GIT NOTES

by kante-srikanth

Note: This document content is gathered from various resources available in internet and solely responsible for learning purpose.

We can configure git at different levels:

```
System                                  # applicable to all users
Global                                  # applicable to current logged in user [ all repos]
Local                                   # applicable to particular repo
```

Configuration

Below config settings are stored in .gitconfig text file

```
git config –global user.name “kante-srikanth”
git config –global user.email kantesrikanth@gmail.com
git config –global core.editor “code –wait”     # set default code editor
git config –global -e                           # opens config file i.e. .gitconfig
```

Help

```
git commandname –help                   # ex: git config -h / git config --help
git help commandname
```

Git project Initialization

```
git init                                # initializes git in our project
```

Staging files

```
git add -A              # stages new, deleted, modified files in entire work tree. Even if ur at folder level.
git add -A folder/      # stages same as above but only in folder/ path.
git add                 # default behavior as above commands.
git add -u              # stages deleted, modified but not untracked / new files in entire tree.
git add -u folder/      # specific to folder path
git add .               # stages the current directory and all its content
git add *.js            # stages with a pattern
git add file1.js        # stages a single file
git add file1.js file2.js   # stages multiple files at a time
```

Viewing the status

```
git status              # gives complete status
git status -s           # gives short status
```

Committing the staging files

```
git commit -m “Message”     # commits with a one-line message
git commit                  # opens the default editor to type a long message
git commit -am “Message”    # skips the staging area
```

Unstaging files / (undoing git add)

```
git reset
# unstages the files; brings all the staged files back to working directory state. [used in git old versions]
git restore --staged file.js
# Copies last version of file.js from repo to index i.e restores the staging area [same as above but new command]
```

Removing files

```
git rm file1.js         # Removes from working directory and staging area [internally does git add .
git rm --cached file1.js    # Removes from staging area only [we need to explicitly perform git add .
```

Discarding & Restoring

```
git restore file.js                          # copies file.js from index to working directory
git restore file1.js file2.js                # restores multiple files in working directory
git restore                                  # discards all local changes (except untracked files)
git clean -fd                                # removes all untracked files
git restore –source=HEAD~1 filename          # restore file from previous commit history i.e HEAD -1
```

Renaming or moving files:

```
git mv file1.js file1.txt                    # renames the file name or moves the file
```

Difference

```
git diff                                     # shows only when there are unstaged changes
git diff --staged                            # shows staged changes
git diff –cached                             # same as the above
git diff HEAD~2 HEAD                         # shows the changes between two commits
git diff HEAD~2 HEAD file.txt                # shows changes for file.txt only
```

Commit History && Browsing:

```
git log                                      # shows history of commits, without filenames
git log –oneline                             # shows one line for history of commits
git log –reverse                             # shows in reverse order
git log --stat                               # shows commit history as well as files names of modified.
git log –patch                               # shows the content changed (patches)
git log file.txt                             # shows the commits that modified file.txt
git log --stat file.txt                      # shows statistics (the number of changes) for file.txt
git log --patch file.txt                     # shows the patches (changes) applied to file.txt
```

Filtering the history

```
git log -3                                   # shows the last 3 entries
git log --author=“kante-srikanth”
git log --before=“2020-08-17”
git log --after=“one week ago”
git log hash1...hash2                        # range of commits
```

Commit viewing

```
git show commitid                            # shows commit changes and history
git show HEAD                                # shows commit changes and history of last commit
git show HEAD~1                              # shows the last commit – 1 .
git show commitid:fullpathtofilename         # shows the exact content of the file
git ls-tree commitid                         # shows all files changed in the given commit]
```

Creating an alias

```
git config --global alias.lg “log --oneline"   # create alias for command ex: git lg || git log --oneline
```

Checkout

```
git checkout commitid                        # checkout given commit, will be in detached HEAD state
git checkout master                          # checkout master branch
git checkout filepath                        # undo all the changes in working directory of the specified file
```

Working with remote repo

```
git clone repo_url                           # clones remote repo to local
git fetch origin master                      # fetches master from origin but don’t merge
git fetch origin                             # fetches all objects from origin
```

```
git fetch                          # shortcut for “git fetch origin”
git pull                           # fetch + merge
git push origin master             # pushes master to origin
git push                           # shortcut for “git push origin master”
```

