

# CHANDAN MUKHERJEE

MTech (IT), BE (Computer Science), Diploma (Electrical)

AWS Certified Cloud Solution Architect Associate

AWS Certified Cloud Practitioner

Microsoft Certified Azure Fundamentals

SCJP (Java), Oracle (SQL) GLOBAL CERTIFIED

Microsoft Certified Innovative Educator

IBM Certification on Cloud, Docker, Kubernetes, Serverless, Python

# GIT – GITHUB

# GIT

Git is a free and open source distributed **Version Control System (VCS)** designed to handle everything from small to very large projects with speed and efficiency.

Git is a DevOps tool used for source code management

git-scm.com

The screenshot shows the official Git website at <https://git-scm.com/>. The header features the Git logo and the tagline "distributed even if your workflow isn't". A search bar is present. Below the header, there's a brief introduction: "Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency." Another section highlights its speed: "Git is lightning fast and has a huge ecosystem of GUIs, hosting services, and command-line tools." To the right, there's a diagram illustrating a distributed repository network with multiple nodes connected by lines. The footer contains links for "About", "Tools", "Install", "Learn", "Reference", and "Community", along with download links for Windows and GitHub.

git --distributed-even-if-your-workflow-isn't

Type / to search entire site...

Git is a **free and open source** distributed version control system designed to handle everything from small to very large projects with speed and efficiency.

Git is **lightning fast** and has a huge ecosystem of **GUIs**, **hosting services**, and **command-line tools**.

**About**  
Git's performance and ecosystem

**Tools**  
Command line tools, GUIs, and hosting services

**Install**  
Binary releases for all major platforms.

**Learn**  
Pro Git book, videos, tutorials, and cheat sheet

**Reference**  
Git's reference documentation

**Community**  
Get involved! Bug reporting, mailing list, chat, development and more.

Latest source release  
**2.52.0**  
[Release Notes \(2025-11-17\)](#)

[Install for Windows](#)

[GitHub Repository](#)

<https://git-scm.com/>

Git runs on your **computer** and works even without the internet.

# Version Control

## What is Version Control?

As a process, version control refers to tracking and managing changes to digital assets over time.

## Version Control System (VCS)?

A **Version Control System (VCS)**, also known as **Source Code Management (SCM)** or **Revision Control System(RCM)**, is a software tool that helps manage changes to source code over time.

It provides a systematic way to track, organize, and coordinate changes made by multiple contributors to a codebase.

The primary goals of a VCS are to facilitate collaboration, enable versioning, and ensure the integrity and traceability of software development projects.

VCS is essential for any project that involves collaboration or multiple versions of files.

It's widely used in software development, writing, design, and many other fields.

### Without Git vs With Git

#### Without Git

Manual backups

Risky changes

Hard to collaborate

#### With Git

Automatic version history

Safe experimentation

Built for teamwork

# Document Version Control



project - v1.docx

project - v2.docx

project - v3.docx

project - v3\_23.12.23.docx

project - v3\_24.12.23.docx

project - v3\_27.12.23 -Review1.docx

project - v3\_27.12.23 -Review2.docx

project - v3\_27.12.23 -Review3.docx

project - v3\_27.12.23 -ReviewFinal.docx

project - v3\_27.12.23 -ReviewFinal2.docx

project - v3\_27.12.23 -ReviewFinal3.docx

## Types of VCS

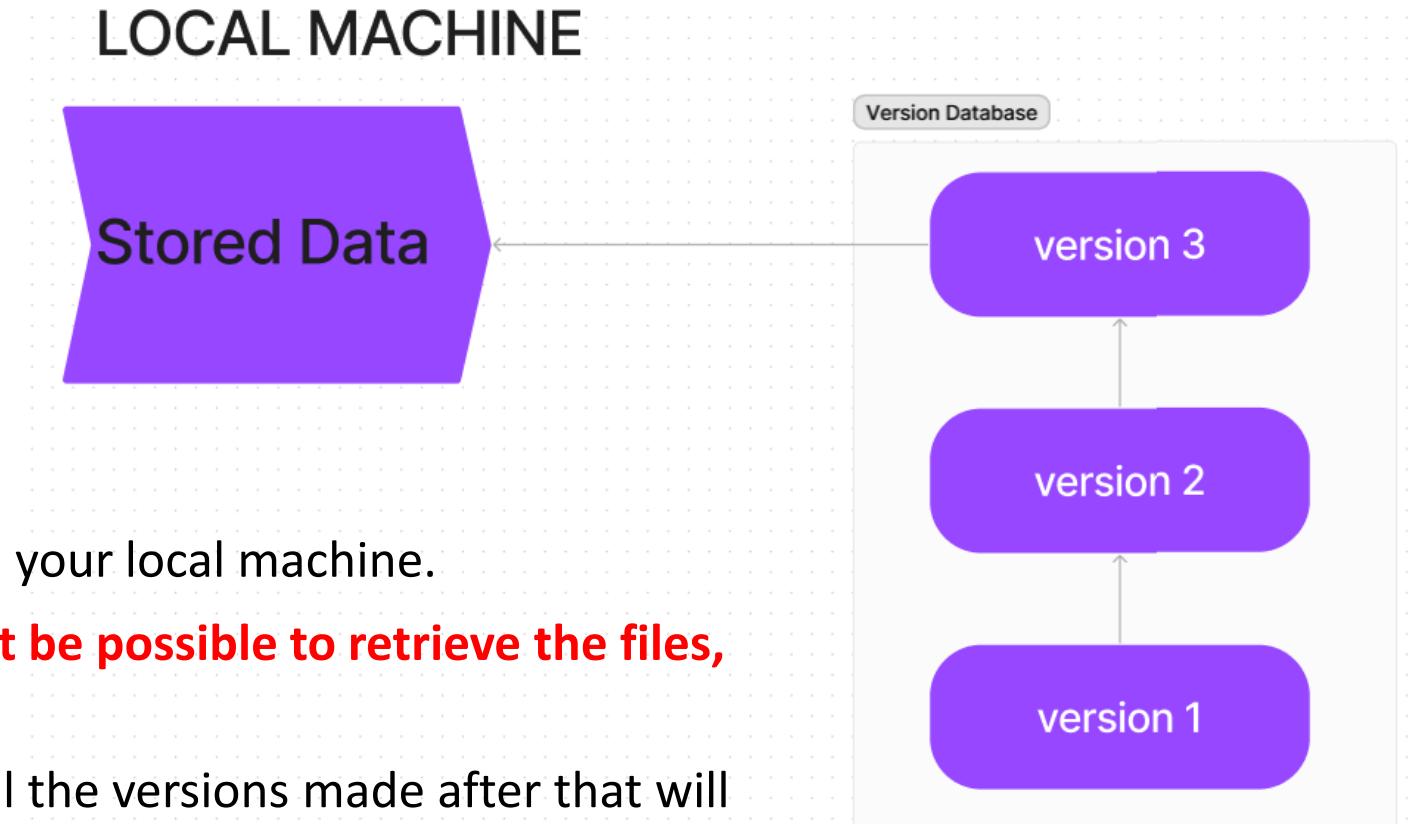
- 1.Local Version Control System
- 2.Centralized Version Control System
- 3.Distributed Version Control System

