

A Tutorial on Git and Github

—

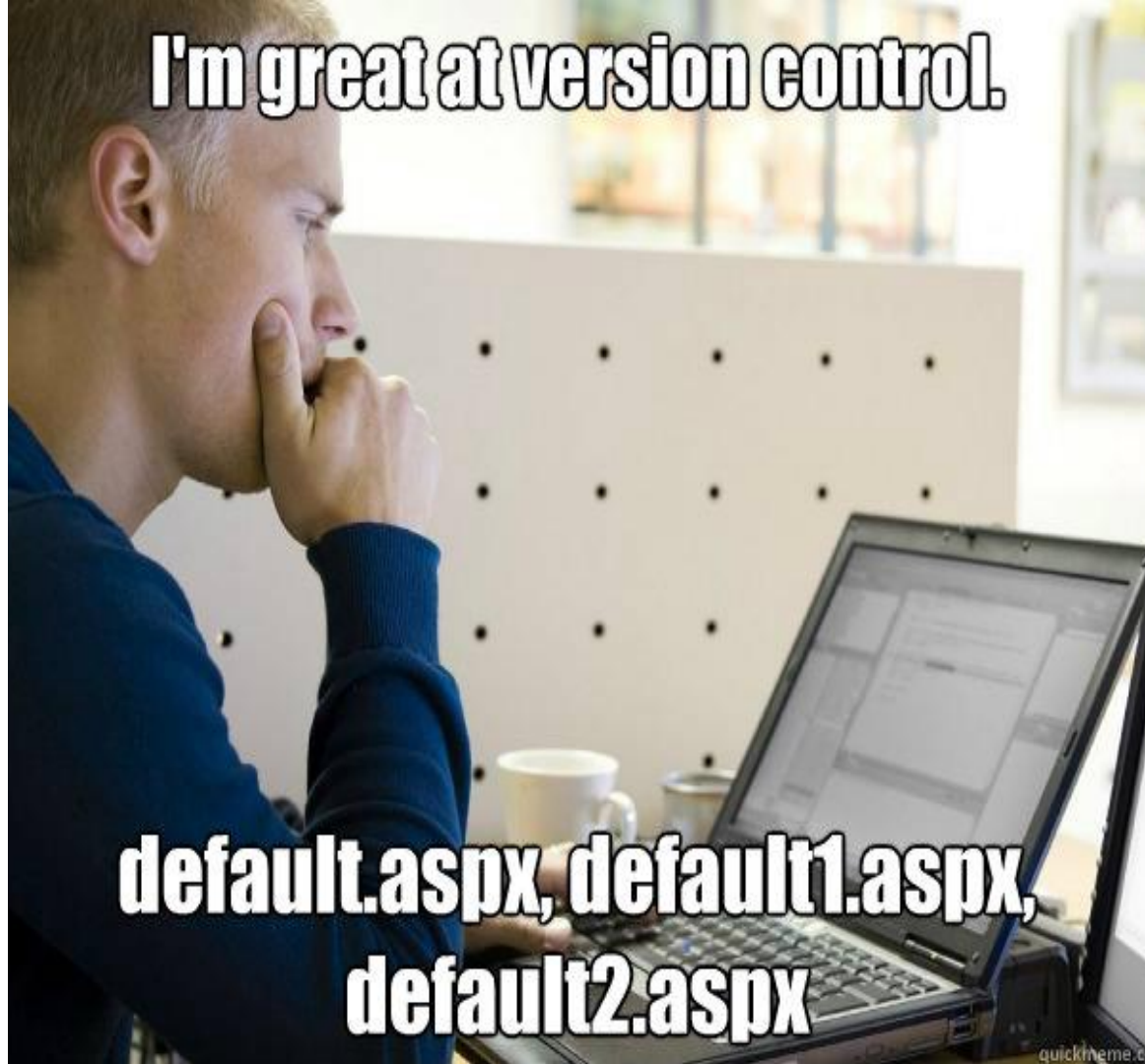
By Reyhane Askari

Table of contents:

- Version control systems and git
- Git Basics
- Branch Management
- Git Merge, Update and Rebase
- Git Conflicts and How to Resolve them
- Interaction with Remote Repos
- Git Stash
- Some Useful Tips
- Git cheat sheet

Version Control System

- Manage multiple versions of your source code.
- Great way to work as a team where you work concurrently.
- Go back and forth between the versions of your code.



