MANJARA CHARITABLE TRUST

RAJIV GANDHI INSTITUTE OF TECHNOLOGY, MUMBAI

DEPARTMENT OF INFORMATION TECHNOLOGY

EXPERIMENT NO. 06

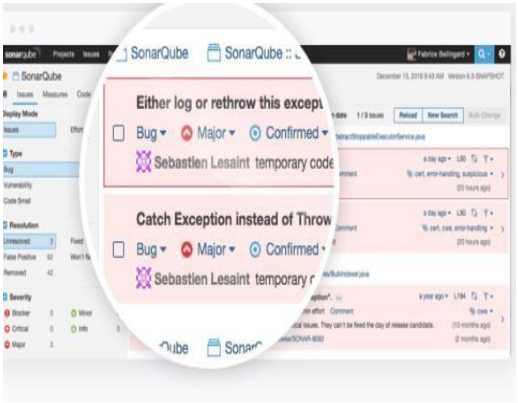
Roll no.: 571
Batch: T4

Aim: Introduction to SonarQube

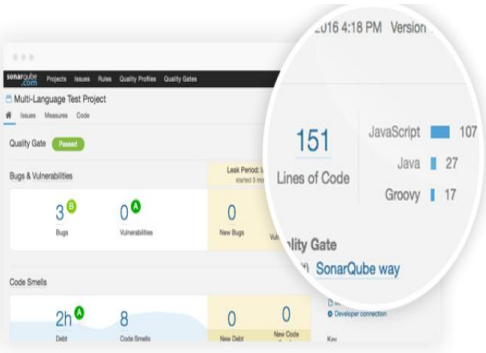
Theory:

SonarQube is an open-source platform developed by SonarSource for continuous inspection of code quality to perform automatic reviews with static analysis of code to detect bugs, code smells, and security vulnerabilities on 20+ programming languages. It is used to measure and analyze to the quality of source code. It is implemented in Java language and is able to analyze the code of about 20 different programming languages. Anything that affects code base, from minor styling details to critical design errors, is inspected and evaluated by SonarQube, which helps software application developers to identify the issue and its effect.

Features of SonarQube:

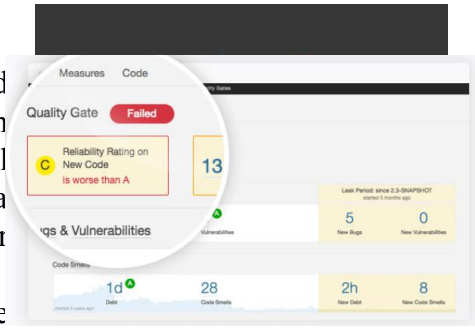


- **Detect Bugs:** Represents wrong code which has not broken yet but it will probably at the worst possible moment. Examples include null- pointer, memory leaks, and logic errors.
- **Code Smells:** A maintainability-related issue in the code which indicate a violation of fundamental design principles. Code smell technically not incorrect but it is not functional as well. Examples include duplicated code, too complex code, Dead Code, Long Parameter List.
- **Security Vulnerability:** A security-related issue which represents a backdoor for attackers. Examples include SQL injection, hard-coded passwords and badly managed errors.
- **Multi-Language**: 20+ Programming Languages SonarQube 4.2 and higher version comes with code analyzer for each major programming language.
- **Multi-Language Projects:** We often use multiple programming languages in the software application development – like [C#, C++ and JavaScript] or [Java, JavaScript and HTML]. SonarQube automatically detects the languages and run corresponding code analyzer for each language.



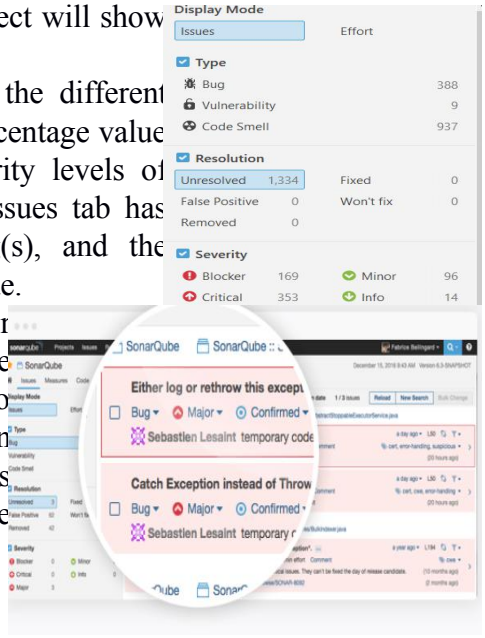
Centralized Quality

- **All projects in one place:** SonarQube enables the centralized system of storing the code metrics which allows an organization to estimate and predict risks of the project. It will not only simplify the deployment but also allows making a qualitative step forward for the project management, monitor the project status.
- **Shared rulesets:** SonarQube provides the facility to create



your own quality profiles, in which you can define Sonar Rules which can be shared among different projects.