Pushing & Pulling changes to repo

```
git add .                          # add changes to staging area
git commit -m “message”            # committing to local repo i.e create snapshot
git push origin branchname or git push   # push local changes to remote repo
git pull origin branchname         # pull latest changes from repo to local
```

Managing branches

```
git branch bugfix                  # creates a new branch called bugfix
git checkout bugfix                # switches to the bugfix branch
git switch bugfix                  # same as the above
git switch -C bugfix               # creates and switches
git checkout -b bugfix             # same as above
git branch -d bugfix               # deletes the bugfix branch
git branch                         # this will list all local branches
git branch -a                      # this will list all local and remote branches
```

Comparing branches

```
git log master bugfix              # lists the commits/changes in the bugfix branch not in master
git diff branch1 branch2           # shows the summary of changes, shows branch1 – branch2
```

Sharing branches

```
git branch -r                      # shows remote tracking branches
git branch -vv                     # shows local & remote tracking branches
git push -u origin bugfix          # pushes bugfix to origin
git push -d origin bugfix          # removes bugfix from origin
```

Managing remotes

```
git remote                         # shows remote repos
git remote add upstream url        # adds a new remote called upstream   upstream == remote repo
git remote rm upstream             # remotes upstream
```

Finding contributors:

```
git shortlog -h                    # gives info about authors, no of commits etc.
```

Blame

```
git blame filename.ext             # shows author of each line in terminal
```

Merge

```
git merge bugfix                   # merges the bugfix branch into the current branch
git merge --no-ff bugfix           # creates a merge commit even if FastForward is possible
git merge --squash bugfix          # performs a squash merge
git merge --abort                  # aborts the merge
git branch --merged                # shows the merged branches
git branch --no-merged             # shows the unmerged branches
```

Create local branch && pushing to origin

```
git branch branchname
git checkout branchname
```

git checkout -b branchname
git push -u origin branchname
#Associates local branch with remote and push changes. so that others can also work on the same branch.

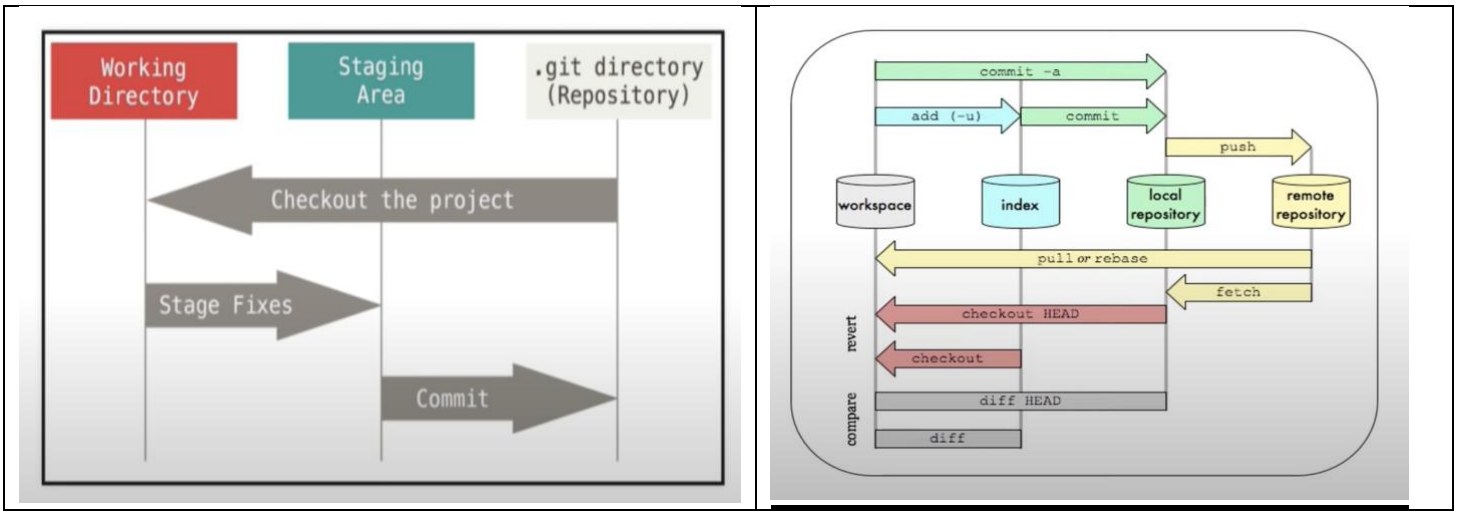
Steps for Merging branch to master

```
git checkout master                 # first checkout local master
git pull origin master              # then pull the changes
git branch –merged                  # check whether our branch is merged or not
git merge branchname                # this will merge the branch into local master
git push origin master              # then push the local master to repo master ..DONE
```

