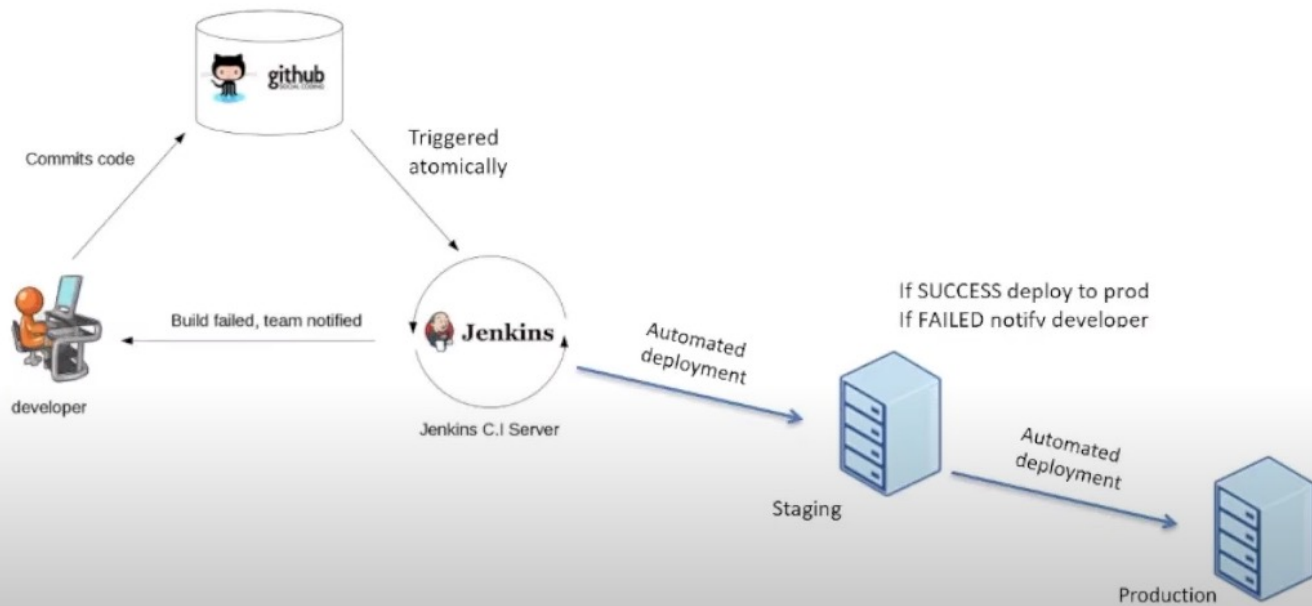


Week 7 : SOFTWARE DEVELOPMENT TOOLS AND ENVIRONMENTS

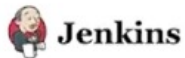


<https://www.youtube.com/watch?v=bY1tZ7Ehdqc>

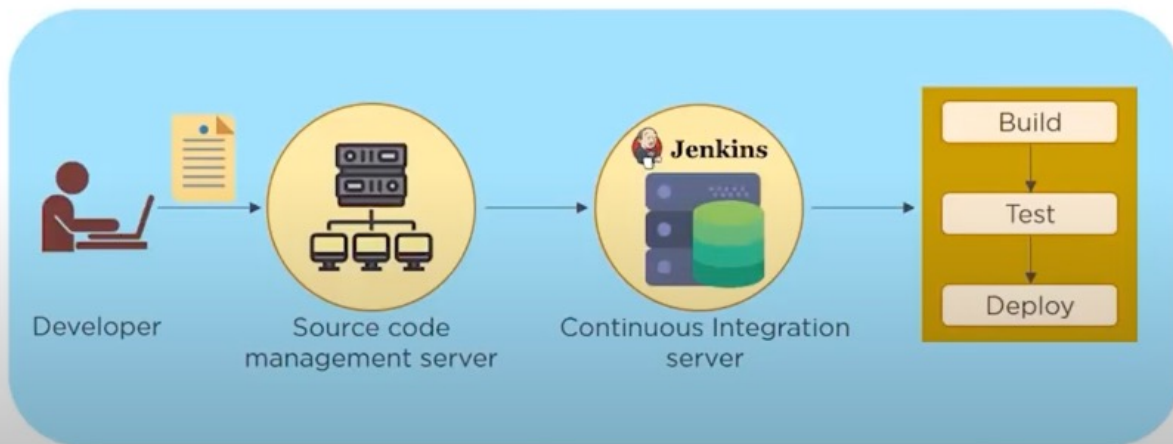
<https://www.youtube.com/watch?v=h9K1NnqwUvE>

