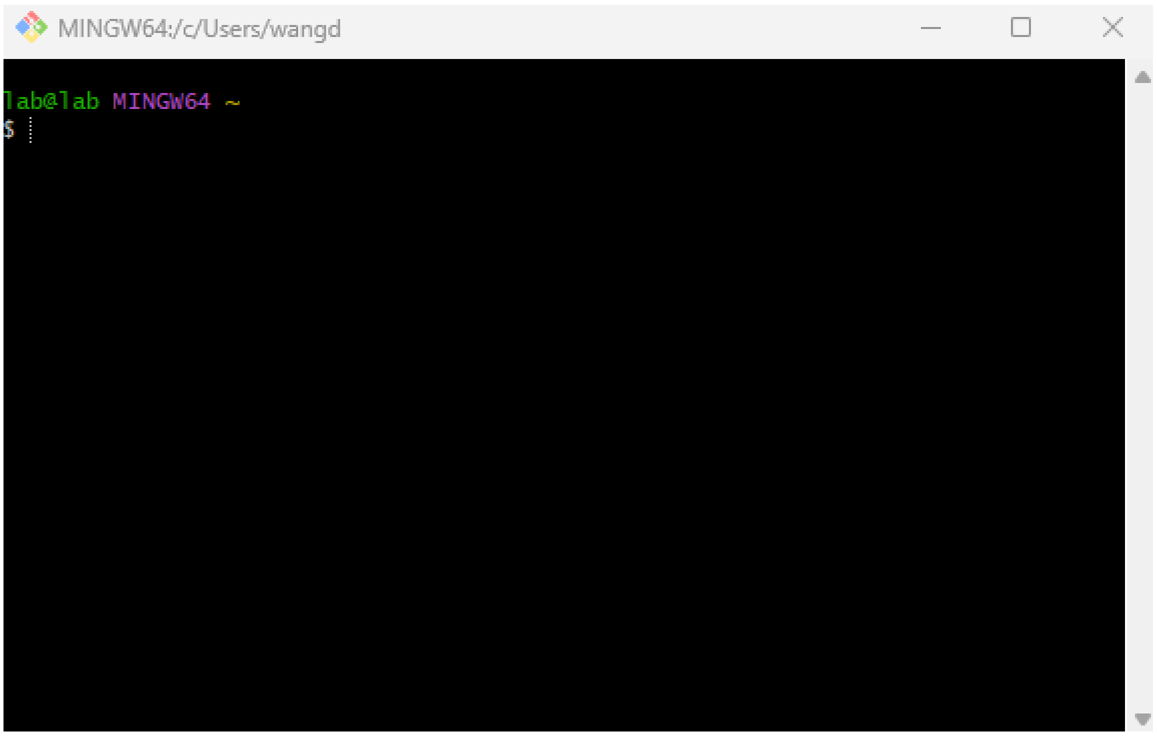
Introduction to Git

This lab tutorial is about how to use git to manage our projects.

Open a terminal

After successfully installing git from https://git-scm.com, you should be able to start a "git bash" from your start up menu if you are using windows:



```
lab@lab MINGW64 ~
$
```

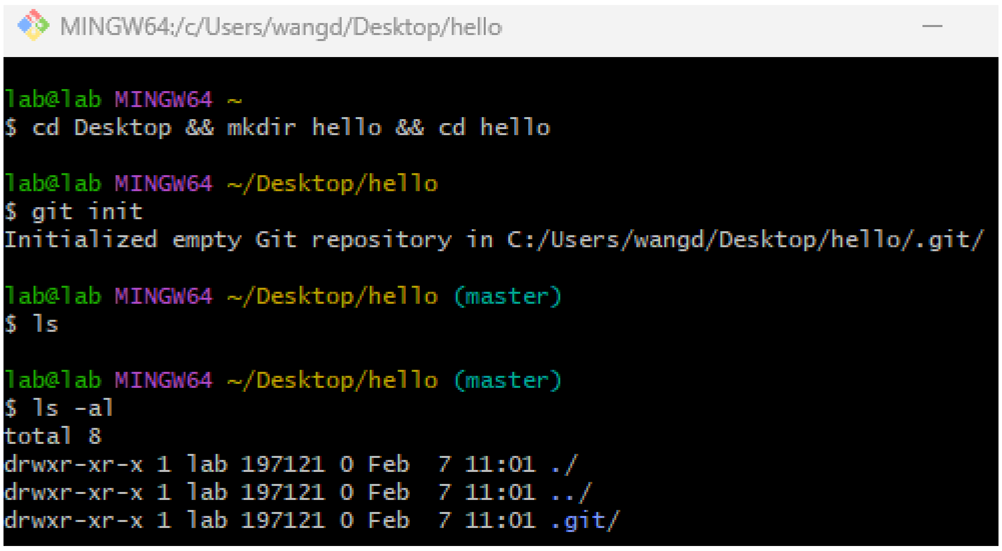
If you are using linux then you only need to open a terminal.