After merging the branch, Delete the local and remote branch

```
git branch –merged                  # check if our local branch is merged into local master
git branch -d branchname            # delete branch locally
git push origin –delete branchname  # delete branch remotely
git branch -a                       # list all remote branches
```

Workflow:



Here index is staging area .Head is used to refer the last commit in the checkout branch.

Recovering lost commits:

- *Reflog shows all the commits including git operations as well ..rebase , merge, branch created etc….*
  Reflog keeps track of every single change made in the reference of a repo.
  Commands:
  - git reflog # shows the history of HEAD
  - git reflog show bugfix # shows the history of bugfix pointer
  - How to recover the deleted branch ?
    git reflog # gives all commit references
    git checkout -b deletedbranchname referncetothecommit
    ex: git checkout -b feature HEAD@{4}

Bisect:

- *This is useful when someone committed error in the code and we are not sure which commit is causing the issue.*
- *Bisect command will checkout commits one by one [start, end] specified automatically until we find bad commit and mark it as bad. Interesting command.*
  Steps:
  - git bisect start # this will initiate the bisect tool/command.
  - git bisect good hash # we need to give the good commit id as start point

- git bisect bad [hash]
  # we can give bad commitid if we are sure abt end pt, if we leave blank current commit will be end.
  # Note: [ ] indicates the param is optional
- Now, the start commit will be checkedout automatically by git and we need to test our scenario, if this commit is not causing issue , we need to mark it as follows.
  - git bisect good
- Now, the next commit will be checkedout automatically by git and again we need to test our scenario, if this is causing the issue, we need to mark it as follows.
  - git bisect bad
- similarly, after marking all commits as either good or bad .. git will provide us the details[commit, author, time etc.…] of bad commit.
- At this point we will be in detached HEAD state.. to get back to our current working branch we need to end the bisect process by following the command.
  - git bisect reset # terminates bisect session & checkout at wip branch

Tagging:

- *This is useful when you want to save commit as checkpoint so that u can restore that checkpoint later when things go wrong. Ex: release v1 , release v2 etc …. In git we create a tag [checkpoint] for commits.*
  Commands:
  - git tag v1.0 # tags the last commit as v1.0
  - git tag v1.0 5e7a828 # tags an earlier commit
  - git tag # lists all the tags
  - git tag -d v1.0 # deletes the given tag
  - git checkout -b branchname tagname
    #we can't checkout tags in it. so we need to create branch from tag.
  - git push origin tagname # to push tags to remote repo.
  - git push origin v1.0 # pushes tag v1.0 to origin
  - git push origin —delete v1.0 # delete the tag from remote

Rewriting Git History:

Reference: **https://youtu.be/ElRzTuYln0M**

Amend:

git commit –amend # this is helpful when u want staged files to be part of the last commit
git commit -amend –no-edit # if we don't want to change the commit message

Rewording:

- *we can do in multiple ways either by using amend or rebase. Difference is that amend will work upon last commit whereas rebase we can work on any of the previous commits.*
  git commit --amend -m "correct message"
  #Helpful when committed bad message & Modify last commit message without new commit
  git rebase -i HEAD~2
  #with rebase , we can act on previous commits as well .. HEAD~2 meaning want to act up on Head to 2 last commit

Deleting: *if we want to drop or delete the commit itself.*

Git rebase -i HEAD~targetcommitnumber #Opens rebase interactive mode, prefix as drop.