<https://www.youtube.com/watch?v=Ozna0MS5D1E>

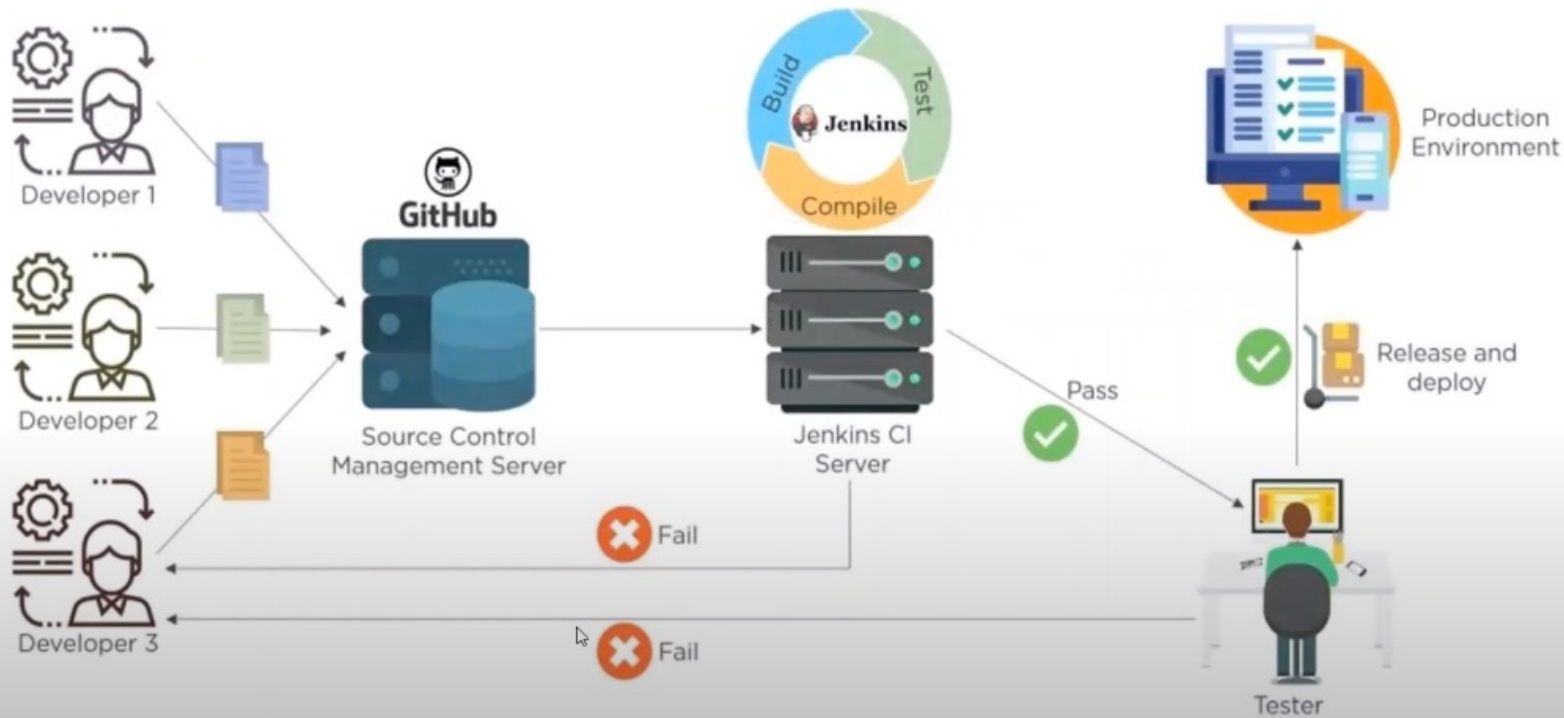
# What is Jenkins?



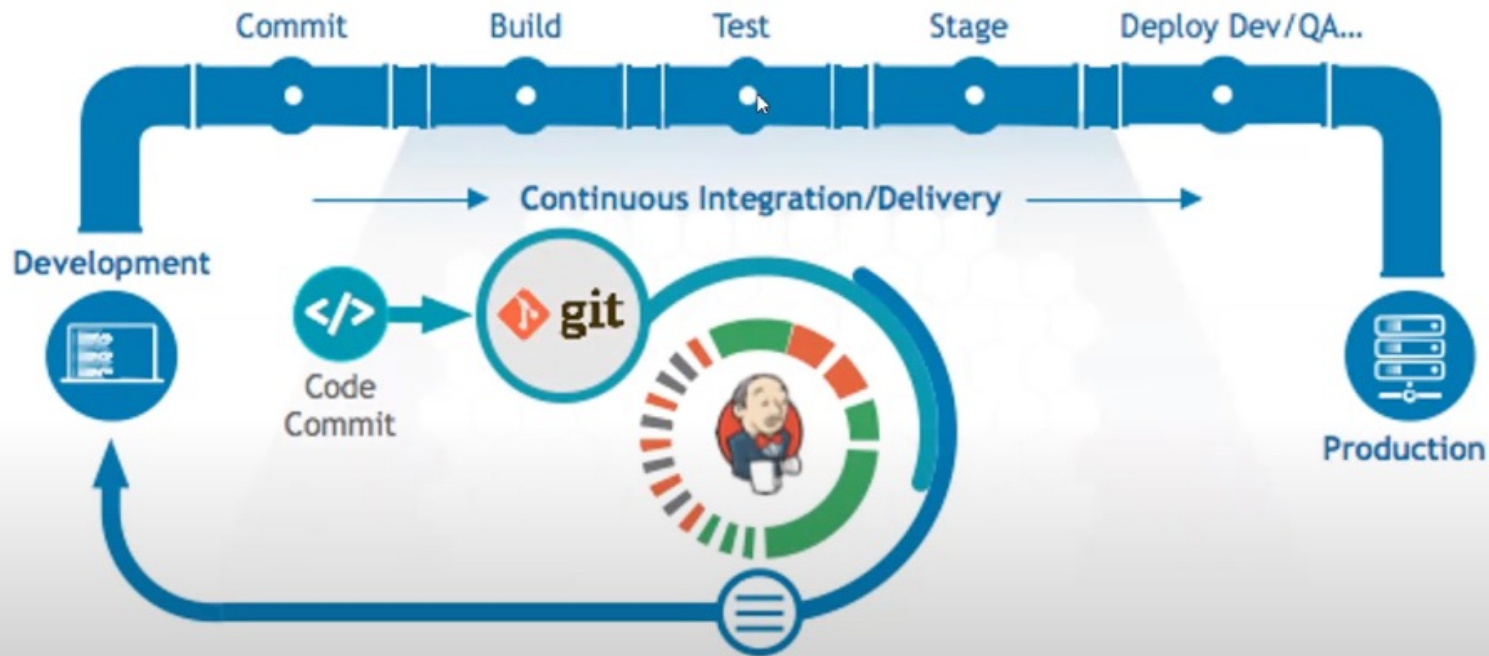
Jenkins is an open source Continuous Integration server written in Java that allows continuous development, test and deployment of codes



