

# Setting up a Version Control System with Git

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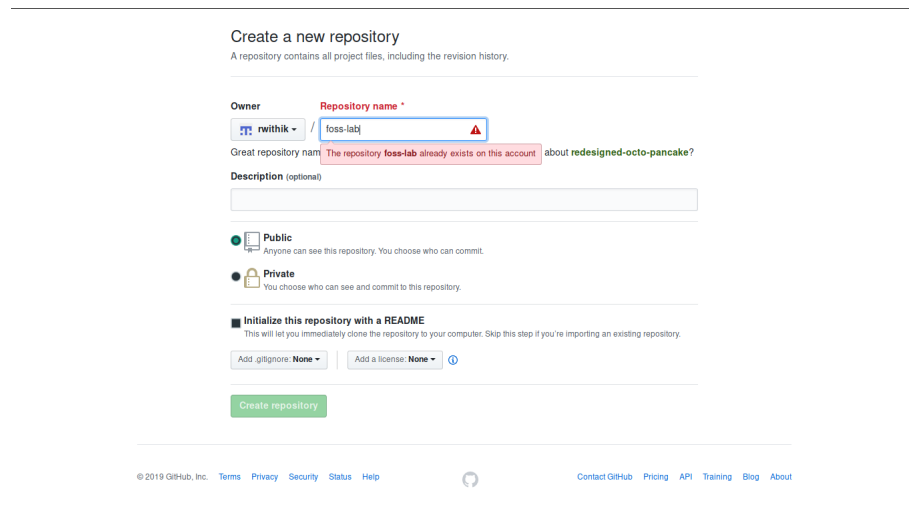
## The Local Repository

The first step in using a version control system is making the actual repository. Here, I've made a directory named 'foss-lab' and converted it into a git repo by using `git init` inside the directory. This creates a `.git` directory inside the repo, which store the details about the git version control system. This directory is our local repository. I've also made a `README.md` file.

```
rwthik@Zeus ~  
» mkdir foss-lab  
rwthik@Zeus ~  
» cd foss-lab  
rwthik@Zeus ~/foss-lab  
» git init  
Initialized empty Git repository in /home/rwthik/foss-lab/.git/  
rwthik@Zeus ~/foss-lab (master)  
» echo "FOSS Lab Repo" > README.md  
rwthik@Zeus ~/foss-lab (master %)  
»
```

# The Remote Repository

The local repository exists only on my system. We need to connect it to a remote repository, for any sort of collaboration to be possible. So, I made an online repo at github.com.



Now we need to connect the local repo to the online repo. This is done using the `git remote` command.  
Syntax: `git remote add origin [URL]`

```
rwithik@Zeus ~  
» mkdir foss-lab  
rwithik@Zeus ~  
» cd foss-lab  
rwithik@Zeus ~/foss-lab  
» git init  
Initialized empty Git repository in /home/rwithik/foss-lab/.git/  
rwithik@Zeus ~/foss-lab (master)  
» echo "FOSS Lab Repo" > README.md  
rwithik@Zeus ~/foss-lab (master %)  
» git remote add origin https://github.com/rwithik/foss-lab  
rwithik@Zeus ~/foss-lab (master %)  
»
```

