Version Control System - Git

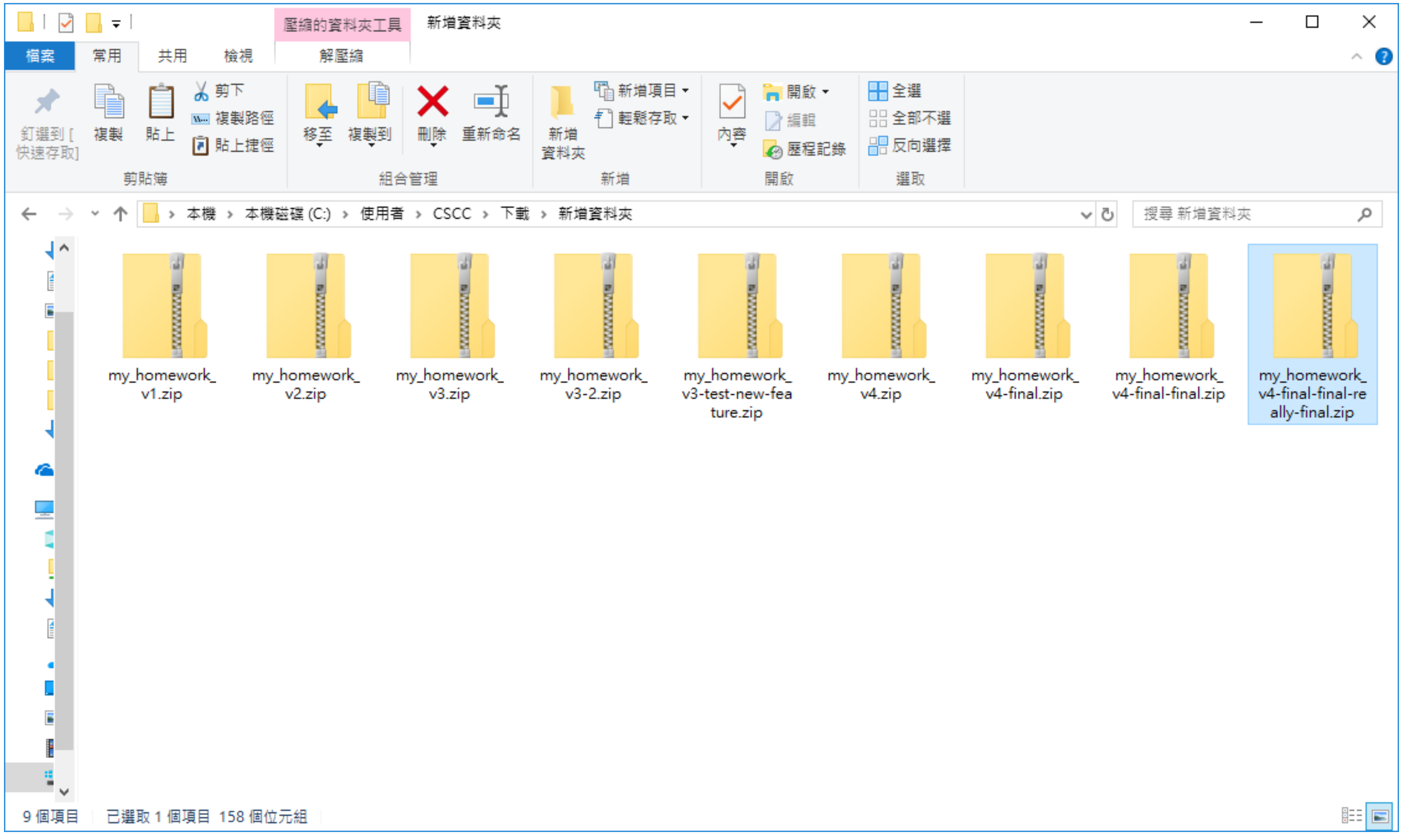
zswu

Overview

- ❑ Why VCS ?
- ❑ Why Git ?
- ❑ Using Git Personally
- ❑ Using Git with Others
- ❑ Etiquette Rules of Using Git
- ❑ Tools & Services
- ❑ Tips

Why VCS (1/3)

❑ How do you manage your homework ?



Why VCS (2/3)

❑ How the people do version control ?

- Share files with CD, USB or Network
- Patch

❑ What is the problem ?

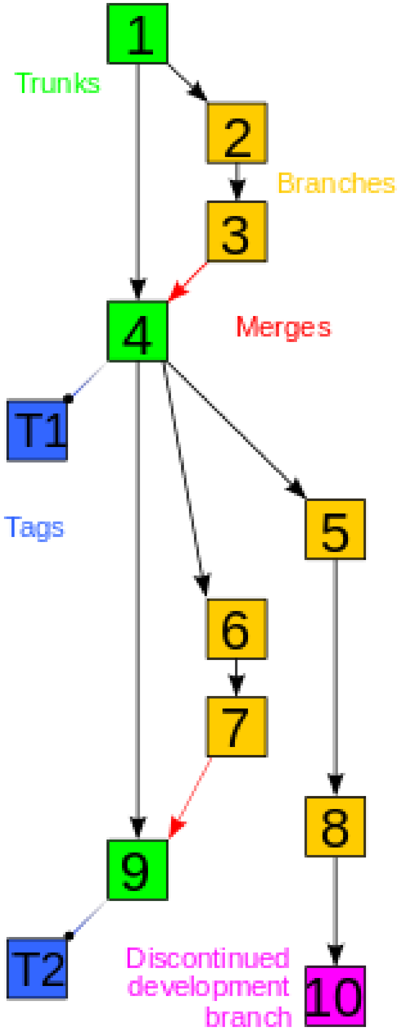
- Many different version
- Hard to maintaining, debugging

Why VCS (3/3)

- ❑ A tool help you manage you project
  - Commit, Rollback, Checkout
  - Branch, Tag
  - Merge
  - Clone, Push, Pull
- ❑ Common VCS
  - CVS
  - RCS
  - SVN
  - …
  - Git

Git

- ❑ Not a software only for you to download code from Github
- ❑ Distributed revision control system (DVCS)
  - P2P instead of Client-Server
  - No Trunk (主幹)
  - Fast
    - ➢ Everything is at local, no need to sync with server
  - Convenient
    - ➢ You can easily create branch without modify the server side repository



Using Git Personally

- ❑ Base version control
  - Init
  - Status
  - Add, Commit
  - Reset
- ❑ View history
  - Log
  - Blame
- ❑ Develop different feature
  - Branch, Tag, Checkout
  - Rebase, Merge

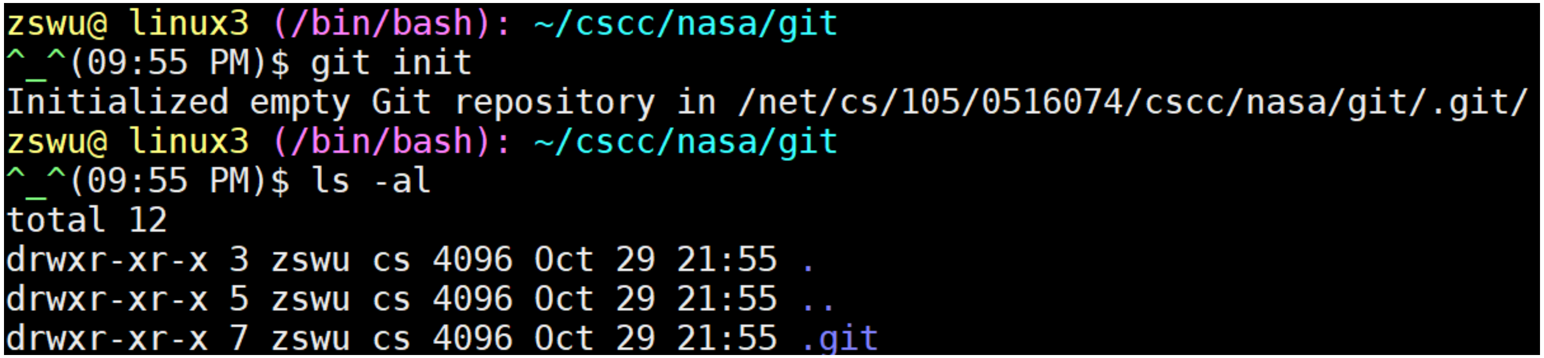
Config

- ❑ You need to add basic config before using git
  - Position
    - ➢ Global (~/.gitconfig)
    - ➢ Local (project-root/.gitconfig)
    - ➢ System (/etc/gitconfig)
  - Basic config
    - ➢ $ git config --global user.name “zswu“
    - ➢ $ git config --global user.email zswu@cs.nctu.edu.tw
  - Other config
    - ➢ core.editor vim
    - ➢ merge.tool vimdiff

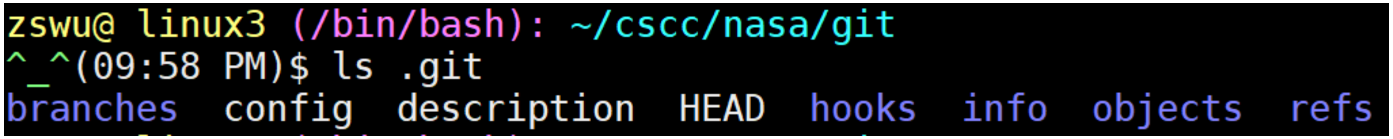
Init

❑ Init a empty local repository

- Create a .git directory, everything about version control is inside this directory



```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(09:55 PM)$ git init
Initialized empty Git repository in /net/cs/105/0516074/cscc/nasa/git/.git/
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(09:55 PM)$ ls -al
total 12
drwxr-xr-x 3 zswu cs 4096 Oct 29 21:55 .
drwxr-xr-x 5 zswu cs 4096 Oct 29 21:55 ..
drwxr-xr-x 7 zswu cs 4096 Oct 29 21:55 .git
```