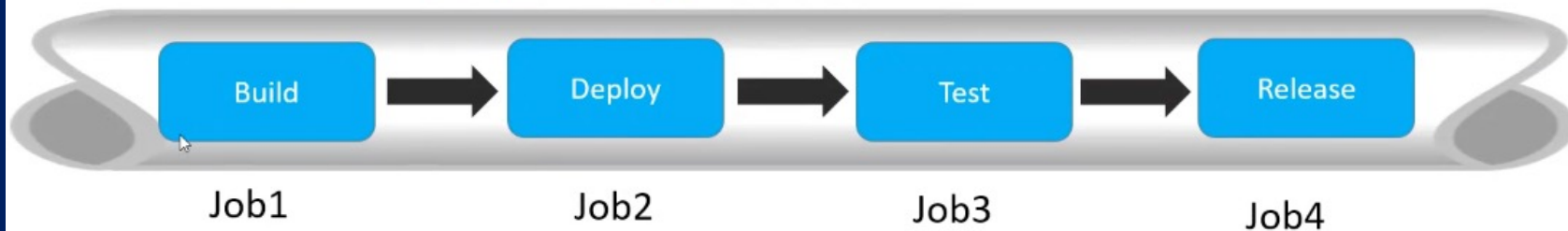
# CI & CD



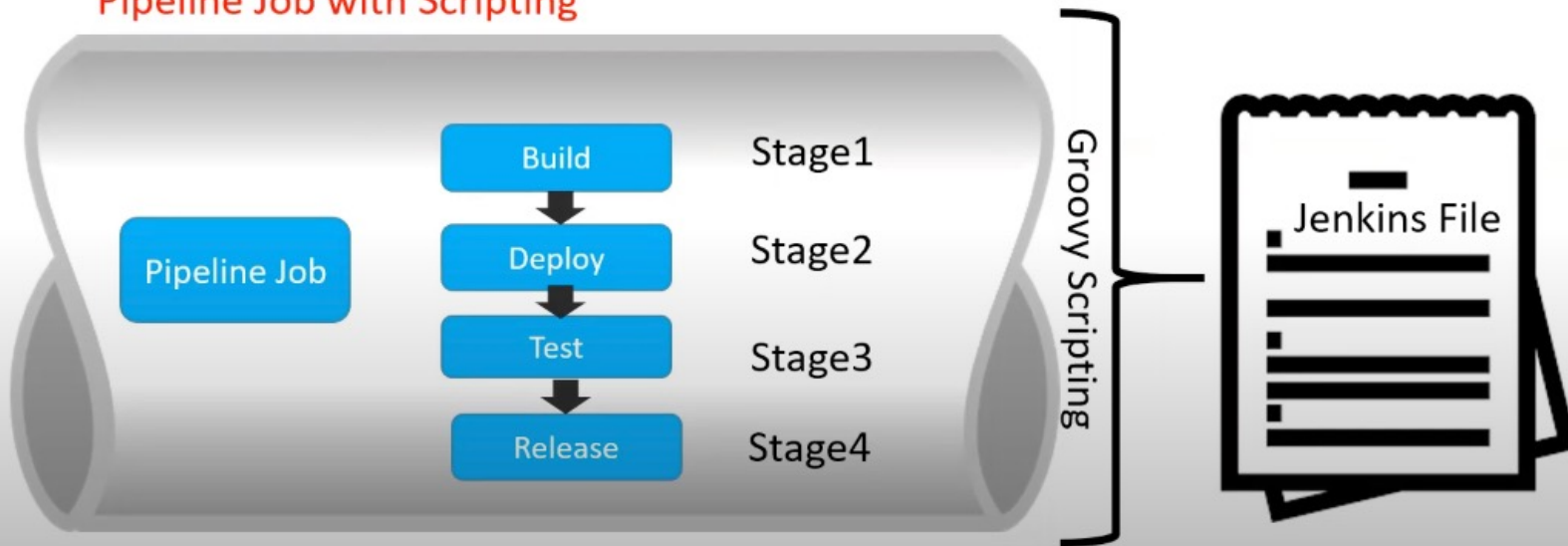
# Jenkins Pipeline



## Build And Delivery Pipeline Plugins

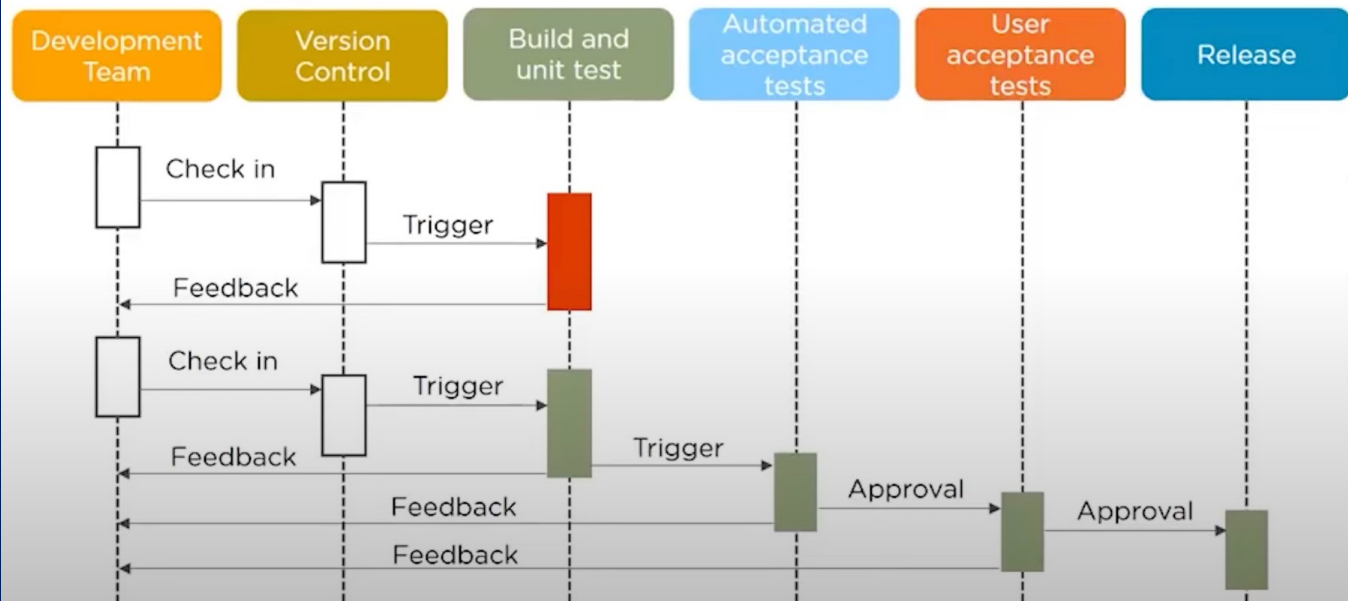


## Pipeline Job with Scripting



# What is Pipeline in Jenkins?

Pipeline is a suite of Jenkins features, installed as plugins, which enable implementing and integrating continuous delivery pipelines into Jenkins.



- Every check-in triggers pipeline execution
- Feedback is sent to the team in every step
- Minimize execution time

# Pipeline concepts

---

- **Pipeline**

- A Pipeline is a user-defined model of a CD pipeline. A Pipeline's code defines your entire build process, which typically includes stages for building an application, testing it and then delivering it.
- Also, *a **pipeline block is a key part of Declarative Pipeline syntax.***

- **Node**

- A node is a machine which is part of the Jenkins environment and is capable of executing a Pipeline.
- Also, *a **node block is a key part of Scripted Pipeline syntax.***

- **Stage**

- A stage block defines a conceptually distinct subset of tasks performed through the entire Pipeline (e.g. "Build", "Test" and "Deploy" stages), which is used by many plugins to visualize or present Jenkins Pipeline status/progress.

