Subject Name: Source Code Management

Subject Code: CS181

Cluster: Beta

Department: CSE



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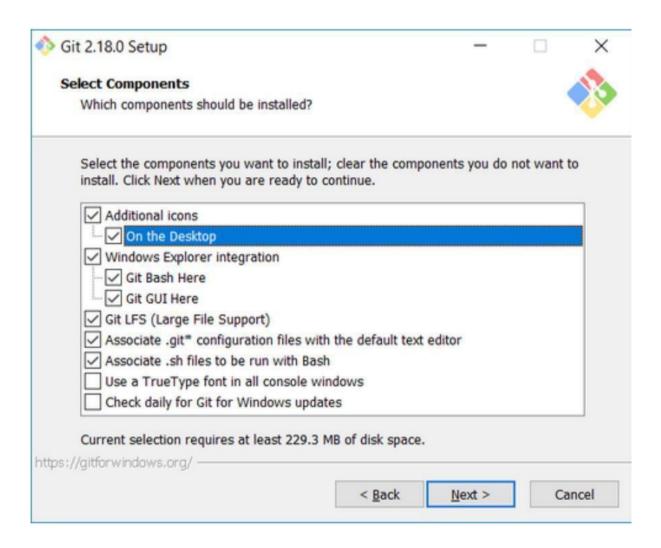


Aim: Setting up the git client.

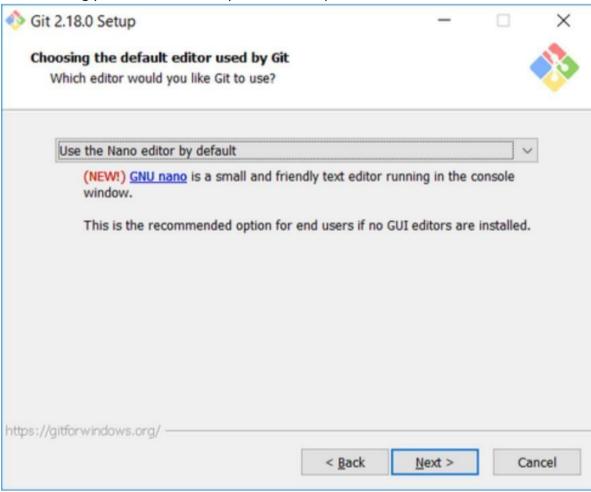
<u>Git Installation:</u> Download the Git installation program (Windows, Mac, or Linux) from <u>Git - Downloads (git-scm.com)</u>.

When running the installer, various screens appear (Windows screens shown). Generally, you can accept the default selections, except in the screens below where you do not want the default selections:

In the Select Components screen, make sure Windows Explorer Integration is selected as shown:

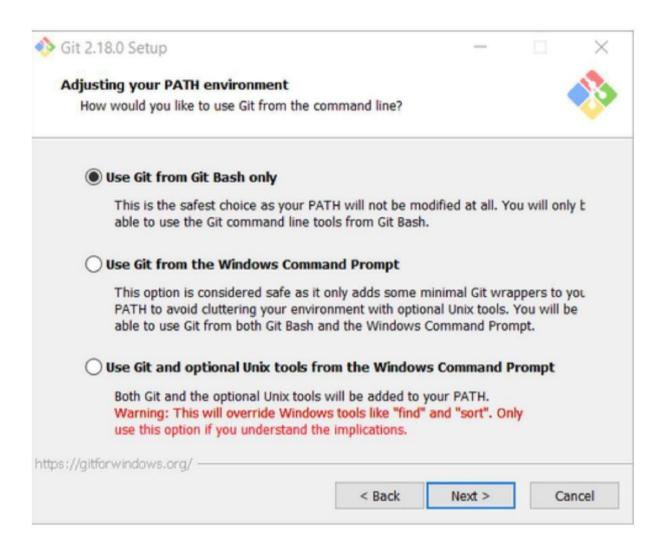


In the choosing the default editor is used by Git dialog, it is strongly recommended that you DO NOT select default VIM editor- it is challenging to learn how to use it, and there are better modern editors available. Instead, choose Notepad++ or Nano – either of those is much easier to use. It is strongly recommended that you select Notepad++.

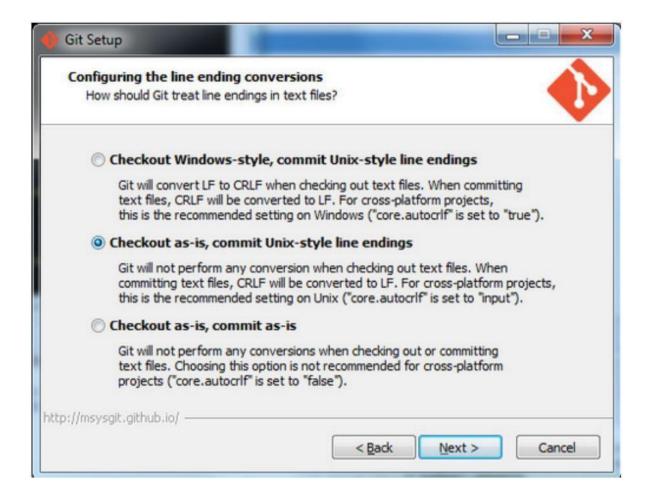


In the Adjusting your PATH screen, all three options are acceptable:

- 1. Use Git from Git Bash only: no integration, and no extra command in your command path.
- 2. Use Git from the windows Command Prompt: add flexibility you can simply run git from a windows command prompt, and is often the setting for people in industry but this does add some extra commands.
- 3. Use Git and optional Unix tools from the Windows Command Prompt: this is also a robust choice and useful if you like to use Unix like commands like grep.



