The Working Cycle

Exercise I: adding files

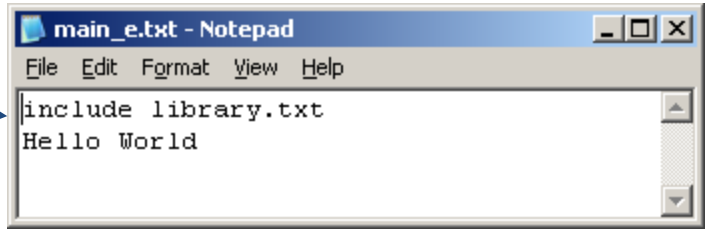
First say to Git who are you, this info will appear on each commit you do. Example:
$ git config --global user.name <YourUSERNAME> #Already, done? check it: git config --global -l
$ git config --global user.email <YourEMAIL>
$ git config --global init.defaultBranch main ## Set **main** branch to be default branch

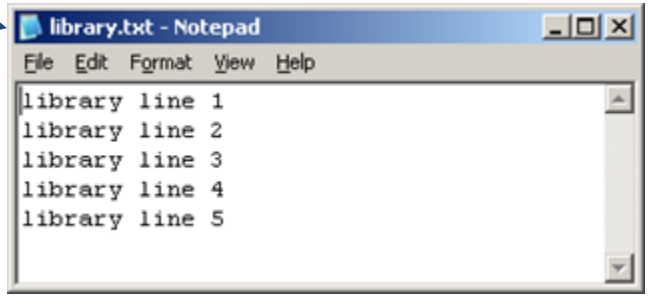
Please Create new (git init) "bare" repository to be your origin(remote) repository
$ git init --bare --shared ~/git_remote_repo

Then clone it to harry repo: cd .git and overview repository objects
$ git clone ~/**git_remote_repo** ~/**harry**

Go to **harry** folder and create two files in your working directory (fill them with these text lines):
$ cd **~/harry** **## Do it in any editor you work, example: VS Code**

`main_e.txt`
`library.txt`





Add your changes to the index
$ git add *

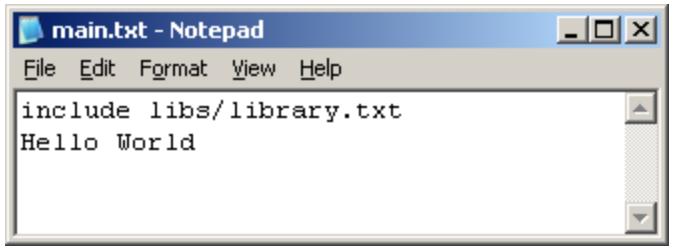
Check your status before commit
$ git status
Commit your changes as "Initial project"
$ git commit -m "Initial project"

The Working Cycle
Exercise II: restructuring files

Rename main_e.txt into main.txt
$ git mv main_e.txt main.txt

Create a folder named libs
$ mkdir libs

Move library.txt into libs (modify main.txt accordingly!)
And add modified main.txt to Index
$ git mv library.txt libs
$ vi main.txt ## Edit in any editor you prefer
$ git add .



Check your status and diff before commit
$ git status $ git diff --staged main.txt

```
# On branch master
# Changes to be committed:
#   (use "git reset HEAD <file>..." to unstage)
#
#       renamed:    library.txt -> libs/library.txt
#       new file:   main.txt
#       deleted:    main_e.txt
#
```

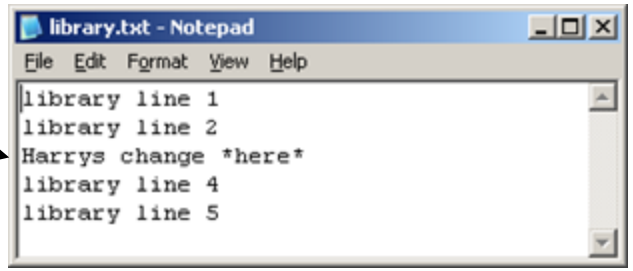
Commit your changes as ”Restructuring project”
$ git commit -m ”Restructuring project”

```
Counting objects: 7, done.
Delta compression using up to 2 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (5/5), 443 bytes, done.
Total 5 (delta 0), reused 0 (delta 0)
Unpacking objects: 100% (5/5), done.
To /nfs/iil/disks/iec_cm/git_repo/gitlab.git
   69a8b48..e2a900c  master -> master
```

Push all your work to origin (remote) repository
$ git push

The Working Cycle
Exercise III: teamwork

Change the 3rd line in **Harry**`s repo and check the status
$ git status $ git diff HEAD ## Use any editor you want