- **Step**

- A single task. Fundamentally, a step tells Jenkins what to do at a particular point in time (or "step" in the process). For example, to execute the shell command make use the sh step: sh 'make'. When a plugin extends the Pipeline DSL, that typically means the plugin has implemented a new step.



# Scripted Pipeline

## Jenkinsfile (Scripted Pipeline)

```
node { ❶
    stage('Build') { ❷
        // ❸
    }
    stage('Test') { ❹
        // ❺
    }
    stage('Deploy') { ❻
        // ❼
    }
}
```

- ❶ Execute this Pipeline or any of its stages, on any available agent.
- ❷ Defines the "Build" stage. `stage` blocks are optional in Scripted Pipeline syntax. However, implementing `stage` blocks in a Scripted Pipeline provides clearer visualization of each stage's subset of tasks/steps in the Jenkins UI.
- ❸ Perform some steps related to the "Build" stage.
- ❹ Defines the "Test" stage.
- ❺ Perform some steps related to the "Test" stage.
- ❻ Defines the "Deploy" stage.
- ❼ Perform some steps related to the "Deploy" stage.

# Jenkins Installation on Ubuntu

---

## Installation Steps

1. **Update System Packages** Update the list of available packages and their versions.

```
sudo apt-get update
```



2. **Installation of Java**

```
sudo apt update
sudo apt install fontconfig openjdk-17-jre
java -version
openjdk version "17.0.8" 2023-07-18
OpenJDK Runtime Environment (build 17.0.8+7-Debian-1deb12u1)
OpenJDK 64-Bit Server VM (build 17.0.8+7-Debian-1deb12u1, mixed mode, sharing)
```



3. **Long Term Support release**

```
curl -fsSL https://pkg.jenkins.io/debian-stable/jenkins.io-2023.key | sudo tee \
  /usr/share/keyrings/jenkins-keyring.asc > /dev/null
echo deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc] \
  https://pkg.jenkins.io/debian-stable binary/ | sudo tee \
  /etc/apt/sources.list.d/jenkins.list > /dev/null
sudo apt-get update
sudo apt-get install jenkins
```



4. **Start Jenkins**

```
sudo systemctl enable jenkins
```



```
sudo systemctl start jenkins
```




```
sudo systemctl status jenkins
```



# Jenkins Plugin

---

 **Jenkins**

Search (⌘+K) ? ? 1 ? ? ?

Dashboard >

+ New Item

👤 People

📅 Build History

⚙️ Manage Jenkins

📌 My Views

Build Queue

No builds in the queue.

Build Executor Status

1 Idle

2 Idle

📌 Add description

## Welcome to Jenkins!

This page is where your Jenkins jobs will be displayed. To get started, you can set up distributed builds or start building a software project.

### Start building your software project

Create a job

### Set up a distributed build

Set up an agent

Configure a cloud

Learn more about distributed builds

+ New Item

👤 People

📅 Build History

⚙️ Manage Jenkins

📌 My Views

Build Queue

No builds in the queue.

Build Executor Status

1 Idle

2 Idle

## Manage Jenkins

Search settings /

Building on the built-in node can be a security issue. You should set up distributed builds. See [the documentation](#).

Set up agentSet up cloudDismiss

### System Configuration

⚙️ System

Configure global settings and paths.

⚙️ Plugins

Add, remove, disable or enable plugins that can extend the functionality of Jenkins.

☁️ Clouds

Add, remove, and configure cloud instances to provision agents on-demand.

🔧 Tools

Configure tools, their locations and automatic installers.

💻 Nodes

Add, remove, control and monitor the various nodes that Jenkins runs jobs on.

### Security

🔒 Security

Secure Jenkins; define who is allowed to access/use the system.

🔑 Credential Providers

Configure the credential providers and types

🔑 Credentials

Configure credentials

👤 Users

Create/delete/modify users that can log in to this Jenkins.


### Status Information

📊 System Information

Displays various environmental information to assist trouble-shooting.

📄 System Log

System log captures output from java.util.logging output related to Jenkins.

 **Jenkins**

Search (⌘+K) ?

Dashboard > Manage Jenkins > Plugins

## Plugins

ssh

Install

Updates

Available plugins

Installed plugins

Advanced settings

Download progress

Install	Name ↓	Released
<input checked="" type="checkbox"/>	<b>SSH</b> 2.6.1 <a href="#">Build Wrappers</a> This plugin executes shell commands remotely using SSH protocol. <div>Warning: This plugin version may not be safe to use. Please review the following security notices:<ul style="list-style-type: none"><li><a href="#">CSRF vulnerability and missing permission checks allow capturing credentials</a></li><li><a href="#">Missing permission check allows enumerating credentials IDs</a></li></ul></div>	5 yr 8 mo ago
<input type="checkbox"/>	<b>JSch dependency</b> 0.2.8-65.v052c39de79b_2 <a href="#">Library plugins (for use by other plugins)</a> <a href="#">Miscellaneous</a> Jenkins plugin that brings the JSch library as a plugin dependency, and provides an SSHAuthenticatorFactory for using JSch with the ssh-credentials plugin.	8 mo 3 days ago
<input type="checkbox"/>	<b>SSH server</b> 3.312.v1c601b_c83b_0e Adds SSH server functionality to Jenkins, exposing CLI commands through it.	5 mo 2 days ago

Dashboard > Manage Jenkins > Plugins

## Plugins

ssh agen

Install

Updates

Available plugins

Installed plugins

Advanced settings

Download progress

Install	Name ↓	Released
<input checked="" type="checkbox"/>	<b>SSH Agent</b> 346.vda_a_c4f2c8e50 This plugin allows you to provide SSH credentials to builds via a ssh-agent in Jenkins.	2 mo 2 days ago

# Jenkins Add SSH-Credentials

---



## Compute Engine

Virtual machines



VM instances



Instance templates



Sole-tenant nodes



Machine images



TPUs



Committed use discounts



Reservations



Migrate to Virtual Machin...