### Local Version Control System

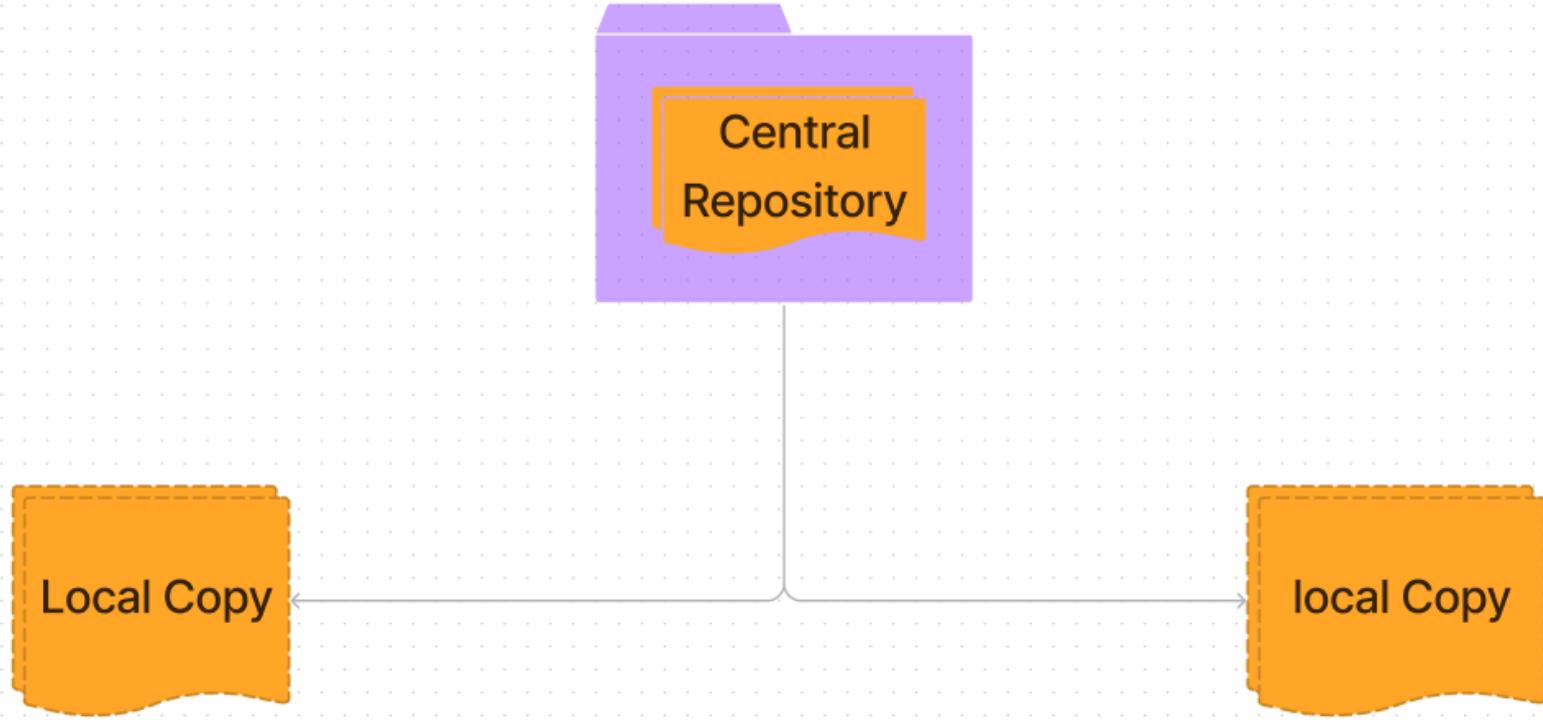
Local Version Control System is located in your local machine.

