

At the end of the course, the student should be able to:

1. To learn the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements
2. To obtain complete knowledge of the “version control system” to effectively track changes augmented with Git and GitHub
3. To demonstrate the importance of Jenkins to Build and deploy Software Applications on server environment
4. Demonstrate the importance of Selenium and Jenkins to test Software Applications
5. To understand concept of containerization and Analyze the Containerization of OS images and deployment of applications over Docker
6. To Synthesize software configuration and provisioning using Puppet /Ansible.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
To learn the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements	2	3	3	2	3	2	2	3	3	3	2	2	3	2
To obtain complete knowledge of the “version control system” to effectively track changes augmented with Git and GitHub	2	3	3	2	3	2	2	3	3	3	2	2	2	2
To demonstrate the importance of Jenkins to Build and deploy Software Applications on server environment	2	3	3	2	3	2	2	3	3	3	2	2	3	2
Demonstrate the importance of Selenium and Jenkins to test Software Applications	2	3	3	2	3	2	2	3	3	3	2	2	3	2

To understand concept of containerization and Analyze the Containerization of OS images and deployment of applications over Docker	2	3	3	2	3	2	2	3	3	3	2	2	2
To Synthesize software configuration and provisioning using Puppet /Ansible.	2	3	3	2	3	2	2	3	3	3	2	2	2

INDEX

1	Code of Conduct	1
2	List of Experiments	3
3	To understand DevOps: Principles, Practices, and DevOps, Engineer Role and Responsibilities.	4
5	a) To understand Version Control System / Source Code Management, install git and create a GitHub account.	8
	b) To Perform various GIT operations on local and Remote repositories using GIT CheatSheet.	
6	a) To understand Continuous Integration, install and configure Jenkins with Maven/Ant/Gradle to setup a build Job. b) To Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server	25
7	To understand Jenkins Master-Slave Architecture and scale your Jenkins standalone implementation by implementing slave nodes.	57
8	To Setup and Run Selenium Tests in Jenkins Using Maven.	63
9	To understand Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers.	72
10	To learn Dockerfile instructions, build an image for a sample web application using Dockerfile.	89
12	To install and Configure Pull based Software Configuration Management and provisioning tools using Puppet.	94
13	To learn Software Configuration Management and provisioning using Puppet Blocks(Manifest, Modules, Classes, Function)	108
14	To provision a LAMP/MEAN Stack using Puppet Manifest.	111

CODE OF CONDUCT FOR THE LABORATORIES

- All the students must observe the Dress Code while in the laboratory.
- Sandals or open-toed shoes are NOT allowed.
- Food, drinks and smoking are NOT allowed.
- All bags must be left at the indicated place.
- The lab timetable must be strictly followed.
- Be PUNCTUAL for your laboratory sessions.
- Program must be executed within the given time.
- Noise must be kept to minimum.
- Workspace must be kept clean and tidy all the time.
- Handle the systems and interfacing kits with care.
- All students are liable for any damage to the accessories due to negligence.
- All interfacing kits connecting cables must be RETURNED to the lab supervisor.
- Students are strictly PROHIBITED from taking out any items from the laboratory.
- Students are NOT allowed to work in the laboratory without the Lab supervisor.
- USB Ports have been disabled. If you want to use USB drive consult lab supervisor.
- Report immediately to the Lab Supervisor of any malfunction of the accessories..

Before leaving the lab

- Place the chairs properly.
- Turn off the system properly.
- Turn off the monitor.

Please check the laboratory notice board regularly for updates.

End semester lab examination, conducted as per the UOM regulations, carries 25 marks of Oral and Practical.

At the end of each laboratory session you must obtain the signature of the teacher along with the marks for the session out of 05 on the lab notebook and 05 for journal.

Lab Reports

- Note that, although students are encouraged to collaborate during lab, each must individually prepare a report and submit.
- They must be organized, neat and legible.
- Your report should be complete, thorough and understandable.
- You should include a well-drawn and labeled engineering schematic for each circuit investigated.
- Your reports should follow the prescribed format, to give your report structure and to make sure that you address all important points.
- Graphics requiring- drawn straight lines should be done with a straight edge. Well drawn free-hand sketches are permissible for schematics.
- Space must be provided in the flow of your discussion for any tables or figures. Do not collect figures and drawings in a single appendix at the end of the report.
- Reports should be submitted within one week after completing a scheduled lab session.

Presentation

- Experimental facts should always be given in the past tense.
- Discussions or remarks about the presentation of data should mainly be in the present tense.
- Discussion of results can be in both the present and past tenses, shifting back and forth from experimental facts to the presentation.
- Any specific conclusions or deductions should be expressed in the past tense.

LIST OF EXPERIMENTS

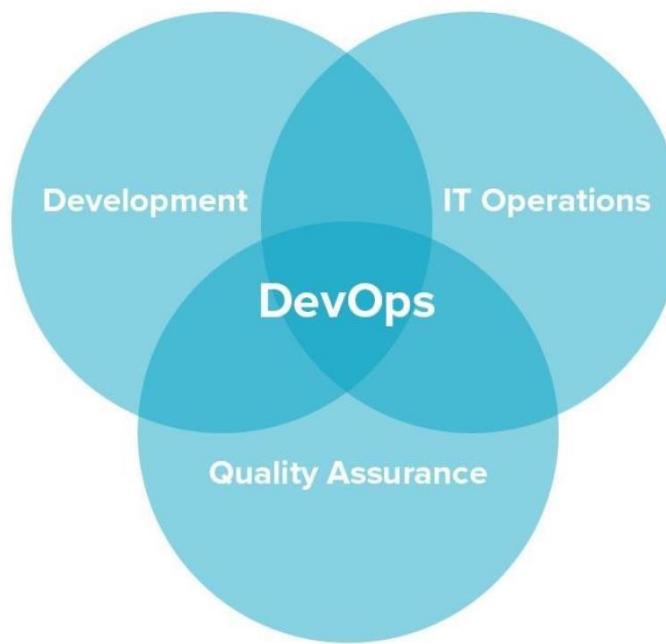
1. To understand DevOps: Principles, Practices, and DevOps, Engineer Role and Responsibilities.
2. To understand Version Control System / Source Code Management, install git and create a GitHub account. b) To Perform various GIT operations on local and Remote repositories using GIT CheatSheet.
3. a) To understand Continuous Integration, install and configure Jenkins with Maven/Ant/Gradle to setup a build Job. b) To Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server
4. To understand Jenkins Master-Slave Architecture and scale your Jenkins standalone implementation by implementing slave nodes.
5. To Setup and Run Selenium Tests in Jenkins Using Maven.
6. To understand Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers.
7. To learn Dockerfile instructions, build an image for a sample web application using Dockerfile.
8. To install and Configure Pull based Software Configuration Management and provisioning tools using Puppet.
9. To learn Software Configuration Management and provisioning using Puppet Blocks(Manifest, Modules, Classes, Function)
10. To provision a LAMP/MEAN Stack using Puppet Manifest.

EXPERIMENT-1

Aim: To understand DevOps: Principles, practices, DevOps, Engineer role and responsibilities.

Theory:

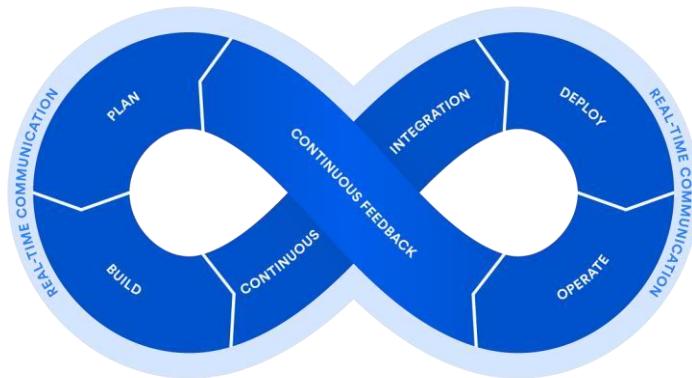
1. **Definition for DevOps:** DevOps stands for development and operations. It's a practice that aims at merging development, quality assurance, and operations (deployment and integration) into a single, continuous set of processes. This methodology is a natural extension of Agile and continuous delivery approaches. By adopting DevOps companies gain three core advantages that cover technical, business, and cultural aspects of development:
 - Higher speed and quality of product releases
 - Faster responsiveness to customer needs
 - Better working environment



2. **Principles:** In 2010 Damon Edwards and John Willis came up with the CAMS model to showcase the key values of DevOps. CAMS is an acronym that stands for Culture, Automation, Measurement, and Sharing.
 - Culture: DevOps is initially the culture and mindset forging strong collaborative bonds between software development and infrastructure operations teams. This culture is built upon the following pillars.

- Constant collaboration and communication: These have been the building blocks of DevOps since its dawn. Your team should work cohesively with the understanding of the needs and expectations of all members.
- Gradual changes: The implementation of gradual rollouts allows delivery teams to release a product to users while having an opportunity to make updates and roll back if something goes wrong.
- Shared end-to-end responsibility: When every member of a team moves towards one goal and is equally responsible for a project from beginning to end, they work cohesively and look for ways of facilitating other members' tasks
- Early problem-solving: DevOps requires that tasks be performed as early in the project lifecycle as possible. So, in case of any issues, they will be addressed more quickly.
- Automation of processes: Automating as many development, testing, configuration, and deployment procedures as possible is the golden rule of DevOps. It allows specialists to get rid of time-consuming repetitive work and focus on other important activities that can't be automated by their nature.
- Measurement of KPIs (Key Performance Indicators): Decision-making should be powered by factual information in the first place. To get optimal performance, it is necessary to keep track of the progress of activities composing the DevOps flow. Measuring various metrics of a system allows for understanding what works well and what can be improved.
- Sharing: Sharing is caring: This phrase explains the DevOps philosophy better than anything else as it highlights the importance of collaboration. It is crucial to share feedback, best practices, and knowledge among teams since this promotes transparency, creates collective intelligence and eliminates constraints. You don't want to put the whole development process on pause just because the only person who knows how to handle certain tasks went on a vacation or quitted.

3. Practices: DevOps requires a delivery cycle that comprises planning, development, testing, deployment, release, and monitoring with active cooperation between different members of a team.



To break down the process even more, let's have a look at the core practices that constitute the DevOps:

- **Agile planning:** In contrast to traditional approaches of project management, agile planning organizes work in short iterations to increase the number of releases. This means that the team has only high-level objectives outlined, while making detailed planning for two iterations in advance. This allows for flexibility and pivots once the ideas are tested on an early product increment.
- **Continuous development:** The concept of continuous “everything” embraces continuous or iterative software development, meaning that all the development work is divided into small portions for better and faster production. Engineers commit code in small chunks multiple times a day for it to be easily tested.
- **Continuous automated testing:** A quality assurance team sets committed code testing using automation tools like Selenium, Ranorex, UFT, etc. If bugs and vulnerabilities are revealed, they are sent back to the engineering team. This stage also entails version control to detect integration problems in advance. A Version Control System (VCS) allows developers to record changes in the files and share them with other members of the team, regardless of their location.
- **Continuous integration and continuous delivery (CI/CD):** The code that passes automated tests is integrated in a single, shared repository on a server. Frequent code submissions prevent a so-called “integration hell” when the differences between individual code branches and the mainline code become so drastic over time that integration takes more than actual coding. Continuous delivery, detailed in our dedicated article, is an approach that merges development, testing, and deployment operations into a streamlined process as it heavily relies on automation. This stage enables the automatic delivery of code updates into a production environment.
- **Continuous deployment:** At this stage, the code is deployed to run in production on a public server. Code must be deployed in a way that doesn't affect already functioning features and can be available for a large number of users. Frequent deployment allows for a “fail fast” approach, meaning that the new features are tested and verified early. There are various automated tools that help engineers deploy a product increment. The most popular are Chef, Puppet, Azure Resource Manager, and Google Cloud Deployment Manager.
- **Continuous monitoring:** The final stage of the DevOps lifecycle is oriented to the assessment of the whole cycle. The goal of monitoring is detecting the problematic areas of a process and analysing the feedback from the team and users to report existing inaccuracies and improve the product's functioning.
- **Microservices:** The microservice architectural approach entails building one application as a set of independent services that communicate with each other, but are configured individually. Building an application this way, you can isolate any arising problems ensuring that a failure in one service doesn't break the rest of the application functions. With the high rate of

deployment, microservices allow for keeping the whole system stable, while fixing the problems in isolation.

4. Engineer's Roles and Responsibilities:

The main function of a DevOps engineer is to introduce the continuous delivery and continuous integration workflow, which requires the understanding of the mentioned tools and the knowledge of several programming languages. Depending on the organization, job descriptions differ. Smaller businesses look for engineers with broader skillsets and responsibilities. For example, the job description may require product building along with the developers. Larger companies may look for an engineer for a specific stage of the DevOps lifecycle that will work with a certain automation tool.

The basic and widely-accepted responsibilities of a DevOps engineer are:

- Writing specifications and documentation for the server-side features

- Continuous deployment and continuous integration (CI/CD) management
- Performance assessment and monitoring
- Infrastructure management
- Cloud deployment and management
- Assistance with DevOps culture adoption

Conclusion: Hence we have understood the formal definition of DevOps, its practices, principles and the roles of a DevOps Engineer.

EXPERIMENT-2

Aim: a) To understand Version Control System / Source Code Management, install git and create a GitHub account.

Theory:

Version Control System/Source code management:

A version control system is a software that tracks changes to a file or set of files over time so that you can recall specific versions later. It also allows you to work together with other programmers. The version control system is a collection of software tools that help a team to manage changes in a source code. It uses a special kind of database to keep track of every modification to the code. Developers can compare earlier versions of the code with an older version to fix the mistakes.

Installation of Git

- In windows,
 - Download GIT from <https://git-scm.com/>
 - And perform the straightforward installation.
- Right click and select Git bash here
- \$git –version



Installation of Git on Ubuntu

- In Ubuntu, install GIT using
`$sudo apt install git`

- Once installation is done, open the terminal in Ubuntu and Confirm the version after installation.
`$git --version`

GitHub is a global company that provides hosting for software development version control using Git. It is a Subsidiary of Microsoft, which acquired the company in 2018 for \$7.5 billion. It offers all of the distributed version control and source code management (SCM) functionality of Git as well as adding its own features. It provides access control and several collaboration features such as bug tracking, feature requests, task management, and wikis for every project.

GitHub offers plans for free, professional, and enterprise accounts. Free GitHub accounts are commonly used to host open source projects. As of January 2019, GitHub offers unlimited private repositories to all Plans, including free accounts. As of May 2019, GitHub reports having over 37 million users and more than 100 million repositories (including at least 28 million public repositories), making it the largest host of source code in the world.

Conclusion:

Hence, we have studied about Version Control System / Source Code Management, installed git and have created a GitHub account.

Aim: b) To perform various GIT operations on local and Remote repositories using GIT Cheat-Sheet.

Theory: GitHub is a global company that provides hosting for software development version control using Git. It is a subsidiary of Microsoft, which acquired the company in 2018 for \$7.5 billion. It offers all of the distributed version control and source code management (SCM) functionality of Git as well as adding its own features. It provides access control and several collaboration features such as bug tracking, feature requests, task management, and wikis for every project.

GitHub offers plans for free, professional, and enterprise accounts. Free GitHub accounts are commonly used to host open source projects. As of January 2019, GitHub offers unlimited private repositories to all plans, including free accounts. As of May 2019, GitHub reports having over 37 million users and more than 100 million repositories (including at least 28 million public repositories), making it the largest host of source code in the world.

Making a new Git folder:



```
MINGW64:/c/riya/SEM 5/DevOps/git/devops
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git
$ mkdir devops

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git
$ cd devops

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops
$
```

Setting up local repository:



```
MINGW64:/c/riya/SEM 5/DevOps/git/local/Mirror
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/local (master)
$ git config --global user.email 'riya@riya.com'

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/local (master)
$ git config --global --list
user.name=riya
user.email=riya@riya.com
```

Setting up new folder for git project:

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops
$ cat >> testfile
this is riya

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops
$ cat testfile
this is riya

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops
$ git init
Initialized empty Git repository in C:/riya/SEM 5/DevOps/git/devops/.git/
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$
```

Adding files to git and committing:

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$ cat file2
this is line 1

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$ git status
On branch master

No commits yet

Untracked files:
  (use "git add <file>..." to include in what will be committed)
    file2
      testfile

nothing added to commit but untracked files present (use "git add" to track)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$ git add .
warning: LF will be replaced by CRLF in file2.
The file will have its original line endings in your working directory
warning: LF will be replaced by CRLF in testfile.
The file will have its original line endings in your working directory

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$ git status
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
    new file:   file2
    new file:   testfile

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$ git commit -m "first commit"
[master (root-commit) 9543445] first commit
  2 files changed, 2 insertions(+)
  create mode 100644 file2
  create mode 100644 testfile

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
```

Committing changes and Detecting changed files:

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$ cat > testfile
this is line2

[2]+  Stopped                  cat > testfile

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$ git commit -m "second commit" testfile
warning: LF will be replaced by CRLF in testfile.
The file will have its original line endings in your working directory
warning: LF will be replaced by CRLF in testfile.
The file will have its original line endings in your working directory
[master d3462eb] second commit
 1 file changed, 1 insertion(+), 1 deletion(-)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$ git log
commit d3462ebb7ed66277196b3d4a0f024e2de7ee0ebd (HEAD -> master)
Author: riya <riya@riya.com>
Date:   Mon Aug 9 20:17:45 2021 +0530

    second commit

commit 95434454f61ec6f0d5126607a1f0a9d441b8c2e7
Author: riya <riya@riya.com>
Date:   Mon Aug 9 20:12:59 2021 +0530

    first commit

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$
```

Adding remote repository:

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$ git remote add origin https://github.com/riyasingh1803/devops.git

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (master)
$ git branch -M main

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git remote show origin
* remote origin
  Fetch URL: https://github.com/riyasingh1803/devops.git
  Push URL: https://github.com/riyasingh1803/devops.git
  HEAD branch: (unknown)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git push -u origin main
Enumerating objects: 7, done.
Counting objects: 100% (7/7), done.
Delta compression using up to 4 threads
Compressing objects: 100% (4/4), done.
Writing objects: 100% (7/7), 500 bytes | 250.00 KiB/s, done.
Total 7 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/riyasingh1803/devops.git
 * [new branch]      main -> main
Branch 'main' set up to track remote branch 'main' from 'origin'.

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$
```

2 lines (2 sloc) | 30 Bytes

[Raw](#) [Blame](#)

```
1 this is line2
2 riya singh here
```

Pulling changes from remote repository:

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git pull https://github.com/riyasingh1803/devops.git
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 676 bytes | 6.00 KiB/s, done.
From https://github.com/riyasingh1803/devops
 * branch            HEAD      -> FETCH_HEAD
Updating d3462eb..c43fcb6
Fast-forward
 testfile | 1 +
 1 file changed, 1 insertion(+)
```

Reading Log of commits:

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git log
commit c43fcb697cd4505da776b3d337a364c81cb0bc5f (HEAD -> main)
Author: riyasingh1803 <83019966+riyasingh1803@users.noreply.github.com>
Date:   Mon Aug 9 20:23:36 2021 +0530

    third commit

commit d3462ebb7ed66277196b3d4a0f024e2de7ee0ebd (origin/main)
Author: riya <riya@riya.com>
Date:   Mon Aug 9 20:17:45 2021 +0530

    second commit

commit 95434454f61ec6f0d5126607a1f0a9d441b8c2e7
Author: riya <riya@riya.com>
Date:   Mon Aug 9 20:12:59 2021 +0530

    first commit

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ |
```

Trying fetch:

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git fetch https://github.com/riyasingh1803/devops.git
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 664 bytes | 5.00 KiB/s, done.
From https://github.com/riyasingh1803/devops
 * branch           HEAD      -> FETCH_HEAD

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git log
commit c43fcb697cd4505da776b3d337a364c81cb0bc5f (HEAD -> main)
Author: riyasingh1803 <83019966+riyasingh1803@users.noreply.github.com>
Date:   Mon Aug 9 20:23:36 2021 +0530

    third commit

commit d3462ebb7ed66277196b3d4a0f024e2de7ee0ebd (origin/main)
Author: riya <riya@riya.com>
Date:   Mon Aug 9 20:17:45 2021 +0530

    second commit

commit 95434454f61ec6f0d5126607a1f0a9d441b8c2e7
Author: riya <riya@riya.com>
Date:   Mon Aug 9 20:12:59 2021 +0530

    first commit

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ |
```

Git branch create and checkout a branch:

```
MINGW64:/c/riya/SEM 5/DevOps/git/devops
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git branch
* main

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat >> fileA.txt
feature1

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git add .
warning: LF will be replaced by CRLF in fileA.txt.
The file will have its original line endings in your working directory

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git commit -m "feature 1 added" fileA.txt
warning: LF will be replaced by CRLF in fileA.txt.
The file will have its original line endings in your working directory
[main fb232ec] feature 1 added
 1 file changed, 1 insertion(+)
 create mode 100644 fileA.txt

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git branch featureX

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git checkout featureX
Switched to branch 'featureX'

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureX)
$ git branch
* featureX
  main

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureX)
$ git log --oneline --graph
* fb232ec (HEAD -> featureX, main) feature 1 added
* c43fcbb6 third commit
* d3462eb (origin/main) second commit
* 9543445 first commit

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureX)
$ cat >> fileA.txt
"feature mistake"
```

Git commit on feature branch:

```
MINGW64:/c/riya/SEM 5/DevOps/git/devops
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureX)
$ git log --oneline --graph
* fb232ec (HEAD -> featureX, main) feature 1 added
* c43fcbb6 third commit
* d3462eb (origin/main) second commit
* 9543445 first commit

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureX)
$ cat >> fileA.txt
"feature mistake"

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureX)
$ git add .
warning: LF will be replaced by CRLF in fileA.txt.
The file will have its original line endings in your working directory

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureX)
$ git commit -m "feature mistake added" fileA.txt
warning: LF will be replaced by CRLF in fileA.txt.
The file will have its original line endings in your working directory
[featureX 3014866] feature mistake added
 1 file changed, 1 insertion(+)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureX)
$ |
```

Checkout old commit:

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devop
s (featureX)
$ cat fileA.txt
feature1
"feature mistake"

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devop
s (featureX)
$ git checkout main
Switched to branch 'main'
Your branch is ahead of 'origin/main' by 2 commits.
  (use "git push" to publish your local commits)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat fileA.txt
cat: file: No such file or directory
feature1

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat fileA.txt
feature1

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ ...
```

Merge with merge commit:

```
MINGW64:/c/riya/SEM 5/DevOps/git/devops
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git checkout -b 'featureZ'
Switched to a new branch 'featureZ'

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureZ)
$ cat fileA.txt
feature1
"feature mistake"

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureZ)
$ cat >> fileA.txt
this is feature Z

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureZ)
$ git commit -m "add feature Z" fileA.txt
warning: LF will be replaced by CRLF in fileA.txt.
The file will have its original line endings in your working directory
warning: LF will be replaced by CRLF in fileA.txt.
The file will have its original line endings in your working directory
[featureZ fda96f1] add feature Z
 1 file changed, 1 insertion(+)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (featureZ)
$ git checkout main
Switched to branch 'main'
Your branch is ahead of 'origin/main' by 3 commits.
  (use "git push" to publish your local commits)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git merge --no-ff featureZ
hint: Waiting for your editor to close the file...          0 [sig] bash 1817! si
gpacket::process: Suppressing signal 18 to win32 process (pid 4892)
718535 [sig] bash 1817! sigpacket::process: Suppressing signal 18 to win32 pr
ocess (pid 4892)
128178939 [sig] bash 1817! sigpacket::process: Suppressing signal 18 to win32
process (pid 4892)
128892627 [sig] bash 1817! sigpacket::process: Suppressing signal 18 to win32
process (pid 4892)
129415297 [sig] bash 1817! sigpacket::process: Suppressing signal 18 to win32
process (pid 4892)
129798942 [sig] bash 1817! sigpacket::process: Suppressing signal 18 to win32
process (pid 4892)
130068800 [sig] bash 1817! sigpacket::process: Suppressing signal 18 to win32
process (pid 4892)
130231930 [sig] bash 1817! sigpacket::process: Suppressing signal 18 to win32
process (pid 4892)
131382524 [sig] bash 1817! sigpacket::process: Suppressing signal 18 to win32
process (pid 4892)
Merge made by the 'recursive' strategy.
  fileA.txt | 1 +
 1 file changed, 1 insertion(+)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat fileA.txt
feature1
"feature mistake"
this is feature Z

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git log --oneline --graph
* e7f2452 (HEAD -> main) Merge branch 'featureZ'
|\ 
| * fda96f1 (featureZ) add feature Z
|/
* 3014866 (featureX) feature mistake added
* fb232ec feature 1 added
* c43fcbb third commit
* d3462eb (origin/main) second commit
* 9543445 first commit

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$
```

Merge with merge conflict:

```
MINGW64:/c/riya/SEM 5/DevOps/git/devops
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat >> myfile
feature1

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git add .
warning: LF will be replaced by CRLF in myfile.
The file will have its original line endings in your working directory

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git commit -m "add feature1" myfile
warning: LF will be replaced by CRLF in myfile.
The file will have its original line endings in your working directory
[main 47df593] add feature1
 1 file changed, 1 insertion(+)
 create mode 100644 myfile

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git checkout -b feature2
Switched to a new branch 'feature2'

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature2)
$ cat >> myfile
feature2

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature2)
$ git add .
warning: LF will be replaced by CRLF in myfile.
The file will have its original line endings in your working directory

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature2)
$ git commit -m "add feature2" myfile
warning: LF will be replaced by CRLF in myfile.
The file will have its original line endings in your working directory
[feature2 e071959] add feature2
 1 file changed, 1 insertion(+)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature2)
$ git checkout main
Switched to branch 'main'
Your branch is ahead of 'origin/main' by 6 commits.
  (use "git push" to publish your local commits)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat myfile
feature1
```

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat myfile
feature1

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat >> myfile
feature3

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git add .
warning: LF will be replaced by CRLF in myfile.
The file will have its original line endings in your working directory

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git commit -m "add feature3" myfile
warning: LF will be replaced by CRLF in myfile.
The file will have its original line endings in your working directory
[main 18ed667] add feature3
 1 file changed, 1 insertion(+)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat myfile
feature1
feature3

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git merge feature2
Auto-merging myfile
CONFLICT (content): Merge conflict in myfile
Automatic merge failed; fix conflicts and then commit the result.