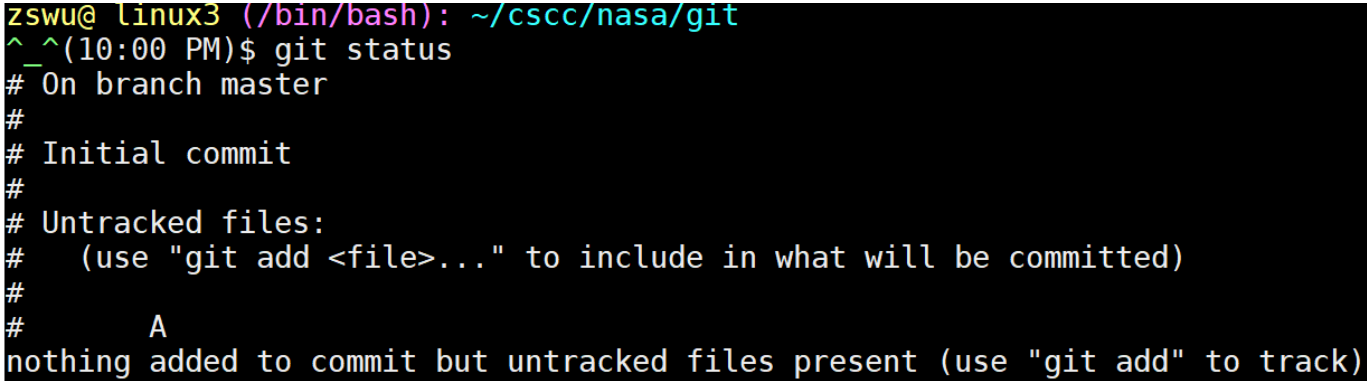


```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(09:58 PM)$ ls .git
branches  config  description  HEAD  hooks  info  objects  refs
```

Status

❑ Show the status

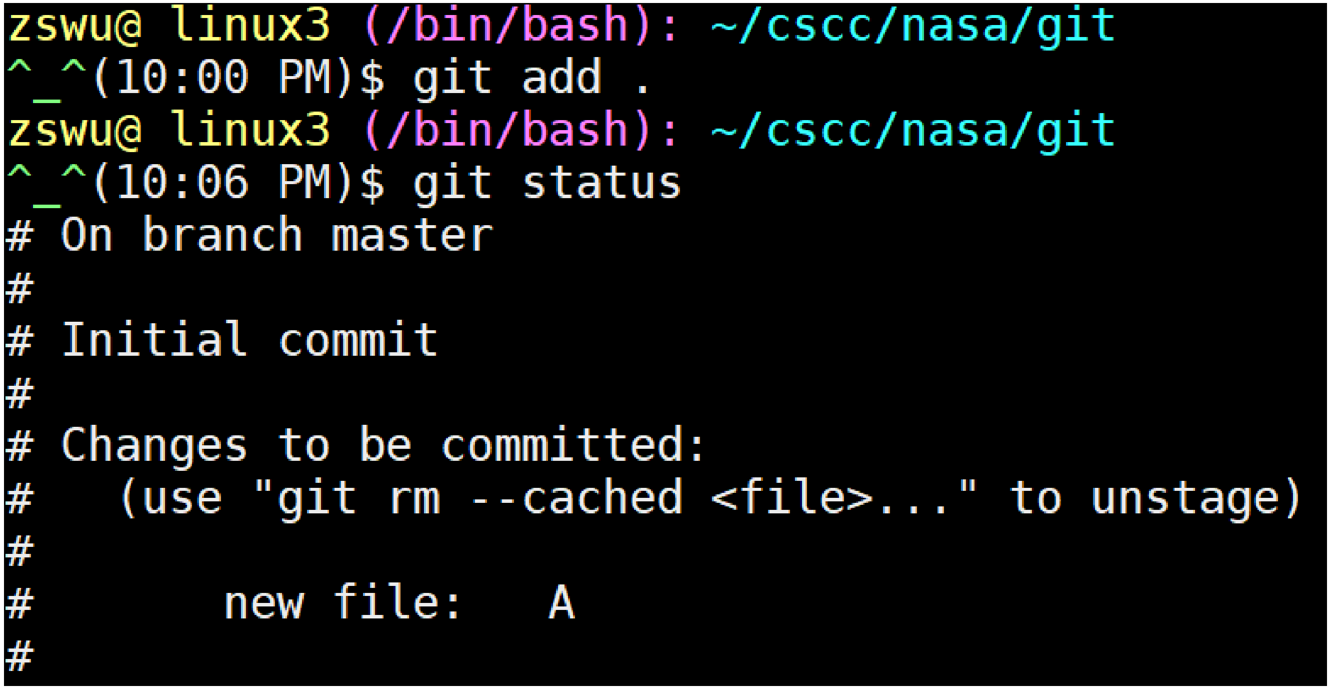
- Untracked files
- Modified files
- Deleted files
- Intermediately state
  - ➢ Rebase
  - ➢ Merge



```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:00 PM)$ git status
# On branch master
#
# Initial commit
#
# Untracked files:
#   (use "git add <file>..." to include in what will be committed)
#
#       A
nothing added to commit but untracked files present (use "git add" to track)
```

Add

- ❑ Add files to the temporary area (to be commited)
  - You don’t need to commit all the thing at the same time
  - Use .gitignore file to prevent some files to be added

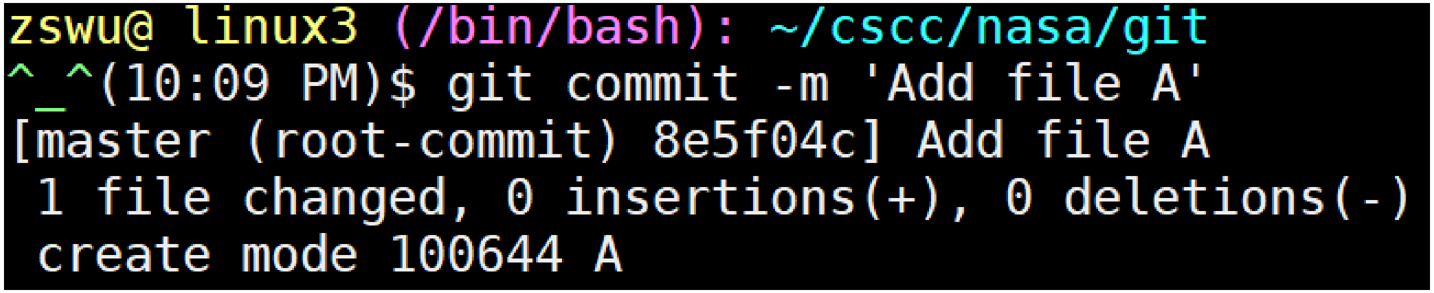


```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:00 PM)$ git add .
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:06 PM)$ git status
# On branch master
#
# Initial commit
#
# Changes to be committed:
#   (use "git rm --cached <file>..." to unstage)
#
#       new file:   A
#
```

Commit

❑ Save your current state

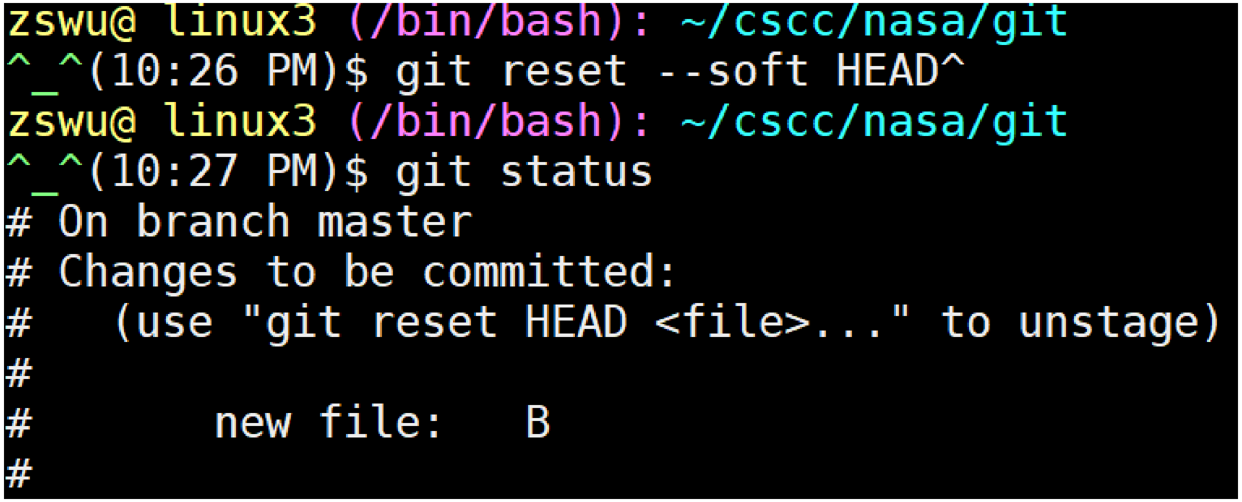
- Has a hash ID
- Which hash ID is the previous state
- What you modified
- Write some log to help people know what have you done



```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:09 PM)$ git commit -m 'Add file A'
[master (root-commit) 8e5f04c] Add file A
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 A
```

Reset

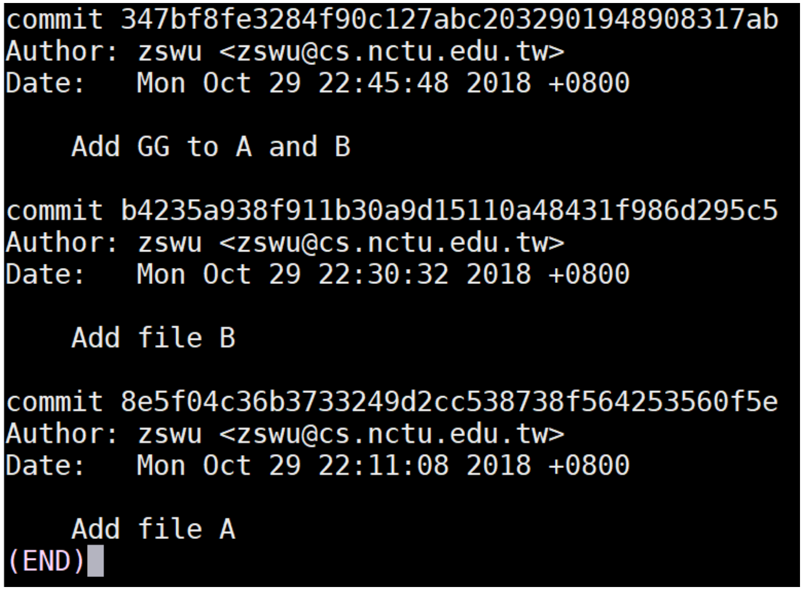
- ❑ Reset a commit or reset temporary area
  - If you regret, you can remove all change from temporary area, or remove a commit
  - HEAD^ / HEAD~1, the previous commit of HEAD
  - https://gitbook.tw/chapters/using-git/reset-commit.html



```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:26 PM)$ git reset --soft HEAD^
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:27 PM)$ git status
# On branch master
# Changes to be committed:
#   (use "git reset HEAD <file>..." to unstage)
#
#       new file:   B
#
```