I'm great at version control.

**default.aspx, default1.aspx,
default2.aspx**

Git

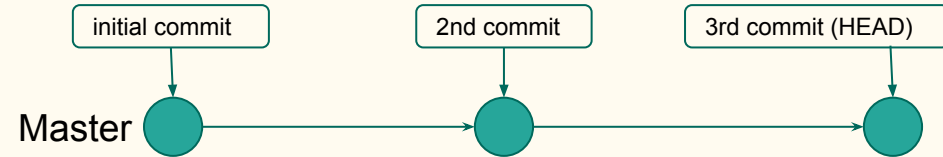
VS

SVN

- Distributed Version Control System
- System does not necessarily rely on a central server
- Clone a copy of a repo which has the full project history
- Motto - Commit fast, commit locally. Push group of changesets at once
- No need to be connected to the central server.

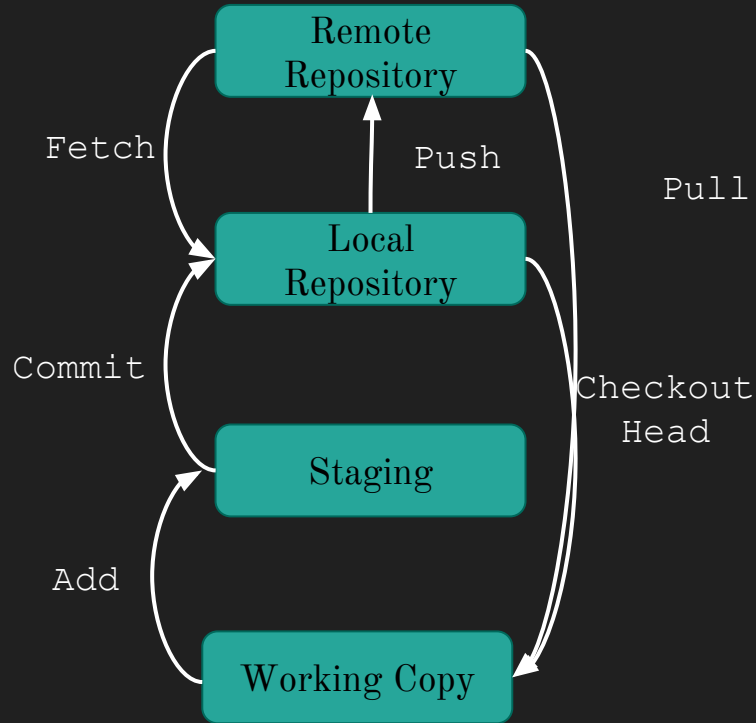
- Centralized Version Control System
- Single central copy of project
- Commit changes to central copy
- No need to keep many copies
- Problem: the functionality depends on you being connected to the central server

Git Basics



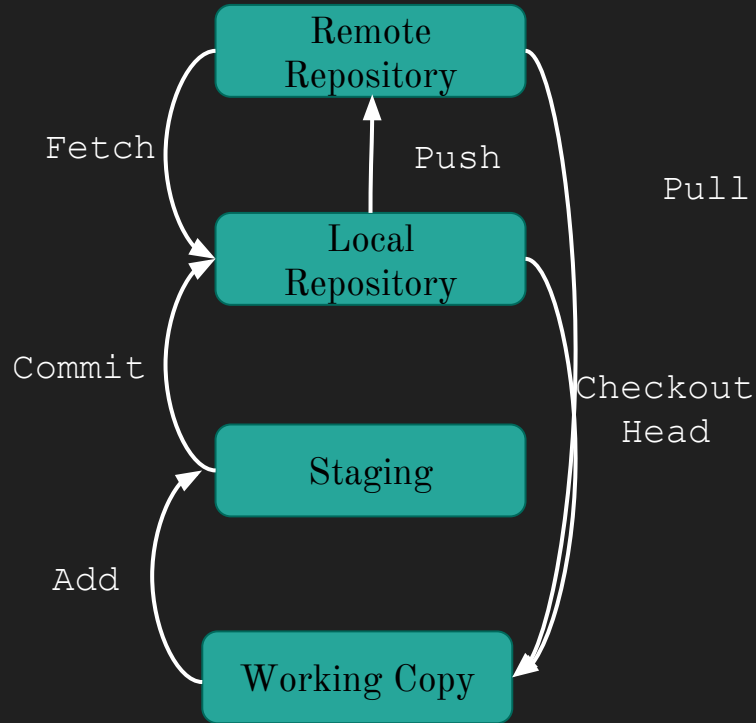
- The full project code and history is called a repository.
- A commit is indeed a snapshot of your code at different stages of the project.
- Also, a repository is a graph of commits.
- Head of the tree is the last commit.