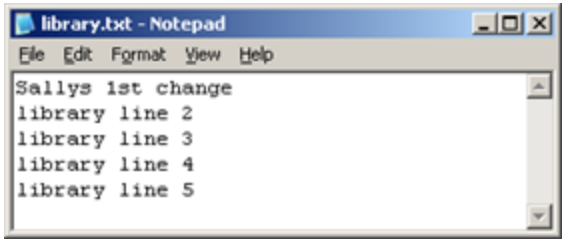


Commit **Harry's** changes as "**Harry's** 1st changes in our library"
$ git commit -a -m "Harry's 1st changes in our library"

Clone the git_remote_repo repo again to ~/**sally** folder, before pushing from **harry**
$ git clone ~/git_remote_repo ~/sally

Push all your work in **Harry**`s repo to origin (central) repo
$ git push

Change the first line in **Sally's** repo commit it and try to push
$ git diff $ git commit -a -m "Sally's 1st changes in our library"
$ git push



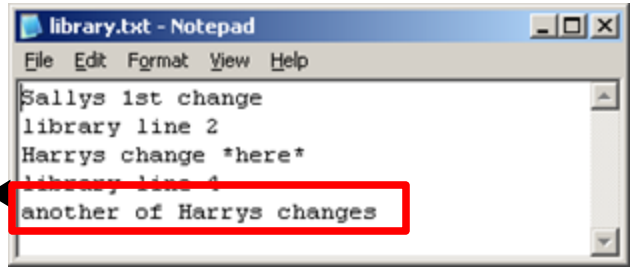
Pull updates to **Sally's** repo:
$ git pull --rebase Overview what you got: git status; git log

$ git diff HEAD^ HEAD – compare HEAD commit with previous commit, do you see both Sally and Harry change?
Push Sally's changes: $ git push

The Working Cycle
Exercise IV: conflicts (with rebase)

Pull Harry's repo to get Sally's last changes: ~/**harry**] $ git pull

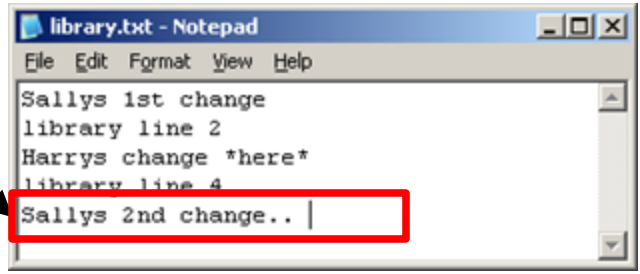
Change the fifth (last) line in Harry's repo, see your change:
$git diff HEAD



Commit **Harry's** changes as "Harry's 2nd changes in our library"
~/**harry**]$ git commit -a -m "Harry's 2nd changes in our library"

Push Harry's changes:~/**harry**]$ git status ~/**harry**]$ git push

Change the fifth (last) in **Sally's** repo commit and try to push
~/**sally**]$ git commit -a -m "Sally 2nd change in library"
~/**sally**]$ git push Why do you think it failed?



Pull Sally's repo: ~/**sally**]$ git pull --rebase

Edit and resolve the conflict: ~/**sally**]$ Open the file:
libs/library.txt
In you editor: **VS code** or vim, or any editor merge /diff editor you use. Fix conflicts (leave only 1 line or both)
Save the file libs/library.txt after the merge conflicts were solved

```
Sally's first change
Library line 2
Harry's change here
Library line 4
<<<<<<< HEAD
Another of Harrys change
=======
Sally 2nd change
>>>>>>> ad9e470 (+Sally 2nd change)
```

The Working Cycle
Exercise IV: conflicts (with rebase) (Continue)

Run "git add libs/library.txt" to mark resolution and add the file to staging area
~/**sally**]$ git add libs/library.txt

Run git status to see what is next?
~/**sally**]$ git status
rebase in progress; onto fe343dc. You are currently rebasing branch 'main' on 'fe343dc'.
  (all conflicts fixed: run "git rebase --continue")

Run git rebase --continue to continue and finish the rebase
~/**sally**]$ git rebase --continue
Applying: Sally 2nd change in library
Recorded resolution for 'library.txt'

Run git status to see what is next?
~/**sally**]$ git status
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

Run git log with diff to see results of rebase and conflict resolution
~/**sally**]$ git log -p -2

Now we can push Sally's changes after rebase
~/**sally**]$ git push

Exercise V Tagging

Create a tag named „**Release_01**“
with commit message "tag Release_01"
 ~/sally]$ git tag Release_01 -m "Official Release_01 GA"

Run git log to see the Tag in yellow color
~/sally]$ git log --graph --oneline --all

Push the tag to origin
~/sally]$ git push --tags

```
* 9ec4c94 (HEAD -> main, tag: Release_01, origin/main, origin/HEAD) + Sally 2nd change
* 9c8fe9e +Another of Harrys change
* 39da746 +Sally's first change
* 0a09798 +Harry's change here
```

Go to Harry repo, run „Commit Viewer“ gitk to see, that you still do not see the tag in Harry repo
~/harry]$ gitk

Fetch with the tag from the harry repository
~/harry]$ git fetch --tags

Run git log to see the tag in yellow color
~/harry]$ git log --graph --oneline --all

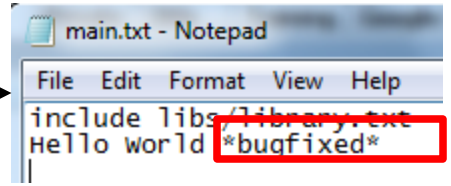
Rebase to align local main branch with origin/main
~/harry]$ git rebase
First, rewinding head to replay your work on top of it...
Fast-forwarded main to refs/remotes/origin/main.