Create a project

Now create a project with `git init`:

```
git init
```

After that the ".git" directory should be created:

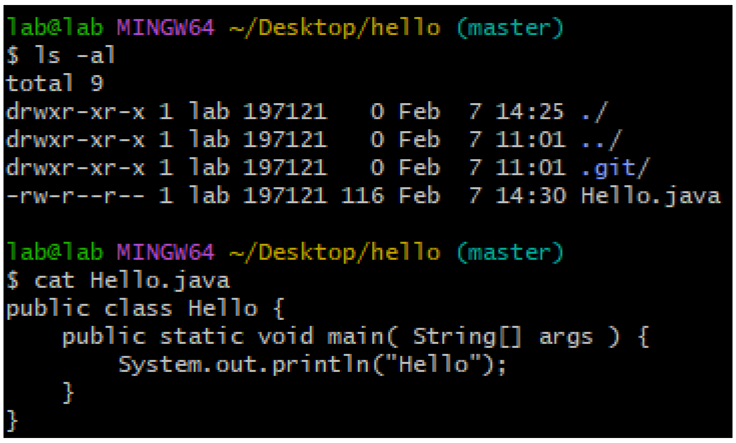

MINGW64:/c/Users/wangd/Desktop/hello

```
lab@lab MINGW64 ~
$ cd Desktop && mkdir hello && cd hello

lab@lab MINGW64 ~/Desktop/hello
$ git init
Initialized empty Git repository in C:/Users/wangd/Desktop/hello/.git/

lab@lab MINGW64 ~/Desktop/hello (master)
$ ls

lab@lab MINGW64 ~/Desktop/hello (master)
$ ls -al
total 8
drwxr-xr-x 1 lab 197121 0 Feb  7 11:01 ./
drwxr-xr-x 1 lab 197121 0 Feb  7 11:01 ../
drwxr-xr-x 1 lab 197121 0 Feb  7 11:01 .git/
```

The ".git" directory shows that this directory is a git project.

Add and commit

Let's first create a new file in the project:

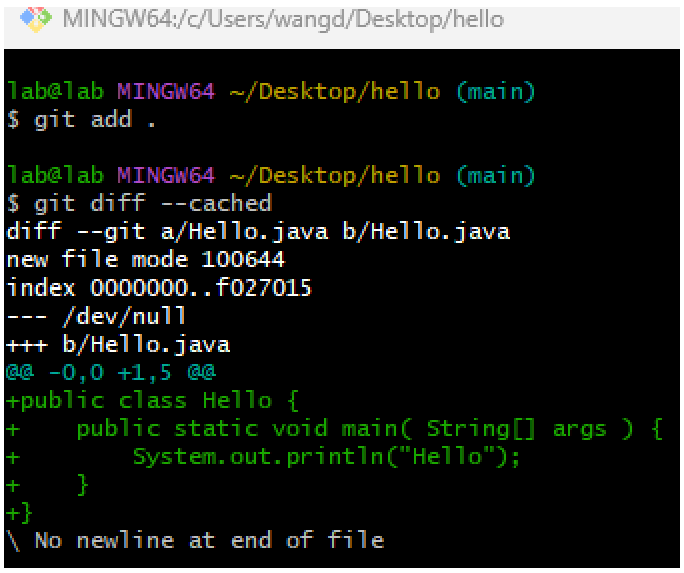


```
lab@lab MINGW64 ~/Desktop/hello (master)
$ ls -al
total 9
drwxr-xr-x 1 lab 197121   0 Feb  7 14:25 ./
drwxr-xr-x 1 lab 197121   0 Feb  7 11:01 ../
drwxr-xr-x 1 lab 197121   0 Feb  7 11:01 .git/
-rw-r--r-- 1 lab 197121 116 Feb  7 14:30 Hello.java

lab@lab MINGW64 ~/Desktop/hello (master)
$ cat Hello.java
public class Hello {
    public static void main( String[] args ) {
        System.out.println("Hello");
    }
}
```

Then you need to take a snapshot to the staging area:

```
git add .
```

You can use `git diff --cached` to see what is added to your project:

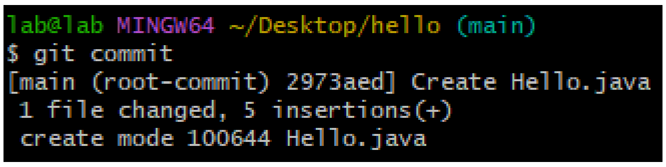


```
MINGW64:/c/Users/wangd/Desktop/hello

lab@lab MINGW64 ~/Desktop/hello (main)
$ git add .

lab@lab MINGW64 ~/Desktop/hello (main)
$ git diff --cached
diff --git a/Hello.java b/Hello.java
new file mode 100644
index 0000000..f027015
--- /dev/null
+++ b/Hello.java
@@ -0,0 +1,5 @@
+public class Hello {
+    public static void main( String[] args ) {
+        System.out.println("Hello");
+    }
+}
\ No newline at end of file
```

Note that the `git diff` command with or without the `--cached` argument is different. See git document https://git-scm.com/docs/git-diff for more details.