Git Basics



- `git clone /url/to/repository`
- `git add <filename>`
- `git status`
- `git diff`
- `git add <filename> -p`
- `git add .`

Git Basics

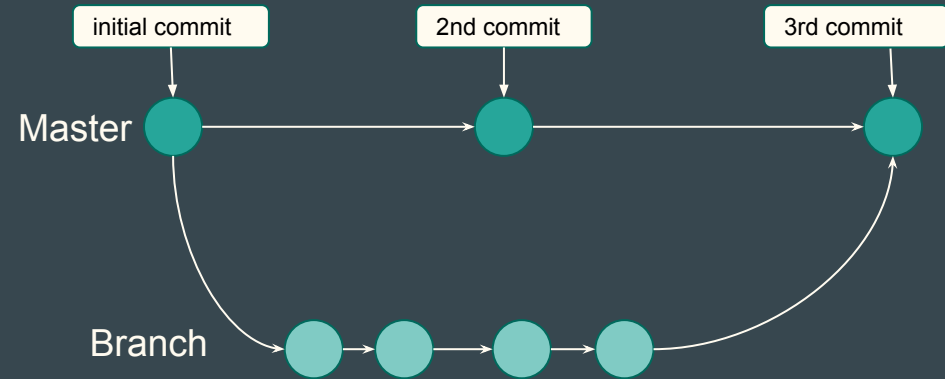


-
- `git commit -m "Commit message"`
 - `git status`
 - `git log`
 - `git log -p`
 - `git push`
 - `git pull`
-

MADE A NEW GIT REPO

**SO YOU COULD SAY IT'S GETTING
PRETTY SERIOUS**

Branch Management



- Create a new branch:

```
git branch new_branch
```

- Move between branches:

```
git checkout other_branch
```

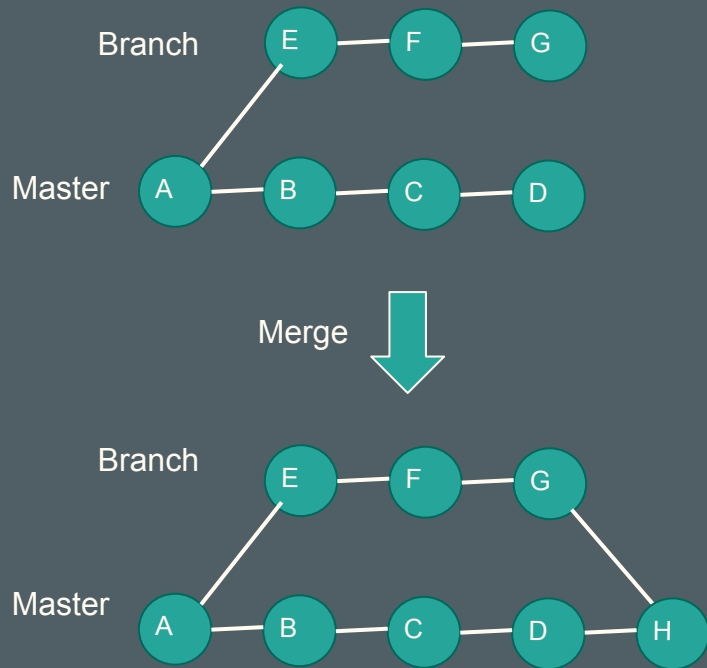
- Create a new branch and checking out to it :

```
git checkout -b new_branch
```

