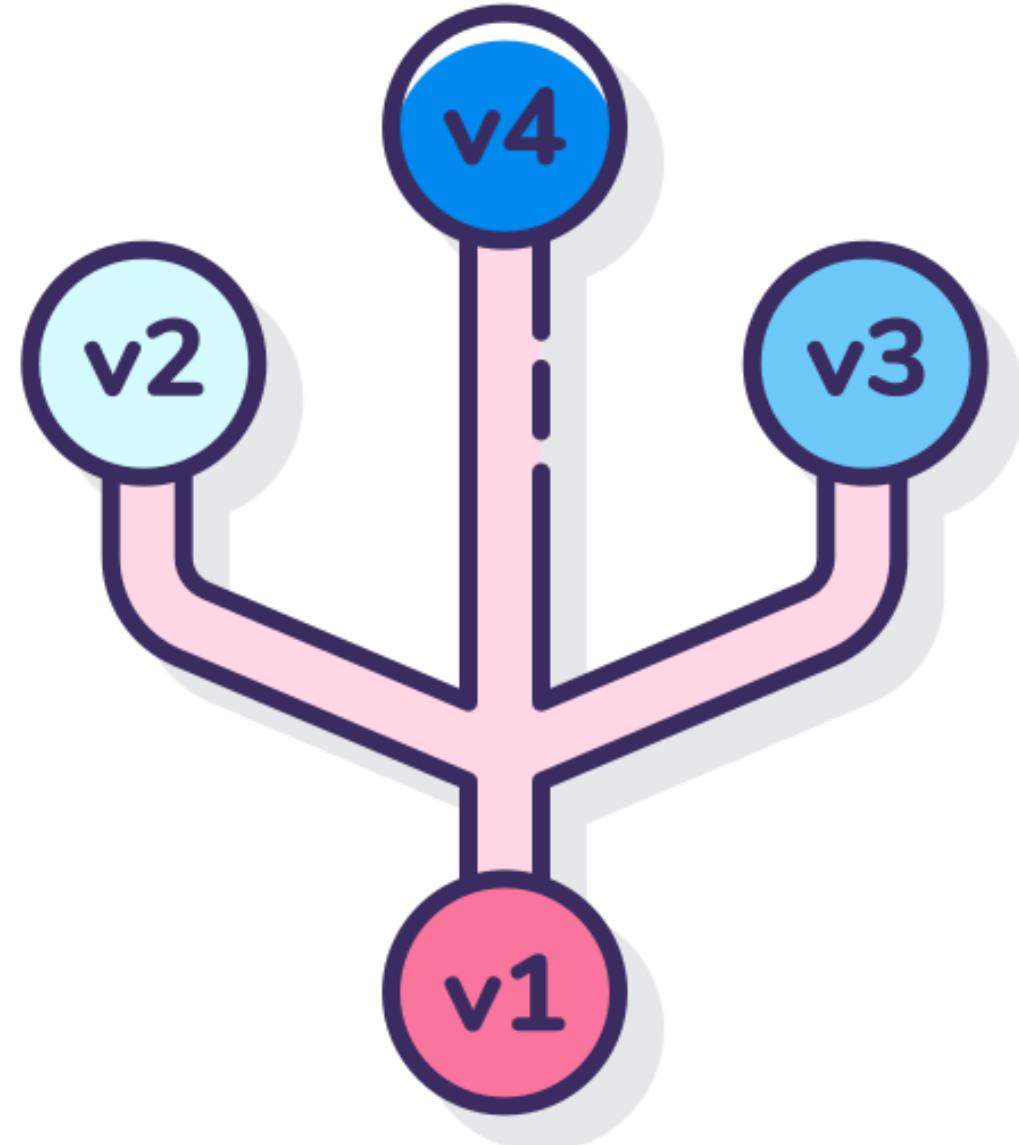


Introduction to Git

Distributed
Version Control

Vikram

IoT Application Dev & DevOps



Contents

git:kunchalavikram1427



git

- Version Control Systems
- Setup Git
- Setup Local Git Repository
- Setup Remote Repository
- Git Branches
- Git Clone
- Git Pull & Fetch
- Git Merge Conflicts

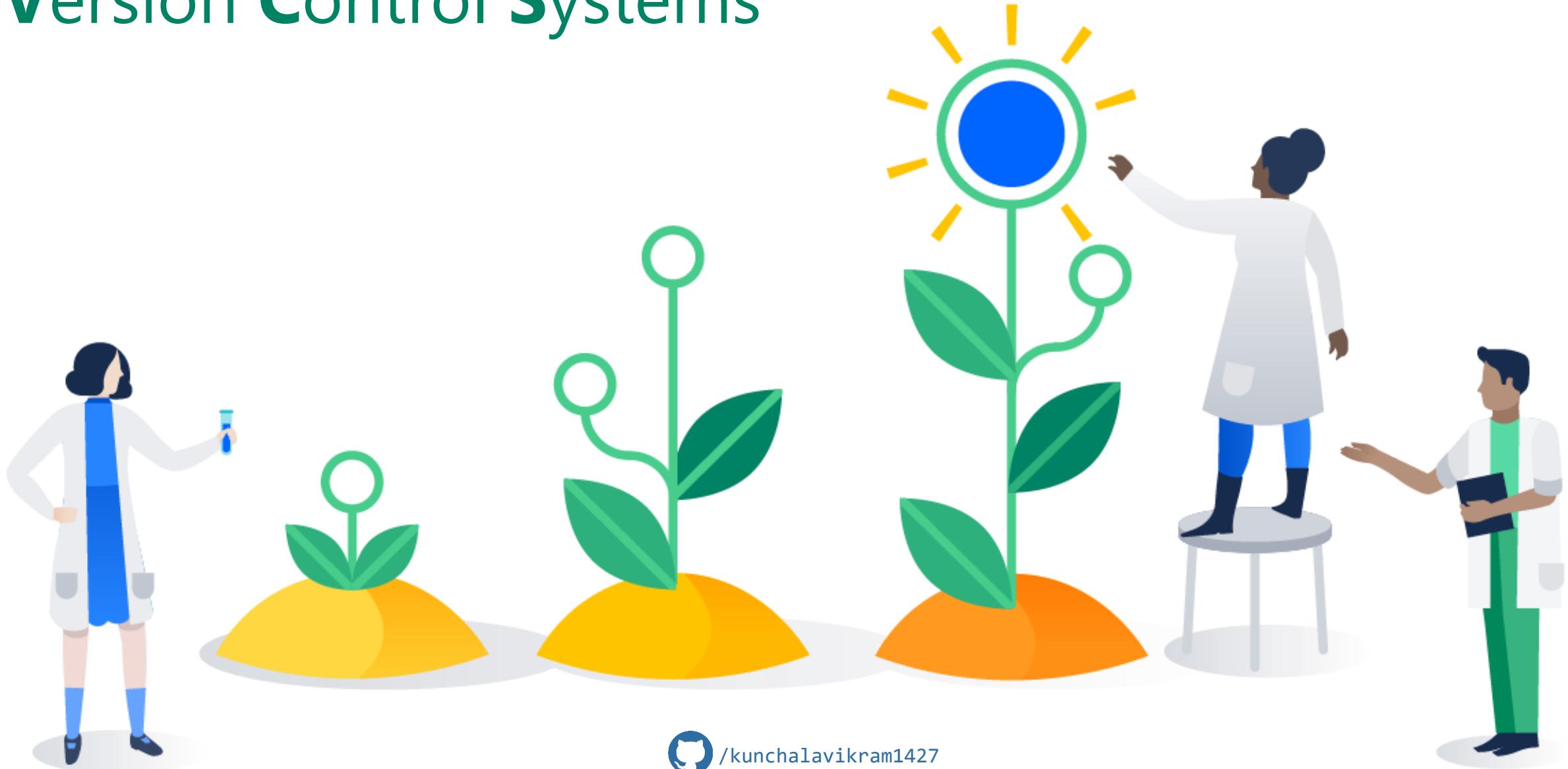


/kunchalavikram1427

git:kunchalavikram1427



Version Control Systems



/kunchalavikram1427



git:kunchalavikram1427

Version Control Systems(VCS)

- Version control, also known as source control, is the practice of tracking and managing changes to software code.
- It enables multiple people to simultaneously work on a single project. Each person edits his or her own copy of the files and chooses when to share those changes with the rest of the team.
- These systems are critical to ensure everyone has access to the latest code. As development gets more complex, there's a bigger need to manage multiple versions of entire products.
- Version control also enables one person you to use multiple computers to work on a project, so it is valuable even if you are working by yourself.
- Version control integrates work done simultaneously by different team members. In most cases, edits to different files or even the same file can be combined without losing any work. In rare cases, when two people make conflicting edits to the same line of a file, then the version control system requests human assistance in deciding what to do.
- Version control gives access to historical versions of your project. If you make a mistake, you can roll back to a previous version. You can reproduce and understand a bug report on a past version of your software. You can also undo specific edits without losing all the work that was done in the meanwhile. For any part of a file, you can determine when, why, and by whom it was ever edited.
- In DevOps, other than keeping track of changes, VCS also helps in developing and shipping the products faster.



/kunchalavikram1427

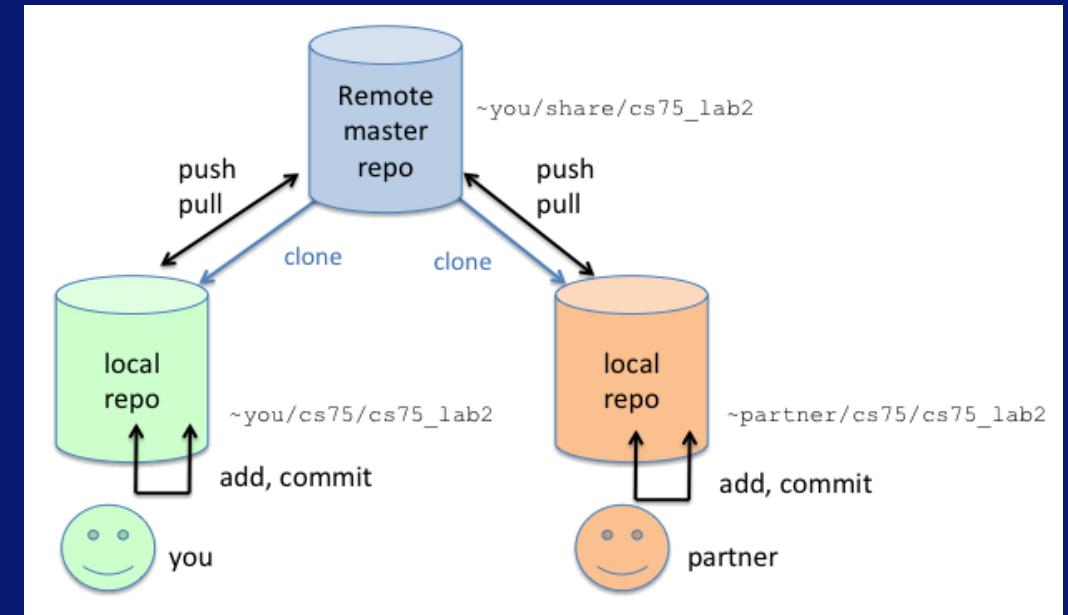


Version Control Systems

git:kunchalavikram1427

Repositories and working copies

- Version control uses a remote repository and a working copy where you do your work
- Your working copy is your personal copy of all the files in the project. You make arbitrary edits to this copy, without affecting your teammates. When you are happy with your edits, you commit your changes to a repository
- A repository is a database of all the edits to, and/or historical versions (snapshots) of, your project
- It is possible for the repository to contain edits(from other developers) that have not yet been applied to your working copy
- You can update your working copy to incorporate any new edits or versions that have been added to the repository since the last time you updated(pulling the latest changes)



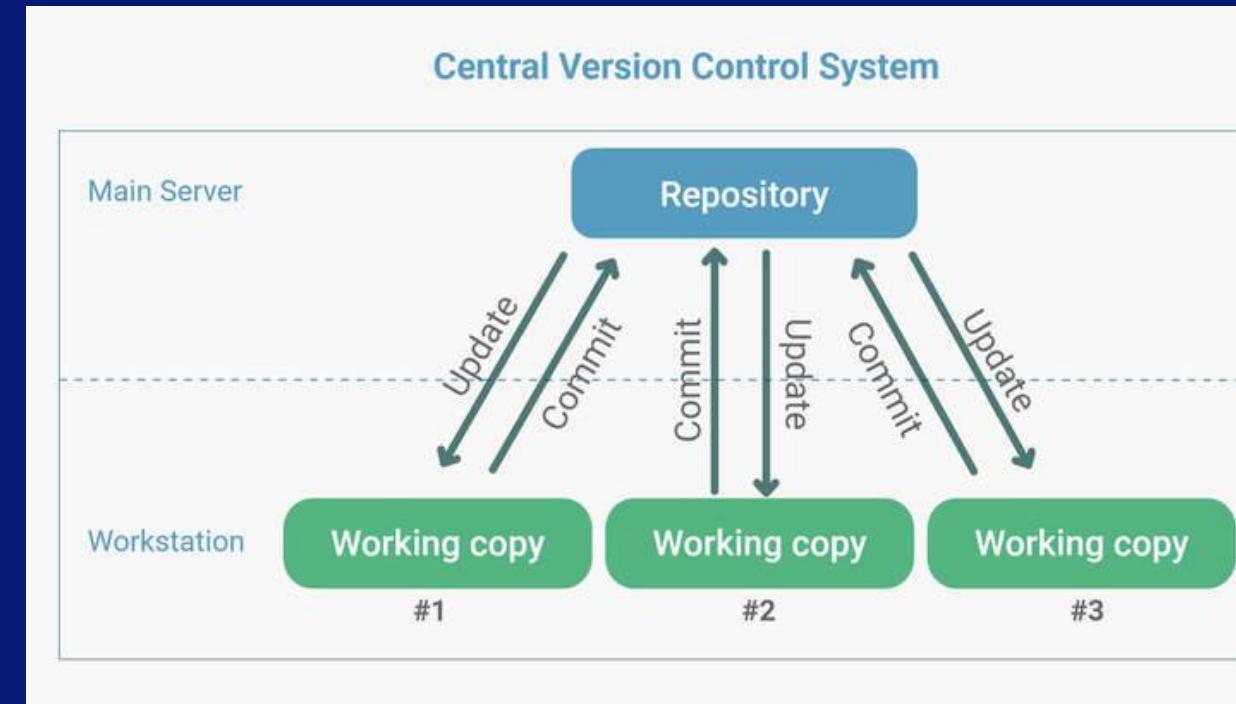
/kunchalavikram1427



Central Vs Distributed VCS

Central VCS

- The main difference between centralized and distributed version control is the number of repositories
- In centralized version control, there is just one repository, and in distributed version control, there are multiple repositories
- In CVCS, the central server stores all the data. Each user gets his or her own working copy, but there is just one central repository. As soon as you commit, it is possible for your co-workers to update and to see your changes
- If the central server gets crashed, there is a high chance of losing the data
- For every command, CVCS connects the central server which impacts speed of operation
- Ex: Subversion VCS