This is not over, you must commit the changes to finish this step with:

```
git commit
```



```
lab@lab MINGW64 ~/Desktop/hello (main)
$ git commit
[main (root-commit) 2973aed] Create Hello.java
 1 file changed, 5 insertions(+)
 create mode 100644 Hello.java
```

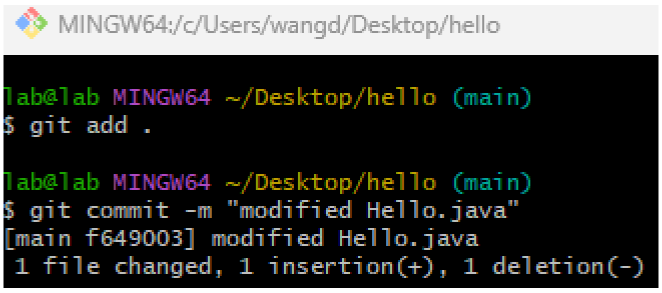
The terminal will prompt for you to enter the "commit message", it is better if you know how to use "vim".

If you are doing this the first time, git will probably ask you to config your info like:

```
git config --global user.name "Your Name"
git config --global user.email your@email.com
```

Just follow the instructions.

You can also specify the commit message when doing the commit, so that you don't need to type the commit message in the next step:



```
MINGW64:/c/Users/wangd/Desktop/hello

lab@lab MINGW64 ~/Desktop/hello (main)
$ git add .

lab@lab MINGW64 ~/Desktop/hello (main)
$ git commit -m "modified Hello.java"
[main f649003] modified Hello.java
 1 file changed, 1 insertion(+), 1 deletion(-)
```

See log

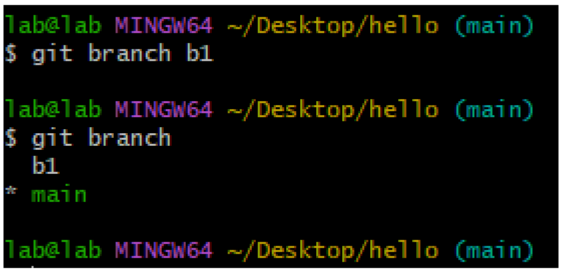
Now we have done one or two commits. If there are many commits in the repository, you may want to see the log to know the history.

You can choose one of the following command or refer to https://www.git-scm.com/docs/git-log for a detailed demostration.

```
git log
git log -p
git log --stat --summary
```

Making branches

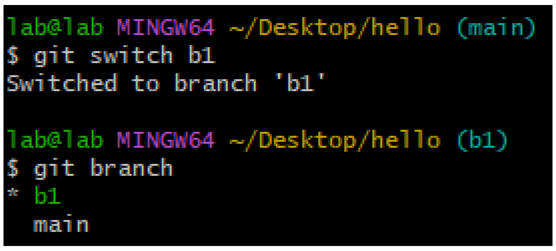
You can have multiple branches in your project.



```
lab@lab MINGW64 ~/Desktop/hello (main)
$ git branch b1

lab@lab MINGW64 ~/Desktop/hello (main)
$ git branch
  b1
* main

lab@lab MINGW64 ~/Desktop/hello (main)
```

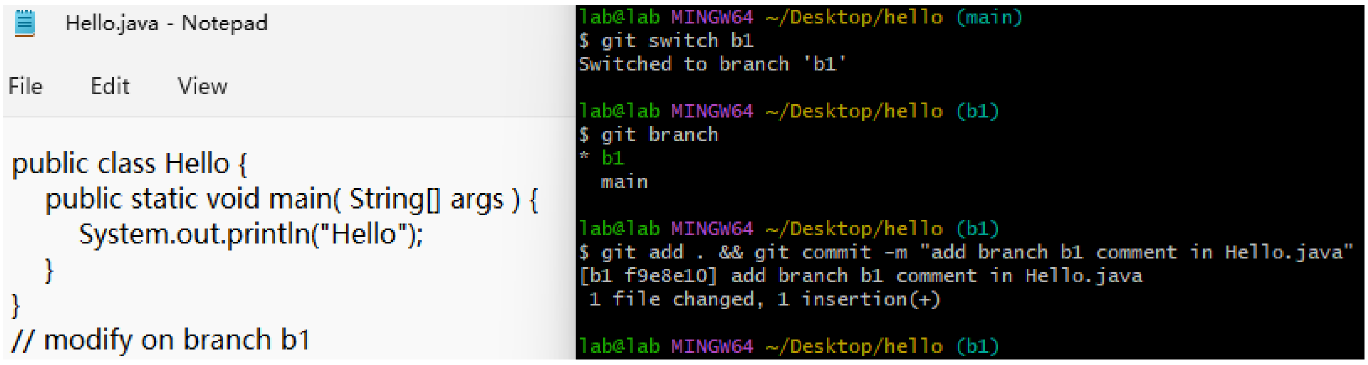
In the above example, we created a new branch named "b1" with command `git branch b1`. Then we use `git branch` to show the branches and we see two branches there: "b1" and "main". The "main" branch is the default one. We also see that the current selected branch is "main".

