분산 버전 관리 도구: Git

Basic

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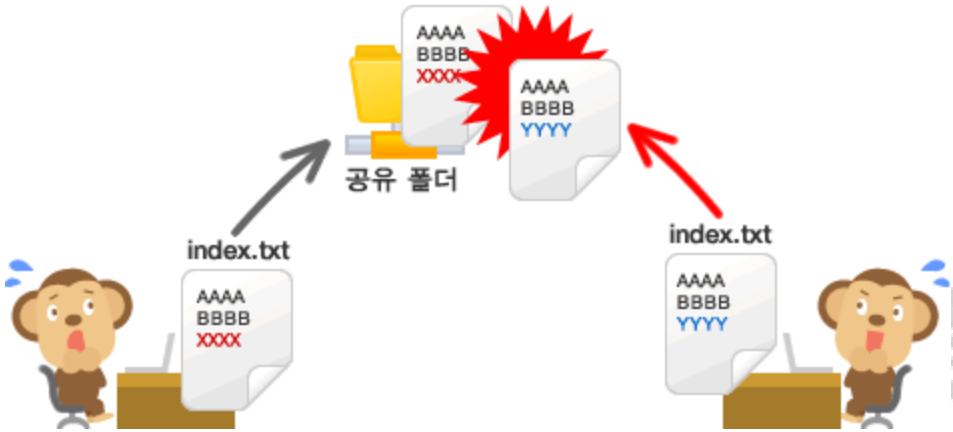
학습 내용

- Git
  - 실습 1
- GitHub
  - 실습 2

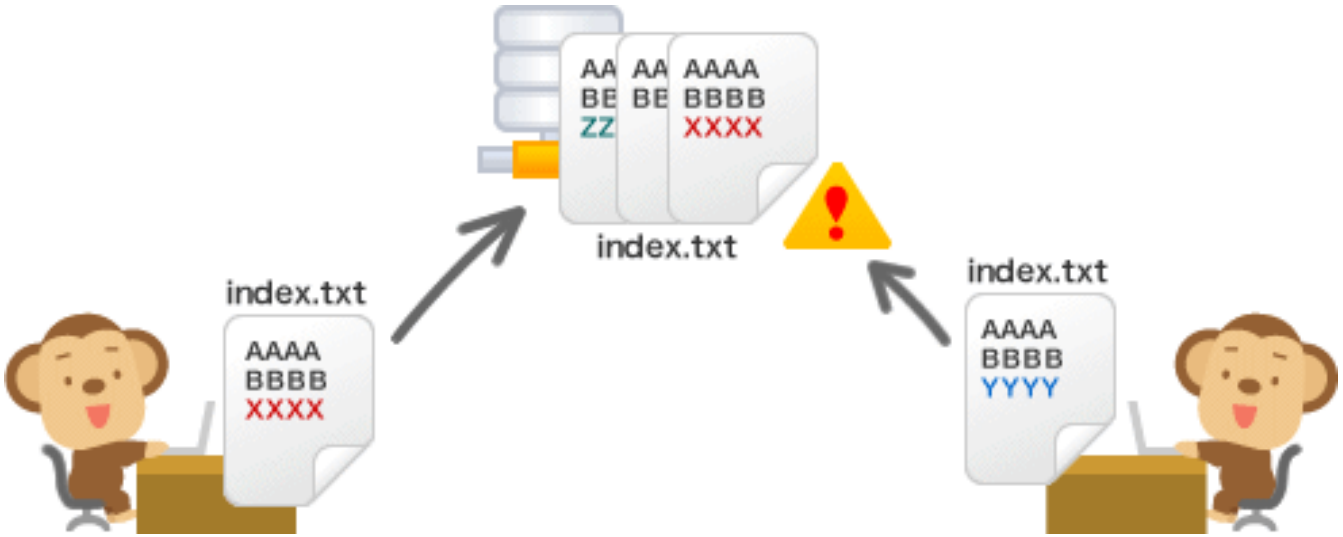
Git

버전 관리



* 출처: https/backlogtool.com/git-guide/kr/intro/intro1_3.html

버전 관리


AA
BB
ZZ
AA
BB
AAAA
BBBB
XXXX
index.txt
index.txt
AAAA
BBBB
XXXX
index.txt
AAAA
BBBB
YYYY

버전 관리 시스템 (Version Control System)

- 동일한 정보에 대한 여러 버전을 관리하는 것
  - 파일의 변화를 시간에 따라 기록하여 과거 특정 시점의 버전을 다시 불러올 수 있는 시스템

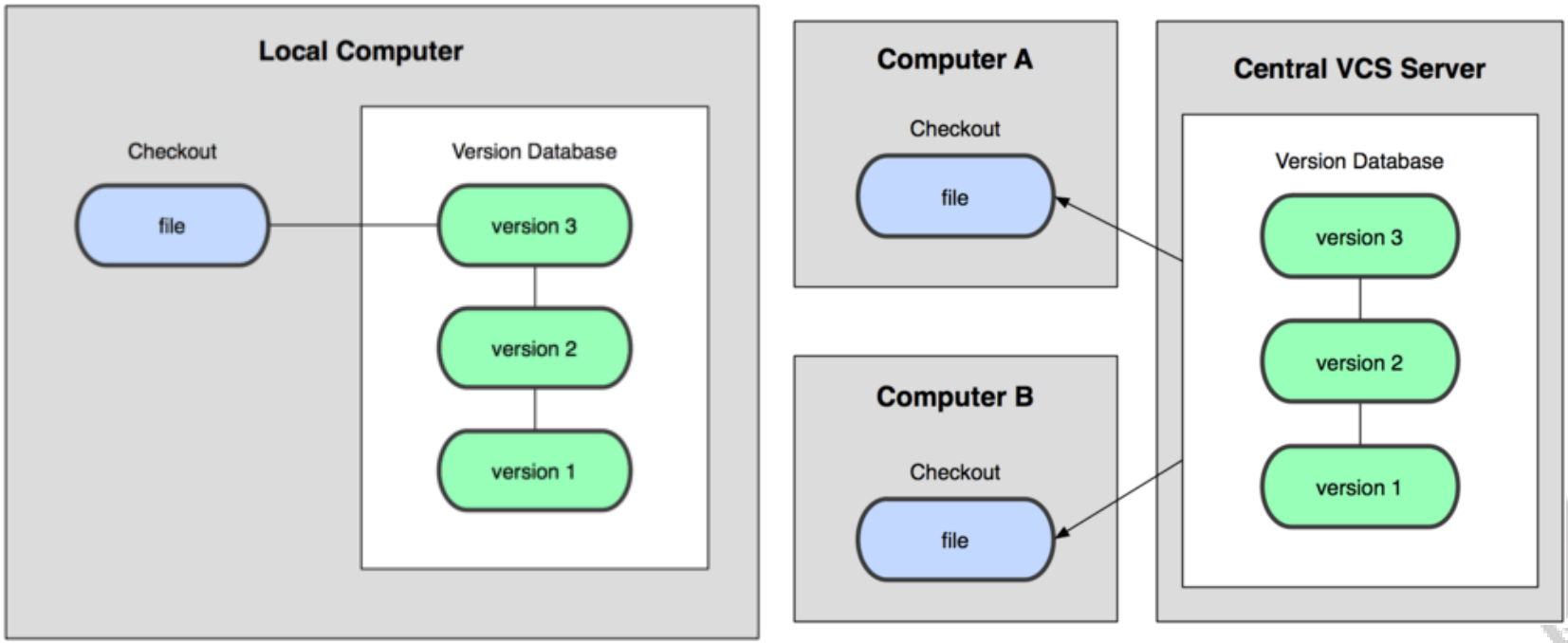
- 왜 사용하는가?
  - 백업
    - 잘못되었을 때 복구를 돕기 위하여
  - 버전 관리
    - 프로젝트 진행 중 과거의 어떤 시점으로 돌아갈 수 있게 하기 위하여
    - 소스 코드의 변경 사항을 추적하기 위하여
    - 코드의 특정 부분이 왜 그렇게 쓰여 졌는지 의미를 추적하기 위하여