Storage



Disks

## VM instances



CREATE INSTANCE



IMPORT VM



REFRESH

INSTANCES

OBSERVABILITY

INSTANCE SCHEDULES

## VM instances

Filter Enter property name or value

<input type="checkbox"/>	Status	Name ↑	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>	✓	<a href="#">jenkins</a>	asia-southeast1-a			10.148.0.15 ( <a href="#">nic0</a> )	34.126.119.107 ( <a href="#">nic0</a> )	SSH ▾ ⋮
<input type="checkbox"/>	✓	<a href="#">prod-instance</a>	asia-southeast1-b			10.148.0.16 ( <a href="#">nic0</a> )	34.143.151.212 ( <a href="#">nic0</a> )	SSH ▾ ⋮

## Related actions



**Explore Backup and DR** NEW  
Back up your VMs and set up disaster recovery



**View billing report**  
View and manage your Compute Engine billing

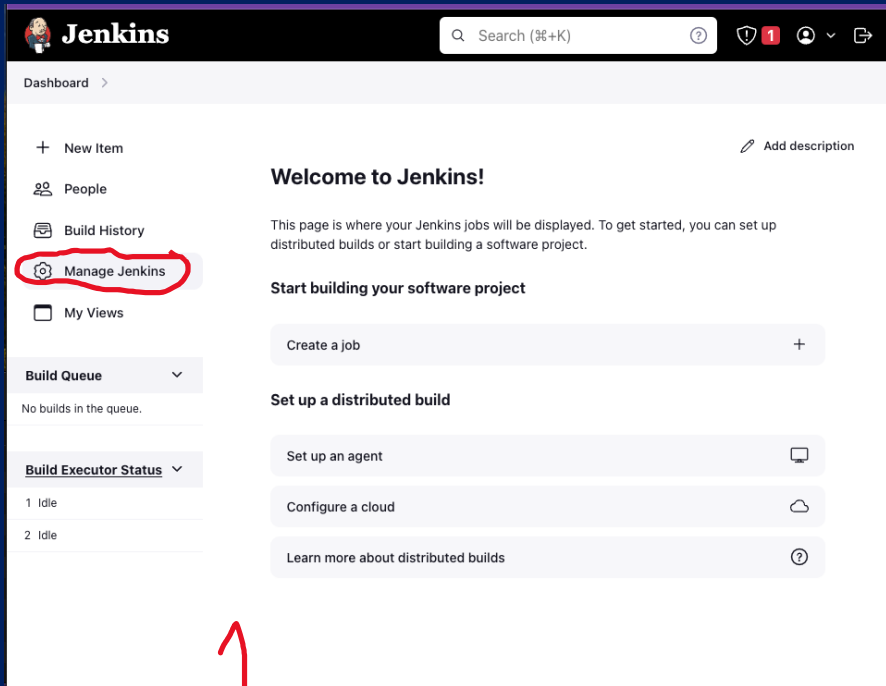


**Monitor VMs**  
View outlier VMs across metrics like CPU and network



**Explore VM logs**  
View, search, analyze, and download VM instance logs





The screenshot shows the Jenkins dashboard. At the top is a black header with the Jenkins logo, a search bar, and several icons. Below the header is a light purple sidebar with a 'Dashboard' link and a list of items: 'New Item', 'People', 'Build History', 'Manage Jenkins' (circled in red), and 'My Views'. The main content area has a 'Welcome to Jenkins!' message and a 'Start building your software project' section with a 'Create a job' button. Below that is a 'Set up a distributed build' section with three options: 'Set up an agent', 'Configure a cloud', and 'Learn more about distributed builds'. A red arrow points to the 'Manage Jenkins' link in the sidebar.

Jenkins

Search (%+K)

Dashboard >

+ New Item

People

Build History

**Manage Jenkins**

My Views

Build Queue

No builds in the queue.

Build Executor Status

1 Idle

2 Idle

Welcome to Jenkins!

This page is where your Jenkins jobs will be displayed. To get started, you can set up distributed builds or start building a software project.

Start building your software project

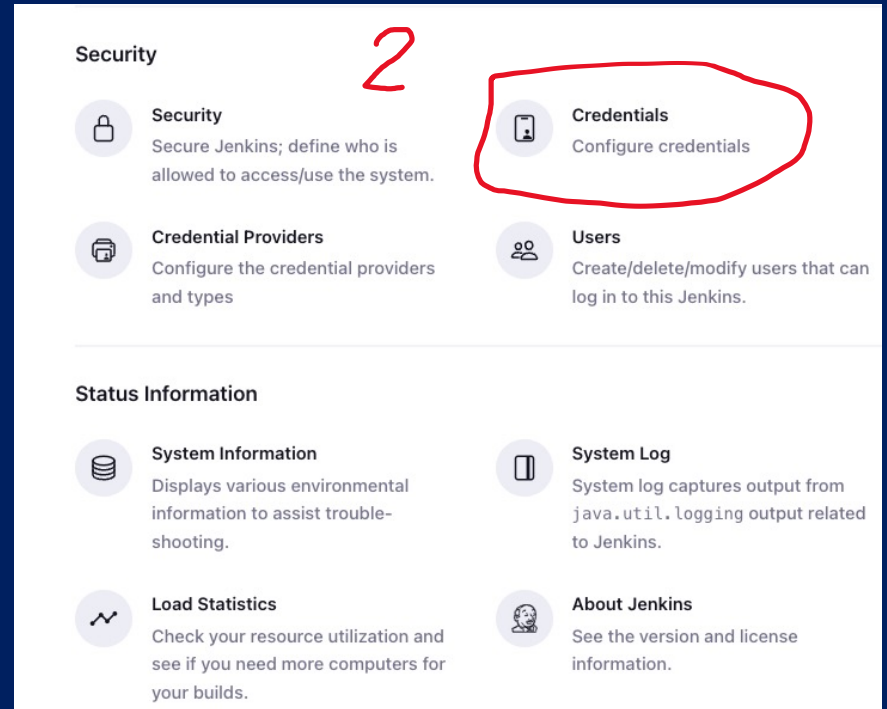
Create a job

Set up a distributed build

Set up an agent

Configure a cloud

Learn more about distributed builds



The screenshot shows the 'Security' and 'Status Information' sections of the Jenkins configuration page. The 'Security' section is highlighted with a red circle and a red number '2'. It contains three items: 'Security' (Secure Jenkins; define who is allowed to access/use the system.), 'Credential Providers' (Configure the credential providers and types), and 'Users' (Create/delete/modify users that can log in to this Jenkins.). The 'Status Information' section contains four items: 'System Information' (Displays various environmental information to assist trouble-shooting.), 'System Log' (System log captures output from java.util.logging output related to Jenkins.), 'Load Statistics' (Check your resource utilization and see if you need more computers for your builds.), and 'About Jenkins' (See the version and license information.).