**If the local machine crashes, it would not be possible to retrieve the files, and all the information will be lost.**

If anything happens to a single version, all the versions made after that will be lost.



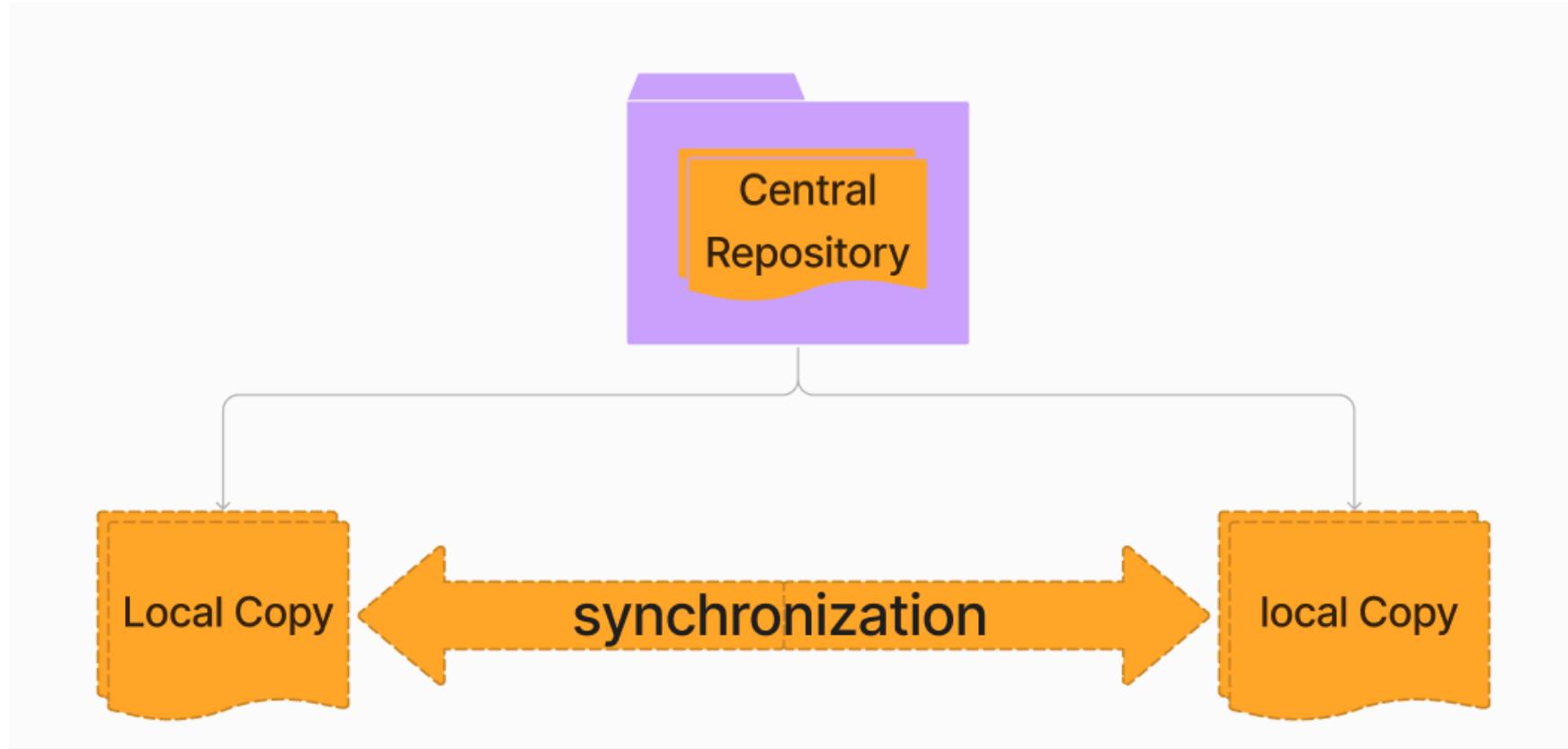
# Centralized Version Control System



In the Centralized Version Control Systems, there will be a single central server that contains all the files related to the project, and many collaborators checkout files from this single server (you will only have a working copy).

**The problem with the Centralized Version Control Systems is if the central server crashes, almost everything related to the project will be lost.**

## Distributed Version Control System



In a **distributed version control system**, there will be one or more servers and many collaborators similar to the centralized system.

But **the difference is, not only do they check out the latest version, but each collaborator will have an exact copy (mirroring) of the main repository(including its entire history) on their local machines.**

**Each user has their own repository and a working copy.**

This is very useful because even if the server crashes, we would not lose everything as several copies are residing in several other computers.

# What Is Git?



Popular source control system



Distributed system



Free and open-source



Track changes in your code over time



Go back to earlier versions if something breaks



Work with branches to build features safely



Collaborate locally without overwriting others' work

Git is originally created by Linus Torvalds, the creator of the Linux kernel.

It is not owned by any single company.