In the Configuring the line ending screen, select the middle option (Checkout-as-is, commit Unix-style line endings) as shown. This helps migrate files towards the Unix-style (LF) terminators that most modern IDE's and editors support. The Windows convention (CR -LF line termination) is only important for Notepad.



Configuring Git to ignore certain files:

This part is extra important and required so that your repository does not get cluttered with garbage files.

By default, Git tracks all files in a project. Typically, this is not what you want; rather, you want Git to ignore certain files such as .bak files created by an editor or .class files created by the Java compiler. To have Git automatically ignore particular files, create a file named .gitignore (note that the filename begins with a dot) in the C:\users\name folder (where name is your MSOE login name).

NOTE: The .gitignore file must NOT have any file extension (e.g. .txt). Windows normally tries to place a file extension (.txt) on a file you create from File Explorer and then it (by default) HIDES the file extension. To avoid this, create the file from within a useful editor (e.g. Notepad++ or UltraEdit) and save the file without a file extension).

Edit this file and add the lines below (just copy/paste them from this screen); these are patterns for files to be ignored (taken from examples provided at https://github.com/github/gitignore.)

```
#Lines (like this one) that begin with # are comments; all other lines are rules
  # common build products to be ignored at MSOE
  *.0
  *.obj
  *.class
  *.exe
  # common IDE-generated files and folders to
 ignore workspace.xml bin / out
  .classpath
  # uncomment following for courses in which Eclipse .project files are not
checked in # .project
  #ignore automatically generated files created by some common applications,
  operating systems
  *.bak
  *.log
  *.ldb
  .DS Store*
 Thumbs.d
 b
  # Any files you do not want to ignore must be specified starting with ! # For
  example, if you didn't want to ignore .classpath, you'd uncomment the following
  rule: # !.classpath
```

Note: You can always edit this file and add additional patterns for other types of files you might want to ignore. Note that you can also have a

.gitignore files in any folder naming additional files to ignore. This is useful for project- specific build products.

Once Git is installed, there is some remaining custom configuration you must do. Follow the steps below:

- a. From within File Explorer, right-click on any folder. A context menu appears containing the commands " Git Bash here" and "Git GUI here". These commands permit you to launch either Git client. For now, select Git Bash here.
- **b.** Enter the command (replacing name as appropriate) git config global core.excludesfile c:/users/name/. gitignore

This tells Git to use the .gitignore file you created in step 2

NOTE: TO avoid typing errors, copy and paste the commands shown here into the Git Bash window, using the arrow keys to edit the red text to match your information.

c. Enter the command git config --global user.Email
 "apaar0244.be21@chitkara.edu.in"

This links your Git activity to your email address. Without this, your commits will often show up as "unknown login". Replace name with your own MSOE email name.

- d Enter the command git config --global user.name "ApaarSaini" Git uses this to log your activity. Replace "Your Name" by your actual first and last name.
- e. Enter the command git config --global push.default simple

 This ensures that all pushes go back to the branch from which they were pulled. Otherwise pushes will go to the master branch, forcing a merge.

CHITKARA UNIVERSITY

Experiment No. 02

Aim

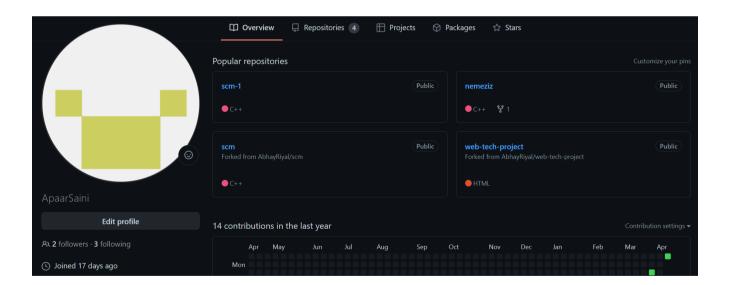
Setting up GitHub Account

The first steps in starting with GitHub are to create an account, choose a product that fits your needs best, verify your email, set up two-factor authentication, and view your profile.

There are several types of accounts on GitHub. Every person who uses GitHub has their own user account, which can be part of multiple organisations and teams. Your user account is your identity on GitHub.com and represents you as an individual.

1. Creating an account: To sign up for an account on GitHub.com, navigate to https://github.com/ and follow the prompts.

To keep your GitHub account secure you should use a strong and unique password. For more information, see "Creating a strong password".



2. Choosing your GitHub product: You can choose GitHub Free or GitHub Pro to get access to different features for your personal account. You can upgrade at any time if you are unsure at first which product you want.

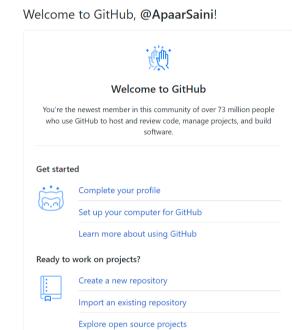
For more information on all GitHub's plans, see "GitHub's products".