Security

**Security**  
Secure Jenkins; define who is allowed to access/use the system.

**Credential Providers**  
Configure the credential providers and types

**Users**  
Create/delete/modify users that can log in to this Jenkins.


Status Information

**System Information**  
Displays various environmental information to assist trouble-shooting.

**System Log**  
System log captures output from java.util.logging output related to Jenkins.

**Load Statistics**  
Check your resource utilization and see if you need more computers for your builds.

**About Jenkins**  
See the version and license information.

 **Jenkins**


Search (⌘+K) ?

Dashboard > Manage Jenkins > Credentials

### Credentials


T	P	Store ↓	Domain	ID	Name
---	---	---------	--------	----	------

### Stores scoped to Jenkins

P	Store ↓	Domains
	System	(global)

Icon: S M L

3

 **Jenkins**

Search (⌘+K) ?

Dashboard > Manage Jenkins > Credentials > System > Global credentials (unrestricted)

### Global credentials (unrestricted)


+ Add Credentials

Credentials that should be available irrespective of domain specification to requirements matching.



ID	Name	Kind	Description
This credential domain is empty. How about <a href="#">adding some credentials</a> ?			

Icon: S M L

4

 Jenkins

Search (#+K)

 1  Tuci! ysuwan

Dashboard > Manage Jenkins > Credentials > System > Global credentials (unrestricted) >

## New credentials

Kind

SSH Username with private key

Scope ?

Global (Jenkins, nodes, items, all child items, etc)

ID ?

ssh-prod\_instance

Description ?

Username

☒ Treat username as secret ?

Private Key

☒ Enter directly

Key


Enter New Secret Below

-----BEGIN OPENSSH PRIVATE KEY-----  
-----END OPENSSH PRIVATE KEY-----



Passphrase

Create

5

 Jenkins

Search (#+K)



 1  Tuchsana Ploysuwan > log

Dashboard > Manage Jenkins > Credentials > System > Global credentials (unrestricted) >

## Global credentials (unrestricted)

+ Add Credentials

Credentials that should be available irrespective of domain specification to requirements matching.

ID	Name	Kind	Description
 ssh-prod_instance	ssh-prod_instance	SSH Username with private key	

Icon: S M L

6

# Jenkins SSH-Agent

---

Compute Engine

Virtual machines

VM instances

Instance templates

Sole-tenant nodes

Machine images

TPUs

Committed use discounts

Reservations

Migrate to Virtual Machin...

Storage

Disks

VM instances

CREATE INSTANCE

IMPORT VM

REFRESH

INSTANCES

OBSERVABILITY

INSTANCE SCHEDULES

VM instances

Filter

Enter property name or value

<input type="checkbox"/>	Status	Name ↑	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>	✓	jenkins	asia-southeast1-a			10.148.0.15 (nic0)	34.126.119.107 (nic0)	SSH ⌵ ⋮
<input type="checkbox"/>	✓	prod-instance	asia-southeast1-b			10.148.0.16 (nic0)	34.143.151.212 (nic0)	SSH ⌵ ⋮

Related actions

Explore Backup and DR

Back up your VMs and set up disaster recovery

View billing report

View and manage your Compute Engine billing

Monitor VMs

View outlier VMs across metrics like CPU and network

Explore VM logs

View, search, analyze, and download VM instance logs

```

Welcome to Ubuntu 23.04 (GNU/Linux 6.2.0-1020-gcp x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Wed Jan  3 04:48:09 UTC 2024

System load:  0.0               Processes:           99
Usage of /:   21.1% of 9.52GB   Users logged in:    0
Memory usage: 5%               IPv4 address for ens4: 10.148.0.16
Swap usage:   0%

0 updates can be applied immediately.

The list of available updates is more than a week old.
To check for new updates run: sudo apt update


The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

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

tuchsanai@prod-instance:~$ mkdir jenkins
tuchsanai@prod-instance:~$ cd jenkins/
tuchsanai@prod-instance:~/jenkins$ pwd
/home/tuchsanai/jenkins
tuchsanai@prod-instance:~/jenkins$

```

1. Create Prod-instance with ssh
2. Create workingd Directory name jenkins in prod-instance  
/home/tuchsanai/jenkins

 **Jenkins**

Search (⌘+K)

Dashboard > Manage Jenkins

+ New Item

People

Build History

Manage Jenkins

My Views

Build Queue

Build Executor Status

1 Idle


2 Idle


## Manage Jenkins


Search settings


Warnings have been published for the following currently installed components:  
[SSH plugin 2.6.1: CSRF vulnerability and missing permission checks allow capturing credentials](#) (no fix available)  
[Missing permission check allows enumerating credentials IDs](#) (no fix available)  
No fixes for these issues are available. It is recommended that you review the security advisory and apply mitigations if possible, or uninstall this plugin.  
[Go to plugin manager](#) [Configure which of these warnings are shown](#)


### System Configuration

**System**  
Configure global settings and paths.

**Tools**  
Configure tools, their locations and automatic installers.

**Nodes**  
Add, remove, control and monitor the various nodes that Jenkins runs jobs on.

**Clouds**  
Add, remove, and configure cloud instances to provision agents on-demand.

 **Jenkins**

Search (⌘+K)

Dashboard > Manage Jenkins > Nodes

Nodes

Clouds

Build Queue

Build Executor Status



No builds in the queue.

1 Idle

2 Idle

## Nodes

[+ New Node](#) Node Monitoring

S	Name ↓	Architecture	Clock Difference	Free Disk Space	Free Swap Space	Free Temp Space
	Built-In Node	Linux (amd64)	In sync	5.65 GB	 0 B	5.65 GB
Data obtained		11 sec	11 sec	11 sec	11 sec	11 sec

Name ?

Prod\_gcp\_vm

Description ?

Number of executors ?

2

Remote root directory ?

/home/fuchsana/jenkins

Labels ?

vm\_prod

Usage ?

Use this node as much as possible

Launch method ?

Launch agents via SSH

Host ?

34.143.151.212

Credentials ?

ssh-prod\_instance

+ Add +

Host Key Verification Strategy ?

Known hosts file Verification Strategy

Advanced

Availability ?

Keep this agent online as much as possible

Node Properties

☐ Disable deferred wipeout on this node ?