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main|MERGING)
$ cat myfile
feature1
<<<<< HEAD
feature3
=====
feature2
>>>>> feature2
```

*myfile - Notepad

File Edit Format View Help

```
feature1
<<<<< HEAD
feature3|
=====
feature2
>>>>> feature2
```

Solving merge conflict:

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main|MERGING)
$ git add .

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main|MERGING)
$ git merge feature2
fatal: You have not concluded your merge (MERGE_HEAD exists).
Please, commit your changes before you merge.

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main|MERGING)
$ git commit -m "resolved conflict"
[main 0f166a9] resolved conflict

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git merge feature2
Already up to date.

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat myfile
feature1

feature3

feature2

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git log --oneline --graph
*   0f166a9 (HEAD -> main) resolved conflict
|\ \
| * e071959 (feature2) add feature2
* | 18ed667 add feature3
| /
* 47df593 add feature1
*   e7f2452 Merge branch 'featurez'
|\ \
| * fda96f1 (featurez) add feature Z
|/
* 3014866 (featureX) feature mistake added
* fb232ec feature 1 added
* c43fcbb third commit
* d3462eb (origin/main) second commit
* 9543445 first commit
```

Conclusion:

Hence, we have performed various GIT operations on local and remote repositories using GIT CheatSheet successfully.

POSTLAB:

REBASING:

```
MINGW64:/c/riya/SEM 5/DevOps/git/devops
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ touch newfile

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git add .

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git commit -m "add newfile" newfile
[main a57021e] add newfile
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 newfile

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git checkout -b feature1
Switched to a new branch 'feature1'

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1)
$ cat >> newfile
feature 1 added

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1)
$ git commit -m "add feature 1" newfile
warning: LF will be replaced by CRLF in newfile.
The file will have its original line endings in your working directory
warning: LF will be replaced by CRLF in newfile.
The file will have its original line endings in your working directory
[feature1 7686c43] add feature 1
 1 file changed, 1 insertion(+)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1)
$ git checkout main
Switched to branch 'main'
Your branch is ahead of 'origin/main' by 10 commits.
  (use "git push" to publish your local commits)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ touch newfile2

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git add .

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git commit -m "add newfile2" newfile2
[main ef1bedf] add newfile2
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 newfile2
```

```
MINGW64:/c/riya/SEM 5/DevOps/git/devops
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git checkout feature1
Switched to branch 'feature1'

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1)
$ git rebase main
Successfully rebased and updated refs/heads/feature1.

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1)
$ git log --oneline --graph --all
* da25acd (HEAD -> feature1) add feature 1
* ef1bedf (main) add newfile2
* a57021e add newfile
* 0f166a9 resolved conflict
|\ \
| * e071959 (feature2) add feature2
* | 18ed667 add feature3
|/
* 47df593 add feature1
* e7f2452 Merge branch 'featureZ'
|/
* fda96f1 (featureZ) add feature Z
|/
* 3014866 (featureX) feature mistake added
* fb232ec feature 1 added
* c43fcbb third commit
* d3462eb (origin/main) second commit
* 9543445 first commit

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1)
$ git checkout main
Switched to branch 'main'
Your branch is ahead of 'origin/main' by 11 commits.
  (use "git push" to publish your local commits)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ cat >> newfile
feature2

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git add .
warning: LF will be replaced by CRLF in newfile.
The file will have its original line endings in your working directory

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git commit -m "add feature2" newfile
warning: LF will be replaced by CRLF in newfile.
The file will have its original line endings in your working directory
```

```
[main 14c4feb] add feature2
1 file changed, 1 insertion(+)

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (main)
$ git checkout feature1
Switched to branch 'feature1'

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1)
$ git rebase main
error: could not apply da25acd... add feature 1
Resolve all conflicts manually, mark them as resolved with
"git add/rm <conflicted_files>", then run "git rebase --continue".
You can instead skip this commit: run "git rebase --skip".
To abort and get back to the state before "git rebase", run "git rebase --abort".
Could not apply da25acd... add feature 1
Auto-merging newfile
CONFLICT (content): Merge conflict in newfile

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1|REBASE 1/1)
$ git status
interactive rebase in progress; onto 14c4feb
Last command done (1 command done):
  pick da25acd add feature 1
No commands remaining.
You are currently rebasing branch 'feature1' on '14c4feb'.
  (fix conflicts and then run "git rebase --continue")
  (use "git rebase --skip" to skip this patch)
  (use "git rebase --abort" to check out the original branch)

Unmerged paths:
  (use "git restore --staged <file>..." to unstage)
  (use "git add <file>..." to mark resolution)
    both modified:  newfile

no changes added to commit (use "git add" and/or "git commit -a")

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1|REBASE 1/1)
$ cat newfile
<<<<< HEAD
feature2
=====
feature 1 added
>>>>> da25acd (add feature 1)
```

Solving merge conflict and rebasing:

```
ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1|REBASE 1/1)
$ git add .

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1|REBASE 1/1)
$ git rebase --continue
[detached HEAD 0857830] add feature 1
 1 file changed, 3 insertions(+)
Successfully rebased and updated refs/heads/feature1.

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1)
$ git log --oneline --graph --all
* 0857830 (HEAD -> feature1) add feature 1
* 14c4feb (main) add feature2
* ef1bedf add newfile2
* a57021e add newfile
* 0f166a9 resolved conflict
|\ 
| * e071959 (feature2) add feature2
* | 18ed667 add feature3
|/
* 47df593 add feature1
* e7f2452 Merge branch 'featurez'
|\
| * fda96f1 (featurez) add feature Z
* 3014866 (featureX) feature mistake added
* fb232ec feature 1 added
* c43fc6 third commit
* d3462eb (origin/main) second commit
* 9543445 first commit

ocean@DESKTOP-NIRCERT MINGW64 /c/riya/SEM 5/DevOps/git/devops (feature1)
$ git rebase --continue
fatal: No rebase in progress?
```

EXPERIMENT-3

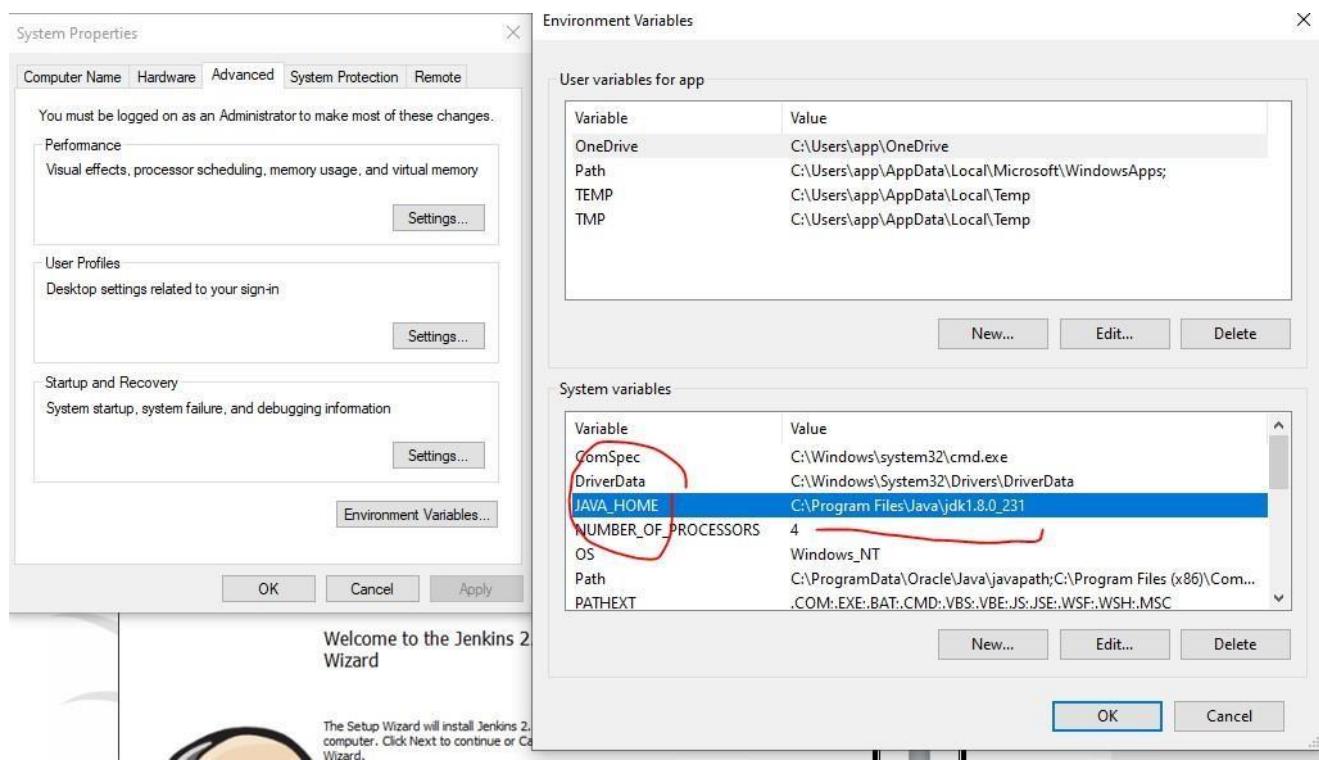
Aim: a) Installation of Jenkins with Maven/Ant/Gradle, GitHub and Python Plugins to setup a build Job.

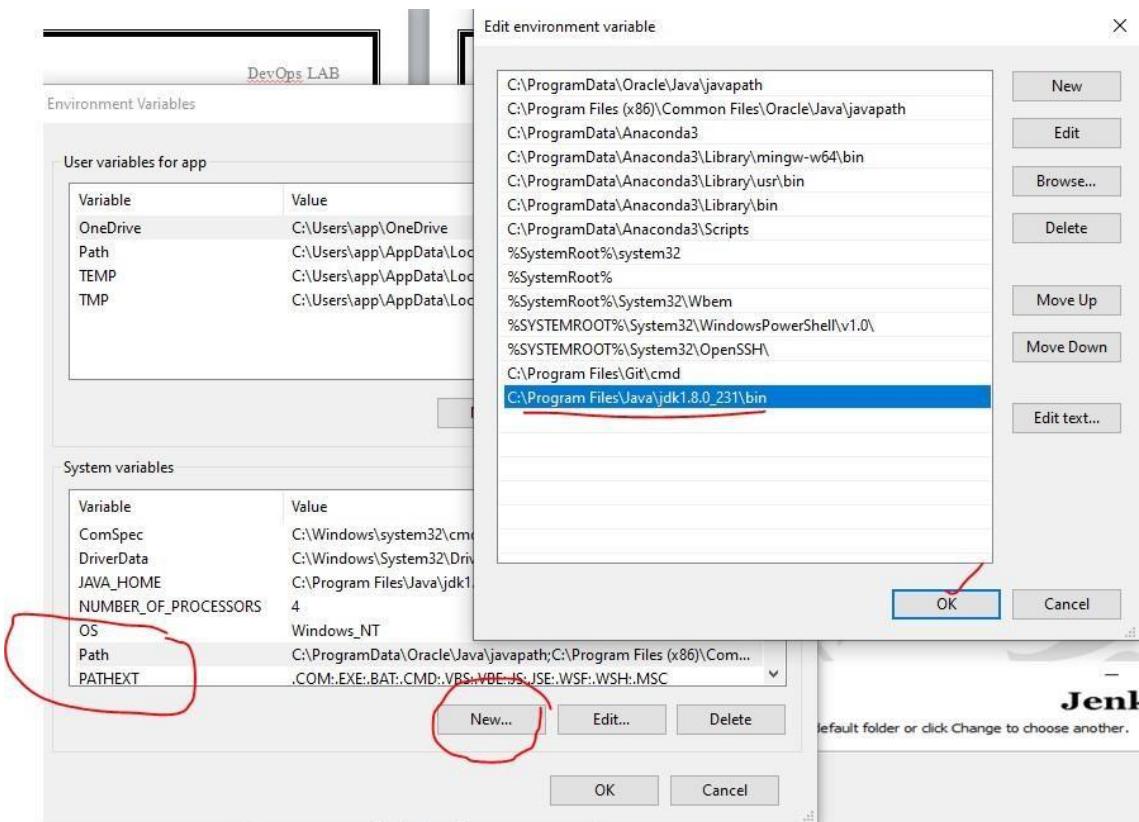
Theory: Jenkins is a free and open-source automation server. It helps automate the parts of software development related to building, testing, and deploying, facilitating continuous integration and continuous delivery. It is a server-based system that runs in servlet containers such as Apache Tomcat.

Installation process of Jenkins

Install Java: Jdk 1.8 or Java 11.

Set environment variable : path and JAVA_HOME





Step 1) Got to <https://www.jenkins.io/download/> and select the platform. In our case Windows

Step 2) Go to download location from local computer and unzip the downloaded package. Doubleclick on unzipped jenkins.msi. You can also Jenkins using a WAR (Web application ARchive) but that is not recommended.

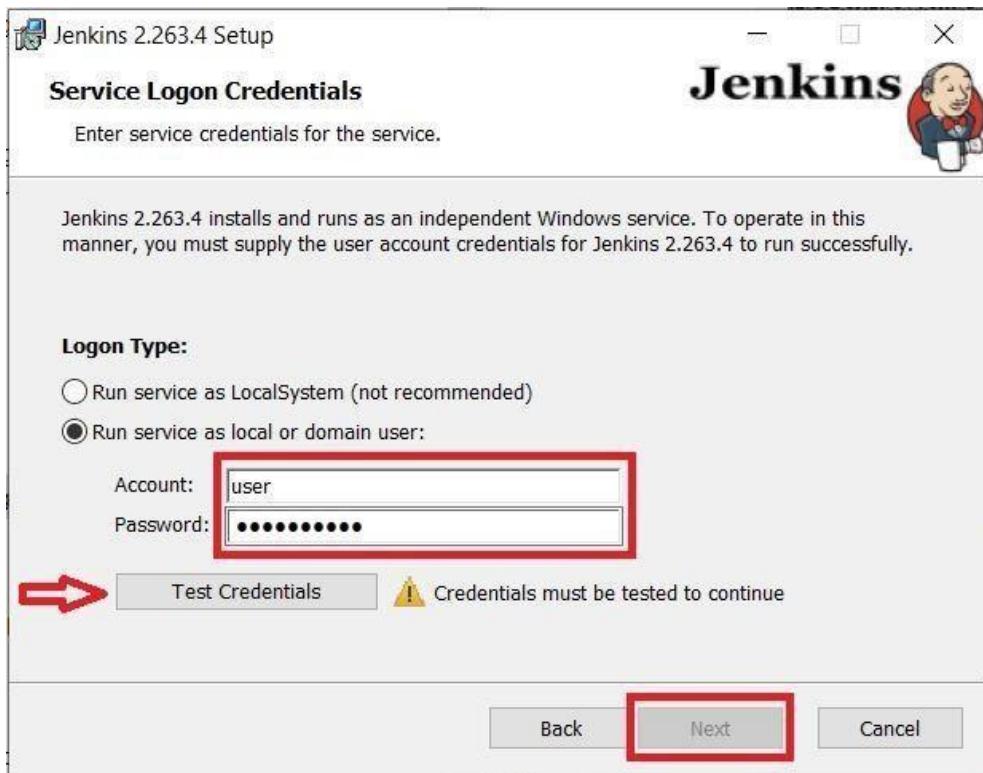
Step 3) In the Jenkins Setup screen, click Next.



Step 4) Choose the location where you want to have the Jenkins instance installed (default location is C:\Program Files (x86)\Jenkins), then click on Next button.

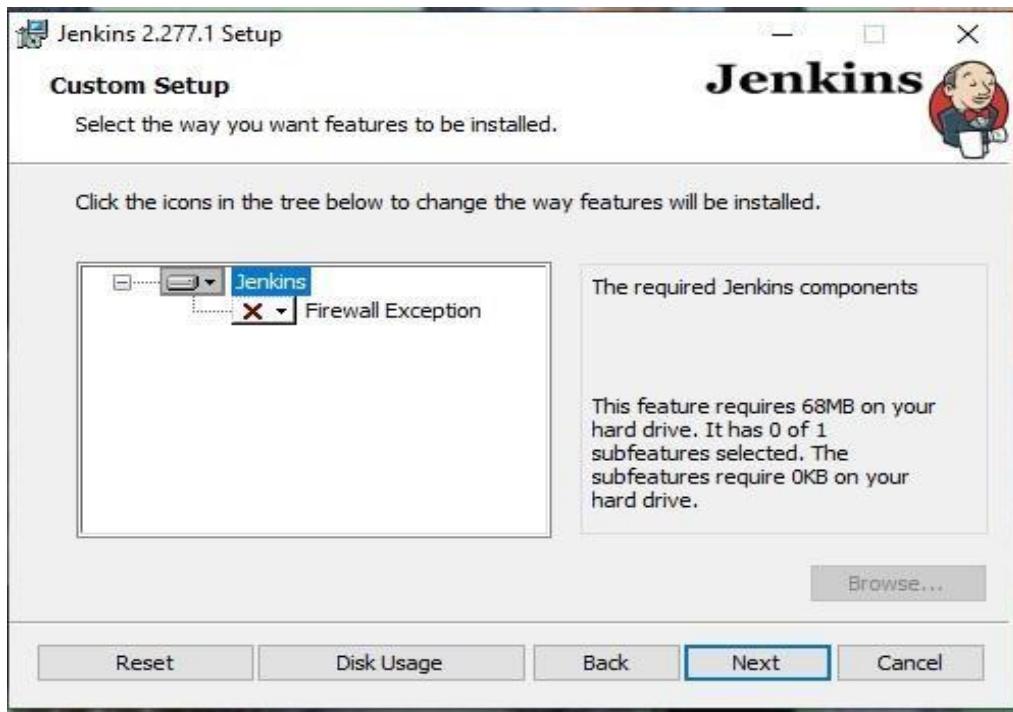


Here, Select Logon type as ' Run service as LocalSystem(Windows equivalent root)



Step 5) Click on the Install button.





Step 6) Once install is complete, click Finish.

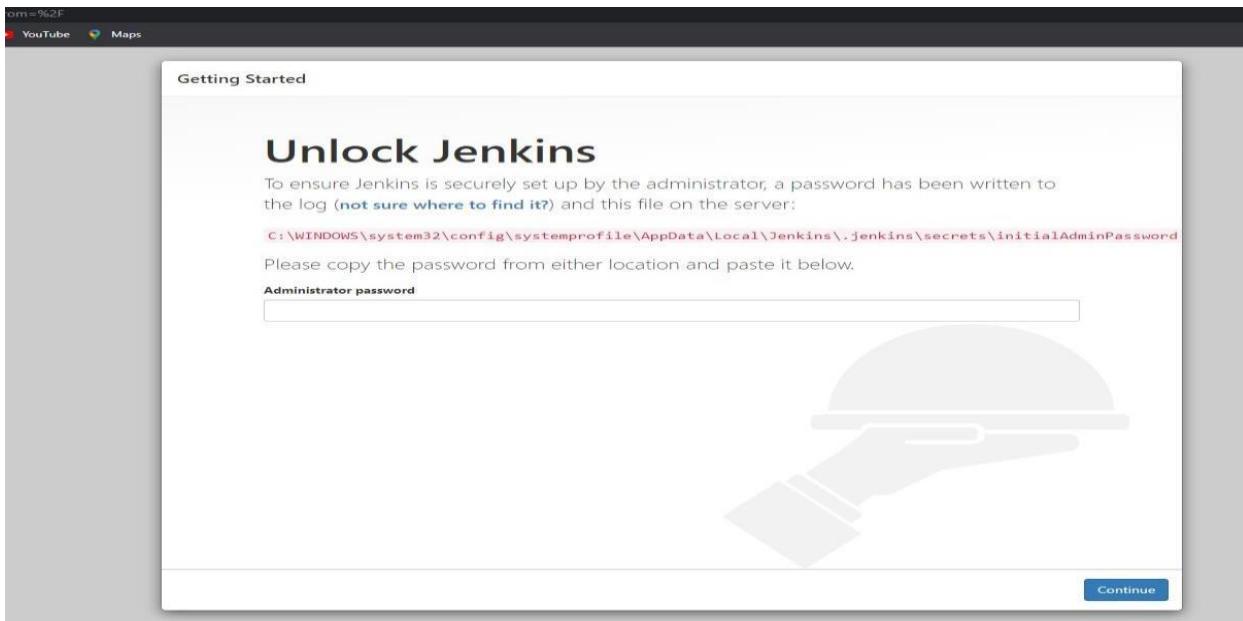


Step 7) During the installation process an info panel may pop-up to inform the user that for a complete setup, the system should be rebooted at the end of the current installation. Click on OK button when the Info panel is popping-up:

How to Unblock Jenkins?

After completing the Jenkins installation phase, you should proceed further and start its configuration. Next steps will guide you how you can unblock Jenkins application:

Step 1) After completing the Jenkins installation process, a browser tab will pop-up asking for the initial Administrator password. To access Jenkins, you need to go to browse the following path in your web browser. <http://localhost:8080>



If you can access the above URL, then it confirms that Jenkins is successfully installed in your system.

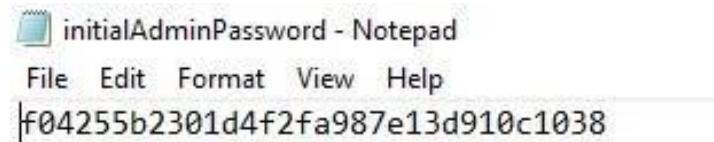
Step 2) The initial Administrator password should be found under the Jenkins installation path (set at Step 4 in Jenkins Installation).

For default installation location to C:\Program Files (x86)\Jenkins, a file called initialAdminPassword can be found under C:\Program Files (x86)\Jenkins\secrets.

However, If a custom path for Jenkins installation was selected, then you should check that location for initialAdminPassword file.

Name	Date modified	Type	Size
filepath-filters.d	16-03-2021 12:24	File folder	
whitelisted-callables.d	16-03-2021 12:24	File folder	
initialAdminPassword	16-03-2021 12:24	File	1 KB
jenkins.model.Jenkins.crumbSalt	16-03-2021 12:24	CRUMBSALT File	1 KB
master.key	16-03-2021 12:24	KEY File	1 KB
org.jenkinsci.main.modules.instance_ide...	16-03-2021 12:24	KEY File	1 KB
slave-to-master-security-kill-switch	16-03-2021 12:24	File	1 KB

Step 3) Open the highlighted file and copy the content of the initialAdminPassword file.



Step 4) Paste the password it into browser's pop-up tab (<http://localhost:8080/login?form=%2F>) and click on Continue button.

Customize Jenkins

You can also customize your Jenkins environment by below-given steps:

Step 1) Click on the "Install suggested plugins button" so Jenkins will retrieve and install the essential plugins

Getting Started

Customize Jenkins

Plugins extend Jenkins with additional features to support many different needs.

Install suggested plugins

Install plugins the Jenkins community finds most useful.

Select plugins to install

Select and install plugins most suitable for your needs.



Jenkins 2.277.1

Getting Started

<input checked="" type="checkbox"/> Folders	<input checked="" type="checkbox"/> OWASP Markup Formatter	<input checked="" type="checkbox"/> Build Timeout	<input checked="" type="checkbox"/> Credentials Binding	Folders
<input checked="" type="checkbox"/> Timestamper	<input type="checkbox"/> Workspace Cleanup	<input type="checkbox"/> Ant	<input type="checkbox"/> Gradle	** Trilead API OWASP Markup Formatter ** Structs ** Pipeline: Step API ** Token Macro Build Timeout ** JACV ** Credentials ** Plain Credentials ** SSH Credentials Credentials Binding ** SCM API ** Pipeline: API Timestamper ** Script Security
<input type="checkbox"/> Pipeline	<input type="checkbox"/> GitHub Branch Source	<input type="checkbox"/> Pipeline: GitHub Groovy Libraries	<input type="checkbox"/> Pipeline: Stage View	
<input type="checkbox"/> Git	<input type="checkbox"/> SSH Build Agents	<input type="checkbox"/> Matrix Authorization Strategy	<input type="checkbox"/> PAM Authentication	
<input type="checkbox"/> LDAP	<input type="checkbox"/> Email Extension	<input type="checkbox"/> Mailer		

Jenkins 2.277.1

Jenkins will start to download and install all the necessary plugins needed to create new Jenkins Jobs.

Note: You can choose the Option "Select Plugins to Install" and select the plugins you want to install
Step 2) After all suggested plugins were installed, the "Create First Admin User" panel will show up.
Fill all the fields with desired account details and hit the "Save and Finish" button.

The screenshot shows the Jenkins 'Create First Admin User' configuration page. At the top left, there is a link labeled 'Getting Started'. The main title is 'Create First Admin User'. Below the title, there are five input fields: 'Username' (with a placeholder 'jenkins'), 'Password' (with a placeholder 'password'), 'Confirm password' (with a placeholder 'password'), 'Full name' (with a placeholder 'Jenkins'), and 'E-mail address' (with a placeholder 'jenkins@jenkins')). At the bottom of the page, there is a footer with the text 'Jenkins 2.277.1'. To the right of the footer, there are two buttons: 'Skip and continue as admin' and a blue 'Save and Continue' button.

