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Software Engineering and Architecture

Git in Practice

Git

- A highly personalized view, so take it as *my* opinion
- Git is *driving a Ferrari without a safety belt!*
  - There are one zillion handles to crank!
  - There are zillions of way to use Git efficiently
  - *There are zillions of way to get lost or mess your repo up completely*
  - **Keep it simple! You ain't gonna need it!**
- And
  - Beware of the good spirit fellow student that 'helps you' by issuing a few weird git command you do not understand!
    - And makes git behave weird for the rest of the course

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If Git F… up badly?

- I have more than once done the '**reboot**'
- **Delete** the local workspace
  - Remove from IntelliJ, delete folder with project
- Clone the repo anew
  - Much better than let a fellow Git-Wizzard issue ten weird commands, give up and walk away, leaving you with:
    - **Big ball of mud**

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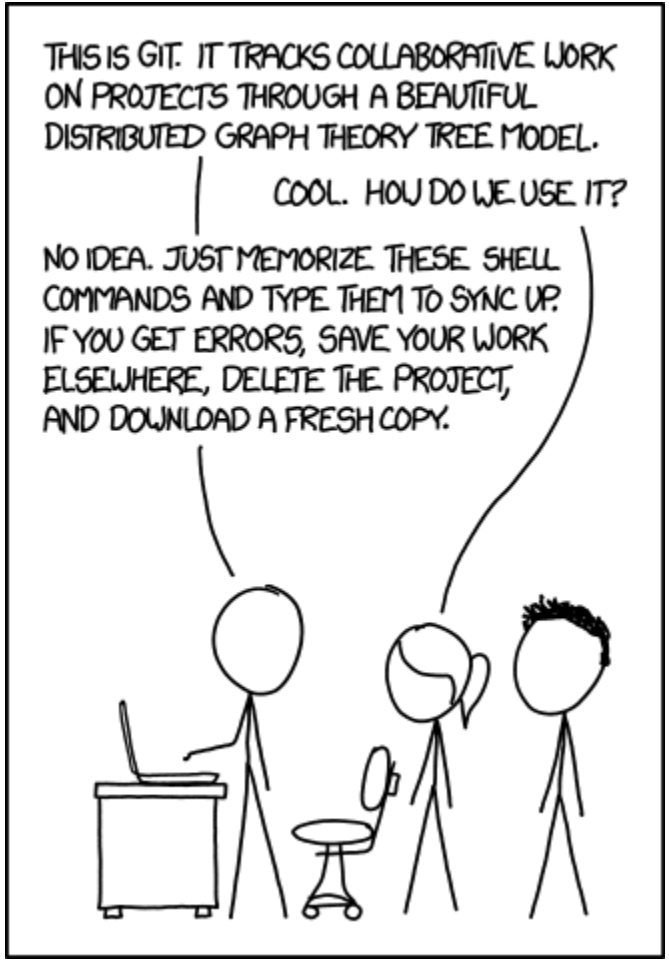
I am not alone ☺



(The Name?)

- According to Quora

Thouhedul Islam Suchi, works at PHP Developers
Updated Apr 13, 2017 · Author has **220** answers and **189.5k** answer views

The name "git" was given by Linus Torvalds when he wrote the very first version. He described the tool as "the stupid content tracker" and the name as (depending on your way):

- random three-letter combination that is pronounceable, and not actually used by any common UNIX command. The fact that it is a mispronunciation of "get" may or may not be relevant.
- stupid. contemptible and despicable. simple. Take your pick from the dictionary of slang.
- "global information tracker": you're in a good mood, and it actually works for you. Angels sing, and a light suddenly fills the room.
- "g*dd*mn idiotic truckload of sh*t": when it breaks

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The Core Workflow

- Git clone (your repo name)
  - Get your copy of the code base (Done **once!** Or if ‘rebooting’ ☺)
- Git add (file)
  - Add newly made files to the staging area/index (See below)
- Git commit –a –m ”meaningful explanation of what you made”
  - ”-a” auto adds all changes to *existing files in repo* the staging area / index
  - “-m” provide a log message
  - IntelliJ will help remember to add them to the index when created within it.