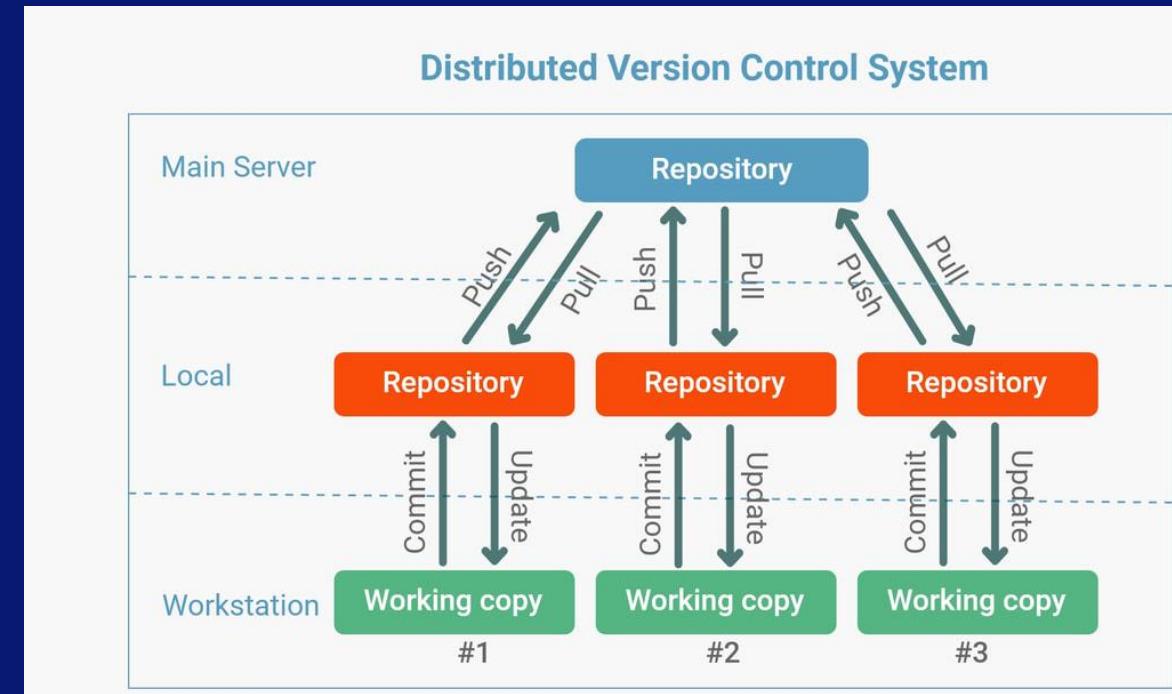




Central Vs Distributed VCS

Distributed VCS

- In distributed version control, each user gets his or her own local repository and a remote repository for all
- After you commit to the local repository, others have no access to your changes until you push your changes to the central repository
- If other users want to check your changes, they will pull the updated central repository to their local repository, and then they update in their local copy
- Even if the main server crashes, code that is in the local systems can be used to restore the data
- DVCS is fast compared to CVCS because you don't have to contact the central server for every command
- Ex: Git, Mercurial



git:kunchalavikram1427



Installing Git



/kunchalavikram1427



git:kunchalavikram1427

Git

Installing Git

For Windows

- Visit <https://git-scm.com/book/en/v2/Getting-Started-Installing-Git> to install Git for your operating systems
- To install GUI clients, visit <https://git-scm.com/downloads/guis>
- Verify if Git is installed by running the command `git version` in the CMD
- Use `git help` to get the list of supported commands and `git help <sub-command>` for help on that command

```
● ● ●  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ git version  
git version 2.27.0.windows.1
```

```
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ git help  
usage: git [--version] [--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>]  
          <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  
sparse-checkout Initialize and modify the sparse-checkout  
  
examine the history and state (see also: git help revisions)  
bisect    Use binary search to find the commit that introduced a bug  
diff      Show changes between commits, commit and working tree, etc  
grep      Print lines matching a pattern  
log       Show commit logs  
show      Show various types of objects  
status    Show the working tree status  
  
grow, mark and tweak your common history  
branch   List, create, or delete branches  
commit   Record changes to the repository  
merge    Join two or more development histories together  
rebase   Reapply commits on top of another base tip  
reset   Reset current HEAD to the specified state  
switch  Switch branches  
tag     Create, list, delete or verify a tag object signed with GPG  
  
collaborate (see also: git help workflows)  
fetch   Download objects and refs from another repository  
pull    Fetch from and integrate with another repository or a local branch  
push    Update remote refs along with associated objects  
  
'git help -a' and 'git help -g' list available subcommands and some  
concept guides. See 'git help <command>' or 'git help <concept>'  
to read about a specific subcommand or concept.  
See 'git help git' for an overview of the system.  
  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ git help init
```



/kunchalavikram1427



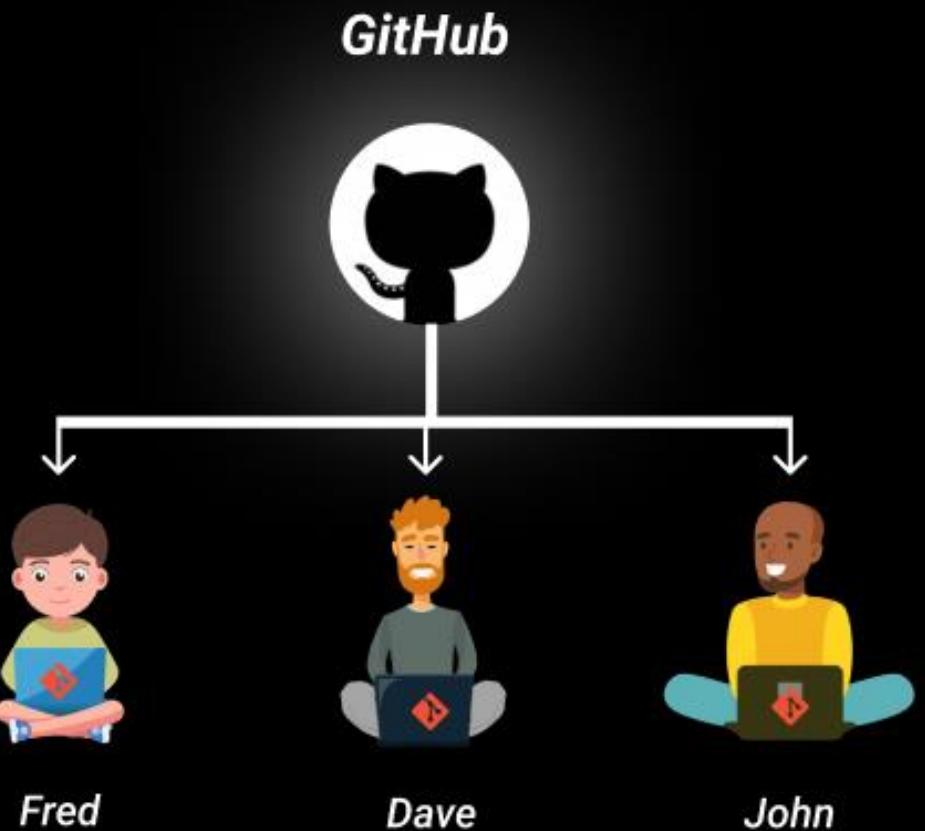
Git

What is Git?

Git is a distributed version control system source code management (SCM) system that records changes to a file or set of files over time, so that you can recall specific versions later.

It allows you to revert selected files back to a previous state, compare changes over time, see who last modified something that might be causing a problem, and more.

Git has a remote repository which is stored in a server and a local repository which is stored in the computer of each developer. This means that the code is not just stored in a central server, but the full copy of the code is present in all the developers' computers

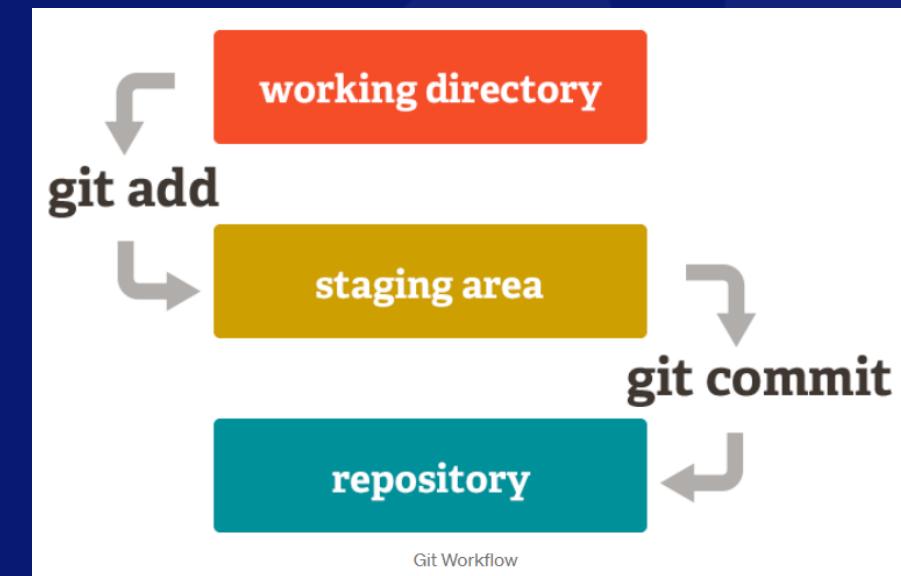
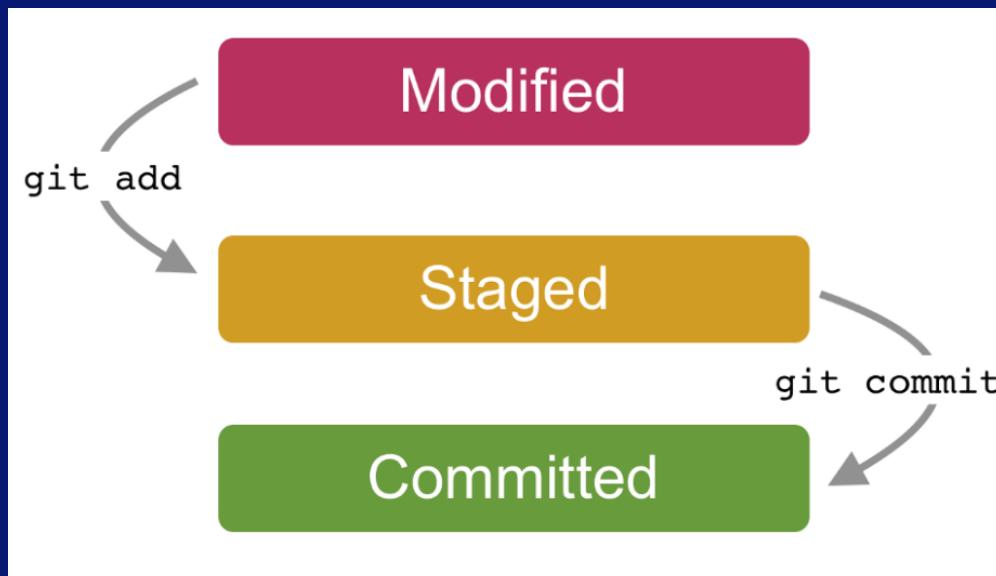




The 3 States of Git

Files in a repository go through three stages before being under version control with git

1. **Modified** means that you have changed the file but have not committed it to your database yet
 2. **Staged** means that you have marked a modified file in its current version to go into your next commit snapshot
 3. **Committed** means that the data is safely stored in your local database
- In addition to these three states, Git files live in one of three areas: the Working directory, Staging area, and the Git directory (your local repository)





Create a local git repository

Create a project

- Create a new project folder in your local filesystem
- Go into this newly created project folder and add a local Git repository to the project using the following commands

git init

- Now this project can be managed using Git
- Git creates a hidden folder **.git** in the project whenever you do **git init**
- The **.git** folder contains all the information that is necessary for your project in version control and all the information about commits, branches, remote repository address, etc. All of them are present in this folder. It also contains a log that stores your commit history so that you can roll back to history
- Without **.git**, the project is considered a local project and not a git project, that means you cannot perform any git operations

```
● ● ●  
428991@LINL190904638 MINGW64 /d  
$ mkdir git-demo  
  
428991@LINL190904638 MINGW64 /d  
$ cd git-demo  
  
428991@LINL190904638 MINGW64 /d/git-demo  
$ git init  
Initialized empty Git repository in D:/git-demo/.git/  
  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ ls -al  
total 8  
drwxr-xr-x 1 428991 1049089 0 Feb 10 19:55 ./  
drwxr-xr-x 1 428991 1049089 0 Feb 10 19:55 ../  
drwxr-xr-x 1 428991 1049089 0 Feb 10 19:55 .git/  
  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$
```



git:kunchalavikram1427

Git

Create a local git repository

Add files to working area

- A newly added file will always be created in the working area and is untracked by default
- Now add some files to the local repository
- Check the status of the files using `git status`
- The status shows that `file1.txt` is an **untracked file** as it is not added to the staging area or Git has no idea what to do with this file yet
- **No commits yet** indicates there are no commits to the local repository yet
- The default Git branch is `master`



```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ touch file1.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ echo "My First File" > file1.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ ls -al
drwxr-xr-x 1 428991 1049089 0 Feb 10 19:55 .git/
-rw-r--r-- 1 428991 1049089 14 Feb 10 19:57 file1.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master

No commits yet

Untracked files:
  (use "git add <file>..." to include in what will be committed)
    file1.txt

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





Create a local git repository

Add files to staging/index using 'add'

- Unlike many version control systems, Git has a staging area (index)
- The Staging area is there to keep track of all the files which are to be committed. Any file which is not added to the staging area will not be committed. This gives the developer control over which files need to be committed at once
- `git add` lets you add files to the staging area
 - `git add file1.txt`
 - `git status`
- The status shows that `file1.txt` is ready to be committed to the local repository
- In case you want to add multiple files you can use:
 - `git add file1 file2 file3`
 - `git add .` or `git add -A`

```
● ● ●

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ ls -a
./ ../ .git/ file1.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git add file1.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
    new file:   file1.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$
```





git:kunchalavikram1427

Git

Create a local git repository

Discard unstaged changes

- Before adding the files to staging, you can also discard the changes done
- Lets add some content to file1.txt and see the file status using `git status`
- The file is now in untracked state
- Git shows few hints whether to commit these changes or to discard them
- To commit simple proceed with `git add` or run `git restore <file-name>` to discard the changes
- Run `git status` again to see the status

i unstaged/untracked files can be committed in a new branch by switching to that branch

```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ ls -a
./ .. .git/ file1.txt file2.txt file3.txt file4.txt file5.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ cat file1.txt
My First File

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ echo "My First Modification to file1" > file1.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ cat file1.txt
My First Modification to file1

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
    modified:   file1.txt

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

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git restore file1.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ cat file1.txt
My First File

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master
nothing to commit, working tree clean
```





git:kunchalavikram1427

Git

Create a local git repository

Add files to staging

- Add few more files as shown in the figure and add to staging area
 - `git add file2.txt file3.txt` (or)
 - `git add .`
- Once a file is in the Staging area, you can unstage the file / untrack it using the `git rm --cached <file_name>` command

```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ touch file2.txt file3.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ echo "My Second File" > file2.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ echo "My Third File" > file3.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
    new file:   file1.txt

Untracked files:
  (use "git add <file>..." to include in what will
  be committed)
    file2.txt
    file3.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git add .

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
    new file:   file1.txt
    new file:   file2.txt
    new file:   file3.txt
```





git:kunchalavikram1427

Git

Create a local git repository

Unstage files

- `git reset <filename>`, `git reset HEAD <filename>`, `git rm --cached <filename>`, `git restore --staged <filename>` all does the same work

```
● ● ●  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ echo "My First Modification to file1" > file1.txt  
  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ git status  
On branch master  
Changes not staged for commit:  
  (use "git add <file>..." to update what will be committed)  
  (use "git restore <file>..." to discard changes in working directory)  
    modified:   file1.txt  
  
no changes added to commit (use "git add" and/or "git commit -a")  
  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ git add .  
  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ git status  
On branch master  
Changes to be committed:  
  (use "git restore --staged <file>..." to unstage)  
    modified:   file1.txt  
  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ git reset HEAD  
Unstaged changes after reset:  
M       file1.txt  
  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ git status  
On branch master  
Changes not staged for commit:  
  (use "git add <file>..." to update what will be committed)  
  (use "git restore <file>..." to discard changes in working directory)  
    modified:   file1.txt
```





Git Config

- The 'Git config' is a great method to configure your choice for the Git installation. Using this command, you can describe the repository behaviour, preferences, and user information
- The global config resides at `~/.gitconfig` in the user's home directory, while the repository specific config at `.git/config` inside the project
- Use `git config --help` for more info
- Before we commit any changes to the repo, we need to set the user name and email address for the git user so as to make Git aware of who has made the commits
- Run below commands to set the configuration
- `git config --global user.name "your name goes here"`
- `git config --global user.email "your email goes here"`

```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git config --global user.name "vikram"

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git config --global user.email "vikram.k@gmail.com"

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git config --global --list
http.sslverify=false
filter.lfs.required=true
filter.lfs.clean=git-lfs clean -- %f
filter.lfs.smudge=git-lfs smudge -- %f
filter.lfs.process=git-lfs filter-process
user.name=vikram
user.email=vikram.k@gmail.com
core.editor="C:/Program Files (x86)/GitExtensions/GitExtensions.exe" fileeditor