Reordering: *If we want to reorder the commits*

Git rebase -i HEAD~2
#In interactive mode, just reorder the lines in VIM editor ..that's it DONE

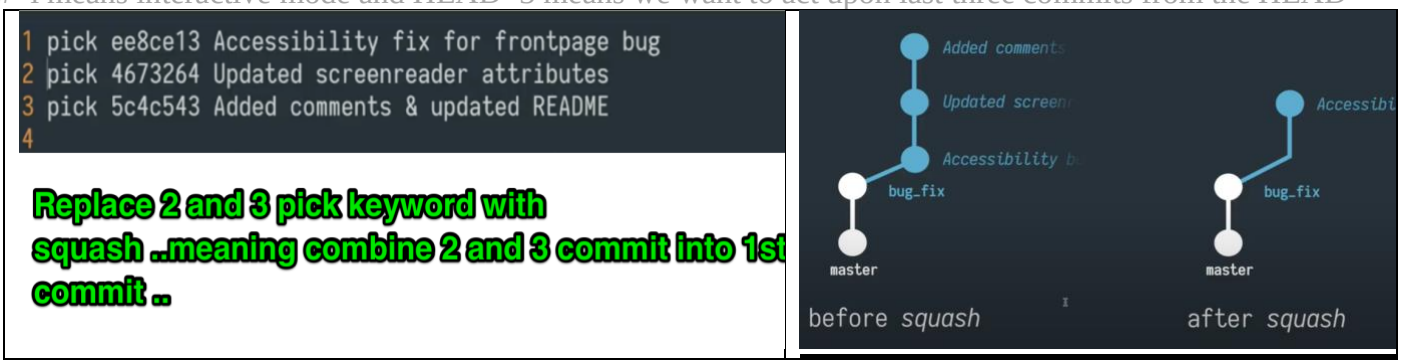
Squashing:

- *Combine multiple commits into one commit.If we have hundreds of commits history for a one feature branch . it will create mess to other developers in understanding the commits ..or it will pollute the commit history.. in this case we can squash all the commits into one commit.*
- *We can either use squash or fixup in interactive mode ..difference is that fixup will discard the commit messages , whereas squash preserve the messages.*

Steps:

Git rebase -i HEAD~3

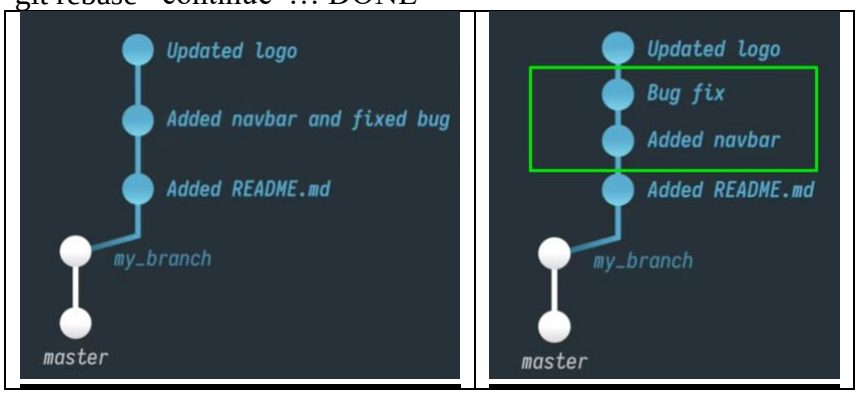
-i means interactive mode and HEAD~3 means we want to act upon last three commits from the HEAD



- ***How can we squash last N commits into one ?****One way is to follow above approach using interactive rebase ,the other way is* git reset –soft HEAD~N && git commit -m “new commit message”
  #N is no of commits to be combined

Splitting:

- if we want to split the commit into two different commits.
  Steps:
  - Git rebase -i HEAD~number
  - In the interactive mode ..change the prefix of the target commit to **edit** , then esc : w q
  - Note: rebase is in progress at this stage ..
  - Next ..undo the staging files using the following command
  - Git reset HEAD^ # this will undo the staging files
  - Continue git add and git commit …as our wish to how many times we want to split that commit …
  - After committing, run following command.
  - git rebase –continue … DONE



Cherry-pick:

- *this is used when u accidently committed the changes in wrong branch and want it to be in correct branch*
  Steps:
  - git cherry-pick commitid # apply this on the target branch
  - After cherry picking the commit, you need to remove i.e reset the commit from the wrong branch. 3 different ways to reset
  - git reset –soft targetcommitid [this will put targetcommitid files in staging area] …..*git status* for more details (or)