The trademark "Git" is registered by the Software Freedom Conservancy, a non-profit organization that supports open-source project

# Why Use Git?

Fast

Disconnected

Powerful yet easy

Branching

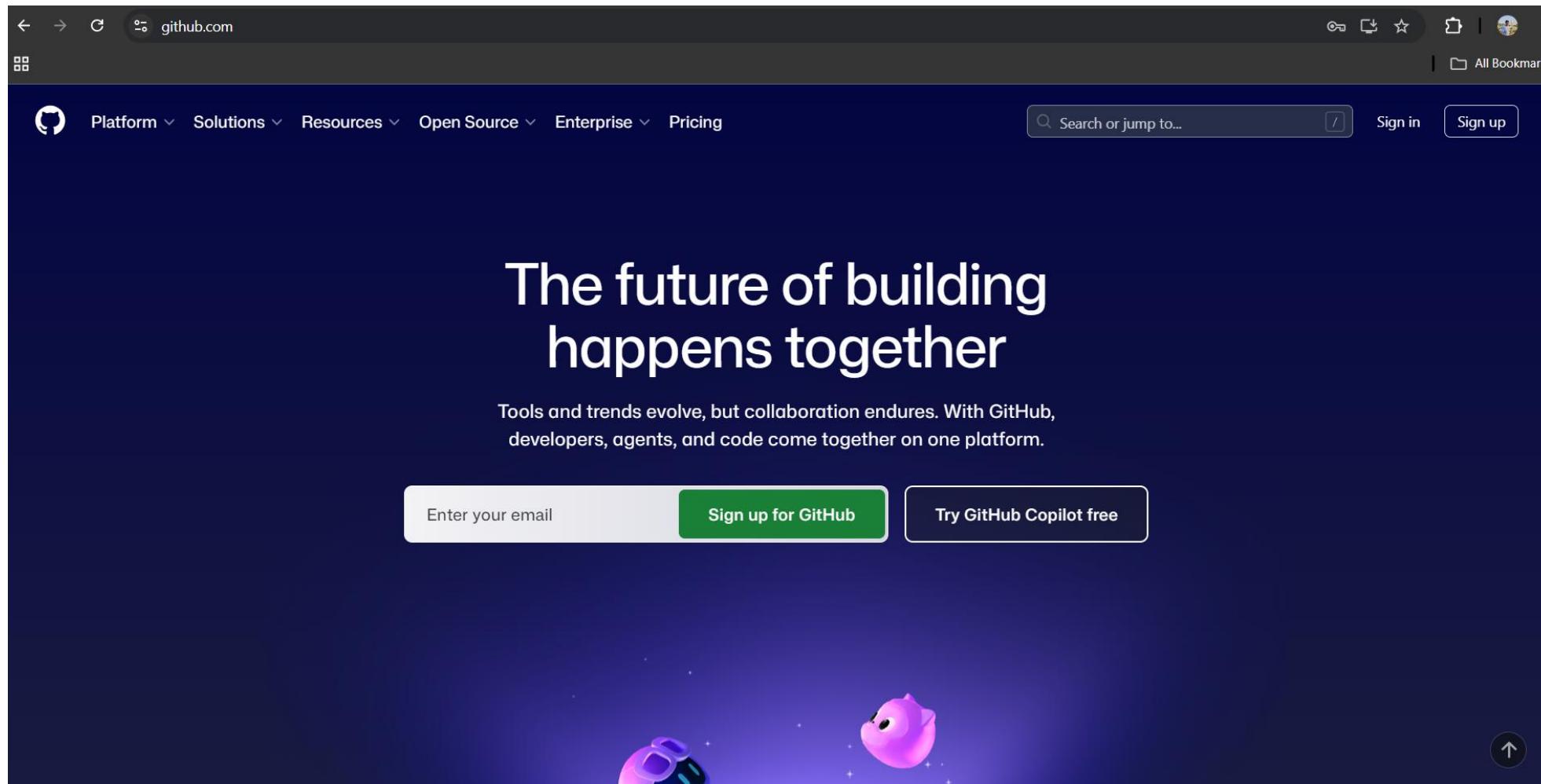
Pull requests

# GITHUB

**GitHub** is a **cloud-based platform** that hosts Git repositories.

GitHub is owned by **Microsoft**, which acquired the company for \$7.5 billion in stock in October 2018.

<https://github.com/>



# What Is GitHub?

- Store code online (backup + access anywhere)
- Collaborate with teams on the same project
- Review code using pull requests
- Track bugs & tasks with issues
- Showcase projects (portfolios, open source)



Hosting service based on Git



More than just source control for your code



Free and paid options

Git offers a broad variety of extra services, including issues management, working with teams, adding a wiki, and so much more.

Some source-based actions can also be done directly in the GitHub interface, such as creating a pull request or performing a merge.