Log

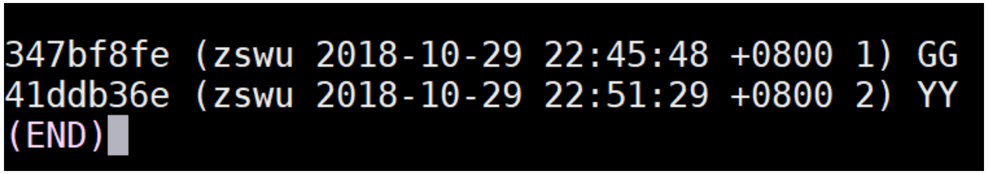
- ❑ List history of the repository
  - Commit message
  - Commit Hash ID
  - Commit author



```
commit 347bf8fe3284f90c127abc2032901948908317ab
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 22:45:48 2018 +0800

    Add GG to A and B

commit b4235a938f911b30a9d15110a48431f986d295c5
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 22:30:32 2018 +0800

    Add file B

commit 8e5f04c36b3733249d2cc538738f564253560f5e
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 22:11:08 2018 +0800

    Add file A
(END)
```

Blame

- ❑ History of a file
  - Show the latest commit of each line
  - To find who added this line into your code

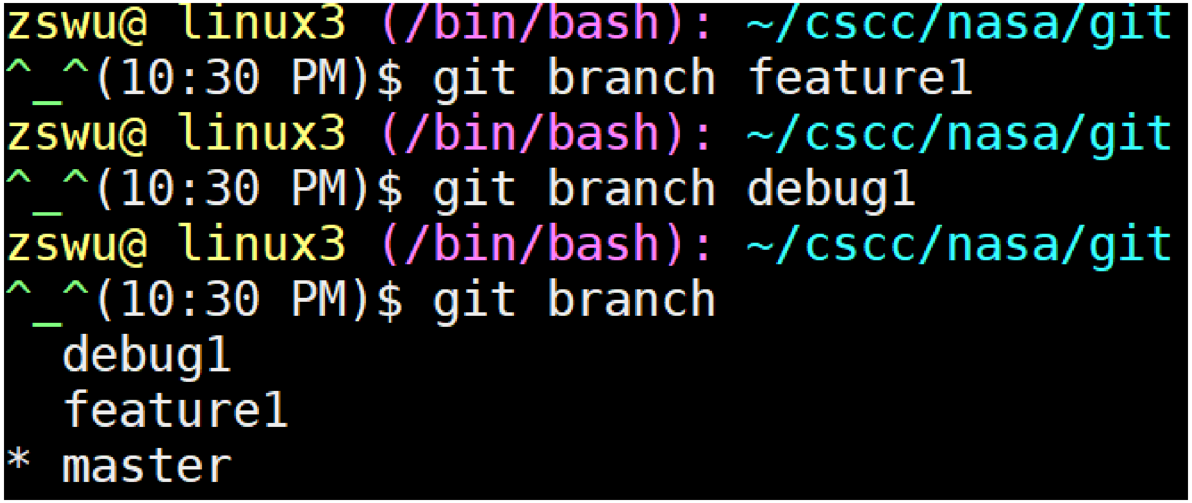


```
347bf8fe (zswu 2018-10-29 22:45:48 +0800 1) GG
41ddb36e (zswu 2018-10-29 22:51:29 +0800 2) YY
(END)
```

Branch

❑ Work on multiple thing at the same time

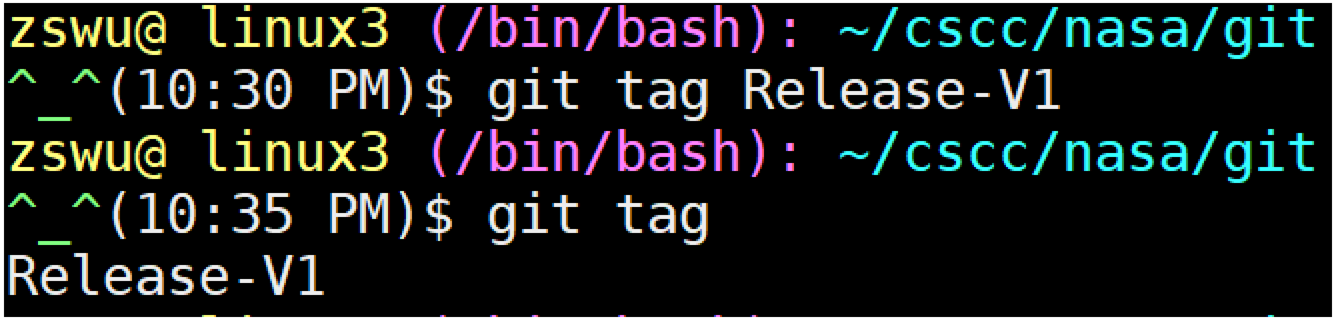
- Add feature or debug individually
- Keep master branch stable



```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:30 PM)$ git branch feature1
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:30 PM)$ git branch debug1
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:30 PM)$ git branch
  debug1
  feature1
* master
```

Tag

- ❑ Tag specific commit
  - Release commit, e.g., v1.0.1, v1.2.3rc, v2.5b3
  - Tag point to only one commit

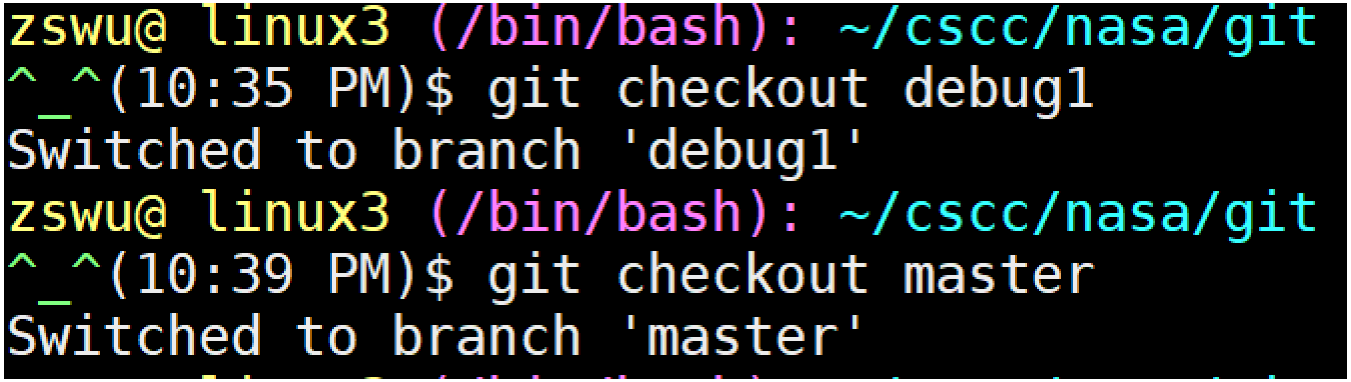


```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:30 PM)$ git tag Release-V1
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:35 PM)$ git tag
Release-V1
```

Checkout

❑ Checkout something

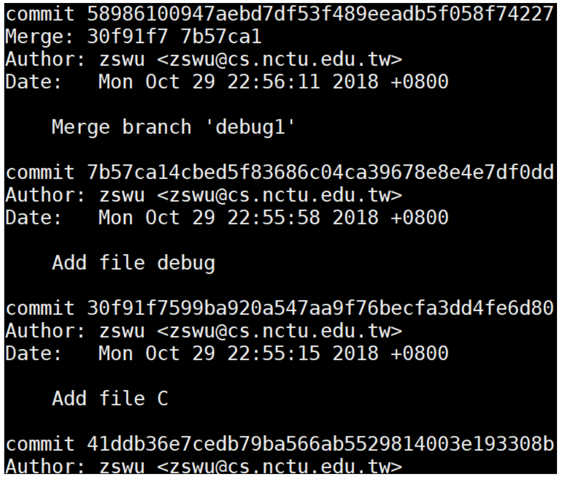
- Branch, Tag
- Commit (by Hash ID)



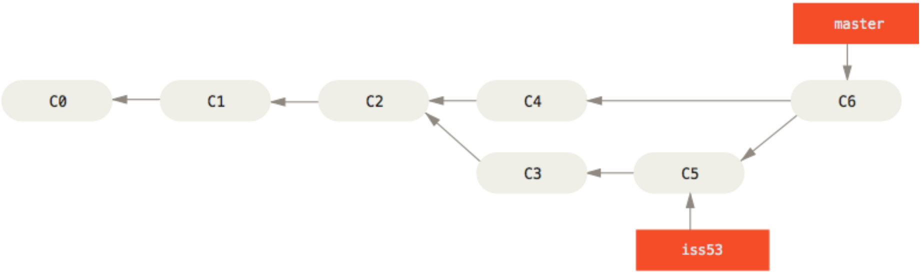
```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:35 PM)$ git checkout debug1
Switched to branch 'debug1'
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(10:39 PM)$ git checkout master
Switched to branch 'master'
```

Merge

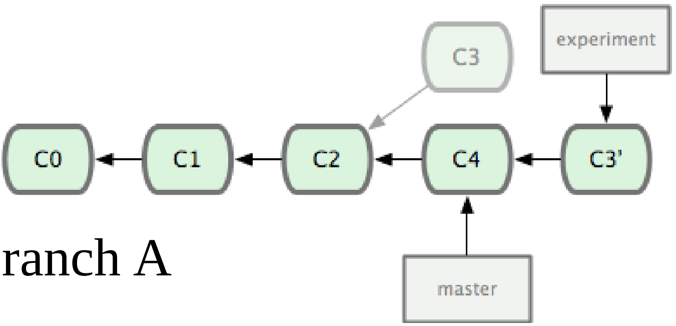
- ❑ Merge branch B to branch A
  - If B is based on A, Fast-forward is applied
  - If both A and B is changed, a merge commit is added
  - If auto merge failed, you need to solve the conflict yourself