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git config --list
http.sslcainfo=C:/Program Files/Git/mingw64/ssl/certs/ca-bundle.crt
http.sslbackend=openssl
diff.astextplain.textconv=astextplain
core.autocrlf=true
core.fscache=true
core.symlinks=false
core.editor="C:\\Program Files\\Notepad++\\notepad++.exe" -multiInst -notabbar -
nosession -noPlugin
credential.helper=manager
filter.lfs.clean=git-lfs clean -- %f
filter.lfs.smudge=git-lfs smudge -- %f
filter.lfs.process=git-lfs filter-process
filter.lfs.required=true
pull.rebase=false
http.sslverify=false
filter.lfs.required=true
filter.lfs.clean=git-lfs clean -- %f
filter.lfs.smudge=git-lfs smudge -- %f
filter.lfs.process=git-lfs filter-process
user.password=Virender418@
user.email=vikram.k@gmail.com
core.editor="C:/Program Files (x86)/GitExtensions/GitExtensions.exe" fileeditor
core.repositoryformatversion=0
core.filemode=false
core.bare=false
core.logallrefupdates=true
core.symlinks=false
core.ignorecase=true
```





Create a local git repository

Committing the code

- Committing is the process in which the code is added to the local repository
- Each commit has an associated commit message, which is a description explaining why a particular change was made. Commit messages capture the history of your changes, so other contributors can understand what you've done and why
- To give commit message, use -m flag
 - `git commit -m "Initial Commit"`
- If you don't use -m, Git will bring up an editor for you to write the commit message
- Each time you commit changes to the repo, Git creates a new SHA(20 byte number) that describes that state



```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git commit -m "Initial Commit"
[master (root-commit) 35b408c] Initial Commit
Committer: vikram <vikram.k@gmail.com>
Your name and email address were configured automatically based
on your username and hostname. Please check that they are accurate.
You can suppress this message by setting them explicitly:
```

```
git config --global user.name "Your Name"
git config --global user.email you@example.com
```

After doing this, you may fix the identity used for this commit with:

```
git commit --amend --reset-author
```

```
3 files changed, 3 insertions(+)
create mode 100644 file1.txt
create mode 100644 file2.txt
create mode 100644 file3.txt
```

```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$
```





git:kunchalavikram1427

Git

Create a local git repository

View commit history

- `git log` command lists the commits made in that repository in reverse chronological order
- From the logs you can see the commit SHA ID, Author, Date and Commit message
- The `HEAD` points out the last commit in the current checkout branch. When you switch branches with `git checkout`, the HEAD is transferred to the new branch

```
● ● ●  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$ git log  
commit 53b694153e68bbed93e9a6cfc0c94d97c759b828 (HEAD -> master)  
Author: 428991 <vikram.k@gmail.com>  
Date:   Wed Feb 10 23:50:22 2021 +0530  
  
Initial Commit  
  
428991@LINL190904638 MINGW64 /d/git-demo (master)  
$
```





git:kunchalavikram1427

Git

Create a local git repository

Add few more files to the staging

- `git log`
- `git show head` is used to check the status of the Head

```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git log
commit 2fecdc59b1199dfb2532903c7e378112f79dc714e (HEAD -> master)
Author: 428991
Date:   Thu Feb 11 08:16:27 2021 +0530

    Second Commit, Added file4.txt and file5.txt

commit 53b694153e68bbcd93e9a6cf0c94d97c759b828
Author: 428991
Date:   Wed Feb 10 23:50:22 2021 +0530

    Initial Commit

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git show head
commit 2fecdc59b1199dfb2532903c7e378112f79dc714e (HEAD -> master)
Author: 428991 <vikram.babu-kunchala@alstomgroup.com>
Date:   Thu Feb 11 08:16:27 2021 +0530

    Second Commit, Added file4.txt and file5.txt

diff --git a/file4.txt b/file4.txt
new file mode 100644
index 000000..6cafdb
--- /dev/null
+++ b/file4.txt
@@ -0,0 +1 @@
+My Fourth File
diff --git a/file5.txt b/file5.txt
new file mode 100644
index 000000..e5d949e
--- /dev/null
+++ b/file5.txt
@@ -0,0 +1 @@
+My Fifth File
```

```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ touch file4.txt file5.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ echo "My Fourth File" > file4.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ echo "My Fifth File" > file5.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master
Untracked files:
  (use "git add <file>..." to include in what will be committed)
    file4.txt
    file5.txt

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

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git add .

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master
Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
    new file:   file4.txt
    new file:   file5.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git commit -m "Second Commit, Added file4.txt and file5.txt"
[master 2fecdc] Second Commit, Added file4.txt and file5.txt
  Committer: 428991 <vikram.babu-kunchala@alstomgroup.com>
Your name and email
on your username and hostname. Please check that they are accurate.
You can suppress this message by setting them explicitly:

  git config --global user.name "Your Name"
  git config --global user.email you@example.com

After doing this, you may fix the identity used for this commit with:

  git commit --amend --reset-author

  2 files changed, 2 insertions(+)
  create mode 100644 file4.txt
  create mode 100644 file5.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master
nothing to commit, working tree clean
```



/kunchalavikram1427



Create a local git repository

View commit history

- `git log --patch -2` shows the difference (the patch output) introduced in each commit. You can also limit the number of log entries displayed, such as using -2 to show only the last two entries
- `git log --stat` shows abbreviated stats for each commit
- `git log --pretty=oneline` (or) `git log --oneline --pretty` changes the log output to formats other than the default. --oneline value for this option prints each commit on a single line
- `git log --name-only` – see files changed
- `git log -p` : If you also want to see complete diffs at each step
- `git log --stat --summary`: overview of the change

```
● ● ●

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git log --stat
commit 2fecdc59b1199dfb2532903c7e378112f79dc714e (HEAD -> master)
Author: 428991 <vikram.k@gmail.com>
Date:   Thu Feb 11 08:16:27 2021 +0530

    Second Commit, Added file4.txt and file5.txt

file4.txt | 1 +
file5.txt | 1 +
2 files changed, 2 insertions(+)

commit 53b694153e68bbed93e9a6fcfc0c94d97c759b828
Author: 428991 <vikram.k@gmail.com>
Date:   Wed Feb 10 23:50:22 2021 +0530

    Initial Commit

file1.txt | 1 +
file2.txt | 1 +
file3.txt | 1 +
3 files changed, 3 insertions(+)

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git log --pretty=oneline
2fecdc59b1199dfb2532903c7e378112f79dc714e (HEAD -> master) Second Commit,
Added file4.txt and file5.txt
53b694153e68bbed93e9a6fcfc0c94d97c759b828 Initial Commit
```





Git ignore (.gitignore)

- Git sees every file in your working copy as one of three things: **tracked** - a file which has been previously staged or committed; **untracked** - a file which has not been staged or committed; or **ignored** - a file which Git has been explicitly told to ignore
- Git is meant to store only source files and never the generated files or the personal config files with confidential information
- Any generated code/binaries should not be committed due to following reasons:
 - The generated files can be recreated at any time on the client side and may need to be created in a different form, so It is a waste of time and space to store them in git
 - The generated files are often large than the original source files themselves. Putting them in the repo means that everyone needs to download and store those generated files, even if they're not using them. This increased the clone times
 - Git usually stores only changes made to the file in the subsequent commits by using diff algorithm. Binary files don't really have good diff tools, so Git will frequently just need to store the entire file each time it is committed
- Any file added to **.gitignore** file in the root project directory will not show up as untracked file while doing git status and so can be ignored. Common files to be ignored include:
 - dependency caches, such as the contents of /node_modules or /packages
 - compiled code, such as .o, .pyc, and .class files
 - build output directories, such as /bin, /out, or /target
 - files generated at runtime, such as .log, .lock, or .tmp
 - hidden system files, such as .DS_Store or Thumbs.db
 - personal IDE config files, such as .idea/workspace.xml

Git Ignore patterns:

<https://www.atlassian.com/git/tutorials/saving-changes/gitignore>

<https://github.com/github/gitignore>





Git ignore (.gitignore)

- Let's create a file called TODO.txt which has todo list for personal reference
- Add some content to this file and check the status
- Git shows the file as untracked. But these are personal preferences and should not be committed or bring under Git's radar
- We can add this file to `.gitignore` file to instruct git to ignore the changes done to TODO file and not to track
- We should commit `.gitignore` file so others can use it and updated it with their own to be ignored content like files generated code, log files, cache files and IDE specific files



```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git log --oneline
755a2fc (HEAD -> master) Added .gitignore
2fedc59 Second Commit, Added file4.txt and file5.txt
53b6941 Initial Commit
```



```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ echo "[TODO]: Change the login button layout" > TODO.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master
Untracked files:
  (use "git add <file>..." to include in what will be committed)
    TODO.txt

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

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ echo "TODO.txt" >> .gitignore

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ cat .gitignore
TODO.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ ls -a
./ ../ .git/ .gitignore file1.txt file2.txt file3.txt file4.txt file5.txt
TODO.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master
Untracked files:
  (use "git add <file>..." to include in what will be committed)
    .gitignore

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





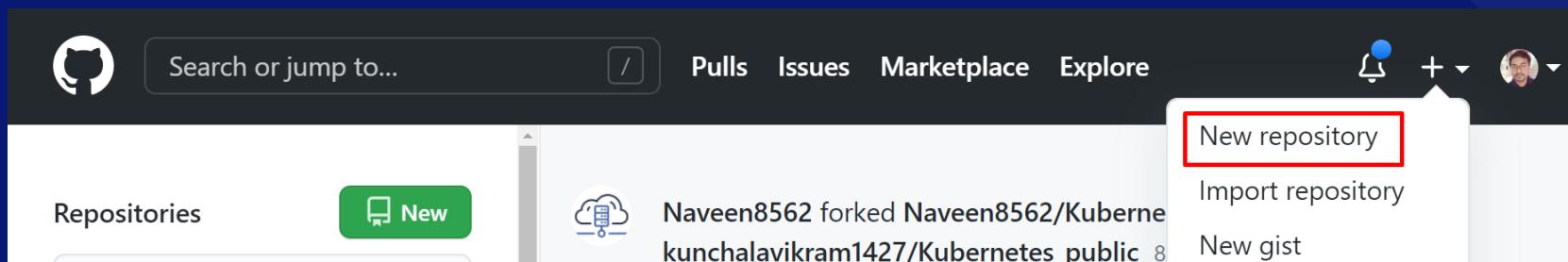
git:kunchalavikram1427

Git

Create a Remote Repo

Remote Repo in Github

- Files/Project which you have created earlier stays within your local repository
- If you want to share these files with other developers or team members to collaborate, you need to push the local repo to a remote repository like GitHub
- After you have a remote repository set up, you upload (push) your files and revision history to it. After someone else makes changes to a remote repo, you can download (pull) their changes into your local repo
- Go to <https://github.com/> and create a New Repository





git:kunchalavikram1427

Git

Create a Remote Repo Remote Repo in Github

- Give a Repository name, Description and Make the repo public
- Click on Create Repository to create it

Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? [Import a repository.](#)

Owner * kunchalavikram1427

Repository name *

Great repository names are short and memorable. Need inspiration? How about [psychic-happiness?](#)

Description (optional)

Public Anyone on the internet can see this repository. You choose who can commit.

Private You choose who can see and commit to this repository.

Initialize this repository with:

Skip this step if you're importing an existing repository.

Add a README file This is where you can write a long description for your project. [Learn more.](#)

Add .gitignore Choose which files not to track from a list of templates. [Learn more.](#)

Choose a license A license tells others what they can and can't do with your code. [Learn more.](#)

Create repository



/kunchalavikram1427



git:kunchalavikram1427

Git

Create a Remote Repo

Remote Repo in Github

- Once created, GitHub will prompt to create a new repo or to add a repo we have created locally
- In our case, since we've already created a local repository, we can push it directly
- Git will also show us the instructions to be followed to push our local repo.
- In this case we need to push to the URL that is shown

Quick setup — if you've done this kind of thing before

or HTTPS SSH <https://github.com/kunchalavikram1427/test-repo.git>

Get started by [creating a new file](#) or [uploading an existing file](#). We recommend every repository include a [README](#), [LICENSE](#), and [.gitignore](#).

...or create a new repository on the command line

```
echo "# test-repo" >> README.md  
git init  
git add README.md  
git commit -m "first commit"  
git branch -M main  
git remote add origin https://github.com/kunchalavikram1427/test-repo.git  
git push -u origin main
```

...or push an existing repository from the command line

```
git remote add origin https://github.com/kunchalavikram1427/test-repo.git  
git branch -M main  
git push -u origin main
```

...or import code from another repository

You can initialize this repository with code from a Subversion, Mercurial, or TFS project.



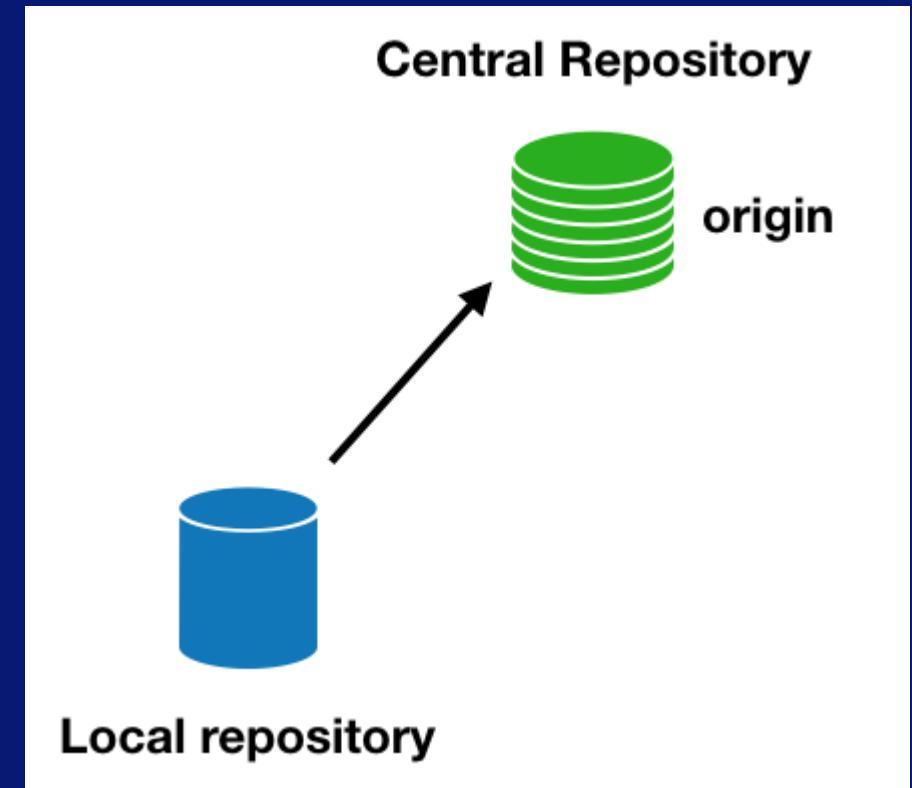
/kunchalavikram1427



Create a Remote Repo

What Is Origin?

- **Origin** is an alias to the remote repository
- We assign an alias so we won't have to write out the URL of the remote repo every time we want to work with the remote repository
- While **origin** is the alias that most people prefer to use, it is not a standard and we can use our own naming conventions





Remote Repo

Adding the remote repo

- Add the remote repo by running
 - `git remote add origin https://github.com/<your-user-account>/test-repo.git`
- `remote` command adds a remote repository to the current repository
- Check the remote URLs and their aliases
 - `git remote -v`
- Remove the remote repo by running
 - `git remote rm origin`



```
428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git remote add origin https://github.com/kunchalavikram1427/test-repo.git
```

```
428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git remote -v
origin https://github.com/kunchalavikram1427/test-repo.git (fetch)
origin https://github.com/kunchalavikram1427/test-repo.git (push)
```

```
428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git config --list
.
.
.
user.name=vikram
remote.origin.url=https://github.com/kunchalavikram1427/test-repo.git
remote.origin.fetch=+refs/heads/*:refs/remotes/origin/*
```





git:kunchalavikram1427

Git

Remote Repo

Push the files to the origin

- `git push` pushes our local repo changes to the added remote repo. **origin** represents the remote repo and **master** is the branch you want to push to. Git will prompt for your git credentials during push
 - `git push -u origin master`
- We can omit origin and -u master parameters from the git push command with the following two Git configuration changes:
 \$ git config remote.pushdefault origin
 \$ git config push.default current
- The first setting saves you from typing origin every time. And with the second setting, Git assumes that the remote branch on the GitHub side will have the same name as your local branch.

```
● ● ●  
428991@LINL190904638 MINGW64 /d/git-demo (dev)  
$ git push -u origin master  
Enumerating objects: 12, done.  
Counting objects: 100% (12/12), done.  
Delta compression using up to 8 threads  
Compressing objects: 100% (6/6), done.  
Writing objects: 100% (12/12), 854 bytes | 427.00 KiB/s, done.  
Total 12 (delta 2), reused 0 (delta 0), pack-reused 0  
remote: Resolving deltas: 100% (2/2), done.  
To https://github.com/kunchalavikram1427/test-repo.git  
 * [new branch]      master -> master  
Branch 'master' set up to track remote branch 'master' from 'origin'.  
  
428991@LINL190904638 MINGW64 /d/git-demo (dev)  
$
```



/kunchalavikram1427



git:kunchalavikram1427

Git

Remote Repo

Push the files to the origin

- Go to your GitHub account and see the changes

The screenshot shows a GitHub repository page for 'kunchalavikram1427 / test-repo'. The 'Code' tab is selected. At the top, it shows 'master' branch, '1 branch', '0 tags', and buttons for 'Go to file', 'Add file', and 'Code'. Below is a list of commits:

Author	Commit Message	Date	Commits
vikram	Added .gitignore	755a2fc 5 hours ago	3 commits
	.gitignore	Added .gitignore	5 hours ago
	file1.txt	Initial Commit	19 hours ago
	file2.txt	Initial Commit	19 hours ago
	file3.txt	Initial Commit	19 hours ago
	file4.txt	Second Commit, Added file4.txt and file5.txt	11 hours ago
	file5.txt	Second Commit, Added file4.txt and file5.txt	11 hours ago

At the bottom, there's a message: 'Help people interested in this repository understand your project by adding a README.' with a 'Add a README' button.