You can switch between branches:



```
lab@lab MINGW64 ~/Desktop/hello (main)
$ git switch b1
Switched to branch 'b1'

lab@lab MINGW64 ~/Desktop/hello (b1)
$ git branch
* b1
  main
```

Now let's do some changes and commit on branch "b1":



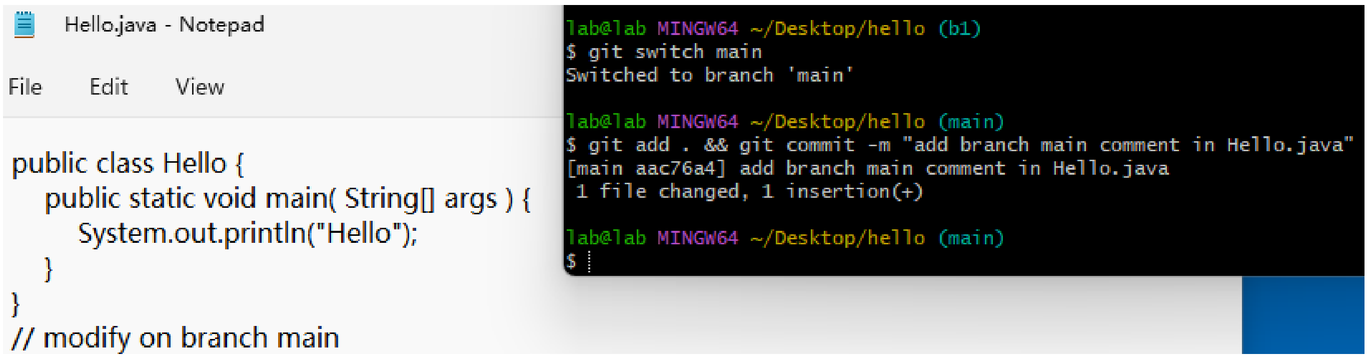
Hello.java - Notepad

File Edit View

```
public class Hello {
    public static void main( String[] args ) {
        System.out.println("Hello");
    }
}
// modify on branch b1
```

```
lab@lab MINGW64 ~/Desktop/hello (main)
$ git switch b1
Switched to branch 'b1'

lab@lab MINGW64 ~/Desktop/hello (b1)
$ git branch
* b1
  main

lab@lab MINGW64 ~/Desktop/hello (b1)
$ git add . && git commit -m "add branch b1 comment in Hello.java"
[b1 f9e8e10] add branch b1 comment in Hello.java
 1 file changed, 1 insertion(+)

lab@lab MINGW64 ~/Desktop/hello (b1)
```

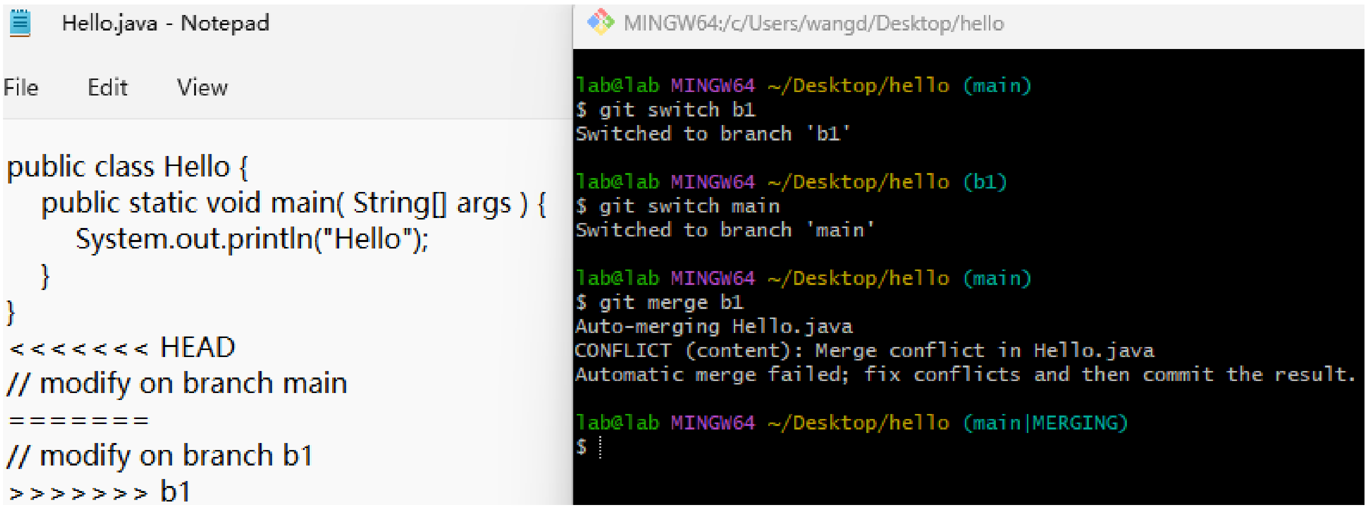
Go back to "main" and make some changes:



```
public class Hello {
    public static void main( String[] args ) {
        System.out.println("Hello");
    }
}
// modify on branch main
```

```
lab@lab MINGW64 ~/Desktop/hello (b1)
$ git switch main
Switched to branch 'main'

lab@lab MINGW64 ~/Desktop/hello (main)
$ git add . && git commit -m "add branch main comment in Hello.java"
[main aac76a4] add branch main comment in Hello.java
 1 file changed, 1 insertion(+)

lab@lab MINGW64 ~/Desktop/hello (main)
$
```

Merge branch "b1" from branch "main" with `git merge b1`. If there is a conflict, as follows:

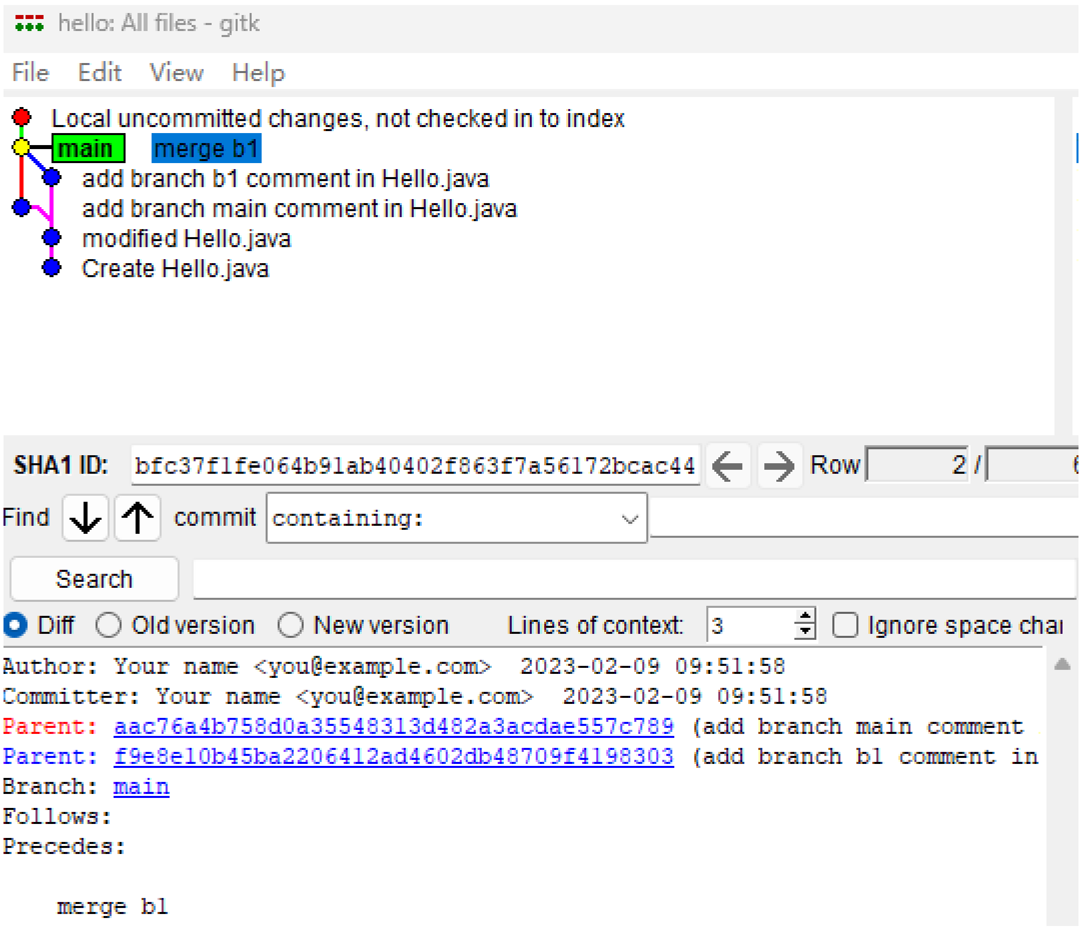


```
public class Hello {
    public static void main( String[] args ) {
        System.out.println("Hello");
    }
}
<<<<<<< HEAD
// modify on branch main
=======
// modify on branch b1
>>>>>>> b1
```

```
lab@lab MINGW64 ~/Desktop/hello (main)
$ git switch b1
Switched to branch 'b1'

lab@lab MINGW64 ~/Desktop/hello (b1)
$ git switch main
Switched to branch 'main'

lab@lab MINGW64 ~/Desktop/hello (main)
$ git merge b1
Auto-merging Hello.java
CONFLICT (content): Merge conflict in Hello.java
Automatic merge failed; fix conflicts and then commit the result.

lab@lab MINGW64 ~/Desktop/hello (main|MERGING)
$
```

you should manually solve the conflict and do a commit. Then everything is fine and you can remove branch "b1" if it is not useful anymore with `git branch -d b1`. Argument "-d" and "-D" are different, refer to git document for more details.

Now everything is fine and you can execute `gitk` to see a graphical view of the change log:



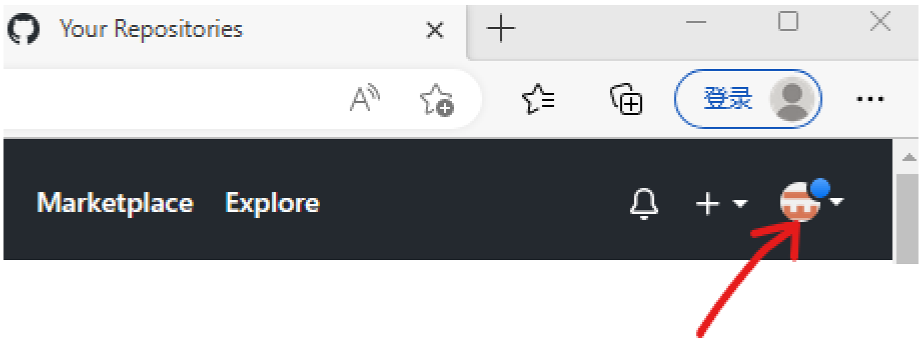
```
Local uncommitted changes, not checked in to index
merge b1
add branch b1 comment in Hello.java
add branch main comment in Hello.java
modified Hello.java
Create Hello.java
```

```
SHA1 ID: bfc37f1fe064b91ab40402f863f7a56172bcac44   Row 2 /
```