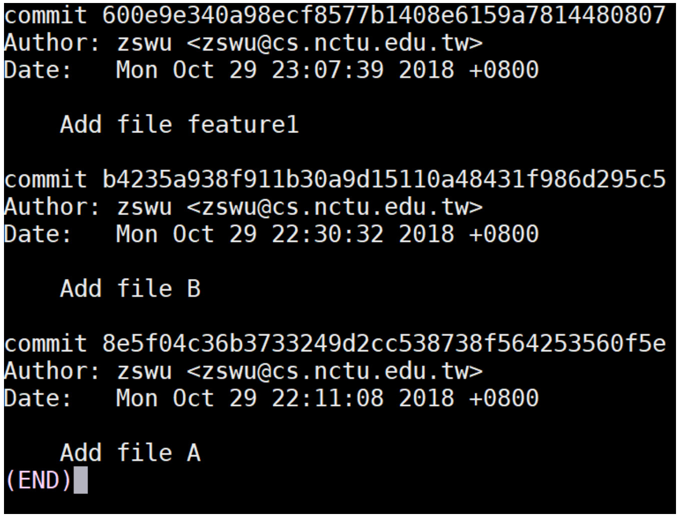
```
commit 58986100947aebd7df53f489eeadb5f058f74227
Merge: 30f91f7 7b57ca1
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 22:56:11 2018 +0800

    Merge branch 'debug1'

commit 7b57ca14cbed5f83686c04ca39678e8e4e7df0dd
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 22:55:58 2018 +0800

    Add file debug

commit 30f91f7599ba920a547aa9f76becfa3dd4fe6d80
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 22:55:15 2018 +0800

    Add file C

commit 41ddb36e7cedb79ba566ab5529814003e193308b
Author: zswu <zswu@cs.nctu.edu.tw>
```



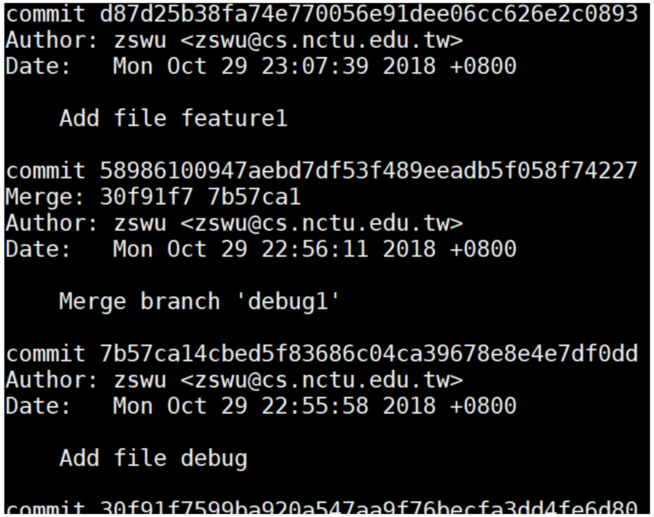
Rebase



- Rebase branch B onto branch A
  - Add each commit of branch B onto branch A
  - No merge commit
  - If you branch B is forked from branch A, you can use rebase to apply the latest branch A commits



```
commit 600e9e340a98ecf8577b1408e6159a7814480807
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:07:39 2018 +0800

    Add file feature1

commit b4235a938f911b30a9d15110a48431f986d295c5
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 22:30:32 2018 +0800

    Add file B

commit 8e5f04c36b3733249d2cc538738f564253560f5e
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 22:11:08 2018 +0800

    Add file A
(END)
```



```
commit d87d25b38fa74e770056e91dee06cc626e2c0893
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:07:39 2018 +0800

    Add file feature1

commit 58986100947aebd7df53f489eeadb5f058f74227
Merge: 30f91f7 7b57ca1
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 22:56:11 2018 +0800

    Merge branch 'debug1'

commit 7b57ca14cbed5f83686c04ca39678e8e4e7df0dd
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 22:55:58 2018 +0800

    Add file debug

commit 30f91f7599ba920a547aa9f76becfa3dd4fe6d80
```

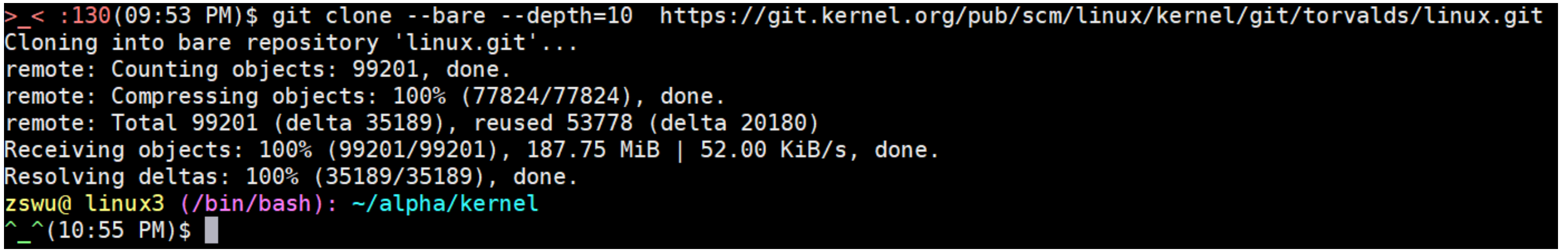
Using Git with Others

- ❑ Remote repository
  - Clone
  - Remote
  - Fetch
  - Push
  - ~~Pull~~ => Fetch + Merge 、Fetch + Rebase
- ❑ Conflict
  - Rebase/Merge --about/--skip/--continue
  - Stash / Stash pop
  - Revert

Clone

❑ Clone a git repository

- Copy all things including history, branch, tag

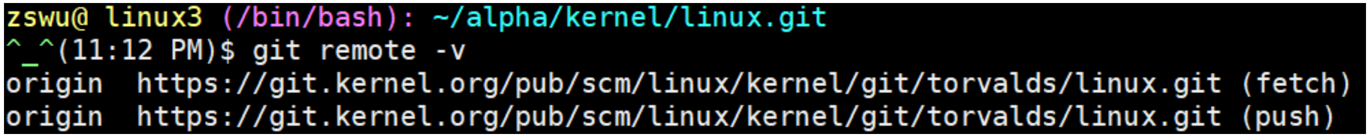


```
>_< :130(09:53 PM)$ git clone --bare --depth=10  https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git
Cloning into bare repository 'linux.git'...
remote: Counting objects: 99201, done.
remote: Compressing objects: 100% (77824/77824), done.
remote: Total 99201 (delta 35189), reused 53778 (delta 20180)
Receiving objects: 100% (99201/99201), 187.75 MiB | 52.00 KiB/s, done.
Resolving deltas: 100% (35189/35189), done.
zswu@ linux3 (/bin/bash): ~/alpha/kernel
^_^(10:55 PM)$ 
```

Remote

❑ About remote repository

- You can add many remote repository
- Usually, origin is your default remote repository

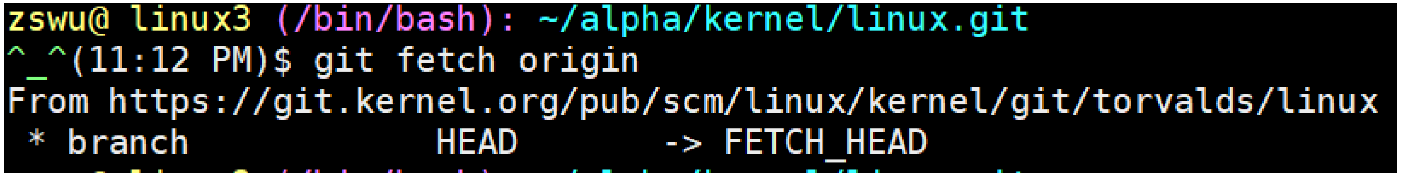


```
zswu@ linux3 (/bin/bash): ~/alpha/kernel/linux.git
^_^(11:12 PM)$ git remote -v
origin  https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git (fetch)
origin  https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git (push)
```

Fetch

❑ Fetch new commits from remote

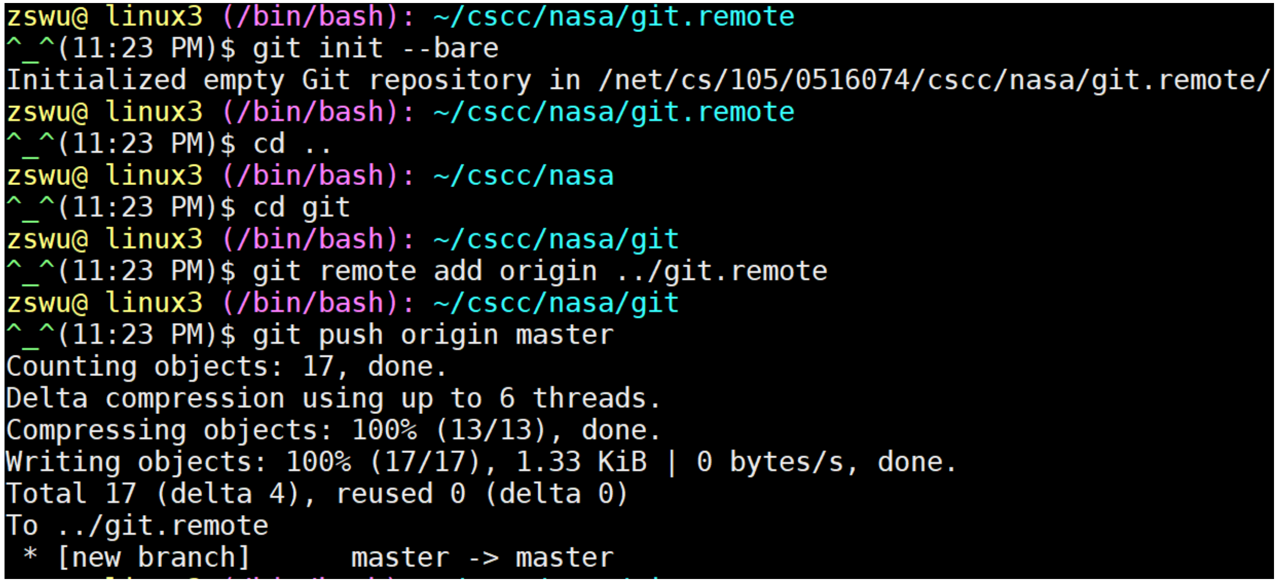
- Remote branch will be placed at remote-name/branch-name
  - ➢ origin/master
  - ➢ origin/debug1
- Usually, we will do this after fetch
  - ➢ $ git rebase origin/master



```
zswu@ linux3 (/bin/bash): ~/alpha/kernel/linux.git
^_^(11:12 PM)$ git fetch origin
From https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux
 * branch            HEAD       -> FETCH_HEAD
```