# GIT VS GITHUB



Git

Software

Version control

Maintained by Linux

Open-Source

No user management

Locally installed

Minimal external tool  
configuration

Little to no competition



GitHub

Service

Git repository hosting

Maintained by Microsoft

Free or paid membership

Built-in user management

Hosted on the web

Active marketplace for  
tool integration

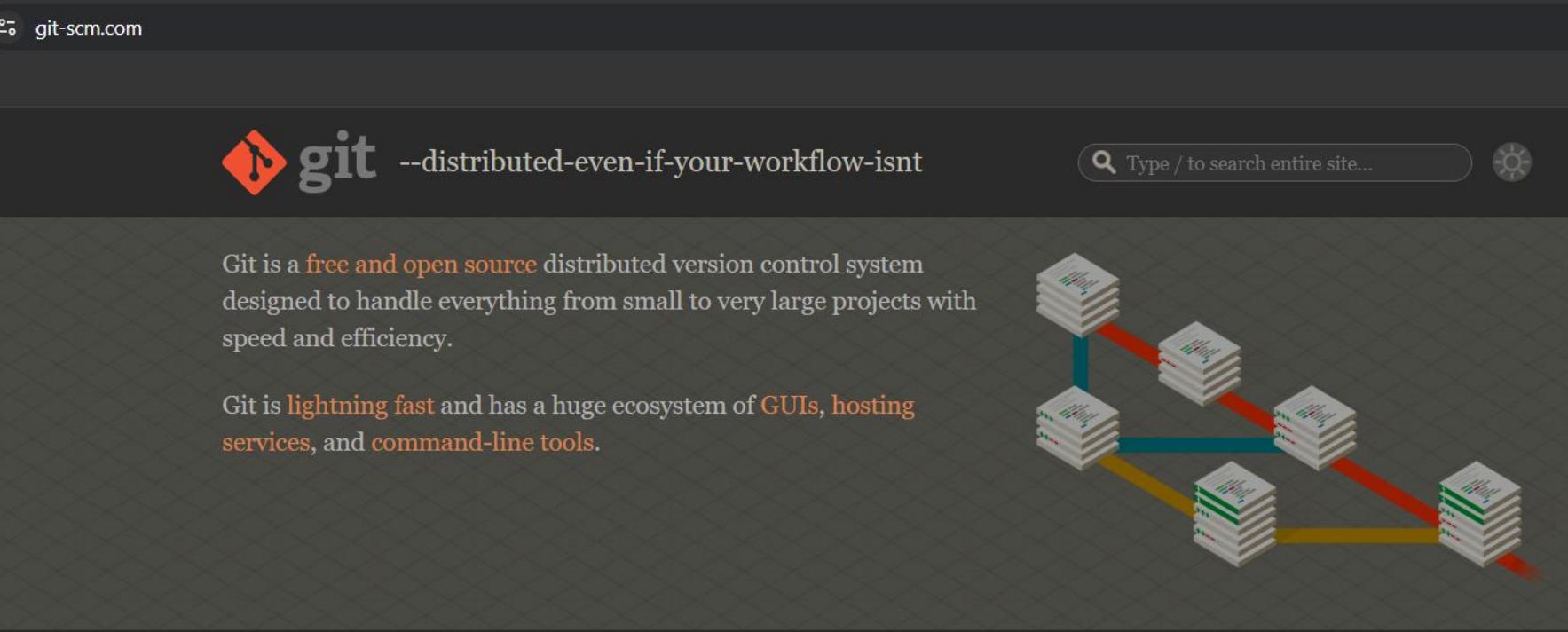
High competition

## GIT VS GITHUB

Feature	Git	GitHub
What it is	Software tool	Online platform
Works offline	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Stores code	Locally	On the cloud
Tracks versions	<input checked="" type="checkbox"/> Yes	Uses Git
Collaboration	Limited	<input checked="" type="checkbox"/> Excellent
Account needed	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/> Yes

# GIT DOWNLOAD AND INSTALL

<https://git-scm.com/>



The screenshot shows the official Git website ([git-scm.com](https://git-scm.com/)). At the top left is the Git logo (a red diamond with a white 'g'). Next to it is the slogan "git --distributed-even-if-your-workflow-isn't". A search bar with a magnifying glass icon and placeholder text "Type / to search entire site..." is positioned to the right. A sun icon is also present. Below the header, there's a large text block about Git's features: "Git is a **free and open source** distributed version control system designed to handle everything from small to very large projects with speed and efficiency." Another text block highlights Git's performance: "Git is **lightning fast** and has a huge ecosystem of **GUIs, hosting services, and command-line tools**." To the right of these descriptions is a 3D-style diagram of six white server stacks connected by colored lines (red, blue, green, yellow) representing a distributed network. The main content area below the header contains several sections: "About" (with a gear icon), "Tools" (with a wrench icon), "Install" (with a download arrow icon), "Learn" (with a lightbulb icon), "Reference" (with a book icon), and "Community" (with a speech bubble icon). On the right side, there's a callout box for the "Latest source release" (version 2.52.0, released on 2025-11-17), featuring a red diamond icon, an "Install for Windows" button, and a "GitHub Repository" link.

git-scm.com

**git** --distributed-even-if-your-workflow-isn't

Type / to search entire site...

Git is a **free and open source** distributed version control system designed to handle everything from small to very large projects with speed and efficiency.

Git is **lightning fast** and has a huge ecosystem of **GUIs, hosting services, and command-line tools**.

**About**  
Git's performance and ecosystem

**Tools**  
Command line tools, GUIs, and hosting services

**Install**  
Binary releases for all major platforms.

**Learn**  
Pro Git book, videos, tutorials, and cheat sheet

**Reference**  
Git's reference documentation

**Community**  
Get involved! Bug reporting, mailing list, chat, development and more.

Latest source release  
**2.52.0**  
[Release Notes](#) (2025-11-17)

**Install for Windows**

[GitHub Repository](#)



Type / to search entire site... ☰

About  
Learn  
Tools  
Reference  
Install  
Community

# Install

Latest version: 2.52.0 ([Release Notes](#))

[Windows](#) [macOS](#) [Linux](#) [Build from Source](#)

[Click here to download](#) the latest (2.52.0) x64 version of **Git for Windows**. This is the most recent [maintained build](#). It was released [about 2 months ago](#), on 2025-11-17.