버전 관리 시스템 (Version Control System)

- 왜 사용하는가? (cont'd)
  - 협업 도구
    - 여러 사람이 같은 프로젝트에 참여할 경우, 각자가 수정한 부분을 팀원 전체가 동기화하는 과정을 자동화하기 위하여
    - 소스 코드에서 누가 수정했는지 추적하기 위하여
    - 대규모 수정 작업을 더욱 안전하게 진행하기 위하여
  - 개발 편의성
    - 가지내기(Branch)로 프로젝트에 영향을 최소화 하면서 새로운 부분을 개발하기 위하여
    - 접붙이기(Merge)로 검증이 끝난 후 새로이 개발된 부분을 본류(trunk)에 합치기 위하여
  - *"많은 오픈 소스 프로젝트에서 어떠한 형태로든 버전 관리를 사용하고 있으므로"*

로컬 vs 중앙집중형 VCS

- 로컬: 1인 개발 시 사용, 팀 단위 사용 시 부적합
- 중앙집중형: 간단한 구조, single point of failure (SPOF)



버전 관리 시스템 (Version Control System)

- 유사 시스템
  - 소스 코드 관리(Source Code Management, SCM)
  - SW 버전 관리(Software Version Management)
  - SW 형상 관리(Software Configuration Management)
  - 리비전 관리 시스템 (Revision Control System)

- 널리 쓰이는 SW
  - SVN (Subversion)
  - Mercurial
  - Git

버전 관리 시스템 (Version Control System)

로컬 전용	무료 / 오픈 소스	SCCS (1972), RCS (1982)
	유료 / 상용	PVCS (1985), QVCS (1991)
클라이언트/서버	무료 / 오픈 소스	CVS (1986, 1990 in C), CVSNT (1998), QVCS Enterprise (1998), Subversion (2000)
	유료 / 상용	Software Change Manager (1970s), Panvalet (1970s), Endevor (1980s), DSEE (1984), Synergy (1990), ClearCase (1992), CMVC (1994), Visual SourceSafe (1994), Perforce (1995), StarTeam (1995), Integrity (2001), Surround SCM (2002), AccuRev SCM (2002), SourceAnywhere (2003), SourceGear Vault (2003), Team Foundation Server (2005), Rational Team Concert (2008)
분산	무료 / 오픈 소스	GNU arch (2001), Darcs (2002), DCVS (2002), ArX (2003), Monotone (2003), SVK (2003), Codeville (2005), Bazaar (2005), Git (2005), Mercurial (2005), Fossil (2007), Veracity (2010)
	유료 / 상용	TeamWare (1990s?), Code Co-op (1997), BitKeeper (1998), Plastic SCM (2006)

* 출처: http://blog.gaerae.com/2015/03/comparison-of-revision-control-software.html

Git: the stupid content tracker

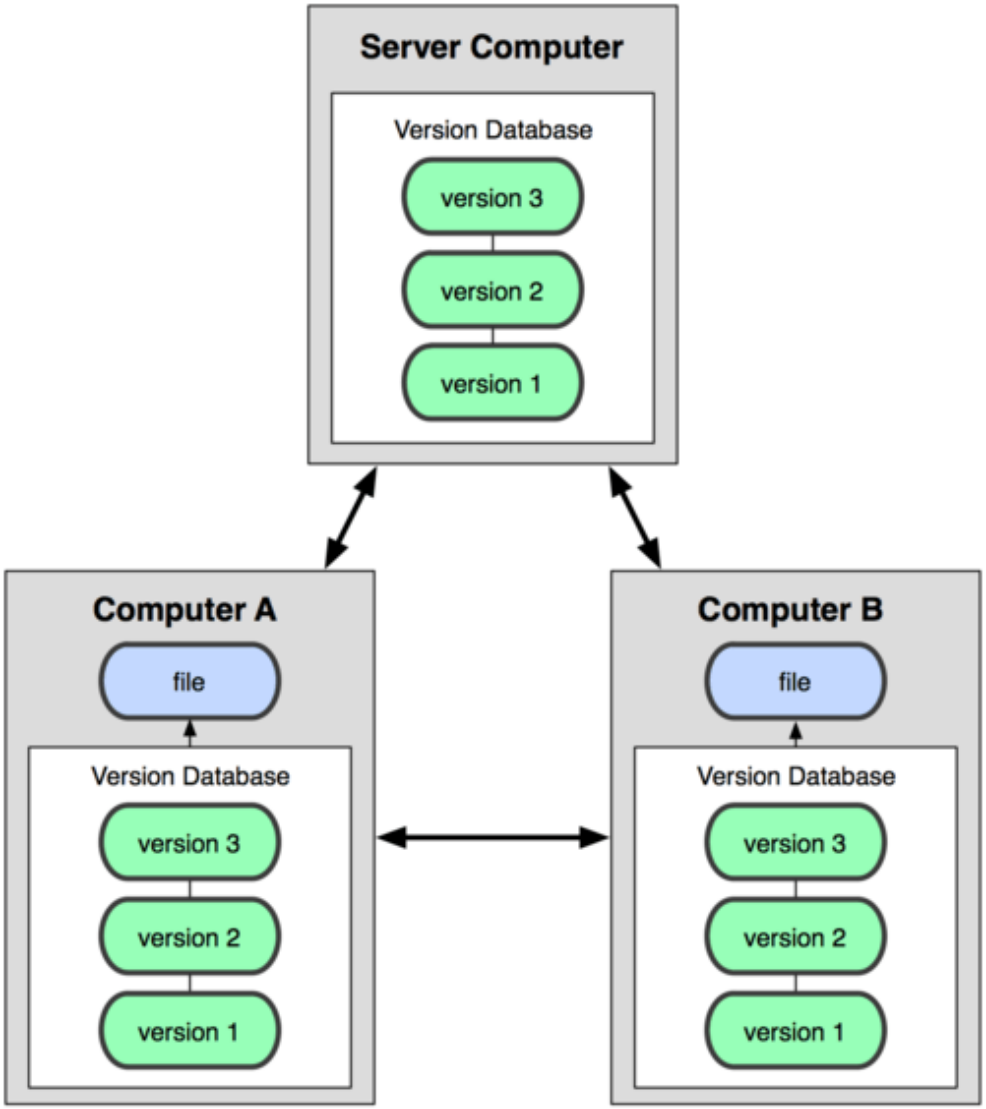
- 분산 버전관리 시스템
  - Distributed Version Control System (DVCS)
  - 여러 사람이 협업하는 환경에서 문서변경사항을 관리하는 시스템
- 이름
  - 영국 속어로 바보
  - Global Information Tracker?
- 특징
  - Free and Open source
  - Easy to learn
  - Tiny footprint
  - Lighting fast performance

git[1]

1.(영·속어) 쓸모없는 놈 2.바보 자식

미국 [git] 영국 [git]