- **Enforce quality gate:** To fully enforce a code quality practice across all teams, you need to set up a Quality Gate. A Quality Gate is a set of conditions the project must meet before it can qualify for production release. The overview of the project will show the results of the SonarQube analysis.
- **Analyze Pull requests:** SonarQube categorizes Issues in the different type. It displays the corresponding number of issues or a percentage value as per different categories. There are five different severity levels of Issues like blocker, critical, major, minor and info. The issues tab has different filter criteria like category, severity level, tag(s), and the calculated effort (regarding time) it will take to rectify an issue.
- **Crack the Issues:** From the issues tab, you have full power to analyze in detail what the main issues are, where they are located when they were added to your code base and who originally introduced them. It provides facility to assign an issue to another user, to add the comment on it, and change its severity level. On Click of a particular issue, shows more description about the issue.



Hands on SonarQube:

- Installation of SonarQube on Windows/Linux
- Configuring SonarQube and SonarScanner
- Testing Local Files in SonarQube
- Integrating SonarQube in Jenkins
- Running Jenkins Pipeline job with examining code using SonarQube

Conclusion:

We have successfully learned about the introduction to SonarQube.

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EXPERIMENT NO. 07

Roll no.: 571
Batch: T4

Aim: Puppet Modules to Configure Agent Nodes

Theory:

Puppet modules are Puppet's prescribed way of organizing configuration code to serve specific purposes, like installing and configuration an application. You can create custom modules, or you can download and use modules published on Puppet Forge. https://forge.puppet.com/

Add a Limited User

1. **From the Puppet master, navigate to the**

   etc/puppetlabs/code/environments/production/modules/
   directory. When a managed node requests its configuration from the master, the Puppet server process will look in this location for your modules:

```
onmaster#cd/etc/puppetlabs/code/environments/production/modules/
```

2. **Create the directory for a new accounts module:**

```
onmaster# mkdir accounts

onmaster# cd accounts
```

3. **Create the following directories inside the accounts module:**

```
onmaster# mkdir {examples,files,manifests,templates}
```

Directory	Description
manifests	The Puppet code which powers themodule
files	Static files to be copied to managednodes
templates	Template files to be copied to managednodes that can be customized with variables
examples	Example code which shows how to use the module

4. **Navigate to the manifests directory**

```
class accounts
 {
      user
      {
            'mahendra': ensure => present,
            home => '/home/mahendra',
            shell => '/bin/bash',
            managehome => true,
            gid => 'mahendra',
      }
}
```

```
onmaster# cd manifests
```

5. Any file which contains Puppet code is called a manifest,

and each manifest file ends in .pp. When located inside a module, a manifest should only define one class.

If a module's manifests directory has an init.pp file, the class definition it contains is considered the main class for the module. The class definition inside init.pp should have the same name as the module.

Create an init.pp file with the contents of the following snippet. Replace all instances of mahendra with a username of your choosing:

/etc/puppetlabs/code/environments/production/modules/accounts/manifests/init.pp Note: class name should be the same as that of your directory you create under modules For e.g. accounts is the directory and class name is accounts.

OPTION	DESCRIPTION
ensure	Ensures that the user exists if set to present,or does not exist if set to absent
home	The path for the user's home directory
managehome	Controls whether a home directory should becreated when creating the user
shell	The path to the shell for the user
gid	The user's primary group

5. **Although the class declares what the user's primary group should be** it will not create the group itself. Create a new file called groups.pp inside the manifests directory with the following contents. Replace username with your chosen username:
accounts/manifests/groups.pp

```
class accounts::groups
{
      group
      {
           'mahendra': #username should be the name you give in accounts class
            ensure  => present,
       }
}
```

Conclusion:

- Successfully done Configuring Puppet Agents
- Successfully done Generate and Sign Certificates
- Successfully done the puppet Master

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EXPERIMENT NO. 08

Roll no.: 571
Batch: T4

Aim: Selenium web driver using python

Theory:

Selenium's Python Module is built to perform automated testing with Python. Selenium Python bindings provides a simple API to write functional/acceptance tests using Selenium WebDriver. Through Selenium Python API you can access all functionalities of Selenium WebDriver in an intuitive way.

Selenium Python Introduction

Selenium Python bindings provide a convenient API to access Selenium Web Drivers like Firefox, I.e., Chrome, Remote etc. The current supported Python versions are 2.7, 3.5 and above.