## Other Git for Windows downloads

[Standalone Installer](#)

[Git for Windows/x64 Setup.](#)

[Git for Windows/ARM64 Setup.](#)

[Portable \("thumbdrive edition"\)](#)

[Git for Windows/x64 Portable.](#)

[Git for Windows/ARM64 Portable.](#)

## Using winget tool

Install winget tool if you don't already have it, then type this command in command prompt or Powershell.

```
winget install --id Git.Git -e --source winget
```

The current source code release is version 2.52.0. If you want the newer version, you can build it from [the source code](#).



[Now What?](#)

SET DEFAULT EDITOR

Git 2.52.0 Setup

### Choosing the default editor used by Git

Which editor would you like Git to use?



**Use Visual Studio Code as Git's default editor**

Visual Studio Code is an Open Source, lightweight and powerful editor running as a desktop application. It comes with built-in support for JavaScript, TypeScript and Node.js and has a rich ecosystem of extensions for other languages (such as C++, C#, Java, Python, PHP, Go) and runtimes (such as .NET and Unity).  
(WARNING!) This will be installed only for this user.

Use this option to let Git use Visual Studio Code as its default editor.

<https://gitforwindows.org/>

Back    Next    Cancel

## SET BRANCH NAME

Git 2.52.0 Setup

Adjusting the name of the initial branch in new repositories

What would you like Git to name the initial branch after "git init"?



**Let Git decide**

Let Git use its default branch name (currently: "master") for the initial branch in newly created repositories.

**Override the default branch name for new repositories**

Many teams already renamed their default branches; common choices are "main", "trunk" and "development". Specify the name "git init" should use for the initial branch:

main

This setting does not affect existing repositories.

<https://gitforwindows.org/>

Back Next Cancel

## Adjusting your PATH environment

How would you like to use Git from the command line?



**Use Git from Git Bash only**

This is the most cautious choice as your PATH will not be modified at all. You will only be able to use the Git command line tools from Git Bash.

**Git from the command line and also from 3rd-party software**

(Recommended) This option adds only some minimal Git wrappers to your PATH to avoid cluttering your environment with optional Unix tools. You will be able to use Git from Git Bash, the Command Prompt and the Windows PowerShell as well as any third-party software looking for Git in PATH.

**Use Git and optional Unix tools from the Command Prompt**

Both Git and the optional Unix tools will be added to your PATH.

**Warning: This will override Windows tools like "find" and "sort". Only use this option if you understand the implications.**

<https://gitforwindows.org/>

Back

Next

Cancel



### Choosing the SSH executable

Which Secure Shell client program would you like Git to use?

**Use bundled OpenSSH**

This uses ssh.exe that comes with Git.

**Use external OpenSSH**

This uses an external ssh.exe. Git will not install its own OpenSSH  
(and related) binaries but use them as found on the PATH.

<https://gitforwindows.org/>

Back

Next

Cancel



### Choosing HTTPS transport backend

Which SSL/TLS library would you like Git to use for HTTPS connections?

**Use the OpenSSL library**

Server certificates will be validated using the ca-bundle.crt file.

**Use the native Windows Secure Channel library**

Server certificates will be validated using Windows Certificate Stores.

This option also allows you to use your company's internal Root CA certificates distributed e.g. via Active Directory Domain Services.

<https://gitforwindows.org/>

Back

Next

Cancel

## Configuring the line ending conversions

How should Git treat line endings in text files?



### Checkout Windows-style, commit Unix-style line endings

Git will convert LF to CRLF when checking out text files. When committing text files, CRLF will be converted to LF. For cross-platform projects, this is the recommended setting on Windows ("core.autocrlf" is set to "true").

### Checkout as-is, commit Unix-style line endings

Git will not perform any conversion when checking out text files. When committing text files, CRLF will be converted to LF. For cross-platform projects, this is the recommended setting on Unix ("core.autocrlf" is set to "input").

### Checkout as-is, commit as-is

Git will not perform any conversions when checking out or committing text files. Choosing this option is not recommended for cross-platform projects ("core.autocrlf" is set to "false").

<https://gitforwindows.org/>

Back

Next

Cancel



## Configuring the terminal emulator to use with Git Bash

Which terminal emulator do you want to use with your Git Bash?

**Use MinTTY (the default terminal of MSYS2)**

Git Bash will use MinTTY as terminal emulator, which sports a resizable window, non-rectangular selections and a Unicode font. Windows console programs (such as interactive Python) must be launched via `winpty` to work in MinTTY.

**Use Windows' default console window**

Git will use the default console window of Windows ("cmd.exe"), which works well with Win32 console programs such as interactive Python or node.js, but has a very limited default scroll-back, needs to be configured to use a Unicode font in order to display non-ASCII characters correctly, and prior to Windows 10 its window was not freely resizable and it only allowed rectangular text selections.

<https://gitforwindows.org/>

Back

Next

Cancel



## Choose the default behavior of `git pull`

What should `git pull` do by default?

**Fast-forward or merge**

Fast-forward the current branch to the fetched branch when possible,  
otherwise create a merge commit.

**Rebase**

Rebase the current branch onto the fetched branch. If there are no local  
commits to rebase, this is equivalent to a fast-forward.