☐ Environment variables

☐ Tool Locations

Save

[illegible]







# How to Change Port for Jenkins?

---



<http://localhost:8080>



<http://localhost:5000>

**HTTP Port (default: 8080)** – This is the main port used by Jenkins to serve web pages on your machine. By default, this port is set to 8080 but can be changed based on your requirements.

If Jenkins fails to start because a port is in use, run systemctl edit jenkins and add the following:

#### 1. Override the Jenkins Service Configuration

```
sudo systemctl edit jenkins
```



#### 2. Add or Modify the ExecStart Command

```
[Service]  
Environment="JENKINS_PORT=5000"
```



#### 3. Reload the Systemd Daemon

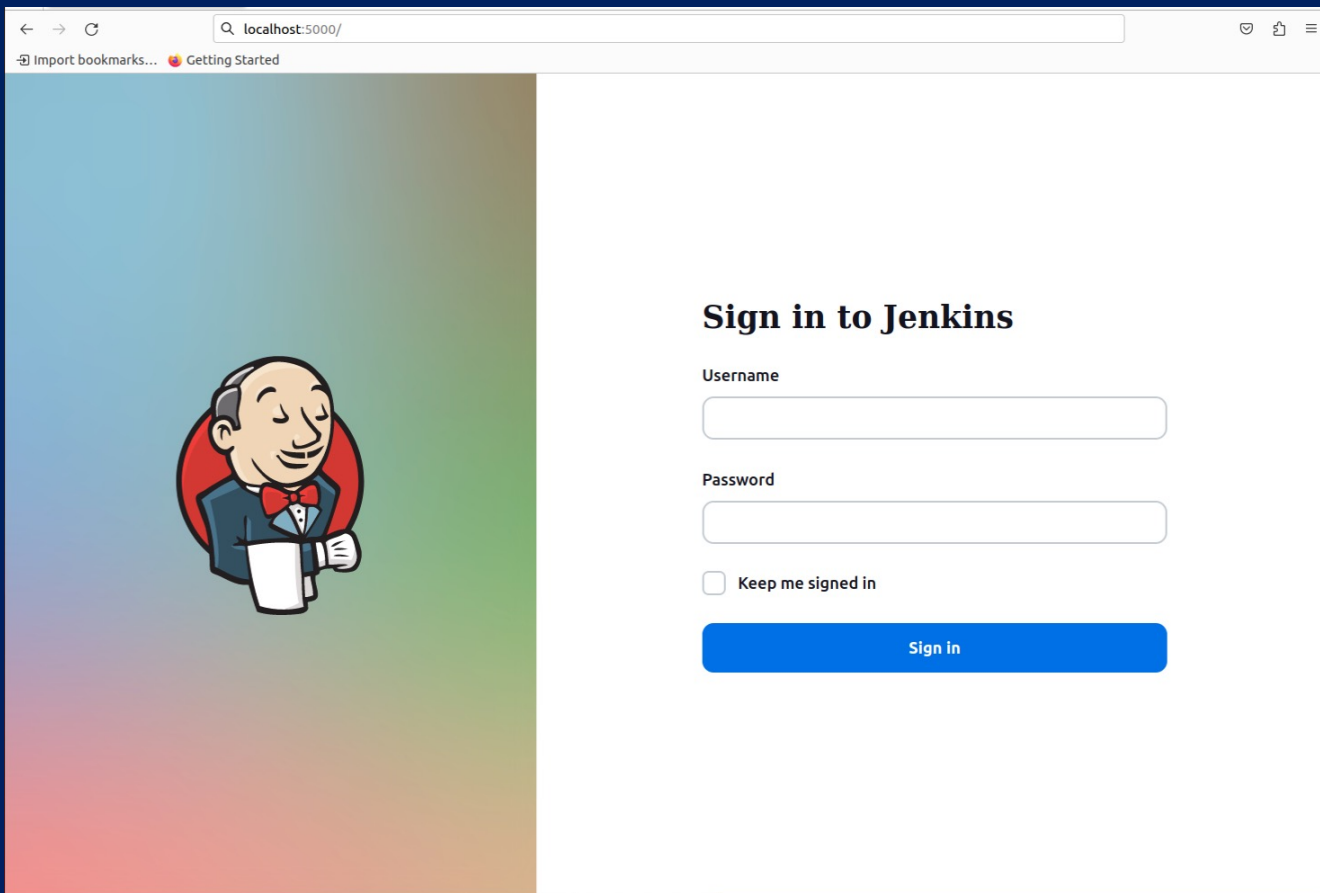
```
systemctl daemon-reload
```



#### 4. Restart the Jenkins service to apply the changes

```
sudo service jenkins restart
```

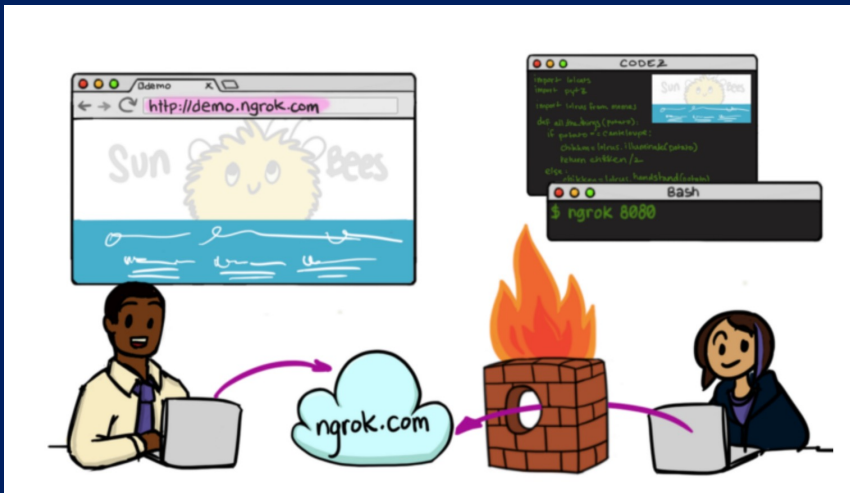




# How to forward my local port to public using ngrok

---

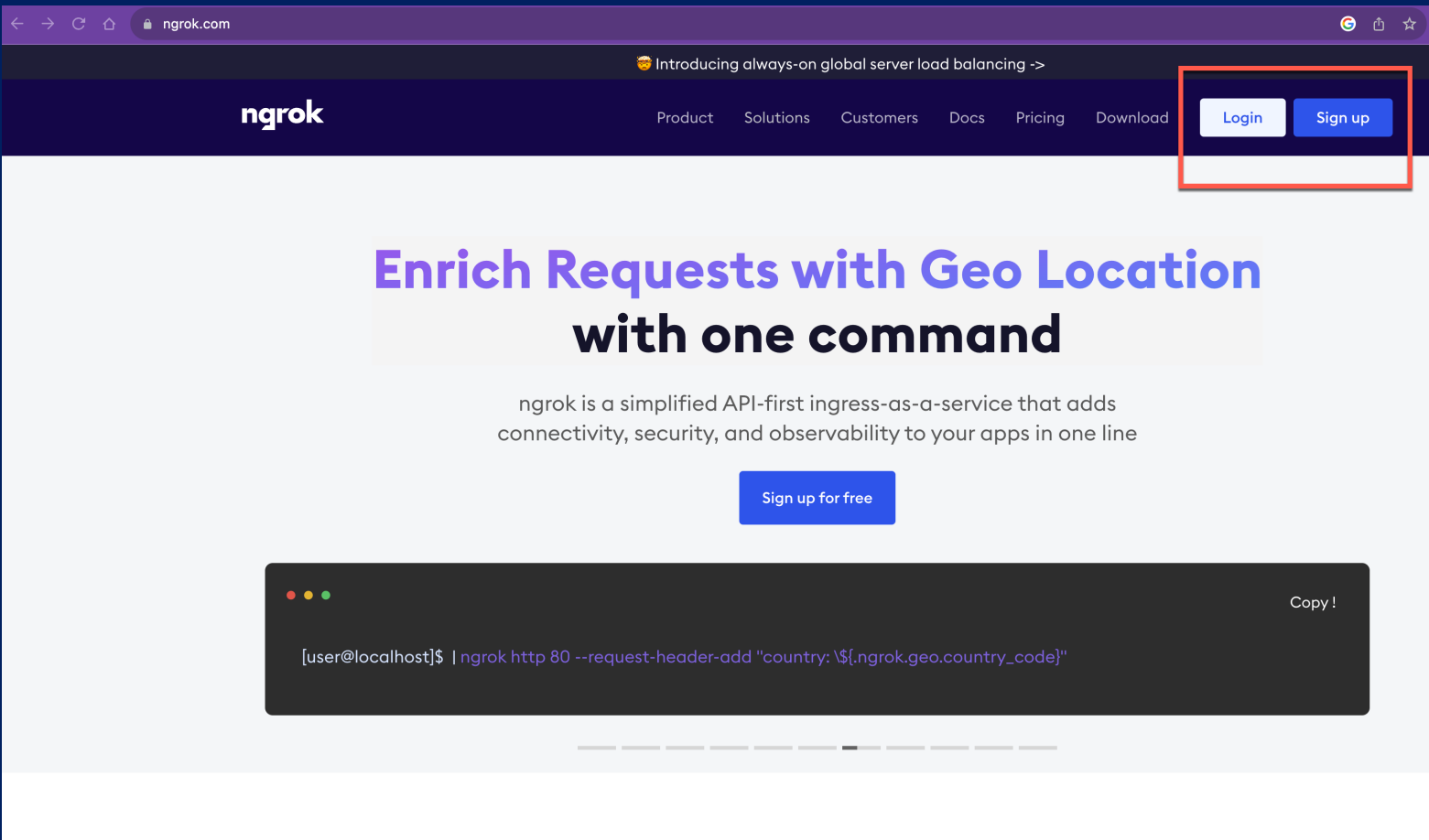
# What is ngrok?



ngrok exposes local servers behind NATs and firewalls to the public internet over secure tunnels.

## Advantages

- Demoing web sites without deploying
- Building webhook consumers on your dev machine
- Testing mobile apps connected to your locally running backend
- Stable addresses for your connected devices that are deployed in the field
- Running personal cloud services from your home





- 🔔 Getting Started ^
- 🔧 Setup & Installation
- 🔑 Your Authtoken**
- 🌐 Cloud Edge v
- 🔄 Tunnels v
- ⚡ Events
- 🔗 API
- 🛡 Security v
- 👤 Users v
- 💰 Billing
- ⚙ Settings v

# Your Authtoken

This is your personal Authtoken. Use this to authenticate the ngrok agent that you downloaded.

To setup ngrok on Ubuntu 22.04, there are two primary methods you can follow. [↗](#)

### 1. Create an Ngrok Account:

- If you don't have an ngrok account, create one on the [official ngrok website](#).