- Delete a branch:

```
git branch -d branch_name
```

Git Merge



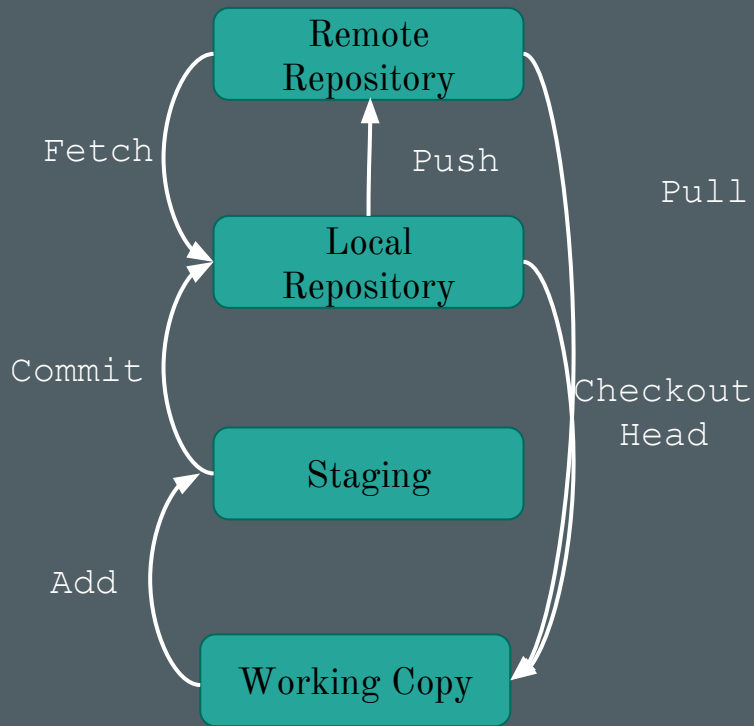
- Combine the commits of two branches:

```
git merge other_branch_name
```

- H is the merge commit.
- Send the new branch to upstream:

```
git push origin branch_name
```

Git Update



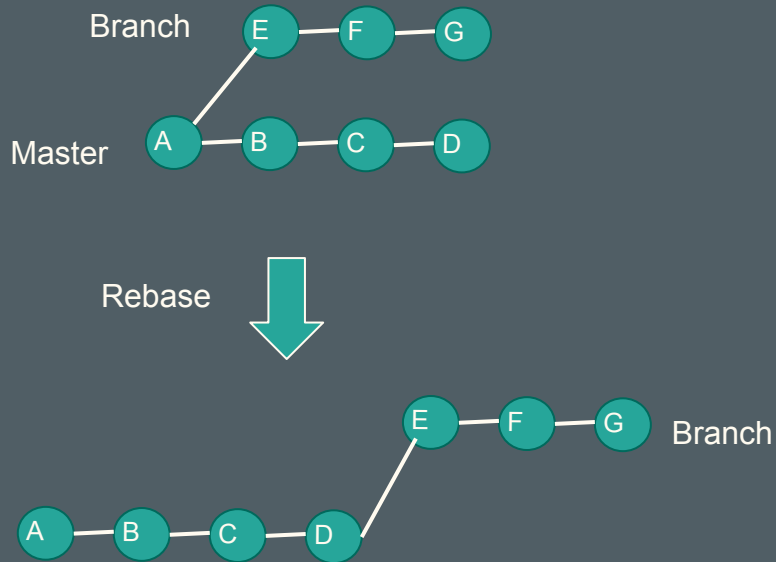
-
- Fetch the changes from a repository but do not merge them:

```
git fetch repo/branch
```

- Update local repository to the newest commit:

```
git pull repo/branch
```

Git Rebase




- Re-apply commits on top of another base tip:

```
git rebase -i branch_name
```

Git Conflicts

During a merge or rebase where you are adding the changes from another branch to your changes, usually git figures out how to integrate the changes but when both branches have made changes to the same lines of code git asks you whether to apply which change.