Git: DVCS

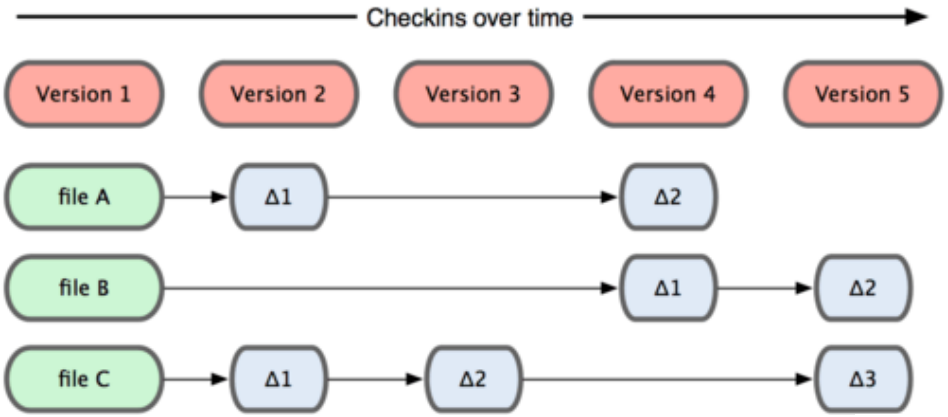

Server Computer
Version Database
version 3
version 2
version 1
Computer A
file
Version Database
version 3
version 2
version 1
Computer B
file
Version Database
version 3
version 2
version 1

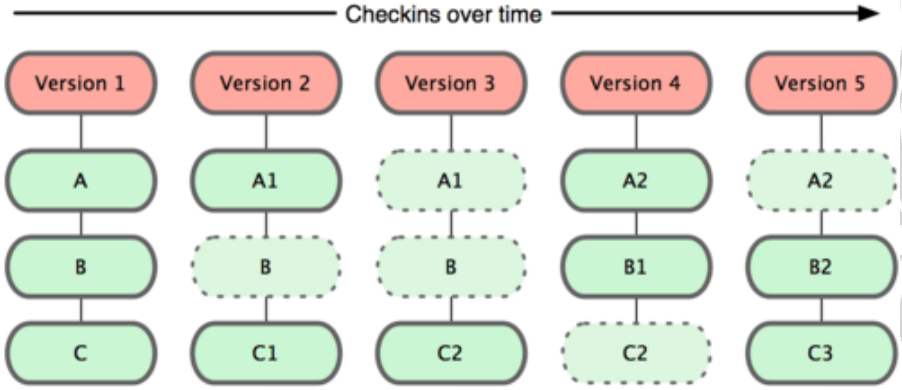
Git: brief history

- 2005년 리눅스 개발 커뮤니티에 의해 개발
- 기존 방식
  - ~2002: 단순 압축 (스냅샷)과 패치를 통해 버전 관리
  - ~2005: BitKeeper 사용. 유료 전환되며 Git 개발
- 설계 목표 (vs. BitKeeper)
  - 빠른 속도
  - 단순한 구조
  - 비선형적인 개발 (수천 개의 동시 다발적인 브랜치)
  - 완벽한 분산
  - 리눅스 커널 같은 대형 프로젝트에도 유용할 것 (속도나 데이터 크기 면)

Git 특징 1

- 단순성: 변화된 부분만을 기록하는 것이 아니라, 전체를 버전 별로 보존
  - 델타 방식 vs. 스냅샷 방식
  - Git은 스냅샷 방식으로, 언제나 데이터를 추가해나가는 방식





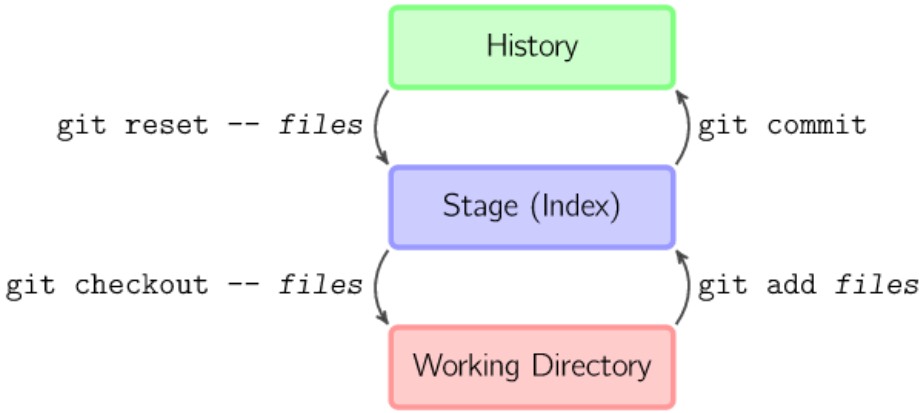
Git 특징 2

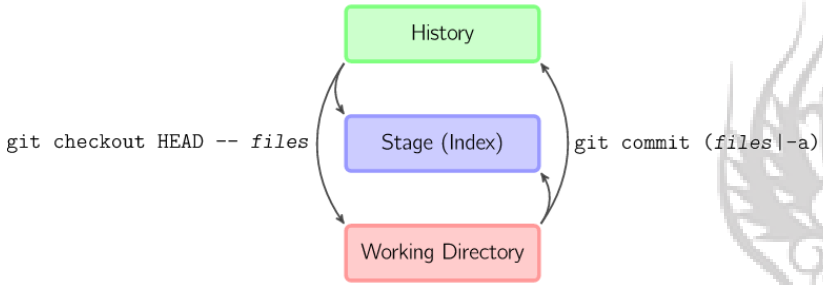
- 빠른 속도: 로컬에서 명령 실행
  - 분산된 형태로 관리되기 때문에 가능함

- 무결성: 변화된 파일에 대한 체크섬 관리
  - 파일, 디렉토리에 대한 SHA-1 Checksum을 이용해 분산 구조에서 무결성을 보장함
  - Git은 모든 데이터를 checksum hash 형태로 관리함

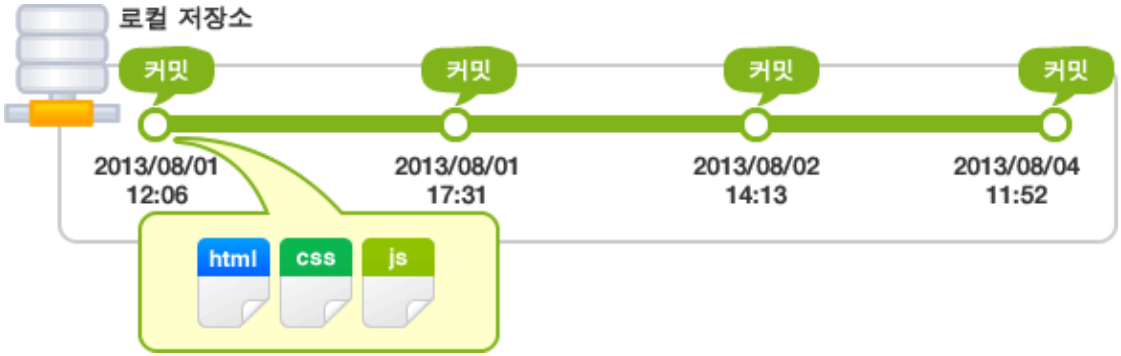
Git의 3가지 영역 (혹은 상태)