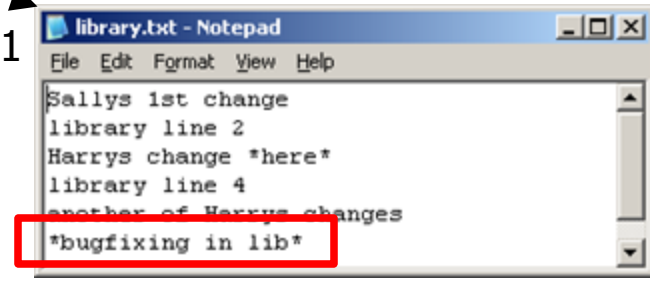
Exercise VI: Branching

Create a branch named „**bugfix/release_01_fix1**“
~/harry]$ git branch ` All in Harry repo only!

Check out this new branch:
~/harry]$ git checkout bugfix/release_01_fix1

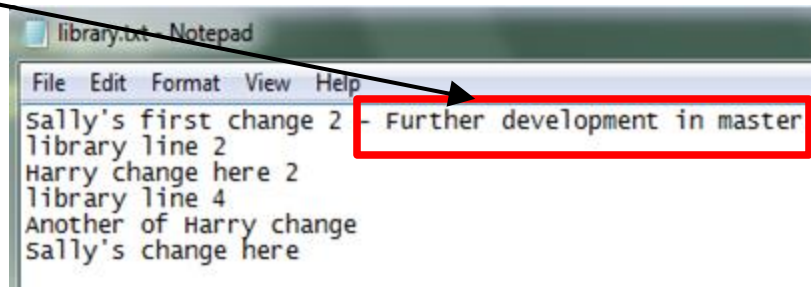
Change Harry’s repo main.txt and libs/library.txt:
Then commit with message „bugfixing“ and push
~/harry]$ git commit -a -m "bugfixing“
~/harry]$ git push --set-upstream origin bugfix/release_01_fix1
Check if remote tracking branch was set, for bugfix/release_01_fix1
~/harry]$ git branch -vv
* bugfix/release_01_fix1 afae908 [origin/bugfix/release_01_fix1]





Check out main branch: ~/harry]$ git checkout main

Add a line in Harry’s repo library.txt main branch, diff and commit it as „making progress in main“, then check status and push the change
~/harry]$ git diff HEAD or ~/harry]$ git gui



~/harry]$ git commit -a -m "making progress in main”
See new branch in log graph
~/harry]$ git log --graph --oneline --branches

~/harry]$ git status and ~/harry]$ git push

Exercise VII: Merging

Check if you are on main branch in Harry repo
~/harry]$ git status
On branch main
nothing to commit (working directory clean)

Merge bugfix/release_01_fix1 into main branch
~/harry]$ git merge bugfix/release_01_fix1

```
commit daef71070a044679e491f8adafb68a34159aa7c1
Merge: 3d11e75 0ac136b
Author: irokhk1x <ilyax.rok
Date:   Mon Jan 6 18:40:39 2014 +0200

    Merge branch 'bugfix_release_01_irokhk1x'

MM      irokhk1x/libs/library.txt
```

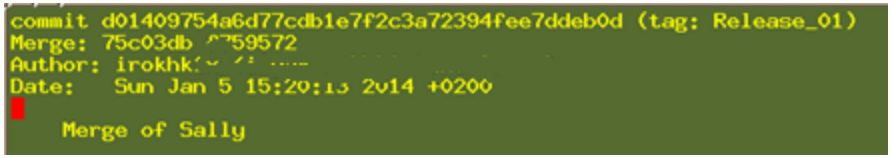
Check if the merge add the bugfix into the main branch
~/harry]$ git log -p
~/harry]$ git diff HEAD^ HEAD
~/harry]$ git log --graph --oneline –all ## See the branch merge

