Basic Shell
&
Version Control - Git

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Basic shell

Basic Terminal Navigation

- ls : To get the list of all the files or folders
- ls -l: Optional flags are added to ls to modify default behavior, listing contents in extended form -l is used for “long” output
- ls -a: Lists of all files including the hidden files, add -a flag
- cd: Used to change the directory
- pwd: Show the present working directory

File and Directory Manipulation

- mkdir : Used to create a directory if not already exist
- cp : This command will copy the files and directories from the source path to the destination path
- mv : Used to move the files or directories
- rm : Used to remove files or directories
- touch : Used to create or update a file.

Displaying the file contents

- cat : It gives the output on the standard output
- more : It is a filter for paging through text one screenful at a time
- less : Similar to more command but it allows backward as well as forward movement
- head : Used to print the first N lines of a file. It accepts N as input and the default value of N is 10
- tail : Used to print the last N lines of a file. It accepts N as input and the default value of N is 10

Version Control - Git

Scenario 1

Scenario 1

一個月後...

Scenario 1

Project_1
Project_1_Final
Project_1_Final2
Project_1_New_Final
Project_1_Revised
Project_1_Small_Revised

為了避免下次遇到一樣的狀況，每次修改的版本都存下來好了

Scenario 2

再一個月後...

Scenario 3

Scenario 3

版本控制

- 版本控制（Version Control）
  - 維護工程藍圖的標準作法
  - 能追蹤工程藍圖從誕生一直到定案的過程
  - 軟體工程技巧，藉此能在軟體開發的過程中，確保由不同人所編輯的同一程式檔案都得到同步

版本控制－概述

- 透過文件控制（documentation control），能記錄任何工程專案內各個模組的改動歷程，並為每次改動編上序號
- 一種簡單的版本控制形式如下：賦予初版一個版本等級「A」。做了第一次改變後，版本等級改為「B」，以此類推。
- 版本控制能提供專案的設計者，將設計回復到之前的任一狀態，這特性在設計過程中碰到完全無法運作的情況時顯得特別重要

Git

- Version control system
- Trace code changelog
- Work together

Git – Three States

- Working Directory
  - state: modified (or unstaged)
- Staging Area
  - state: staged
- Repository
  - state: committed

Git hosting platforms

- Github
- Gitlab
- Bitbucket
- …

Github

- https://github.com/
- GitHub在2008年由GitHub公司開發上線，並在十年後被微軟以75億美元收購
- 截至2023年1月26日，已經有超過1億開發人員使用GitHub，是世界上最大的開源社群。
- 它不但是程式碼存放處，也是工程師們交流程式碼的主要社群。

Github

espaces
Marketplace
Explore
Overview
Repositories
Projects
Packages
Stars
Find a repository...
Type
Language
Sort
New
Signed in as
NetDBExp
Set status
Your profile
Your repositories
Your projects

Github - Create a new repository

Github - Create a new repository

Git config

- 查看設定
  - git config -l
- 設定基本資訊
  - git config --global user.name "Your Name"
  - git config --global user.email "Your Email"
- 設定預設的branch名稱
  - git config --global init.defaultBranch main

```
hint: Using 'master' as the name for the initial branch. This default branch name
hint: is subject to change. To configure the initial branch name to use in all
hint: of your new repositories, which will suppress this warning, call:
hint:
hint:   git config --global init.defaultBranch <name>
hint:
hint: Names commonly chosen instead of 'master' are 'main', 'trunk' and
hint: 'development'. The just-created branch can be renamed via this command:
hint:
hint:   git branch -m <name>
```

```
bhchen@2023pd2:/home/bhchen/course$ git config -l
bhchen@2023pd2:/home/bhchen/course$ git config --global user.name "bhchen"
bhchen@2023pd2:/home/bhchen/course$ git config --global user.email "ncku.pd2.ta@netdb.csie.ncku.edu.tw"
bhchen@2023pd2:/home/bhchen/course$ git config -l
user.name=bhchen
user.email=ncku.pd2.ta@netdb.csie.ncku.edu.tw
```