Step 3) Once you have filled the above data, finally it will ask for URL information where you can configure the default instance path for Jenkins. Leave it as it is to avoid any confusion later. However, if another application is already using 8080 port, you can use another port for Jenkins and finally save the settings, and you are done with installation of Jenkins. Hit the "Save and Continue" button:

Getting Started

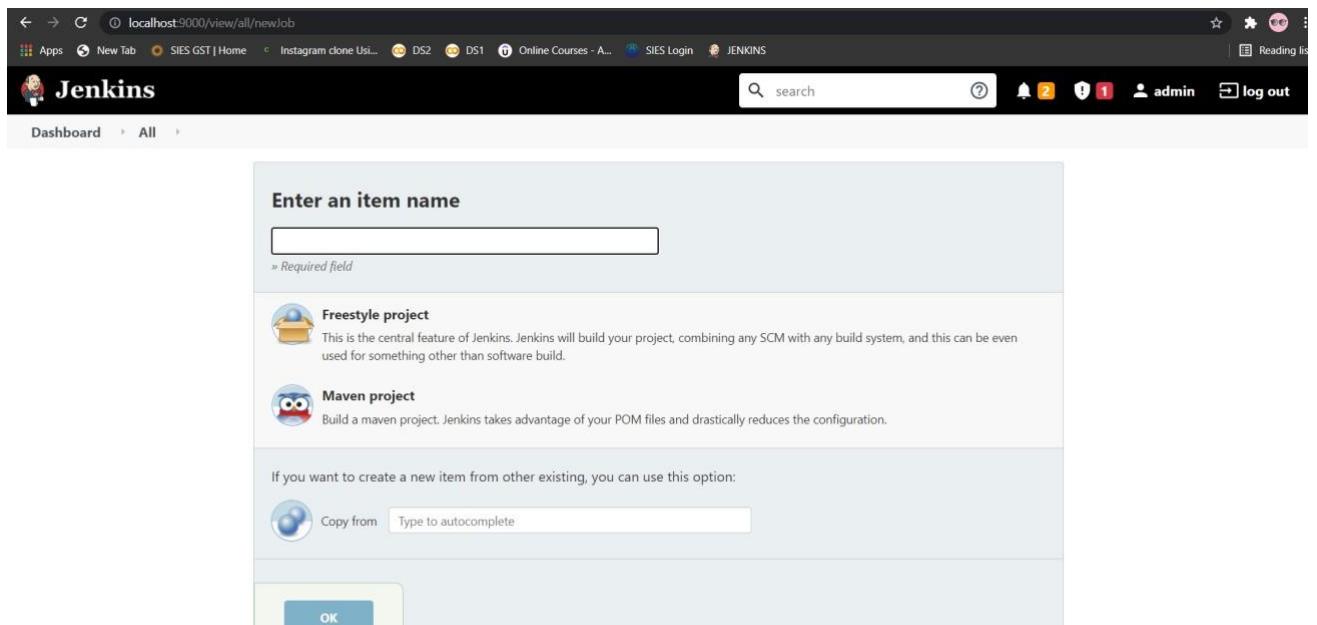
Jenkins is ready!

Your Jenkins setup is complete.

[Start using Jenkins](#)

We have successfully installed a new Jenkins Server. Hit the "Start using Jenkins" button.

Below you can find the Jenkins instance up and run, ready to create first Jenkins jobs:



Installation of Maven Integration Plugins:

The screenshot shows the Jenkins Plugin Manager interface. A search bar at the top contains the query 'maven'. Below it, a table lists several available plugins:

Name	Version	Released
Maven Integration	3.12	1 mo 27 days ago
Jira	3.5	1 mo 18 days ago
Pipeline Maven Integration	3.10.0	5 mo 29 days ago
Cobertura	1.16	1 yr 5 mo ago
Artifactory		

At the bottom of the page, there are buttons for 'Install without restart' and 'Download now and install after restart'. A note indicates that the information was obtained 1 day 3 hours ago.

The screenshot shows the Jenkins Update Center interface. It displays a list of available plugins and their installation status:

Plugin	Status
Git	Success
SSH Build Agents	Success
Matrix Authorization Strategy	Success
PAM Authentication	Success
LDAP	Success
Email Extension	Success
Mailer	Success
Loading plugin extensions	Success
Authentication Tokens API	Success
Docker Commons	Success
Docker API	Success
Docker	Success
Node Iterator API	Success
Variant	Success
Amazon Web Services SDK	Success
CloudBees AWS Credentials	Success
Amazon EC2	Success
Loading plugin extensions	Success
Python	Success
Loading plugin extensions	Success
Javadoc	Success
Maven Integration	Installing
Loading plugin extensions	Pending

At the bottom of the page, there are links to 'Go back to the top page' and 'Restart Jenkins when installation is complete and no jobs are running'.

The screenshot shows the Jenkins dashboard. At the top right, there are three status indicators: Python (Success), Loading plugin extensions (Success), Javadoc (Success), Maven Integration (Success), and Loading plugin extensions (Success). Below this, a search bar contains the text "maven". Under the search bar, tabs for "Updates", "Available", "Installed" (which is selected), and "Advanced" are visible. A table lists installed plugins, each with a checkbox and a brief description:

Enabled	Name
<input checked="" type="checkbox"/>	Apache HttpComponents Client 4.x API Plugin Bundles Apache HttpComponents Client 4.x and allows it to be used by Jenkins plugins. This plugin is up for adoption! We are looking for new maintainers. Visit our Adopt a Plugin initiative for more information.
<input checked="" type="checkbox"/>	Javadoc Plugin
<input checked="" type="checkbox"/>	JSch dependency plugin Jenkins plugin that brings the JSch library as a plugin dependency, and provides an SSHAuthenticatorFactory for using JSch wi
<input checked="" type="checkbox"/>	JUnit Allows JUnit-format test results to be published.
<input checked="" type="checkbox"/>	Mailer Plugin This plugin allows you to configure email notifications for build results
<input checked="" type="checkbox"/>	Maven Integration plugin This plug-in provides, for better and for worse, a deep integration of Jenkins and Maven: Automatic triggers between projects automated configuration of various Jenkins publishers (Junit, ...).

Installation of Python Plugin:

python plugin

Updates	Available	Installed	Advanced
Enabled		Name ↓	
		bouncycastle API	Version 2.23
		This plugin provides a stable API to Bouncy Castle related tasks.	<input type="button"/> Uninstall
		Command Agent Launcher Plugin	Version 1.6
		Allows agents to be launched using a specified command.	<input type="button"/> Uninstall
		JUnit Plugin	Version 1.52
		Allows JUnit-format test results to be published.	<input type="button"/> Uninstall
		Oracle Java SE Development Kit Installer Plugin	Version 1.5
		Allows the Oracle Java SE Development Kit (JDK) to be installed via download from Oracle's website.	<input type="button"/> Uninstall
		Python Plugin	Version 1.3
		Adds the ability to execute python scripts as build steps.	<input type="button"/> Uninstall
		Trilead API Plugin	Version 1.0.13
		Trilead API Plugin provides the Trilead library to any dependent plugins in an easily update-able manner.	<input type="button"/> Uninstall

Installation of GitHub Plugin:

github

Updates	Available	Installed	Advanced
Install ↑		Name	Version
		GitHub	Released
<input type="checkbox"/>		External Site/Tool Integrations github	1.34.1
		This plugin integrates GitHub to Jenkins.	3 days 8 hr ago
<input type="checkbox"/>		GitHub API	1.123
		api-plugin github Library plugins (for use by other plugins)	6 mo 7 days ago
		This plugin provides GitHub API for other plugins.	
<input type="checkbox"/>		GitHub Branch Source	2.11.2
		github pipeline Source Code Management	1 mo 13 days ago
		Multibranch projects and organization folders from GitHub. Maintained by CloudBees, Inc.	
<input type="checkbox"/>		Pipeline: GitHub Groovy Libraries	1.0
		github pipeline	4 yr 7 mo ago
		Allows Pipeline Groovy libraries to be loaded on the fly from GitHub.	
<input type="button"/> Install without restart		<input type="button"/> Download now and install after restart	Update information obtained: 5 min 43 sec ago <input type="button"/> Check now

```
at sun.net.www.protocol.https.HttpsURLConnectionImpl.getResponseBodyCode(Unknown Source)
at hudson.model.UpdateCenter$UpdateCenterConfiguration.testConnection(UpdateCenter.java:1406)
at hudson.model.UpdateCenter$UpdateCenterConfiguration.checkUpdateCenter(UpdateCenter.java:1189)
at hudson.model.UpdateCenter$ConnectionCheckJob.run(UpdateCenter.java:1640)
at java.util.concurrent.Executors$RunnableAdapter.call(Unknown Source)
at java.util.concurrent.FutureTask.run(Unknown Source)
at hudson.remoting.AtmostOneThreadExecutor$Worker.run(AtmostOneThreadExecutor.java:121)
at java.lang.Thread.run(Unknown Source)
```

OkHttp	Success
GitHub API	Success
Plain Credentials	Success
Credentials Binding	Success
Pipeline: SCM Step	Success
Git client	Success
Git	Success
Token Macro	Success
GitHub	Success
Loading plugin extensions	Success

↳ [Go back to the top page](#)

(you can start using the installed plugins right away)

↳ Restart Jenkins when installation is complete and no jobs are running

The screenshot shows the Jenkins plugin management interface. It lists two installed plugins:

- GitHub API Plugin**: Version 1.123. This plugin provides GitHub API for other plugins. It has a checked checkbox and an "Uninstall" button.
- GitHub plugin**: Version 1.34.1. This plugin integrates GitHub to Jenkins. It also has a checked checkbox and an "Uninstall" button.

Conclusion:

Hence, we have successfully installed Jenkins and configured Jenkins with Maven/Ant/Gradle ,GitHub and Python Plugins to setup a build Job.

Aim: b)

- i. To set up and build a Java, Maven /Ant and Python jobs in Jenkins.
- ii. To build the pipeline of jobs using Maven / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server.

Theory:

Jenkins is a free and open source automation server. It helps automate the parts of software development related to building, testing, and deploying, facilitating continuous integration and continuous delivery. It is a server-based system that runs in servlet containers such as Apache Tomcat.

- A. To set up and build a Java, Maven /Ant and Python jobs in Jenkins.

Steps for Creating and Testing Python job in Jenkins:

1. Install python and set environment settings on our machine.
2. Install Python plugins in Jenkins i.e. Manage Jenkins-> Manage Plugins -> Available-> Python Plugin -> select the plugin and click on install without restart.
3. Create a new job as freestyle project in Jenkins. New Item - > Freestyle Project. Add some optional description.

The screenshot shows the Jenkins 'New Item' creation interface. At the top, there is a text input field labeled 'Enter an item name' containing 'demo 3'. Below this, there is a list of project types:

- Freestyle project**: Described as the central feature of Jenkins, allowing combination of any SCM with any build system.
- Maven project**: Described as suitable for Maven projects, utilizing POM files to reduce configuration.
- Pipeline**: Described as orchestrating long-running activities across multiple build agents, suitable for workflows.
- Multi-configuration project**: Described as suitable for projects with many configurations, like testing across environments.
- Folder**: Described as a container for nested items, useful for grouping things together.

At the bottom right of the list, there is a blue 'OK' button.

The screenshot shows the Jenkins interface for a project named 'localpython'. The 'General' tab is active. In the 'Description' field, the text 'factorial program in python' is entered. Under 'Source Code Management', the dropdown is set to 'None'. At the bottom of the screen, there are two buttons: 'Save' and 'Apply'.

- Configure -> Build section, add build steps-> commands to run the py script. Implicit =>select Execute python script => write some implicit python script here -> save and apply. Go to step 5. Explicit => write the following Build steps, assuming your python script is stored in this location D:\python scripts

E:

python helloworld.py

The screenshot shows the Jenkins build configuration page. The 'Build' tab is selected. Under the 'Build' section, there is one step: 'Execute Windows batch command' with the command 'E: python helloworld.py'. Below the build steps, there is a 'Post-build Actions' section with a 'Save' and 'Apply' button.

5. Build Now -> Console Output.

Console Output

```
Started by user Riya Singh
Running as SYSTEM
Building in workspace C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\.jenkins\workspace\localpython
[localpython] $ cmd /c call C:\WINDOWS\TEMP\jenkins139812211413211883.bat

C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\.jenkins\workspace\localpython>E:

E:\>python helloworld.py
The factorial of 5 is 120

E:\>exit 0
Finished: SUCCESS
```

Steps for Testing Java job in Jenkins:

1. Install Java and set environment settings.
2. Create a new job as freestyle project.

The screenshot shows the Jenkins interface for creating a new item. The top navigation bar includes the Jenkins logo, a search bar, and a log out button. Below the bar, there's a 'Dashboard' link and an 'All' link. The main content area is a form titled 'Enter an item name' with a required field 'Java_Project'. It lists four project types: 'Freestyle project', 'Maven project', 'Pipeline', and 'Multi-configuration project', each with a small icon and a brief description. At the bottom of the form is a blue 'OK' button.

3. Configure ->Build section, commands to run the Java program. Add build steps-> select Windows batch commands. Go to Configure -> Build section, write the following Build steps, assuming your java program is stored in this location D:\java program
E:
javac sum.java
java sum %a% %b%
-> save and apply

General Source Code Management Build Triggers Build Environment Build Post-build Actions

Description
java hello world

[Plain text] Preview

Discard old builds ?

GitHub project ?

This build requires lockable resources ?

This project is parameterized ? X

String Parameter

Name ?
a

Default Value ?
10

Description ?

General Source Code Management Build Triggers Build Environment Build Post-build Actions

String Parameter

Name ?
b

Default Value ?
20

Description ?

[Plain text] Preview

Trim the string ?

Add Parameter ▾

Throttle builds ?

Disable this project ?

Execute concurrent builds if necessary ?

Save **Apply** **Advanced...**

The screenshot shows the Jenkins 'Build' configuration page. At the top, there are tabs: General, Source Code Management, Build Triggers, Build Environment, **Build**, and Post-build Actions. The 'Build' tab is selected. Below the tabs, there is a checkbox labeled 'With Ant' and a help icon. The main section is titled 'Build' and contains a step titled 'Execute Windows batch command'. The 'Command' field contains the following script:
E:
javac sum.java
java sum %a% %b%
Below the command field, there is a link 'See the list of available environment variables' and an 'Advanced...' button. At the bottom of the build section, there is a 'Save' button and an 'Apply' button.

4. Build Now -> Console Output. Verify the output of your java program.

Console Output

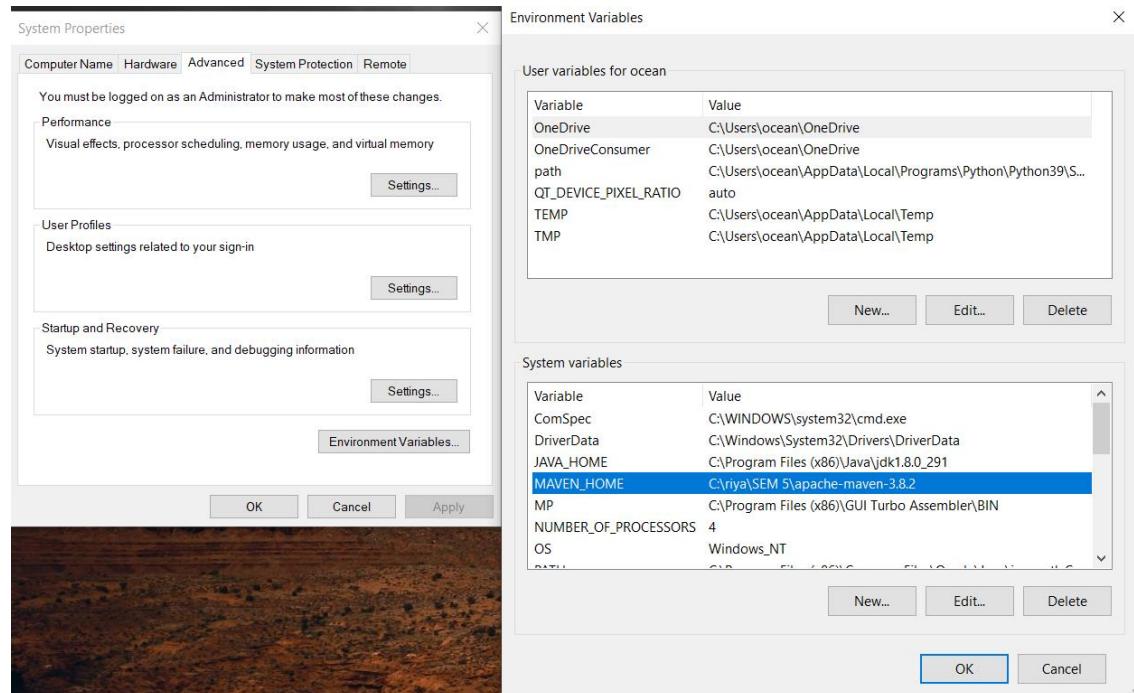
Started by user **Riya Singh**
Running as SYSTEM
Building in workspace C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\.jenkins\workspace\javaproject
[javaproject] \$ cmd /c call C:\WINDOWS\TEMP\jenkins6370759890409017119.bat

```
C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\.jenkins\workspace\javaproject>E:  
E:>javac sum.java  
E:>java sum 10 20  
Sum of integers is: 30  
E:>exit 0  
Finished: SUCCESS
```

Steps for Building Maven job from the GitHub remote repository into Jenkins:

1. Install Maven and set environment settings. Make sure you've previously set java settings properly.

Install Maven Integration plugin if not installed earlier and go to Manage Jenkins -> Global tool configurations -> Set Name => Maven <version> and Maven Home => path value of MAVEN_HOME.



2. Build maven project in your machine using mvn commands to learn how to create and build any maven project as shown here: <https://maven.apache.org/guides/getting-started/maven-in-five-minutes.html>

```

C:\ Command Prompt
C:\Users\ocean>cd C:\riya\SEM 5\apache-maven-3.8.2
C:\riya\SEM 5\apache-maven-3.8.2>mvn archetype:generate -DgroupId=com.mycompany.app -DartifactId=my-app -DarchetypeArtifactId=maven-archetype-quickstart -DarchetypeVersion=1.4 -DinteractiveMode=false
[INFO] Scanning for projects...
[INFO] 
[INFO] --- < org.apache.maven:standalone-pom >-
[INFO] Building Maven Stub Project (No POM) 1
[INFO] -----[ pom ]-----
[INFO] 
[INFO] >>> maven-archetype-plugin:3.2.0:generate (default-cli) > generate-sources @ standalone-pom >>>
[INFO] 
[INFO] <<< maven-archetype-plugin:3.2.0:generate (default-cli) < generate-sources @ standalone-pom <<<
[INFO] 
[INFO] 
[INFO] --- maven-archetype-plugin:3.2.0:generate (default-cli) @ standalone-pom ---
[INFO] Generating project in Batch mode
[INFO] 
[INFO] Using following parameters for creating project from Archetype: maven-archetype-quickstart:1.4
[INFO] 
[INFO] Parameter: groupId, Value: com.mycompany.app
[INFO] Parameter: artifactId, Value: my-app
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Parameter: package, Value: com.mycompany.app
[INFO] Parameter: packageInPathFormat, Value: com/mycompany/app
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] Parameter: package, Value: com.mycompany.app
[INFO] Parameter: groupId, Value: com.mycompany.app
[INFO] Parameter: artifactId, Value: my-app
[INFO] Project created from Archetype in dir: C:\riya\SEM 5\apache-maven-3.8.2\my-app
[INFO] 
[INFO] BUILD SUCCESS
[INFO] 
[INFO] Total time: 02:09 min
[INFO] Finished at: 2021-09-07T14:44:12+05:30
[INFO] 

C:\riya\SEM 5\apache-maven-3.8.2>cd my-app
C:\riya\SEM 5\apache-maven-3.8.2\my-app>mvn package
[INFO] Scanning for projects...
[INFO] 
[INFO] --- < com.mycompany.app:my-app >-
[INFO] Building my-app 1.0-SNAPSHOT
[INFO] -----[ jar ]-----
[INFO] 
[INFO] --- maven-resources-plugin:3.0.2:resources (default-resources) @ my-app ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory C:\riya\SEM 5\apache-maven-3.8.2\my-app\src\main\resources
[INFO] 
[INFO] Command Prompt
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/tukaani/xz/1.5/xz-1.5.pom
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/tukaani/xz/1.5/xz-1.5.pom (1.9 kB at 7.5 kB/s)
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/3.4/plexus-archiver-3.4.pom
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/3.4/plexus-archiver-3.4.pom (5.3 kB at 21 kB/s)
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-archiver/3.1.1/maven-archiver-3.1.1.jar
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-shared-utils/3.0.1/maven-shared-utils-3.0.1.jar
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-io/2.7.1/plexus-io-2.7.1.jar
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/3.4/plexus-archiver-3.4.jar
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/apache/commons/commons-compress/1.11/commons-compress-1.11.jar
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-archiver/3.1.1/maven-archiver-3.1.1.jar (24 kB at 93 kB/s)
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/tukaani/xz/1.5/xz-1.5.jar
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-io/2.7.1/plexus-io-2.7.1.jar (86 kB at 260 kB/s)
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/3.4/plexus-archiver-3.4.jar (187 kB at 540 kB/s)
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/commons/commons-compress/1.11/commons-compress-1.11.jar (154 kB at 400 kB/s)
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/tukaani/xz/1.5/xz-1.5.jar (100 kB at 193 kB/s)
[INFO] [INFO] Building jar: C:\riya\SEM 5\apache-maven-3.8.2\my-app\target\my-app-1.0-SNAPSHOT.jar
[INFO] [INFO] BUILD SUCCESS
[INFO] 
[INFO] Total time: 01:48 min
[INFO] Finished at: 2021-09-07T14:47:00+05:30
[INFO] 

C:\riya\SEM 5\apache-maven-3.8.2\my-app>java -cp target/my-app-1.0-SNAPSHOT.jar com.mycompany.app.App
Hello World!

C:\riya\SEM 5\apache-maven-3.8.2\my-app>
```

3. Create a maven job as Maven Project.

maven project
» Required field

Freestyle project
This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build system, and this can be even used for something other than software build.

Maven project
Build a maven project. Jenkins takes advantage of your POM files and drastically reduces the configuration.

Pipeline
Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.

Multi-configuration project
Allows you to define multiple configurations for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific

OK

4. In Configure section - >go to Source Code Management -> Git - > paste this repository URL => <https://github.com/bushsk/SimpleMavenProject.git> (Assuming our maven project is on GitHub repository).

Dashboard > maven_pro >

General Source Code Management Build Triggers Build Environment Pre Steps Build Post Steps Build Settings

Description

FIRST MAVEN PROJECT

[Plain text] Preview

Discard old builds GitHub project This build requires lockable resources This project is parameterized Throttle builds Disable this project Execute concurrent builds if necessary

Advanced...

Source Code Management

None

Save Apply

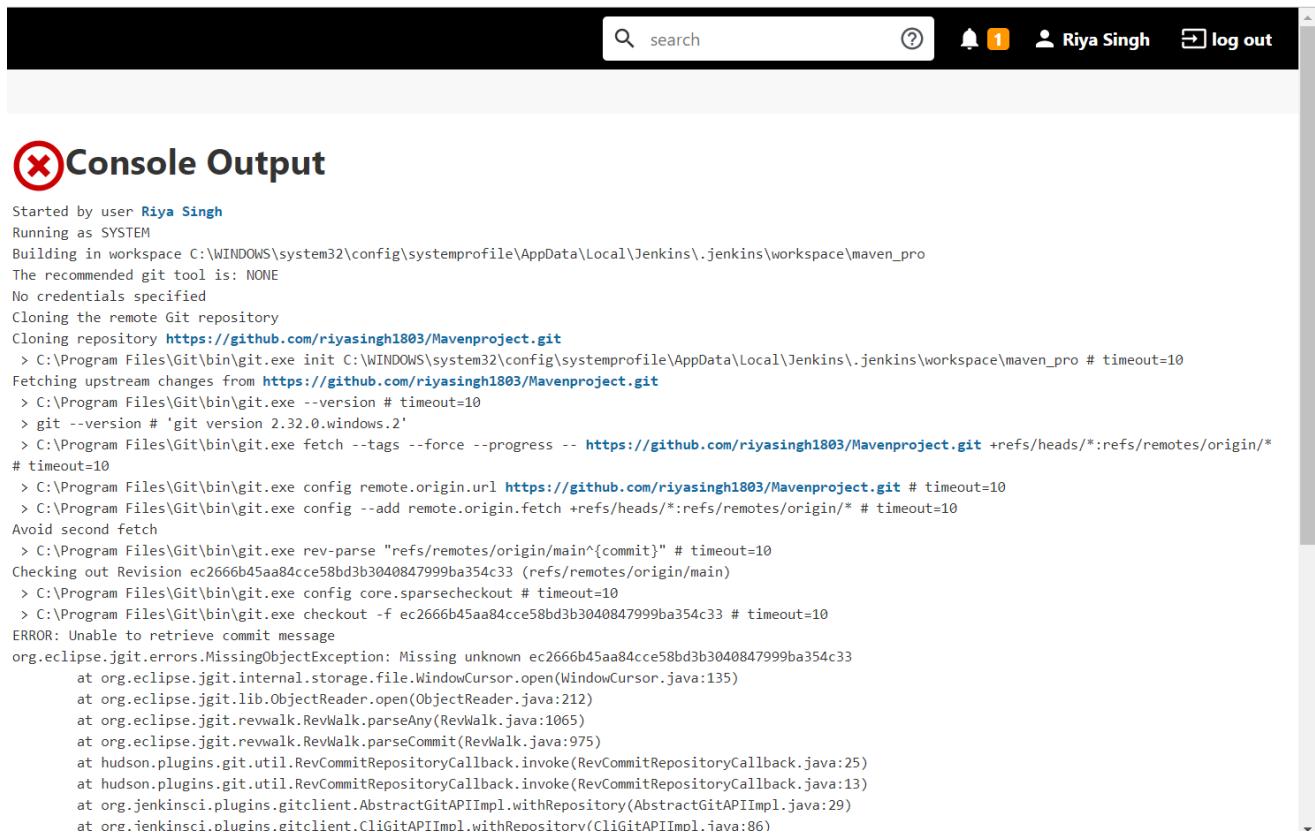
The screenshot shows the 'Source Code Management' tab selected in the Jenkins configuration interface. Under the 'Post-build Actions' section, 'Git' is chosen as the provider. A 'Repository URL' field contains 'https://github.com/riyasingh1803/Mavenproject.git'. The 'Credentials' dropdown is set to '- none -'. Buttons for 'Advanced...', 'Add Repository', and 'Add Branch' are visible. In the 'Branches to build' section, a 'Branch Specifier' field contains '/main'. A red 'X' button is present next to the field. Buttons for 'Save' and 'Apply' are at the bottom.