Push the merge changes to original repo,
see file annotation
~/harry]$ git push
~/harry]$ git blame ./libs/library.txt

```
3d11e757 irokhk1x/libs/library.txt (irokhk1x 2014-01-06 18:39:16 +0200 1) Sally's first change 2 - Further development in master
c7225035 irokhk1x/library.txt      (irokhk1x 2014-01-02 18:12:33 +0200 2) library line 2
f4c97122 irokhk1x/libs/library.txt (irokhk1x 2014-01-05 11:27:53 +0200 3) Harry change here 2
c7225035 irokhk1x/library.txt      (irokhk1x 2014-01-02 18:12:33 +0200 4) library line 4
f7595725 irokhk1x/libs/library.txt (irokhk1x 2014-01-05 14:32:03 +0200 5) Another of Harry change
75c03db6 irokhk1x/libs/library.txt (irokhk1x 2014-01-05 14:40:29 +0200 6) Sally's change here
0ac136bc irokhk1x/libs/library.txt (irokhk1x 2014-01-06 16:51:32 +0200 7) *bugfixing in lib*
```

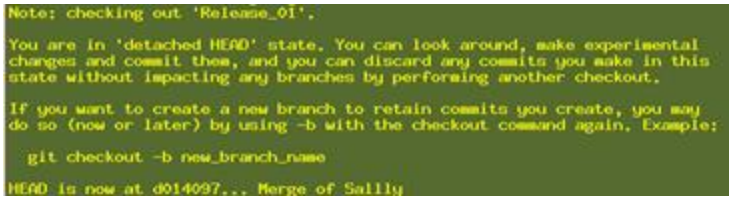
Check Out, Branch and Cherry Pick old commit

Exercise VIII



Check if you are on main branch in Harry's repo
~/harry]$ git status
On branch main
nothing to commit (working directory clean)

Run log to find commit we want to check out (with tags)
~/harry]$ git log --decorate



Check out specific revision, Tag Release_01 points to
~/harry]$ git checkout Release_01 Or ~/harry]$ git checkout d01409754a6d77cdb1e7f2c3a72394fee7ddeb0d

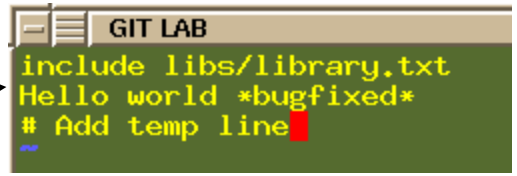
Check out the merge add the bugfix into the main branch
~/harry]$ git checkout -b bugfix/release_01_fix2 Or ~/harry]$ git branch bugfix/release_01_fix2 Release_01

Cherry Pick commit („making progress in the main") into current branch bugfix/release_01_fix2
~/harry]$ git log main --decorate --name-only and copy appropriate commit string
~/harry]$ git cherry-pick 3d11e757f7e6d6843a2f7965c2e901874d13c48f
~/harry]$ git diff HEAD^ HEAD – review check-pick merge results
~/harry]$ git log --graph --oneline --all

Push the cherry-pick changes to the original repo
~/harry]$ git push --set-upstream origin

Git Reverts of all kinds
Exercise IX

Check if you are on main branch in Harry's repo
~/harry]$ git status
On branch main
nothing to commit (working directory clean)



How to undo modify

Edit the file main.txt add a line „# Add temp line" save the file
~/harry]$ vi main.txt

Run git status and see how to discard last file changes
~/harry]$ git status

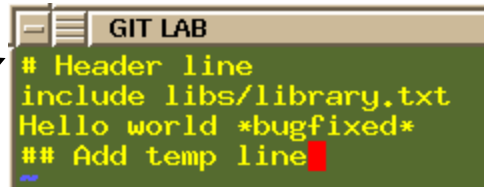
Discard the change in the Working Copy in the file main.txt,
~/harry]$ git diff HEAD main.txt – Always see what you are going to discard first!!!
~/harry]$ git checkout -- main.txt (discard the change)

Run git status and see status of the file now
~/harry]$ git status

How to undo staged changes

Do the below steps again (vi main.txt, git status, git diff HEAD main.txt)
~/harry]$ git add main.txt (To add main.txt to the Index)
~/harry]$ git diff --staged (Compare HEAD and staged, see what you are going to discard first!!!)
~/harry]$ git reset HEAD main.txt (Unstage the file)
~/harry]$ git diff
~/harry]$ git checkout -- main.txt (discard the change)

Git Reverts of all kinds
Exercise IX Continue



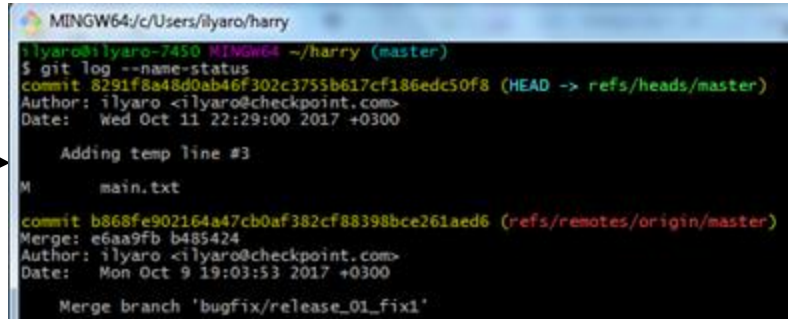
How to revert latest local commit

Do the upper steps again (vi main.txt, git status, git diff main.txt, git add main.txt)