Create a new repository on the command line

- echo "# course" >> README.md
- git init
- git add README.md
- git commit -m "first commit"
- git branch -M main
- git remote add origin {remote_url}
- git push -u origin main

```
bhchen@2023pd2:/home/bhchen/course$ echo "# course" >> README.md
bhchen@2023pd2:/home/bhchen/course$ git init
Initialized empty Git repository in /home/bhchen/course/.git/
bhchen@2023pd2:/home/bhchen/course$ git status
On branch main

No commits yet

Untracked files:
  (use "git add <file>..." to include in what will be committed)
        README.md

nothing added to commit but untracked files present (use "git add" to track)
bhchen@2023pd2:/home/bhchen/course$ git add README.md
bhchen@2023pd2:/home/bhchen/course$ git status
On branch main

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
        new file:   README.md

bhchen@2023pd2:/home/bhchen/course$ git commit -m "first commit"
[main (root-commit) 0403a75] first commit
 1 file changed, 1 insertion(+)
 create mode 100644 README.md
bhchen@2023pd2:/home/bhchen/course$ git status
On branch main
nothing to commit, working tree clean
bhchen@2023pd2:/home/bhchen/course$ git remote add origin https://github.com/NetDBExp/course.git
bhchen@2023pd2:/home/bhchen/course$ git push -u origin main
Username for 'https://github.com': NetDBExp
Password for 'https://NetDBExp@github.com':
Enumerating objects: 3, done.
Counting objects: 100% (3/3), done.
Writing objects: 100% (3/3), 226 bytes | 226.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/NetDBExp/course.git
 * [new branch]      main -> main
Branch 'main' set up to track remote branch 'main' from 'origin'.
```

Create a new repository on the command line

Ignoring Files

- .gitignore

```
# ignore all .a files
*.a

# but do track lib.a, even though you're ignoring .a files above
!lib.a

# only ignore the TODO file in the current directory, not subdir/TODO
/TODO

# ignore all files in any directory named build
build/

# ignore doc/notes.txt, but not doc/server/arch.txt
doc/*.txt

# ignore all .pdf files in the doc/ directory and any of its subdirectories
doc/**/*.pdf
```

```
bhchen@2023pd2:/home/bhchen/course$ echo "test" > test.a
bhchen@2023pd2:/home/bhchen/course$ git status
On branch main
Your branch is up to date with 'origin/main'.

Untracked files:
  (use "git add <file>..." to include in what will be committed)
        test.a

nothing added to commit but untracked files present (use "git add" to track)
bhchen@2023pd2:/home/bhchen/course$ echo "*.a" >> .gitignore
bhchen@2023pd2:/home/bhchen/course$ git status
On branch main
Your branch is up to date with 'origin/main'.

Untracked files:
  (use "git add <file>..." to include in what will be committed)
        .gitignore

nothing added to commit but untracked files present (use "git add" to track)
```

Viewing Your Staged and Unstaged Changes

- git diff by itself doesn't show all changes made since your last commit — only changes that are still unstaged

```
bhchen@2023pd2:/home/bhchen/course$ echo "123" >> README.md
bhchen@2023pd2:/home/bhchen/course$ git diff
diff --git a/README.md b/README.md
index 31e1755..5b54231 100644
--- a/README.md
+++ b/README.md
@@ -1 +1,2 @@
 # course
+123
bhchen@2023pd2:/home/bhchen/course$ git add -A
bhchen@2023pd2:/home/bhchen/course$ git diff
bhchen@2023pd2:/home/bhchen/course$ echo "456" >> README.md
bhchen@2023pd2:/home/bhchen/course$ git diff
diff --git a/README.md b/README.md
index 5b54231..5c1a2c7 100644
--- a/README.md
+++ b/README.md
@@ -1,2 +1,3 @@
 # course
 123
+456
```

Removing Files

```
bhchen@2023pd2:/home/bhchen/course$ ls
README.md  test.a  test.b
bhchen@2023pd2:/home/bhchen/course$ rm test.b
bhchen@2023pd2:/home/bhchen/course$ git status
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

Changes not staged for commit:
  (use "git add/rm <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        deleted:    test.b

no changes added to commit (use "git add" and/or "git commit -a")
bhchen@2023pd2:/home/bhchen/course$ git rm test.b
rm 'test.b'
bhchen@2023pd2:/home/bhchen/course$ git status
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        deleted:    test.b
```

Viewing the Commit History

```
bhchen@2023pd2:/home/bhchen/course$ git log
commit b85ed51cfa876ca7f6bd0a4ec6f74845cfcb0615 (HEAD -> main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:30:01 2023 +0000

    rm test.c

commit c878482e47cec98f24987ac08e0de5c4fdeddbb6
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:27:46 2023 +0000

    add test.c

commit 7b3b82a6e49dad56ad5fa954c0756394c1a85f10
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:18:18 2023 +0000

    add test.b

commit 0403a75ecd3f4b73b4e058a046d62aeb5dfa5e6f (origin/main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 16:27:49 2023 +0000

    first commit
```