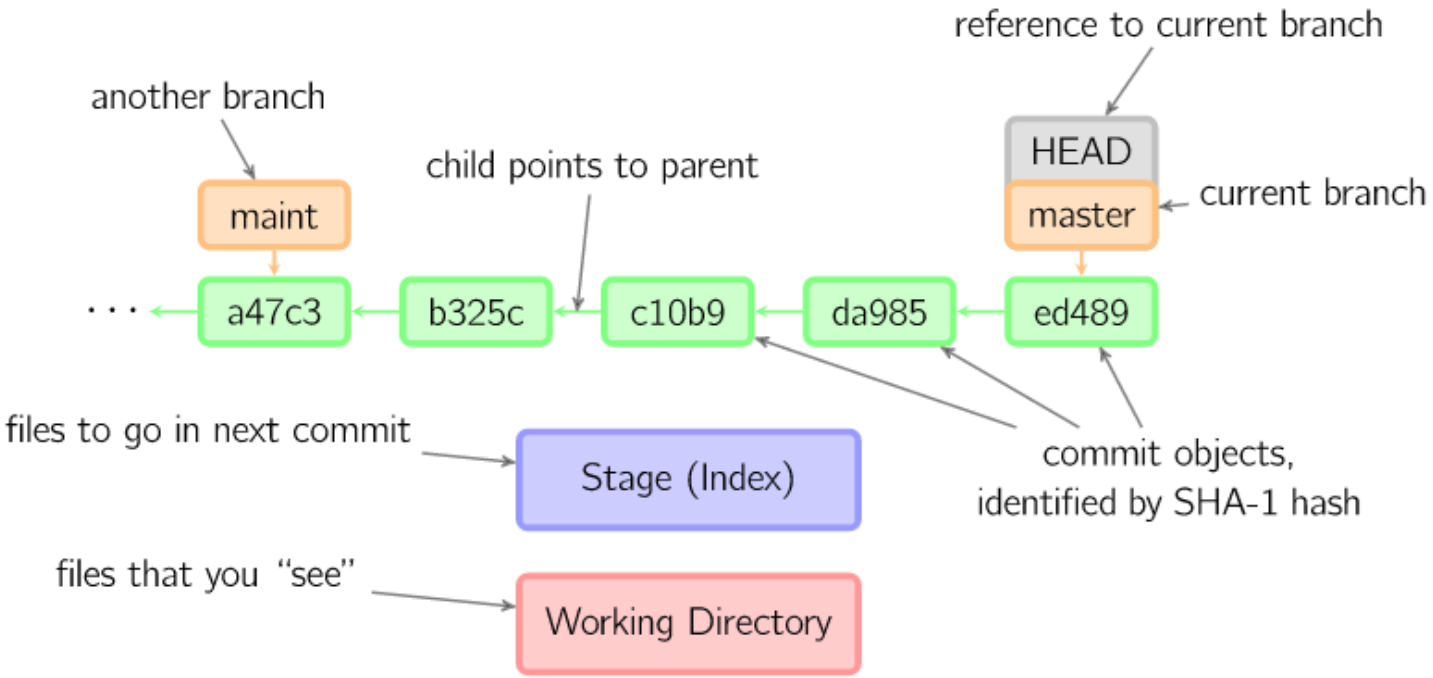
- 작업 폴더(Working Directory)
  - 사용자가 변경하는 실제 파일이 들어가는 폴더
- 스테이지(Stage, Index)
  - 변경사항을 관리할 파일들의 리스트
  - 작업 폴더 중에서 커밋할 파일만을 모아둘 수 있음
- 변경이력(History, Git directory, repository)
  - 커밋(Commit)이라 불리는 변경사항 묶음과 커밋들의 연결관계