~/harry]$ git commit -a -m "Adding temp line number 3 commit"

Run log to see the two latest commits

~/harry]$ git log --name-status



Run git reset to reset current branch to previous commit

~/harry]$ git reset --hard HEAD^

(Be carefull --hard resets Index, Working Tree also)

Run log now to see the previous good commit back to be first

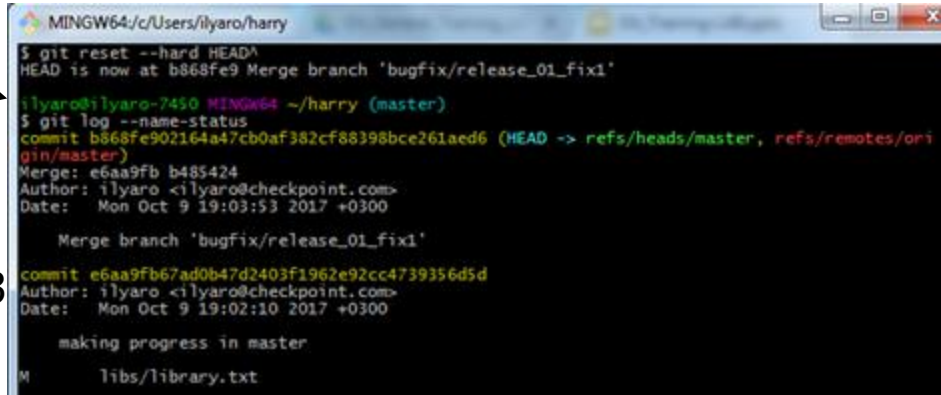
~/harry]$ git log --name-status

Where is the temp commit? It exists, just not Referenced, run reflog to see it:

~/harry]$ git reflog

$ git reflog

8291f8a HEAD@{1}: commit: Adding temp line #3



Git Reverts of all kinds
Exercise IX Continue

How to Revert Remote Commit

Let us reset main branch back to "Adding temp line number 3 commit"
~/harry]$ git reset --hard 8291f8a

Push the commit to the original repo
~/harry]$ git push

See the log and copy commit sha1
~/harry]$ git log -2

Now let us revert already pushed to origin commit, never mind who did it.
Let us revert commit "Adding temp line number 3 commit"
~/harry]$ git revert 8291f8a48d0ab46f302c3755b617cf186edc50f8

Run diff of the file main.txt to see what we get after revert
~/harry]$ git diff HEAD^ HEAD – you should see 1 line less
~/harry]$ git log -2

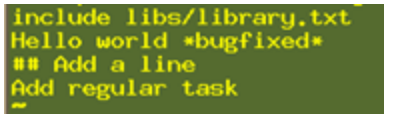
Run git status and see revert commit
~/harry]$ git status

Push the origin commit revert to the original repo
~/harry]$ git push

Git Stash usage
Exercise X

When you are in the middle of something, your boss comes in and demands that you fix something immediately. Stash you work, do emergency fix, commit it and pop you stash back

Do regular task in main branch, change file main.txt add line „Add regular Task"



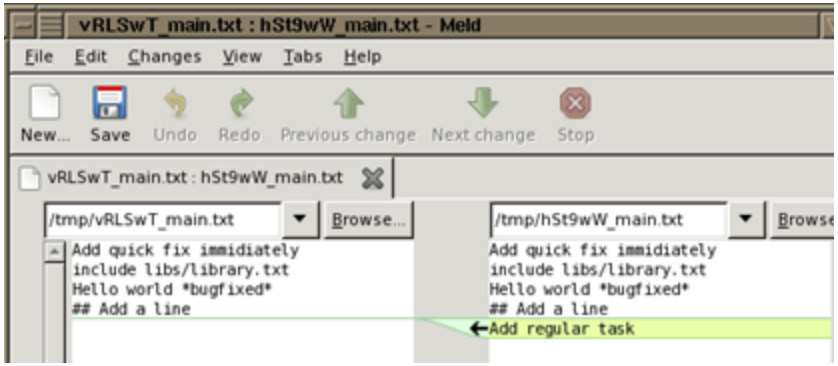

```
~/harry]$ vi main.txt
~/harry]$ git stash
Saved working directory and index state WIP on main: 581fe85 Revert "Adding temp line #3"
HEAD is now at 581fe85 Revert "Adding temp line #3"
```

Do emergency fix in main branch, change file main.txt add first line „Add quick fix immediately "


```
~/harry]$ vi main.txt

~/harry]$ git commit -a -m "Fix a bug in a quick"

~/harry]$ git stash pop
Auto-merging ilyar/main.txt
# On branch main
Dropped refs/stash@{0} (bd59435b9a1e08a702f8416f642c4d207d72e020)
```