- **Open Source and Portable** – Selenium is an open source and portable Web testing Framework.
- **Combination of tool and DSL** – Selenium is combination of tools and DSL (Domain Specific Language) in order to carry out various types of tests.
- **Easier to understand and implement** – Selenium commands are categorized in terms of different classes which make it easier to understand and implement.
- **Reduce test execution time** – Selenium supports parallel test execution that reduce the time taken in executing parallel tests.
- **Lesser resources required** – Selenium requires lesser resources when compared to its competitors like UFT, RFT, etc.
- **Supports Multiple Operating Systems** – Android, iOS, Windows, Linux, Mac, Solaris.
- **Supports Multiple Browsers** – Google Chrome, Mozilla Firefox, Internet Explorer, Edge, Opera, Safari, etc.
- **Parallel Test Execution** – It also supports parallel test execution which reduces time and increases the efficiency of tests.

I. Selenium Python Installation

For any operating system selenium can be installed after you have installed python on your operating system.
Open Terminal/Cmd and Write Command as written Below

```
python –m pip install selenium
```

II. Installing Webdrivers

One Can Install Firefox, Chromium, PhantomJs(Deprecated Now), etc.

- for using Firefox you may need to install GeckoDriver
- for using Chrome you may need to install Chromium

Programs using Selenium

1) Navigating links using get method – Selenium Python

Selenium's Python Module is built to perform automated testing with Python. Selenium Python bindings provides a simple API to write functional/acceptance tests using Selenium WebDriver. Through Selenium Python API you can access all functionalities of Selenium WebDriver in an intuitive way. This article illustrates about how to use Selenium Python to navigate to any link on web using get method of Selenium Webdriver in python.

How to navigate links using Python Selenium

The first thing one'll want to do with WebDriver is navigate to a link. The normal way to do this is by calling get method:

Syntax –

```
driver.get(url)
```

Example-

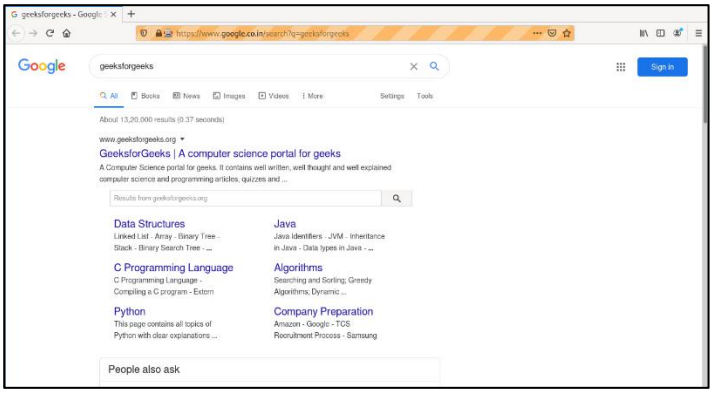
```
driver.get("http://www.google.com")
```

WebDriver will wait until the page has fully loaded (that is, the onload event has fired) before returning control to your test or script. It's worth noting that if your page uses a lot of AJAX on load then WebDriver may not know when it has completely loaded. If you need to ensure such pages are fully loaded then you can use waits.

Project Example:
After you have installed Selenium, create a file called run.py as

Program:

```
# Python program to demonstrate selenium
# import webdriver
from selenium import webdriver
# create webdriver object
driver = webdriver.Firefox()
```



2) Interacting with Webpage – Selenium Python

Selenium's Python Module is built to perform automated testing with Python. Selenium Python bindings provide a simple API to write functional/acceptance tests using Selenium WebDriver. Just being able to go to places isn't terribly useful. What we'd really like to do is to interact with the pages, or, more specifically, the HTML elements within a page. First of all, we need to find one. WebDriver offers a number of ways to find elements. For example, given an element defined as:

```
<input type="text" name="passwd" id="passwd-id" />
```

To find an element one needs to use one of the locating strategies, For example,

```
element = driver.find_element(By.ID,"passwd-id")
element = driver.find_element(By.NAME, "passwd")
```

Also, to find multiple elements, we can use

```
elements = driver.find_elements(By.NAME, "passwd")
```

One can also look for a link by its text, but be careful! The text must be an exact match! One should also be careful when using XPATH in WebDriver. If there's more than one element that matches the query, then only the first will be returned. If nothing can be found, a NoSuchElementException will be raised. WebDriver has an "Object-based" API, we represent all types of elements using the same interface. This means that although one may see a lot of possible methods one could invoke when one hits IDE's auto-complete key combination, not all of them will make sense or be valid.