**Only ever fast-forward**

Fast-forward to the fetched branch. Fail if that is not possible.  
This is the standard behavior of `git pull`.

<https://gitforwindows.org/>

Back

Next

Cancel



## Choose a credential helper

Which credential helper should be configured?

**Git Credential Manager**

Use the [cross-platform Git Credential Manager](#).

See more information about the future of Git Credential Manager [here](#).

**None**

Do not use a credential helper.

<https://gitforwindows.org/>

Back

Next

Cancel



## Configuring extra options

Which features would you like to enable?



### Enable file system caching

File system data will be read in bulk and cached in memory for certain operations ("core.fscache" is set to "true"). This provides a significant performance boost.

### Enable symbolic links

Enable [symbolic links](#) (requires the SeCreateSymbolicLink permission).  
Please note that existing repositories are unaffected by this setting.

<https://gitforwindows.org/>

Back

Install

Cancel

## Completing the Git Setup Wizard

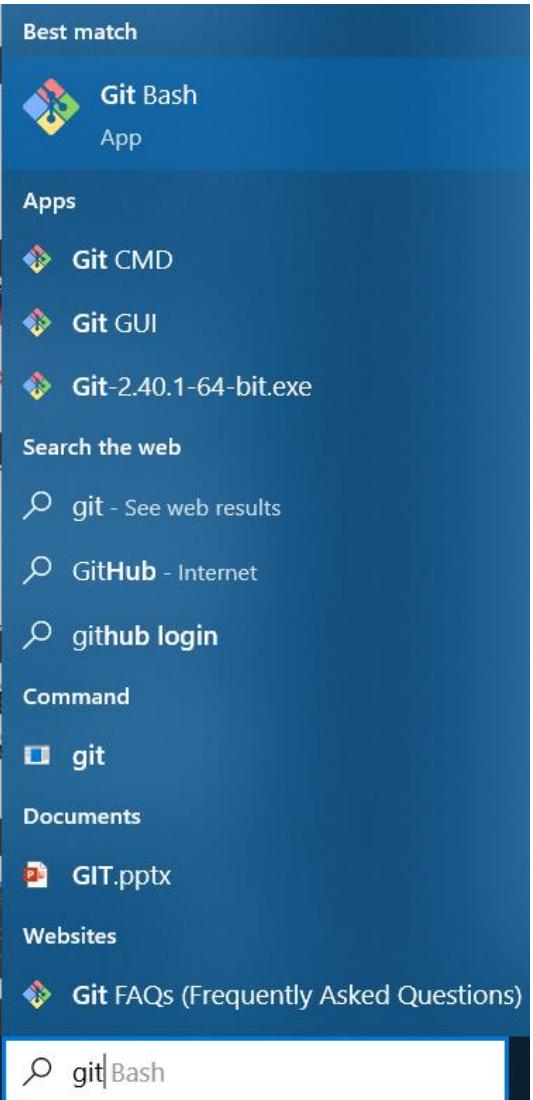
Setup has finished installing Git on your computer. The application may be launched by selecting the installed shortcuts.

Click Finish to exit Setup.



- Launch Git Bash
- View Release Notes

Finish



# GIT COMMAND INTRODUCTION

**USE GIT BASH**

A screenshot of a terminal window titled "MINGW64:c/Users/User". The window displays a green terminal prompt: "User@CHANDAN MINGW64 ~ \$". The terminal window has a blue header bar.

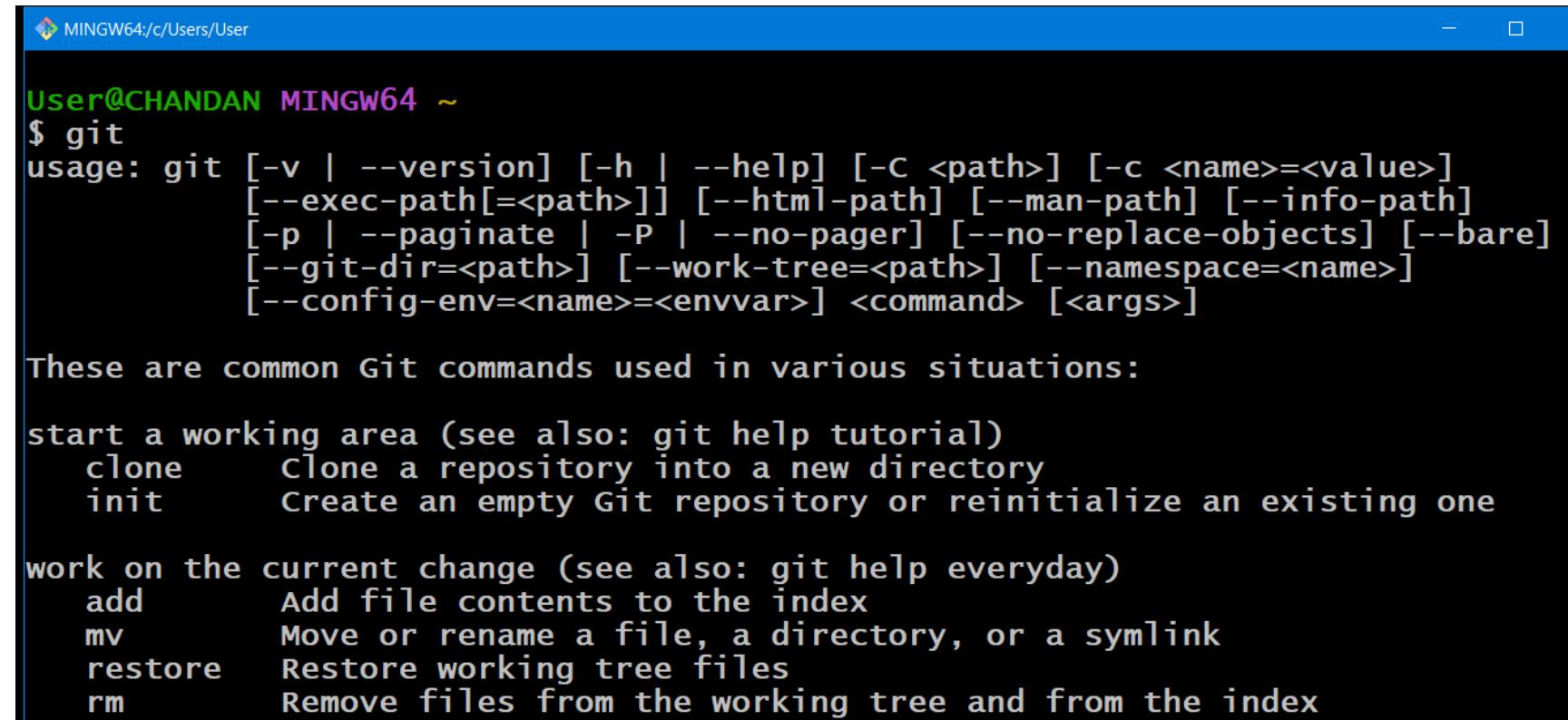
## GIT VERSION CHECK

```
User@CHANDAN MINGW64 ~
$ git --version
git version 2.40.1.windows.1
```