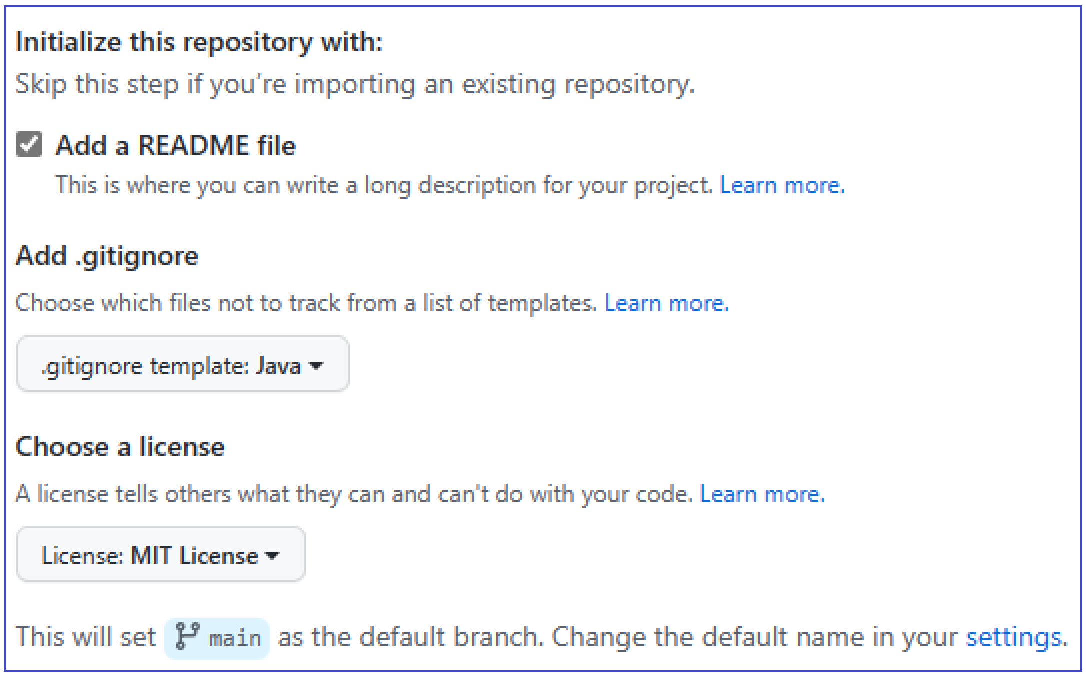
```
Author: Your name <you@example.com>  2023-02-09 09:51:58
Committer: Your name <you@example.com>  2023-02-09 09:51:58
Parent: aac76a4b758d0a35548313d482a3acdae557c789 (add branch main comment
Parent: f9e8e10b45ba2206412ad4602db48709f4198303 (add branch b1 comment in
Branch: main
Follows:
Precedes:

    merge b1
```

Using github

Go to https://github.com and register an account if you haven't already done it.



Click the button above, click "repositories", "new" to create a new repository. When github ask you to set the initial configuration, you can choose to add "readme", "gitignore" and "licence" file to you repo:



Initialize this repository with:
Skip this step if you're importing an existing repository.

☑ **Add a README file**
This is where you can write a long description for your project. Learn more.

Add .gitignore
Choose which files not to track from a list of templates. Learn more.

.gitignore template: Java

Choose a license
A license tells others what they can and can't do with your code. Learn more.

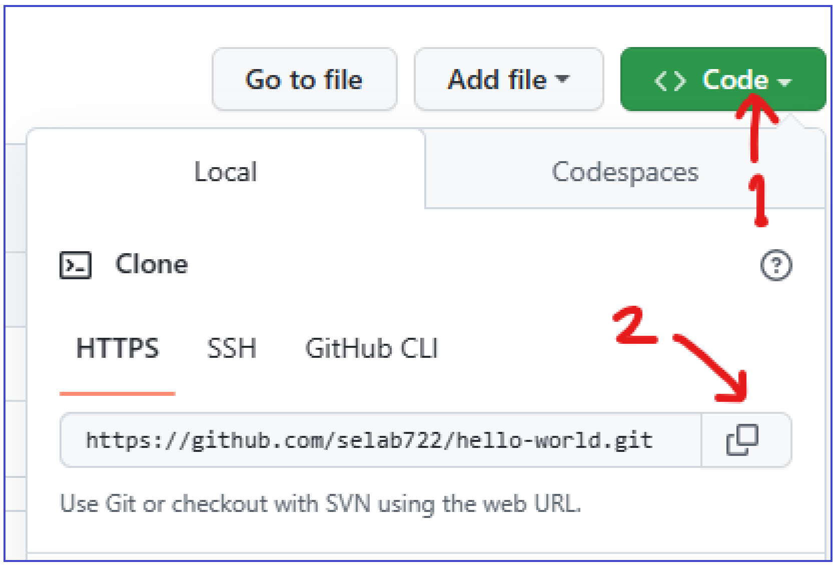
License: MIT License

This will set `main` as the default branch. Change the default name in your settings.

Click "Create repository" and your repository will be created.

You can directly edit some files using github but sometimes you still want to edit them locally, specially when you need an IDE.