Note: Ensure that the GitHub Plugin is installed at this point. If it has not been installed, then do install it from Manage Jenkins-> Manage Plugins

5. In Build section -> Write the goals and options as => clean compile package. Make sure Root POM is set to pom.xml. -> save and apply.

The screenshot shows a Jenkins build configuration page. At the top, there are tabs: General, Source Code Management, Build Triggers, Build Environment, Pre Steps (which is selected and highlighted in blue), Build, Post Steps, and Build Settings. Below the tabs, there's a section for 'Post-build Actions' which is currently empty. The 'Pre Steps' section has a button 'Add pre-build step ▾'. The 'Build' section includes fields for 'Root POM' (set to 'pom.xml') and 'Goals and options' (set to 'clean compile package'). There is also an 'Advanced...' button. The 'Post Steps' section contains three radio buttons: 'Run only if build succeeds' (unchecked), 'Run only if build succeeds or is unstable' (unchecked), and 'Run regardless of build result' (checked). A note below says 'Should the post-build steps run only for successful builds, etc.' There is a 'Save' button and an 'Apply' button in a 'Build Settings' box.

6. Go to build now -> console output and verify whether the .jar file with the given artefact has been created or not inside the given path shown in the console output.



The screenshot shows a Jenkins job console output. At the top, there's a navigation bar with a search field, a help icon, a notification bell with one message, a user profile for 'Riya Singh', and a 'log out' button. Below the header, the title 'Console Output' is displayed with a red circular 'X' icon. The main area contains the Jenkins log output:

```

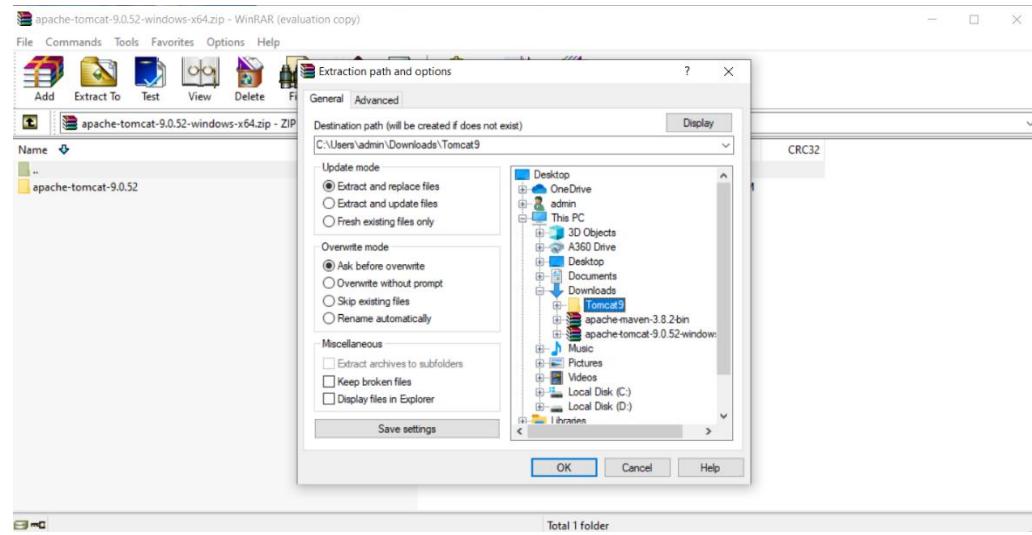
Started by user Riya Singh
Running as SYSTEM
Building in workspace C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\.jenkins\workspace\maven_pro
The recommended git tool is: NONE
No credentials specified
Cloning the remote Git repository
  Cloning repository https://github.com/riyasingh1803/Mavenproject.git
    > C:\Program Files\Git\bin\git.exe init C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\.jenkins\workspace\maven_pro # timeout=10
Fetching upstream changes from https://github.com/riyasingh1803/Mavenproject.git
  > C:\Program Files\Git\bin\git.exe --version # timeout=10
  > git --version # 'git version 2.32.0.windows.2'
  > C:\Program Files\Git\bin\git.exe fetch --tags --force --progress -- https://github.com/riyasingh1803/Mavenproject.git +refs/heads/*:refs/remotes/origin/*
# timeout=10
  > C:\Program Files\Git\bin\git.exe config remote.origin.url https://github.com/riyasingh1803/Mavenproject.git # timeout=10
  > C:\Program Files\Git\bin\git.exe config --add remote.origin.fetch +refs/heads/*:refs/remotes/origin/* # timeout=10
Avoid second fetch
  > C:\Program Files\Git\bin\git.exe rev-parse "refs/remotes/origin/main^{commit}" # timeout=10
Checking out Revision ec2666b45aa84cce58bd3b3040847999ba354c33 (refs/remotes/origin/main)
  > C:\Program Files\Git\bin\git.exe config core.sparsecheckout # timeout=10
  > C:\Program Files\Git\bin\git.exe checkout -f ec2666b45aa84cce58bd3b3040847999ba354c33 # timeout=10
ERROR: Unable to retrieve commit message
org.eclipse.jgit.errors.MissingObjectException: Missing unknown ec2666b45aa84cce58bd3b3040847999ba354c33
  at org.eclipse.jgit.internal.storage.file.WindowCursor.open(WindowCursor.java:135)
  at org.eclipse.jgit.lib.ObjectReader.open(ObjectReader.java:212)
  at org.eclipse.jgit.revwalk.RevWalk.parseAny(RevWalk.java:1065)
  at org.eclipse.jgit.revwalk.RevWalk.parseCommit(RevWalk.java:975)
  at hudson.plugins.git.util.RevCommitRepositoryCallback.invoke(RevCommitRepositoryCallback.java:25)
  at hudson.plugins.git.util.RevCommitRepositoryCallback.invoke(RevCommitRepositoryCallback.java:13)
  at org.jenkinsci.plugins.gitclient.AbstractGitAPIImpl.withRepository(AbstractGitAPIImpl.java:29)
  at org.jenkinsci.plugins.gitclient.CliGitAPIImpl.withRepository(CliGitAPIImpl.java:86)

```

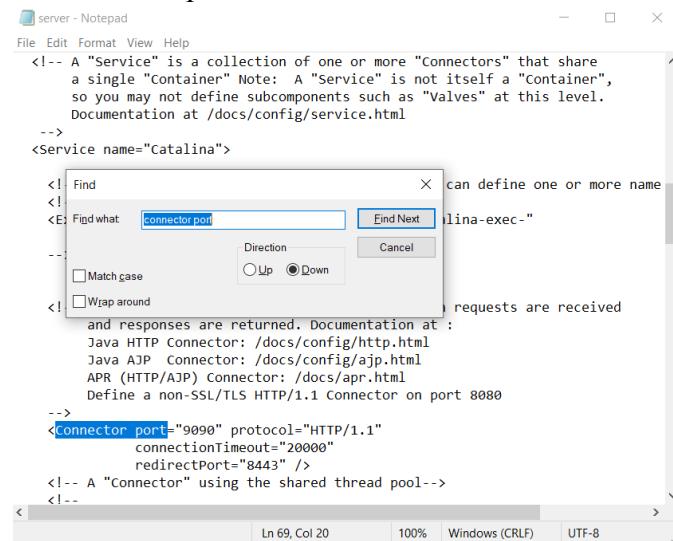
- B. To build the pipeline of jobs using Maven / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server.

Steps for Building Maven job from the GitHub remote repository into Jenkins using Jenkins pipeline: Setup and run apache tomcat server:

1.
 - a. Download apache tomcat server from official apache's tomcat website and Install it by extracting and set it to run on port 9090 or any other port since Jenkins is already running on 8080 port and by default tomcat also runs on 8080.



- b. To do the above, go to the apache tomcat directory and find server.xml inside config folder. Find this line by Ctrl+f “<Connector port="8080"" and replace it with “<Connector port="9090" and save it.



- c. Start the server by running the startup.bat file found inside apache-tomcat-9.0.52\bin folder and go to browser and test if the home page of server is up or not on localhost:9090.

Deployment of web application directory [C:\Users\admin\Downloads\Tomcat9\apache-tomcat-9.0.52\webapps\examples] has finished in [449] ms
06-Sep-2021 22:39:19.464 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deploying web application directory [C:\Users\admin\Downloads\Tomcat9\apache-tomcat-9.0.52\webapps\host-manager]
06-Sep-2021 22:39:19.520 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web application directory [C:\Users\admin\Downloads\Tomcat9\apache-tomcat-9.0.52\webapps\host-manager] has finished in [56] ms
06-Sep-2021 22:39:19.520 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deploying web application directory [C:\Users\admin\Downloads\Tomcat9\apache-tomcat-9.0.52\webapps\ROOT]
06-Sep-2021 22:39:19.569 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web application directory [C:\Users\admin\Downloads\Tomcat9\apache-tomcat-9.0.52\webapps\ROOT] has finished in [44] ms
06-Sep-2021 22:39:19.610 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web application directory [C:\Users\admin\Downloads\Tomcat9\apache-tomcat-9.0.52\webapps\ROOT] has finished in [41] ms
06-Sep-2021 22:39:19.620 INFO [main] org.apache.coyote.AbstractProtocol.start Starting ProtocolHandler ["http-nio-9098"]
06-Sep-2021 22:39:19.810 INFO [main] org.apache.catalina.startup.Catalina.start Server start up in [1467] milliseconds

Apache Tomcat/9.0.52

If you're seeing this, you've successfully installed Tomcat. Congratulations!

Recommended Reading:
[Security Considerations How-To](#)
[Manager Application How-To](#)
[Clustering/Session Replication How-To](#)

Developer Quick Start

Tomcat Setup
First Web Application Realms & AAA
JDBC DataSources Examples Servlet Specifications
Tomcat Versions

Managing Tomcat
For security, access to the `manager` webapp is restricted. Users are defined in: `$CATALINA_HOME/conf/tomcat-users.xml`
In Tomcat 9.0 access to the manager application is split between different users.
[Read more...](#)

Release Notes
[Changelog](#)
[Migration Guide](#)
[Security Notices](#)

Documentation
[Tomcat 9.0 Documentation](#)
[Tomcat 9.0 Configuration](#)
[Tomcat Wiki](#)
Find additional important configuration information in:
`$CATALINA_HOME/ RUNNING.txt`
Developers may be interested in:
[Tomcat 9.0 Bug Database](#)
[Tomcat 9.0 JavaDocs](#)
[Tomcat 9.0 Git Repository at GitHub](#)

Getting Help
FAQ and Mailing Lists
The following mailing lists are available:
tomcat-announce
Important announcements, releases, security vulnerability notifications. (Low volume.)
tomcat-users
User support and discussion
taglibs-user
User support and discussion for Apache Taglibs
tomcat-dev
Development mailing list, including commit messages

2. Go to Jenkins Dashboard and create a new pipeline project.

Dashboard All

Enter an item name

pipeline demo

» Required field

Freestyle project
This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build system, and this can be even used for something other than software build.

Maven project
Build a maven project. Jenkins takes advantage of your POM files and drastically reduces the configuration.

Pipeline
Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.

Multi-configuration project
Create jobs for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific

3. Go to Pipeline Section and choose Pipeline Script and write the following script here:

```
pipeline{

    agent any

    tools {

        maven 'Maven 3.8.2'

    }

    stages{

        stage("Git Clone"){

            steps

            {

                git 'https://github.com/riyasingh1803/hello-world.git'

            }

        }

        stage("Build"){

            steps

            {

                bat 'mvn clean install'

            }

        }

        stage("Deploy"){

            steps

            {

                bat

                    'copy

C:\\Windows\\System32\\config\\systemprofile\\AppData\\Local\\Jenkins\\.jenkins\\workspace\\maven_
```

```
pipeline\|webapp\|target\|webapp.war C:\|riya\|SEM 5\apache-tomcat-9.0.52-windows-x64\apache-tomcat-9.0.52\|webapps'
```

```
}
```

```
}
```

```
}
```

```
}
```

The screenshot shows the Jenkins General configuration page for a pipeline project. The project name is 'maven_pipeline'. The 'General' tab is selected. In the 'Description' field, the text 'pipeline project' is entered. Below the description, there is a 'Plain text' link and a 'Preview' button. A list of build triggers is shown, each with a help icon (blue question mark):

- Discard old builds
- Do not allow concurrent builds
- Do not allow the pipeline to resume if the controller restarts
- GitHub project
- Pipeline speed/durability override
- Preserve stashes from completed builds
- This project is parameterized
- Throttle builds

Below the triggers, there is a 'Build Triggers' section with three options:

- Build after other projects are built
- Build periodically
- GitHub hook trigger for GITScm polling

At the bottom of the page are two buttons: 'Save' and 'Apply'.

```

1 pipeline{
2   agent any
3   tools {
4     maven 'Maven 3.8.2'
5   }
6
7   stages{
8     stage("Git Clone"){
9       steps
10    {
11      git 'https://github.com/riyasingh1803/hello-world.git'
12    }
13  }
14  stage("Build"){
15    steps
16    {
17    }
18  }
19 }

```

Use Groovy Sandbox

Save Apply

4. Got to Build Now and verify if the pipeline build is successful. Go to <http://localhost:9090/webapp/> and verify if the home page of your application is up or not.

```

Started by user Riya Singh
Running in Durability level: MAX_SURVIVABILITY
[Pipeline] Start of Pipeline
[Pipeline] node
[Pipeline] {
[Pipeline] stage
[Pipeline] {
  [Pipeline] {
    [Pipeline] stage
    [Pipeline] {
      [Pipeline] {
        [Pipeline] stage
        [Pipeline] {
          [Pipeline] {
            [Pipeline] stage
            [Pipeline] {
              [Pipeline] {
                [Pipeline] {
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                                                                                      [Pipeline] {
................................................................

```

Conclusion:

Hence we have successfully built python, java and maven jobs using Jenkins. Also we have created a Jenkins pipeline to deploy test and deploy an application over the tomcat server.

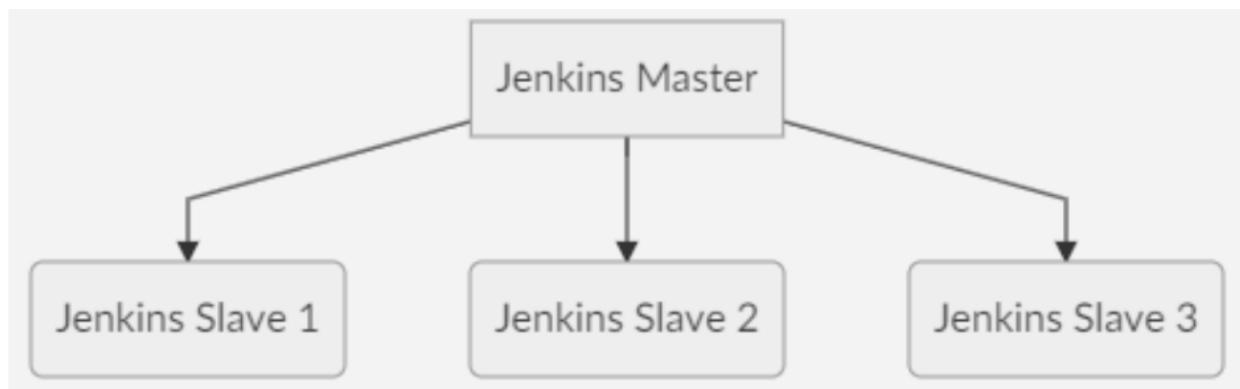
EXPERIMENT-4

AIM: To study Jenkins Master-Slave Architecture to scale your Jenkins standalone implementation by implementing slave nodes.

THEORY:

Jenkins is a free and open source automation server. It helps automate the parts of software development related to building, testing, and deploying, facilitating continuous integration and continuous delivery. It is a server-based system that runs in servlet containers such as Apache Tomcat.

Jenkins Master and Slave Architecture



The Jenkins master acts to schedule the jobs and assign slaves and send builds to slaves to execute the jobs. It will also monitor the slave state (offline or online) and getting back the build result responses from slaves and the display build results on the console output. The workload of building jobs is delegated to multiple slaves.

Jenkins Master

Your main Jenkins server is the Master. The Master's job is to handle:

- Scheduling build jobs.
- Dispatching builds to the slaves for the actual execution.
- Monitor the slaves (possibly taking them online and offline as required).
- Recording and presenting the build results.
- A Master instance of Jenkins can also execute build jobs directly.

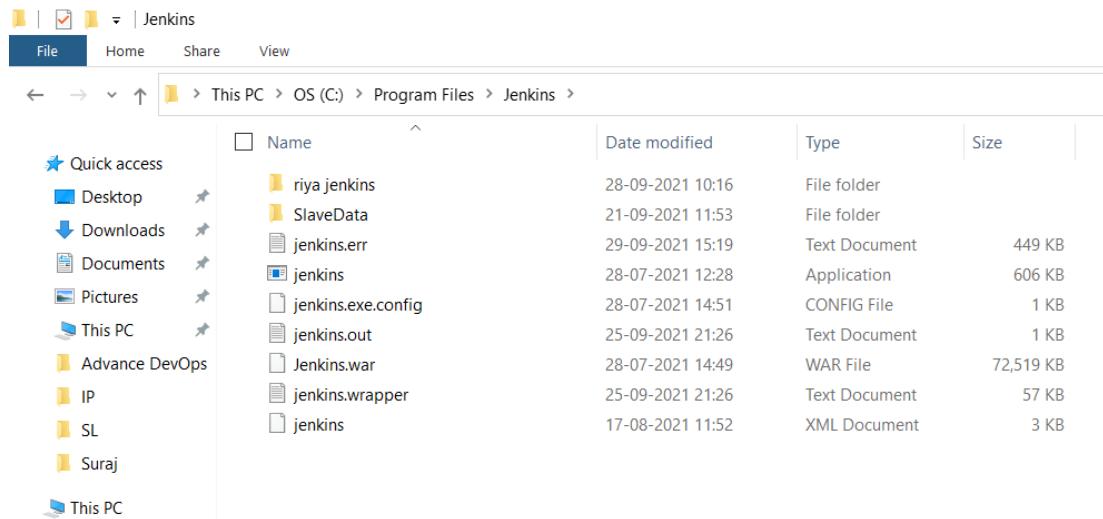
Jenkins Slave

A Slave is a Java executable that runs on a remote machine. Following are the characteristics of Jenkins Slaves:

- It hears requests from the Jenkins Master instance.
- Slaves can run on a variety of operating systems.
- The job of a Slave is to do as they are told to, which involves executing build jobs dispatched by the Master.
- You can configure a project to always run on a particular Slave machine or a particular type of Slave machine, or simply let Jenkins pick the next available Slave.

Output:

Step 1: Create a workspace by creating a folder anywhere in your system



Step 2: Create a new node with the following configuration:

Jenkins

Dashboard > Nodes > Replica

Name: Replica

Description: Maven Jobs

Number of executors: 3

Remote root directory: C:\Program Files\Jenkins\SlaveData

Labels: Maven_jobs

Usage: Use this node as much as possible

Launch method

Launch agent by connecting it to the master

Disable WorkDir

Custom WorkDir path

Internal data directory

remoting

Fail if workspace is missing

Use WebSocket

Advanced...

Availability

Keep this agent online as much as possible

Node Properties

Disable deferred wipeout on this node

Environment variables

Tool Locations

Save

Step 3 : Click on launch to download Jenkins agent.jar and click on agent.jar to download it

The screenshot shows the Jenkins interface for managing a slave node named "Agent Replica (Maven Jobs)". The top navigation bar includes links for Dashboard, Nodes, and Replica. On the left, a sidebar provides options like Back to List, Status, Delete Agent, Configure, Build History, Load Statistics, and Log. The main content area displays instructions for connecting the agent via browser or command line, along with specific command examples. It also lists the "Labels" assigned to this node (Maven_jobs) and "Projects tied to Replica" (None).

Agent Replica (Maven Jobs)

Connect agent to Jenkins one of these ways:

- Launch agent from browser
- Run from agent command line:

```
java -jar agent.jar -jnlpUrl http://localhost:8080/computer/Replica/jenkins-agent.jnlp -secret 17e95e8c72280376db9274e7c4b19fe213c393087eb732dc81593a9cb86d6120 -workDir "C:\Program Files\Jenkins\SlaveData"
```

Run from agent command line, with the secret stored in a file:
echo 17e95e8c72280376db9274e7c4b19fe213c393087eb732dc81593a9cb86d6120 > secret-file
java -jar agent.jar -jnlpUrl http://localhost:8080/computer/Replica/jenkins-agent.jnlp -secret @secret-file -workDir "C:\Program Files\Jenkins\SlaveData"

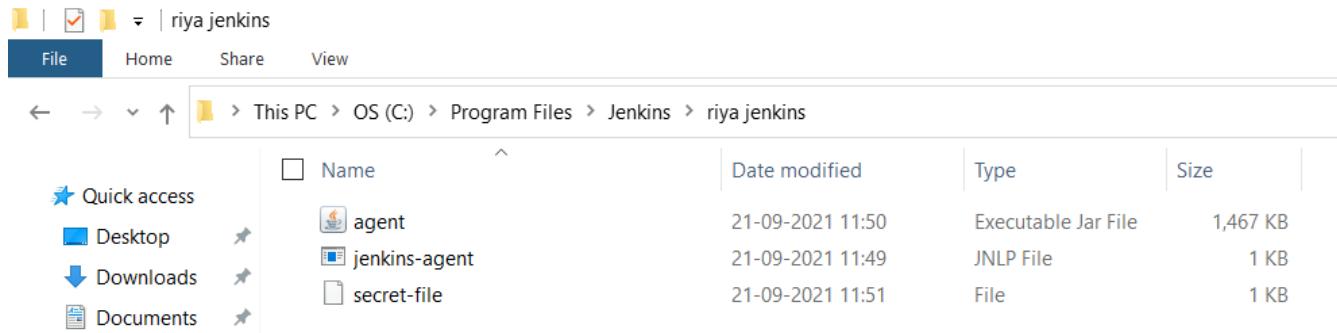
Labels

Maven_jobs

Projects tied to Replica

None

Step 4: Run the following commands being on the same file location where you download above files and observe the status as connected.



Step 5 : run commands in cmd of your slave node

```
C:\Program Files\Jenkins\SlaveData>java -jar agent.jar -jnlpUrl http://localhost:8080/computer/SlaveNode/jenkins-agent.jnlp -secret @secret-file -workDir "C:\Program Files\Jenkins\SlaveData"
Sep 22, 2021 3:01:54 PM org.jenkinsci.remoting.engine.WorkDirManager initializeWorkDir
INFO: Using C:\Program Files\Jenkins\SlaveData\remoting as a remoting work directory
Sep 22, 2021 3:01:54 PM org.jenkinsci.remoting.engine.WorkDirManager setupLogging
INFO: Both error and output logs will be printed to C:\Program Files\Jenkins\SlaveData\remoting
Sep 22, 2021 3:01:54 PM hudson.remoting.jnlp.Main createEngine
INFO: Setting up agent: SlaveNode
Sep 22, 2021 3:01:54 PM hudson.remoting.jnlp.Main$Cuilistener <init>
INFO: Jenkins agent is running in headless mode.
Sep 22, 2021 3:01:54 PM hudson.remoting.Engine startEngine
INFO: Using Remoting version: 4.7
Sep 22, 2021 3:01:54 PM org.jenkinsci.remoting.engine.WorkDirManager initializeWorkDir
INFO: Using C:\Program Files\Jenkins\SlaveData\remoting as a remoting work directory
Sep 22, 2021 3:01:56 PM hudson.remoting.jnlp.Main$Cuilistener status
INFO: WebSocket connection open
Sep 22, 2021 3:01:56 PM hudson.remoting.jnlp.Main$Cuilistener status
INFO: Connected
```

Step 6: Create a new job / item and select the label expression of your slave node under ‘Restrict where this project can be run’

Jenkins

Dashboard > slaveproject >

General Source Code Management Build Triggers Build Environment Build Post-build Actions

Description
testing a project on master-slave

[Plain text] Preview

Discard old builds GitHub project This build requires lockable resources This project is parameterized Throttle builds Disable this project Execute concurrent builds if necessary Restrict where this project can be run

Label Expression
Maven_jobs

Label Maven_jobs matches 1 node. Permissions or other restrictions provided by plugins may further reduce that list.

Advanced...

Save Apply

General Source Code Management Build Triggers **Build Environment** Build Post-build Actions Advanced...

Inspect build log for published Gradle build scans With Ant

Build

Execute Windows batch command

Command
echo "hi this is working"

See the list of available environment variables

Advanced...

Add build step ▾

Post-build Actions

Add post-build action ▾

Save Apply

Step 7: Build

The screenshot shows the Jenkins interface for a build named '#1' of a project called 'slaveproject'. The left sidebar has links for 'Back to Project', 'Status', 'Changes', 'Console Output' (which is selected), 'View as plain text', 'Edit Build Information', and 'Delete build #1'. The main content area is titled 'Console Output' with a green checkmark icon. It displays the following log output:

```
Started by user Riya Singh
Running as SYSTEM
Building remotely on Replica (Maven_jobs) in workspace C:\Program Files\Jenkins\SlaveData\workspace\slaveproject
[slaveproject] $ cmd /c call C:\Users\ocean\AppData\Local\Temp\jenkins3514568751711384533.bat
C:\Program Files\Jenkins\SlaveData\workspace\slaveproject>echo "hi this is working"
"hi this is working"
C:\Program Files\Jenkins\SlaveData\workspace\slaveproject>exit 0
Finished: SUCCESS
```

Conclusion:

Hence Jenkins Master-Slave Architecture to scale Jenkins standalone has been implemented by implementing slave nodes.

