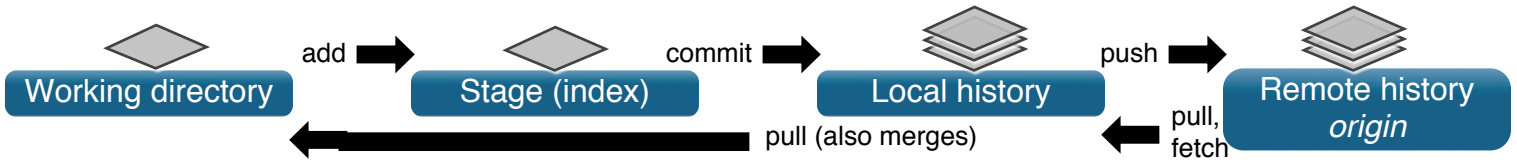
Version Control with Git Cheat Sheet



Using Git with a Feature-Branch Workflow

1. Create, checkout branch.
2A. Create, modify, delete code. (Not shown)
2B. Add files to stage and review work.
2C. Commit files to history often. Repeat 2A.
3. Ready? Clean up and combine commits.
4. Merge branch into master; tag master
5. Push, delete branch.

1. Create

git clone <url>
From remote history; creates local folder
git clone git@github.com:mikec/myproj.git

git init
Create a new Git repository from your current directory; add and commit files then.

git remote add origin <url>;
git push --set-upstream origin master
From local history to blank remote history
git remote add origin
git@github.com:mcombs964/myproject.git

git remote --verbose # verify origin url
If the url is wrong you can use:
git remote remove origin

1. Branch

git branch [--all | --verbose]
List branches. --all shows local and remotes

git branch <new-branch> [source-branch]
Create local branch based on HEAD or source

git checkout <branch1>
Switch to branch

git branch --move <branch1> <branch2>
Rename branch1 to branch2

git branch --delete <branch1>
Delete local branch1

2B. Add/Reset

git add . | --update | --patch <files> | <files>
Add all new/modified/deleted or specified files to stage. --update skips new files. --patch has interactive prompts to add parts of files.

git mv <files>
Rename or move files; update stage

git rm [--cached] <files>
Delete file from working area and index. --cached removes from history only.

git reset [files]
Unstage uncommited work; remove all (or specified) files from stage without changing working directory.

git reset --hard
DANGER! Delete uncommited work.

git clean [--dry-run | --force]
DANGER! Delete unstaged files.

2B. Review Work

git status
Files staged and in working directory.

git diff [file] # working vs stage code changes
Code changes between working and stage

git diff HEAD # working vs last commit code changes
Code changes between working and last commit

git diff --cached # stage vs last commit code changes
Code changes between stage and last commit

git diff <commit1> <commit2> # history code changes

git log [–oneline | --graph | --decorate]
History of commits

git log <branch> **--not master**
History of commits for branch

git show <commit>[:<file>]
History of commits and code changes. :file narrows scope

git reflog [--relative-date | --all]
Show changes to HEAD and SHA-1s

2C. Commit/Revert

git commit [--all | --message "<description title>"]
Copy staged changes into local history. *See Commit Message Style on back.*

git commit --amend
Combine new changes with last commit, overwrite last description

git reset HEAD^
Undo prior commit: roll back code (move HEAD and branch) to prior commit.

git revert <commit>
Unapply changes in specified commit, then create a new commit.

git checkout <commit> <file>
Bring file from specified commit in local history to working directory.

3. Clean Up Commits

git rebase --interactive master
Clean up/combine commits and modify history of current branch. In editor, change command per line to pick, squash, etc.

After rebase, use *push origin [branch] --force*

4. Resolve Merge Conflicts

Git will try to resolve merges. Successes will be staged, conflicts will be unmerged. Use git status to list them. *See Figures 1, 2 on back.*

git checkout master; git merge <branch>
Merge branch into master.

git checkout master; git merge --no-ff <branch1>
Merge without fast-forward to create a merge commit. This aids history visualization. See figure 2.

git diff [--base | --ours | --theirs] <file>
Compare file to master (base) file, current master (ours) changes, branch (theirs) changes, or all. See figure 4.

5. Push/Pull

git push origin [branch] [--all | --tags]
Pushes current branch. --all pushes all branches, --tags pushes tags.

git push --delete origin <branch>
Delete branch on origin, retain local branch

git pull origin <branch>
Get changes from remote and merge

git fetch origin <branch>
Get changes from remote without merge

git cherry-pick <commit>
Bring changes (not all files) from a commit in history into working directory

git tag [--list [pattern] | -n [num]]
List tags. -n shows 1 or num lines of annotation

git tag [--delete] <tagname> [old-commit]
Tag current branch or old commit

git push --delete <tagname>
Delete tag in remote history

Fix Merge Conflicts Manually

1. Identify which files have merge conflicts with git status.
2. Manually resolve conflicts in each file with **vim** or **mergetool**. Conflicts are marked with <<<< through >>>>.

```
unchanged code for context
<<<< HEAD (current branch
marker)
current code
==== (branch separator)
incoming code
>>>> branch-name (incoming
branch marker)
```

3. Chose current or incoming code or merge the contents, then delete markers and separator.
4. Use git add for resolved file, delete .orig file.
5. Use git commit when all files are resolved.

git mergetool <file>
Launch previously configured GUI mergetool. Make appropriate changes, then confirm at CLI.

Git Basics

The Feature Branch Workflow assumes a new branch for every new feature. The master branch never has broken code, and released versions are tagged. Feature branches might be merged into a dev branch, merged into master per release.

Commit Early and Often Commits should be atomic (implement one feature or fix). Committing a partial file may help. Regardless, commit anytime you want and then use rebase --interactive to clean them up.