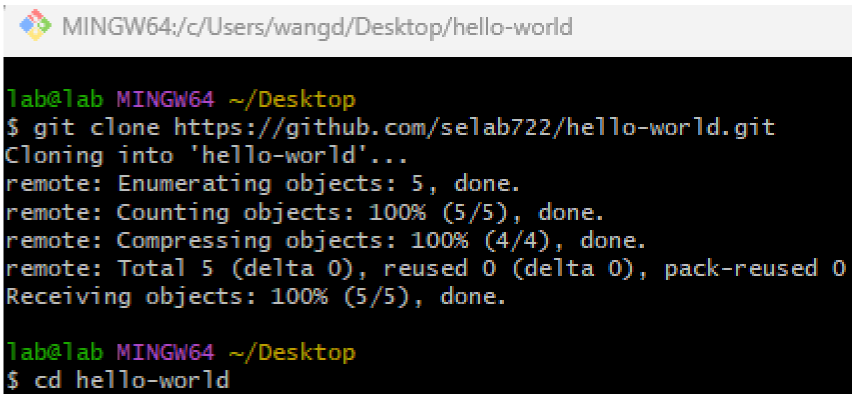
So click "code" and "clone" to copy the link (like https://github.com/username/hello-world.git) to the click board:



https://github.com/selab722/hello-world.git

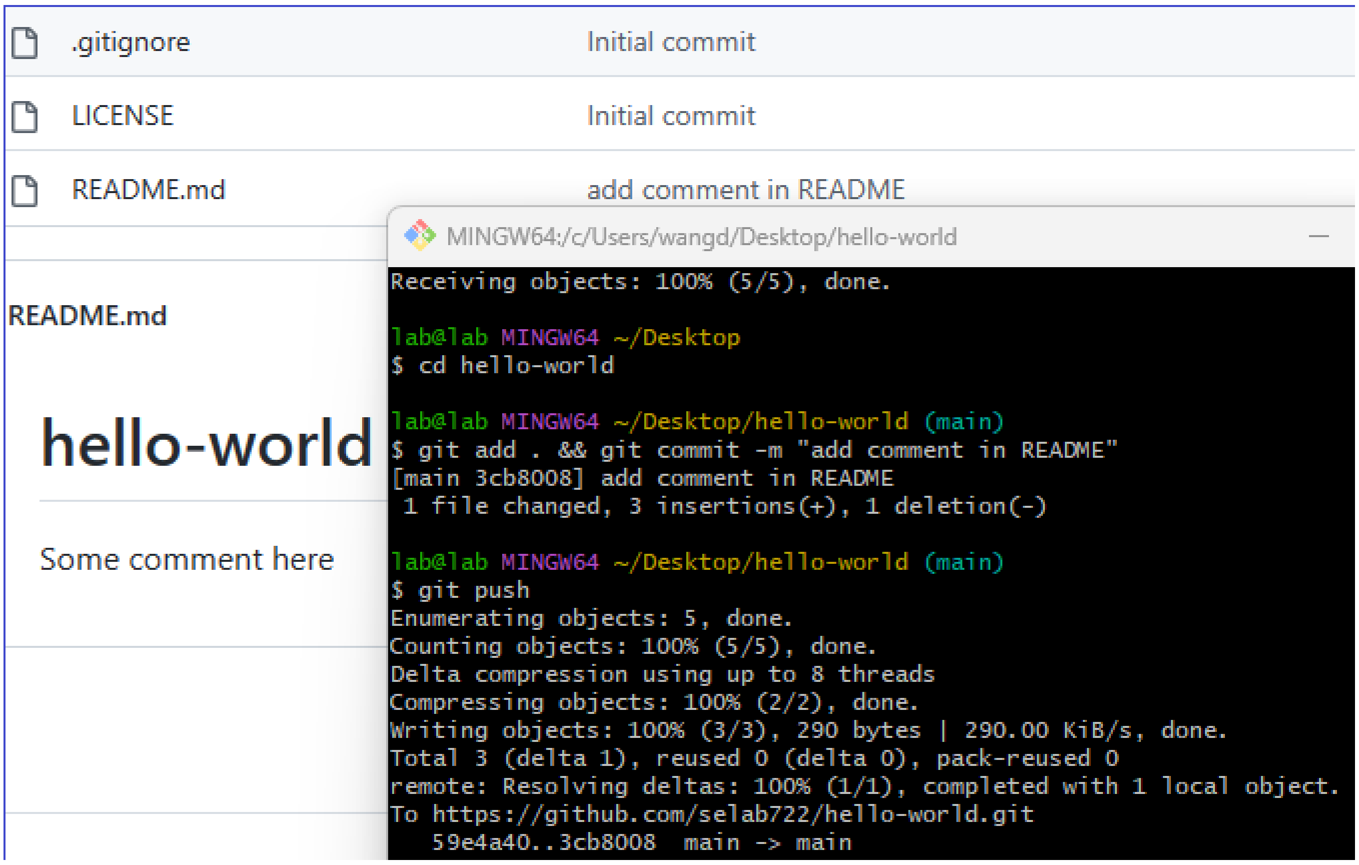
Use Git or checkout with SVN using the web URL.