### 2. Download ngrok:

- You can download ngrok directly from the Setup & Installation page on the ngrok dashboard or use the following command in the terminal to download the binary file:

```
wget https://bin.equinox.io/c/bNyj1mQVY4c/ngrok-v3-stable-linux-amd64.tgz
```



### 3. Decompress & Install Ngrok Tunnel:

- Extract the downloaded file with the following command:

```
tar zxvf ngrok-v3-stable-linux-amd64.tgz
```



### 4. Connect Ubuntu to the ngrok account:

- Run the following command to add the auth token to the default Ngrok.yml configuration file (replace the token with your own):

```
./ngrok config add-authtoken <YourAuthToken>
```



### 5. Usage:

- To create a tunnel to your local server or port forwarding using ngrok, use the following command (replace `8080` with your desired port):

```
./ngrok http 8080
```



- This will provide you with a URL accessible on any device having internet connectivity. The URL of your local Web Interface will be like "<http://127.0.0.1:8080>," and the URL provided by ngrok to access this web server worldwide will be something like "<https://in.ngrok.io>" .

ngrok

Introducing Always-On Global Server Load Balancer: <https://ngrok.com/r/gslb>

Session Status

online

Account [1234567890@gmail.com](mailto:1234567890@gmail.com) (Plan: Free)

Version

3.3.5

Region

Asia Pacific (ap)

Latency

39ms

Web Interface

<http://127.0.0.1:4040>

Forwarding

<https://8bc7-171-96-174-205.ngrok-free.app> -> <http://localhost:8080>

Connections

tll	opn	rt1	rt5	p50	p90
2	0	0.01	0.00	30.64	30.92

HTTP Requests

-----

GET /static/e6b141b3/favicon.ico	200 OK
GET /login	200 OK
GET /static/e6b141b3/images/svg/logo.svg	200 OK
GET /static/e6b141b3/jsbundles/simple-page.css	200 OK
GET /	403 Forbidden

← → ↻ 🏠 8bc7-171-96-174-205.ngrok-free.app/login?from=%2F



## Sign in to Jenkins

Username

Password

☐ Keep me signed in

Sign in