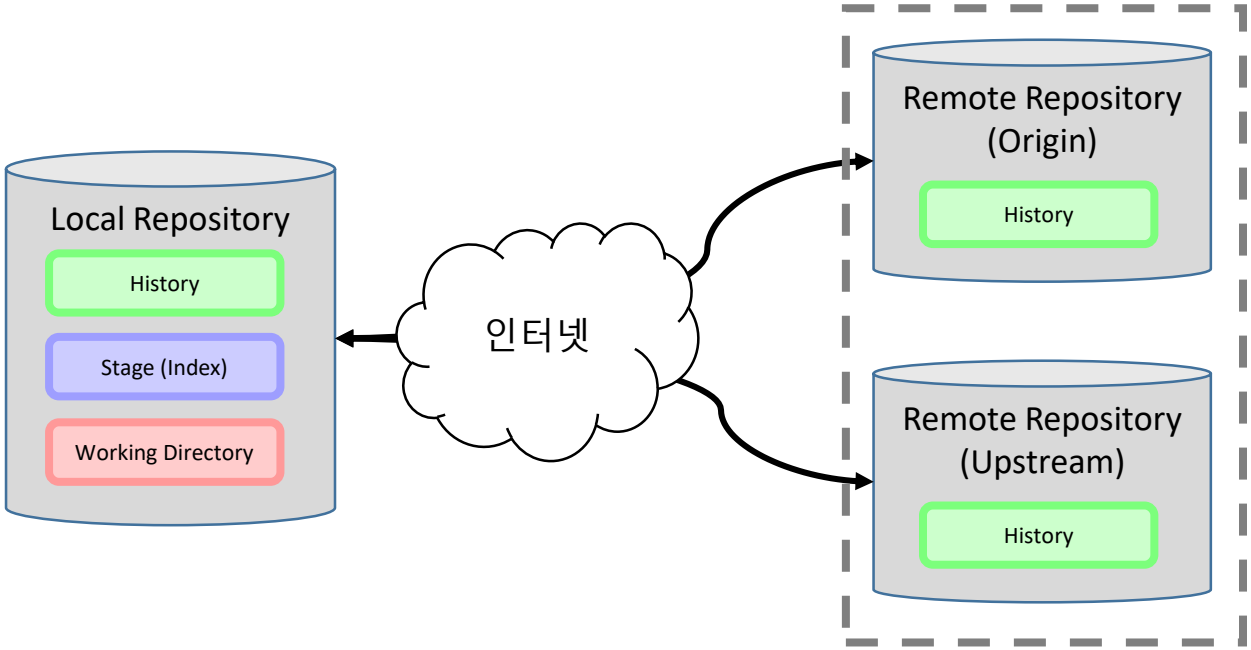
일반적인 git의 동작 상태





로컬저장소와 원격저장소

- 협업을 위해서는 원격저장소가 필수적
- 로컬저장소와 원격저장소 간에 이력을 주고받을 수 있음
- 원격저장소가 여러 개 일 수 있음



많이 사용되는 원격 저장소
- GitHub
- BitBucket
- GitLab

로컬 – 원격 저장소 간의 이동

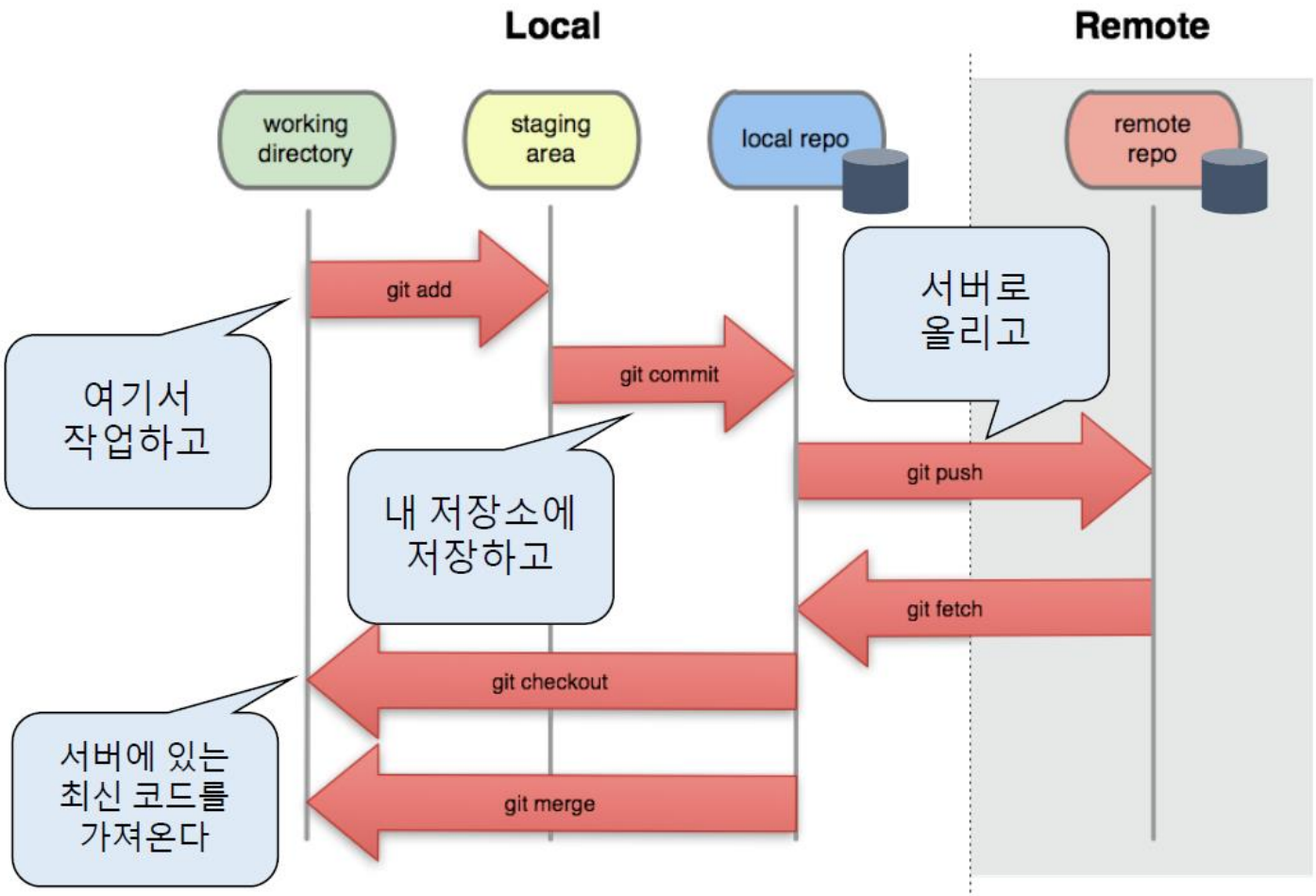


그림 출처 : http://pismute.github.io/whygitisbetter/#everything-is-local

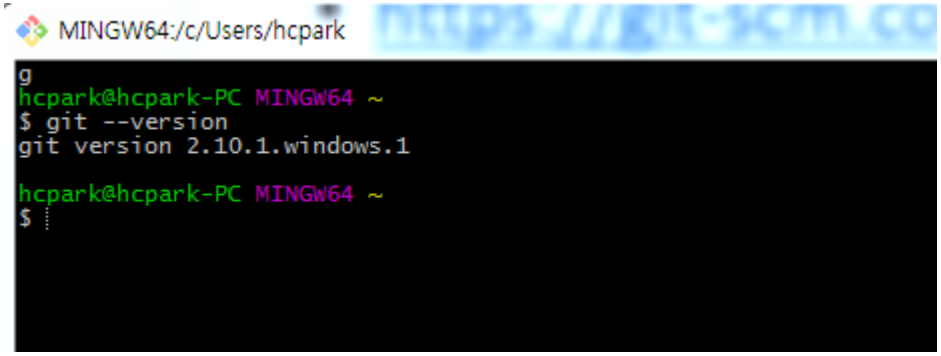
실습 #1

Git 설치 및 시작

Git 설치

- https://git-scm.com/

- 설치가 끝나면, 시작 메뉴 > 모든 프로그램 > Git > Git Bash를 실행



Git 저장소 만들기

- $ mkdir tutorial
- $ cd tutorial
- $ git init
  - 결과: Initialized empty Git repository in c:\Users/yourname/Desktop/tutorial/.git/

- 로컬 저장소 완성
  - ls
  - ls –al

Git 설정

- 사용자명 및 e-mail 설정 (gmail 이용)
  - $ git config --global user.name " <사용자명> "
  - $ git config --global user.email " <메일 주소>“
- 색상 설정 (자동)
  - $ git config --global color.ui auto

Your first COMMIT

- 메모장 등을 이용해 test.c 작성, tutorial 폴더에 저장
  - Notepad test.c
  - vi 사용 가능
- $ git status

```
hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ ls
test.c

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git status
On branch master

Initial commit

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

        test.c

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

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$
```

Your first COMMIT

- $ git add test.c

```
hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git add test.c

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git status
On branch master

Initial commit

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

        new file:   test.c


hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$
```

- $ git commit -m “your comment”

```
hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git commit -m "my first commit"
[master (root-commit) d7a71a5] my first commit
 1 file changed, 7 insertions(+)
 create mode 100644 test.c

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git status
On branch master
nothing to commit, working tree clean

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$
```

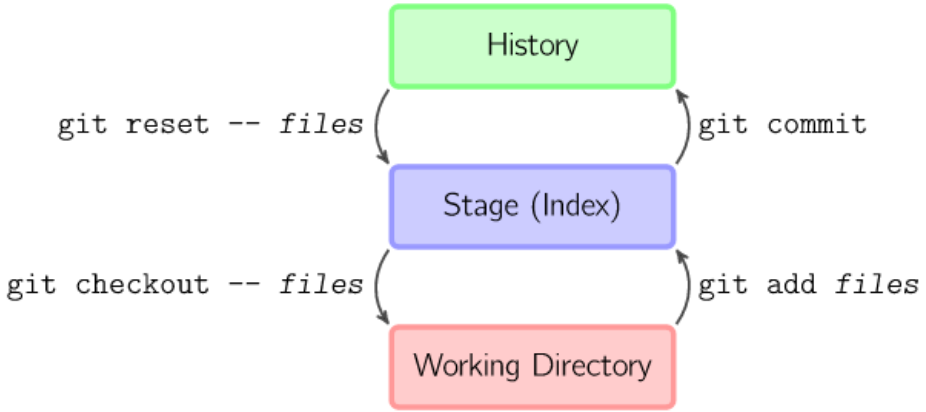
저장소 이력 확인

- $ git log

```
$ git log
commit d7a71a5edfb5e0e2fea75032f6bad8ce374b886f
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 16:36:34 2017 +0900

    my first commit

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$
```

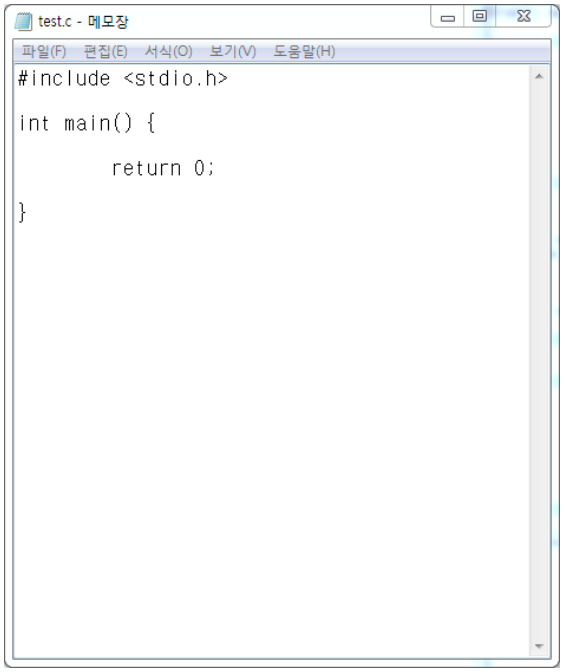
새로운 commit 작성하기

```
hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ notepad test.c

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git status
On branch master
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        modified:   test.c

no changes added to commit (use "git add" and/or "git commit -a")

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git commit -m "second commit"
On branch master
Changes not staged for commit:
        modified:   test.c

no changes added to commit

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git add test.c

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git commit -m "second commit"
[master d9917de] second commit
 1 file changed, 1 insertion(+)

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git log
commit d9917de88f98a69a9cd5c557f3da0a8de1cb8b23
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 16:39:40 2017 +0900

    second commit

commit d7a71a5edfb5e0e2fea75032f6bad8ce374b886f
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 16:36:34 2017 +0900

    my first commit

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$
```