Push

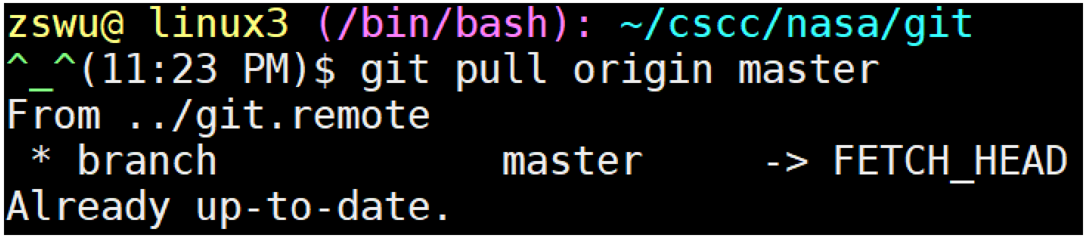
- ❑ Push things to remote branch
  - You must have write permission on remote server
  - Push a branch to remote
    - ➢ If exist, update it



```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git.remote
^_^(11:23 PM)$ git init --bare
Initialized empty Git repository in /net/cs/105/0516074/cscc/nasa/git.remote/
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git.remote
^_^(11:23 PM)$ cd ..
zswu@ linux3 (/bin/bash): ~/cscc/nasa
^_^(11:23 PM)$ cd git
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:23 PM)$ git remote add origin ../git.remote
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:23 PM)$ git push origin master
Counting objects: 17, done.
Delta compression using up to 6 threads.
Compressing objects: 100% (13/13), done.
Writing objects: 100% (17/17), 1.33 KiB | 0 bytes/s, done.
Total 17 (delta 4), reused 0 (delta 0)
To ../git.remote
 * [new branch]      master -> master
```

Pull

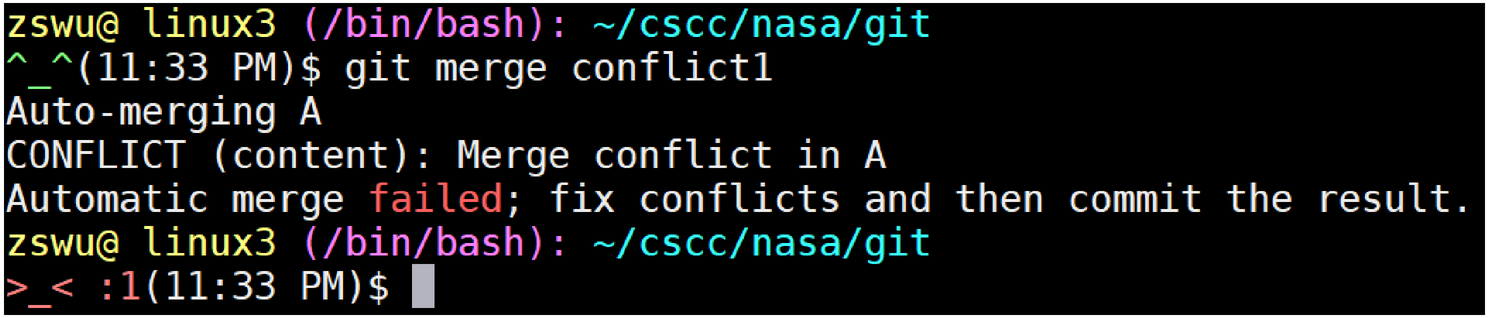
- ❑ Pull is equal to fetch + merge, or fetch + rebase
  - Defaults to fetch + merge
  - Pull something add a lots of marge message into your project
    - ➢ Use fetch + rebase instead



```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:23 PM)$ git pull origin master
From ../git.remote
 * branch            master     -> FETCH_HEAD
Already up-to-date.
```

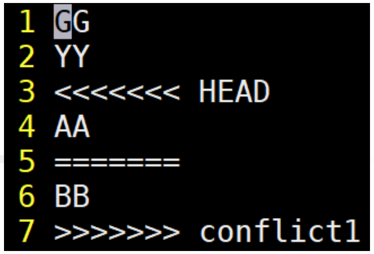
Conflict

- Why
  - Modify same file
    - Auto merge failed
  - Squash commits
    - Squash will change commits history
  - $ git push -f
    - Try to not do this



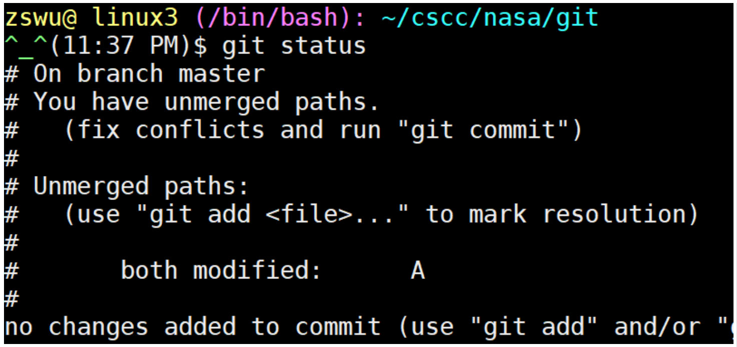
```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:33 PM)$ git merge conflict1
Auto-merging A
CONFLICT (content): Merge conflict in A
Automatic merge failed; fix conflicts and then commit the result.
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
>_< :1(11:33 PM)$
```

Merge/Rebase Conflict

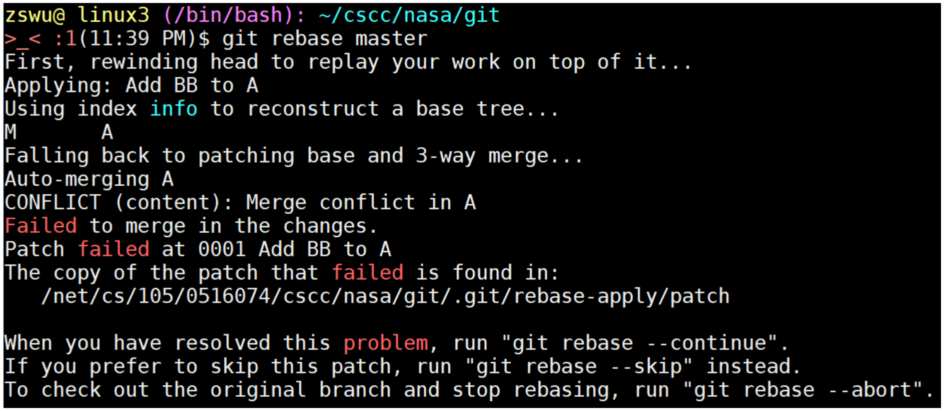


```
GG
YY
<<<<<<< HEAD
AA
=======
BB
>>>>>>> conflict1
```

- ❑ Continue
  - After you fixed the conflict, continue the action (Merge/Rebase)
- ❑ Skip
  - Skip this commit, it won’t be merge into target branch
- ❑ Abort
  - Abort, nothing will change ☺



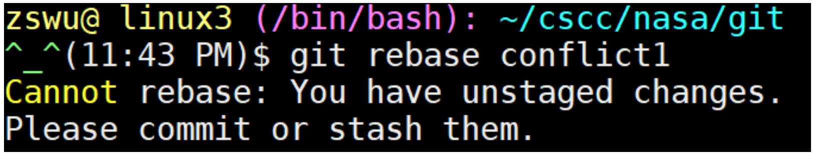
```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:37 PM)$ git status
# On branch master
# You have unmerged paths.
#   (fix conflicts and run "git commit")
#
# Unmerged paths:
#   (use "git add <file>..." to mark resolution)
#
#       both modified:      A
#
no changes added to commit (use "git add" and/or "
```



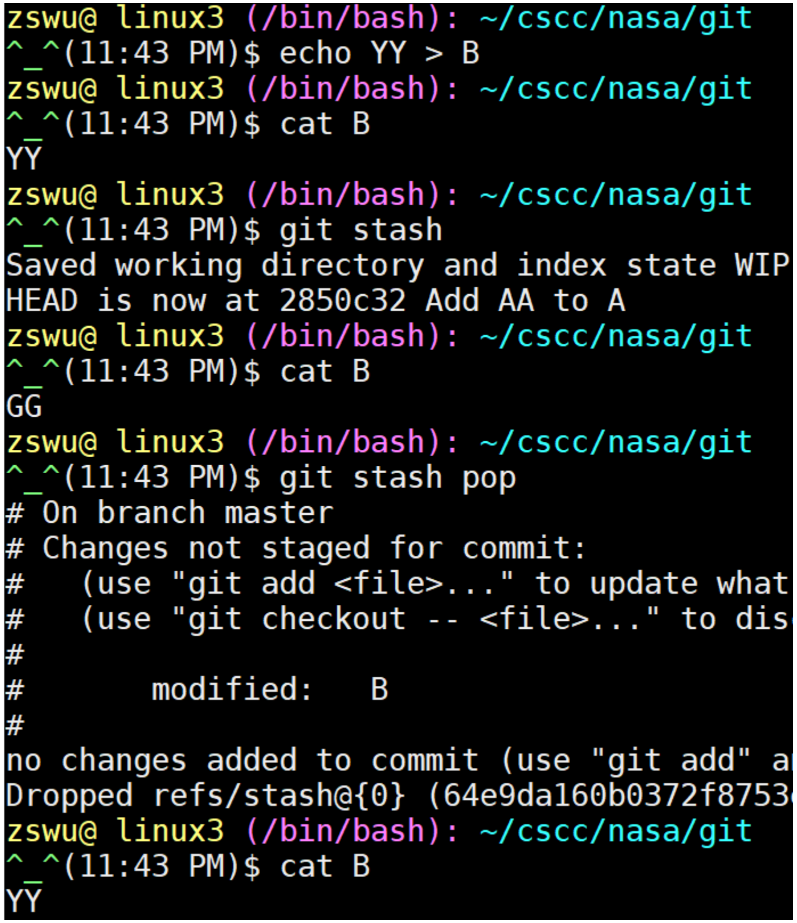
```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
>_< :1(11:39 PM)$ git rebase master
First, rewinding head to replay your work on top of it...
Applying: Add BB to A
Using index info to reconstruct a base tree...
M       A
Falling back to patching base and 3-way merge...
Auto-merging A
CONFLICT (content): Merge conflict in A
Failed to merge in the changes.
Patch failed at 0001 Add BB to A
The copy of the patch that failed is found in:
   /net/cs/105/0516074/cscc/nasa/git/.git/rebase-apply/patch

When you have resolved this problem, run "git rebase --continue".
If you prefer to skip this patch, run "git rebase --skip" instead.
To check out the original branch and stop rebasing, run "git rebase --abort".
```