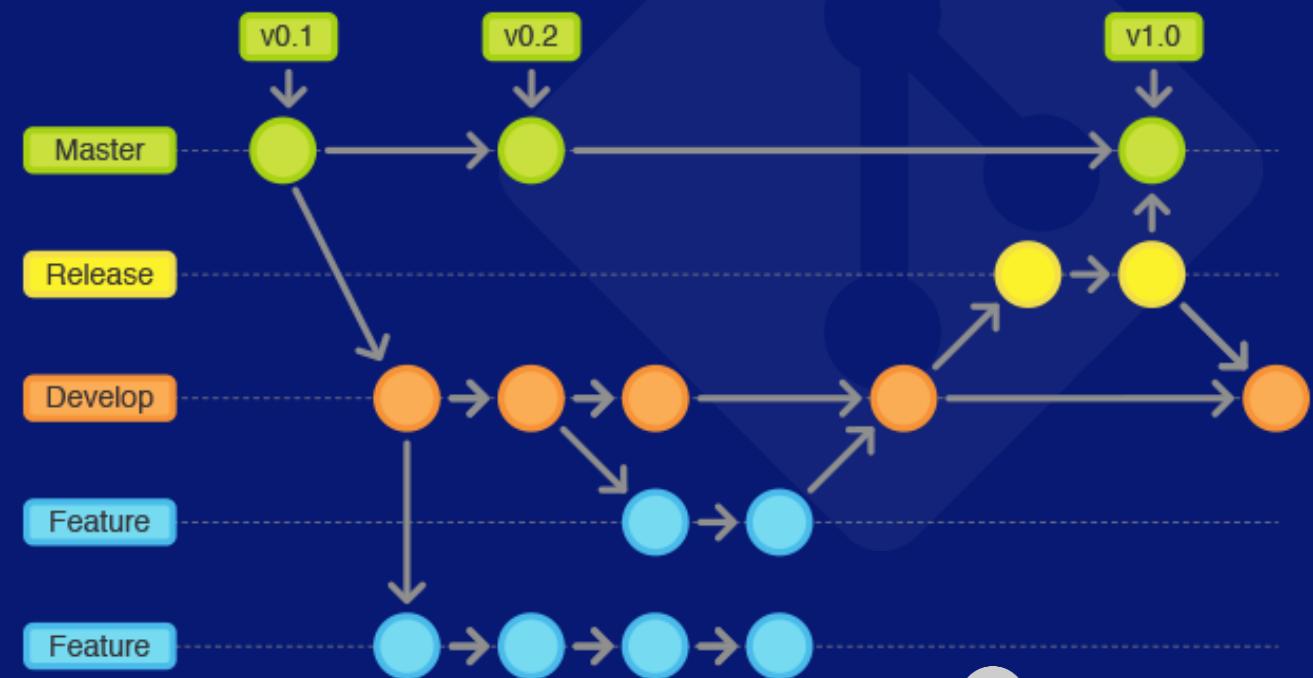
/kunchalavikram1427



Branches

- GIT Branch is about maintaining the separate line of development. The default branch is **Master**
- Git lets you branch out from the original code base. This lets you more easily work with other developers, and gives you a lot of flexibility in your workflow
- Let's say you need to work on a new feature for a website. You create a new branch and start working. You haven't finished your new feature, but you get a request to make a rush change that needs to go live on the site today. You switch back to the master branch, make the change, and push it live. Then you can switch back to your new feature branch and finish your work. When you're done, you merge the new feature branch into the master branch, and both the new feature and rush change are kept!

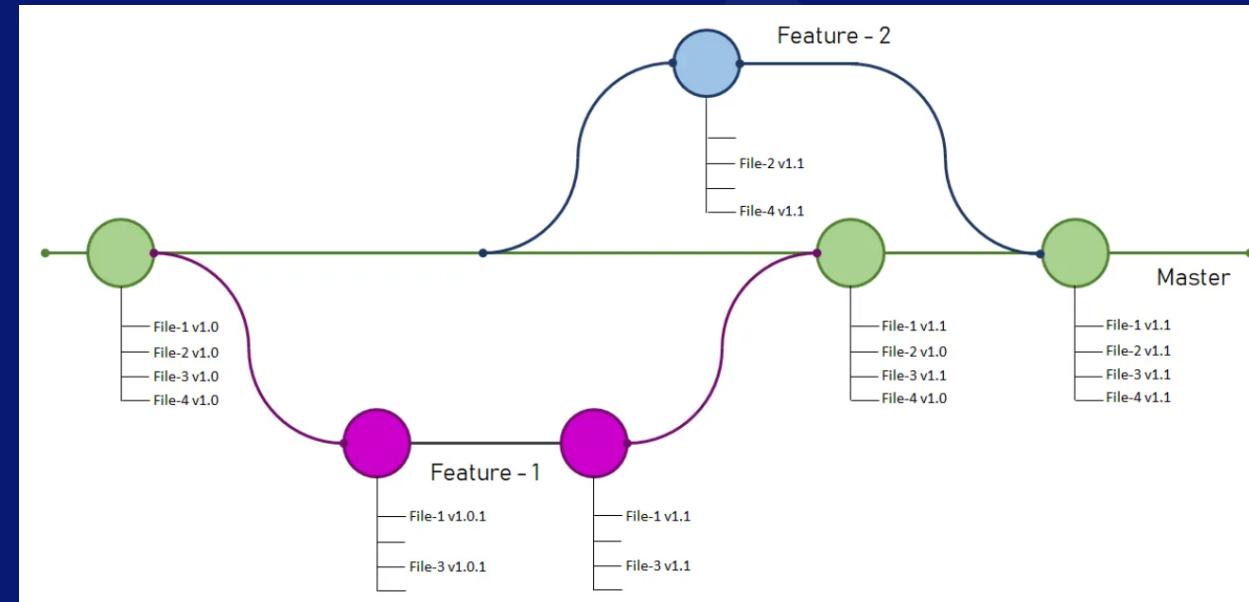
Git Branch is basically a pointer to the last commit





Branches

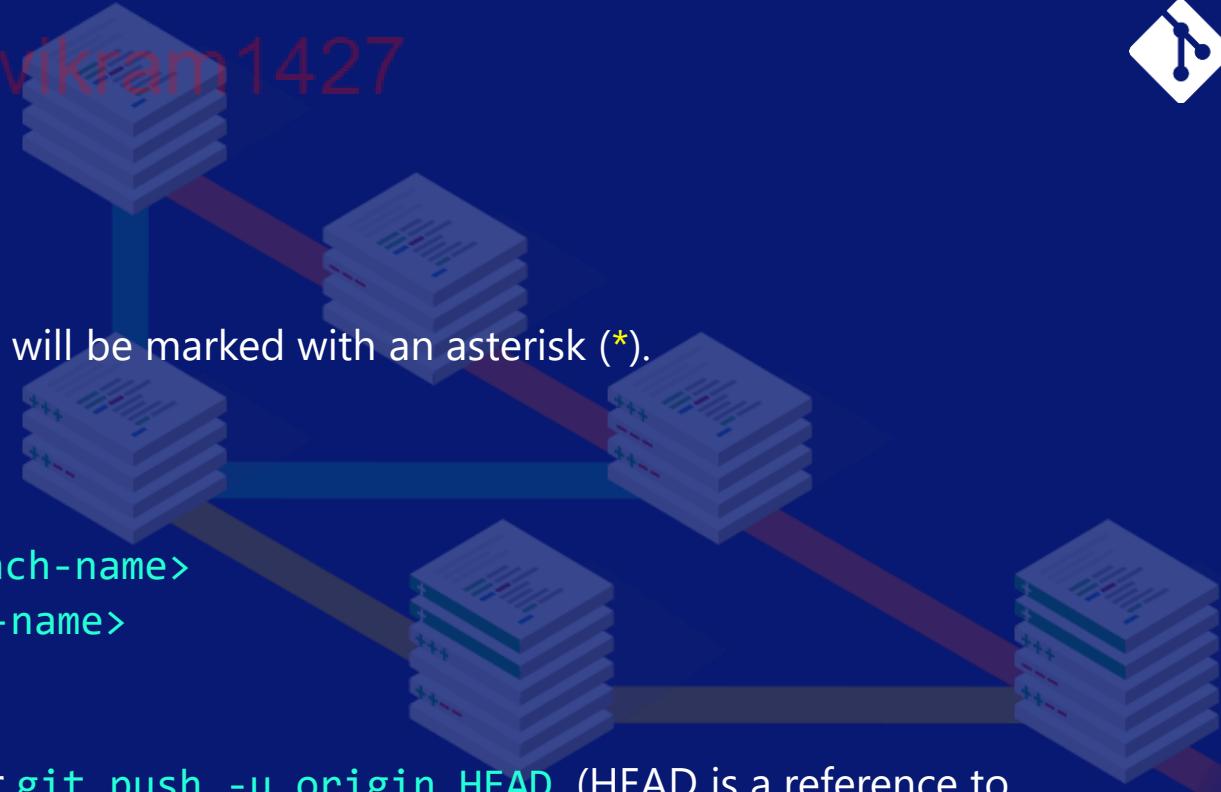
- Basically, A branch is the isolated and independent line of developing the feature
- Assume the middle line as the master branch where the code is stable, working and updated
- Then, assume a developer-1 is assigned to develop Feature – 1. So, Developer-1 is cutting a branch from the master branch which is indicated in the diagram as in Magenta colour
- Similarly Developer-2 is assigned to develop Feature-2 and he is cutting a branch from the master branch which is indicated in Blue colour
- When both of them are done with their changes they merge their branches to the master and these feature branches can be safely deleted
- Let's assume the codebase is the set of four files called File-1, File-2, File-3, and File-4. So, when Developer-1 is taking the branch from master to develop feature-1 (assume File-1 and File-3 are going to be changed for the development). So, the developer can safely commit his changes on both files into the master branch. Vice versa, When Developer-2 is taking the branch from master to develop feature-2 (assume File-2 and File-4 are going to be changed for the development).





Branch commands

- Check What Branch You're On: `git status`
- To see local branches: `git branch` (The current local branch will be marked with an asterisk (*).)
- To see remote branches: `git branch -r`
- To see all local and remote branches: `git branch -a`
- Create a New Branch: `git branch <branch-name>`
- Switch to a Branch In Your Local Repo: `git checkout <branch-name>`
- Create a branch and checkout: `git checkout -b <branch-name>`
- Rename a Branch: `git branch -m <branch-name>`
- To get a list of all branches from the remote: `git pull`
- Push to a Branch: `git push -u origin <branch-name>` or `git push -u origin HEAD` (HEAD is a reference to the top of the current branch, so it's an easy way to push to a branch of the same name on the remote. This saves you from having to type out the exact name of the branch!)
- If your local branch already exists on the remote: `git push`
- You'll want to make sure your working tree is clean and see what branch you're on: `git status`
- `git merge <branch-name>` (If you want this branch to merge to master, you should already be in master branch before merging. If not run `git checkout master`)
- To delete a remote branch :`git push origin --delete <branch-name>`
- To delete a local branch: `git branch -d <branch-name>` (or) `git branch -D <branch-name>` (the -d option only deletes the branch if it has already been merged. The -D option is a shortcut for --delete --force, which deletes the branch irrespective of its merged status)



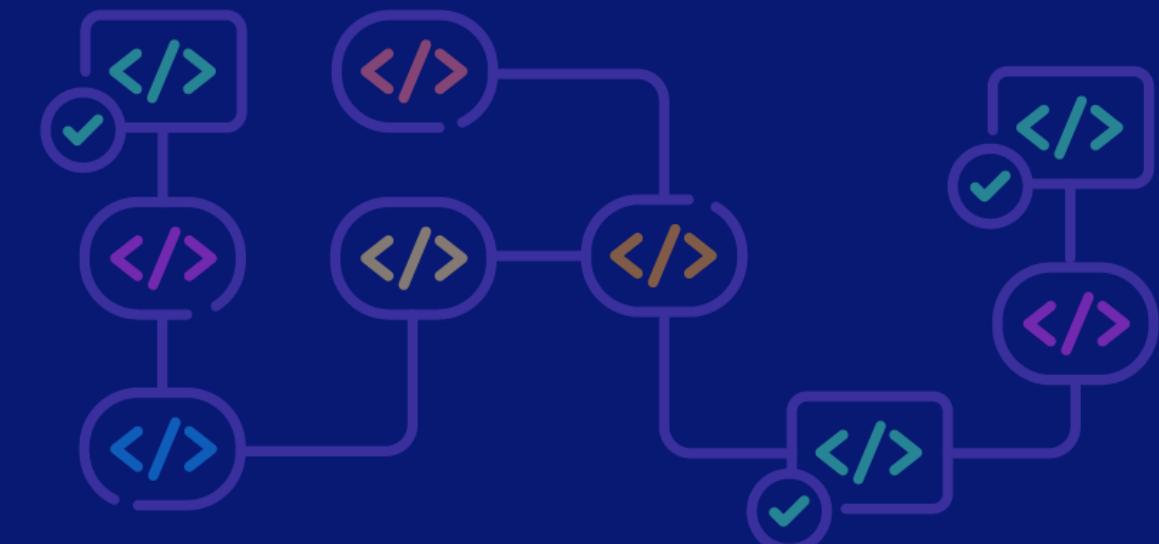
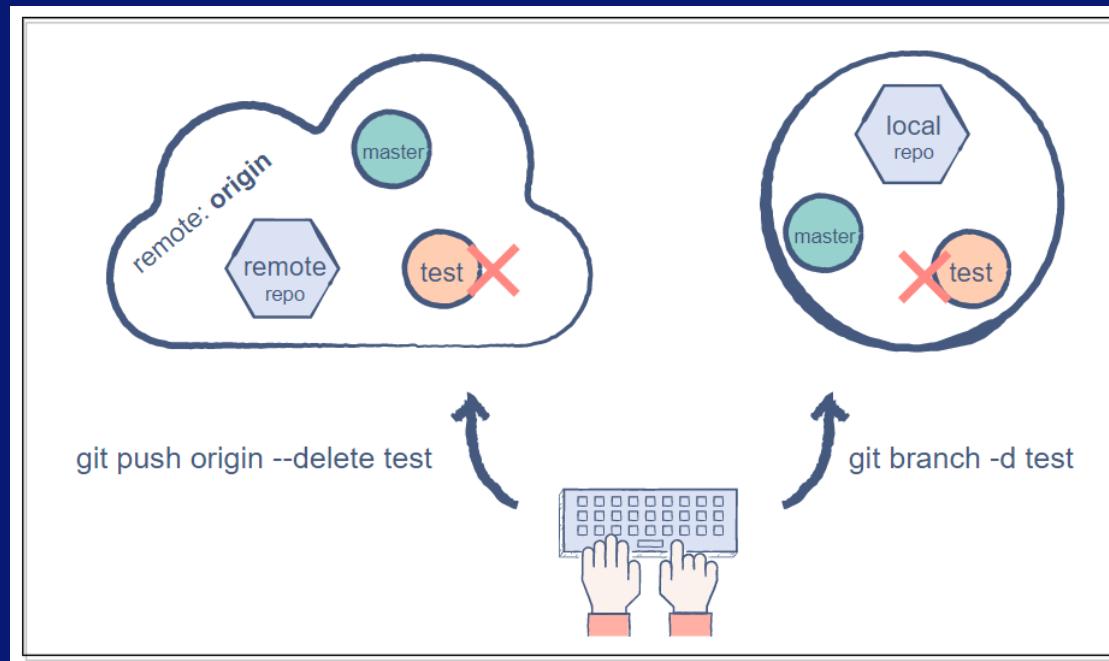


git:kunchalavikram1427

Git

Branch commands

- Delete a remote branch: `git push origin --delete :<branch-name>` or `git push origin :<branch_name>`
- Rename a local branch by being in the same branch: `git branch -m <new-branch-name >`
- Rename a local branch by being in another branch: `git branch -m <old-branch-name > <new-branch-name >`
- If you are in the branch which needs to be renamed in remote, then pass the following command with upstream argument -u: `git push origin -u new-name`