- git reset targetcommitid
  # this will put in working directory ..by default mixed reset is used] (or)
- git reset –hard targetcommitid
  # this will bring the exact state of targetcommitid including unstaged files. This may delete some wip changes…. To get them back use git reflog and git checkout targetcommitid
- git reset # unstage all the changes ... optional
- git clean -fd # to clean the untracked files] … optional
- git reflog # list all commits even deleted … optional

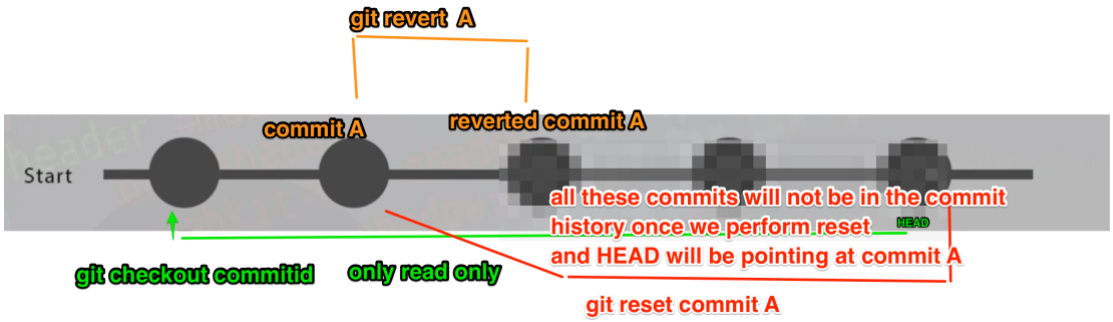
Stashing:

- *stashes can be applied in different branches .. for example ur working on master and stashed some changes ..now u want that changes in another branch …you can apply the stash on new branch and it works*

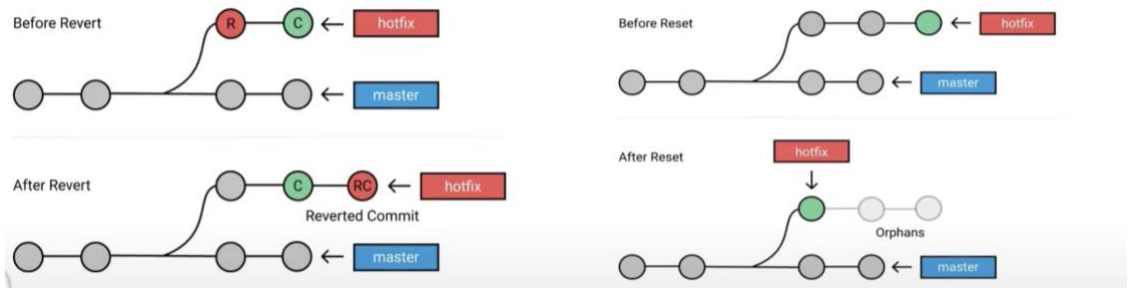
  Steps:
  - git stash save “message for recollect” # to quickly switch to other branch and]
  - git stash push -m “New tax rules” # same as above
  - git stash list # to see stash list]
  - git stash show stash@{1} # shows the given stash
  - git stash show 1 # shortcut for stash@{1}
  - git stash apply stashid # to apply the stash, it will not delete the stash]
  - git stash pop # applies the top stash and drop it from the stash list]
  - git stash drop stashid # to drop/delete the stash]
  - git stash clear # drops all stash]

Undoing commits:

- By three ways we can undo things
- git checkout commitid
  #checkout commitid and work on it .. also detaches the head
- git revert commitid
  #used for reverting the commits, creates new commit and reverts the changes to previous, This is used to revert the commit which is not fixing the issues but others checkout the code on it.
- git reset commitid
  resets the commit, no history of commits is present

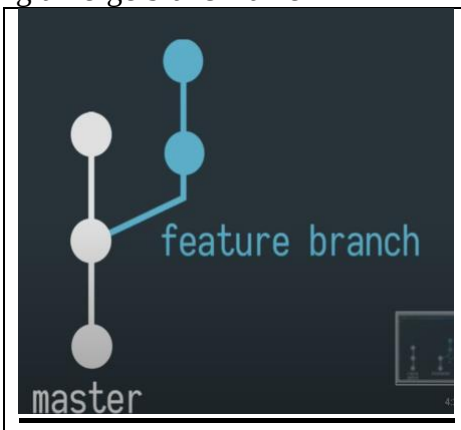


- Reset – scraps and rewrites the commit history and it will take back to the last working state.
- Revert – creates new commit and adds the history.