Stash / Stash Pop

❑ Stash things not yet commit
- Like a stack, first in last out
- Convenient when rebasing/merging



```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:43 PM)$ git rebase conflict1
Cannot rebase: You have unstaged changes.
Please commit or stash them.
```

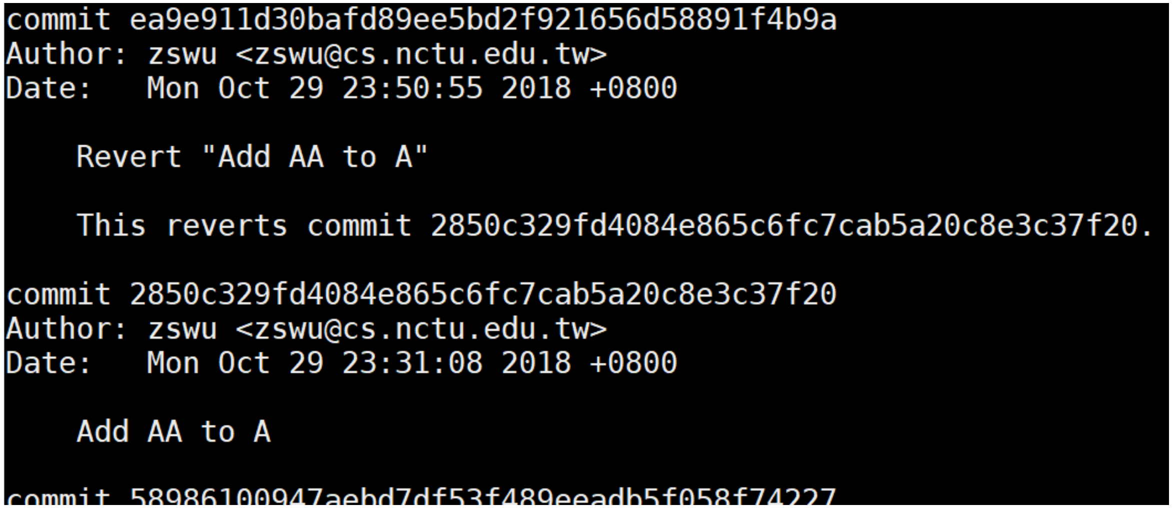


```
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:43 PM)$ echo YY > B
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:43 PM)$ cat B
YY
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:43 PM)$ git stash
Saved working directory and index state WIP
HEAD is now at 2850c32 Add AA to A
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:43 PM)$ cat B
GG
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:43 PM)$ git stash pop
# On branch master
# Changes not staged for commit:
#   (use "git add <file>..." to update what
#   (use "git checkout -- <file>..." to dis
#
#       modified:   B
#
no changes added to commit (use "git add" a
Dropped refs/stash@{0} (64e9da160b0372f8753
zswu@ linux3 (/bin/bash): ~/cscc/nasa/git
^_^(11:43 PM)$ cat B
YY
```

Revert

❑ Revert a commit

- Revert a commit by adding a new commit
  - ➢ Won’t break the history
- The new commit offset the old one



```
commit ea9e911d30bafd89ee5bd2f921656d58891f4b9a
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:50:55 2018 +0800

    Revert "Add AA to A"

    This reverts commit 2850c329fd4084e865c6fc7cab5a20c8e3c37f20.

commit 2850c329fd4084e865c6fc7cab5a20c8e3c37f20
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:31:08 2018 +0800

    Add AA to A

commit 58986100947aebd7df53f489eeadb5f058f74227
```

Etiquette Rules of Using Git (1/5)

❑ Commit Message

- What you done
- Why
- How
- Format is important
- $ git rebase -i HEAD~x

❑ Don’t modify master directly

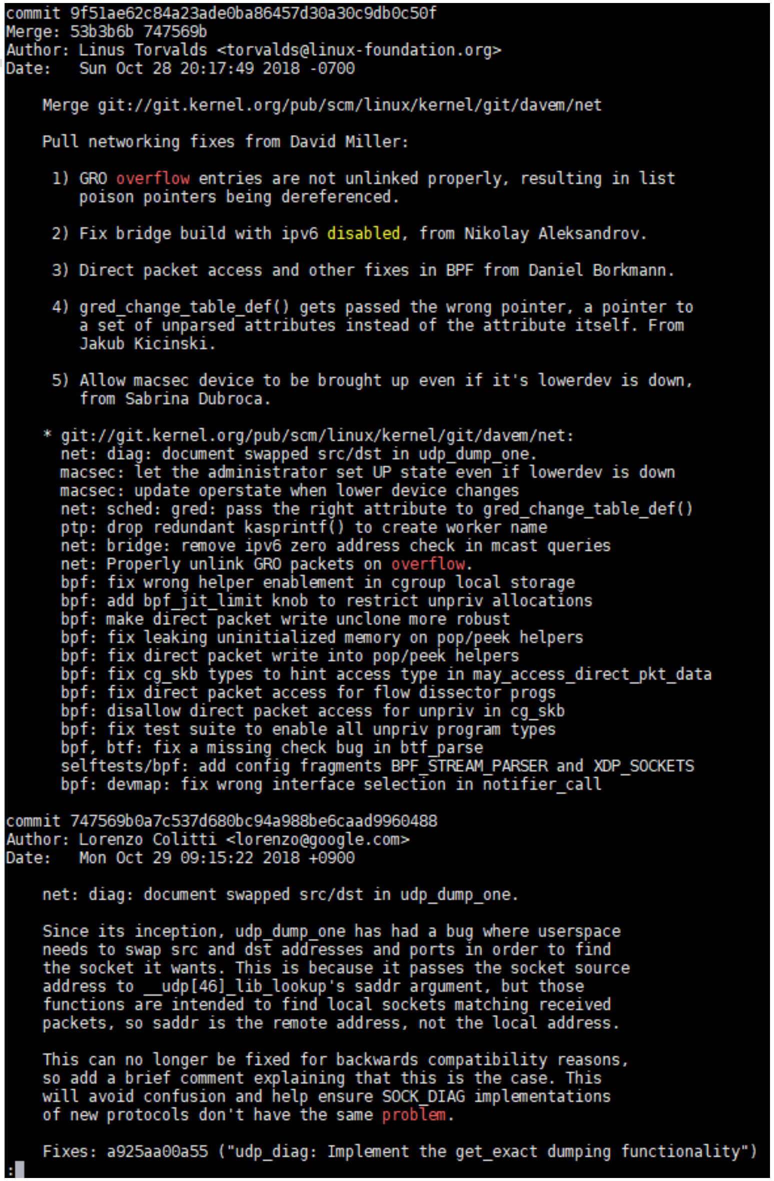
- Master branch may become unstable
- Others need to solve the conflict that cause by your temporary code
- To keep history clean

Etiquette Rules of Using Git (2/5)

- ❑ Keep history clean
  - Don’t change the history if you share branch with others
    - ➢ A lots of conflicts
  - Try to not use $ git push -f
    - ➢ A lots of conflicts
  - Try to not use merge (use reabase), except you are on master branch
    - ➢ Branch may become incapable of being merge
  - Try to not do $ git pull (fetch + merge)
    - ➢ Will add unnecessary merge commit
  - Use rebase -i
    - ➢ Rewrite your history

Etiquette Rules of Using Git (3/5)