/kunchalavikram1427



git:kunchalavikram1427

Git

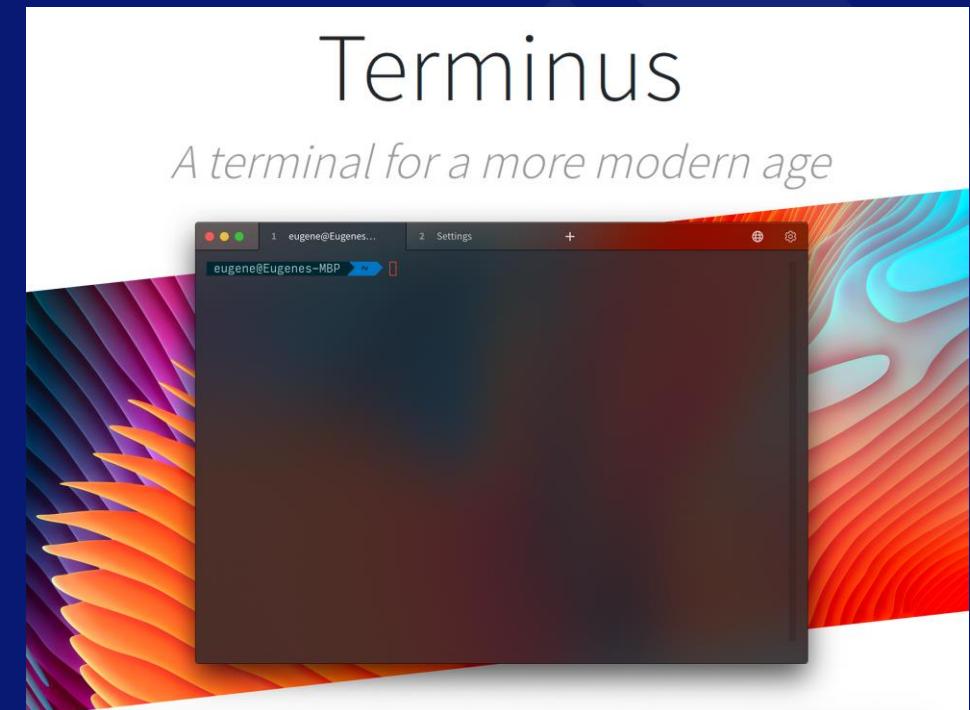
CLI

- Git can be used using a command line (terminal), or a desktop app that has a GUI (graphical user interface) such as [SourceTree](#) shown next
- I prefer using terminus <https://github.com/Eugeny/terminus> which is a CLI tool. It directly shows the current git branch as seen below and has many features like Serial, SSH protocols
- Download it from here <https://github.com/Eugeny/terminus/releases/tag/v1.0.132>

```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master
nothing to commit, working tree clean

428991@LINL190904638 MINGW64 /d/git-demo (master)
$

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ |
```



/kunchalavikram1427



git:kunchalavikram1427

Git

SourceTree

- To visually see every commit and branches, download [SourceTree](https://www.sourcetreeapp.com/) from <https://www.sourcetreeapp.com/>
- During installation, SourceTree will automatically detect your Git installation
- Once installed, import the git project created or add a remote origin
- As you can see below, during our demo we have made 3 commits to the master branch

The screenshot shows the SourceTree application interface. The left sidebar has sections for WORKSPACE (File Status, History, Search), BRANCHES (master selected), TAGS, REMOTES, and STASHES. The main area displays a commit history for the 'master' branch. The commits are:

Description	Date	Author	Commit ID
Added .gitignore	11 Feb 2021 13:40	vikram	755a2fc
Second Commit, Added file4.txt and file5.txt	11 Feb 2021 8:16	428991	2fedc59
Initial Commit	10 Feb 2021 23:50	428991	53b6941

Below the commits, a specific commit is expanded (53b6941). The commit details are:

Commit: 53b694153e68bbcd93e9a6fc0c94d97c759b828 [53b6941]
Author: 428991 <vikram.babu-kunchala@LAPTOP-1>
Date: 10 February 2021 11:50:22 PM
Committer: 428991

The commit content is shown in a file viewer:

File Contents
+ My First File



Git

Branches

- Show current branch. The current local branch will be marked with an asterisk (*)
 - `git status`
- List all of the branches in your repository
 - `git branch`
 - `git branch --list`
- Create a new branch dev
 - `git branch dev`
- Switch to another branch
 - `git checkout dev`
- Create and checkout at once
 - `git checkout -b dev`
- Check HEAD (HEAD points out the last commit in the current checkout branch)
 - `git show head`

For making commits to a new branch, you should be in that branch already!

git:kunchalavikram1427

```
● ● ●

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git log --oneline
755a2fc (HEAD -> dev, master) Added .gitignore
2fedc59 Second Commit, Added file4.txt and file5.txt
53b6941 Initial Commit

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git status
On branch master
nothing to commit, working tree clean

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git branch
* master

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git branch dev
* master

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git branch
  dev
* master

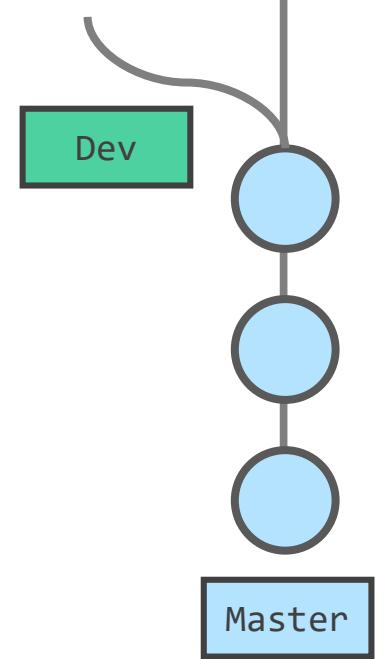
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git checkout dev
Switched to branch 'dev'

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git status
On branch dev
nothing to commit, working tree clean

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git branch
* dev
  master

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git show head
commit 755a2fc69ec0ef2b740cf5e2b8c8768dc69e20ec (HEAD -> dev, master)

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git log --oneline
755a2fc (HEAD -> dev, master) Added .gitignore
2fedc59 Second Commit, Added file4.txt and file5.txt
53b6941 Initial Commit
```



/kunchalavikram1427



Git

Branches

Push the files to origin

- Add a new file file6.txt ad check the status
 - `git status`
- Add the file to staging
 - `git add .`
- Commit to local
 - `git commit -m "Added Sixth File to Dev Branch"`
- Push to remote dev branch
 - `git push origin dev`
- Check log
 - `git log --oneline`



Add and commit in 1 shot:

`git commit -a -m "Commit message"`

git:kunchalavikram1427

```
428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ ls -a
./ ../.git/ .gitignore file1.txt file2.txt file3.txt file4.txt
file5.txt TODO.txt

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ touch file6.txt

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ echo "My Sixth File" > file6.txt

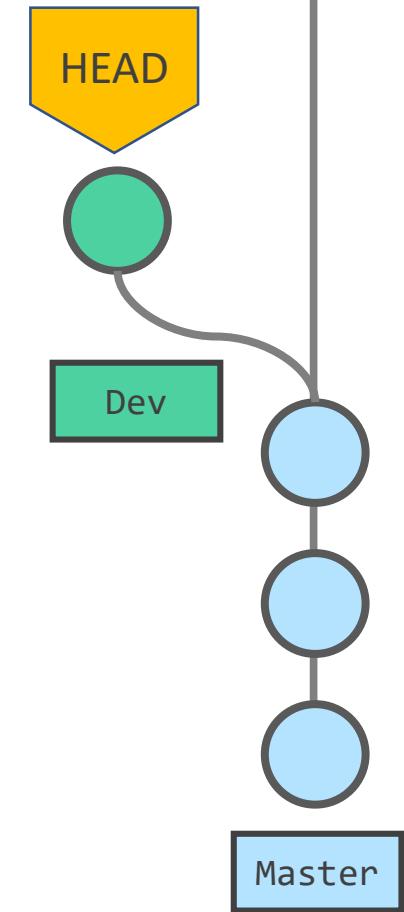
428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git status
On branch dev
Untracked files:
  (use "git add <file>..." to include in what will be committed)
    file6.txt

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

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git add .
warning: LF will be replaced by CRLF in file6.txt.
The file will have its original line endings in your working directory

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git commit -m "Added Sixth File to Dev Branch"
[dev 7f953dd] Added Sixth File to Dev Branch
 1 file changed, 1 insertion(+)
 create mode 100644 file6.txt

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git push origin dev
Enumerating objects: 4, done.
Counting objects: 100% (4/4), done.
Delta compression using up to 8 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 295 bytes | 295.00 KiB/s, done.
Total 3 (delta 1), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
remote: Create a pull request for 'dev' on GitHub by visiting:
remote:   https://github.com/kunchalavikram1427/test-repo/pull/new/dev
remote
To https://github.com/kunchalavikram1427/test-repo.git
 * [new branch]      dev -> dev
```



```
428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git log --oneline
7f953dd (HEAD -> dev, origin/dev) Added Sixth File to Dev Branch
755a2fc (origin/master, master) Added .gitignore
2fedc59 Second Commit, Added file4.txt and file5.txt
53b6941 Initial Commit
```



/kunchalavikram1427



git:kunchalavikram1427

Git

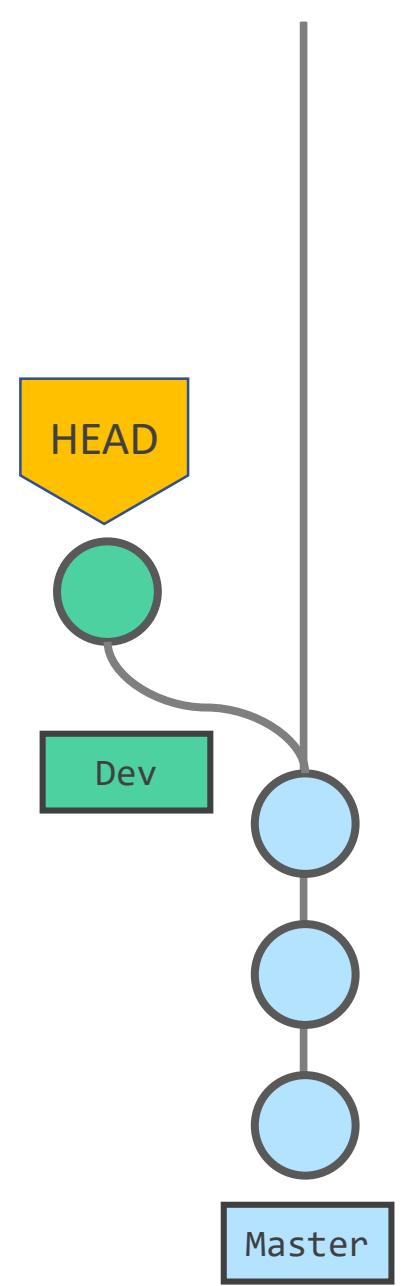
Branches

Push the files to origin

- To know from which commit/branch, the **dev** branch is created, run the below command by being in the **dev** branch
 - `git log --graph --decorate`
- From the log it is evident that dev branch is created from the master
- Similarly, to know the branching information of a particular branch, switch to that branch and run the command

```
● ● ●

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git log --graph --decorate
* commit 7f953dd9292ca608e7a803fda7bfc682f7d01070 (HEAD -> dev, origin/dev)
| Author: vikram
| Date:  Thu Feb 11 19:10:49 2021 +0530
|
|     Added Sixth File to Dev Branch
|
* commit 755a2fc69ec0ef2b740cf5e2b8c8768dc69e20ec (origin/master, master)
| Author: vikram
| Date:  Thu Feb 11 13:40:26 2021 +0530
|
|     Added .gitignore
|
* commit 2fedc59b1199dfb2532903c7e378112f79dc714e
| Author: 428991
| Date:  Thu Feb 11 08:16:27 2021 +0530
|
|     Second Commit, Added file4.txt and file5.txt
|
* commit 53b694153e68bbcd93e9a6fcfc0c94d97c759b828
| Author: 428991
| Date:  Wed Feb 10 23:50:22 2021 +530
|
|     Initial Commit
```



/kunchalavikram1427



git:kunchalavikram1427

Git

Branches

Push the files to origin

- Check your files in the repository in dev branch

dev had recent pushes less than a minute ago

Compare & pull request

dev ▾ 2 branches 0 tags

Go to file Add file ▾ Code ▾

This branch is 1 commit ahead of master.

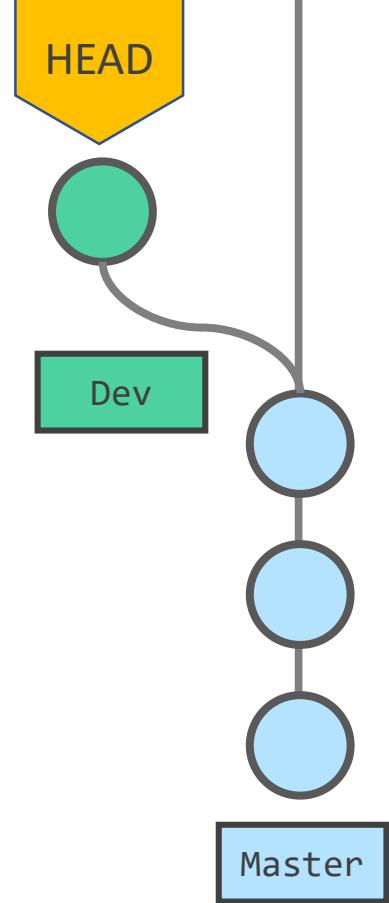
Pull request Compare

vikram Added Sixth File to Dev Branch 7f953dd 6 minutes ago 4 commits

File	Commit Message	Time
.gitignore	Added .gitignore	6 hours ago
file1.txt	Initial Commit	19 hours ago
file2.txt	Initial Commit	19 hours ago
file3.txt	Initial Commit	19 hours ago
file4.txt	Second Commit, Added file4.txt and file5.txt	11 hours ago
file5.txt	Second Commit, Added file4.txt and file5.txt	11 hours ago
file6.txt	Added Sixth File to Dev Branch	6 minutes ago

Help people interested in this repository understand your project by adding a README.