So after getting an element what next? One might want to enter text into a field,

```
element.send_keys("some text")
```

One can simulate pressing the arrow keys by using the "Keys" class:

```
element.send_keys(" and some", Keys.ARROW_DOWN)
```

Also note, that it is possible to call send_keys on any element, which makes it possible to test keyboard shortcuts such as those used on Gmail. One can easily clear the contents of a text field or textarea with the clear method:

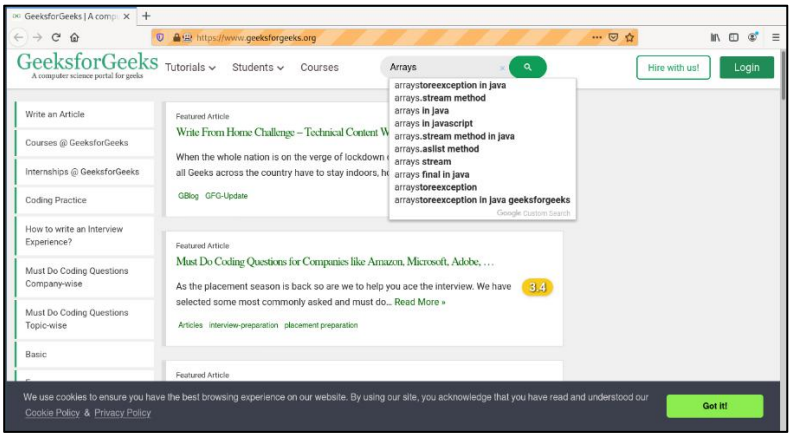
```
element.clear()
```

Project Example:

Let us try to search for something automatically at geeksforgeeks

Program

```
# import webdriver
from selenium import webdriver
from selenium.webdriver.common.by import By
# create webdriver object
driver = webdriver.Firefox()
# get geeksforgeeks.org
driver.get("https://www.geeksforgeeks.org/")
```



3) Locating single elements in Selenium Python

Locators Strategies in Selenium Python are methods that are used to locate elements from the page and perform an operation on the same. Selenium's Python Module is built to perform automated testing with Python. Selenium Python follows different locating strategies for elements. For locating elements, you have to import *By*

```
from selenium.webdriver.common.by import By
```

Locators	Description
By.ID	The first element with the id attribute value matching the location will be returned.
By.NAME	The first element with the name attribute value matching the location will be returned.
By.XPATH	The first element with the xpath syntax matching the location will be returned.
By.LINK_TEXT	The first element with the link text value matching the location will be returned.
By.PARTIAL_LINK_TEXT	The first element with the partial link text value matching the location will be returned.
By.TAG_NAME	The first element with the given tag name will be returned.
By.CLASS_NAME	The first element with the matching class attribute name will be returned.
By.CSS_SELECTOR	The first element with the matching CSS selector will be returned.

By.ID

With this strategy, the first element with the id attribute value matching the location will be returned. If no element has a matching id attribute, a NoSuchElementException will be raised.

Syntax:

```
driver.find_element(By.ID, "id_of_element")
```

By.NAME

With this strategy, the first element with the name attribute value matching the location will be returned. If no element has a matching name attribute, a NoSuchElementException will be raised.

Syntax:

```
driver.find_element(By.NAME, "name_of_element")
```

By.XPATH

With this strategy, the first element with pattern of xpath matching the location will be returned. If no element has a matching element attribute, a NoSuchElementException will be raised.

Syntax:

```
driver.find_element(By.XPATH, "xpath")
```

By.LINK_TEXT

With this strategy, the first element with the link text value matching the location will be returned. If no element has a matching link text attribute, a NoSuchElementException will be raised.

Syntax:

```
driver.find_element(By.LINK_TEXT, "Text of Link")
```

By.PARTIAL_LINK_TEXT

With this strategy, the first element with the partial link text value matching the location will be returned. If no element has a matching partial link text attribute, a NoSuchElementException will be raised.

Syntax:

```
driver.find_element(By.PARTIAL_LINK_TEXT, "Text of Link")
```

By.TAG_NAME

With this strategy, the first element with the given tag name will be returned. If no element has a matching tag name, a NoSuchElementException will be raised.

Syntax:

```
driver.find_element(By.TAG_NAME, "Tag name")
```

By.CLASS_NAME

With this strategy, the first element with the matching class attribute name will be returned. If no element has a matching class attribute name, a NoSuchElementException will be raised.

Syntax:

```
driver.find_element(By.CLASS_NAME, "class_of_element")
```

By.CSS_SELECTOR

With this strategy, the first element with the matching CSS selector will be returned. If no element has a matching CSS selector, a NoSuchElementException will be raised.

Syntax:

```
driver.find_element(By.CSS_SELECTOR, "CSS Selectors")
```

Conclusion:

We have successfully implemented the following

- Navigating links using get method – Selenium Python
- Interacting with Webpage – Selenium Python
- Locating single elements in Selenium Python

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EXPERIMENT NO. 09

Roll no.: 571
Batch: T4

Aim: Jira software

Theory:

What Is Jira?