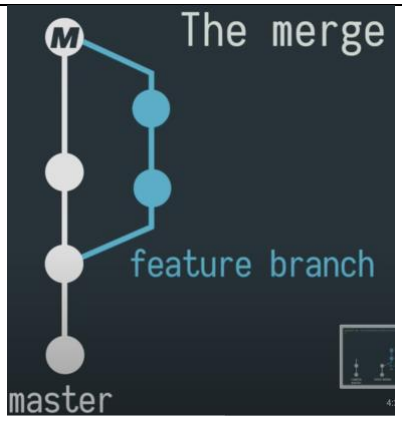


Rebase:

- *The goal of rebase and merge is to merge the commits from feature branch to master branch.*
- *one of the difference between rebase and merge is … rebase rewrites the commit history inorder to produce the straight linear succession of commits. Where as merge puts the fork history[will not rewrite the history] together again*
- With merge:
  - git merge branchname

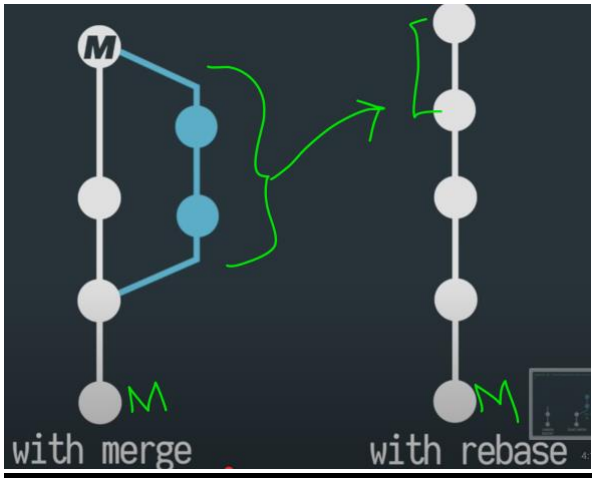


Before merge



After merge

- With rebase:
  Steps:
  - Git rebase master from featurebranch # this will point to latest master
  - Now checkout to master ..and git rebase featurebranch
    #this will pull the feature branch commits into master …



Upstream:

- *when u clone a remote repo and create local branch and work on it. And Now if u want to push the localbranch to remote repo.*
- *When you use git push … you will get the following error ..*
- *fatal: The current branch beta has no upstream branch. To push the current branch and set the remote as upstream.*
- *Meaning : your local branch is not present in remote repo .. so you need to upstream the localbranch or associate in remote repo. You can do in following ways:*
  Use:
- git push origin localbranch # associate localbranch in remote repo and push the changes
- git push --set-upstream origin localbranch # set upstream in remote and push

Bisect:

- *This is useful when someone committed error in the code and we are not sure which commit is causing the issue. Bisect command will checkout commits one by one*
- *[start, end] specified automatically until we find bad commit and mark it as bad. Interesting command.*

Steps:

- git bisect start # this will initiate the bisect tool/command.
- git bisect good hash # we need to give the good commit id as start point
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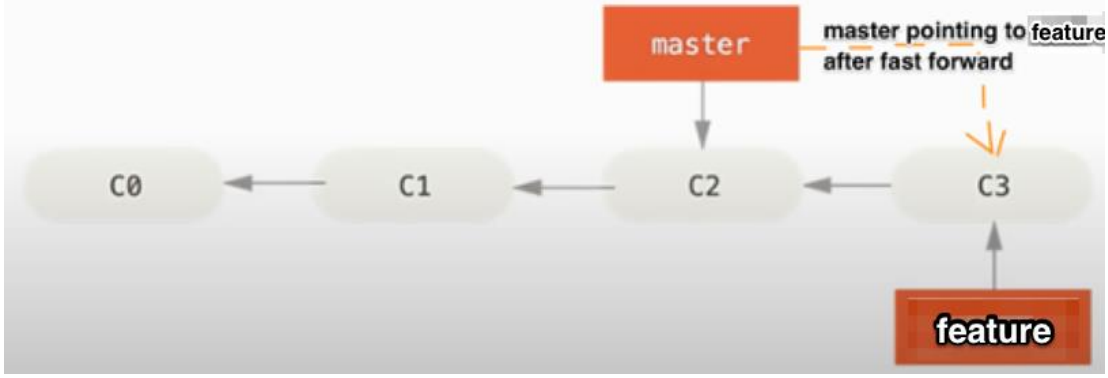
  - git bisect bad
- similarly, after marking all commits as either good or bad .. git will provide us the details[commit, author, time etc.…] of bad commit.
- At this point we will be in detached HEAD state.. to get back to our current working branch we need to end the bisect process by following the command.
  - git bisect reset # terminates bisect session & checkout at wip branch