Undoing Things

- Unstage the file
  - git restore --staged <file>
- Unmodifying a modified file
  - git checkout -- <file>

```
bhchen@2023pd2:/home/bhchen/course$ git status
On branch main
Your branch is ahead of 'origin/main' by 3 commits.
  (use "git push" to publish your local commits)

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   test.b
        new file:   test.d

bhchen@2023pd2:/home/bhchen/course$ git restore --staged test.b
bhchen@2023pd2:/home/bhchen/course$ git status
On branch main
Your branch is ahead of 'origin/main' by 3 commits.
  (use "git push" to publish your local commits)

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        new file:   test.d

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   test.b

bhchen@2023pd2:/home/bhchen/course$ git diff
diff --git a/test.b b/test.b
index 9daeafb..357bfd8 100644
--- a/test.b
+++ b/test.b
@@ -1 +1,2 @@
 test
+123
bhchen@2023pd2:/home/bhchen/course$ cat test.b
test
123
bhchen@2023pd2:/home/bhchen/course$ git checkout -- test.b
bhchen@2023pd2:/home/bhchen/course$ cat test.b
test
bhchen@2023pd2:/home/bhchen/course$
```

Reset Demystified - mixed

```
bhchen@2023pd2:/home/bhchen/course$ git log
commit 0cc91ee8f738174e7306d19242c14e7eb4088434 (HEAD -> main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 18:13:38 2023 +0000

    add test.d

commit b85ed51cfa876ca7f6bd0a4ec6f74845cfcb0615
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:30:01 2023 +0000

    rm test.c

commit c878482e47cec98f24987ac08e0de5c4fdeddbb6
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:27:46 2023 +0000

    add test.c

commit 7b3b82a6e49dad56ad5fa954c0756394c1a85f10
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:18:18 2023 +0000

    add test.b

commit 0403a75ecd3f4b73b4e058a046d62aeb5dfa5e6f (origin/main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 16:27:49 2023 +0000

    first commit
```

```
bhchen@2023pd2:/home/bhchen/course$ git log
commit b85ed51cfa876ca7f6bd0a4ec6f74845cfcb0615 (HEAD -> main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:30:01 2023 +0000

    rm test.c

commit c878482e47cec98f24987ac08e0de5c4fdeddbb6
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:27:46 2023 +0000

    add test.c

commit 7b3b82a6e49dad56ad5fa954c0756394c1a85f10
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:18:18 2023 +0000

    add test.b

commit 0403a75ecd3f4b73b4e058a046d62aeb5dfa5e6f (origin/main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 16:27:49 2023 +0000

    first commit
bhchen@2023pd2:/home/bhchen/course$ git status
On branch main
Your branch is ahead of 'origin/main' by 3 commits.
  (use "git push" to publish your local commits)

Untracked files:
  (use "git add <file>..." to include in what will be committed)
        test.d

nothing added to commit but untracked files present (use "git add" to track)
```

Reset Demystified - hard

```
bhchen@2023pd2:/home/bhchen/course$ git log
commit 0cc91ee8f738174e7306d19242c14e7eb4088434 (HEAD -> main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 18:13:38 2023 +0000

    add test.d

commit b85ed51cfa876ca7f6bd0a4ec6f74845cfcb0615
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:30:01 2023 +0000

    rm test.c

commit c878482e47cec98f24987ac08e0de5c4fdeddbb6
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:27:46 2023 +0000

    add test.c

commit 7b3b82a6e49dad56ad5fa954c0756394c1a85f10
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:18:18 2023 +0000

    add test.b

commit 0403a75ecd3f4b73b4e058a046d62aeb5dfa5e6f (origin/main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 16:27:49 2023 +0000

    first commit
```

```
bhchen@2023pd2:/home/bhchen/course$ ls
README.md  test.a  test.b  test.d
bhchen@2023pd2:/home/bhchen/course$ git reset --hard HEAD~
HEAD is now at b85ed51 rm test.c
bhchen@2023pd2:/home/bhchen/course$ git log
commit b85ed51cfa876ca7f6bd0a4ec6f74845cfcb0615 (HEAD -> main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:30:01 2023 +0000

    rm test.c

commit c878482e47cec98f24987ac08e0de5c4fdeddbb6
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:27:46 2023 +0000

    add test.c

commit 7b3b82a6e49dad56ad5fa954c0756394c1a85f10
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 17:18:18 2023 +0000

    add test.b

commit 0403a75ecd3f4b73b4e058a046d62aeb5dfa5e6f (origin/main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 16:27:49 2023 +0000

    first commit
bhchen@2023pd2:/home/bhchen/course$ ls
README.md  test.a  test.b
```