Commit Message Style
Title (50 chars), blank line, body (72 chars wrap). Semantic title example: "feat: add play gesture", types are **chore, docs, feat, fix, refactor, style, or test**. See Semantic Commit Messages.

When to Push
Private branches can be pushed anytime with the understanding that nobody else will check them out. Others should be cleaned up before pushing.

Merge into the Master Branch
Feature branches with one commit can use fast forward commits; others should use merge commits. After merge, delete the branch.

In this guide the local repository is called *history* and the remote repository is called *remote history* (or ***origin***, its most common name). The default branch name in a new history is ***master***. Options are shown in long form for better mnemonics; --message instead of -m.

HEAD: current commit (and branch)
HEAD^: First parent of HEAD
<commit>: HEAD, tag name, branch name, or leading substring of the commit SHA-1
<file>: filespec
<branch>: branch names cannot contain spaces

Don't forget: **git help** [command]

References

Git in Practice by Mike McQuaid

Official Docs at git-scm.com

A Visual Git Reference

Visualizing Git Concepts with D3 (interactive)

Atlassian Git Tutorial

Interactive Git Cheatsheet

Escape a Git Mess

Configure

git config --global user.name "Mike Combs"

git config --global user.email "mike@example.com"

git config --global core.editor "vim"

git config --global merge.tool "diffmerge"

git config --global credential.helper osxkeychain
Use keychain for passwords instead of reprompting. Also: git-credential-gnome-keyring or git-credential-winstore

git config --global --edit
Open ~/.gitconfig global config file in editor for editing

vim .gitignore
Edit this to ignore temporary, object, project, and other files. Find examples at https://github.com/github/gitignore. For example:

```
.Rhistory
.RData
.Rproj.user/
.DS_Store
__pycache__/
*.py[cod]
*$py.class
```

git rm --cached <files>
Remove files from history in case they got there before you put them in .gitignore

git status --ignored
Show files ignored due to .gitignore

git config --global alias.<name> <cmd>
Define an alias for <cmd>
git config --global alias.log1 "log --graph --decorate --oneline"

git <alias>
Use previously defined alias

Log Options

git log <since id>..<until id> # show range of commits
git log -<limit> # limit number of commits shown
git log --author="<pattern>"
git log --decorate # show branch and tag names
git log --graph # show graph of commits
git log --grep="<pattern>"
git log --oneline # show each commit on 1 line
git log -p # show full diff
git log --stat # show files and changed line counts

Regression

git blame --date=short -w -s -L 40,60 <file>
For each line in file, show author, date, and commit. -w ignores white space, -s hides author name, -L specifies range of lines

Bisect uses a binary search of history to help find a commit that introduced a bug.

git bisect start; git bisect bad;
git bisect good <commit>
Start regression process, indicate HEAD is bad, identify last known good commit. Bisect will now checkout a revision within these bounds.

git bisect <bad | good>
After you check for a problem, use this to checkout the next commit. Repeat until problem is isolated.

git bisect reset
End regression process, return to HEAD

git bisect log
Show bisect steps

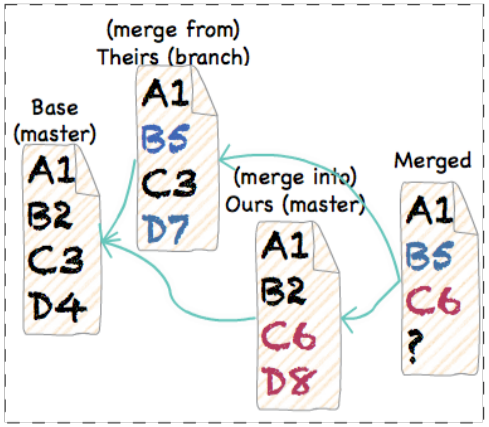
Rebase

git rebase master <branch>
If master changed after branch fork, create new commits to base branch on current master. See figure 3.

3-Way Merge

In this merge, Git cannot automatically resolve line D because it has been changed in the branch, and then later in the master. Usually *ours* is the current master branch, and *theirs* is the feature branch.

Fig 4: Three-Way Merge



FF-Merge, Merge Commit

In the figures, 'A' is the first commit and subsequent commits point to their parents.

Fig 1: Master and Feature branches

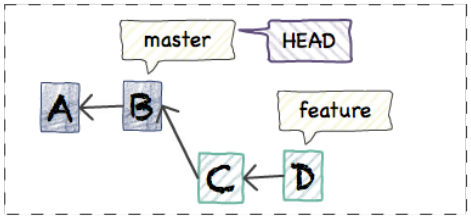


Fig 2A: After merge commit

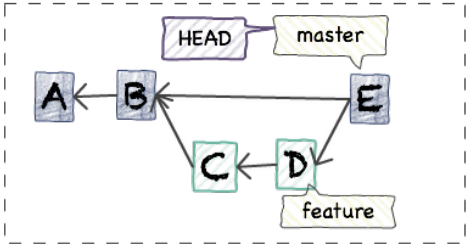


Fig 2B: After fast-forward merge

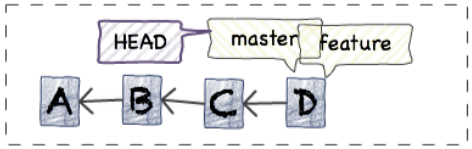


Fig 3A: After branch, commit added to Master

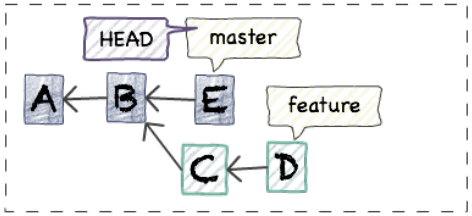


Fig 3B: Feature rebased on Master