Now continue you work, diff changes, commit and push

```
~/harry]$ git diff

~/harry]$ git commit -a -m "Regular task"
~/harry]$ git push
```

Format/Apply Patch
Exercise XI

Go to Harry's repository and add line to the END of file library.txt
~/harry/libs (main)
$ vi library.txt

Commit the change in Harry's repository
~/harry/libs (main)
$ git commit -am "harry's commit for patch"

Format patch of the last commit
~/harry/libs (main)
$ git format-patch -1 7b82010d86bcc9f020c413e216a1caf3d0651147
0001-harry-s-patch-phange.patch

See the patch file on file system
~/harry/libs (main)
$ ls
0001-harry-s-patch-change.patch library.txt

Go to Sally's repository and pull latest commits
~/harry/libs (main)
$ cd ~/sally/libs
~/sally/libs (main)
$ git pull

Format/Apply Patch
Exercise XI Continue

See what you got in the patch
$ ~/sally/libs (main)
$ git apply --stat ~/harry/libs/0001-harry-s-patch-change.patch
 library.txt | 2 ++
 1 file changed, 2 insertions(+)

Check if the patch is applicable, “no output no errors”
$ ~/sally/libs (main)
$ git apply --check ~/harry/libs/0001-harry-s-patch-change.patch

See content of the patch file, looks familiar?
$ ~/sally/libs (main)
$ cat ~/harry/libs/0001-harry-s-patch-change.patch

Apply the patch with signature of the patch
$ ~/sally/libs (main)
$ git am --signoff < ~/harry/libs/0001-harry-s-patch-change.patch
Applying: harry's patch change

$ ~/sally/libs (main)
$ git log -1 -c
commit 38a8ce3ce4cd260303ba930ab1a3c2b49e3dd217
    harry's patch change

    Signed-off-by: Ilya <astra07_2010@yahoo.com

Squash several commits to 1 commit
Exercise XII

In Sally's repository do 2 changes and 2 commits

We want to squash 2 commits 9fb9d06 and 5822495
$ ~/sally/libs (main)
$ git log --pretty=oneline -3
9fb9d060ab4ffe34f033d7b61163ce6697894a7b Add 2nd commit for squash
5822495ba795f4b0a18e89d52e77473dcd700c65 Add alt commit line
38a8ce3ce4cd260303ba930ab1a3c2b49e3dd217 harry's commit for patch

Run git rebase interactively on commit **before** 2 commits you want to squash
$ ~/sally (main)
$ git rebase -i HEAD^^ OR $ git rebase -i 38a8ce3ce4cd260303ba930ab1a3c2b49e3dd217
The first commit **pick** (leave it)
The second squash into first commit

```
pick 5822495 This is parent commit
s 9fb9d06 This is child commit
# Rebase 38a8ce3..9fb9d06 onto 38a8ce3
```

[detached HEAD e33ede3] Add alt commit line
2 files changed, 3 insertions(+)
Successfully rebased and updated refs/heads/main.

Run now $git log -p -2 You should see only 1 commit instead of 2 that was before

What happened with the 2 commits being squashed? Disappeared? Let us find them
$ git reflog

Pull directly from another repository not origin. Exercise XIII

Pull then push in Sally's repository and pull again to be fully synced with Harry
~/sally/libs (main)
$ git log --pretty=oneline -1
fde4fd370a20dd1491e5f5edd8498f1cc833912d Push for harry

Pull then push in Harry's repository and Pull again to be fully synced with Sally
Let's see harry's log from within sally's repository
~/sally/libs (main)
$ git **-C ~/harry** log main --pretty=oneline -1
fde4fd370a20dd1491e5f5edd8498f1cc833912d Add alt commit line
Change sally's file and commit it
~/sally/libs (main)
$ vi library.txt $ git diff $ git commit -am "Commit to pull for harry"

Go to harry's repository: $ cd ~/harry and pull the commit
~/harry (main)
$ git pull ~/sally main:main

Let us see the logs of the 2 repositories again
~/harry (main)
$ git log main --pretty=oneline -1
c98ab2d24894ee330a5c75f1c7fc77d83a7061db (HEAD -> main) Commit to pull for harry
$ git **-C ~/sally** log main --pretty=oneline -1
c98ab2d24894ee330a5c75f1c7fc77d83a7061db (HEAD -> main) Commit to pull for harry

Backup slides

Rebase (Already present in TeamWork)
Exercise VIII

Go to Sally's repository and add line to the END of file library.txt

```
$ ~/sally/libs (main)
$ vi library.txt
```

Commit the change in Sally's repository

```
$ ~/sally/libs (main)
$ git commit -a -m "sally's commit"
[main 4a14da9] sally commit
 1 file changed, 2 insertions(+)
```