## Making Changes

Any new files or any changes in existing files should be added to the local and remote repositories. This is done with the **git add** command. This adds the modified and new files to the staging area. Then the files are committed with a commit message using **git commit**. This records the changes in the local repo. Syntax: `git add [FILE(S)]`  
`git commit -m "MESSAGE"`

```
rwithik@Zeus Projects/foss-lab (master !*)  
» ls  
Images README.md Reports Scripts  
rwithik@Zeus Projects/foss-lab (master !*)  
» git add .  
rwithik@Zeus Projects/foss-lab (master -+)  
»
```

```
rwithik@Zeus Projects/foss-lab (master -+)  
» git commit -m "Git Expt"  
[master 60cd50c] Git Expt  
75 files changed, 320 insertions(+), 33 deletions(-)  
rename Images/{Expt1-3 => Cycle1}/cat.png (100%)  
rename Images/{Expt1-3 => Cycle1}/cd.png (100%)  
rename Images/{Expt1-3 => Cycle1}/chmod.png (100%)  
rename Images/{Expt1-3 => Cycle1}/cp.png (100%)  
rename Images/{Expt1-3 => Cycle1}/curl.png (100%)  
rename Images/{Expt1-3 => Cycle1}/echo.png (100%)  
rename Images/{Expt1-3 => Cycle1}/ftp.png (100%)  
rename Images/{Expt1-3 => Cycle1}/grep.png (100%)  
rename Images/{Expt1-3 => Cycle1}/head.png (100%)  
rename Images/{Expt1-3 => Cycle1}/jobdisplay.png (100%)  
rename Images/{Expt1-3 => Cycle1}/kill.png (100%)  
rename Images/{Expt1-3 => Cycle1}/less.png (100%)  
rename Images/{Expt1-3 => Cycle1}/ls.png (100%)  
rename Images/{Expt1-3 => Cycle1}/man1.png (100%)  
rename Images/{Expt1-3 => Cycle1}/man2.png (100%)  
rename Images/{Expt1-3 => Cycle1}/mkdir.png (100%)  
rename Images/{Expt1-3 => Cycle1}/mv.png (100%)  
rename Images/{Expt1-3 => Cycle1}/pipimg.png (100%)  
rename Images/{Expt1-3 => Cycle1}/ps.png (100%)  
rename Images/{Expt1-3 => Cycle1}/pwd.png (100%)  
rename Images/{Expt1-3 => Cycle1}/redirection.png (100%)  
rename Images/{Expt1-3 => Cycle1}/rm.png (100%)  
rename Images/{Expt1-3 => Cycle1}/sort.png (100%)  
rename Images/{Expt1-3 => Cycle1}/ssh.png (100%)  
rename Images/{Expt1-3 => Cycle1}/tail.png (100%)  
rename Images/{Expt1-3 => Cycle1}/touch.png (100%)  
rename Images/{Expt1-3 => Cycle1}/tree.png (100%)  
rename Images/{Expt1-3 => Cycle1}/uniq.png (100%)  
rename Images/{Expt1-3 => Cycle1}/uniq.png (100%)  
rename Images/{Expt1-3 => Cycle1}/wget.png (100%)
```

## Pushing Changes to the Remote Repository

The changes we committed are currently recorded in the local repository. To push these changes to the remote repo, use **git push**. In the example given below, origin is the name of the remote, and master is the name of the branch.

Syntax: `git push [REMOTE NAME] [BRANCH NAME]`

```
create mode 100644 Images/Cycle2/8.png
create mode 100644 Images/Cycle2/9.png
create mode 100644 Images/Network/1.png
create mode 100644 Images/Network/2.png
create mode 100644 Images/Network/3.png
create mode 100644 Images/Network/4.png
create mode 100644 Images/Network/5.png
create mode 100644 Images/Network/6.png
create mode 100644 Images/Network/7.png
create mode 100644 Images/Network/8.png
create mode 100644 Images/Network/9.png
rename Reports/{Expt1-3.pdf => Cycle1.pdf} (99%)
rename Reports/{Expt1-3.tex => Cycle1.tex} (76%)
create mode 100644 Reports/Network.pdf
create mode 100644 Reports/Network.tex
create mode 100644 Reports/Practical1.pdf
create mode 100644 Reports/Practical1.tex
create mode 100755 Scripts/Expt8.sh
create mode 100644 Scripts/ulist
rwthik@Zeus Projects/foss-lab (master)
» git push origin master
Username for 'https://github.com': rwthik
Password for 'https://rwthik@github.com':
Enumerating objects: 63, done.
Counting objects: 100% (63/63), done.
Delta compression using up to 4 threads
Compressing objects: 100% (58/58), done.
Writing objects: 100% (60/60), 3.92 MiB | 237.00 KiB/s, done.
Total 60 (delta 2), reused 0 (delta 0)
remote: Resolving deltas: 100% (2/2), completed with 1 local object.
To https://github.com/rwthik/foss-lab
   d6fd740..60cd50c master -> master
rwthik@Zeus Projects/foss-lab (master)
»
```