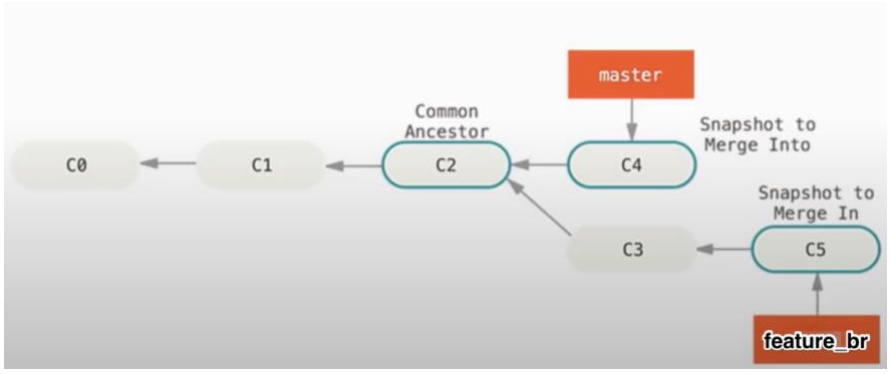
Fast-Forward Merge:

- *We created feature branch from masterc2 and working on it, now when you merge feature, this will result in fast forward merge. That means as c2 is ancestor of c3, master will now be pointing to c3. Fast forwarded master to feature@c3*



3-Way Merge or Recursive strategy:

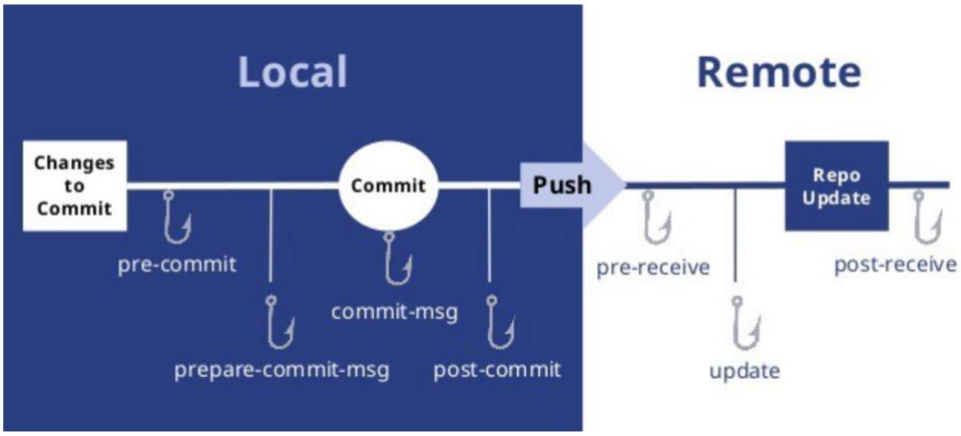
- *In this case as there is new commit in masterc4, and feature_br is not having the c4 latest master … when we merge the feature_br into master, this merge follows recursive / 3 way strategy.*



Git hooks:

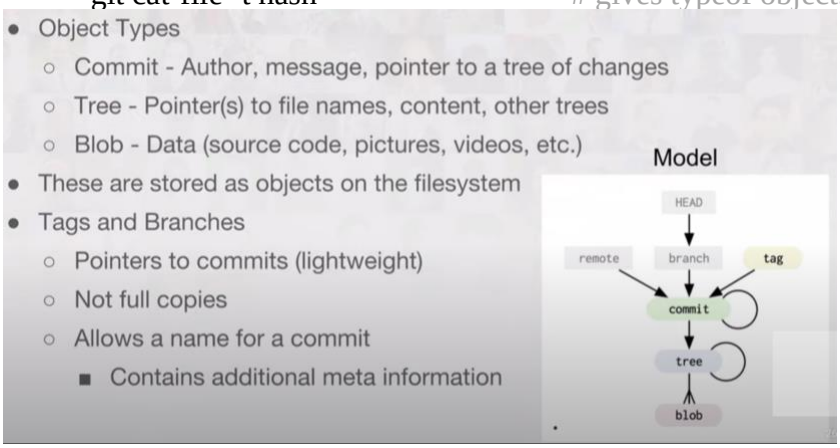
- *Git hooks allows to run the custom scripts whenever any of the git life cycle events occurs such as merge, commit, pushing etc..*