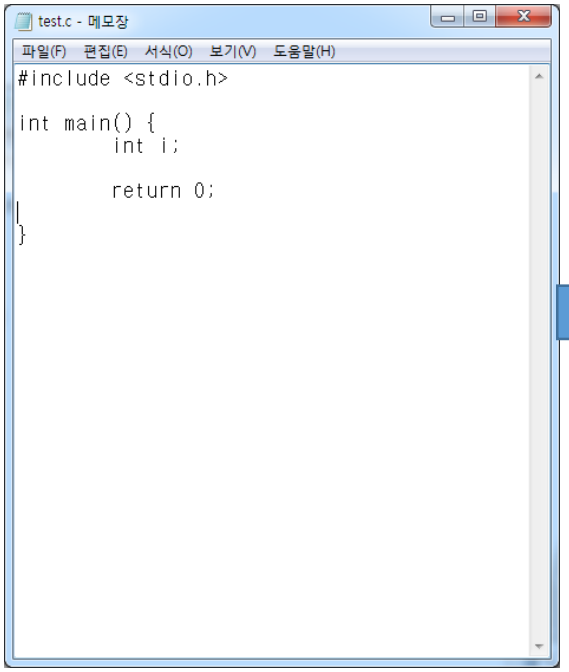


파일 되돌리기 1. working의 변화

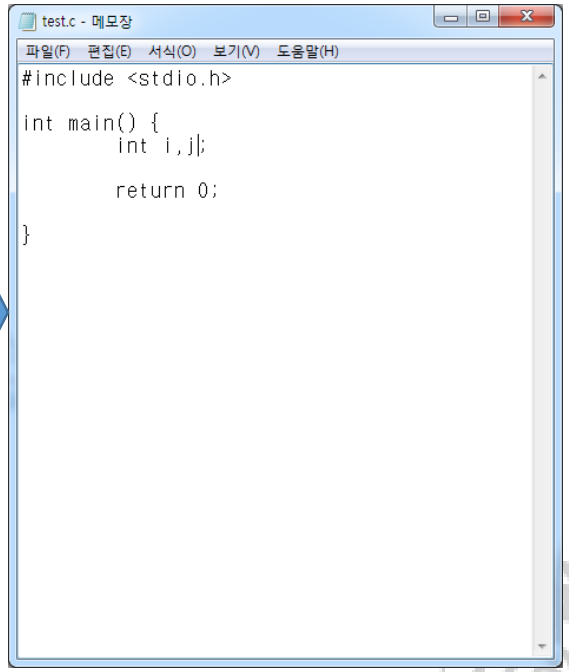
First commit



Second commit

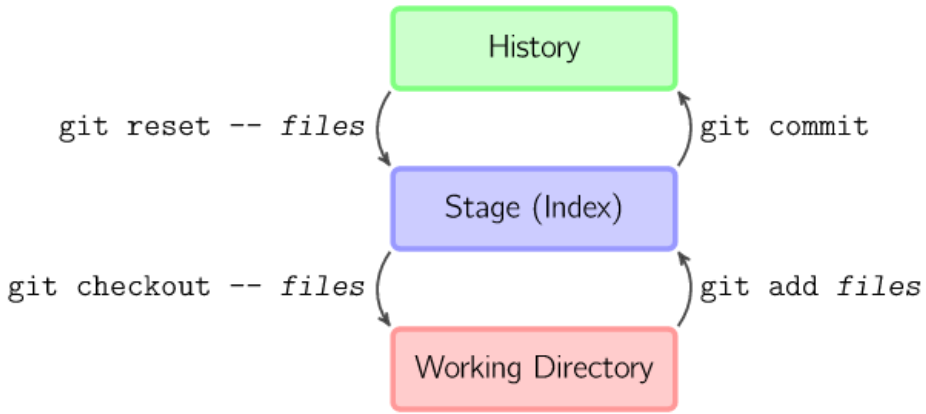


Current status



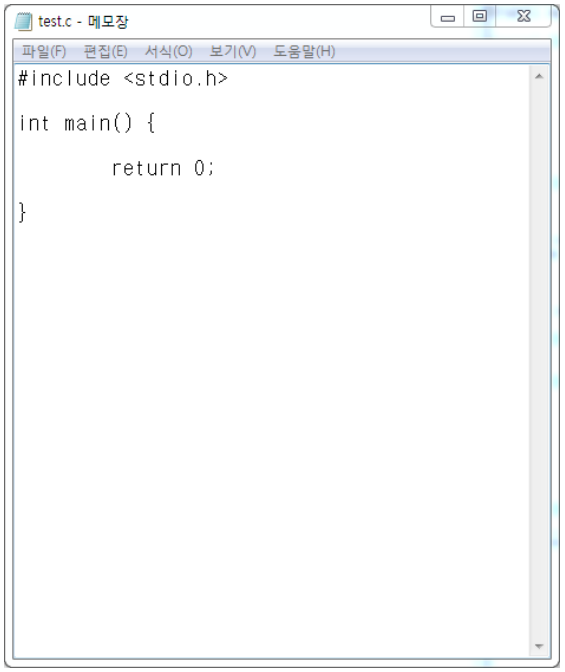
파일 되돌리기 1. working의 변화

```
hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git status
On branch master
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        modified:   test.c

no changes added to commit (use "git add" and/or "git commit -a")

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git checkout -- test.c

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git status
On branch master
nothing to commit, working tree clean

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ cat test.c
#include <stdio.h>

int main() {
        int i;

        return 0;

}
hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$
```