GIT MERGE

A wide, flat, dry landscape under a cloudy sky, with the text 'GIT MERGE' overlaid at the top. The landscape is a vast, open field with sparse, low-lying vegetation in shades of brown and tan. The horizon is straight and distant, with a few small, dark shrubs visible. The sky is a pale blue with soft, white clouds. The text 'GIT MERGE' is written in a large, bold, white, blocky font with a thick black outline, positioned in the upper right quadrant of the image.

How to Resolve Git Conflicts?

- Find which files have conflicts using:

```
git status
```

```
both modified:    doc/install_generic.inc
both modified:    doc/install_windows.txt
both modified:    doc/requirements.inc
```

How to Resolve Git Conflicts?

- Go to that file and find the conflict and choose the line that you want to keep.

```
<<<<<<< HEAD
```

```
    * **Recommended**: MKL, which is free through Conda with ``mkl  
-service`` package.
```

```
=====
```

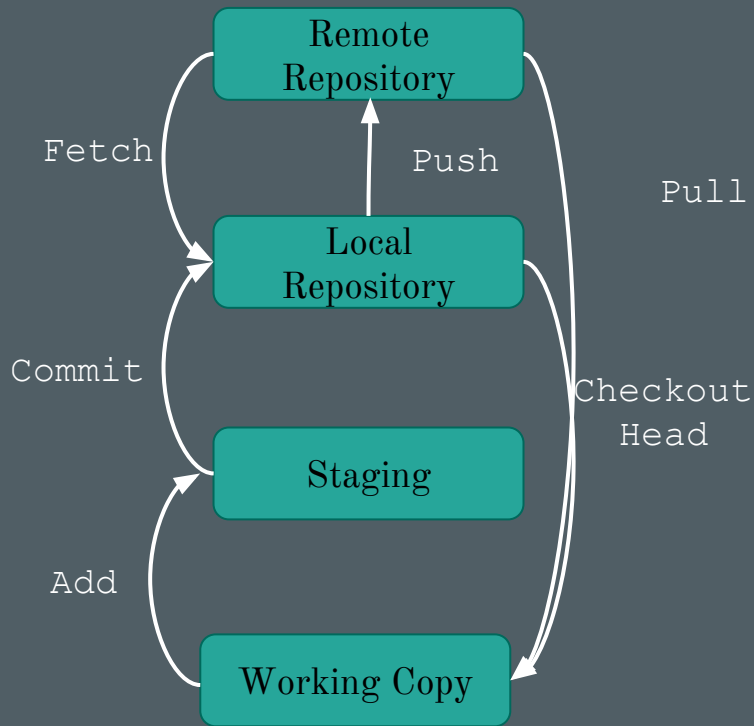
```
    * **Recommended**: MKL, which is free through Conda.
```

```
>>>>>>> 1b62e953a... Merge pull request #5433 from notoraptor/windoc
```

How to Resolve Git Conflicts?

- Resolve all the conflicts and then:
 - `git add path/to/files/with/conflicts`
- Then commit your changes:
 - `git commit`
- Continue to rebase:
 - `git rebase --continue`
- Or abort the rebase in case you want to stop applying the changes:
 - `git rebase --abort`

Interaction with remote repos



-
- See your remote repos:

```
git remote -v
```

- Add a remote repository:

```
git remote -v, add [name][url]
```

- Send the changes from a local repo to a remote repo:

```
git push repo/branch
```

- Push and force the local changes to the remote:

```
git push -f repo/branch
```

Never force push when there are conflicts!
Always rebase or merge if your push was rejected!