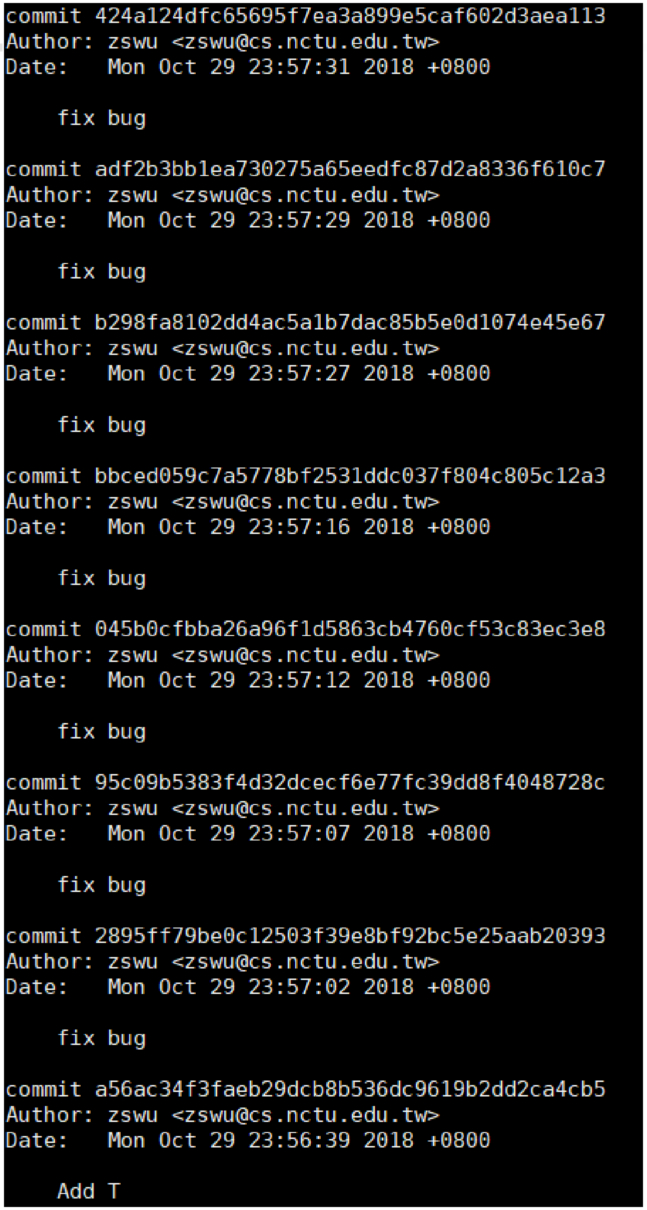
- ❑ Good commit message



```
commit 9f51ae62c84a23ade0ba86457d30a30c9db0c50f
Merge: 53b3b6b 747569b
Author: Linus Torvalds <torvalds@linux-foundation.org>
Date:   Sun Oct 28 20:17:49 2018 -0700

    Merge git://git.kernel.org/pub/scm/linux/kernel/git/davem/net

    Pull networking fixes from David Miller:

     1) GRO overflow entries are not unlinked properly, resulting in list
        poison pointers being dereferenced.

     2) Fix bridge build with ipv6 disabled, from Nikolay Aleksandrov.

     3) Direct packet access and other fixes in BPF from Daniel Borkmann.

     4) gred_change_table_def() gets passed the wrong pointer, a pointer to
        a set of unparsed attributes instead of the attribute itself. From
        Jakub Kicinski.

     5) Allow macsec device to be brought up even if it's lowerdev is down,
        from Sabrina Dubroca.

    * git://git.kernel.org/pub/scm/linux/kernel/git/davem/net:
      net: diag: document swapped src/dst in udp_dump_one.
      macsec: let the administrator set UP state even if lowerdev is down
      macsec: update operstate when lower device changes
      net: sched: gred: pass the right attribute to gred_change_table_def()
      ptp: drop redundant kasprintf() to create worker name
      net: bridge: remove ipv6 zero address check in mcast queries
      net: Properly unlink GRO packets on overflow.
      bpf: fix wrong helper enablement in cgroup local storage
      bpf: add bpf_jit_limit knob to restrict unpriv allocations
      bpf: make direct packet write unclone more robust
      bpf: fix leaking uninitialized memory on pop/peek helpers
      bpf: fix direct packet write into pop/peek helpers
      bpf: fix cg_skb types to hint access type in may_access_direct_pkt_data
      bpf: fix direct packet access for flow dissector progs
      bpf: disallow direct packet access for unpriv in cg_skb
      bpf: fix test suite to enable all unpriv program types
      bpf, btf: fix a missing check bug in btf_parse
      selftests/bpf: add config fragments BPF_STREAM_PARSER and XDP_SOCKETS
      bpf: devmap: fix wrong interface selection in notifier_call

commit 747569b0a7c537d680bc94a988be6caad9960488
Author: Lorenzo Colitti <lorenzo@google.com>
Date:   Mon Oct 29 09:15:22 2018 +0900

    net: diag: document swapped src/dst in udp_dump_one.

    Since its inception, udp_dump_one has had a bug where userspace
    needs to swap src and dst addresses and ports in order to find
    the socket it wants. This is because it passes the socket source
    address to __udp[46]_lib_lookup's saddr argument, but those
    functions are intended to find local sockets matching received
    packets, so saddr is the remote address, not the local address.

    This can no longer be fixed for backwards compatibility reasons,
    so add a brief comment explaining that this is the case. This
    will avoid confusion and help ensure SOCK_DIAG implementations
    of new protocols don't have the same problem.

    Fixes: a925aa00a55 ("udp_diag: Implement the get_exact dumping functionality")
:
```

Etiquette Rules of Using Git (4/5)

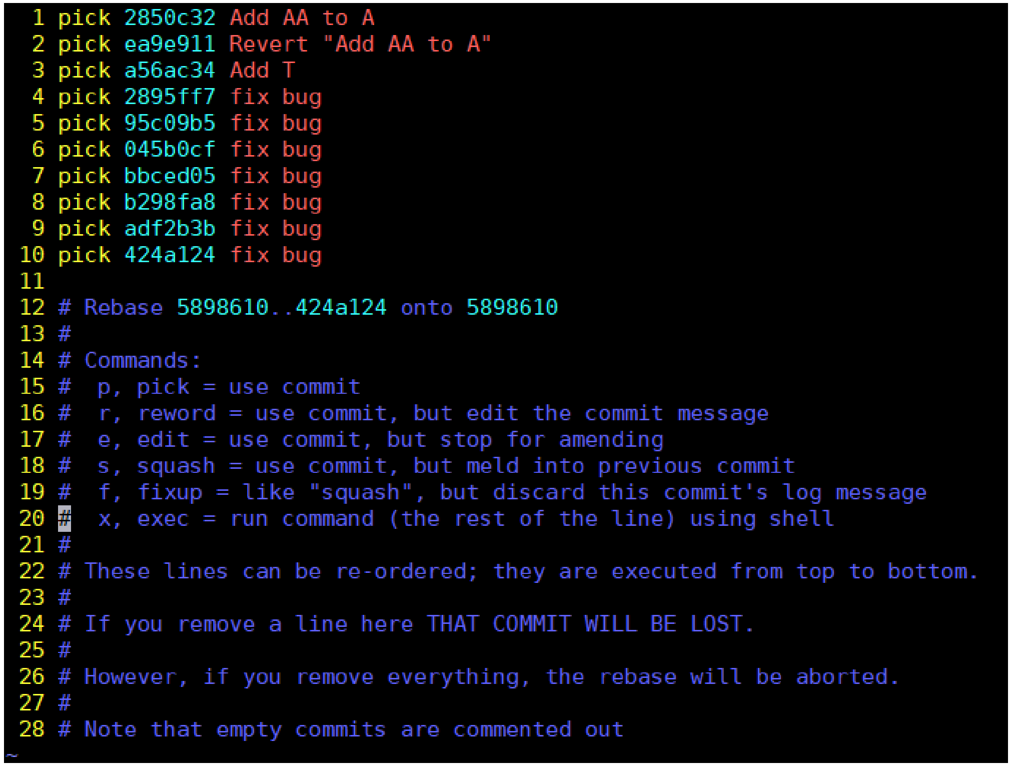
- ❑ Bad commit message



```
commit 424a124dfc65695f7ea3a899e5caf602d3aea113
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:57:31 2018 +0800

    fix bug

commit adf2b3bb1ea730275a65eedfc87d2a8336f610c7
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:57:29 2018 +0800

    fix bug

commit b298fa8102dd4ac5a1b7dac85b5e0d1074e45e67
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:57:27 2018 +0800

    fix bug

commit bbced059c7a5778bf2531ddc037f804c805c12a3
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:57:16 2018 +0800

    fix bug

commit 045b0cfbba26a96f1d5863cb4760cf53c83ec3e8
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:57:12 2018 +0800

    fix bug

commit 95c09b5383f4d32dcecf6e77fc39dd8f4048728c
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:57:07 2018 +0800

    fix bug

commit 2895ff79be0c12503f39e8bf92bc5e25aab20393
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:57:02 2018 +0800

    fix bug

commit a56ac34f3faeb29dcb8b536dc9619b2dd2ca4cb5
Author: zswu <zswu@cs.nctu.edu.tw>
Date:   Mon Oct 29 23:56:39 2018 +0800

    Add T
```

Etiquette Rules of Using Git (5/5)

- ❑ Use rebase -i to create clean history
  - $ git rebase -i HEAD~10



```
pick 2850c32 Add AA to A
pick ea9e911 Revert "Add AA to A"
pick a56ac34 Add T
pick 2895ff7 fix bug
pick 95c09b5 fix bug
pick 045b0cf fix bug
pick bbced05 fix bug
pick b298fa8 fix bug
pick adf2b3b fix bug
pick 424a124 fix bug

# Rebase 5898610..424a124 onto 5898610
#
# Commands:
#  p, pick = use commit
#  r, reword = use commit, but edit the commit message
#  e, edit = use commit, but stop for amending
#  s, squash = use commit, but meld into previous commit
#  f, fixup = like "squash", but discard this commit's log message
#  x, exec = run command (the rest of the line) using shell
#
# These lines can be re-ordered; they are executed from top to bottom.
#
# If you remove a line here THAT COMMIT WILL BE LOST.
#
# However, if you remove everything, the rebase will be aborted.
#
# Note that empty commits are commented out
~
```

Tools & Services (1/2)

❑ Online Git Service

- Web interface
- Remote repository
- Issue, Pull Requests (or Merge Requests… etc.)
- Code Review
- Community
- CI/CD
- Example
  - GitHub
  - GitLab
  - Bitbucket

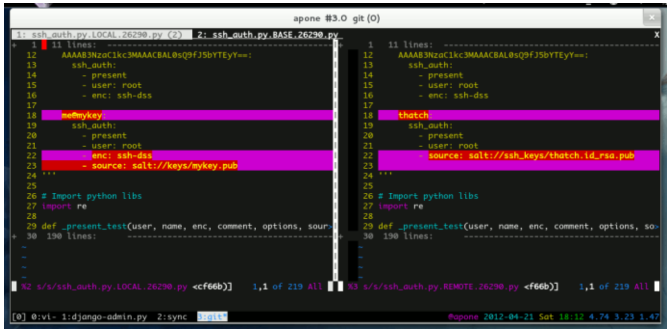
Tools & Services (2/2)

- ❑ Tools
  - Gerrit
    - Web-based code review tool
  - Tig
    - ncurses-based text-mode interface for Git
    - https://www.jianshu.com/p/e4ca3030a9d5
  - Git GUI
    - GUI-based interface for Git
  - KDiff3 / vimdiff / meld
    - Help users to solve conflict
  - etc.