- Jira is a software application used for issue tracking and project management. The tool, developed by the Australian software company Atlassian, has become widely used by agile development teams to track bugs, stories, epics, and other tasks.
- Jira is a suite of agile work management solutions that powers collaboration across all teams from concept to customer. Jira offers several products and deployment options that are purpose-built for Software, IT, Business, Ops teams, and more.
- Jira helps teams plan, assign, track, report, and manage work and brings teams together for everything from agile software development and customer support to start-ups and enterprises.
- It is also used for project management. The JIRA dashboard consists of many useful functions and features which make handling of issues easy.

What is Jira used for ?

Originally designed as a bug and issue tracker, Jira serves as a powerful work management tool for various use cases like:

- Requirement and Test case Management – to manage manual and automated tests
- Agile Teams – JIRA software provides scrum and Kanban boards for teams practicing agile methodologies.
- Project Management – JIRA software can be configured to fit any type of project right from onset, through execution, to wrap up.
- Software Development – for developing better software, faster by incorporating Atlassian tools.
- DevOps – Atlassian open DevOps helps teams ship better software, stressing on best practices.
- Product Management – JIRA helps design detailed roadmaps, handle dependencies, and share plans and progresses.
- Task Management –JIRA makes it easy to create tasks to work on, with details, due dates and reminders.
- Bug Tracking – the powerful jira workflow engine makes sure that bugs, once captured are automatically assigned and prioritized.

Different Features of JIRA

- Scrum and Kanban Boards
- Roadmaps
- Bug and Issue Tracking
- Agile Reporting
- Custom Workflows
- Over 3000 App Integrations
- Audit Logs

What Types of Teams Use It Today?

As it grew in popularity and as the agile development methodology became more widely used by software companies, Atlassian expanded the Jira platform to offer services to different teams. Today, it provides several internal products, including:

- Jira Core
  This is the platform's basic project-management tool, designed for non-technical teams. Departments such as HR, marketing, finance, and operations use the Core tool for change requests, workflow approvals, and general task management.
- Jira Software
  This is the version designed for software development teams. Jira Software offers all of Core's features but also includes agile functionality. Software teams use this tool for bug tracking, managing basic software-development tasks, and product management.
  Note: Jira Software is also designed to support development teams that use Kanban, Scrum, and other popular agile frameworks.
- Jira Service Desk
  This is an add-on developed for IT teams. Call center managers, helpdesk agents, and other support professionals use Jira Service Desk for issue ticketing, incident management, and change management.

Advantages of JIRA

- JIRA is a bug tracking tool that allows software developers to plan, track and work faster.
- JIRA is the main source of information for future software releases. Developers can plan new features to be added and bugs to be fixed in the next release.
- Organize Documentation Tasks
- Track Documentation Progress
- Helps Meet Deadlines
- Provides Faster Feedback
- Integration Available with third-party software

Disadvantages of JIRA

- The tool is hard to set up and get used to
- It's complicated user interface can make managing tasks difficult
- No built-in timeline to track your project progress
- No collaboration features to communicate with your team
- It's mainly built for engineering and software development teams
- No idea management features to keep track of your ideas and plans
- The tool can be expensive
- It's known for being a slow tool with long query load times

JIRA Issue and Issue Types

A JIRA issue helps track bugs or underlying issues in a project. You can create issues after having imported a project. There are several useful features under issues like:

- Issue Types
- Screens
- Workflows
- Fields
- Attributes

JIRA Issue Types

Issue Types in JIRA displays every kind of item that can be created and tracked with the testing tool. The issues fall into categories like new features, sub tasks, bugs.

The issue type schemes available are|:

- Defaults Issue Type Scheme - where all newly created issues are automatically added.
- Agile Scrum Issue Type Scheme – for issues and projects dealing with Agile Scrum