Git Stash

- If you have unstaged files, and you want to checkout to another branch, you need to save your changes:

```
git stash
```

- To retrieve the saved changes on that branch:

```
git stash pop
```

- You can see the current stash list:

```
git stash list
```

Workflows for contributing to other repos

- Fork the repo to contribute to
- Checkout your forked repo
- Add a remote pointing to the repo to contribute to

Some Useful Tips

- Never ever commit to the master, always create a new branch first.
- Make the commit messages informative not like: "*new changes*", give a short description like: "*changed make_node() to be more readable*"
- Before starting to implement a new feature, always fetch and pull the changes in the remote branch which is often called the upstream.
- If you want to revert non-committed local changes use:

```
git reset --hard
```

- If you want to go to a specific commit:

```
git checkout {sha1-code}
```

- Select one commit and apply it to the active branch:

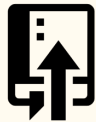
```
git cherry-pick {sha1-code}
```

And the Final Tip:

In case of fire



1. git commit



2. git push



3. leave building

GIT CHEAT SHEET

presented by TOWER › Version control with Git - made easy



CREATE

Clone an existing repository

```
$ git clone ssh://user@domain.com/repo.git
```

Create a new local repository

```
$ git init
```

LOCAL CHANGES

Changed files in your working directory

```
$ git status
```

Changes to tracked files

```
$ git diff
```

Add all current changes to the next commit

```
$ git add .
```

Add some changes in <file> to the next commit

```
$ git add -p <file>
```

Commit all local changes in tracked files

```
$ git commit -a
```

Commit previously staged changes

```
$ git commit
```

Change the last commit

Don't amend published commits!

```
$ git commit --amend
```

COMMIT HISTORY

Show all commits, starting with newest

```
$ git log
```

Show changes over time for a specific file

```
$ git log -p <file>
```

Who changed what and when in <file>

```
$ git blame <file>
```

BRANCHES & TAGS

List all existing branches

```
$ git branch -av
```

Switch HEAD branch

```
$ git checkout <branch>
```

Create a new branch based on your current HEAD

```
$ git branch <new-branch>
```

Create a new tracking branch based on a remote branch

```
$ git checkout --track <remote/branch>
```

Delete a local branch

```
$ git branch -d <branch>
```

Mark the current commit with a tag

```
$ git tag <tag-name>
```

UPDATE & PUBLISH

List all currently configured remotes

```
$ git remote -v
```

Show information about a remote

```
$ git remote show <remote>
```

Add new remote repository, named <remote>

```
$ git remote add <shortname> <url>
```

Download all changes from <remote>, but don't integrate into HEAD

```
$ git fetch <remote>
```

Download changes and directly merge/integrate into HEAD

```
$ git pull <remote> <branch>
```

Publish local changes on a remote

```
$ git push <remote> <branch>
```

Delete a branch on the remote

```
$ git branch -dr <remote/branch>
```

Publish your tags

```
$ git push --tags
```

MERGE & REBASE

Merge <branch> into your current HEAD

```
$ git merge <branch>
```

Rebase your current HEAD onto <branch>

Don't rebase published commits!

```
$ git rebase <branch>
```

Abort a rebase

```
$ git rebase --abort
```

Continue a rebase after resolving conflicts

```
$ git rebase --continue
```

Use your configured merge tool to solve conflicts

```
$ git mergetool
```

Use your editor to manually solve conflicts and (after resolving) mark file as resolved

```
$ git add <resolved-file>
```

```
$ git rm <resolved-file>
```

UNDO

Discard all local changes in your working directory

```
$ git reset --hard HEAD
```

Discard local changes in a specific file

```
$ git checkout HEAD <file>
```

Revert a commit (by producing a new commit with contrary changes)

```
$ git revert <commit>
```

Reset your HEAD pointer to a previous commit

...and discard all changes since then

```
$ git reset --hard <commit>
```

...and preserve all changes as unstaged changes

```
$ git reset <commit>
```

...and preserve uncommitted local changes

```
$ git reset --keep <commit>
```

References:

- https://sites.google.com/a/lisa.iro.umontreal.ca/lisainfo/getting-started/welcome/tutorials-kick-off-meeting/tutorials-2015/git_github_tutorial
- <https://git-scm.com/docs/>
- <http://rogerdudler.github.io/git-guide/>
- <https://www.slideshare.net/anuragupadhaya/git-101-for-beginners>