EXPERIMENT-5

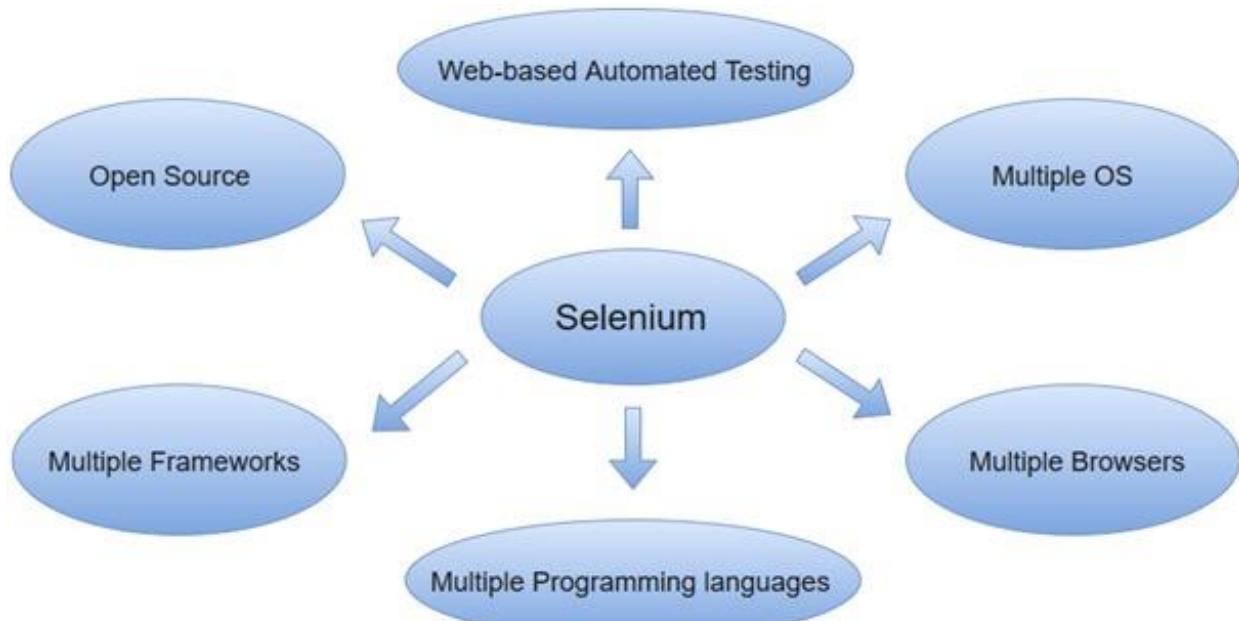
- Aim:**
- To setup an Eclipse IDE and Run Selenium Tests Using Maven.
 - To Setup and Run Selenium Tests in Jenkins Using Maven.

Theory:

Jenkins is a free and open source automation server. It helps automate the parts of software development related to building, testing, and deploying, facilitating continuous integration and continuous delivery. It is a server-based system that runs in servlet containers such as Apache Tomcat.

What is Selenium?

Selenium is a free (open-source) automated testing framework used to validate web applications across different browsers and platforms. You can use multiple programming languages like Java, C#, Python etc. to create Selenium Test Scripts. Testing done using the Selenium testing tool is usually referred to as Selenium Testing.



Selenium can be used to automate functional tests and can be integrated with automation test tools such as Maven, Jenkins, & Docker to achieve continuous testing. It can also be integrated with tools such as TestNG, & JUnit for managing test cases and generating reports.

Selenium WebDriver:

Selenium WebDriver is the most important component of Selenium Tool's Suite. The latest release "Selenium 2.0" is integrated with WebDriver API which provides a simpler and more concise programming interface.

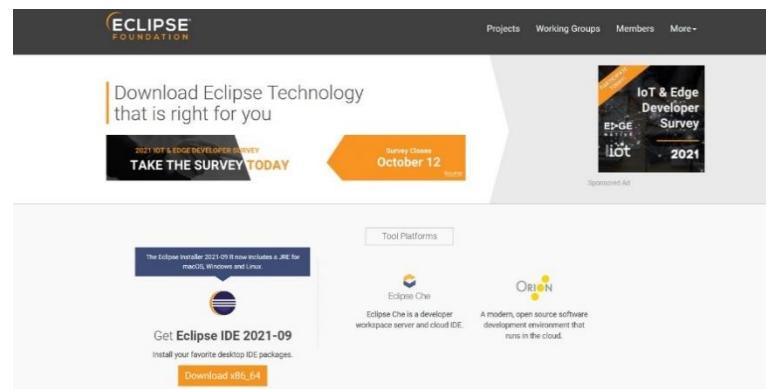
TestNG:

- TestNG is a very important framework when you are actually developing the framework from scratch level.
- TestNG provides you full control over the test cases and the execution of the test cases. Due to this reason, TestNG is also known as a testing framework.
- If you want to run a test case A before that as a pre-request you need to run multiple test cases before you begin a test case A. You can set and map with the help of TestNG so that pre-request test cases run first and then only it will trigger a test case A. In such way, you can control the test cases.
- TestNG framework came after Junit, and TestNG framework adds more powerful functionality and easier to use.
- It is an open source automated TestNG framework. In TestNG, NG stands for "Next Generation".
- TestNG framework eliminates the limitations of the older framework by providing more powerful and flexible test cases with help of easy annotations, grouping, sequencing and parameterizing.
- In TestNG, there is no constraint available such as @beforeclass and @afterclass which is present in Junit.
- TestNG enables you to group the test cases easily which is not possible in JUnit.
- TestNG supports three additional levels such as @Before/After suite, @Before/AfterTest, and Before/AfterGroup.
- TestNG does not extend any class. TestNG framework allows you to define the test cases where each test case is independent of other test cases

a) To setup an Eclipse IDE and Run Selenium Tests Using Maven.

Steps for writing Selenium test cases in Eclipse using maven:

1. Download and install any latest version of Eclipse IDE from <https://www.eclipse.org/downloads/>



2. Create your first maven project.
3. Add a new java AppTest class in your \src\test\java. Make sure to that filename should have a keyword „Test“.
4. Add the TestNG dependency under dependencies tag in pom.xml <dependencies> visit <https://mvnrepository.com/artifact/org.testng/testng/7.4.0> to copy the following dependency tag.

[Home](#) » [org.testng](#) » [testng](#) » [7.4.0](#)

TestNG » 7.4.0

Testing framework for Java

License	Apache 2.0
Categories	Testing Frameworks
HomePage	https://testng.org
Date	(Feb 27, 2021)
Files	jar (907 KB) View All
Repositories	Central
Used By	9,917 artifacts

[Maven](#) [Gradle](#) [Gradle \(Short\)](#) [Gradle \(Kotlin\)](#) [SBT](#) [Ivy](#) [Grape](#) [Leiningen](#) [Buildr](#)

```
!--- https://mvnrepository.com/artifact/org.testng/testng -->
<dependency>
    <groupId>org.testng</groupId>
    <artifactId>testng</artifactId>
    <version>7.4.0</version>
    <scope>test</scope>
</dependency>
```

Include comment with link to declaration

5. Write a sample test case using TestNG to print “Hello world” by annotating @Test and left click on red cross when shown as error to import package import org.testng.annotations.Test and similarly write some valid /suitable test cases.

6. Save and Run as Maven test.

The screenshot shows the Eclipse IDE interface. In the top left, there's a code editor window titled 'TestHelloWorld.java' containing Java code for a Selenium test. In the bottom right, there's a 'Console' view window showing the output of a Maven test run. The console output includes the command 'javaw.exe', the test configuration details, the test execution results ('Hello world! This is Riya Singh'), and the final build summary ('BUILD SUCCESS').

```

1 package seleniumexample;
2
3 import org.openqa.selenium.By;
4 import org.openqa.selenium.JavascriptExecutor;
5 import org.openqa.selenium.WebDriver;
6 import org.openqa.selenium.chrome.ChromeDriver;
7 import org.testng.annotations.Test;
8
9 public class TestHelloWorld {
10     @Test
11     public void testhelloworld()
12     {
13         System.out.println("Hello world! This is Riya Singh");
14     }
15
16 }
17

```

```

Problems Declaration Console <terminated> C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (15-Oct-2021, 10:09:25 pm)
-----
Running seleniumexample.TestHelloWorld
Configuring TestNG with: org.apache.maven.surefire.testng.conf.TestNG652Configurator@4563e9ab
Hello world! This is Riya Singh
Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.926 sec

Results :

Tests run: 1, Failures: 0, Errors: 0, Skipped: 0

[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time:  6.564 s
[INFO] Finished at: 2021-10-15T22:09:36+05:30
[INFO] -----

```

7. Verify if the build is successful or not in the console output.
8. Now add Selenium dependency under dependencies tag in your pom.xml. Visit <https://mvnrepository.com/artifact/org.seleniumhq.selenium/selenium-chrome-driver> to copy the following dependency tag.

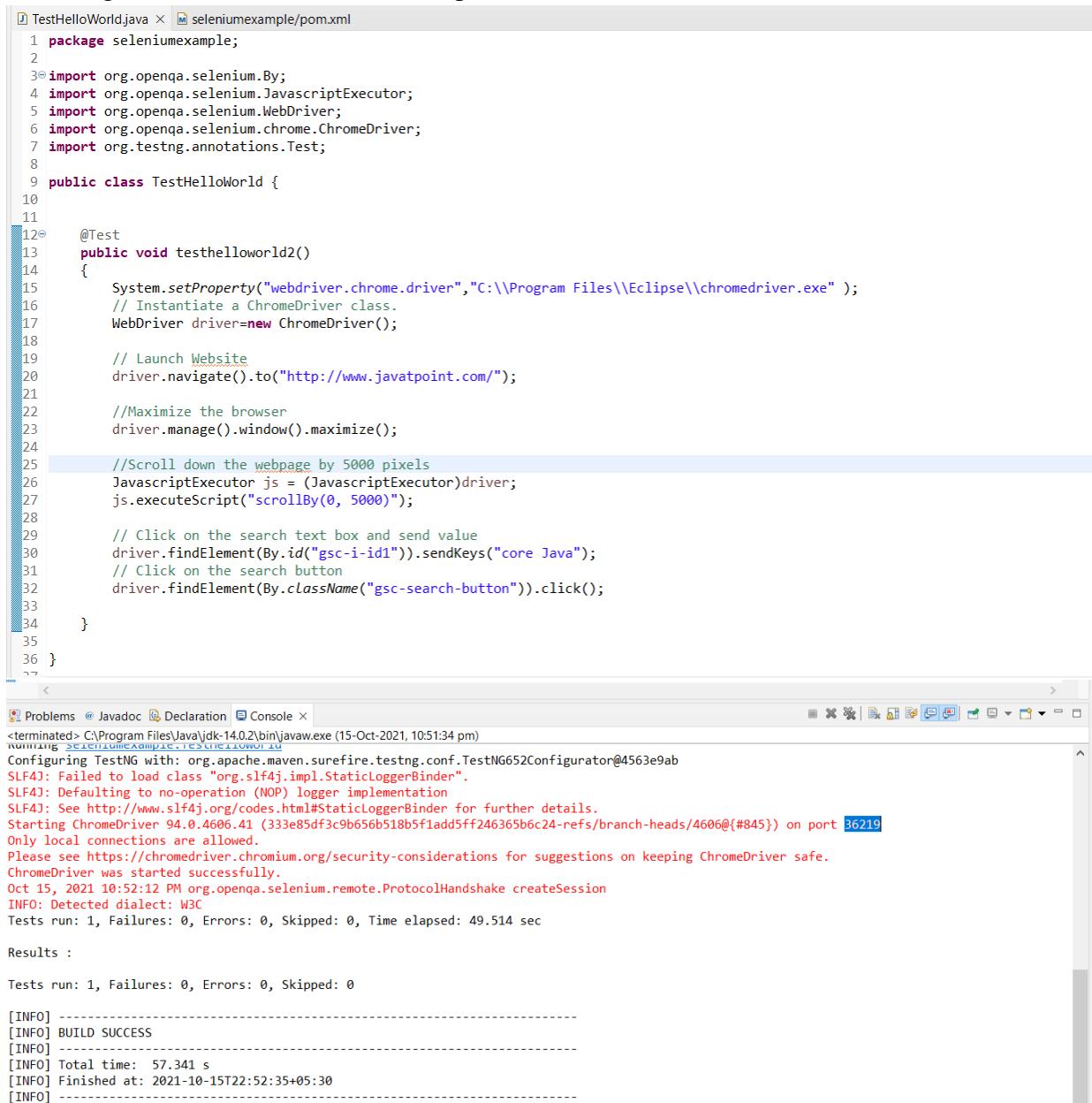
The screenshot shows the Eclipse IDE interface with the 'pom.xml' file open in the code editor. The code defines a Maven project with a group ID of 'com.sies.abc', an artifact ID of 'seleniumexample', and a version of '0.0.1-SNAPSHOT'. It includes dependencies for 'org.testng' (version 7.4.0) and 'org.seleniumhq.selenium' (artifact ID 'selenium-chrome-driver', version 4.0.0-alpha-6). The 'properties' section specifies Java version 1.8, compiler source and target versions of 1.8, and a maven.compiler.target of 1.8.

```

<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
    <modelVersion>4.0.0</modelVersion>
    <groupId>com.sies.abc</groupId>
    <artifactId>seleniumexample</artifactId>
    <version>0.0.1-SNAPSHOT</version>
    <dependencies>
        <dependency>
            <groupId>org.testng</groupId>
            <artifactId>testng</artifactId>
            <version>7.4.0</version>
            <scope>test</scope>
        </dependency>
        <dependency>
            <groupId>org.seleniumhq.selenium</groupId>
            <artifactId>selenium-chrome-driver</artifactId>
            <version>4.0.0-alpha-6</version>
        </dependency>
    </dependencies>
    <properties>
        <java.version>1.8</java.version>
        <maven.compiler.source>1.8</maven.compiler.source>
        <maven.compiler.target>1.8</maven.compiler.target>
    </properties>
</project>

```

9. Download a web driver for chrome similar to the version of your chrome browser and extract chrome driver on some suitable location in your drive. <https://sites.google.com/a/chromium.org/chromedriver/downloads>. Ensure that it should be of same version as that of your Chrome browser. To Check chrome version => Go in Help -> About Google chrome.
10. Add following test case using selenium chrome web drivers : Under this test, we will automate the following scenarios and observe the output:



The screenshot shows the Eclipse IDE interface with the following details:

- Java Editor:** The code is written in Java, utilizing the Selenium WebDriver API to interact with a Chrome browser. The code performs a search for "core Java" on javatpoint.com.
- Console Output:**
 - Shows the command run: `mvn test`.
 - Logs from the TestNG framework indicate the configuration of the test environment.
 - Logs from the Selenium WebDriver show the creation of a ChromeDriver instance and the start of the browser.
 - Test results: 1 test run, 0 failures, 0 errors, 0 skipped, and a total time of 49.514 seconds.
 - Build summary at the end of the log.

a. Invoke Google Chrome browser.

b. Open URL: <http://www.javatpoint.com>

The screenshot shows the JavaTpoint website. At the top, there's a navigation bar with links for Home, Python, Java, JavaScript, HTML, SQL, PHP, C#, C++, DS, Aptitude, Reasoning, Selenium, DBMS, C, Android, Interview Q. Below the navigation bar, there's a banner for a YouTube channel and another for Upstox. On the left, there's a section for 'Latest Tutorials' with icons for Splunk, SPSS, Swagger, Transact-SQL, and Tumblr. On the right, there's a 'Feedback' section with a link to feedback@javatpoint.com and a '100+ Latest Updates' section listing various news items from October 2014.

c. Click on the Search text box.

d. Type the value "javatpoint tutorials"

e. Click on the Search button.

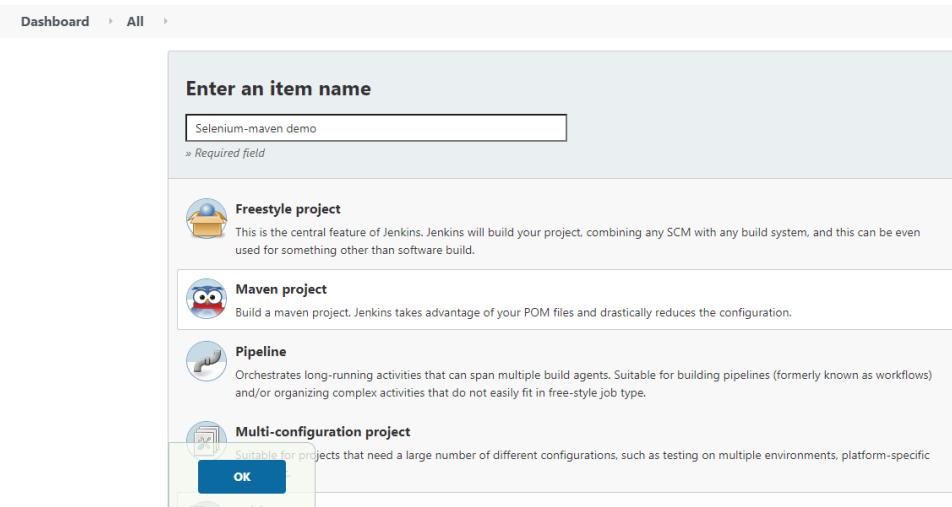
The screenshot shows the JavaTpoint website search results for 'javatpoint tutorials'. The search bar at the top contains 'javatpoint tutorials'. Below it, there are several search results:

- LinkedIn Ads Tutorial - Search LinkedIn Ads Tutorial** (Ad) - A link to a page about LinkedIn Ads.
- Java Online Tutorial Course - Start Learning Today** (Ad) - A link to an Udemy course.
- Java programming language - Java programming language** (Ad) - A link to a page about Java programming.
- Javatpoint: Tutorials List** - A link to the JavaTpoint tutorials page.
- Java Tutorial | Learn Java Programming - javatpoint** - A link to the Java tutorial page.
- Learn C Programming Language Tutorial - javatpoint** - A link to the C programming tutorial page.

b) To Setup and Run Selenium Tests in Jenkins Using Maven.

Procedure:

1. Create a maven job as Maven Project.



2. In Configure section -> go to Source Code Management -> Git -> paste this repo url => (Assuming our maven project is on Github repository) Note: Ensure that the GitHub Plugin is installed at this point. If it has not been installed, then do install it from Manage Jenkins-> Manage Plugins.

3. Go to Build section -> Write the goals and options as => clean test. Make sure Root POM is set to pom.xml. -> save and apply.

selenium_project

General Source Code Management Build Triggers Build Environment **Pre Steps** Build Post Steps Build Settings

Post-build Actions

Build

Root POM
C:\Users\ocean\eclipse-workspace\seleniumexample\pom.xml

Goals and options
test

Post Steps

Run only if build succeeds Run only if build succeeds or is unstable Run regardless of build result
Should the post-build steps run only for successful builds, etc.

Add post-build step ▾

Build Settings

E-mail Notification

Post-build Actions

Add post-build action ▾

Save Apply

4. Go to build now -> console output and verify whether build as successful.

Console Output

Started by user [Riya Singh](#)
Running as SYSTEM
Building on master in workspace C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\workspace\selenium_project
Parsing POMs
Discovered a new module com.sies.abc:seleniumexample seleniumexample
Modules changed, recalculating dependency graph
Established TCP socket on 11152
[seleniumexample] \$ "C:\Program Files (x86)\Java\jdk1.8.0_291/bin/java" -cp
C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\plugins\maven-plugin\WEB-INF\lib\maven35-agent-
1.13.jar;C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\jenkins\tools\hudson.tasks.Maven_MavenInstallation\Maven_3.8.2\boot\plexus-
classworlds-
2.6.0.jar;C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\jenkins\tools\hudson.tasks.Maven_MavenInstallation\Maven_3.8.2/conf/logging
jenkins.maven3.agent.Maven35Main
C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\jenkins\tools\hudson.tasks.Maven_MavenInstallation\Maven_3.8.2
C:\Windows\System32\config\systemprofile\AppData\Local\Jenkins\war\WEB-INF\lib\remoting-4.7.jar
C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\jenkins\plugins\maven-plugin\WEB-INF\lib\maven35-interceptor-1.13.jar
C:\WINDOWS\system32\config\systemprofile\AppData\Local\Jenkins\jenkins\plugins\maven-plugin\WEB-INF\lib\maven3-interceptor-commons-1.13.jar 11152
<==[JENKINS REMOTING CAPACITY]==>channel started
Executing Maven: -B -f C:\Users\ocean\eclipse-workspace\seleniumexample\pom.xml test
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.sies.abc:seleniumexample >-----
[INFO] Building seleniumexample 0.0.1-SNAPSHOT
[INFO] -----[jar]-----
[INFO] Downloading from central: <https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.pom>
[INFO] Downloaded from central: <https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.pom> (8.1 kB at 1.1 kB/s)
[INFO] Downloading from central: <https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/23/maven-plugins-23.pom>
[INFO] Downloaded from central: <https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/23/maven-plugins-23.pom> (9.2 kB at 12 kB/s)
[INFO] Downloading from central: <https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/22/maven-parent-22.pom>

```
[INFO] Downloading from central: https://repo.maven.apache.org/maven2/org/apache/wagon/wagon-provider-api/1.0-beta-2/wagon-provider-api-1.0-beta-2.jar
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/surefire/surefire-grouper/2.12.4/surefire-grouper-2.12.4.jar (38 kB at 59 kB/s)
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/wagon/wagon-provider-api/1.0-beta-2/wagon-provider-api-1.0-beta-2.jar (46 kB at 78 kB/s)
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-artifact/2.0/maven-artifact-2.0.jar (79 kB at 65 kB/s)
[INFO] Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/1.0.4/plexus-utils-1.0.4.jar (164 kB at 100 kB/s)

-----
TESTS
-----
Running seleniumexample.TestHelloWorld
Configuring TestNG with: org.apache.maven.surefire.testng.conf.TestNG652Configurator@f30e0a
Hello world test 1
Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 3.578 sec

Results :

Tests run: 1, Failures: 0, Errors: 0, Skipped: 0

[JENKINS] Recording test results
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 04:28 min
[INFO] Finished at: 2021-09-26T20:44:55+05:30
[INFO] -----
Waiting for Jenkins to finish collecting data
[JENKINS] Archiving C:\Users\ocean\eclipse-workspace\seleniumexample\pom.xml to com.sies.abc/seleniumexample/0.0.1-SNAPSHOT/seleniumexample-0.0.1-SNAPSHOT.pom
channel stopped
Finished: SUCCESS
```

Conclusion:

Hence, we successfully completed the setup of Eclipse IDE and have run Selenium tests using maven on:

- a) Eclipse IDE
- b) Jenkins

EXPERIMENT-6

Aim: To understand Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers.

Theory:

Docker Engine is an open source containerization technology for building and containerizing your applications. Docker Engine acts as a client-server application with:

- A server with a long-running daemon process dockerd.
- APIs which specify interfaces that programs can use to talk to and instruct the Docker daemon.
- A command line interface (CLI) client docker.

The CLI uses Docker APIs to control or interact with the Docker daemon through scripting or direct CLI commands. Many other Docker applications use the underlying API and CLI. The daemon creates and manage Docker objects, such as images, containers, networks, and volumes.

Docker uses a client-server architecture. The Docker client talks to the Docker daemon, which does the heavy lifting of building, running, and distributing your Docker containers. The Docker client and daemon can run on the same system, or you can connect a Docker client to a remote Docker daemon. The Docker client and daemon communicate using a REST API, over UNIX sockets or a network interface. Another Docker client is Docker Compose, that lets you work with applications consisting of a set of containers.

The Docker daemon

The Docker daemon (dockerd) listens for Docker API requests and manages Docker objects such as images, containers, networks, and volumes. A daemon can also communicate with other daemons to manage Docker services.

The Docker client

The Docker client (docker) is the primary way that many Docker users interact with Docker. When you use commands such as docker run, the client sends these commands to dockerd, which carries them out. The docker command uses the Docker API. The Docker client can communicate with more than one daemon.

Docker registries

A Docker registry stores Docker images. Docker Hub is a public registry that anyone can use, and Docker is configured to look for images on Docker Hub by default. You can even run your own private registry.

When you use the docker pull or docker run commands, the required images are pulled from your

configured registry. When you use the docker push command, your image is pushed to your configured registry.

Docker objects

When you use Docker, you are creating and using images, containers, networks, volumes, plugins, and other objects. This section is a brief overview of some of those objects.

Images

An image is a read-only template with instructions for creating a Docker container. Often, an image is based on another image, with some additional customization. For example, you may build an image which is based on the ubuntu image, but installs the Apache web server and your application, as well as the configuration details needed to make your application run.

You might create your own images or you might only use those created by others and published in a registry. To build your own image, you create a Dockerfile with a simple syntax for defining the steps needed to create the image and run it. Each instruction in a Dockerfile creates a layer in the image. When you change the Dockerfile and rebuild the image, only those layers which have changed are rebuilt. This is part of what makes images so lightweight, small, and fast, when compared to other virtualization technologies.

Containers

A container is a runnable instance of an image. You can create, start, stop, move, or delete a container using the Docker API or CLI. You can connect a container to one or more networks, attach storage to it, or even create a new image based on its current state.

By default, a container is relatively well isolated from other containers and its host machine. You can control how isolated a container's network, storage, or other underlying subsystems are from other containers or from the host machine.

A container is defined by its image as well as any configuration options you provide to it when you create or start it. When a container is removed, any changes to its state that are not stored in persistent storage disappear.

There are different stages when we create a Docker container which is known as Docker Container Lifecycle. Some of the states are:

- **Created:** A container that has been created but not started
- **Running:** A container running with all its processes
- **Paused:** A container whose processes have been paused
- **Stopped:** A container whose processes have been stopped
- **Deleted:** A container in a dead state

Installation of Docker:

To get started with Docker Engine on Ubuntu, make sure you meet the prerequisites, and then install Docker.

Prerequisites: OS requirements

To install Docker Engine, you need the 64-bit version of one of these Ubuntu versions:

- Ubuntu Hirsute 21.04
- Ubuntu Focal 20.04 (LTS)
- Ubuntu Bionic 18.04 (LTS)

Installation methods: You can install Docker Engine in different ways, depending on your needs:

1. Most users set up Docker's repositories and install from them
2. Some users download the DEB package and install it manually and manage upgrades completely manually.
3. In testing and development environments, some users choose to use automated convenience scripts to install Docker.