3. Verifying your email address: To ensure you can use all the features in your GitHub plan, verify your email address after signing up for a new account. For more information, see

"Verifying your email address"

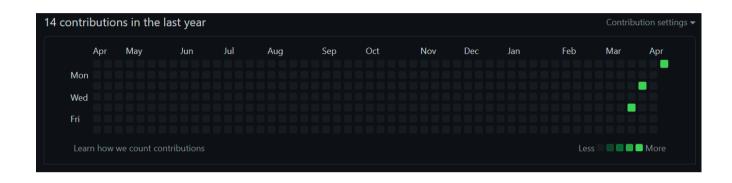
[GitHub] Welcome to GitHub, @ApaarSaini! External Inbox x

GitHub <noreply@github.com>



Mar 24, 2022, 2:00

4. Viewing your GitHub profile and contribution graph: Your GitHub profile tells people the story of your work through the repositories and gists you've pinned, the organisation memberships you've chosen to publicize, the contributions you've made, and the projects you've created. For more information, see "About your profile" and "Viewing contributions on your profile."





Aim: Program to generate logs

Basic Git init

Git init command creates a new Git repository. It can be used to convert an existing, undersigned project to a Git repository or initialize a new, empty repository. Most other Git commands are not available outside of an initialize repository, so this is usually the first command you'll run in a new project.

Basic Git status

The git status command displays the state of the working directory and the staging area. It lets you see which changes have been staged, which haven't, and which files aren't being tracked by Git. Status output does not show you any information regarding the committed project history.

```
Apaar@LAPTOP-T6AC6A70 MINGW64 /d/Sem-1/IWT/HTML/project (master)
$ git status
On branch master
No commits yet
Changes to be committed:

(use "git rm --cached <file>..." to unstage)

new file: amai-mask.html
         new file:
                       atomic-samurai.html
                       bang.html
         new file:
         new file:
                        bg-img.png
                        blizzard.html
         new file:
         new file:
                        boros.html
                        cha list.html
         new file:
                        deep-sea-king.html
         new
              file:
              file:
                        genos.html
              file:
                        home.css
                        index.html
```

Basic Git commit

The git commit command captures a snapshot of the project's currently staged changes.

Committed snapshots can be thought of as "safe" versions of a project—Git will never change them unless you explicitly ask it to. Prior to the execution of git commit, The git add command is used to promote or 'stage' changes to the project that will be stored in a commit. These two commands git commit and git add are two of the most frequently used

```
Apaar@LAPTOP-T6AC6A70 MINGW64 /d/Sem-1/IWT/HTML/project (master)

$ git commit -m "adding iwt files to repository"
[master (root-commit) 65eb423] adding iwt files to repository
19 files changed, 1396 insertions(+)
create mode 100644 amai-mask.html
create mode 100644 atomic-samurai.html
```

Basic Git add command

The git add command adds a change in the working directory to the staging area. It tells Git that you want to include updates to a particular file in the next commit. However, git add doesn't really affect the repository in any significant way—changes are not actually recorded until you run git commit

```
Untracked files:
  (use "git add <file>..." to include in what will be committed)
Apaar@LAPTOP-T6AC6A70 MINGW64 /d/Sem-1/IWT/HTML/project (master)
$ git add new.txt
$ git status
On branch master
No commits yet
Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
       new file:
                  amai-mask.html
       new file:
                  atomic-samurai.html
                  bang.html
       new file:
                  bg-img.png
       new file:
       new file:
                  blizzard.html
       new file:
                  boros.html
       new file:
                  cha list.html
       new file:
                  deep-sea-king.html
       new file:
                  genos.html
       new file:
                  home.css
       new file:
                  house-of-evolution.html
       new file:
                   index.html
       new file:
                  king.html
                  mumen-rider.html
       new file:
       new file:
                  new.txt
                  puri.html
                   saitama.html
                   sonic.html
       new file:
                   tornado.html
```

Basic Git log

Git log command is one of the most usual commands of git. It is the most useful command for Git. Every time you need to check the history, you have to use the git log command. The basic git log command will display the most recent commits and the status of the head. It will use as:

```
Apaar@LAPTOP-T6AC6A70 MINGW64 /d/Sem-1/IWT/HTML/project (master)

$ git log
commit 65eb423d4d4b75a0eba839b7c015f7b441e70c5d (HEAD -> master, origin_opm/master)
Author: ApaarSaini <apaar0244.be21@chitkara.edu.in>
Date: Sun Apr 10 22:10:36 2022 +0530

adding iwt files to repository
```



Aim: Create and visualize branches in Git

How to create branches?

The main branch in git is called master branch. But we can make branches out of this main master branch. All the files present in master can be shown in branch but the files which are created in branch are not shown in master branch. We also can merge both the parent(master) and child (other branches).

- 1. For creating a new branch: git branch "name of branch"
- 2. To check how many branches we have : git branch
- 3. To change the present working branch: git checkout "name of the branch"

Visualizing Branches:

To visualize, we have to create a new file in the new branch "activity1" instead of the master branch. After this we have to do three step architecture i.e. working directory, staging area and git repository.

After this I have done the 3 Step architecture which is tracking the file, send it to stagging area and finally we can rollback to any previously saved version of this file.

After this we will change the branch from activity1 to master, but when we switch back to master branch the file we created i.e "hello" will not be there. Hence the new file will not be shown in the master branch. In this way we can create and change different branches. We can also merge the branches by using the git merge command.