Tips (1/3)

❑ Conflict Solving

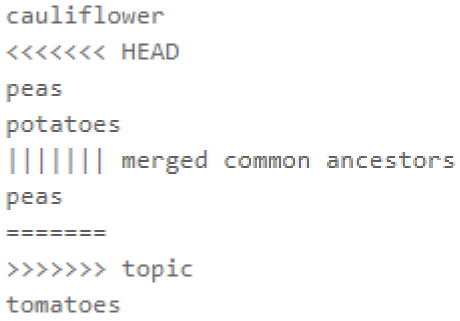
- Use merge tools
  - ➢ $ git config --global merge.tool kdiff3
- Show common ancestor
  - ➢ $ git config --global merge.conflictstyle diff3
- Change merge algorithm
  - ➢ $ git merge --strategy-option=patience
- More...
  - ➢ https://developer.atlassian.com/blog/2015/12/tips-tools-to-solve-git-conflicts/



```
1: ssh_auth.py.LOCAL.26290.py (2)   2: ssh_auth.py.BASE.26290.py
+ 11 lines: ------------------------------------------
    AAAAB3NzaC1kc3MAAACBAL0sQ9fJ5bYTEyY==:
      ssh_auth:
        - present
        - user: root
        - enc: ssh-dss

    me@mykey:
      ssh_auth:
        - present
        - user: root
        - enc: ssh-dss
        - source: salt://keys/mykey.pub
'''

# Import python libs
import re

def _present_test(user, name, enc, comment, options, sour>
+ 190 lines: ------------------------------------------
~
~
~
~
%2 s/s/ssh_auth.py.LOCAL.26290.py <cf66b)]    1,1 of 219 All
```

```
+ 11 lines: ------------------------------------------
    AAAAB3NzaC1kc3MAAACBAL0sQ9fJ5bYTEyY==:
      ssh_auth:
        - present
        - user: root
        - enc: ssh-dss

    thatch:
      ssh_auth:
        - present
        - user: root
        - source: salt://ssh_keys/thatch.id_rsa.pub

'''

# Import python libs
import re

def _present_test(user, name, enc, comment, options, so>
+ 190 lines: ------------------------------------------
~
~
~
~
%3 s/s/ssh_auth.py.REMOTE.26290.py <f66b)]    1,1 of 219 All
```

```
[0] 0:vi- 1:django-admin.py  2:sync  3:git*          @apone 2012-04-21 Sat 18:12 4.74 3.23 1.47
```

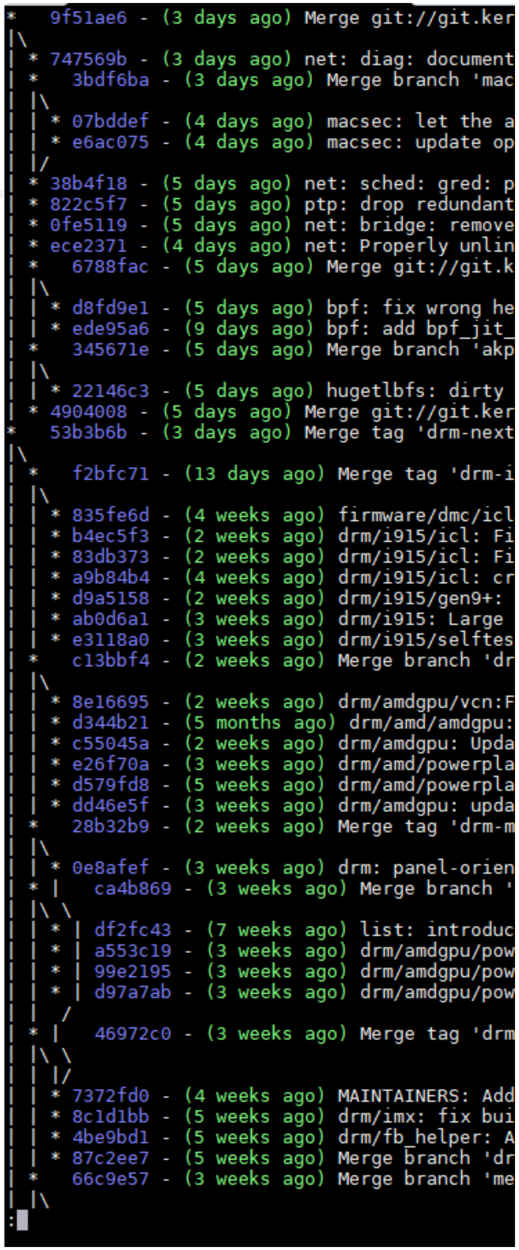


```
cauliflower
<<<<<<< HEAD
peas
potatoes
||||||| merged common ancestors
peas
=======
>>>>>>> topic
tomatoes
```

Tips (2/3)

❑ History visualize

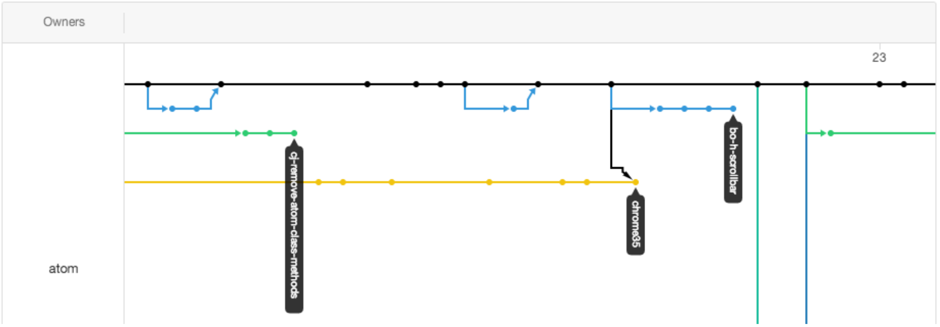
- Use git log
  - ➢ $ git log --decorate --graph [--oneline]
  - ➢ $ git log --graph --abbrev-commit --decorate --format=format:'%C(bold blue)%h%C(reset) - %C(bold green)(%ar)%C(reset) %C(white)%s%C(reset) %C(dim white)- %an%C(reset)%C(bold yellow)%d%C(reset)' --all
  - ➢ $ man git-log

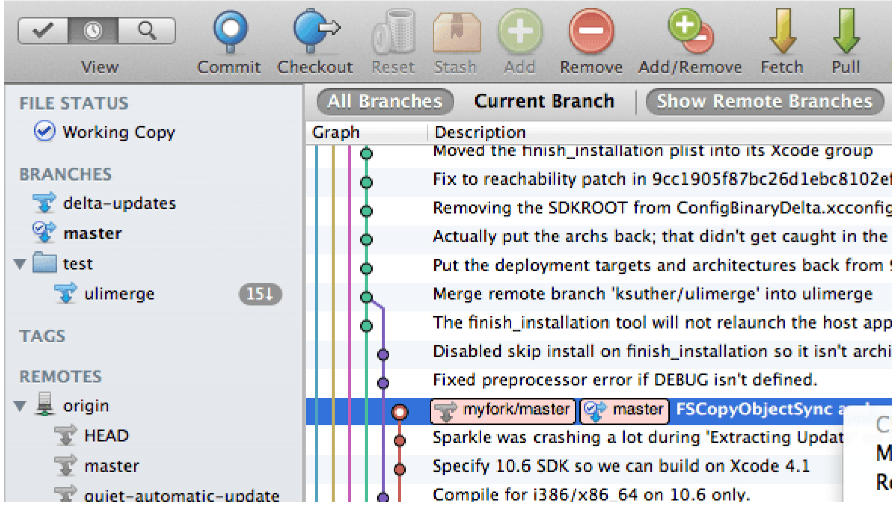


```
*   9f51ae6 - (3 days ago) Merge git://git.ker
|\
| * 747569b - (3 days ago) net: diag: document
| *   3bdf6ba - (3 days ago) Merge branch 'mac
| |\
| | * 07bddef - (4 days ago) macsec: let the a
| | * e6ac075 - (4 days ago) macsec: update op
| |/
| * 38b4f18 - (5 days ago) net: sched: gred: p
| * 822c5f7 - (5 days ago) ptp: drop redundant
| * 0fe5119 - (5 days ago) net: bridge: remove
| * ece2371 - (4 days ago) net: Properly unlin
| *   6788fac - (5 days ago) Merge git://git.k
| |\
| | * d8fd9e1 - (5 days ago) bpf: fix wrong he
| | * ede95a6 - (9 days ago) bpf: add bpf_jit_
| *   345671e - (5 days ago) Merge branch 'akp
| |\
| | * 22146c3 - (5 days ago) hugetlbfs: dirty
| * 4904008 - (5 days ago) Merge git://git.ker
*   53b3b6b - (3 days ago) Merge tag 'drm-next
|\
| *   f2bfc71 - (13 days ago) Merge tag 'drm-i
| |\
| | * 835fe6d - (4 weeks ago) firmware/dmc/icl
| | * b4ec5f3 - (2 weeks ago) drm/i915/icl: Fi
| | * 83db373 - (2 weeks ago) drm/i915/icl: Fi
| | * a9b84b4 - (4 weeks ago) drm/i915/icl: cr
| | * d9a5158 - (2 weeks ago) drm/i915/gen9+:
| | * ab0d6a1 - (3 weeks ago) drm/i915: Large
| | * e3118a0 - (3 weeks ago) drm/i915/selftes
| *   c13bbf4 - (2 weeks ago) Merge branch 'dr
| |\
| | * 8e16695 - (2 weeks ago) drm/amdgpu/vcn:F
| | * d344b21 - (5 months ago) drm/amd/amdgpu:
| | * c55045a - (2 weeks ago) drm/amdgpu: Upda
| | * e26f70a - (3 weeks ago) drm/amd/powerpla
| | * d579fd8 - (5 weeks ago) drm/amd/powerpla
| | * dd46e5f - (3 weeks ago) drm/amdgpu: upda
| *   28b32b9 - (2 weeks ago) Merge tag 'drm-m
| |\
| | * 0e8afef - (3 weeks ago) drm: panel-orien
| * |   ca4b869 - (3 weeks ago) Merge branch '
| |\ \
| | * | df2fc43 - (7 weeks ago) list: introduc
| | * | a553c19 - (3 weeks ago) drm/amdgpu/pow
| | * | 99e2195 - (3 weeks ago) drm/amdgpu/pow
| | * | d97a7ab - (3 weeks ago) drm/amdgpu/pow
| |  /
| * |   46972c0 - (3 weeks ago) Merge tag 'drm
| |\ \
| | |/
| | * 7372fd0 - (4 weeks ago) MAINTAINERS: Add
| | * 8c1d1bb - (5 weeks ago) drm/imx: fix bui
| | * 4be9bd1 - (5 weeks ago) drm/fb_helper: A
| | * 87c2ee7 - (5 weeks ago) Merge branch 'dr
| *   66c9e57 - (3 weeks ago) Merge branch 'me
| |\
:
```

Tips (3/3)

- ❑ History visualize (cont.)
  - GitHub / Online tools
  - Git GUI





Moved the finish_installation plist into its Xcode group
Fix to reachability patch in 9cc1905f87bc26d1ebc8102e
Removing the SDKROOT from ConfigBinaryDelta.xcconfig
Actually put the archs back; that didn't get caught in the
Put the deployment targets and architectures back from
Merge remote branch 'ksuther/ulimerge' into ulimerge
The finish_installation tool will not relaunch the host app
Disabled skip install on finish_installation so it isn't archi
Fixed preprocessor error if DEBUG isn't defined.
FSCopyObjectSync a
Sparkle was crashing a lot during 'Extracting Updat
Specify 10.6 SDK so we can build on Xcode 4.1
Compile for i386/x86_64 on 10.6 only.