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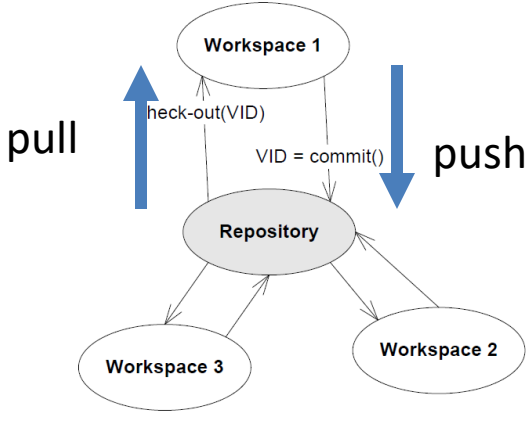
The Core Workflow

- Git push
  - Copy all your commits to the team's remote repository
- Git pull
  - Get your team mates commits into your local repo
    - Merge conflicts must be handled
- Git status
  - See status of your local workspace
- Git log -3
  - See last 3 versions' log messages



Branching

- Git fetch origin
  - Get the branches overview from the origin + all newly made branches
- Git branch –a
  - Show all branches *including* all on the origin that you do not have currently
- Git checkout {branchname}
  - Checkout given branch, switch to it, **and begin tracking it**
- Git checkout **–b** {branchname}
  - *Create a new branch, switch to it, and begin tracking it*

.gitignore

- **Do not pollute your repo!**
  - There are *'source'* artefacts and there are *'derived'* artefacts
    - Source = manual hard intellectual work
      - Java source files, graphics files, sound clips, etc.
    - Derived = a tool produces it in milliseconds
      - .class files, .jar, JavaDoc, test output, coverage HTML, …
- .gitignore
  - Put a file '.gitignore' in your root
  - State all 'derived' artefacts in it (folders, file wildcards)
    - /build ignore all that gradle produces in the build folder
    - *.iml ignore IntelliJ configuration files
    - /out ignore all IntelliJ generated files

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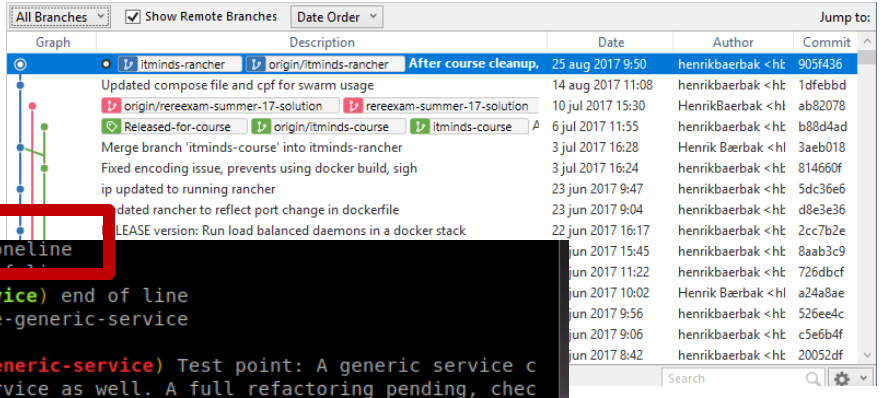
My own workflow

- Overviewing branches without graphics is hard!
- I develop on Lubuntu
  - But makes most branching/merging in SourceTree on Windows ☺
- But can be viewed in shell:




```
csdev@m51:~/proj/cave  git log --graph --simplify-by-decoration --all --oneline
* 090c012 (refs/stash
* c486118 (origin/merge-create-generic-service, merge-create-generic-service) end of line
*   335e1f5 Merge branch 'issue-create-generic-service' into merge-create-generic-service
|\
| * abd384a (HEAD -> issue-create-generic-service, origin/issue-create-generic-service) Test point: A generic service c
reator is intro in objmgr+factory. Demo that it can be used for quote service as well. A full refactoring pending, chec
king to see if it is usable in the mandatory 2.1 solution
* | 0b315c6 (tag: image_cave-jar-1.29, origin/f20-solution, f20-solution) Doc update with overview.
* | 2bc2f6d (tag: image_cave-jar-1.28) minor
* | a9134cc (tag: image_cave-jar-1.27) MileStone: CDT now working with test containers for RealCaveServiceConnector. Cf
g is still a big mess.
* |   e504fba Merged code that reintroduces the PlayerNameService
|\ \
| |/
| * c8d6506 (origin/dev, dev) Milestone: PlayerNameService reintroduced. All tests pass. Manual tests looks fine.
* | cdafc3e (tag: image_cave-jar-1.25) Snapshot. Next Action require changes to the master branch!
```