## Comparing Previous Versions

Use the `git log` command to see all the previous changes with their commit messages.

```
commit 60cd50c91d9a49c80827e001ed1802a03a81af0c (HEAD -> master, origin/master)
Author: rwithik <rwithik@gmail.com>
Date:   Fri Feb 22 18:39:18 2019 +0530

    Git Expt

commit 5ff5156981be12598050aa2caf011446ef73750e
Author: rwithik <rwithik@gmail.com>
Date:   Sun Feb 17 22:27:47 2019 +0530

    Experiments 4-6

commit d6fd740f9616839e6c63bfa87c154738b0ba1189
Author: rwithik <rwithik@gmail.com>
Date:   Sun Feb 17 20:14:32 2019 +0530

    Cleaning up

commit c88f4dee7ffa21f0cfa0044d42a725cbcf39bc8e
Author: rwithik <rwithik@gmail.com>
Date:   Fri Feb 15 07:44:56 2019 +0530

    Cleaning up

commit 039c60e6d3adf7721629556204d274f856e30a02
Author: rwithik <rwithik@gmail.com>
Date:   Thu Feb 14 21:08:07 2019 +0530

    report 1

commit 89e823403c546e394b98c44de0d0c748fe91345d
Author: rwithik <rwithik@gmail.com>
Date:   Tue Feb 12 19:49:35 2019 +0530

    .
```

Use `git checkout` to revert to a previous state of the repo.  
Syntax: `git checkout [BRANCH]`

```
rwithik@Zeus foss-lab/Reports (master)
» ls
Cycle1.aux  Cycle1.tex  Network.pdf  Practicel.log  VersionControlSystem.aux  VersionControlSystem.tex
Cycle1.log  Network.aux  Network.tex  Practicel.pdf  VersionControlSystem.log
Cycle1.pdf  Network.log  Practicel.aux  Practicel.tex  VersionControlSystem.pdf
rwithik@Zeus foss-lab/Reports (master)
» git checkout 89e8234
Note: checking out '89e8234'.

You are in 'detached HEAD' state. You can look around, make experimental
changes and commit them, and you can discard any commits you make in this
state without impacting any branches by performing another checkout.

If you want to create a new branch to retain commits you create, you may
do so (now or later) by using -b with the checkout command again. Example:

    git checkout -b <new-branch-name>

HEAD is now at 89e8234 added gitignore
rwithik@Zeus foss-lab/Reports
» ls
Cycle1.aux  Network.aux  Practicel.aux  VersionControlSystem.aux
Cycle1.log  Network.log  Practicel.log  VersionControlSystem.log
rwithik@Zeus foss-lab/Reports
» git checkout master
Previous HEAD position was 89e8234 added gitignore
Switched to branch 'master'
Your branch is ahead of 'origin/master' by 4 commits.
(use 'git push' to publish your local commits)
rwithik@Zeus foss-lab/Reports (master)
»
```

## Merge Conflicts

The `git pull` command is used to update the local repo when it is behind the remote repo. Automatic merges of changed files occur normally, but in cases where the same lines are changed in both the repos, a merge conflict occurs. It can be resolved by editing the conflicted files and choosing which change to keep.

```
rwthik@Zeus Projects/foss-lab (master)
» vim README.md
rwthik@Zeus Projects/foss-lab (master *)
» git add .
rwthik@Zeus Projects/foss-lab (master +)
» gcmsg "minor edit"
[master dd0e6fc] minor edit
1 file changed, 1 insertion(+), 1 deletion(-)
rwthik@Zeus Projects/foss-lab (master)
» git pull
Username for 'https://github.com': rwthik
Password for 'https://rwthik@github.com':
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), 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), done.
From https://github.com/rwthik/foss-lab
d6c4896..6282461 master -> origin/master
Auto-merging README.md
CONFLICT (content): Merge conflict in README.md
Automatic merge failed; fix conflicts and then commit the result.
rwthik@Zeus Projects/foss-lab (master ?)
» █
```

```
1  <<<<<< HEAD
1  KTU CSE S4 FOSS Lab Repo 2019
2  =====
3  FOSS Lab Stuff
4  >>>>> 6282461e96b3c00955496fa715af5d253f68d964
```

```
rwthik@Zeus Projects/foss-lab (master)
» git add .
rwthik@Zeus Projects/foss-lab (master)
» git commit -m "Conflict resolution"
[master 0521217] Conflict resolution
rwthik@Zeus Projects/foss-lab (master)
» cat README.md
KTU CSE S4 FOSS Lab Repo 2019
rwthik@Zeus Projects/foss-lab (master)
»
```

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