Add a README



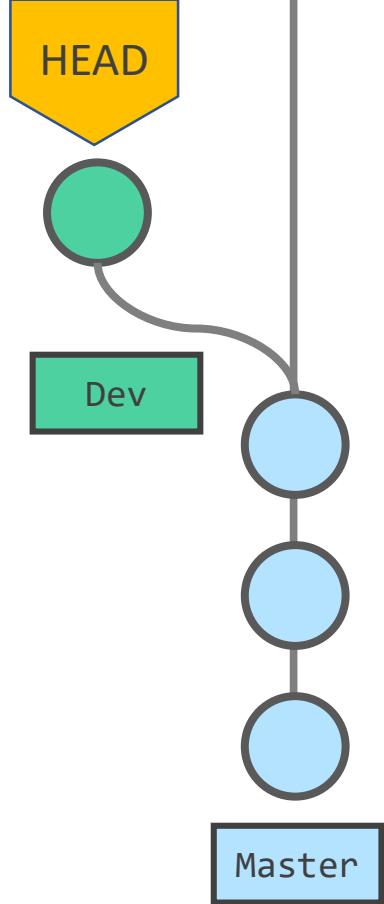
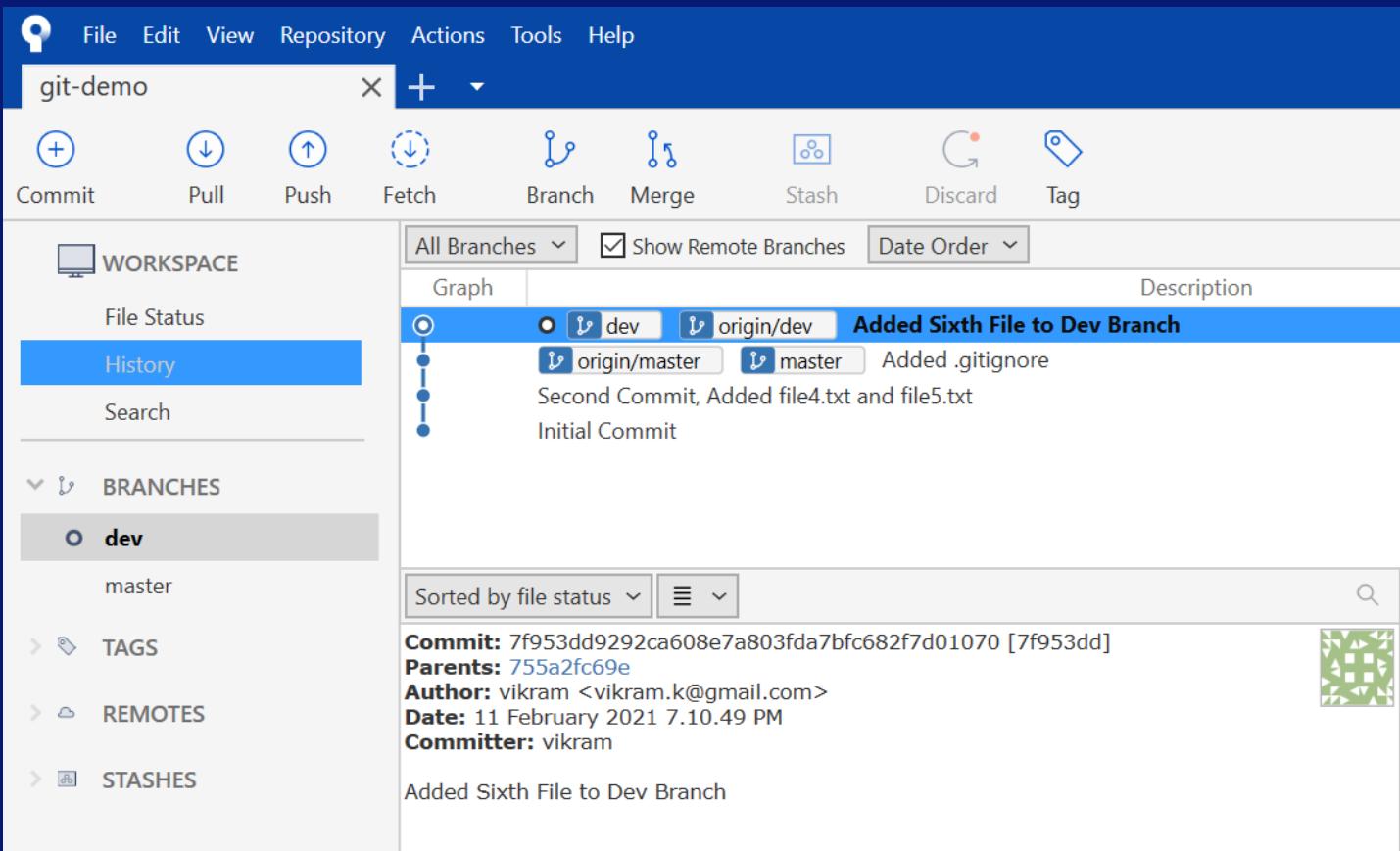
/kunchalavikram1427

Git

Branches

Push the files to origin

- Verify the same in SourceTree





Branches Checkout

- The git checkout command operates upon three distinct entities: files, commits, and branches
- The git checkout command lets you navigate between the branches created by git branch
- Checking out a branch updates the files in the working directory to match the version stored in that branch, and it tells Git to record all new commits on that branch
 - `git checkout master` – switches the branch to master and update the files as well
- Since file6.txt is only in dev branch, the file is missing in the master branch. Master is 1 commit behind the dev branch

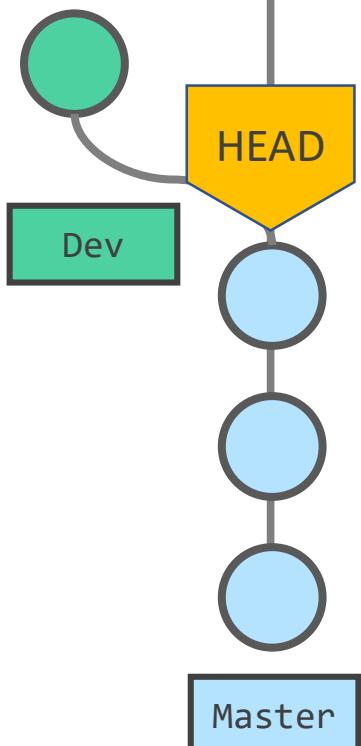
```
● ● ●

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ ls -a
./ ../.git/ .gitignore file1.txt file2.txt file3.txt file4.txt file5.txt file6.txt TODO.txt

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git checkout master
Switched to branch 'master'
Your branch is up to date with 'origin/master'.

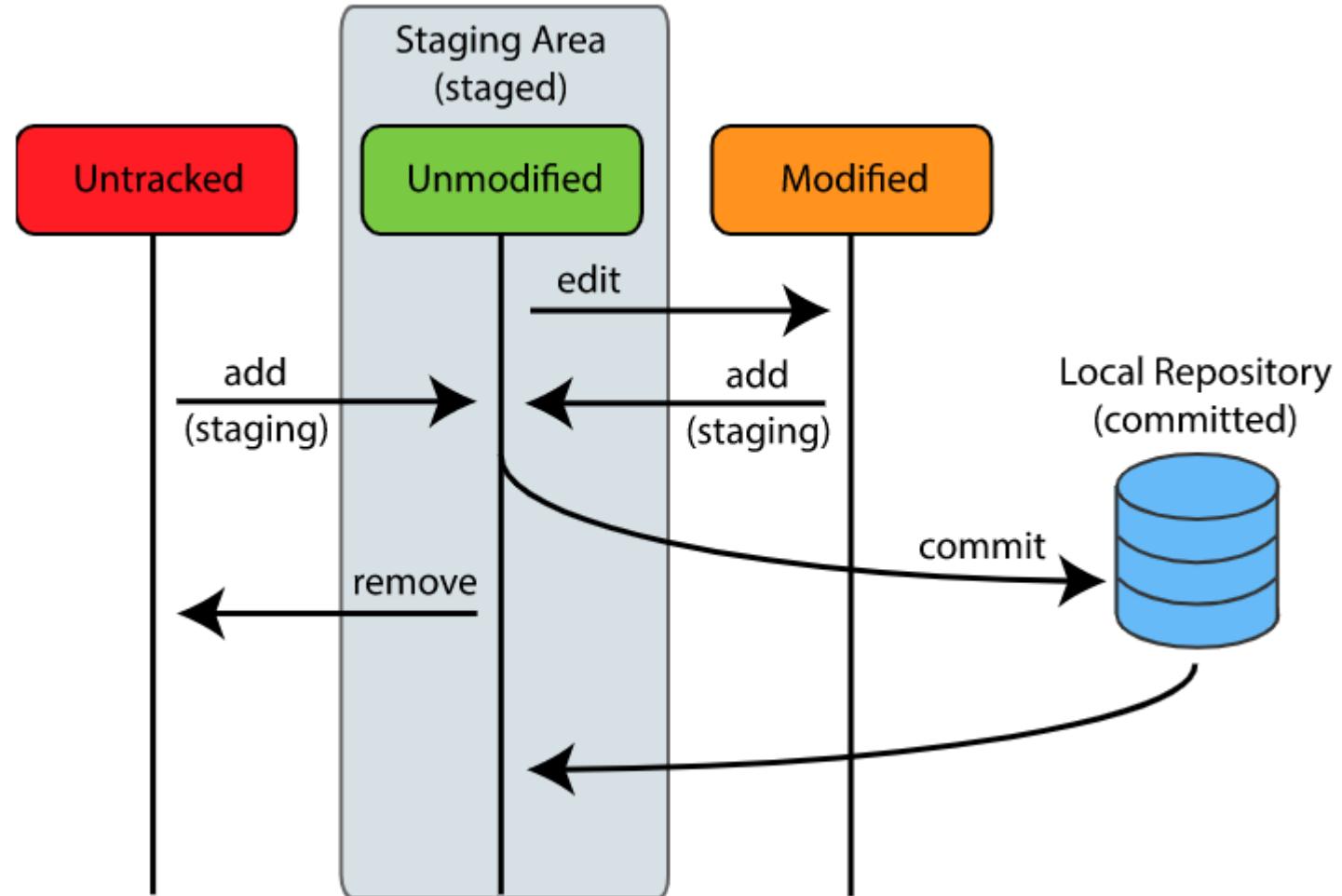
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ ls -a
./ ../.git/ .gitignore file1.txt file2.txt file3.txt file4.txt file5.txt TODO.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git show head
commit 755a2fc69ec0ef2b740cf5e2b8c8768dc69e20ec (HEAD -> master, origin/master)
```





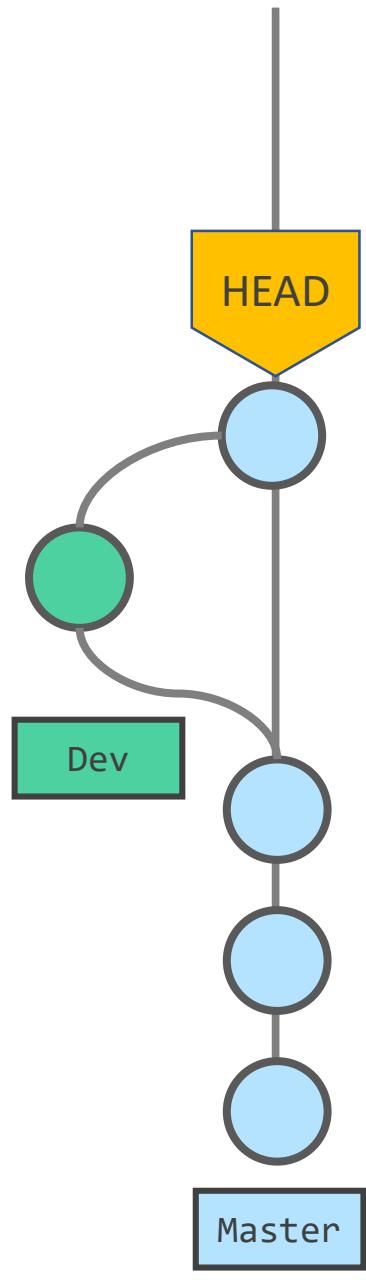
Workflow





Merge

- A branch is nothing but a pointer to the latest commit in the Git repository
- Currently, **dev** branch is ahead of the **master** by 1 commit
- Let's merge all the changes in the dev branch to master using `git merge` command
- In order to merge the code from the dev branch into the master branch, we should first checkout to master
 - `git checkout master`
 - `git merge dev`
- After running these 2 commands, the merge should be successful. In this example, there are no conflicts. But in real projects, there will be conflicts when a merge is being done.
- We will see about Merge conflicts in the later part of the Tutorial
- Run `git log` now and you will notice that the master now has now 4 commits and the **file6.txt** which is created in dev branch
- Since dev branch is now merged to master, it can be safely removed
- To delete a local branch: `git branch -d <branch-name>` (or) `git branch -D <branch-name>` (the -d option only deletes the branch if it has already been merged. The -D option is a shortcut for --delete --force, which deletes the branch irrespective of its merged status)
- Let's delete the branch dev using `git branch -d dev`
- Push all the changes to the remote repo using `git push`
- To delete remote dev branch, run: `git push origin :dev`





git:kunchalavikram1427

Git

Merge

- Check the remote & local branches using
 - `git branch -a`

```
428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git branch -a
* master
  remotes/origin/master
```

The screenshot shows a GitHub repository interface. At the top, there are buttons for 'master' (selected), '1 branch', '0 tags', 'Go to file', 'Add file', and a 'Code' dropdown. A red arrow points to the 'master' branch selection button with the text 'No Dev Branch'. Below this, a 'Switch branches/tags' dropdown has 'Find or create a branch...' and 'Tags' selected. The main area displays a list of commits:

Commit	Date
Added .gitignore	yesterday
Initial Commit	2 days ago
Initial Commit	2 days ago
Initial Commit	2 days ago
file3.txt	
file4.txt	Second Commit, Added file4.txt and file5.txt
file5.txt	Second Commit, Added file4.txt and file5.txt
file6.txt	Added Sixth File to Dev Branch

At the bottom, there's a note: 'Help people interested in this repository understand your project by adding a README.' and a 'Add a README' button.

```
428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git log --oneline
7f953dd (HEAD -> dev, origin/dev) Added Sixth File to Dev Branch
755a2fc (origin/master, master) Added .gitignore
2fedc59 Second Commit, Added file4.txt and file5.txt
53b6941 Initial Commit

428991@LINL190904638 MINGW64 /d/git-demo (dev)
$ git checkout master && git log --oneline
Switched to branch 'master'
Your branch is up to date with 'origin/master'.
755a2fc (HEAD -> master, origin/master) Added .gitignore
2fedc59 Second Commit, Added file4.txt and file5.txt
53b6941 Initial Commit

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git merge dev
Updating 755a2fc..7f953dd
Fast-forward
  file6.txt | 1 +
  1 file changed, 1 insertion(+)
  create mode 100644 file6.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git log --oneline
7f953dd (HEAD -> master, origin/dev, dev) Added Sixth File to Dev Branch
755a2fc (origin/master) Added .gitignore
2fedc59 Second Commit, Added file4.txt and file5.txt
53b6941 Initial Commit

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ ls -a
./ ../.git/.gitignore file1.txt file2.txt file3.txt file4.txt file5.txt file6.txt TODO.txt

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git branch -d dev
Deleted branch dev (was 7f953dd).

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git push
Total 0 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/kunchalavikram1427/test-repo.git
  755a2fc..7f953dd  master -> master

428991@LINL190904638 MINGW64 /d/git-demo (master)
$ git push origin :dev
To https://github.com/kunchalavikram1427/test-repo.git
 - [deleted]          dev
```



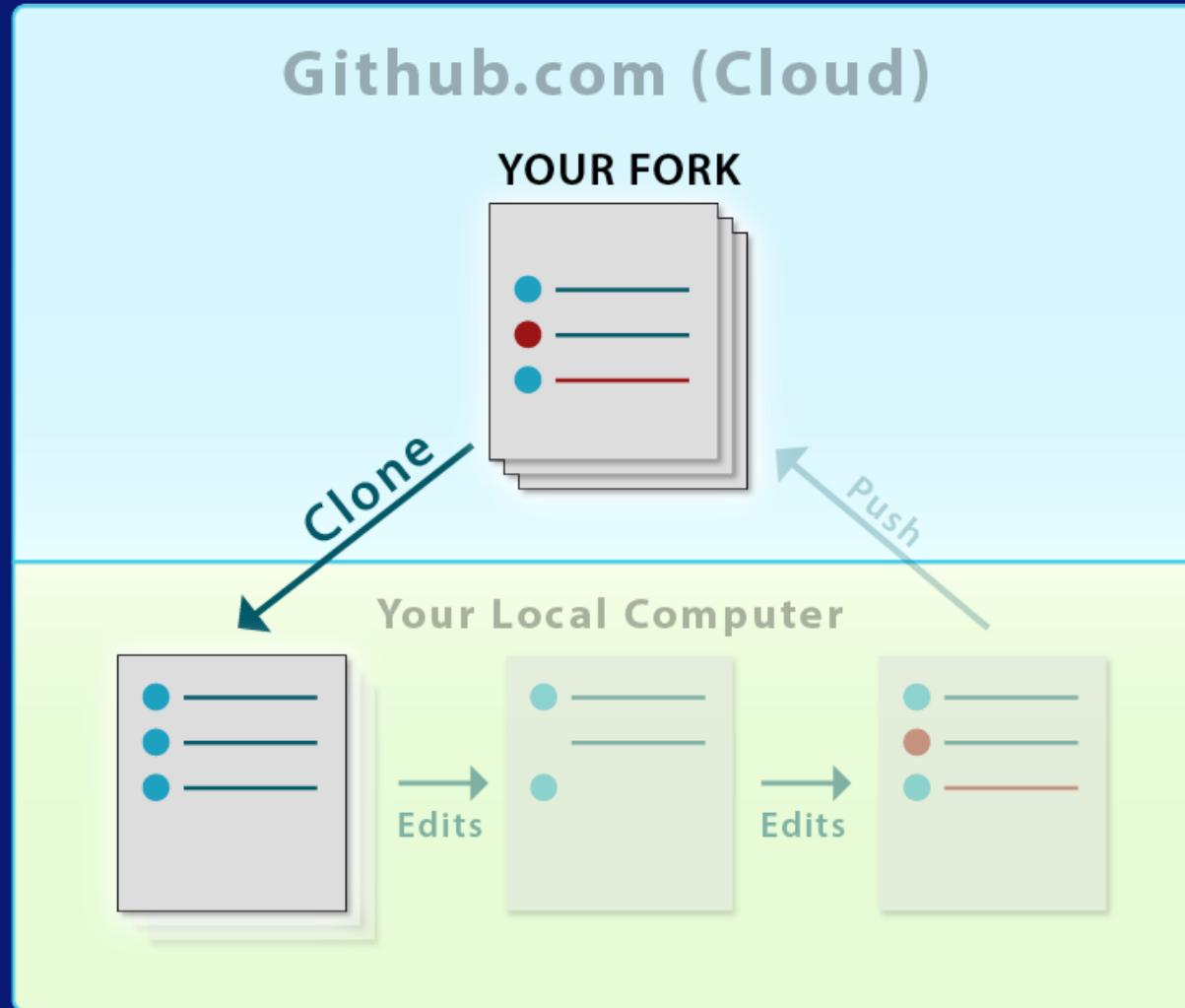
Cloning an Existing Repository

- `git clone` is used to clone an existing remote repository into your computer by using the command
 - `git clone <repository-url>`
- When we clone a repository, all the files are downloaded to the local machine but the remote git repository remains unchanged
- Making changes to this cloned repo and committing them on your local repository will not affect the remote repository in any way
- These changes made on the local machine can be pushed to the remote repository anytime the user wants
- Whenever working on a team, whether it's in an open source project or a corporate setting, it's always a good practice to create a new branch (usually based on master) and start the changes from there
- You cannot directly push your changes to the master branch(main) of the cloned repository unless you are added as the collaborator to that project by the project admin
- In any way, it is always advised to create a separate branch, work on the changes in that branch and create a **Pull Request(PR)** or **Merge Request** for merging feature branch changes to the master branch
- The master branch holds the working copy of the work product and no changes are to be pushed to that branch unless properly reviewed and approved