Push the change to origin

```
$ ~/sally/libs (main)
$ git push origin
```

Go to Harry's repository

```
$ ~/sally/libs (main)
$ cd ~/harry/libs
```

Add first line to the beginning of the file library.txt

```
$ ~/harry/libs (main)
$ vi library.txt
```

Rebase (Already present in TeamWork)
Exercise VIII Continue

Commit the change in Harry's repository
$ ~/harry/libs (main)
$ git commit -a -m "harry's change"
[main 70ed6d3] harry's change
 1 file changed, 2 insertions(+)

Fetch the Sally's commit
$ ~/harry/libs (main)
$ git fetch
From c:/Users/Ilya/git_remote_repo
   06cfb7a..4a14da9 main   -> origin/main

See the log, where is the Sally's commit and where is Harry's commit, are they on the same line?
$ ~/harry/libs (main)
$ git log --graph --oneline --branches

Now run rebase
$ ~/harry/libs (main)
$ git rebase
First, rewinding head to replay your work on top of it... Applying: harry's change

Now see the log, where is the Sally's commit and where is Harry's commit now? Why?
$ ~/harry/libs (main)
$ gitk

Push directly to another repo not origin, From sally to harry directly. Exercise XVI

Pull then push in Sally's repository and pull again to be fully synced with Harry

```
$ ~/sally/libs (main)
$ git log --pretty=oneline -3
93dffff1a6160c747d18c5fd36d0cf82062042a2 harry's change
e33ede3a4a6428f523d8bec1041098464cad58b7 Add alt commit line
930ab1a3c2b49e3dd217 harry's patch change
```

Pull then push in Harry's repository and Pull again to be fully synced with Sally

Let's see harry's log from within sally's repository

```
$ ~/sally/libs (main)
$ git -C ~/harry log main --pretty=oneline -3
93dffff1a6160c747d18c5fd36d0cf82062042a2 harry's change
e33ede3a4a6428f523d8bec1041098464cad58b7 Add alt commit line
930ab1a3c2b49e3dd217 harry's patch change
```

Change sally's file

```
$ ~/sally/libs (main)
$ vi library.txt

$ git diff HEAD

$ ~/sally (main)
$ git commit -a -m "Push for harry"
```

Push directly to another repo not origin, From sally to harry directly. Exercise XVI continue

$ ~/sally/libs (main)
$ git push ~/harry main:main

Worked? Why not? Go to Harry's repository
$ ~/sally/libs (main)
$ cd ~/harry/libs

Check another branch:
~/harry]$ git checkout bugfix/release_01_fix1

Back to Sally's repository $ cd ~/sally

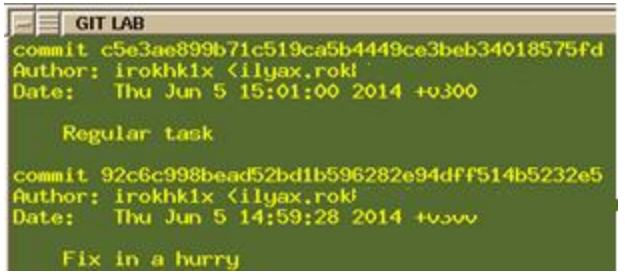
$ ~/sally (main)
$ git push ~/harry main:main
To c:/Users/Ilya/harry 93dffff..fde4fd3 main -> main

$ ~/harry (main)
$ git **-C ~/harry** log main --pretty=oneline -1
fde4fd370a20dd1491e5f5edd8498f1cc833912d Push for harry

Advanced working with branches
Exercise XI

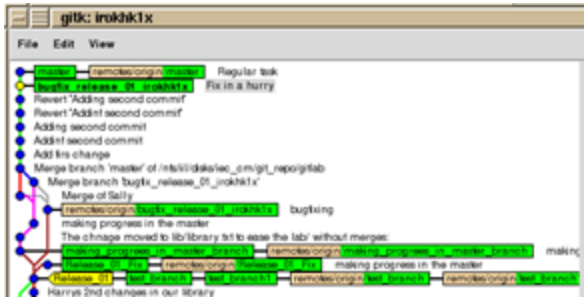
How to take changes that happened on the main in the meanwhile

Let us check out bugfix/release_01_fix1 branch
~/harry]$ git checkout bugfix/release_01_fix1

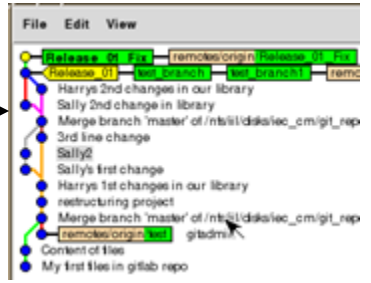


Run git log --all (refs) and copy „Fix in a hurry" commit sha1
~/harry]$ git log –all
Now let us merge our branch bugfix/release_01_fix1 with commit HEAD^ on main branch
92c6c998bead52bd1b596282e94dff514b5232e5