In this way we can create and change different branches. We can also merge the branches by using git merge command.

```
Apaar@LAPTOP-T6AC6A70 MINGW64 /d/sem-1/IWT/HTML/project (master)

$ git branch "javascript"

Apaar@LAPTOP-T6AC6A70 MINGW64 /d/sem-1/IWT/HTML/project (master)

$ git branch
    javascript

* master

Apaar@LAPTOP-T6AC6A70 MINGW64 /d/sem-1/IWT/HTML/project (master)

$ git checkout "javascript"

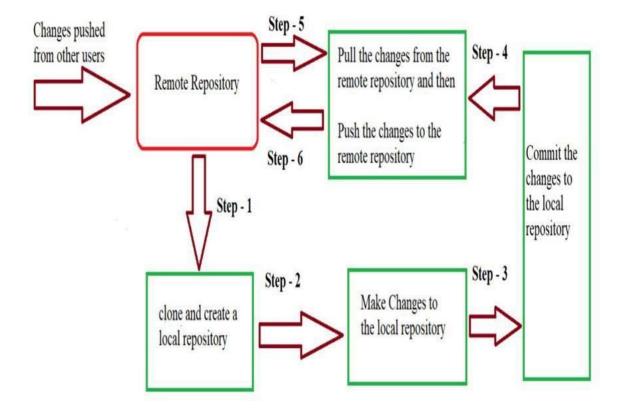
Switched to branch 'javascript'

D new.txt
```



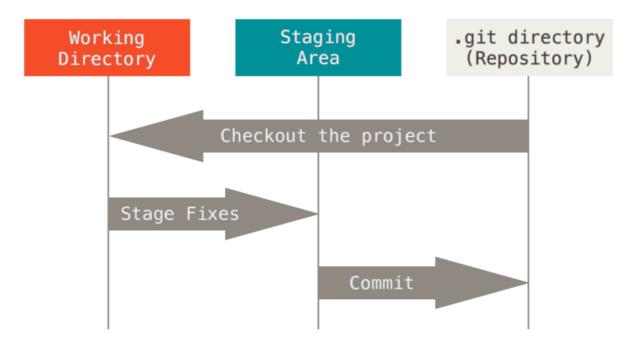
Aim: Git lifecycle description

Git is used in our day-to-day work, we use Git for keeping a track of our files, working in a collaboration with our team, to go back to our previous code versions if we face some error. Git helps us in many ways. Let us look at the Lifecycle description that git has and understand more about its life cycle. Let us see some of the basic steps that we have to follow while working with Git-



- **Step 1-** We first clone any of the code residing in the remote repository to make our won local repository.
- **Step 2-** We edit the files that we have cloned in our local repository and make the necessary changes in it.
- **Step 3-** We commit our changes by first adding them to our staging area and committing them with a commit message.
- **Step 4 and Step 5-** We first check whether there are any of the changes done in the remote repository by some other users and we first pull that changes.
- **Step 6-** If there are no changes we push our changes to the remote repository and we are done with our work.

When a directory is made a git repository, there are mainly 3 states which make the essence of Git version Control System. The three states are-



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1. Working Directory

Whenever we want to initialize aur local project directory to make a Git repository, we use the git init command. After this command, git becomes aware of the files in the project although it does not track the files yet. The files are further tracked in the staging area.

2. Staging Area

Now, to track files the different versions of our files we use the command git add. We can term a staging area as a place where different versions of our files are stored. git add command copies the version of your file from your working directory to the staging area. We can, however, choose which files we need to add to the staging area because in our working directory there are some files that we don't want to get tracked, examples include node modules, temporary files, etc. Indexing in Git is the one that helps Git in understanding which files need to be added or sent. You can find your staging area in the .git folder inside the index file. git add<filename> git add.

3. Git Directory

Now since we have all the files that are to be tracked and are ready in the staging area, we are ready to commit aur files using the git commit command. Commit helps us in keeping the track of the metadata of the files in our staging area. We specify every commit with a message which tells what the commit is about. Git preserves the information or the metadata of the files that were committed in a Git Directory which helps Git in tracking files basically it preserves the photocopy of the committed files. Commit also stores the name of the author who did the commit, files that are committed, and the date at which they are committed along with the commit message.

git commit -m <Message>

Aim: Add collaborators on GitHub Repo

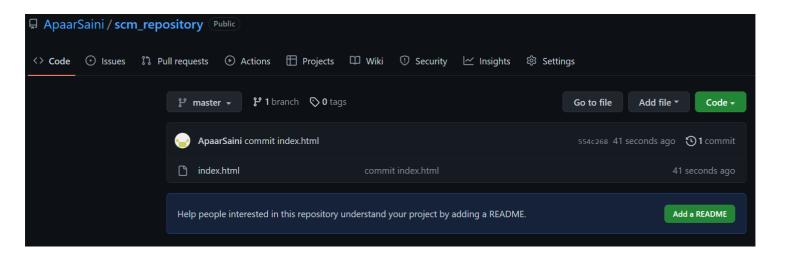
In GitHub, We can invite other GitHub users to become collaborators to our private repositories(which expire after 7 days if not accepted, restoring any unclaimed licenses). Being a collaborator, of a personal repository you can pull (read) the contents of the repository and push (write) changes to the repository. You can add unlimited collaborators on public and private repositories(with some per-day limit restrictions). But,in a private repository, the owner of the repo can only grant write access to the collaborators, and they can't have read-only access.

Steps to add collaborators:

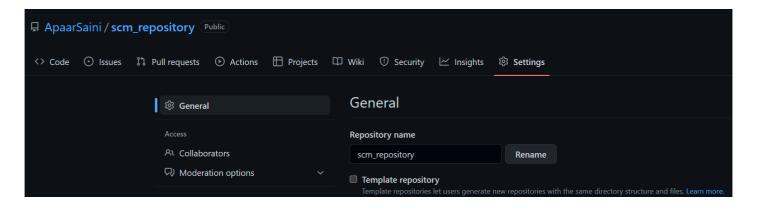
Step 1: Get the GitHub username of people who you want to add as collaborators, in case they aren't on GitHub, they will need to sign-up.