Cloning an Existing Repository





Git

git:kunchalavikram1427

Cloning an Existing Repository

- Clone the repository
 - `git clone <URL>`
- Check the existing branches
 - `git branch -a`
- Check the commit history
 - `git log --stat`

The screenshot shows a GitHub repository page for 'vikrambabu1427/clone-test'. The 'Code' dropdown menu is open, and the 'Clone' option is highlighted with a red box. The URL 'https://github.com/vikrambabu1427/clone-test' is displayed next to it.

```
428991@LINL190904638 MINGW64 /d
$ git clone https://github.com/vikrambabu1427/clone-test.git
Cloning into 'clone-test'...
remote: Enumerating objects: 8, done.
remote: Counting objects: 100% (8/8), done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 8 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (8/8), 1.35 KiB | 20.00 KiB/s, done.

428991@LINL190904638 MINGW64 /d/clone-test
$ cd clone-test/
$ git status
On branch main
Your branch is up to date with 'origin/main'.

nothing to commit, working tree clean

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ ls -a
./ ../.git/ file1.txt file2.txt file3.txt README.md

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git log --stat --summary
commit 0efbd8d268a9f5acf74398684996ae00c9d4e3d (HEAD -> main, origin/main, origin/HEAD)
Author: vikrambabu1427 <78962677+vikrambabu1427@users.noreply.github.com>
Date:   Fri Feb 12 17:59:23 2021 +0530

    initial commit

    initial commit. Added file1,file2, file3

file1.txt | 1 +
file2.txt | 1 +
file3.txt | 1 +
3 files changed, 3 insertions(+)
create mode 100644 file1.txt
create mode 100644 file2.txt
create mode 100644 file3.txt

commit 3ec6e4e46a12688ece1fcac2a03a7db82ceb42
Author: vikrambabu1427 <78962677+vikrambabu1427@users.noreply.github.com>
Date:   Fri Feb 12 17:57:40 2021 +0530

    Initial commit

README.md | 2 ++
1 file changed, 2 insertions(+)
create mode 100644 README.md
```



Cloning an Existing Repository

Lets create a new branch and make changes

- Create new branch & switch
 - `git checkout -b feature-01`
- Edit an existing file and add it to staging
 - `git add file3.txt`
- Commit the changes to local repo
 - `git commit -m "Modified file3"`
- Push the changes to remote repo
 - `git push origin feature-01`
- Check remote & local branches
 - `git branch -a`

```
428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git checkout -b "feature-01"
Switched to a new branch 'feature-01'

428991@LINL190904638 MINGW64 /d/clone-test (feature-01)
$ cat file3.txt
My Third File

428991@LINL190904638 MINGW64 /d/clone-test (feature-01)
$ echo "Modified Third File" >> file3.txt

428991@LINL190904638 MINGW64 /d/clone-test (feature-01)
$ git status
On branch feature-01
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
    modified:   file3.txt

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

428991@LINL190904638 MINGW64 /d/clone-test (feature-01)
$ ls -a
./ ../.git/ file1.txt file2.txt file3.txt README.md

428991@LINL190904638 MINGW64 /d/clone-test (feature-01)
$ git add file3.txt

428991@LINL190904638 MINGW64 /d/clone-test (feature-01)
$ git commit -m "Modified file3"
[feature-01 bedc5ec] Modified file3
 1 file changed, 1 insertion(+)

428991@LINL190904638 MINGW64 /d/clone-test (feature-01)
$ git push origin feature-01

Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 8 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 275 bytes | 137.00 KiB/s, done.
Total 3 (delta 1), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
remote:
remote: Create a pull request for 'feature-01' on GitHub by visiting:
remote:     https://github.com/vikrambabu1427/clone-test/pull/new/feature-01
remote:
To https://github.com/vikrambabu1427/clone-test.git
 * [new branch]      feature-01 -> feature-01

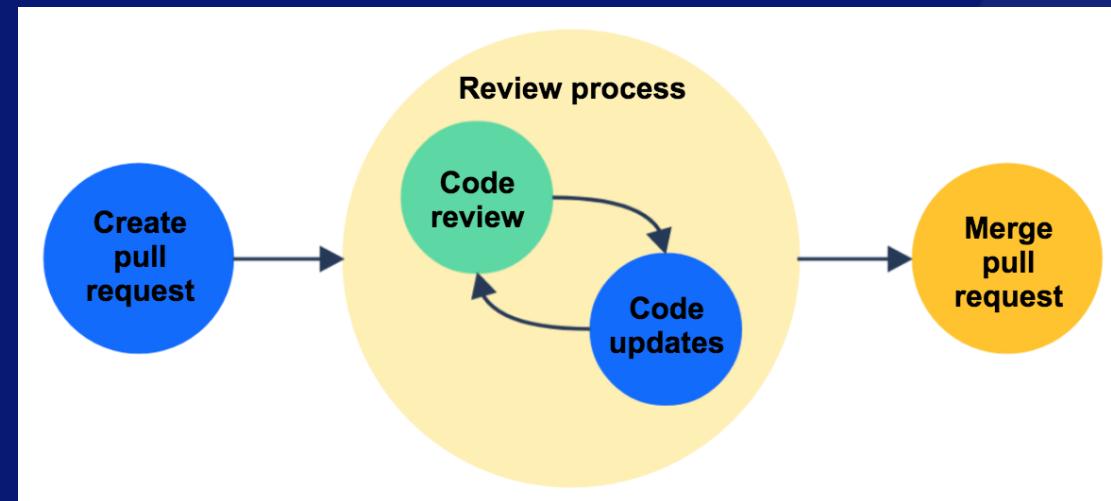
428991@LINL190904638 MINGW64 /d/clone-test (feature-01)
$ git branch -a
* feature-01
  main
  remotes/origin/HEAD -> origin/main
  remotes/origin/feature-01
  remotes/origin/main
```





Create a Pull Requests

- Pull requests are a way to discuss changes before merging them into your codebase
- Let's say you're managing a project. A developer makes changes on a new branch and would like to merge that branch into the master. They can create a pull request to notify you to review their code. You can discuss the changes, and decide if you want to merge it or not
- Although it is possible to push and merge a branch directly into "master", creating a pull request is usually the way to go when suggesting changes in a codebase
- Opening a pull request creates an opportunity for code review and actionable feedback; that's why it became a standard procedure for collaborating in most open source projects





Git

git:kunchalavikram1427

Creating a Pull Request

To create a PR, go to the repository and search for [Create Pull Request](#)

The screenshot shows a GitHub repository page for 'vikrambabu1427 / clone-test'. The 'Code' tab is selected. A yellow banner at the top displays the message 'feature-01 had recent pushes less than a minute ago' with a red border. To the right of the banner is a green button labeled 'Compare & pull request' with a red border. Below the banner, there are navigation buttons for 'main' (with a dropdown arrow), '1 branch', '0 tags', 'Go to file', 'Add file', and 'Code'. The main content area shows a commit history:

Author	Commit Message	Date	Commits
vikrambabu1427	initial commit	0efb1d8 36 minutes ago	2 commits
	README.md	Initial commit	38 minutes ago
	file1.txt	initial commit	36 minutes ago
	file2.txt	initial commit	36 minutes ago
	file3.txt	initial commit	36 minutes ago



/kunchalavikram1427



Creating a Pull Request

- Select the source and destination branches. In our case we want to merge `feature-01` to `master`
 - Add a Reviewer who can review the changes, Write merge comments, Select the Assignee(PR opener) and `create pull request`

Open a pull request

Create a new pull request by comparing changes across two branches. If you need to, you can also [compare across forks](#).

base: main ▾ ← compare: feature-01 ▾ ✓ Able to merge. These branches can be automatically merged.

Modified file3

Write Preview

H B I E ↵ ⌂ ⌂ ☑ @ ⌂ ↵

Leave a comment

Attach files by dragging & dropping, selecting or pasting them.

Reviewers

No reviews

Assignees

Assign up to 10 people to this pull request

Type or choose a name

Suggestions

 vikrambabu1427 vikrambabu1427
None yet

Milestone

No milestone

Create pull request ▾





Git

git:kunchalavikram1427

Creating a Pull Request

- The reviewer get notified of PR
- Verifies the files and Merges the branch if there are no conflicts. This closes the PR

The screenshot shows a GitHub pull request page for a repository named `vikrambabu1427 / clone-test`. The pull request has been merged, indicated by the green "Merge pull request" button at the bottom.

- Pull requests tab:** The "Pull requests" tab is highlighted with a red box and contains the number "1".
- Summary:** The pull request summary states "vikrambabu1427 wants to merge 1 commit into `main` from `feature-01`".
- Activity:** A comment from `vikrambabu1427` is shown, stating "Modified file 3".
- Files changed:** The "Files changed" section shows 1 file: "Modified file3".
- Assignees:** The "Assignees" field is populated with `vikrambabu1427`.
- Merge status:** A message indicates "This branch has no conflicts with the base branch. Merging can be performed automatically." A red arrow points to this message.
- Merge button:** A large red box highlights the "Merge pull request" button at the bottom of the pull request card.



Git

git:kunchalavikram1427

Creating a Pull Request

- Post successful merging

Modified file3 #1

Merged vikrambabu1427 merged 1 commit into main from feature-01 now

Conversation 0 Commits 1 Checks 0 Files changed 1

vikrambabu1427 commented 2 minutes ago

Modified file 3

Modified file3

vikrambabu1427 self-assigned this 1 minute ago

vikrambabu1427 merged commit a85aba7 into main now

Pull request successfully merged and closed

You're all set—the feature-01 branch can be safely deleted.

Delete branch

The screenshot shows a GitHub pull request merge history. At the top, it says "Modified file3 #1" and "Merged vikrambabu1427 merged 1 commit into main from feature-01 now". Below this, there are tabs for Conversation (0), Commits (1), Checks (0), and Files changed (1). A comment from "vikrambabu1427" is shown, stating "Modified file 3". The commit history shows "Modified file3" by "vikrambabu1427" at "bedc5ec". This is followed by a self-assigned action by "vikrambabu1427" and a merge action merging commit "a85aba7" into "main" at "now". At the bottom, a message says "Pull request successfully merged and closed" and "You're all set—the feature-01 branch can be safely deleted.", with a "Delete branch" button. The GitHub logo is in the bottom right corner.



Git

Creating a Pull Request

- Post successful merging

The screenshot shows the GitHub repository `vikrambabu1427/clone-test`. The main branch has 2 branches and 0 tags. The commit history shows:

- vikrambabu1427 Merge pull request #1 from vikrambabu1427/feature-01** (4 commits, 43 seconds ago)
- `README.md`: Initial commit (43 minutes ago)
- `file1.txt`: initial commit (41 minutes ago)
- `file2.txt`: initial commit (41 minutes ago)
- `file3.txt`: Modified file3 (12 minutes ago)

The screenshot shows the GitHub repository `vikrambabu1427/clone-test`. The `main` branch has a commit for `clone-test / file3.txt` by `vikram`.

vikram Modified file3
1 contributor
2 lines (2 sloc) | 34 Bytes

```
1 My Third File
2 Modified Third File
```

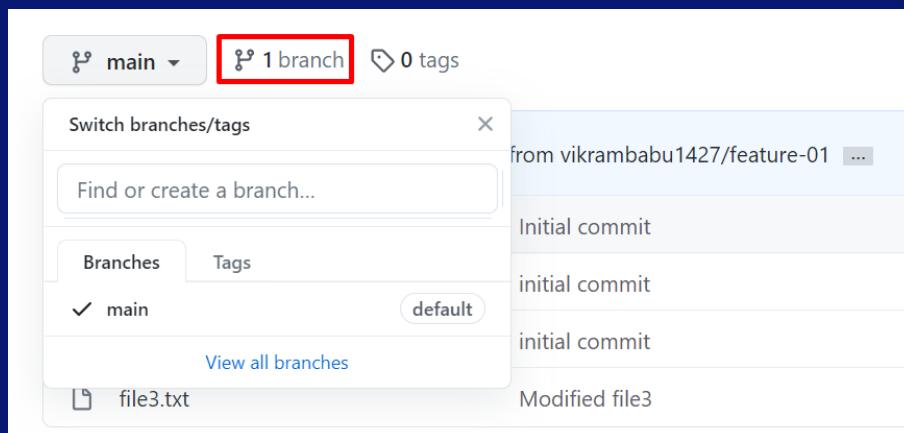


git:kunchalavikram1427

Git

Git Pull

- Pull the latest changes from the repo since there are changes in the master branch after PR
 - `git pull`
- Delete the feature branch from both local and remote as it is already merged to master
 - `git branch -d feature-01`
 - `git push origin :feature-01`



```
428991@LINL190904638 MINGW64 /d/clone-test (feature-01)
$ git checkout main
Switched to branch 'main'
Your branch is behind 'origin/main' by 2 commits, and can be fast-forwarded.
(use "git pull" to update your local branch)
```

```
428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git pull
Updating 0efb1d8..a85aba7
Fast-forward
  file3.txt | 1 +
  1 file changed, 1 insertion(+)
```

```
428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git branch -d feature-01
Deleted branch feature-01 (was bedc5ec).
```

```
428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git push origin :feature-01
To https://github.com/vikrambabu1427/clone-test.git
 - [deleted]           feature-01
```

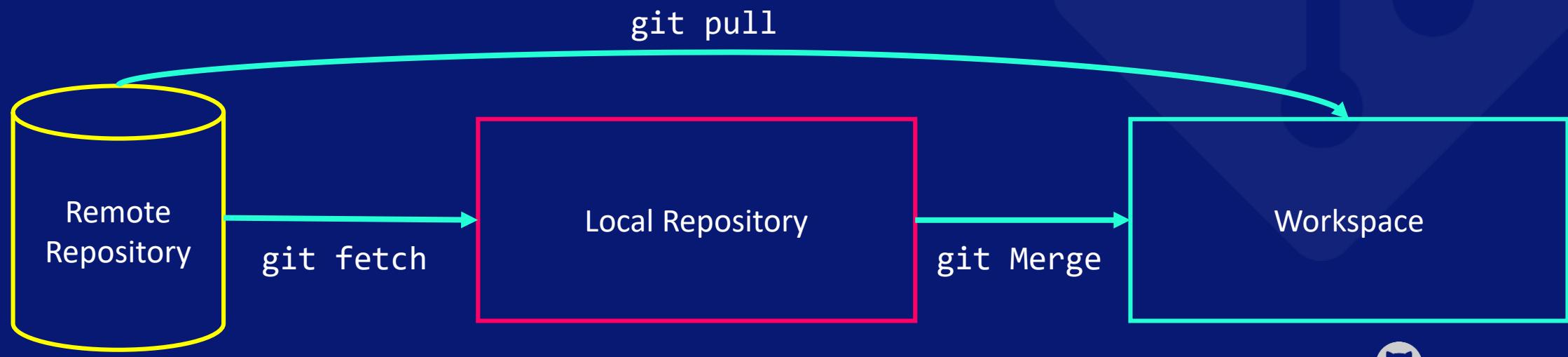


/kunchalavikram1427



Git Pull vs Git Fetch

- In our previous demo, once the `feature-01` branch is merged to `master`, master has a new modified file `file3.txt`
- Our local repository is unaware of this change as the merging happened directly in the remote repo
- In order to get the latest changes from the remote repo, we can use `git fetch` or `git pull`(as done in earlier demo)
- `git fetch` pulls all new commits from the desired branch and saves it in a new branch in your local repository. If you need to reflect these changes in your target branch, `git fetch` should be followed with a `git merge`
- `git pull` does both fetch and merge in 1 shot
- `Git pull = git fetch + git merge`





git:kunchalavikram1427

Git

Git Pull vs Git Fetch

- There is a new file `file4.txt` added to the remote repo

The screenshot shows a GitHub repository page for 'vikrambabu1427/clone-test'. The main branch is selected. In the file list, there are five files: 'README.md', 'file1.txt', 'file2.txt', 'file3.txt', and 'file4.txt'. The 'file4.txt' file is highlighted with a red border.