CheatSheet

- Git-tower.com

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>
```

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Best Practices

- Commit related changes
  - Fixing two bugs should lead to two commits
- Commit ***often***
  - ‘Take small steps’, break big into small, one step at a time
  - Safe version to retract to in case of ‘Do Over’
- Push and pull ***often***
  - Do not let team efforts drift apart!

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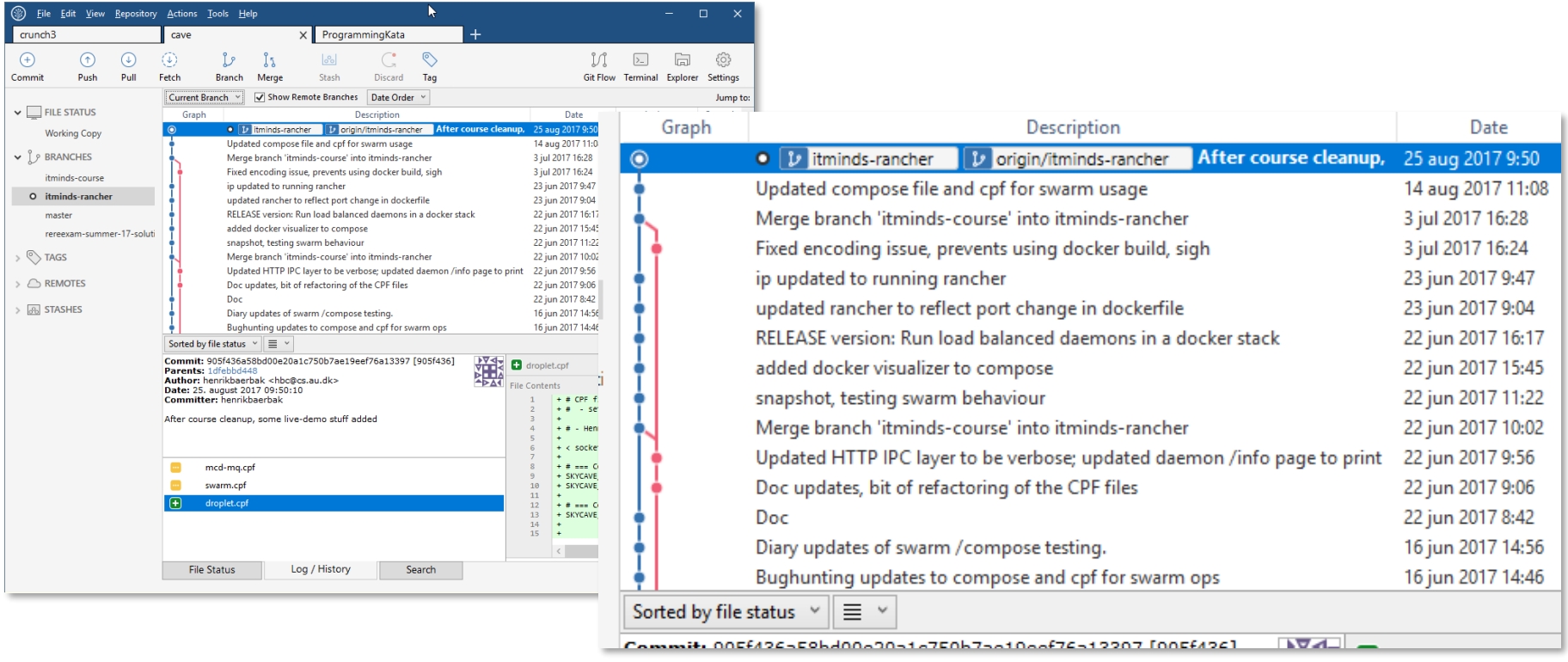
Best Practices

- **Use the commit log to express the goal achieved/contents of the commit**



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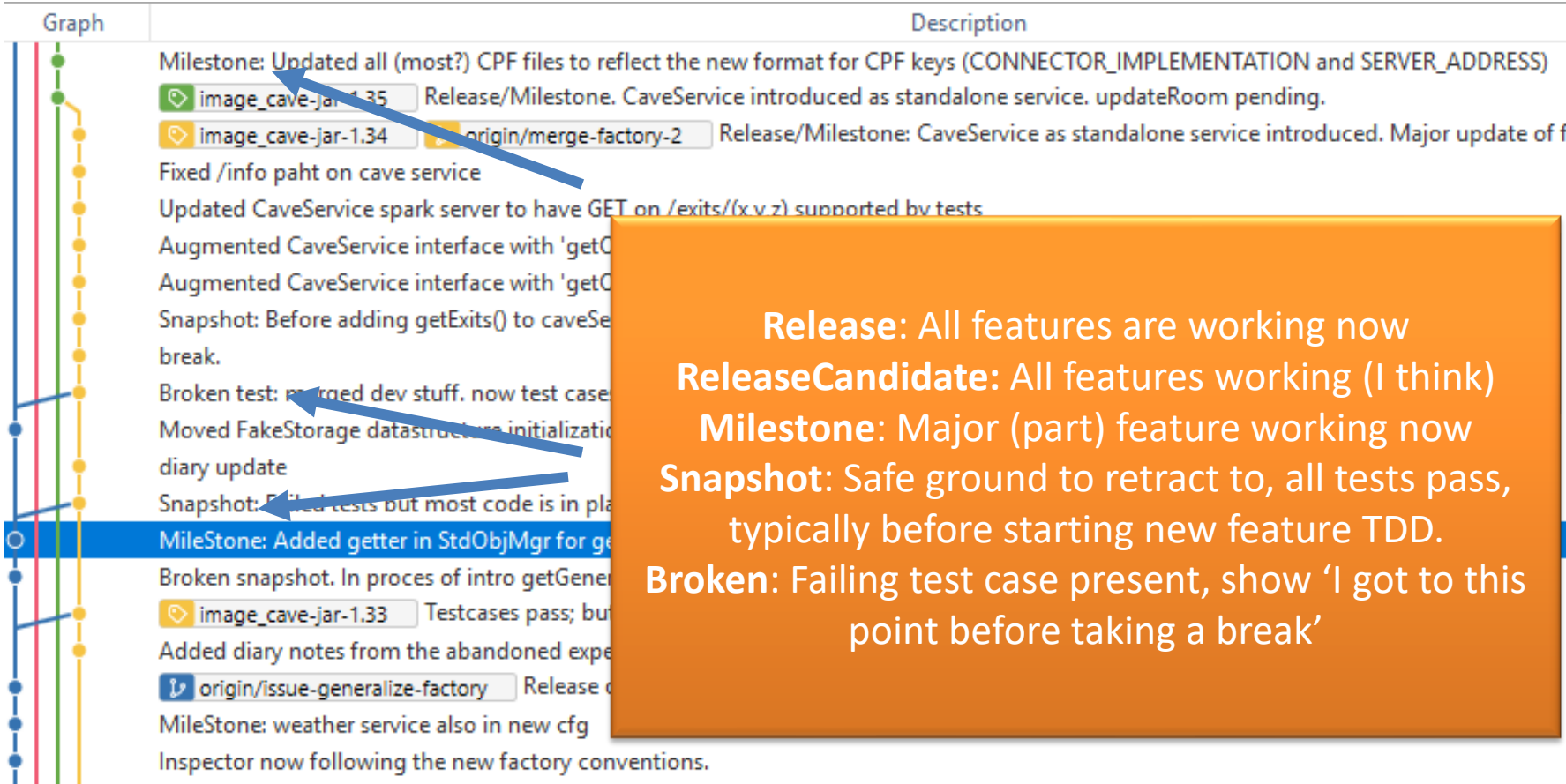
Best Practices

- I have developed a practice of a ‘tag line’



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Best Practices

- ***Commits may break but pushed ones may not***
  - I sometimes commit broken builds if I must change work task
    - They highlight what I am working on to myself the next day!
  - But never push them
    - Pushed commits must reflect a finished step/feature/bugfix/**all tests pass**
  - But – best practice is of course that also commits have **all tests passing**

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Mandatory Note

- **Use AU GitLab**. Make it **private!**
- Use your own login name on Git repo when you are in the ‘driver seat’ = programmer role in TDD
- TAs are instructed to review you logs for
  - Clarity and sensible commit logs
  - ‘small steps and commit often’
  - **Equal workload of each group participant**