Step 2: Open the repo on which you wish to add collaborators

Step 3: Go to the settings tab (The last option in the image below)



Step 4: Select Collaborators on left side-bar



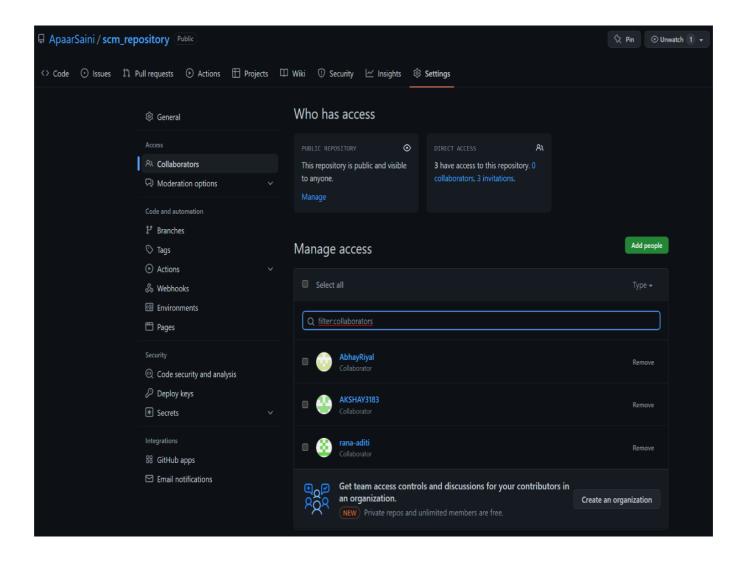
Step 5: It might ask your GitHub account password saying "Sudo mode" is going to be activated, if asked, enter

your password.

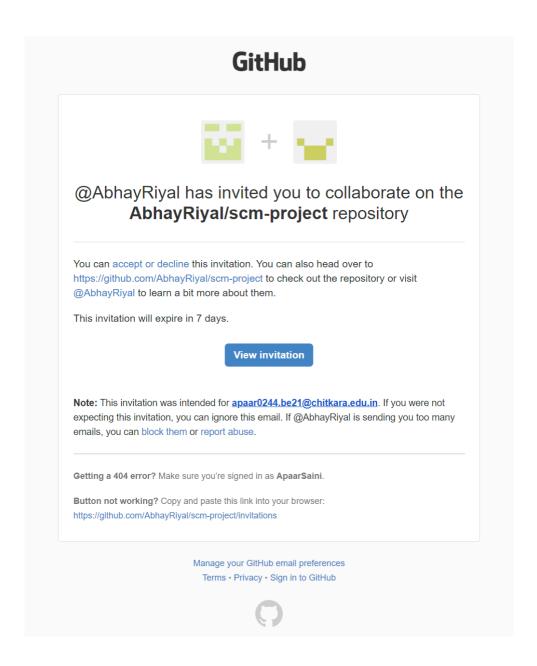
Step 6: Click Add People

Step 7: A pop-up will appear in which you need to enter the username or email of the person you want to add as a collaborator

Step 8: Insert their username/email and click on the add button.



Step 9: After this, they will receive an email that they are being invited to a GitHub repository. Once they accept the invitation they will be added as a collaborator to theRepository!



Aim: Fork and Commit

Forking a repository means creating a copy of the repo. When you fork a repo, you create your own copy of the repository on your GitHub account. This is done for thefollowing reasons:

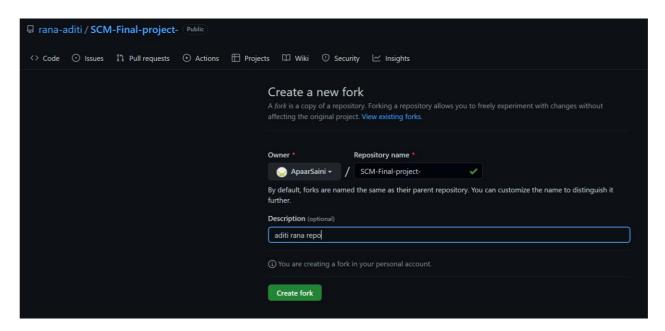
- 1. You have your own copy of the project on which you may test your own changes without changing the original project.
- 2. This helps the maintainer of the project to better check the changes you made to the project and has the power to either accept, reject or suggest something.
- 3. When you clone an Open Source project, which isn't yours, you don't have the rightto push code directly into the project.

Steps to fork a repository:

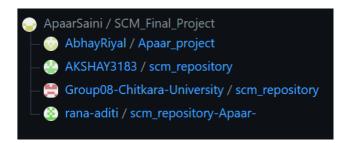
1. Go to the repository that you wish to fork on GitHub, and click the fork button ontop as shown in the image below



2. Once you click fork, you can optionally add a description and then click the "Create fork" button.



3. On clicking "Create fork" it will redirect you to the page of the fork of the repo on your account on which you can make changes without affecting the original repo!



MAKING COMMITS:

Commit is like a snapshot of your repository. These commits are snapshots of your entire repository at specific times. You should make new commits often, based onlogical units of change.

Over time, commits should tell a story of the history of your repository and how it came to be the way that it currently is.

Commits include lots of metadata in addition to the contents and message, like theauthor, timestamp, and more.

Steps to make a commit in the forked repo:

- 1. Click on any file that you want to change in the original repo, I am taking the READMEfile as an example here
 - 2. On the file's page click the pencil icon to start editing as shown in the image below
 - **3.** You can write what you want to add in the file
 - **4.** When you are adding stuff to a file you can scroll down where there is the option to add commit title and its description
 - **5.** You can give it a title and then click the "Commit changes" button on the bottom to complete the commit!