How to Use

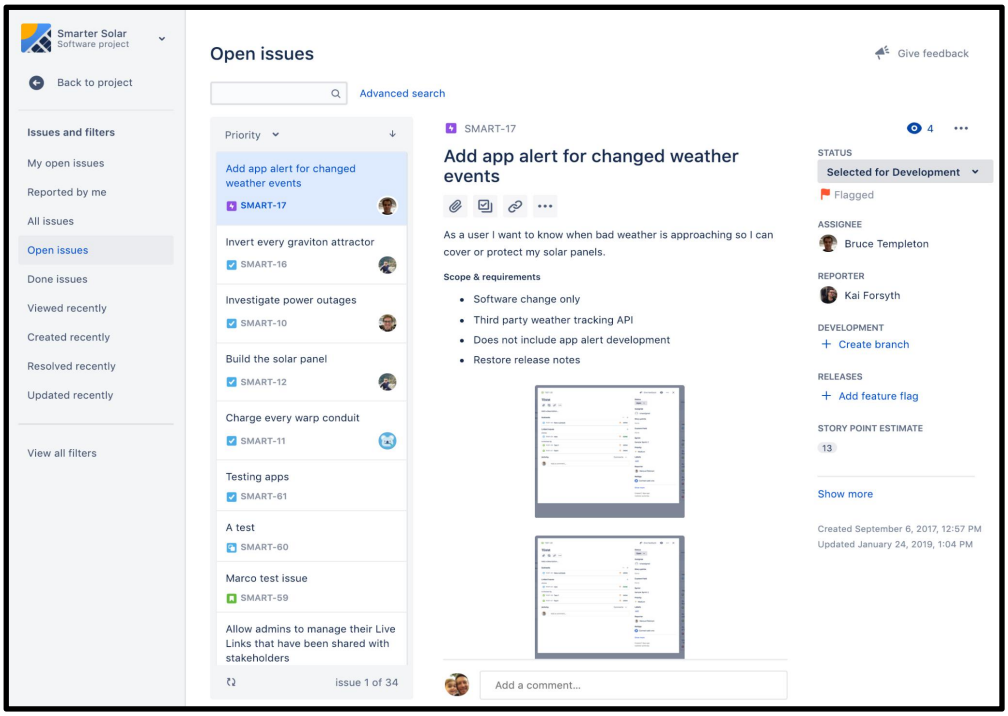
Jira workflow – a workflow maps the steps required in a task and defines your process. Suppose you have a business requirement, you'll first create the technical design and from there, create the test cases. Once test cases are created, coding is done, followed by testing.

To create a new workflow, go to *Settings* > *Issues* > *Workflows* >*Add Workflow*

Jira automation – the automation features of Jira enables users to automate their tasks and project updates so that they can speed up work, free up resources, which means there's less chance of mismanagement in the project lifecycle.

Jira automation can be used for tasks like:

- Automatically close parent task if sub task is completed
- Assign all tasks to particular team member
- Import customer issues from other JIRA apps
- Send regular task status updates to relevant personnel.



Conclusion:

We have successfully learned about:

- What Is Jira
- What is Jira used for
- What Types of Teams Use It Today
- Advantages of JIRA
- Disadvantages of JIRA
- JIRA Issue and Issue Types
- How to use Jira

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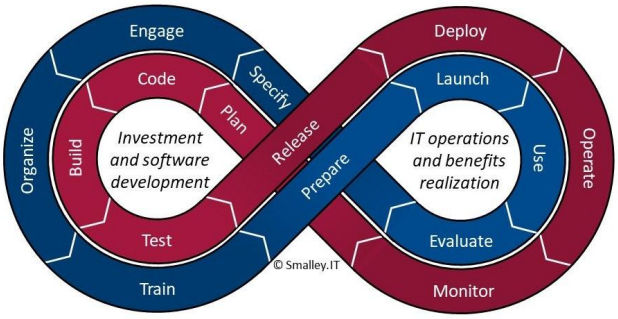
EXPERIMENT NO. 10

Roll no.: 571
Batch: T4

Aim: Docker

Theory:

Docker is a virtual machine, but unlike virtual machines that create a completely separate operating system. Docker allows the applications to use the Linux kernel of the same machine on which it is installed. By using this benefit, it can make the applications ready to ship to other machines running the same Linux OS with somewhat different configurations. So, why should you learn about Docker basics? Through Docker DevOps, developers can easily pack all parts of an application like libraries and other dependencies and ship it out as a single package. Package delivery of the application can keep the developer assured about the timely delivery of the application without being concerned about the type and configuration of the platform. In this way, application size gets reduced significantly, and at the time of shipping, application performance also gets improved. Another fantastic fact about Dockers is that it is an open-source tool. Anyone can use it to meet their needs even if they want any additional feature or in case they want to add a part that does not exist in the application. After learning Docker basics, you will have a clear idea about how to use Docker. The Docker design tool was designed for developers and system administrators, an essential part of DevOps. With Docker, developers can focus on application development rather than being worried about the platform where it will run. They can start all by themselves using ready-to-use Docker programs. These programs are part of the Docker tool. Docker minimizes the number of required systems and increases application deployment flexibility. Being lightweight and small, Docker requires lower overhead and has a small footprint.



To understand the Docker basics, you must also look at some of the benefits. Check them below.