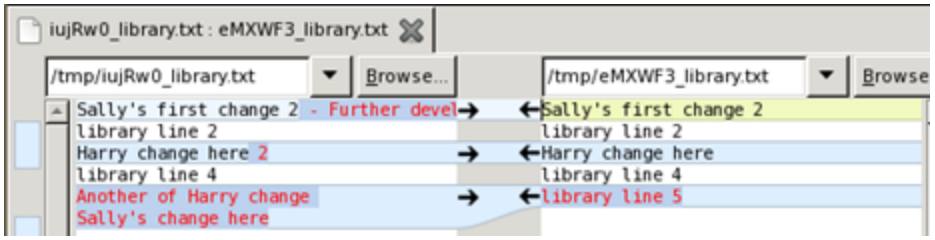
~/harry]$git merge 92c6c998bead52bd1b596282e94dff514b5232e5
Updating 0ac136b..92c6c99
Fast-forward
ilyar/libs/library.txt | 2 +-
ilyar/main.txt | 3 ++-
2 files changed, 3 insertions(+), 2 deletions(-)



Compare my branch to the main (as it was when I last updated from main)
~/harry]$ git checkout bugfix/release_01_fix1
Run Git log to see when last time was merged from main?
~/harry]$ gitk &

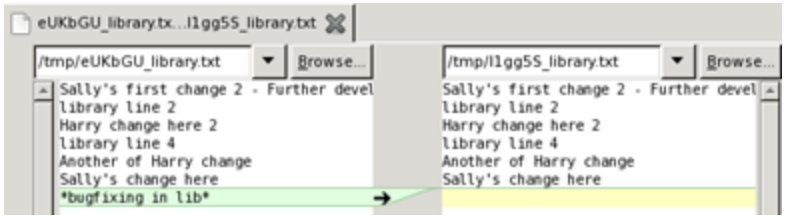


Advanced working with branches
Exercise XI Continue



~/harry]$ git diff HEAD bccdb778dc129c990a0c09147c914a34eff12dda

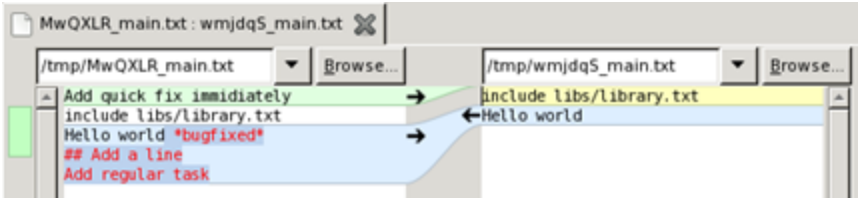
How to Compare two branches



Let us diff main and bugfix_release_01_fix1 branches
~/harry]$ git difftool main bugfix/release_01_fix1

~/harry]$ git diff main bugfix/release_01_fix1 – without external tool

```
diff --git a/ilyar/libs/library.txt b/ilyar/libs/library.txt
index 59a920d..0ebca13 100644
--- a/ilyar/libs/library.txt
+++ b/ilyar/libs/library.txt
@@ -4,4 +4,3 @@ Harry change here 2
 library line 4
 Another of Harry change
 Sally's change here
-*bugfixing in lib*
diff --git a/ilyar/main.txt b/ilyar/main.txt
index 75bb070..1e22422 100644
--- a/ilyar/main.txt
+++ b/ilyar/main.txt
@@ -1,5 +1,2 @@
-Add quick fix immidiately
 include libs/library.txt
-Hello world *bugfixed*
-## Add a line
-Add regular task
+Hello world
```



Using the git log
Exercise XII

Git log in cmd and GUI
This is the log command in cmd to see merge info + files, that were changed + all branches
~/harry]$ git log -p --branches

~/harry]$ gitk --all & to see gui log of all branches and

~/harry]$ gitk & to see log of only current branch

Write click on commit and select "Mark this commit"
Now go to another commit, write click on it and select "Compare with marked commit"

Check out bugfix/release_01_fix1 branch

~/harry]$ git checkout bugfix/release_01_fix1
Check that you have commits not yet pushed, only such commits Can be changed!!!

Using the git log
Exercise XII Continue

```
~/harry]$ git push origin --dry-run
   0ac136b..b597fd2  bugfix/release_01_fix1 -> bugfix/release_01_fix1
```

Change commit message to “We can edit unpushed messages only”

```
~/harry]$ git commit --amend -m "We can edit unpushed messages only"
[bugfix/release_01_fix1 d4e3205] We can edit unpushed messages only
 1 files changed, 1 insertions(+), 0 deletions(-)
```

```
~/harry]$ git log
commit d4e3205f7c80db7d4bda4ac588b5fcfd73f9ee31
Author: ilyar <astra07_2010@yahoo.com>
Date:   Sun Jun 8 15:30:33 2014 +0300
    We can edit unpushed messages only
```

Now push latest changes to the origin repo

```
~/harry]$ git push
```