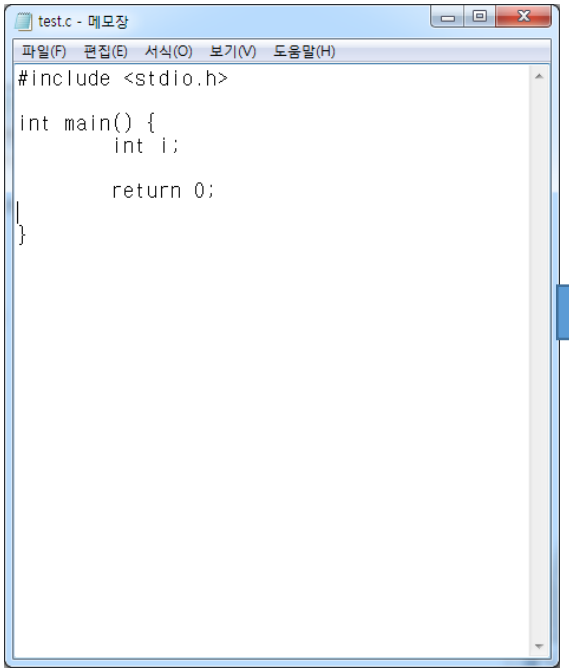


파일 되돌리기 2. stage의 변화

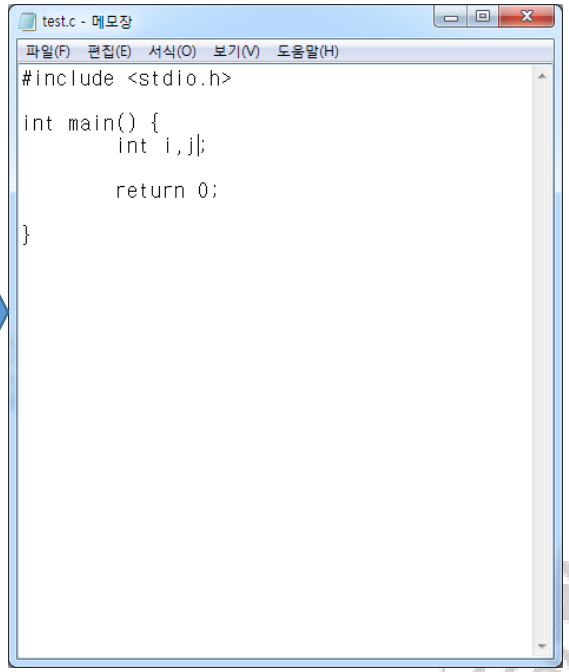
First commit



Second commit

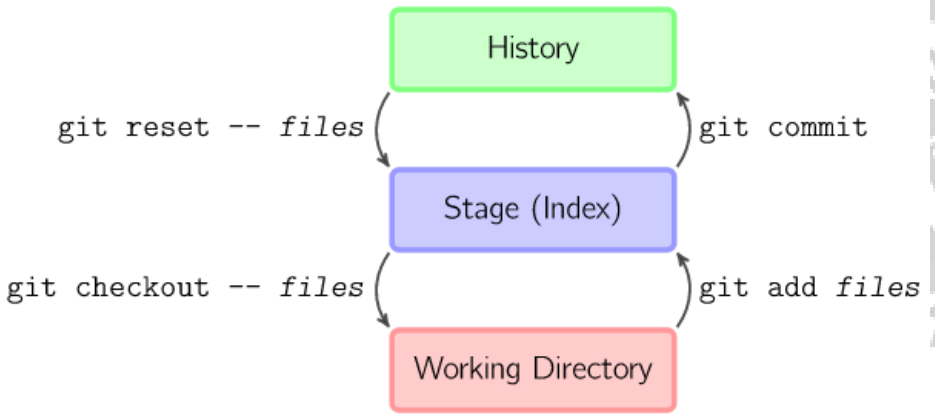


Current status

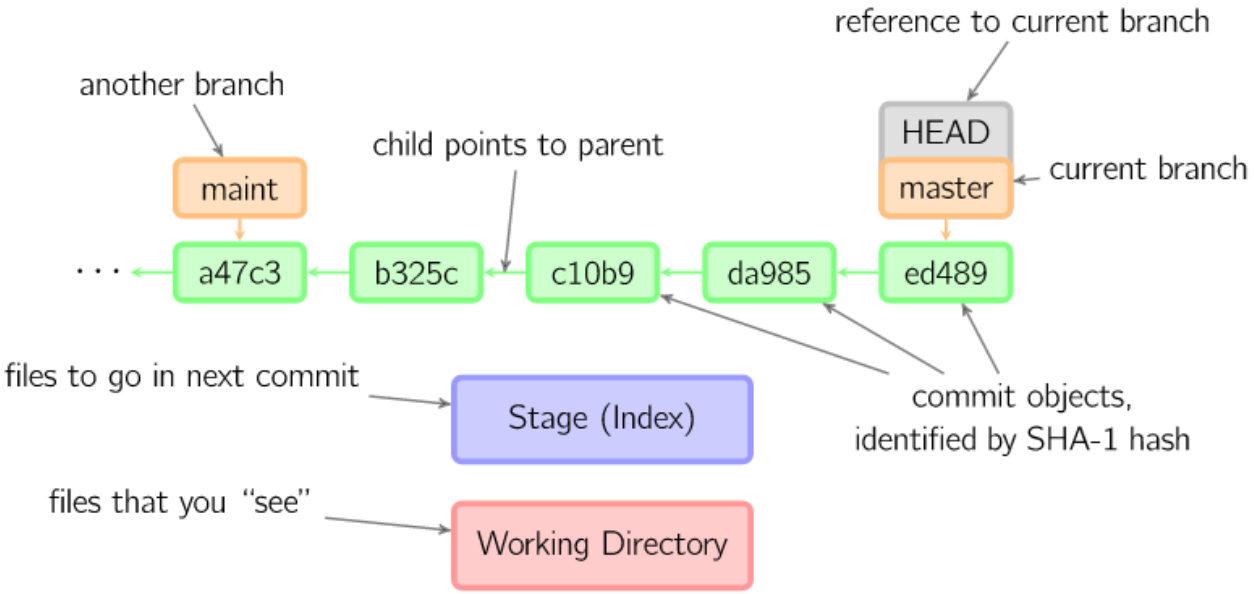


파일 되돌리기 2. stage의 변화

```
hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ notepad test.c

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git add .

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ status
bash: status: command not found

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        modified:   test.c


hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git reset -- test.c
Unstaged changes after reset:
M       test.c

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git status
On branch master
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        modified:   test.c

no changes added to commit (use "git add" and/or "git commit

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ cat test.c
#include <stdio.h>

int main() {
        int i,j;

        return 0;

}
hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$
```



파일 되돌리기 3. HEAD 위치 변경



- git reflog
  - HEAD의 변경 이력을 보는 명령
- git checkout
  - HEAD를 옮기는 명령

파일 되돌리기 3. HEAD 위치 변경

```
hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git reflog
d7a71a5 HEAD@{0}: checkout: moving from master to master
d7a71a5 HEAD@{1}: reset: moving to HEAD~
d9917de HEAD@{2}: reset: moving to HEAD
d9917de HEAD@{3}: commit: second commit
d7a71a5 HEAD@{4}: commit (initial): my first commit

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git checkout d9917de
Note: checking out 'd9917de'.

You are in 'detached HEAD' state. You can look around, make experimental
changes and commit them, and you can discard any commits you make in this
state without impacting any branches by performing another checkout.

If you want to create a new branch to retain commits you create, you may
do so (now or later) by using -b with the checkout command again. Example:

  git checkout -b <new-branch-name>

HEAD is now at d9917de... second commit

hcpark@hcpark-PC MINGW64 ~/tutorial ((d9917de...))
$ git log
commit d9917de88f98a69a9cd5c557f3da0a8de1cb8b23
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 16:39:40 2017 +0900

    second commit

commit d7a71a5edfb5e0e2fea75032f6bad8ce374b886f
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 16:36:34 2017 +0900

    my first commit

hcpark@hcpark-PC MINGW64 ~/tutorial ((d9917de...))
$ cat test.c
#include <stdio.h>

int main() {
        int i;

        return 0;

}
hcpark@hcpark-PC MINGW64 ~/tutorial ((d9917de...))
$
```

```
hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git commit -m "second commit"
[master d9917de] second commit
 1 file changed, 1 insertion(+)

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$ git log
commit d9917de88f98a69a9cd5c557f3da0a8de1cb8b23
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 16:39:40 2017 +0900

    second commit

commit d7a71a5edfb5e0e2fea75032f6bad8ce374b886f
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 16:36:34 2017 +0900

    my first commit

hcpark@hcpark-PC MINGW64 ~/tutorial (master)
$
```

파일 되돌리기 3. HEAD 위치 변경

- 또다른 방법
  - Git reset 사용
  - Branch 학습 이후에 설명

Git tag

```
phcph@NOTE9 MINGW64 ~/tutorial (master)
$ git log
commit 798c47abffd84e764492e2f83aa8876feadf681f
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:46:31 2017 +0900

    3rd commit

commit ee23f1a1f351bea6b19caba6ff656461fcbe0758
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:46:04 2017 +0900

    2nd commit

commit b645b93df906e3e37bf7853790e9ae5796e933ca
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:45:28 2017 +0900

    1st commit

phcph@NOTE9 MINGW64 ~/tutorial (master)
$ git tag v0.1

phcph@NOTE9 MINGW64 ~/tutorial (master)
$ git tag
v0.1
```