Undo git reset --hard

- Reference logs
  - git reflog

```
bhchen@2023pd2:/home/bhchen/course$ git reflog
b85ed51 (HEAD -> main) HEAD@{0}: reset: moving to HEAD~
8a9b37c HEAD@{1}: commit: add test.d
b85ed51 (HEAD -> main) HEAD@{2}: reset: moving to HEAD~
a1aeba9 HEAD@{3}: commit: add test.d
b85ed51 (HEAD -> main) HEAD@{4}: reset: moving to HEAD~
0cc91ee HEAD@{5}: commit: add test.d
b85ed51 (HEAD -> main) HEAD@{6}: commit: rm test.c
c878482 HEAD@{7}: commit: add test.c
7b3b82a HEAD@{8}: commit: add test.b
0403a75 (origin/main) HEAD@{9}: commit (initial): first commit
bhchen@2023pd2:/home/bhchen/course$ ls
README.md  test.a  test.b
bhchen@2023pd2:/home/bhchen/course$ git reset a1aeba9
Unstaged changes after reset:
D       test.d
bhchen@2023pd2:/home/bhchen/course$ git reset a1aeba9 --hard
HEAD is now at a1aeba9 add test.d
```

Basic Branching

```
bhchen@2023pd2:/home/bhchen/course$ git branch b1
bhchen@2023pd2:/home/bhchen/course$ git checkout b1
Switched to branch 'b1'
bhchen@2023pd2:/home/bhchen/course$ git branch
* b1
  main
```

```
bhchen@2023pd2:/home/bhchen/course$ git branch
* b1
  main
bhchen@2023pd2:/home/bhchen/course$ cat test.b
test
bhchen@2023pd2:/home/bhchen/course$ echo "b1_add" >> test.b
bhchen@2023pd2:/home/bhchen/course$ git diff
diff --git a/test.b b/test.b
index 9daeafb..48a5a1d 100644
--- a/test.b
+++ b/test.b
@@ -1 +1,2 @@
 test
+b1_add
bhchen@2023pd2:/home/bhchen/course$ git add .
bhchen@2023pd2:/home/bhchen/course$ git commit -m "add text from b1"
[b1 a9d30db] add text from b1
 1 file changed, 1 insertion(+)
bhchen@2023pd2:/home/bhchen/course$ git log
commit a9d30dbfaf7cdf96c30b92061f9f397e907558eb (HEAD -> b1)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 18:46:04 2023 +0000

    add text from b1

commit a1aeba929b91f9b02a85c7a458c85de927426a97 (main)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 18:19:22 2023 +0000

    add test.d
```

Basic Merging

```
bhchen@2023pd2:/home/bhchen/course$ git branch
* b1
  main
bhchen@2023pd2:/home/bhchen/course$ git checkout main
Switched to branch 'main'
Your branch is ahead of 'origin/main' by 4 commits.
  (use "git push" to publish your local commits)
bhchen@2023pd2:/home/bhchen/course$ cat test.b
test
bhchen@2023pd2:/home/bhchen/course$ git merge b1
Updating a1aeba9..a9d30db
Fast-forward
 test.b | 1 +
 1 file changed, 1 insertion(+)
bhchen@2023pd2:/home/bhchen/course$ cat test.b
test
b1_add
bhchen@2023pd2:/home/bhchen/course$ git log
commit a9d30dbfaf7cdf96c30b92061f9f397e907558eb (HEAD -> main, b1)
Author: bhchen <ncku.pd2.ta@netdb.csie.ncku.edu.tw>
Date:   Mon Feb 20 18:46:04 2023 +0000

    add text from b1
```

Reference

- https://www.geeksforgeeks.org/basic-shell-commands-in-linux/
- https://en.wikipedia.org/wiki/Version_control
- https://git-scm.com/book/en/v2