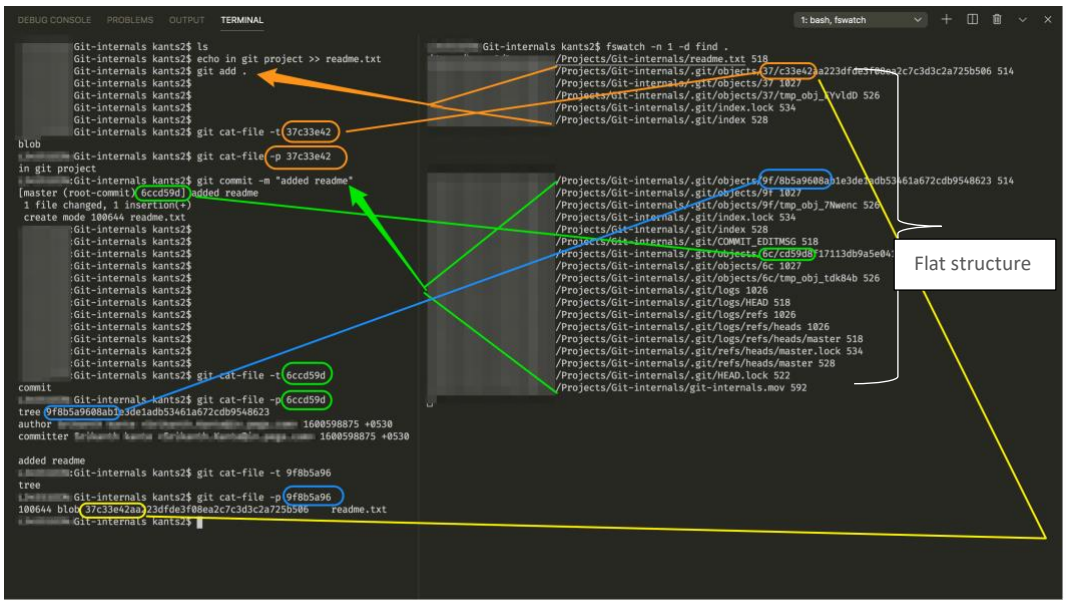
```
~/my_repo$ ls -a
.  ..  .git
~/my_repo$ cd .git
~/my_repo/.git$ ls
branches  config  description  HEAD  hooks  info  objects  refs
~/my_repo/.git$ cd hooks
~/my_repo/.git/hooks$ ls
applypatch-msg.sample      pre-applypatch.sample      pre-rebase.sample
commit-msg.sample          pre-commit                 pre-receive.sample
fsmonitor-watchman.sample  prepare-commit-msg.sample  update.sample
post-update.sample         pre-push.sample
~/my_repo/.git/hooks$ vim pre-commit
~/my_repo/.git/hooks$ chmod +x pre-commit
~/my_repo/.git/hooks$
```



Git Internals(*Internal working of git*):

- *For every git add . git creates one blob object which contains the content of the file.*
- *For every commit it creates , two objects tree and commit object.*
- *Tree object contains all related blob objects and commit object contains details of the commit. All these objects are stored in git as flat structure as below … but the logic lies in how these objects are pointing to each other. That logic is stored in each commit object.*
- Commands:
  - git cat-file -p hash # open the object
  - git cat-file -t hash # gives typeof object.





fswatch is used to show the folder changes for every one sec

VIM Commands:

i	# for insert mode ..to write
esc : wq	# write and quit
dd	# delete the line
:q	# quit the VIM
vim filename	# creates new file

for more VIM commands visit https://www.fprintf.net/vimCheatSheet.html
for Linux commands visit https://maker.pro/linux/tutorial/basic-linux-commands-for-beginners