Aim: Merge and Resolve conflicts created due to own activity and collaborator's activity.

There are a few steps that could reduce the steps needed to resolve merge conflicts in Git.

- 1. The easiest way to resolve a conflicted file is to open it and make any necessary changes.
- 2. After editing the file, we can use the git add a command to stage the new merged content.
- 3. The final step is to create a new commit with the help of the git commit command.
- 4. Git will create a new merge commit to finalize the merge

Let us now look into the Git commands that may play a significant role in resolving conflicts.

1. Merge conflict occurs.

```
Lenovo@DESKTOP-06H3FJB MINGW64 /r/conflict (feature)
$ git commit -a -m "second heading"
[feature d3bbe48] second heading
 1 file changed, 1 insertion(+), 1 deletion(-)
_enovo@DESKTOP-06H3FJB MINGW64 /r/conflict (feature)
$ git switch master
Switched to branch 'master'
Lenovo@DESKTOP-06H3FJB MINGW64 /r/conflict (master)
$ git commit -a -m "third heading"
[master 2dab4e0] third heading
 1 file changed, 1 insertion(+), 1 deletion(-)
_enovo@DESKTOP-06H3FJB MINGW64 /r/conflict (master)
$ git merge feature
Auto-merging index.html
CONFLICT (content): Merge conflict in index.html
Automatic merge failed; fix conflicts and then commit the result.
.enovo@DESKTOP-06H3FJB MINGW64 /r/conflict (master|MERGING)
```

2. Resolving conflict through code editor.

3. Adding files and making a commit for the merge.

4. Merging of branches happen.

```
Lenovo@DESKTOP-06H3FJB MINGW64 /r/conflict (master|MERGING)
$ git commit -a -m "merged feature and master branch"
[master df8837d] merged feature and master branch
```

5. Snapshot git log after merging of feature and master branch.

```
df8837d1628af0e47f1aa959f9ad5fd74266eb24 (HEAD -> master)
Merge: 2dab4e0 d3bbe48
Author: ApaarSaini <apaar0244.be21@chitkara.edu.in>
        Thu Jun 2 00:39:04 2022 +0530
    merged feature and master branch
commit 2dab4e03b87ed7ca477c85a91a69c70e3da4210b
Author: ApaarSaini <apaar0244.be21@chitkara.edu.in>
Date:
        Thu Jun 2 00:36:02 2022 +0530
    third heading
commit d3bbe488bd6a720a6b5936010793d6e27776d318 (feature)
Author: ApaarSaini <apaar0244.be21@chitkara.edu.in>
        Thu Jun 2 00:35:14 2022 +0530
    second heading
commit 384e5214557954f0e5c53acc1e451963f1f793bf
Author: ApaarSaini <apaar0244.be21@chitkara.edu.in>
      Thu Jun 2 00:34:05 2022 +0530
```

Aim: Reset and Revert

While Working with Git in certain situations we want to undo changes in the workingarea or index area, sometimes remove commits locally or remotely and we need to reverse those changes.

There are 2 ways to make these changes

- 1) Change previous commits, i.e, the commit with the wrong code is replaced, forthis we use "RESET"
- 2) Make a new commit that changes the effect of the previous commit withoutactually removing it from history, for this, we use "REVERT"

Git reset

Git reset can be used to remove previous commits from your repository or unstage the currently staged files

To stage a currently staged file we will rum git add and git commit..

git log should show:

```
Apaar@LAPTOP-T6AC6A70 MINGW64 /d/SCM/reset_revert (master)

§ git log
commit f578d2678661fe576f4441c0a4dbc8e1173c3152 (HEAD -> master)
Author: Apaarsaini <apaar0244.be21@chitkara.edu.in>
Date: Thu Jun 2 14:30:59 2022 +0530

add heading one

commit e6b2c5be6e19ab5e6831a45d8968696e94df84f4
Author: Apaarsaini <apaar0244.be21@chitkara.edu.in>
Date: Thu Jun 2 14:29:26 2022 +0530

added para

commit 230a8f7c17e247a9e803c448d06b6d3ed952686b
Author: Apaarsaini <apaar0244.be21@chitkara.edu.in>
Date: Thu Jun 2 14:28:14 2022 +0530

initial commit
```

To unstage, and remove previous commit from git log we will run

Git reset HEAD~1

After which git log will change to:

In such a way, we can add HEAD~n to remove any n commits from the top.Reset has 3 ways it resets the commits

Git reset —hard **HEAD~n**: In this, it removes the commits from the history and also deletes the changes made by those commits

NOTE: this will remove **ALL** the changes made by those commits with no way torecover them, use with caution!

Git reset —mixed HEAD \sim n: This is the default option which is the same as git reset HEAD \sim n it only removes the commits and unstaged the files but the changes made by those commits still exist in the working directory

Git reset—**soft HEAD~n:** In this, it only removes the commits but would not upstage the file and the changes stay the same in the working directory, used for example to changethe title of the previous commit.

Git Revert

Git revert is used to undo the changes made by some commit without actually removing the commit from the history, it just makes another commit with those changes reversed

For example, if the git log currently is

```
Apaar@LAPTOP-T6AC6A70 MINGW64 /d/SCM/reset_revert (master)

$ git log
commit c390d7fb3de56b14b8dd15d1b2699662c3c46bea (HEAD -> master)
Author: Apaarsaini <apaar0244.be21@chitkara.edu.in>
Date: Thu Jun 2 14:56:27 2022 +0530

reset the last commit

commit e6b2c5be6e19ab5e6831a45d8968696e94df84f4
Author: Apaarsaini <apaar0244.be21@chitkara.edu.in>
Date: Thu Jun 2 14:29:26 2022 +0530

added para

commit 230a8f7c17e247a9e803c448d06b6d3ed952686b
Author: Apaarsaini <apaar0244.be21@chitkara.edu.in>
Date: Thu Jun 2 14:28:14 2022 +0530

initial commit
```

If we want to remove the topmost commit, then we will copy its commit ID/hash.