Then run `git clone` locally to clone the repository to your local disk:



```
lab@lab MINGW64 ~/Desktop
$ git clone https://github.com/selab722/hello-world.git
Cloning into 'hello-world'...
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (4/4), done.
remote: Total 5 (delta 0), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (5/5), done.

lab@lab MINGW64 ~/Desktop
$ cd hello-world
```

You can now do any modification as a local project (remember to "cd" into the project directory). You can also use `git pull` to "pull" updates from the github repo to your local. You can use `git push` to "push" local updates to the github repo.



.gitignore	Initial commit
LICENSE	Initial commit
README.md	add comment in README

README.md

hello-world

Some comment here

```
Receiving objects: 100% (5/5), done.

lab@lab MINGW64 ~/Desktop
$ cd hello-world

lab@lab MINGW64 ~/Desktop/hello-world (main)
$ git add . && git commit -m "add comment in README"
[main 3cb8008] add comment in README
 1 file changed, 3 insertions(+), 1 deletion(-)

lab@lab MINGW64 ~/Desktop/hello-world (main)
$ git push
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 8 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 290 bytes | 290.00 KiB/s, done.
Total 3 (delta 1), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (1/1), completed with 1 local object.
To https://github.com/selab722/hello-world.git
   59e4a40..3cb8008  main -> main
```

Lab exercise

Click the invitation link:

https://classroom.github.com/a/bKn4YmXB

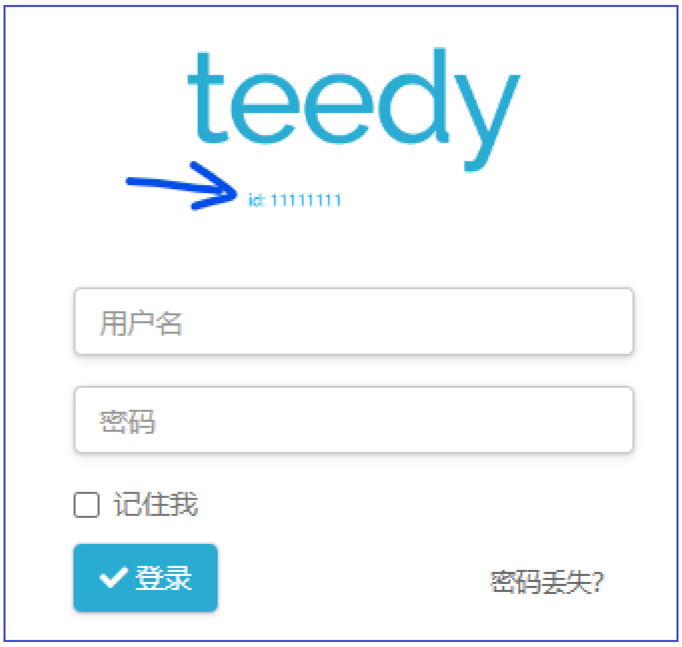
Accept it and the github classroom will automatically create a repository for you to work on as:

https://github.com/sustech-cs304/lab03-your-id (don't click this, it's not a real address).

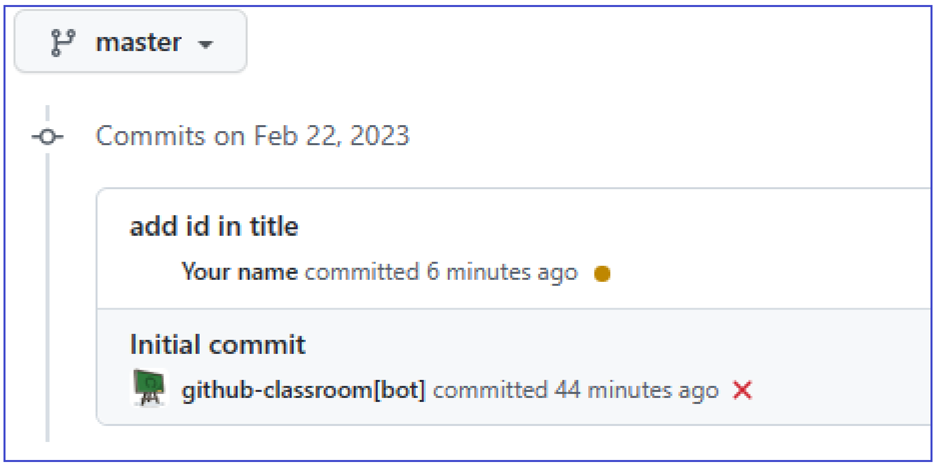
You need to do the following:

- Create a new branch named "b-yourid". Here "yourid" means your id. If your id is 11111111, then your branch is "b-11111111". Switch to the new branch.

- In this new branch, make a little modification to the software so that when the teedy is started, you can see your id under "teedy". Looks like follows:



- Commit your changes in this branch, then go back to the original branch, merge the branch "b-yourid". Make sure the merge is successful.
- Push your local changes to the github repository: https://github.com/sustech-cs304/lab03-your-id. Make sure the new branch "b-yourid" is also pushed to this remote repo. Refer to https://github.com/git-guides/git-push if you need to know how to do that.
- Show the changes you have made to your TA, like:


master

Commits on Feb 22, 2023

add id in title
Your name committed 6 minutes ago

Initial commit
github-classroom[bot] committed 44 minutes ago

References

- https://git-scm.com/docs/gittutorial
- https://git-scm.com/docs/user-manual