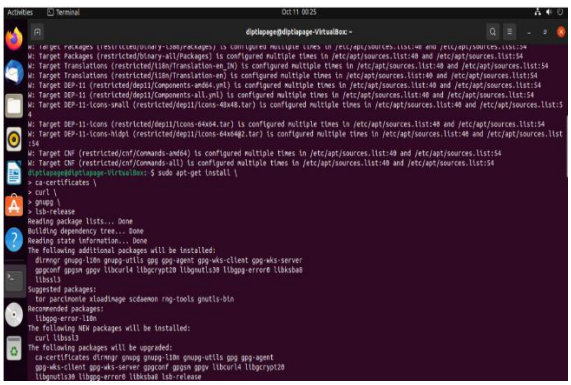
1) **Low System Requirements**
   Companies choose containers for deployment rather than virtual machines as they require complex and huge hardware. Containers use shared operating systems, which are much more efficient than virtual machines. They do not use the operating system as a whole and leave 99.9% of total space free that any other program or process can use. So, if you have a perfectly tuned container system, you can run more server instances on the same machine compared to the virtual machines.

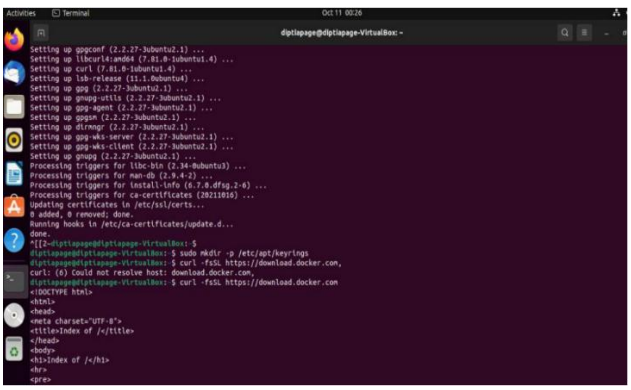
2) **Continuous Integration & Deployment**
   Another reason for using Docker containers is its continuous integration and deployment ability. This Docker Container tutorial will give you a fair idea of their functions. Through DevOps methodology and DevOps Lifecycle, developers can integrate their code with a shared repository and deploy it efficiently and quickly.
3) **Quick Application Portability**
   Containers give instant application portability. It means that developers can pack, ship, and run the application as a self-sufficient container. You run it virtually from anywhere. So it is pretty easy to use and makes the application deployment more efficient.
4) **Code Isolation**
   Even DevOps Engineer and developers can isolate their code into a single container through Docker if they feel so. Due to this, program modification or update becomes easier. With the help of Dockers, companies can easily break an extensive application into smaller ones to deploy it. Docker's containers are pretty easier to deploy on the cloud as well. Hence, they it can get easily incorporated into DevOps application. Also, you must be sure of the best DevOps implementation practices for assured outcomes.
5) **Local Development Environment**
   For CI/CD process, a local development environment can be set up through Docker. This environment is similar to the live server. Multiple development environments can get created with unique software, configuration, and operating systems from the same host. So, you can test an application for different servers. Also, anyone can work on the same project with various settings regardless of the local host environment.
6) **Increased Efficiency**
   An IT team with strong DevOps knowledge can deploy the software even 200 times faster than any lowperforming IT department and recover 24 times faster with a lower failure rate. So, businesses are using DevOps, and for that, they are using DevOps Docker to test the application in a safe and secure environment. So, this is just an excellent way to deliver some applications.

The following steps are of publishing images on Docker:

Step 1- Update Software Repositories

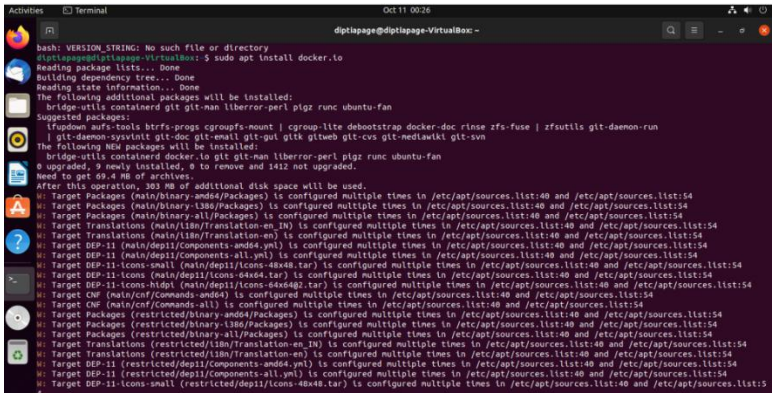
sudo apt-get update





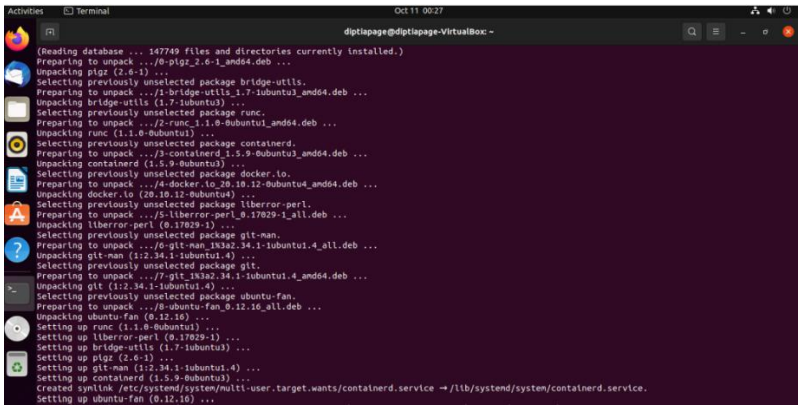
Step 2- Uninstall old versions of Docker. It is recommended to uninstall any old Docker software before proceeding.

```
sudo apt-get remove docker docker-engine docker.io
```



Step 3- Install Docker on Ubuntu. To install Docker on Ubuntu, in the terminal window enter the below command

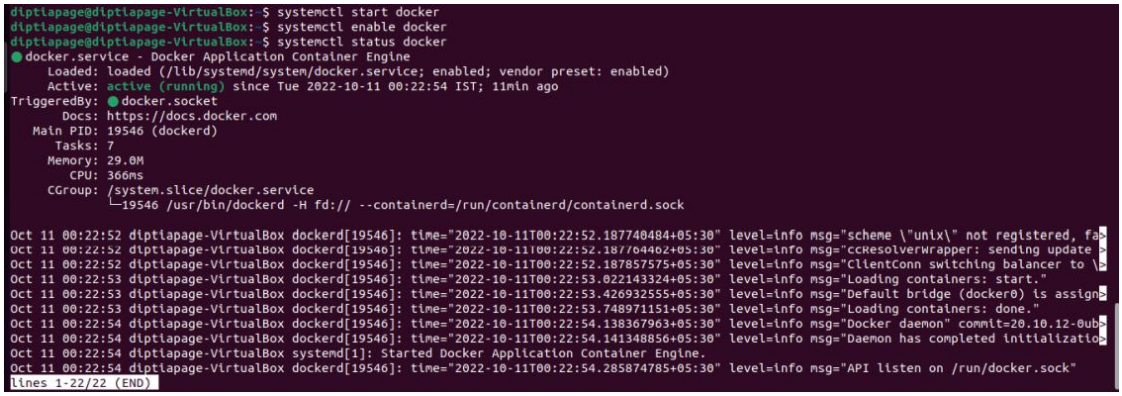
```
sudo apt install docker.io
```



Step 4- Start and Automate Docker

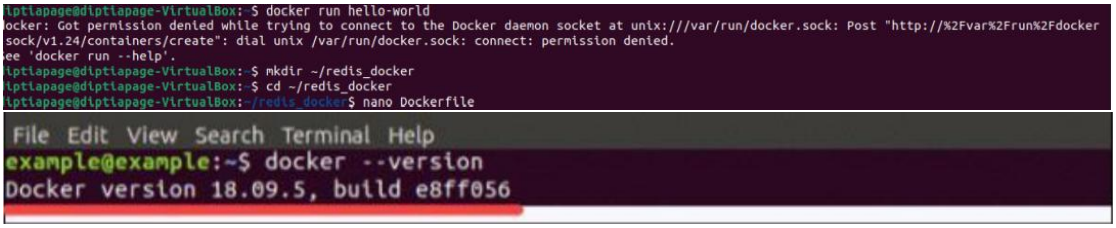
```
sudo systemctl start docker
```

```
sudo systemctl enable docker
```



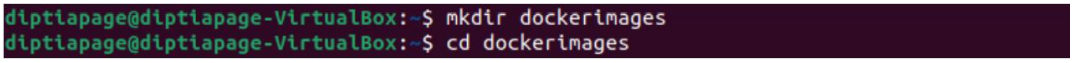
Step 5- Check Docker version

docker –version



Step 6- To create image in Docker first create a directory in which you can store images you build.

mkdir MyDockerImages



Step 7- Move into that directory and create a new empty file

cd MyDockerImages

touch Dockerfile

Step 8- Open the file with a text editor of your choice. using Nano:

nano Dockerfile

Step 9- Then add the following command which will generate as output save and exit the file.

Step 10- You can check the content of the file by using cat command.

cat Dockerfile

```
diptiapage@diptiapage-VirtualBox:~/redis_docker$ cat 8.3dockerfile
FROM ubuntu

MAINTAINER dipti

RUN apt-get update

CMD ["echo", "Hello World"]
diptiapage@diptiapage-VirtualBox:~/redis_docker$
```

Conclusion:

We have successfully learned about:

- What Is Docker
- What is Docker used for
- What Types of Teams use It today
- Advantages of Docker
- Disadvantages of Docker
- Docker issue and issue types
- How to use Docker