Install using the convenience script: Docker provides a convenience script at get.docker.com to install Docker into development environments quickly and non-interactively. This example downloads the script from get.docker.com and runs it to install the latest stable release of Docker on Linux:

```
$ curl -fsSL https://get.docker.com -o get-docker.sh  
$ sudo sh get-docker.sh
```

Procedure:

To get OS detail and version

```
it77@it77-OptiPlex-3050 :~$ lsb_release -a
```

```
root@riya: /home/ubuntu  
root@riya:/home/ubuntu# lsb_release -a  
No LSB modules are available.  
Distributor ID: Ubuntu  
Description:     Ubuntu 20.04.2 LTS  
Release:        20.04  
Codename:       focal  
root@riya:/home/ubuntu# □
```

Uninstall old versions

```
it77@it77-OptiPlex-3050 :~$ sudo su
```

```
t77@it77-OptiPlex-305i0 :~$ sudo apt-get remove docker docker-engine docker.io containerd runc
```

```
root@riya:/home/ubuntu# sudo apt-get remove docker docker-engine docker.io containerd runc
Reading package lists... Done
Building dependency tree
Reading state information... Done
Package 'docker-engine' is not installed, so not removed
Package 'docker' is not installed, so not removed
Package 'containerd' is not installed, so not removed
Package 'runc' is not installed, so not removed
Package 'docker.io' is not installed, so not removed
0 upgraded, 0 newly installed, 0 to remove and 114 not upgraded.
root@riya:/home/ubuntu# 
```

it77@it77-OptiPlex-3050 :~\$ sudo apt install curl

```
root@riya:/home/ubuntu# sudo apt install curl
Reading package lists... Done
Building dependency tree
Reading state information... Done
curl is already the newest version (7.68.0-1ubuntu2.7).
0 upgraded, 0 newly installed, 0 to remove and 114 not upgraded.
root@riya:/home/ubuntu# 
```

root@it77-OptiPlex-3050:/home/it77# curl -fsSL https://get.docker.com -o get-docker.sh

root@it77-OptiPlex-3050:/home/it77# ls

```
root@riya:/home/ubuntu# curl -fsSL https://get.docker.com -o get-docker.sh
root@riya:/home/ubuntu# ls
get-docker.sh
root@riya:/home/ubuntu# 
```

root@it77-OptiPlex-3050:/home/it77# sudo sh get-docker.sh

```
root@riya:/home/ubuntu
root@riya:/home/ubuntu# sudo sh get-docker.sh
# Executing docker install script, commit: 93d2499759296ac1f9c510605fef85052a2c3
2be
Warning: the "docker" command appears to already exist on this system.

If you already have Docker installed, this script can cause trouble, which is
why we're displaying this warning and provide the opportunity to cancel the
installation.

If you installed the current Docker package using this script and are using it
again to update Docker, you can safely ignore this message.

You may press Ctrl+C now to abort this script.
+ sleep 20
+ sh -c apt-get update -qq >/dev/null
+ sh -c DEBIAN_FRONTEND=noninteractive apt-get install -y -qq apt-transport-https
  ca-certificates curl >/dev/null
+ sh -c curl -fsSL "https://download.docker.com/linux/ubuntu/gpg" | gpg --dearmo
r --yes -o /usr/share/keyrings/docker-archive-keyring.gpg
+ sh -c echo "deb [arch=amd64 signed-by=/usr/share/keyrings/docker-archive-keyri
ng.gpg] https://download.docker.com/linux/ubuntu focal stable" > /etc/apt/source
s.list.d/docker.list
+ sh -c apt-get update -qq >/dev/null
+ sh -c DEBIAN_FRONTEND=noninteractive apt-get install -y -qq --no-install-recom
mends docker-ce-cli docker-scan-plugin docker-ce >/dev/null
+ version_gte 20.10
+ [ -z ]
+ return 0
+ sh -c DEBIAN_FRONTEND=noninteractive apt-get install -y -qq docker-ce-rootless
-extras >/dev/null
+ sh -c docker version
Client: Docker Engine - Community
 Version:          20.10.9
 API version:      1.41
 Go version:       go1.16.8
 Git commit:       c2ea9bc
 Built:            Mon Oct  4 16:08:29 2021
 OS/Arch:          linux/amd64
 Context:          default
 Experimental:    true

Server: Docker Engine - Community
Engine:
 Version:          20.10.9
 API version:      1.41 (minimum version 1.12)
 Go version:       go1.16.8
 Git commit:       79ea9d3
 Built:            Mon Oct  4 16:06:37 2021
 OS/Arch:          linux/amd64
 Experimental:    false
```

```
Server: Docker Engine - Community
Engine:
  Version:          20.10.9
  API version:     1.41 (minimum version 1.12)
  Go version:      go1.16.8
  Git commit:      79ea9d3
  Built:           Mon Oct 4 16:06:37 2021
  OS/Arch:         linux/amd64
  Experimental:   false
containerd:
  Version:          1.4.11
  GitCommit:        5b46e404f6b9f661a205e28d59c982d3634148f8
runc:
  Version:          1.0.2
  GitCommit:        v1.0.2-0-g52b36a2
docker-init:
  Version:          0.19.0
  GitCommit:        de40ad0
=====

```

To run Docker as a non-privileged user, consider setting up the Docker daemon in rootless mode for your user:

```
dockerd-rootless-setuptool.sh install
```

Visit <https://docs.docker.com/go/rootless/> to learn about rootless mode.

To run the Docker daemon as a fully privileged service, but granting non-root users access, refer to <https://docs.docker.com/go/daemon-access/>

WARNING: Access to the remote API on a privileged Docker daemon is equivalent to root access on the host. Refer to the 'Docker daemon attack surface' documentation for details: <https://docs.docker.com/go/attack-surface/>

```
=====
root@riya:/home/ubuntu# 
```

Basic Docker Commands:

Check the version of Docker installed

```
root@it77-OptiPlex-3050:/home/it77# docker --version
```

```
root@riya:/home/ubuntu# docker --version
Docker version 20.10.9, build c2ea9bc
root@riya:/home/ubuntu# 
```

Running existing Docker images: Go to Docker public repository at <https://hub.docker.com> to get the official images available for testing purpose

Run docker image

```
root@it77-OptiPlex-3050:/home/it77# docker run docker/whalesay cowsay hello_you
```

```
root@riya:/home/ubuntu# docker run docker/whalesay cowsay hello_you
< hello_you >
-----
      \
      \
      \
          ##
          ##  ##  ##
          ##  ##  ##  ##
          / ***** \  /  ===
~~~ {~~ ~~~~ ~~~ ~~~~ ~~ ~ /  ===- ~~~
      \  o  /
      \  \  \
      \  \  \
root@riya:/home/ubuntu#
```

```
root@it77-OptiPlex-3050:/home/it77# docker run docker/whalesay cowsay hello_me
```

```
root@riya:/home/ubuntu# docker run docker/whalesay cowsay hello_me
< hello_me >
-----
      \
      \
      \
          ##          .
          ##  ##  ##
          ##  ##  ##  == 
          ##  ##  ##  ##  ===
          /"*****"*****"/  ===
~~~ {~~ ~~~~ ~~~ ~~~~ ~~ ~ /  ===- ~~~
      \_____\o_____/  /
      \_\_\_\_\_\_/\_/
root@riya:/home/ubuntu#
```

Check all pulled images

```
root@it77-OptiPlex-3050:/home/it77# docker images
```

```
root@riya:/home/ubuntu# docker images
REPOSITORY      TAG      IMAGE ID      CREATED      SIZE
riya            v44      c5fdc106be15    11 days ago   163MB
ubuntu          latest    597ce1600cf4    2 weeks ago   72.8MB
postgres         latest    6ce504119cc8    2 weeks ago   374MB
docker/whalesay  latest    6b362a9f73eb    6 years ago   247MB
```

Pull the sample images

```
root@it77-OptiPlex-3050:/home/it77# sudo docker pull postgres
```

```
root@riya:/home/ubuntu# sudo docker pull postgres
Using default tag: latest
latest: Pulling from library/postgres
7d63c13d9b9b: Pull complete
cad0f9d5f5fe: Pull complete
ff74a7a559cb: Pull complete
c43dfd845683: Pull complete
e554331369f5: Pull complete
d25d54a3ac3a: Pull complete
bbc6df00588c: Pull complete
d4deb2e86480: Pull complete
cb59c7cc00aa: Pull complete
80c65de48730: Pull complete
1525521889be: Pull complete
38df9e245e81: Pull complete
380030b85e81: Pull complete
Digest: sha256:eb83331cc518946d8ee1b52e6d9e97d0cdef6195b7bf25323004f2968e91a825
Status: Downloaded newer image for postgres:latest
docker.io/library/postgres:latest
```

Check all running container

```
root@it77-OptiPlex-3050:/home/it77# docker ps // note the container id
```

```
root@riya:/home/ubuntu# docker ps
CONTAINER ID      IMAGE      COMMAND      CREATED      STATUS      PORTS      NAMES
```

```
root@it77-OptiPlex-3050:/home/it77# docker ps -a //previously ran containers
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS
	PORTS	NAMES		
3a23b46db17c	docker/whalesay	"cowsay hello_me"	3 minutes ago	Exited
(0)	3 minutes ago	tender_haslett		
9d24292f5542	docker/whalesay	"cowsay hello_you"	4 minutes ago	Exited
(0)	4 minutes ago	pedantic_herschel		
409ecf8fa654	riya:v44	"nginx -g 'daemon off..."	11 days ago	Exited
(0)	11 days ago	intelligent_einstein		
c33364f48252	5d259d090daf	"/bin/sh -c 'apt ins..."	11 days ago	Exited
(1)	11 days ago	friendly_raman		
07ebe5b9b801	5d259d090daf	"/bin/sh -c 'apt ins..."	11 days ago	Exited
(100)	11 days ago	eloquent_lehmann		
f97d70b7bfe7	967ecfde73da	"/bin/sh -c 'apt upd..."	11 days ago	Exited
(100)	11 days ago	unruffled_chatelet		
1210b682107a	ubuntu:latest	"bash"	11 days ago	Exited
(127)	11 days ago	joyful_euclid		
f2e55c0c248f	docker/whalesay	"cowsay hello_you"	11 days ago	Exited
(0)	11 days ago	jolly_ride		

Pull the docker image of Ubuntu

```
root@it77-OptiPlex-3050:/home/it77# docker pull ubuntu:latest
```

```
root@riya:/home/ubuntu# docker pull ubuntu:latest
latest: Pulling from library/ubuntu
7bla6ab2e44d: Pull complete
Digest: sha256:626ffe58f6e7566e00254b638eb7e0f3b11d4da9675088f4781a50ae288f3322
Status: Downloaded newer image for ubuntu:latest
docker.io/library/ubuntu:latest
```

```
root@it77-OptiPlex-3050:/home/it77# docker images
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
ubuntu	latest	ba6accce29	16 hours ago	72.8MB
postgres	latest	d191afba1bb1	4 days ago	374MB
riya	v44	c5fdc106be15	11 days ago	163MB
ubuntu	<none>	597ce1600cf4	2 weeks ago	72.8MB
postgres	<none>	6ce504119cc8	2 weeks ago	374MB

Run the command in a container: Getting a bash in Ubuntu

```
root@it77-OptiPlex-3050:/home/it77# docker run -it ubuntu:latest bash
```

```
root@riya:/home/ubuntu# docker run -it ubuntu:latest bash
root@951c413324c4:/#
```

```
root@it77-OptiPlex-3050:/home/it77# docker ps
```

```
ubuntu@riya:~$ docker ps
CONTAINER ID   IMAGE      COMMAND   CREATED     STATUS      PORTS
 NAMES
8be05b4cdfcf   ubuntu:latest   "bash"   11 seconds ago   Up 10 seconds
admiring_mayer
```

Create an Apache Server and host index.html in the Containers

```
root@67e9bd16d77b:/# apt update
```

```
root@riya:/home/ubuntu# apt update
Hit:1 https://download.docker.com/linux/ubuntu focal InRelease
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal InRelease [265 kB]
Hit:3 http://security.ubuntu.com/ubuntu focal-security InRelease
Hit:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:5 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports InRelease
Fetched 265 kB in 1s (210 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
119 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

```
root@67e9bd16d77b:/# apt install apache2
```

```
root@riya:/home/ubuntu# apt install apache2
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom www-browser
The following packages will be upgraded:
  apache2 apache2-bin apache2-data apache2-utils
4 upgraded, 0 newly installed, 0 to remove and 115 not upgraded.
Need to get 1519 kB of archives.
After this operation, 0 B of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 a
pache2 amd64 2.4.41-4ubuntu3.7 [95.6 kB]
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 a
pache2-bin amd64 2.4.41-4ubuntu3.7 [1180 kB]
Get:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 a
pache2-data all 2.4.41-4ubuntu3.7 [159 kB]
Get:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 a
pache2-utils amd64 2.4.41-4ubuntu3.7 [84.4 kB]
Fetched 1519 kB in 2s (992 kB/s)
(Reading database ... 64961 files and directories currently installed.)
Preparing to unpack .../apache2_2.4.41-4ubuntu3.7_amd64.deb ...
Unpacking apache2 (2.4.41-4ubuntu3.7) over (2.4.41-4ubuntu3.6) ...
Preparing to unpack .../apache2-bin_2.4.41-4ubuntu3.7_amd64.deb ...
Unpacking apache2-bin (2.4.41-4ubuntu3.7) over (2.4.41-4ubuntu3.6) ...
Preparing to unpack .../apache2-data_2.4.41-4ubuntu3.7_all.deb ...
Unpacking apache2-data (2.4.41-4ubuntu3.7) over (2.4.41-4ubuntu3.6) ...
Preparing to unpack .../apache2-utils_2.4.41-4ubuntu3.7_amd64.deb ...
Unpacking apache2-utils (2.4.41-4ubuntu3.7) over (2.4.41-4ubuntu3.6) ...
Setting up apache2-bin (2.4.41-4ubuntu3.7) ...
Setting up apache2-data (2.4.41-4ubuntu3.7) ...
Setting up apache2-utils (2.4.41-4ubuntu3.7) ...
Setting up apache2 (2.4.41-4ubuntu3.7) ...
Processing triggers for systemd (245.4-4ubuntu3.6) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for ufw (0.36-6) ...
root@riya:/home/ubuntu#
```

```
root@67e9bd16d77b:/# cd /var/www/html
```

```
root@67e9bd16d77b:/var/www/html# mv index.html index.backup
```

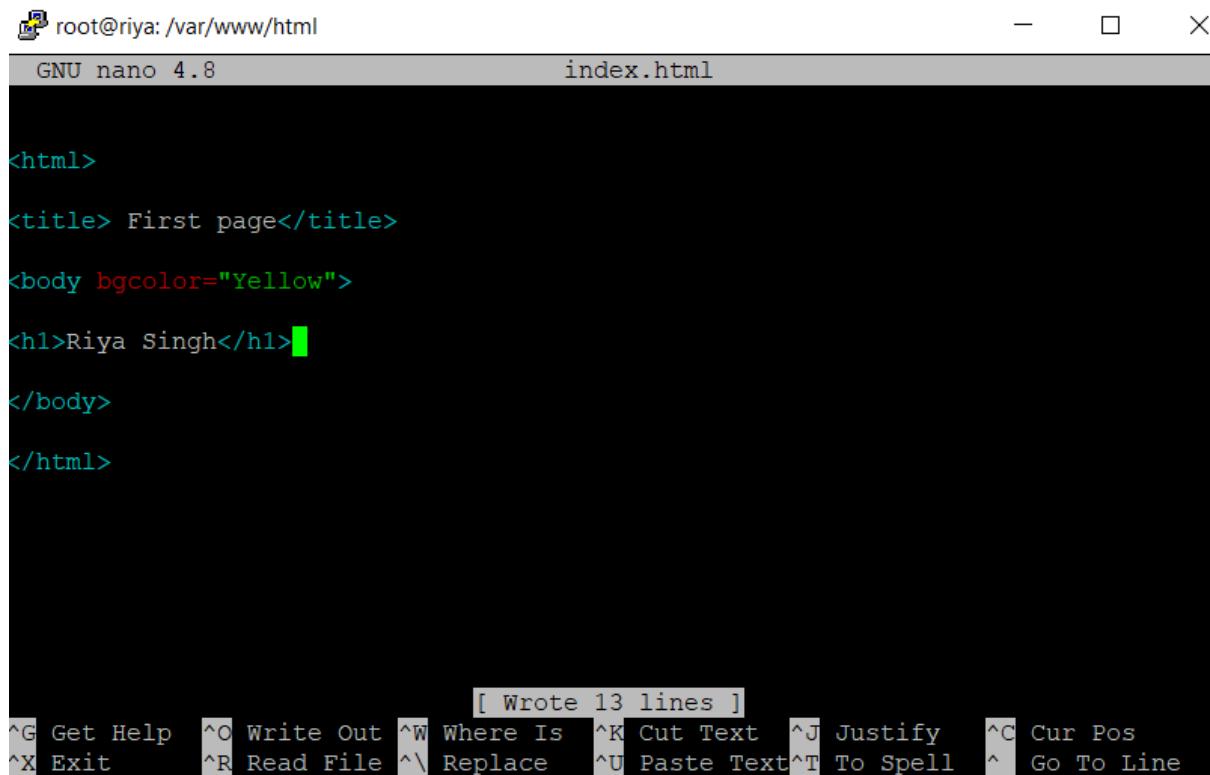
```
root@67e9bd16d77b:/var/www/html# ls
```

```
root@riya:/home/ubuntu# cd /var/www/html
root@riya:/var/www/html# mv index.html index.backup
root@riya:/var/www/html# ls
index.backup
root@riya:/var/www/html#
```

```
root@67e9bd16d77b:/var/www/html# apt install nano
```

```
root@riya:/var/www/html# apt install nano
Reading package lists... Done
Building dependency tree
Reading state information... Done
nano is already the newest version (4.8-1ubuntu1).
0 upgraded, 0 newly installed, 0 to remove and 115 not upgraded.
root@riya:/var/www/html#
```

```
root@67e9bd16d77b:/var/www/html# nano index.html
```



```
root@riya: /var/www/html
GNU nano 4.8                               index.html

<html>
<title> First page</title>
<body bgcolor="Yellow">
<h1>Riya Singh</h1>
</body>
</html>

[ Wrote 13 lines ]
^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos
^X Exit      ^R Read File  ^\ Replace   ^U Paste Text ^T To Spell  ^  Go To Line
```

```
root@67e9bd16d77b:/var/www/html# service apache2 restart
```

```
root@e0f2f6372a7e:/var/www/html# service apache2 restart
 * Restarting Apache httpd web server apache2
AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 172.17.0.2. Set the 'ServerName' directive globally to suppress this message
[ OK ]
```

```
root@67e9bd16d77b:/var/www/html# service apache2 status
```

```
root@e0f2f6372a7e:/var/www/html# service apache2 status
 * apache2 is running
```

Commit an image by opening a new tab in the terminal:

```
root@it77-OptiPlex-3050:/home/it77# docker commit 67e9bd16d77b bushsk/ubuntu_1:v1
```

```
[admin@riya:~$ docker commit 8be05b4cdfcf riyal8/riya:v1
sha256:dc8966a44682e89675354989994121384b2ae9fce35b5a0e413c342fd37d7fe7
```

Check the size and image and image id of the committed image

```
root@it77-OptiPlex-3050:/home/it77# docker images
```

```
ubuntu@riya:~$ docker images
REPOSITORY      TAG      IMAGE ID      CREATED      SIZE
riyal8/riya    v1       dc8966a44682  45 seconds ago  72.8MB
ubuntu          latest   ba6accce29     17 hours ago  72.8MB
postgres        latest   d191afba1bb1  4 days ago   374MB
riya            v44      c5fdc106be15  11 days ago  163MB
ubuntu          <none>  597ce1600cf4  2 weeks ago  72.8MB
postgres        <none>  6ce504119cc8  2 weeks ago  374MB
bushsk/ubuntu_1 latest   473a86121ce5  6 months ago 221MB
docker/whalesay latest   6b362a9f73eb  6 years ago  247MB
ubuntu@riya:~$
```

```
root@67e9bd16d77b:/var/www/html# exit
```

Link the port of container with the port of host machine

```
root@it77-OptiPlex-3050:/home/it77# docker run -itd -p 8888:80 --name cid1 bushsk/ubuntu_1
```

```
root@riya:/home# docker run -itd -p 8888:80 --name riya riyal8/riya:v1
c8e53de6ca09bcfff7e96ba2ad0aa68d687afcead2f9a346f3970a03d83657eb
```

```
root@it77-OptiPlex-3050:/home/it77# docker ps
```

```
ubuntu@riya:~$ docker ps
CONTAINER ID      IMAGE      COMMAND      CREATED      STATUS      PORTS
                   NAMES
c8e53de6ca09    riyal8/riya:v1  "bash"      51 seconds ago  Up 50 seconds  0.0.0.0:8888->80/tcp
cp, :::8888->80/tcp  riya
ubuntu@riya:~$
```

```
root@it77-OptiPlex-3050:/home/it77# ufw allow 8888
```

```
root@riya:/home# ufw allow 8888
Rules updated
Rules updated (v6)
```

Start Apache in the container

root@it77-OptiPlex-3050:/home/it77# docker exec -it 948fbca4fa7d service apache2 restart

```
root@ip-172-31-206:/home/ubuntu# docker exec -it 6e642bea8ced service apache2
restart
* Restarting Apache httpd web server apache2
AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 172.17.0.2. Set the 'ServerName' directive globally to suppress this message
[ OK ]
```

root@it77-OptiPlex-3050:/home/it77# ifconfig

```
root@ip-172-31-39-206:/home/ubuntu# ifconfig
docker0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.17.0.1 netmask 255.255.0.0 broadcast 172.17.255.255
        inet6 fe80::42:bfff:fe03:4b4 prefixlen 64 scopeid 0x20<link>
            ether 02:42:bf:03:04:b4 txqueuelen 0 (Ethernet)
            RX packets 4439 bytes 245376 (245.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 5202 bytes 44024023 (44.0 MB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 9001
    inet 172.31.39.206 netmask 255.255.240.0 broadcast 172.31.47.255
        inet6 fe80::876:feff:fedb:9c0c prefixlen 64 scopeid 0x20<link>
            ether 0a:76:fe:db:9c:0c txqueuelen 1000 (Ethernet)
            RX packets 101515 bytes 264551104 (264.5 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 18220 bytes 1774502 (1.7 MB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
            loop txqueuelen 1000 (Local Loopback)
            RX packets 476 bytes 40741 (40.7 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 476 bytes 40741 (40.7 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

veth1e7fc6b: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::5404:1bff:fe35:f3bd prefixlen 64 scopeid 0x20<link>
        ether 56:04:1b:35:f3:bd txqueuelen 0 (Ethernet)
        RX packets 0 bytes 0 (0.0 B)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX packets 14 bytes 1156 (1.1 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```

First page x +
Not secure | 65.0.85.41:8989
Riya Singh

root@ip-172-31-33-254:/home
debconf: falling back to frontend: Teletype
setting up libicu66:amd64 (66.1-2ubuntu2) ...
setting up libnginx-mod-stream (1.18.0-0ubuntu1.2) ...
setting up libfreetype6:amd64 (2.10.1-2ubuntu0.1) ...
Setting up libcurl4-openssl4:amd64 (4.15.8-0ubuntu1.1) ...
setting up libfontconfig1:amd64 (2.13.1-2ubuntu3) ...
Setting up libxml2:amd64 (2.9.10+dfsg-Subuntu0.20.04.2) ...
setting up libxpm4:amd64 (1:3.5.12-1) ...
Setting up libbsd0:amd64 (2.2.5-5.2ubuntu2.1) ...
Setting up libxslt1.1:amd64 (1.1.34-4) ...
Setting up libnginx-mod-http-image-filter (1.18.0-0ubuntu1.2) ...
Setting up libnginx-mod-http-xslt-filter (1.18.0-0ubuntu1.2) ...
Setting up nginx-common (1.18.0-0ubuntu1.2) ...
invoke-rc.d: policy-rc.d denied execution of start.
Setting up nginx (1.18.0-0ubuntu1.2) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Removing intermediate container 8a40ad5cbee2
--> 2bf596b0087
Step 5/7 : EXPOSE 80
--> Running in 5f13931leacf
Removing intermediate container 5f13931leacf
--> c5fdc106be15
Step 6/7 : COPY index.html /var/www/html/index.html
--> 9833b1dc2ad
Step 7/7 : CMD ["nginx", "-g", "daemon off;"]
--> Running in 6aa20022e41d
Removing intermediate container 6aa20022e41d
--> c5fdc106be15
Successfully built c5fdc106be15
Successfully tagged riya:v44
root@ip-172-31-33-254:/home# docker run -itd -p 8989:80 riya:v44
409ecf5fa5467735-cf8542fd9e62af0e947d5fd59446782bda0cf1f0ed4e85
root@ip-172-31-33-254:/home#

```

Login in hub

```
root@it77-OptiPlex-3050:/home/it77# docker login
```

```

root@riya:/home# docker login
Authenticating with existing credentials...
WARNING! Your password will be stored unencrypted in /root/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
root@riya:/home#

```

Pushing the image on Docker Hub