## CLEAR BASH

```
User@CHANDAN MINGW64 ~
$ clear
```

## GET ALL GIT COMMANDS



The screenshot shows a terminal window titled 'MINGW64:/c/Users/User'. The command '\$ git' is entered, followed by the usage information for the 'git' command. Below this, a section titled 'These are common Git commands used in various situations:' lists several commands with their descriptions.

```
User@CHANDAN MINGW64 ~
$ git
usage: git [-v | --version] [-h | --help] [-C <path>] [-c <name>=<value>]
           [--exec-path[=<path>]] [--html-path] [--man-path] [--info-path]
           [-p | --paginate | -P | --no-pager] [--no-replace-objects] [--bare]
           [--git-dir=<path>] [--work-tree=<path>] [--namespace=<name>]
           [--config-env=<name>=<envvar>] <command> [<args>]

These are common Git commands used in various situations:

start a working area (see also: git help tutorial)
  clone      Clone a repository into a new directory
  init       Create an empty Git repository or reinitialize an existing one

work on the current change (see also: git help everyday)
  add        Add file contents to the index
  mv         Move or rename a file, a directory, or a symlink
  restore    Restore working tree files
  rm         Remove files from the working tree and from the index
```

# GIT HELP

```
MINGW64:c/Users/User
User@CHANDAN MINGW64 ~
$ git --help
usage: git [-v | --version] [-h | --help] [-C <path>] [-c <name>=<value>]
           [--exec-path[=<path>]] [--html-path] [--man-path] [--info-path]
           [-p | --paginate | -P | --no-pager] [--no-replace-objects] [--bare]
           [--git-dir=<path>] [--work-tree=<path>] [--namespace=<name>]
           [--config-env=<name>=<envvar>] <command> [<args>]

These are common Git commands used in various situations:

start a working area (see also: git help tutorial)
  clone      Clone a repository into a new directory
  init       Create an empty Git repository or reinitialize an existing one

work on the current change (see also: git help everyday)
  add        Add file contents to the index
  mv        Move or rename a file, a directory, or a symlink
  restore    Restore working tree files
  rm        Remove files from the working tree and from the index
```

<https://www.adservio.fr/post/top-20-git-commands-with-examples#el9>

# The 3 States of Git

All these changes are still in local



## Modified

The modified state means that the file has been changed, but it hasn't been committed to the database yet.



## Staged

staged means that the modified file is marked to be part of the next commit snapshot.



## Committed

In the committed state, the data is basically stored in the local database.

```
graph TD; WD[Working Directory] --> SA[Staging Area]; SA --> LR[Local Repository]; LR --> RR[Remote Repository]
```

Remote Repository

Local Repository

Staging Area

Working Directory

Starting at the bottom is the **working directory** where **content is created, edited, deleted, and so on.**

Any new content must exist here before it can be put into (tracked by) Git.

This serves the same purpose as the Dev area in the dev-test-prod-public model.

Next is the **staging area**.

This **serves as a holding area to accumulate and stage changes from the working directory before they are committed into the next level**—the local repository.

You can think of this process as being similar to how you might move content to the testing stage in your dev-test-prod-public model.

After the staging area comes the **local repository**.

**This is the actual source repository where content that Git manages is stored.**

Once content is committed to the local repository, it becomes a version in the repository and can be retrieved later.

**The combination of the working directory, staging area, and local repository make up your local environment.**

These are the parts of the Git system that exist on your local machine—actually, within a special subdirectory of the root (top-level) directory of your working directory.

The remote repository is a separate Git repository intended to collect and host content pushed to it from one or more local repositories.