Use git revert as such.

Git revert [commit id without brackets]

Which will open a text editor asking for a commit message, after you close the editor it will show the changes made

```
undo  "added an input type text"

This reverts commit 566f13fabb92f95e9afbcb585ee3e46e83437f25.

# Please enter the commit message for your changes. Lines starting
# with '#' will be ignored, and an empty message aborts the commit.

# On branch master
# Changes to be committed:
# modified: index.html
#
```

```
[master 5e63029] Revert "added an input type text"
  1 file changed, 1 deletion(-)
```

The git log now should be

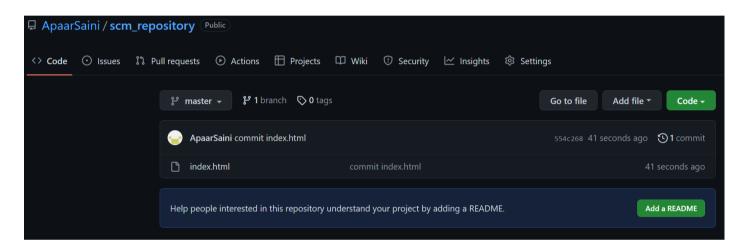
```
paar@LAPTOP-T6AC6A70 MINGW64 /d/SCM/reset_revert (ma
git revert c390d7fb3de56b14b8dd15d1b2699662c3c46bea
[master a2e7ea4] Revert "reset the last commit"
1 file changed, 1 insertion(+), 1 deletion(-)
Apaar@LAPTOP-T6AC6A70 MINGW64 /d/SCM/reset_revert (master)
git log
commit a2e7ea4443bc110a03e2fa52b360e70891b49403 (HEAD -> master)
Author: ApaarSaini <apaar0244.be21@chitkara.edu.in>
Date: Thu Jun 2 14:57:37 2022 +0530
    Revert "reset the last commit"
    This reverts commit c390d7fb3de56b14b8dd15d1b2699662c3c46bea.
    reverted to where paragraph was added
commit c390d7fb3de56b14b8dd15d1b2699662c3c46bea
Author: ApaarSaini <apaar0244.be21@chitkara.edu.in>
Date: Thu Jun 2 14:56:27 2022 +0530
     reset the last commit
commit e6b2c5be6e19ab5e6831a45d8968696e94df84f4
Author: ApaarSaini <apaar0244.be21@chitkara.edu.in>
         Thu Jun 2 14:29:26 2022 +0530
Date:
    added para
commit 230a8f7c17e247a9e803c448d06b6d3ed952686b
Author: ApaarSaini <apaar0244.be21@chitkara.edu.in>
         Thu Jun 2 14:28:14 2022 +0530
Date:
    initial commit
```

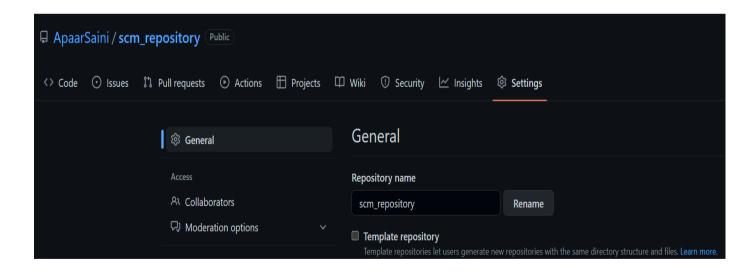
The main difference between RESET and REVERT is that *Reset* changes the history and makes it so that the mistake or the wrong commit never happened while *Revert* fixes the mistake of the previous commit with another commit while keeping the wrongcommits in the history.