```
root@it77-OptiPlex-3050:/home/it77# docker push bushsk/ubuntu_1
```

```

root@riya:/home# docker ps
CONTAINER ID        IMAGE               COMMAND      CREATED             STATUS              PORTS
 NAMES
c8e53de6ca09      riya18/riya:v1   "bash"       30 minutes ago   Up 30 minutes    0.0.0
.0:8888->80/tcp, :::8888->80/tcp   riya
root@riya:/home# docker commit c8e53de6ca09 riya18/modified-ubuntu
sha256:dc3ad06ca40d03c378067d69067c8b2335cb6ee58d59c566f77c20c4995daf61
root@riya:/home# docker images
REPOSITORY          TAG      IMAGE ID      CREATED             SIZE
riya18/modified-ubuntu latest   dc3ad06ca40d  7 seconds ago   72.8MB
riya18/modified/ubuntu latest   fe464b5fa813  2 minutes ago   72.8MB
riya18/riya         v1      dc8966a44682  37 minutes ago   72.8MB
ubuntu              latest   ba6acccecd29  17 hours ago   72.8MB
postgres            latest   d191afbalbb1  4 days ago    374MB
riya                v44     c5fdc106be15  11 days ago   163MB
ubuntu              <none>  597ce1600cf4  2 weeks ago   72.8MB
postgres            <none>  6ce504119cc8  2 weeks ago   374MB
bushsk/ubuntu_1     latest   473a86121ce5  6 months ago   221MB
docker/whalesay     latest   6b362a9f73eb  6 years ago   247MB
root@riya:/home# docker push riya18/modified-ubuntu
Using default tag: latest
The push refers to repository [docker.io/riya18/modified-ubuntu]
6b355ecd4f5c: Pushed
4e571d608bd6: Pushed
9f54eef41275: Pushed
latest: digest: sha256:f15ef9e38cd9ee5a337829c257742cd6e6e702b061b450a2f7cbd10e5475485b size: 943

```

The screenshot shows the Docker Hub interface for the repository 'riya18/modified-ubuntu'. At the top, there's a navigation bar with links for Explore, Repositories, Organizations, Help, Upgrade, and a user dropdown for 'riya18'. Below the header, the repository name 'riya18' and 'modified-ubuntu' are visible. The main content area has tabs for General, Tags, Builds, Collaborators, Webhooks, and Settings. Under the General tab, there's a section for 'Advanced Image Management' which says 'View all your images and tags in this repository, clean up unused content, recover untagged images. Available for Pro and Team accounts.' Below this, it shows the repository details: 'riya18 / modified-ubuntu', 'This repository does not have a description', and 'Last pushed: a minute ago'. To the right, there's a 'Docker commands' section with a button to 'Push a new tag to this repository' and a command box containing 'docker push riya18/modified-ubuntu:tagname'. Another section shows 'Tags and Scans' with 1 tag listed: 'latest'. On the right side, there's a 'VULNERABILITY SCANNING - DISABLED' link and an 'Enable' button. A 'Public View' button is also present. Further down, there's an 'Automated Builds' section with a note about connecting to GitHub or Bitbucket for automatic builds.

Stopping and removing containers using container id

```
root@it77-OptiPlex-3050:/home/it77# docker stop bd9fdf66daaf
```

```
root@riya:/home# docker stop c8e53de6ca09
c8e53de6ca09
```

```
root@it77-OptiPlex-3050:/home/it77# docker kill bd9fdf66daaf -- > not advisable
```

```
root@it77-OptiPlex-3050:/home/it77# docker rm bd9fdf66daaf
```

```
root@it77-OptiPlex-3050:/home/it77# docker ps -a
```

Remove multiple containers using container ids:

```
root@it77-OptiPlex-3050:/home/it77# docker rm bd9 abc
```

```
root@it77-OptiPlex-3050:/home/it77# docker rm $(docker ps -aq)
```

```
root@it77-OptiPlex-3050:/home/it77# docker ps -a
```

Deleting the images

```
root@it77-OptiPlex-3050:/home/it77# docker images
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
riya18/modified-ubuntu	latest	dc3ad06ca40d	7 seconds ago	72.8MB
riya18/modified/ubuntu	latest	fe464b5fa813	2 minutes ago	72.8MB
riya18/riya	v1	dc8966a44682	37 minutes ago	72.8MB
ubuntu	latest	ba6accce2d29	17 hours ago	72.8MB
postgres	latest	d191afba1bb1	4 days ago	374MB
riya	v44	c5fdc106be15	11 days ago	163MB
ubuntu	<none>	597ce1600cf4	2 weeks ago	72.8MB
postgres	<none>	6ce504119cc8	2 weeks ago	374MB
bushsk/ubuntu_1	latest	473a86121ce5	6 months ago	221MB
docker/whalesay	latest	6b362a9f73eb	6 years ago	247MB

```
root@it77-OptiPlex-3050:/home/it77# docker rmi 5c6
```

```
root@riya:/home# docker rmi fe464b5fa813
Untagged: riya18/modified/ubuntu:latest
Deleted: sha256:fe464b5fa8131b4e33a47231baae1343c7c5f0bee6d9e73de974a62a7d72ddf4
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
riya18/modified-ubuntu	latest	dc3ad06ca40d	4 minutes ago	72.8MB
riya18/riya	v1	dc8966a44682	42 minutes ago	72.8MB
ubuntu	latest	ba6accce2d29	17 hours ago	72.8MB
postgres	latest	d191afba1bb1	4 days ago	374MB
riya	v44	c5fdc106be15	11 days ago	163MB
ubuntu	<none>	597ce1600cf4	2 weeks ago	72.8MB
postgres	<none>	6ce504119cc8	2 weeks ago	374MB
bushsk/ubuntu_1	latest	473a86121ce5	6 months ago	221MB
docker/whalesay	latest	6b362a9f73eb	6 years ago	247MB

Conclusion: Hence we have successfully understood the concept of Docker Architecture and Container Life Cycle, installed Docker and executed docker commands to manage images and interact with containers.

EXPERIMENT-7

Aim: To learn Dockerfile instructions, build an image for a sample web application using Dockerfile.

Theory: Docker can build images automatically by reading the instructions from a Dockerfile. A Dockerfile is a text document that contains all the commands a user could call on the command line to assemble an image. Using docker build users can create an automated build that executes several command-line instructions in succession. Docker also gives you the capability to create your own Docker images, and it can be done with the help of Docker Files. A Docker File is a simple text file with instructions on how to build your images.

The **FROM** keyword tells Docker, from which base image you want to base your image from. In our example, we are creating an image from the Ubuntu image.

The next command is the person who is going to maintain this image. Here you specify the **MAINTAINER** keyword and just mention the email ID.

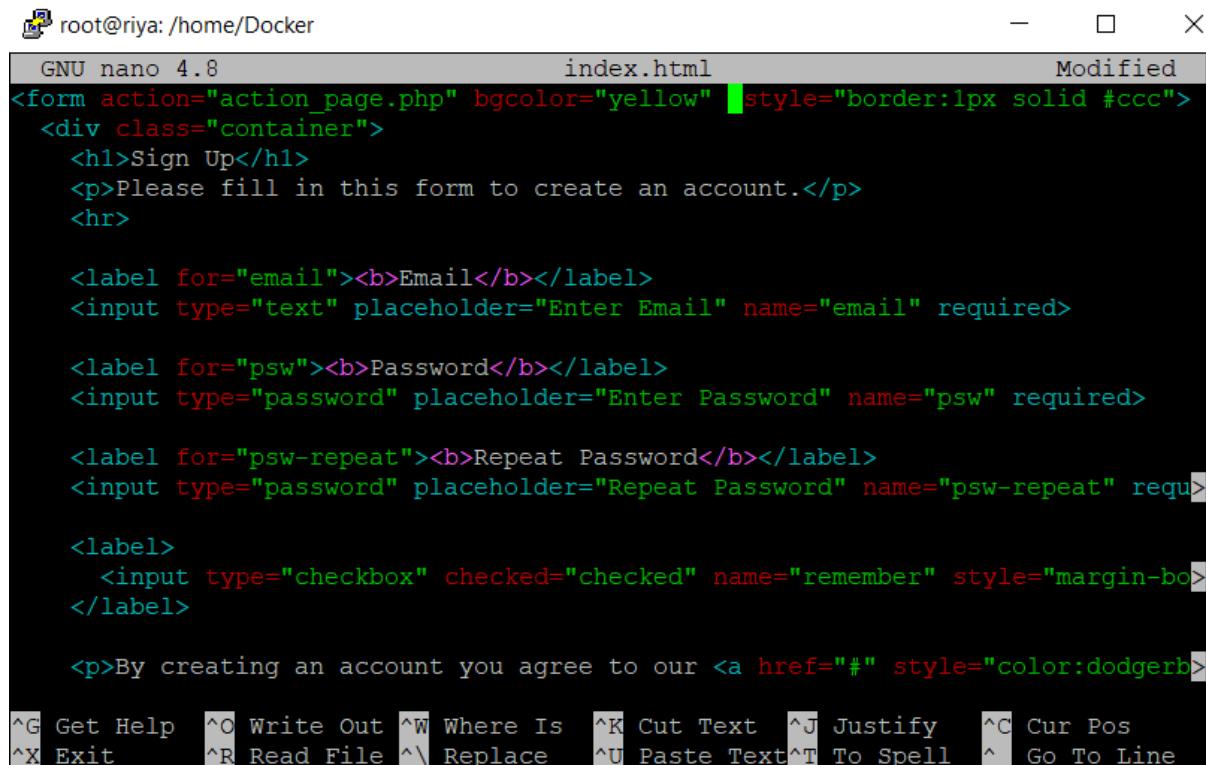
The **RUN** command is used to run instructions against the image. In our case, we first update our Ubuntu system and then install the nginx server on our Ubuntu image.

The last **CMD** command is used to display a message to the user.

Procedure:

1. Create a File and redirect your path into it
2. Make an HTML file containing the code of your webpage using nano command.

```
root@riya:/home# mkdir Docker
root@riya:/home# cd Docker
root@riya:/home/Docker# nano index.html
```



The screenshot shows a terminal window with the nano 4.8 editor open. The file being edited is 'index.html'. The content of the file is an HTML form for sign-up:

```
GNU nano 4.8                               index.html                         Modified
<form action="action_page.php" bgcolor="yellow" style="border:1px solid #ccc">
  <div class="container">
    <h1>Sign Up</h1>
    <p>Please fill in this form to create an account.</p>
    <hr>

    <label for="email"><b>Email</b></label>
    <input type="text" placeholder="Enter Email" name="email" required>

    <label for="psw"><b>Password</b></label>
    <input type="password" placeholder="Enter Password" name="psw" required>

    <label for="psw-repeat"><b>Repeat Password</b></label>
    <input type="password" placeholder="Repeat Password" name="psw-repeat" required>

    <label>
      <input type="checkbox" checked="checked" name="remember" style="margin-bottom:10px;">
    </label>

    <p>By creating an account you agree to our <a href="#" style="color:dodgerblue">Terms of Service</a> and <a href="#" style="color:dodgerblue">Privacy Policy</a>.</p>
  </div>
</form>
```

At the bottom of the terminal, there is a legend of keyboard shortcuts:

- ^G Get Help
- ^O Write Out
- ^W Where Is
- ^K Cut Text
- ^J Justify
- ^C Cur Pos
- ^X Exit
- ^R Read File
- ^V Replace
- ^U Paste Text
- ^T To Spell
- ^L Go To Line

3. Create a file with the name, Dockerfile and write the following code using nano command

FROM ubuntu:latest

MAINTAINER "Riya"

```
RUN apt update -y  
EXPOSE 80 # Exposing port 80 of web server  
COPY index.html /var/www/html/index.html  
CMD ["nginx", "-g", "daemon off;"]
```

```
root@riya:/home/Docker# nano Dockerfile  
  
Use "fg" to return to nano.  
[2]+  Stopped                  nano Dockerfile  
root@riya:/home/Docker# █
```

```
root@riya: /home/Docker  
GNU nano 4.8                               Dockerfile  
FROM ubuntu:latest  
MAINTAINER "Riya"  
RUN apt update -y  
RUN apt install nginx  
EXPOSE 80  
COPY index.html /var/www/html/index.html  
CMD ["nginx", "-g", "daemon off;"]  
█
```

4. Run the following Build command

docker build -t pavani .

```
[root@riya: /home/Docker]
Setting up libgd3:amd64 (2.2.5-5.2ubuntu2.1) ...
Setting up libxslt1.1:amd64 (1.1.34-4) ...
Setting up libnginx-mod-http-image-filter (1.18.0-0ubuntu1.2) ...
Setting up libnginx-mod-http-xslt-filter (1.18.0-0ubuntu1.2) ...
Setting up nginx-core (1.18.0-0ubuntu1.2) ...
invoke-rc.d: could not determine current runlevel
invoke-rc.d: policy-rc.d denied execution of start.
Setting up nginx (1.18.0-0ubuntu1.2) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Removing intermediate container e38b1b47376f
--> 03475a7726be
Step 5/7 : EXPOSE 80
--> Running in 85fffb6bc9f7
Removing intermediate container 85fffb6bc9f7
--> f480052a8e07
Step 6/7 : COPY index.html /var/www/html/index.html
--> d2052a555d06
Step 7/7 : CMD ["nginx", "-g", "daemon off;"]
--> Running in 7ac9a57b4e72
Removing intermediate container 7ac9a57b4e72
--> f5a73eeeeef08
Successfully built f5a73eeeeef08
Successfully tagged riya:latest
```

5. Run the following Run commands to activate the webpage on localhost
docker run -itd -p 8989:80 riya

ufw allow 8989

```
[root@riya:/home/Docker# docker run -itd -p 8989:80 riya
e93f7cddeee0e102af0224dc441480d02f8e85c38effc98cc25197e67b76c7b6
root@riya:/home/Docker# ]
```

6. Open browser and put IP/localhost with port number as 8989 and run your web application.

15.206.94.214:8989 Not secure | 15.206.94.214:8989

Sign Up

Please fill in this form to create an account.

Email Password Repeat Password Remember me

By creating an account you agree to our [Terms & Privacy](#).



Conclusion: Hence, we learnt Dockerfile instructions, built an image for a sample web application using Dockerfile.

EXPERIMENT-8

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

Theory: 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. Puppet code is declarative, which means that you describe the desired state of your systems, not the steps needed to get there. Puppet then automates the process of getting these systems into that state and keeping them there. Puppet does this through Puppet primary server and a Puppet agent. The Puppet primary server is the server that stores the code that defines your desired state. The Puppet agent translates your code into commands and then executes it on the systems you specify, in what is called a Puppet run.

You can configure systems with Puppet either in a client-server architecture, using the Puppet agent and Puppet master applications, or in a stand-alone architecture, using the Puppet apply application.

The agent-master architecture When set up as an agent-master architecture, a Puppet master server controls the configuration information, and each managed agent node requests its own configuration catalog from the master.

In this architecture, managed nodes run the Puppet agent application, usually as a background service. One or more servers run the Puppet master application, Puppet Server.

Periodically, each Puppet agent sends facts to the Puppet master, and requests a catalog. The master compiles and returns that node's catalog, using several sources of information it has access to.

Once it receives a catalog, Puppet agent applies it to the node by checking each resource the catalog describes. If it finds any resources that are not in their desired state, it makes the changes necessary to correct them. Or, in no-op mode, it reports on what changes would have been done.

After applying the catalog, the agent sends a report to the Puppet master. For more information, see:

- [Puppet Agent on *nix Systems](#)
- [Puppet Agent on Windows Systems](#)
- [Puppet Server Communications and security](#)

Puppet agent nodes and Puppet masters communicate by HTTPS with client verification.

The Puppet master provides an HTTP interface, with various endpoints available. When requesting or submitting anything to the master, the agent makes an HTTPS request to one of those endpoints.

Client-verified HTTPS means each master or agent must have an identifying SSL certificate. They each examine their counterpart's certificate to decide whether to allow an exchange of information.

Puppet includes a built-in certificate authority for managing certificates. Agents can automatically request certificates through the master's HTTP API. You can use the `puppet cert` command to inspect requests and sign new certificates. And agents can then download the signed certificates.

Advantages of Puppet

- Puppet keeps on verifying the configuration at a specified interval (which you can modify as per requirement).

- Puppet defines the configurations for a host with the help of a language which is very easy to learn and is only used for that purpose.
- Mostly Puppet is used by all the industry like Google, red hat etc.
- The larger open-source developer base
- Its works very smooth, even when deployed in a large infrastructure (thousands of hosts to manage)

Installation of Puppet Master:

Setting hostname of Master and Agent:

```
ubuntu@riya2:~$ sudo su
root@riya2:/home/ubuntu# hostnamectl set-hostname puppet-master
root@riya2:/home/ubuntu# hostname
puppet-master
root@riya2:/home/ubuntu# exit
exit
ubuntu@riya2:~$ sudo su
root@puppet-master:/home/ubuntu#
```

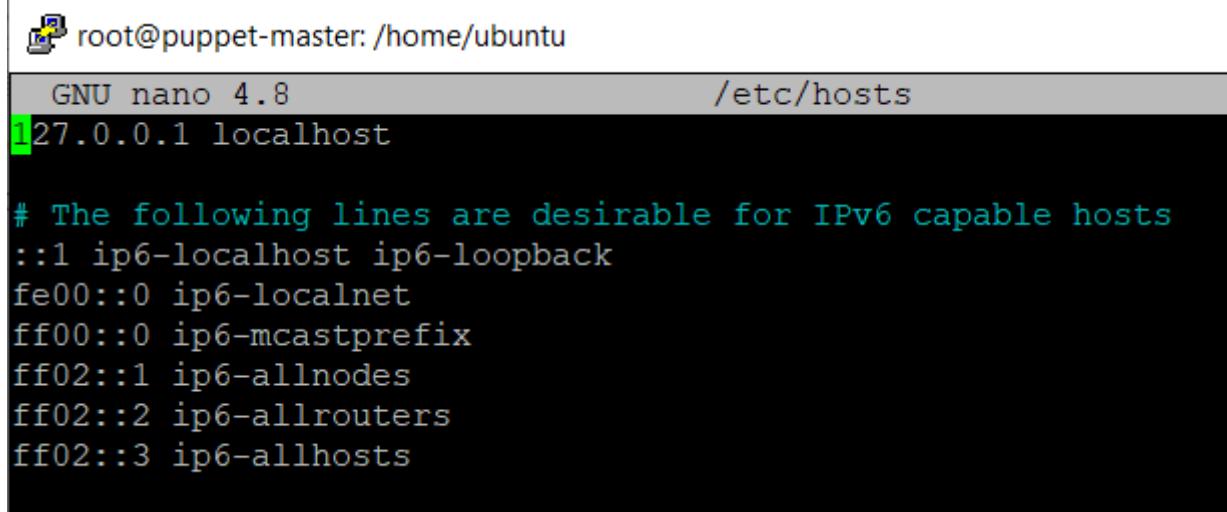
```
root@puppet-master:/home/ubuntu# ifconfig
docker0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
      inet 172.17.0.1 netmask 255.255.0.0 broadcast 172.17.255.255
        ether 02:42:7a:a6:a0:4d txqueuelen 0 (Ethernet)
          RX packets 0 bytes 0 (0.0 B)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 0 bytes 0 (0.0 B)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 9001
      inet 172.31.33.254 netmask 255.255.240.0 broadcast 172.31.47.255
        inet6 fe80::6b:88ff:fedec:dd prefixlen 64 scopeid 0x20<link>
          ether 02:6b:88:de:dd:ec txqueuelen 1000 (Ethernet)
          RX packets 15489 bytes 20274966 (20.2 MB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 3805 bytes 407701 (407.7 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

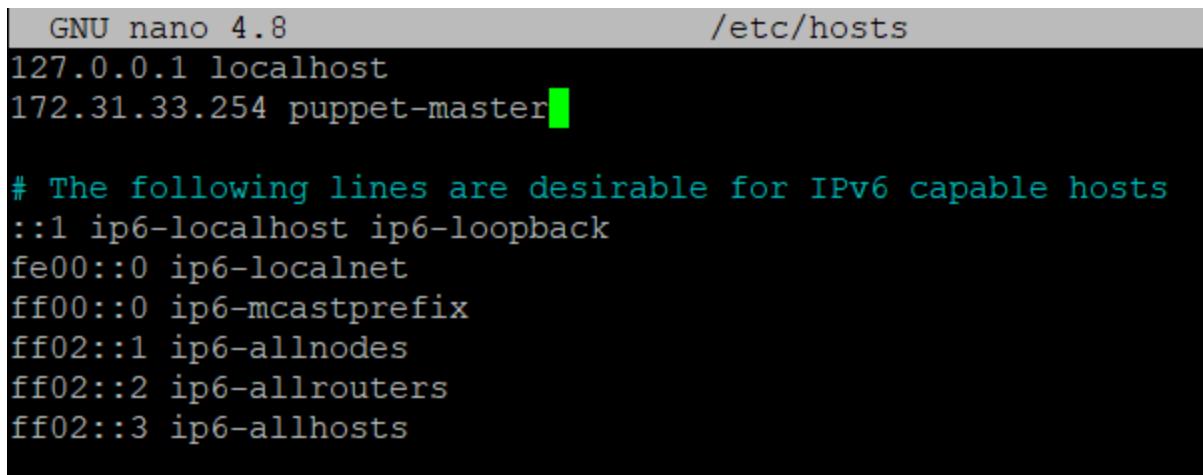
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
      inet 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
          loop txqueuelen 1000 (Local Loopback)
          RX packets 388 bytes 33070 (33.0 KB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 388 bytes 33070 (33.0 KB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
root@puppet-master:/home/ubuntu# echo $(hostname -I) $(hostname)  
172.31.33.254 172.17.0.1 puppet-master  
root@puppet-master:/home/ubuntu#
```

```
root@puppet-master:/home/ubuntu# nano /etc/hosts
```



```
root@puppet-master:/home/ubuntu  
GNU nano 4.8 /etc/hosts  
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
```



```
GNU nano 4.8 /etc/hosts  
127.0.0.1 localhost  
172.31.33.254 puppet-master  
  
# 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
```

Run apt update and upgrade your master

```
apt-get update && apt-get upgrade -y
```

```

 root@puppet-master:/home/ubuntu
root@puppet-master:/home/ubuntu# apt-get update && apt-get upgrade -y
Get:1 https://download.docker.com/linux/ubuntu focal InRelease [57.7 kB]
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal InRelease [265 kB]
[...]
Get:3 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:5 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]
Get:6 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1294 kB]
Get:7 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [945 kB]
Get:8 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [269 kB]
Get:9 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 c-n-f Metadata [14.4 kB]
Get:10 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [522 kB]
Get:11 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted Translation-en [74.8 kB]
Get:12 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 c-n-f Metadata [504 B]
Get:13 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [866 kB]
Get:14 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/universe Translation-en [186 kB]
Get:15 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 c-n-f Metadata [19.3 kB]
Get:16 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [178 kB]
Get:17 http://security.ubuntu.com/ubuntu focal-security/main amd64 c-n-f Metadata [8840 B]

```

apt install puppetmaster -y

```

root@puppet-master:/home/ubuntu# apt install puppetmaster -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  augeas-lenses facter fonts-lato hiera javascript-common libaugeas0 libboost-filesystem1.71.0 libboost-locale1.71.0 libboost-log1.71.0 libboost-program-options1.71.0 libboost-regex1.71.0
  libboost-thread1.71.0 libcppc-hocon0.1.7 libfactercr3.11.0 libjs-jquery libleatherman1.4.2 libruby2.7 libyaml-cpp0.6 puppet puppet-master rake ruby ruby-augeas ruby-deep-merge
  ruby-minitest ruby-net-telnet ruby-power-assert ruby-sellinux ruby-shadow ruby-sync ruby-test-unit ruby-xmlrpc ruby2.7 rubygems-integration unzip zip
Suggested packages:
  augeas-doc mcollective-common puppet-common augeas-tools ruby-rrd ruby-hocon ri ruby-dev bundler
The following NEW packages will be installed:
  augeas-lenses facter fonts-lato hiera javascript-common libaugeas0 libboost-filesystem1.71.0 libboost-locale1.71.0 libboost-log1.71.0 libboost-program-options1.71.0 libboost-regex1.71.0
  libboost-thread1.71.0 libcppc-hocon0.1.7 libfactercr3.11.0 libjs-jquery libleatherman1.4.2 libruby2.7 libyaml-cpp0.6 puppet puppet-master puppetmaster rake ruby ruby-augeas ruby-deep-merge
  ruby-minitest ruby-net-telnet ruby-power-assert ruby-sellinux ruby-shadow ruby-sync ruby-test-unit ruby-xmlrpc ruby2.7 rubygems-integration unzip zip
0 upgraded, 37 newly installed, 0 to remove and 8 not upgraded.
Need to get 12.9 MB of archives.
After this operation, 66.1 MB of additional disk space will be used.
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/main amd64 fonts-lato all 2.0-2 [2699 kB]
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/universe amd64 augeas-lenses all 1.12.0-1build1 [309 kB]
Get:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libboost-filesystem1.71.0 amd64 1.71.0-6ubuntu6 [242 kB]
Get:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libboost-thread1.71.0 amd64 1.71.0-6ubuntu6 [249 kB]
Get:5 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libboost-locale1.71.0 amd64 1.71.0-6ubuntu6 [430 kB]
Get:6 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libboost-program-options1.71.0 amd64 1.71.0-6ubuntu6 [342 kB]
Get:7 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/universe amd64 libboost-regex1.71.0 amd64 1.71.0-6ubuntu6 [471 kB]
Get:8 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/universe amd64 libboost-log1.71.0 amd64 1.71.0-6ubuntu6 [612 kB]
Get:9 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/universe amd64 libleatherman1.4.2 amd64 1.4.2+dfsg-2ubuntu3 [377 kB]
Get:10 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal/universe amd64 libcppc-hocon0.1.7 amd64 0.1.7-1build1 [366 kB]

```

```
puppet --version
```

```
service puppetmaster status
```

```
root@puppet-master:/home/ubuntu# puppet --version
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
5.5.10
root@puppet-master:/home/ubuntu# service puppetmaster status
● puppet-master.service - Puppet master
   Loaded: loaded (/lib/systemd/system/puppet-master.service; enabled; vendor preset: enabled)
   Active: active (running) since Sun 2021-10-24 10:43:07 UTC; 6min ago
     Docs: man:puppet-master(8)
     Main PID: 18013 (puppet)
        Tasks: 2 (limit: 1160)
      Memory: 62.3M
        CGroup: /system.slice/puppet-master.service
                  └─18013 /usr/bin/ruby /usr/bin/puppet master

Oct 24 10:43:07 puppet-master puppet[17995]: Removing file Puppet::SSL::CertificateRe
Oct 24 10:43:07 puppet-master puppet[17995]: Removing file Puppet::SSL::CertificateRe
Oct 24 10:43:07 puppet-master puppet[17995]: The WEBrick Puppet master server is depr
Oct 24 10:43:07 puppet-master puppet[17995]:   (location: /usr/lib/ruby/vendor_ruby/>
Oct 24 10:43:07 puppet-master puppet[17995]: Accessing 'bindaddress' as a setting is >
Oct 24 10:43:07 puppet-master puppet[17995]:   (location: /usr/lib/ruby/vendor_ruby/>
Oct 24 10:43:07 puppet-master puppet[17995]: /usr/lib/ruby/vendor_ruby/puppet/util.rb:315: w
Oct 24 10:43:07 puppet-master puppet[18013]: Reopening log files
Oct 24 10:43:07 puppet-master puppet[18013]: Starting Puppet master version 5.5.10
Oct 24 10:43:07 puppet-master systemd[1]: Started Puppet master.
```

Installation of Puppet Agent:

Setting hostname of Agent:

```
ubuntu@riya2:~$ sudo su
root@riya2:/home/ubuntu# hostnamectl set-hostname puppet-agent
root@riya2:/home/ubuntu# hostname
puppet-agent
root@riya2:/home/ubuntu# sudo su
root@puppet-agent:/home/ubuntu# 
root@puppet-agent:/home/ubuntu# echo $(hostname -I) $(hostname)
172.31.42.39 puppet-agent
root@puppet-agent:/home/ubuntu# 
root@puppet-agent:/home/ubuntu# nano /etc/hosts
```

```
root@puppet-agent: /home/ubuntu
GNU nano 4.8                               /etc/hosts
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

GNU nano 4.8                               /etc/hosts
127.0.0.1 localhost
172.31.42.39 puppet-agent

# 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
```

Run apt update and upgrade your agent

```

root@puppet-agent:/home/ubuntu# apt-get update && apt-get upgrade -y
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates InRelease [1
14 kB]
Get:3 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-backports InRelease
[101 kB]
Get:5 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 P
ackages [1294 kB]
Get:6 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [945
kB]
Get:7 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main Transla
tion-en [269 kB]
Get:8 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 c
-n-f Metadata [14.4 kB]
Get:9 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted a
md64 Packages [522 kB]
Get:10 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted
Translation-en [74.8 kB]
Get:11 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted
amd64 c-n-f Metadata [504 B]
Get:12 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/universe am
d64 Packages [866 kB]
Get:13 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal-updates/universe Tr

```

Install puppet on agent:

```

root@puppet-agent:/home/ubuntu# apt install puppet
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  augeas-lenses factor fonts-lato hiera javascript-common libaugeas0
  libboost-filesystem1.71.0 libboost-locale1.71.0 libboost-log1.71.0
  libboost-program-options1.71.0 libboost-regex1.71.0 libboost-thread1.71.0
  libcpp-hocon0.1.7 libfacter3.11.0 libjs-jquery libleatherman1.4.2 libruby2.7
  libyaml-cpp0.6 rake ruby ruby-augeas ruby-deep-merge ruby-minitest
  ruby-net-telnet ruby-power-assert ruby-selinux ruby-shadow ruby-sync
  ruby-test-unit ruby-xmlrpc ruby2.7 rubygems-integration unzip zip
Suggested packages:
  augeas-doc mcollective-common puppet-common apache2 | lighttpd | httpd
  augeas-tools ruby-rrd ruby-hocon ri ruby-dev bundler
The following NEW packages will be installed:
  augeas-lenses factor fonts-lato hiera javascript-common libaugeas0
  libboost-filesystem1.71.0 libboost-locale1.71.0 libboost-log1.71.0
  libboost-program-options1.71.0 libboost-regex1.71.0 libboost-thread1.71.0
  libcpp-hocon0.1.7 libfacter3.11.0 libjs-jquery libleatherman1.4.2 libruby2.7
  libyaml-cpp0.6 puppet rake ruby ruby-augeas ruby-deep-merge ruby-minitest
  ruby-net-telnet ruby-power-assert ruby-selinux ruby-shadow ruby-sync
  ruby-test-unit ruby-xmlrpc ruby2.7 rubygems-integration unzip zip
0 upgraded, 35 newly installed, 0 to remove and 8 not upgraded.
Need to get 12.9 MB of archives.
After this operation, 66.0 MB of additional disk space will be used.

```

The screenshot shows two terminal windows. The left window is titled 'root@puppet-master:/home/ubuntu' and displays log entries from the Puppet master. The right window is titled 'root@puppet-agent:/home/ubuntu' and displays log entries from the Puppet agent. Both logs show the start of the Puppet master and agent processes, including dependency resolution and configuration processing.

```

root@puppet-master:/home/ubuntu
Memory: 64.3M
CGroup: /system.slice/puppet-master.service
└─19392 /usr/bin/ruby /usr/bin/puppet master

Oct 24 14:35:37 puppet-master puppet[19374]: Removing file Puppet::SSL/TLS certificate
Oct 24 14:35:37 puppet-master puppet[19374]: Removing file Puppet::SSL/TLS certificate
Oct 24 14:35:37 puppet-master puppet[19374]: The WEBrick Puppet master
Oct 24 14:35:37 puppet-master puppet[19374]:   (location: /usr/lib/ruby
Oct 24 14:35:37 puppet-master puppet[19374]: Accessing 'bindaddress' >
Oct 24 14:35:37 puppet-master puppet[19374]:   (location: /usr/lib/ruby
Oct 24 14:35:37 puppet-master puppet[19374]:   /usr/lib/ruby/vendor_ruby/puppet
Oct 24 14:35:37 puppet-master puppet[19392]: Reopening log files
Oct 24 14:35:37 puppet-master puppet[19392]: Starting Puppet master v>
Oct 24 14:35:37 puppet-master systemd[1]: Started Puppet master.
lines 1-20/20 (END) .. skipping...
● puppet-master.service - Puppet master
  Loaded: loaded (/lib/systemd/system/puppet-master.service; enabled; vendor
    Active: active (running) since Sun 2021-10-24 14:35:37 UTC; 2min 11s ago
      Docs: man:puppet(8)
    Main PID: 19392 (puppet)
       Tasks: 2 (limit: 1160)
      Memory: 64.3M
     CGroup: /system.slice/puppet-master.service
             └─19392 /usr/bin/ruby /usr/bin/puppet master

Oct 24 14:35:37 puppet-master puppet[19374]: Removing file Puppet::SSL/TLS certificate
Oct 24 14:35:37 puppet-master puppet[19374]: Removing file Puppet::SSL/TLS certificate
Oct 24 14:35:37 puppet-master puppet[19374]: The WEBrick Puppet master

```

```

root@puppet-agent:/home/ubuntu
Setting up libboost-thread1.71.0:amd64 (1.71.0-6ubuntu6) ...
Setting up libboost-locale1.71.0:amd64 (1.71.0-6ubuntu6) ...
Setting up libjs-jquery (3.3.1-dfsg-3) ...
Setting up ruby-xmlrpc (0.3.0-2) ...
Setting up libboost-program-options1.71.0:amd64 (1.71.0-6ubuntu6) ...
Setting up libboost-log1.71.0 (1.71.0-6ubuntu6) ...
Setting up libbleatherman1.4.2:amd64 (1.4.2+dfsg-2ubuntu3) ...
Setting up libcpp-hocon0.1.7:amd64 (0.1.7-1build1) ...
Setting up libfacterc3.11.0:amd64 (3.11.0-4) ...
Setting up facter (3.11.0-4) ...
Setting up rake (13.0.1-4) ...
Setting up ruby2.7 (2.7.0-5ubuntu1.5) ...
Setting up ruby2.7 (2.7.0-5ubuntu1.5) ...
Setting up ruby (1:2.7+1) ...
Setting up ruby-deep-merge (1.1.1-1) ...
Setting up ruby-shadow (2.5.0-1build2) ...
Setting up hiera (3.2.0-2) ...
Setting up ruby-selinux:amd64 (3.0-1build2) ...
Setting up ruby-augeas (1:0.5.0-3build7) ...
Setting up puppet (5.5.10-4ubuntu3) ...
Processing triggers for mime-support (3.64ubuntu1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Processing triggers for systemd (245.4-4ubuntu3.13) ...
Processing triggers for man-db (2.9.1-1) ...
root@puppet-agent:/home/ubuntu# puppet --version
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
5.5.10
root@puppet-agent:/home/ubuntu#

```

```

root@puppet-agent:/home/ubuntu# puppet --version
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
5.5.10
root@puppet-agent:/home/ubuntu#

```

```

root@puppet-agent:/home/ubuntu# nano /etc/puppet/puppet.conf

```

Configure puppet master entry in puppet agent by adding foll. line into puppet.conf:

```
GNU nano 4.8          /etc/puppet/puppet.conf
[main]
ssldir = /var/lib/puppet/ssl
server = puppet-master

[master]
vardir = /var/lib/puppet
cadir = /var/lib/puppet/ssl/ca
dns_alt_names = puppet

[ Wrote 8 lines ]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit      ^R Read File ^\ Replace   ^U Paste Text^T To Spell ^ Go To Line
```

Invoke or start puppet agent

```
root@puppet-agent:/home/ubuntu# service puppet status
● puppet.service - Puppet agent
  Loaded: loaded (/lib/systemd/system/puppet.service; disabled; vendor prese>
  Active: inactive (dead)
    Docs: man:puppet-agent(8)
lines 1-4/4 (END)
```

puppet agent --no-daemonize --onetime --verbose

```
root@puppet-agent:/home/ubuntu# puppet agent --no-daemonize --onetime --verbose
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:315: warning: deprecated Object#=~ is called on Puppet::Transaction::Report; it always returns nil
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
Info: Creating a new SSL key for puppet-agent.us-east-2.compute.internal
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
Info: csr_attributes file loading from /etc/puppet/csr_attributes.yaml
Info: Creating a new SSL certificate request for puppet-agent.us-east-2.compute.internal
Info: Certificate Request fingerprint (SHA256): 89:FF:F6:FC:A2:5B:1E:14:83:E6:9E
:3F:74:04:A7:55:63:B0:B8:0D:8D:B4:49:0F:ED:E0:4E:6A:D9:22:71:5B
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
```

List all certificates on master

```
root@puppet-master:/home/ubuntu# puppet --version
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
5.5.10
root@puppet-master:/home/ubuntu# puppet cert list -all
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:315: warning: deprecated Object#=~ is called on Puppet::Transaction::Report; it always returns nil
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
Warning: `puppet cert` is deprecated and will be removed in a future release.
  (location: /usr/lib/ruby/vendor_ruby/puppet/application.rb:370:in `run')
+ "puppet-master.ap-south-1.compute.internal" (SHA256) 91:80:EC:76:79:82:D9:B
C:C2:9E:4B:96:B4:03:30:C5:86:A1:05:E5:FA:63:62:AE:2F:7B:E6:3C:69:42:EC:98 (alt names: "DNS:puppet", "DNS:puppet-master.ap-south-1.compute.internal")
root@puppet-master:/home/ubuntu#
```

```
root@puppet-agent:/home/ubuntu# puppet agent --no-daemonize --onetime --verbose
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:315: warning: deprecated Object#=~ is called on Puppet::Transaction::Report; it always returns nil
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
Info: Creating a new SSL key for puppet-agent.us-east-2.compute.internal
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
Info: csr_attributes file loading from /etc/puppet/csr_attributes.yaml
Info: Creating a new SSL certificate request for puppet-agent.us-east-2.compute.internal
Info: Certificate Request fingerprint (SHA256): 89:FF:F6:FC:A2:5B:1E:14:83:E6:9E:3F:74:04:A7:55:63:B0:B8:0D:8D:B4:49:0F:ED:60:4E:6A:D9:22:71:5B
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
Error: Could not request certificate: Error 500 on SERVER: Server Error: can't modify frozen String: ""
Exiting; failed to retrieve certificate and waitforcert is disabled
root@puppet-agent:/home/ubuntu#
```

```
^X
root@puppet-master:/home/ubuntu# puppet --version
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
5.5.10
root@puppet-master:/home/ubuntu# puppet cert list -all
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:315: warning: deprecated Object#=~ is called on Puppet::Transaction::Report; it always returns nil
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
Warning: 'puppet cert' is deprecated and will be removed in a future release.
  (location: /usr/lib/ruby/vendor_ruby/puppet/application.rb:370:in `run')
  "puppet-agent.us-east-2.compute.internal" (SHA256) 89:FF:F6:FC:A2:5B:1E:14:83:E6:9E:3F:74:04:A7:55:63:B0:B8:0D:8D:B4:49:0F:ED:60:4E:6A:D9:22:71:5B
+ "puppet-master.us-east-2.compute.internal" (SHA256) B8:A3:FE:AE:96:EC:A7:C9:89:F2:5F:62:68:6E:9C:D9:09:FC:90:22:1F:B9:F5:95:87:BE:4C:27:A6:39:41:78 (alt names: "DNS:puppet", "DNS:puppet-master.us-east-2.compute.internal")
root@puppet-master:/home/ubuntu#
```

Sign certificate on puppet master:

puppet cert sign puppet-agent.localdomain

```
root@puppet-master:/home/ubuntu# puppet cert sign puppet-master.ap-south-1.compute.internal
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:315: warning: deprecated Object#=~ is called on Puppet::Transaction::Report; it always returns nil
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
Warning: 'puppet cert' is deprecated and will be removed in a future release.
  (location: /usr/lib/ruby/vendor_ruby/puppet/application.rb:370:in `run')
Error: Could not find CSR for: "puppet-master.ap-south-1.compute.internal".
```

Enable your agent and set server:

```
root@puppet-agent:/home/ubuntu# puppet agent --enable
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:315: warning: deprecated Object#=~ is called on Puppet::Transaction::Report; it always returns nil
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
root@puppet-agent:/home/ubuntu# puppet agent --server puppet-master
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:315: warning: deprecated Object#=~ is called on Puppet::Transaction::Report; it always returns nil
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
```

Configure modules on puppet master to install curl on Agent:

```
root@puppet-agent:/home/ubuntu# apt install curl
Reading package lists... Done
Building dependency tree
Reading state information... Done
curl is already the newest version (7.68.0-1ubuntu2.7).
curl set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 8 not upgraded.
```

```
root@puppet-master:/home/ubuntu# cd /etc/puppet/code
root@puppet-master:/etc/puppet/code# mkdir -p environments/production/manifests
root@puppet-master:/etc/puppet/code# ls environments
root@puppet-master:/etc/puppet/code# cd environments/production/manifests# pwd
bash: cd: too many arguments
root@puppet-master:/etc/puppet/code# cd environments/production/manifests
root@puppet-master:/etc/puppet/code/environments/production/manifests# pwd
/etc/puppet/code/environments/production/manifests
root@puppet-master:/etc/puppet/code/environments/production/manifests#
root@puppet-master:/etc/puppet/code/environments/production/manifests# nano site.pp
```

```
root@puppet-master:/etc/puppet/code/environments/production/manifests# nano site.pp
GNU nano 4.8
node 'puppet-agent'{
    package {
        'curl':
            name => 'curl',
            ensure => installed,
    }
}
```

```
root@puppet-master:/etc/puppet/code/environments/production/manifests# puppet parser
validate site.pp
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
root@puppet-master:/etc/puppet/code/environments/production/manifests#
```

Conclusion:

Hence, we understood how to install and configure Pull based Software Configuration Management and provisioning tools using Puppet.

EXPERIMENT-9

Aim: To learn Software Configuration Management and provisioning using Puppet Blocks (Manifest, Modules, Classes, Function)

Theory: Puppet is a tool that helps you manage and automate the configuration of servers. Puppet provides the flexibility to integrate Reports with third-party tools using Puppet APIs.

Four types of Puppet building blocks are:

- Resources
- Classes
- Manifest
- Modules

Puppet Resources:

Puppet Resources are the building blocks of Puppet.

Resources are the inbuilt functions that run at the back end to perform the required operations in puppet.

Puppet Classes:

A combination of different resources can be grouped together into a single unit called class.

Puppet Manifest:

Manifest is a directory containing puppet DSL files. Those files have a .pp extension. The .pp extension stands for puppet program. The puppet code consists of definitions or declarations of Puppet Classes.

Puppet Modules:

Modules are a collection of files and directories such as Manifests, Class definitions. They are the reusable and sharable units in Puppet. For example, the MySQL module to install and configure MySQL or the Jenkins module to manage Jenkins, etc.



There are three kinds of resource types:

1. Puppet core or built-in resource types.
2. Puppet defined resource types.
3. Puppet custom resource types.

Puppet core or built-in resource types:

Core or built-in resource types are the pre-built puppet resource types shipped with puppet software. All of the core or built-in Puppet resource types are written and maintained by Puppet team.

Puppet defined resource types:

Defined resource types are lightweight resource types written in Puppet declarative language using a combination of existing resource types.

Puppet custom resource types:

Custom resource types are completely customized resource types written in Ruby. Let's explore about puppet resource types ...

Puppet

classes

Puppet classes are the collection of puppet resources bundled together as a single unit. Puppet introduced classes to make the structure re-usable and organized.

First, we need to define a class using class definition syntax; classes must be unique and can be declared only once with the same name:

```
class <class-name> {
  <Resource declarations>
}
```

Example:

```
class ntpconfig { file
  {
    "/etc/ntp.conf":
    ensure=> "present", content=> "server 0.centos.pool.ntp.org iburst\n",
  }
}
```

So far we have only defined the class, but we have not used it anywhere. Meaning this code that we have written will never get executed unless we declare this class elsewhere.

Conclusion:

Hence, we understood about Software Configuration Management and provisioning using Puppet Blocks (Manifest, Modules, Classes, Function).

EXPERIMENT-10

Aim: To provision a LAMP/MEAN Stack using Puppet Manifest.

Theory:

Puppet Manifest:

In Puppet, all the programs which are written using Ruby programming language and saved with an extension of .pp are called manifests. In general terms, all Puppet programs which are built with an intention of creating or managing any target host machine is called a manifest.

LAMP Stack:

The widely popular LAMP stack is a set of open source software used for web application development. For a web application to work smoothly, it has to include an operating system, a web server, a database, and a programming language. LAMP, on the other hand, stands for Linux, Apache, MySQL, and PHP, Perl, or Python. It's still relevant as it offers a great alternative to commercial software packages. Further, it works well as a bundle of programs that provide a robust platform to develop and implement web-based applications and servers.

MEAN Stack:

MEAN is a software bundle that stands for MongoDB, ExpressJS, AngularJS, and NodeJS. Together in a stack, these free programs enhance the simplicity of the web development process. Choosing MEAN over LAMP will provide your development team with the benefit of enhanced speed for data retrieval, flexibility in deployment, and a single language that's used from top to bottom.

Creating a puppet module:

Create the foll. dir structures to add a LAMP stack module and create a lamp class inside init.pp:

```
root@puppet-master:# cd /etc/puppet/code
root@puppet-master:/etc/puppet/code# cd environments/production/manifests
root@puppet-master:/etc/puppet/code/environments/production/manifests# mkdir -p modules/lang/manifests
root@puppet-master:/etc/puppet/code/environments/production/manifests# cd modules/lang/manifests
root@puppet-master:/etc/puppet/code/environments/production/manifests/modules/lang/manifests# nano init.pp
```

```
GNU nano 4.8                               init.pp
class lamp {
    # execute 'apt-get update'
    exec { 'apt-update':
        command => '/usr/bin/apt-get update'  # command this resource will run
    }

    # install apache2 package
    package { 'apache2':
        require => Exec['apt-update'],          # require 'apt-update' before installing
        ensure => installed,
    }

    # ensure apache2 service is running
    service { 'apache2':
        ensure => running,
    }

    # install mysql-server package
    package { 'mysql-server':
        require => Exec['apt-update'],          # require 'apt-update' before installing
        ensure => installed,
    }

    # ensure mysql service is running
    service { 'mysql':
        ensure => running,
    }

    # install php package
    package { 'php':
        require => Exec['apt-update'],          # require 'apt-update' before installing
        ensure => installed,
    }

    # ensure info.php file exists
    file { '/var/www/html/info.php':
        ensure => file,
        content => '',      # phpinfo code
        require => Package['apache2'],          # require 'apache2' package before creating
    }
}
```

Include lamp class inside site.pp:

```
root@puppet-master:/etc/puppet/code/environments/production/manifests/modules/lang/ma  
nifests# nano site.pp
```

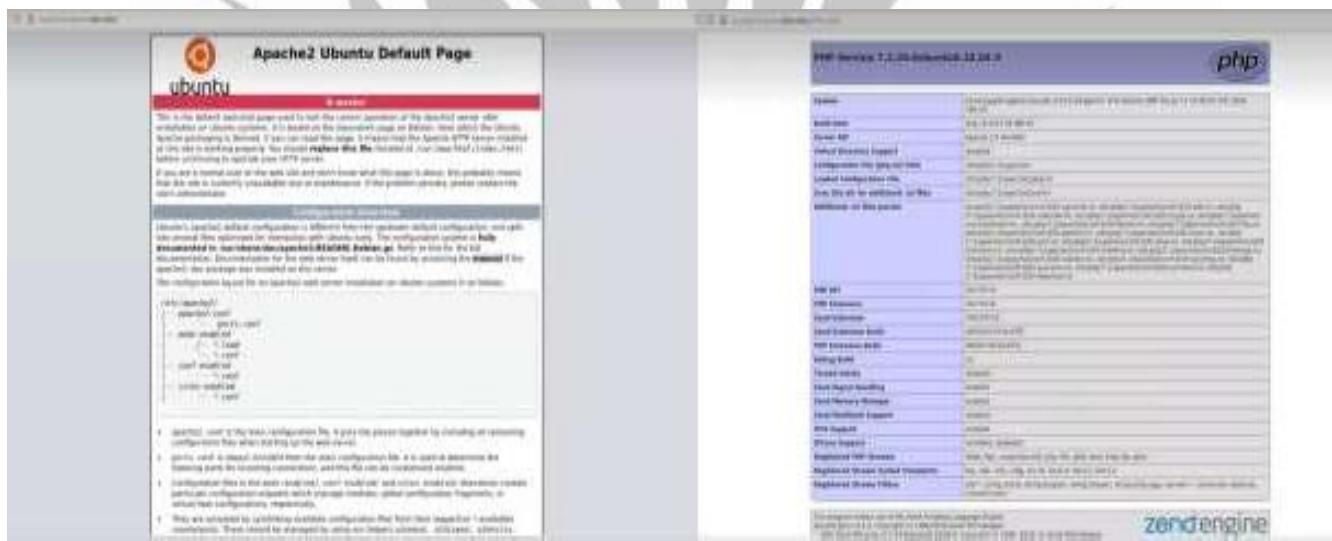
```
node 'puppet-agent'{  
    include lamp  
    package {  
        'curl':  
            name => 'curl',  
            ensure => installed,  
    }  
}
```

Before fetching the catalog on agent, verify first whether the following packages are installed or not:

```
root@puppet-master:/# mysql  
  
Command 'mysql' not found, but can be installed with:  
  
apt install mysql-client-core-8.0      # version 8.0.26-0ubuntu0.20.04.3, or  
apt install mariadb-client-core-10.3   # version 1:10.3.31-0ubuntu0.20.04.1  
  
root@puppet-master:/# php  
  
Command 'php' not found, but can be installed with:  
  
apt install php7.4-cli  
  
root@puppet-master:/# apache  
  
Command 'apache' not found, did you mean:  
  
    command 'apache2' from deb apache2-bin (2.4.41-4ubuntu3.7)  
  
Try: apt install <deb name>
```

Fetch the catalog:

```
root@puppet-agent:/home/ubuntu# puppet agent -t
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
/usr/lib/ruby/vendor_ruby/puppet/util.rb:315: warning: deprecated Object#=~ is called on Puppet::Transaction::Report; it always returns nil
/usr/lib/ruby/vendor_ruby/puppet/util.rb:461: warning: URI.escape is obsolete
```



Creating index.html file inside LAMP module:

```
root@puppet-agent:/home/ubuntu# cd /etc/puppet/code/environments/production
root@puppet-agent:/etc/puppet/code/environments/production# cd modules/lamp bash
bash: cd: too many arguments
root@puppet-agent:/etc/puppet/code/environments/production# cd modules
root@puppet-agent:/etc/puppet/code/environments/production/modules# mkdir lamp
root@puppet-agent:/etc/puppet/code/environments/production/modules# cd lamp
root@puppet-agent:/etc/puppet/code/environments/production/modules/lamp# mkdir files
root@puppet-agent:/etc/puppet/code/environments/production/modules/lamp# ls
files
root@puppet-agent:/etc/puppet/code/environments/production/modules/lamp# mkdir manifest
root@puppet-agent:/etc/puppet/code/environments/production/modules/lamp# ls
files manifest
root@puppet-agent:/etc/puppet/code/environments/production/modules/lamp# 
```

```
GNU nano 4.8                               index.html





<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Navbar</title>
</head>
<style>
    * {
        margin: 0;
        padding: 0;
        box-sizing: border-box;
    }

    nav{
        background-color: #2C394B;
    }

    nav ul{
        display: flex;
    }
    nav ul li {
        color: #fff;
        list-style-type: none;
        padding: 15px 25px;
    }

    nav ul li:hover{
        color: #FF4C29;
        background-color: #082032;
    }
</style>
<body>
    <nav>
        <ul>
            <li>Home</li>
            <li>About</li>
            <li>Service</li>
            <li>Contact</li>
        </ul>
    </nav>
</body>
```

Add a file resource to create an index.html inside init.pp:

```
GNU nano 4.8                               init.pp
class lamp {
  # execute 'apt-get update'
  exec { 'apt-update':                      # exec resource named 'apt-update'
    command => '/usr/bin/apt-get update'   # command this resource will run
  }

  # install apache2 package
  package { 'apache2':
    require => Exec['apt-update'],           # require 'apt-update' before installing
    ensure => installed,
  }

  # ensure apache2 service is running
  service { 'apache2':
    ensure => running,
  }

  # install mysql-server package
  package { 'mysql-server':
    require => Exec['apt-update'],           # require 'apt-update' before installing
    ensure => installed,
  }

  # ensure mysql service is running
  service { 'mysql':
    ensure => running,
  }

  # install php package
  package { 'php':
    require => Exec['apt-update'],           # require 'apt-update' before installing
    ensure => installed,
  }
  # ensure info.php file exists
  file { '/var/www/html/info.php':
    ensure => file,
    content => '',      # phpinfo code
    require => Package['apache2'],          # require 'apache2' package before creating
  }

info.php# change index.html
file{ 'var/www/html/index.html':
  ensure => present,
  source => 'puppet:///modules/lamp/index.html',
  require => File[/var/www/html/index.html],
}
}
```

Conclusion:

Hence, we provisioned a LAMP/MEAN Stack using Puppet Manifest.