- Let's fetch all those changes into our local repository
 - `git fetch`
- List all the files in the workspace. Notice that `file4.txt` is still not visible
 - `ls -a`
- Lets merge the current branch with `origin/main` to merge the remote changes(`main` is master branch here)
 - `git merge origin main`
- Now List all the files in the workspace again. Notice `file4.txt` added to the workspace
 - `ls -a`

```
428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git fetch
remote: Enumerating objects: 4, done.
remote: Counting objects: 100% (4/4), done.
From https://github.com/vikrambabu1427/clone-test
a85aba7..9261946 main      -> origin/main

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git status
On branch main
Your branch is behind 'origin/main' by 1 commit, and can be fast-forwarded.
(use "git pull" to update your local branch)

nothing to commit, working tree clean

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ ls -a
./ ../.git/ file1.txt file2.txt file3.txt README.md

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git merge origin master
merge: master - not something we can merge

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git merge origin main
Updating a85aba7..9261946
Fast-forward
 file4.txt | 1 +
 1 file changed, 1 insertion(+)
 create mode 100644 file4.txt

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ ls -a
./ ../.git/ file1.txt file2.txt file3.txt file4.txt README.md
```



/kunchalavikram1427



git:kunchalavikram1427

Git

Git Pull vs Git Fetch

- There is a new file `file5.txt` added to the remote repo

A screenshot of a GitHub repository page. The repository name is 'vikrambabu1427'. The commit history shows the following changes:

- Initial commit: README.md
- initial commit: file1.txt
- initial commit: file2.txt
- Modified file3: file3.txt
- Create file4.txt: file4.txt
- Create file5.txt: file5.txt (highlighted with a red border)

- List all the files in the workspace. Notice that `file5.txt` is still not visible
 - `ls -a`
- Lets pull all the changes
 - `git pull origin main`
- Now List all the files in the workspace again. Notice `file5.txt` added to the workspace
 - `ls -a`

```
428991@LINL190904638 MINGW64 /d/clone-test (main)
$ ls -a
./ ../ .git/ file1.txt file2.txt file3.txt file4.txt README.md

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git pull origin main
remote: Enumerating objects: 4, done.
remote: Counting objects: 100% (4/4), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 1), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 669 bytes | 41.00 KiB/s, done.
From https://github.com/vikrambabu1427/clone-test
 * branch            main      -> FETCH_HEAD
   9261946..9a17738  main      -> origin/main
Updating 9261946..9a17738
Fast-forward
 file5.txt | 1 +
 1 file changed, 1 insertion(+)
 create mode 100644 file5.txt

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ ls -a
./ ../ .git/ file1.txt file2.txt file3.txt file4.txt file5.txt
README.md

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ cat file5.txt
Added Fifth File
```

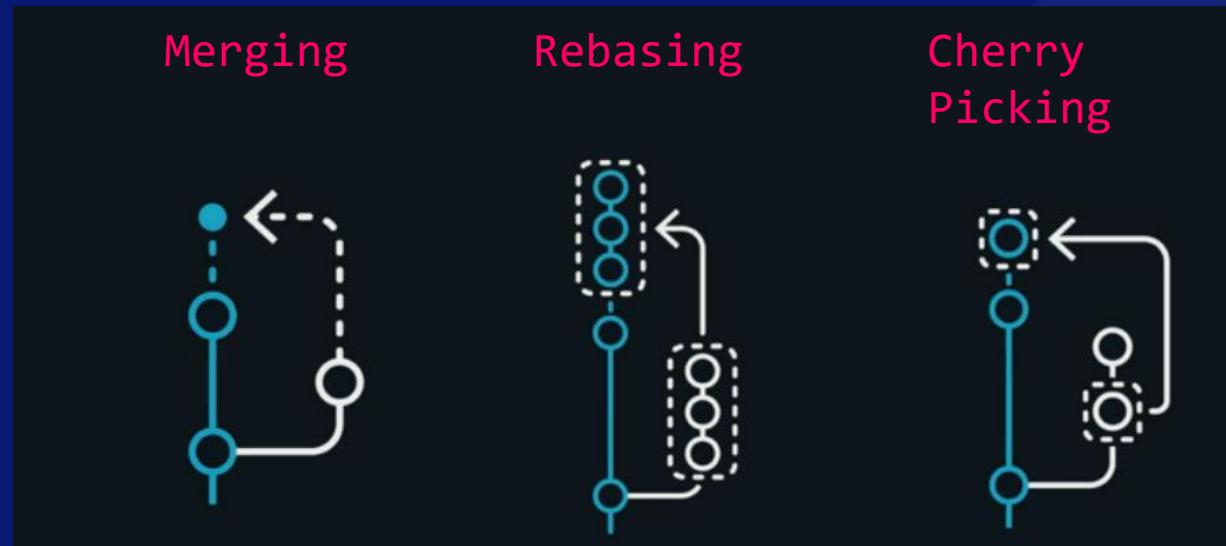


/kunchalavikram1427



Merge Conflicts

- A merge conflict is an event that occurs when Git is unable to automatically resolve differences in code between two commits
- Since working with remote repositories allows multiple developers to work in parallel, each on their copy of the repository, merge conflicts may occur when two developers change the same file and try to upload the changes to the central repo.
- The way to solve the problem is by pulling the updated version from the central repository, updating the file with your changes, and pushing it back to remote repository
- Conflicts occur during





Merge Conflicts

- To understand merge conflicts, let's modify the file `file4.txt` in the remote repo, replicating a real time scenario
- Since the file is changed in the remote repo, our local repo is unaware of these changes as we didn't do `git pull` to update it
- Let us now modify the same file `file4.txt` in our local and try to push it to remote repo
- Since the same file is already modified in the remote repo(pushed by developer-02), there will be merge conflicts and push to remote fails
- Git will show us the list of files that are conflicting with the remote repo
- We need to modify these files by deleting or retaining the content after discussing with the developer who committed the change before
- After the modifications, we can commit those changes and push to remote repository

The screenshot shows a GitHub repository page for 'vikrambabu1427 / clone-test'. The 'Code' tab is selected. A dropdown menu shows 'main' and 'clone-test / file4.txt'. Below the dropdown, a commit by 'vikrambabu1427' is listed: 'Update file4.txt'. It has 1 contributor. The file details show 2 lines (2 sloc) and 40 Bytes. The content of the file is:

```
1 My Fourth File  
2 Modified by developer-02
```



Merge Conflicts

- There is a new file `file4.txt` added to the remote repo by other developer
- To the same file in our local, add some content and commit it to the local repo
 - `git commit -a -m "Modified file4 by dev 03"`
- Push the changes to the remote origin
 - `git push`
- Observe that the push failed due to merge conflicts. Developer-02 has already modified the same file and pushed it to remote before developer-03 pushed the same file
- Git will show us the list of files with merge conflicts
 - `git status`
- We need to modify these files to include common changes needed by both the developers

```
428991@LINL190904638 MINGW64 /d/clone-test (main)
$ echo "Modified by developer-03" >> file4.txt

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ cat file4.txt
My Fourth File
Modified by developer-03

428991@LINL190904638 MINGW64 /d/clone-test (main|MERGING)
$ git commit -a -m "Modified file4 by dev 03"
[main 75ce4c6] Modified file4 by dev 03

428991@LINL190904638 MINGW64 /d/clone-test (main|MERGING)
$ git push
To https://github.com/vikrambabu1427/clone-test.git
 ! [rejected]          main -> main (non-fast-forward)
error: failed to push some refs to
'https://github.com/vikrambabu1427/clone-test.git'
hint: Updates were rejected because the tip of your current branch is
behind
hint: its remote counterpart. Integrate the remote changes (e.g.
hint: 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for
details.

428991@LINL190904638 MINGW64 /d/clone-test (main|MERGING)
$ git status
On branch main
Your branch and 'origin/main' have diverged,
and have 1 and 1 different commits each, respectively.
(use "git pull" to merge the remote branch into yours)

You have unmerged paths.
(fix conflicts and run "git commit")
(use "git merge --abort" to abort the merge)

Unmerged paths:
(use "git add <file>..." to mark resolution)
  both modified:  file4.txt
```





Resolve Merge Conflicts

- Open the file which has merge conflicts in any of the text editors
- Git added some syntax including seven "less than" characters, <<<<<< and seven "greater than" characters, >>>>>>, separated by seven equal signs, ======. These can be searched using your editor to quickly find where edits need to be made.
- There are two sections within this block:
 1. The "less than" characters denote the current branch's edits (in this case, "HEAD," which is another word for your current branch), and the equal signs denote the end of the first section.
 2. The second section is where the edits are from the attempted merge; it starts with the equal signs and ends with the "greater than" signs
- As a developer, you decide what stays and what goes
- We need to remove these less/greater than characters & equal signs and keeps the changes required. In our case, we decide to include both the changes
- Now commit the modified files and push to the remote repo
 - `git commit -a -m "Modified file4 by dev 03"`
 - `git push`

```
GNU nano 4.9.3
My Fourth File
<<<<<< HEAD
Modified by developer-03
=====
Modified by developer-02
>>>>> ff36fc1e569934c38613a5e074d461b0f1774774
```

After
Resolving
Conflicts

```
GNU nano 4.9.3
My Fourth File
Modified by developer-03
Modified by developer-02
```





Git

git:kunchalavikram1427

Resolve Merge Conflicts

- Check the changes in the remote repository as well

main clone-test / file4.txt

vikram Modified file4 by dev 03

1 contributor

3 lines (3 sloc) | 65 Bytes

```
1 My Fourth File
2 Modified by developer-03
3 Modified by developer-02
```

```
428991@LINL190904638 MINGW64 /d/clone-test (main|MERGING)
$ cat file4.txt
My Fourth File
Modified by developer-03
Modified by developer-02

428991@LINL190904638 MINGW64 /d/clone-test (main|MERGING)
$ git commit -a -m "Modified file4 by dev 03"
[main 75ce4c6] Modified file4 by dev 03

428991@LINL190904638 MINGW64 /d/clone-test (main)
$ git push
Enumerating objects: 10, done.
Counting objects: 100% (10/10), done.
Delta compression using up to 8 threads
Compressing objects: 100% (5/5), done.
Writing objects: 100% (6/6), 595 bytes | 297.00 KiB/s, done.
Total 6 (delta 2), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (2/2), completed with 1 local object.
To https://github.com/vikrambabu1427/clone-test.git
ff36fc1..75ce4c6 main -> main
```



/kunchalavikram1427



git:kunchalavikram1427

PART - 03

Git Reset, Rebase & Cherry pick

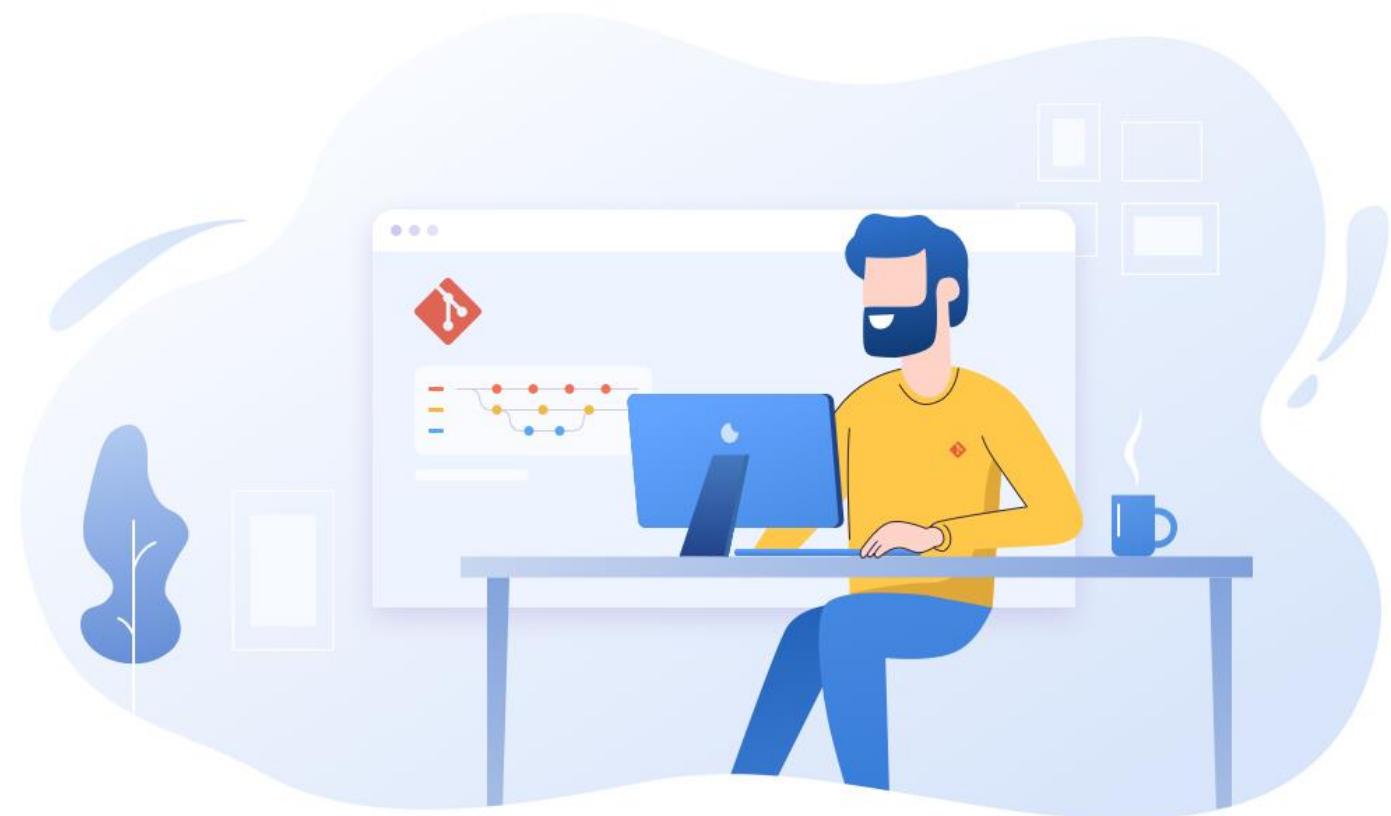


/kunchalavikram1427

References

git:kunchalavikram1427

- <https://git-scm.com/book/en/v2/Git-Tools-Reset-Demystified>
- <https://mirrors.edge.kernel.org/pub/software/scm/git/docs/gittutorial.html>
- <http://gitready.com/>





git:kunchalavikram1427



Like our good work and want to sponsor/contribute for more tutorials like this? Send an email to
kunchalavikram1427@gmail.com

Your support is highly appreciated!



Subscribe to my Facebook page:

<https://www.facebook.com/vikram.devops>

and join my group:

<https://www.facebook.com/groups/171043094400359>

for all latest updates on DevOps, Python and IoT



<https://www.youtube.com/channel/UCE1cGZfooxT7-VbqVbuKjMg>



/kunchalavikram1427

git:kunchalavikram1427

Q&A



git:kunchalavikram1427

Thank You