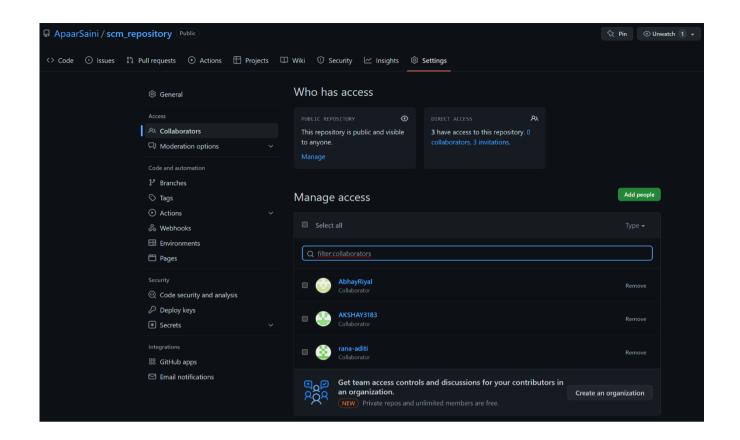
Final source code management project :-

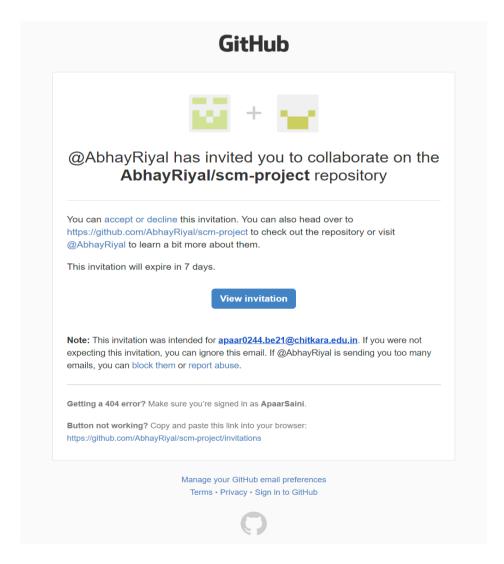
Steps-

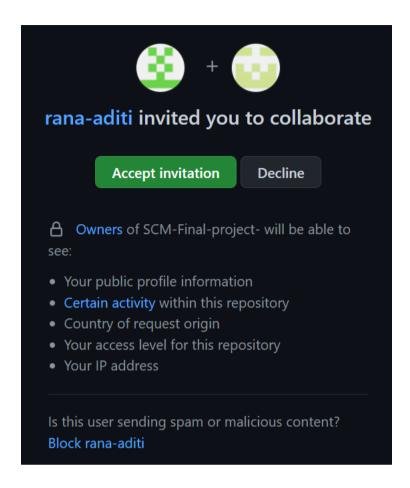
1. Creating a distributed repository and adding people as collaborators.



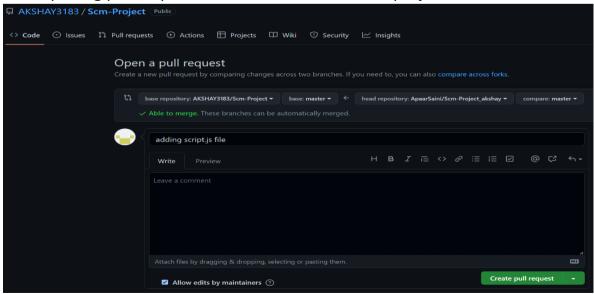




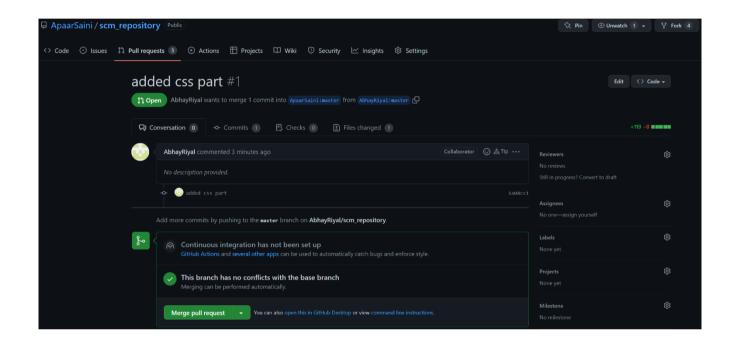


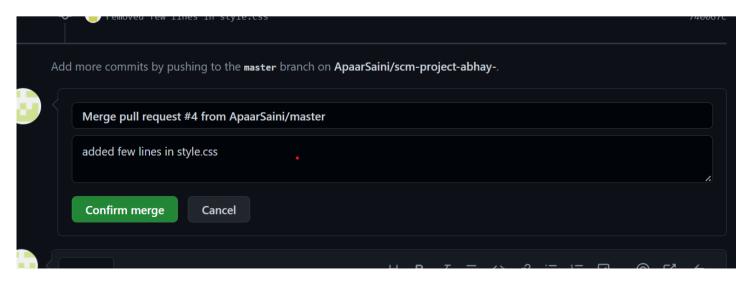


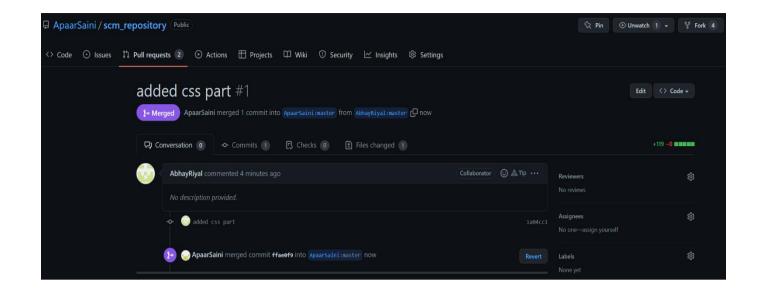
2. Opening pull request for other team members projects.



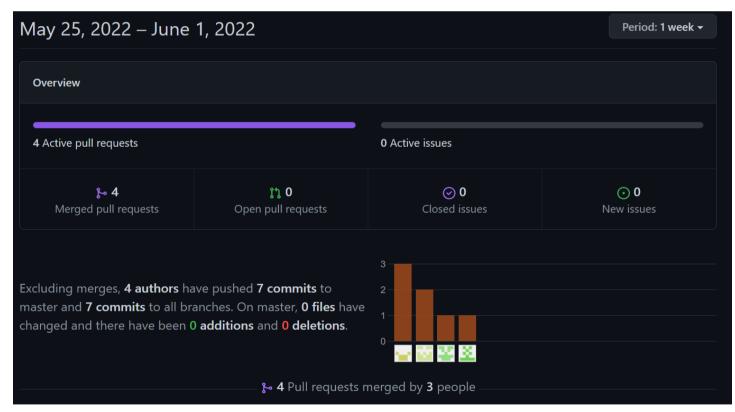
3. Closing and merging pull requests as a maintainer.







4. Network graph as maintainer.





5. Contribution graph for whole year.