Git tag

```
phcph@NOTE9 MINGW64 ~/tutorial ((v0.2))
$ git tag
v0.1
v0.2
gi
phcph@NOTE9 MINGW64 ~/tutorial ((v0.2))
$ git checkout v0.1
Previous HEAD position was 668e013... 5th commit
HEAD is now at 798c47a... 3rd commit

phcph@NOTE9 MINGW64 ~/tutorial ((v0.1))
$ git log
commit 798c47abffd84e764492e2f83aa8876feadf681f
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:46:31 2017 +0900

    3rd commit

commit ee23f1a1f351bea6b19caba6ff656461fcbe0758
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:46:04 2017 +0900

    2nd commit

commit b645b93df906e3e37bf7853790e9ae5796e933ca
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:45:28 2017 +0900

    1st commit

phcph@NOTE9 MINGW64 ~/tutorial ((v0.1))
$
```

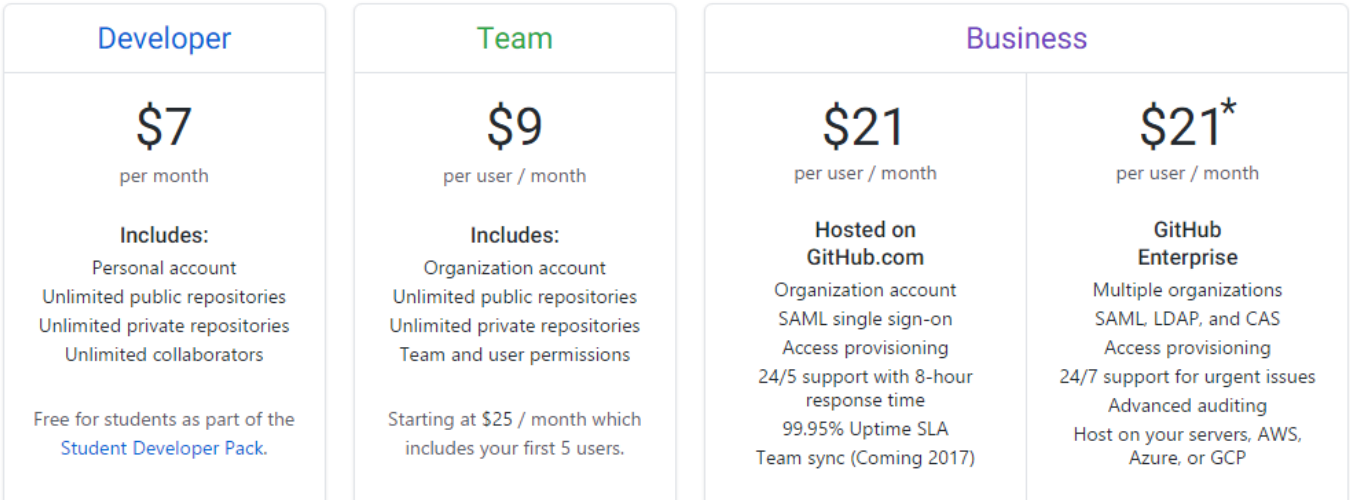
실습 과제 (git 개인 실습 #1)

- local repository 생성 후, 7개 이상의 commit을 만든다
  - File은 “test.c” 1개, 내용은 “1”, “2”,”3” 식으로 단순 증가
  - git log 캡처: log.jpg
- 중간에 tag를 3개 이상 만든다
  - v0.1~v0.3
  - git tag 캡처: tag.jpg
- HEAD를 다양한 방식으로 움직여본다
  - git checkout <commit id> 2가지
  - git checkout <tag> 2가지
  - 각각 cat test.c 로 내용 확인 (HEAD 위치에 따라 적절히 변경되어야 함)
  - 수행 화면 캡처: head.jpg
- 제출 기한:
  - 10/13 (일) 23:59
  - 지각 감점: 5%p / day (3주 내 제출해야 함)

GitHub

GitHub는?

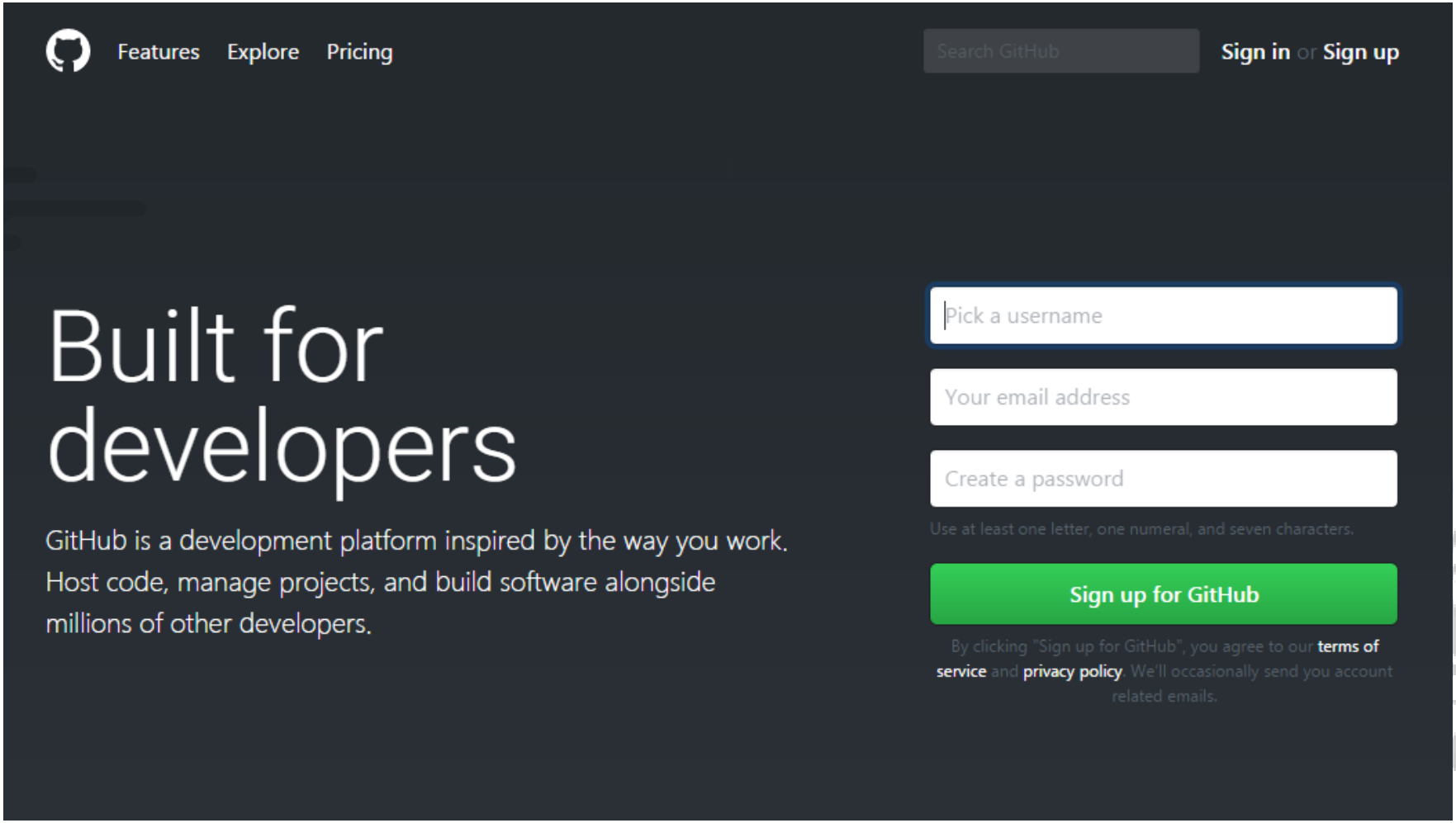
- Git의 원격 저장소를 제공
- 프로젝트 관리 도구 제공
  - 위키, 이슈관리, 머지 요청 관리, 팀원 관리 등
- 비용
  - 오픈소스 프로젝트는 무료



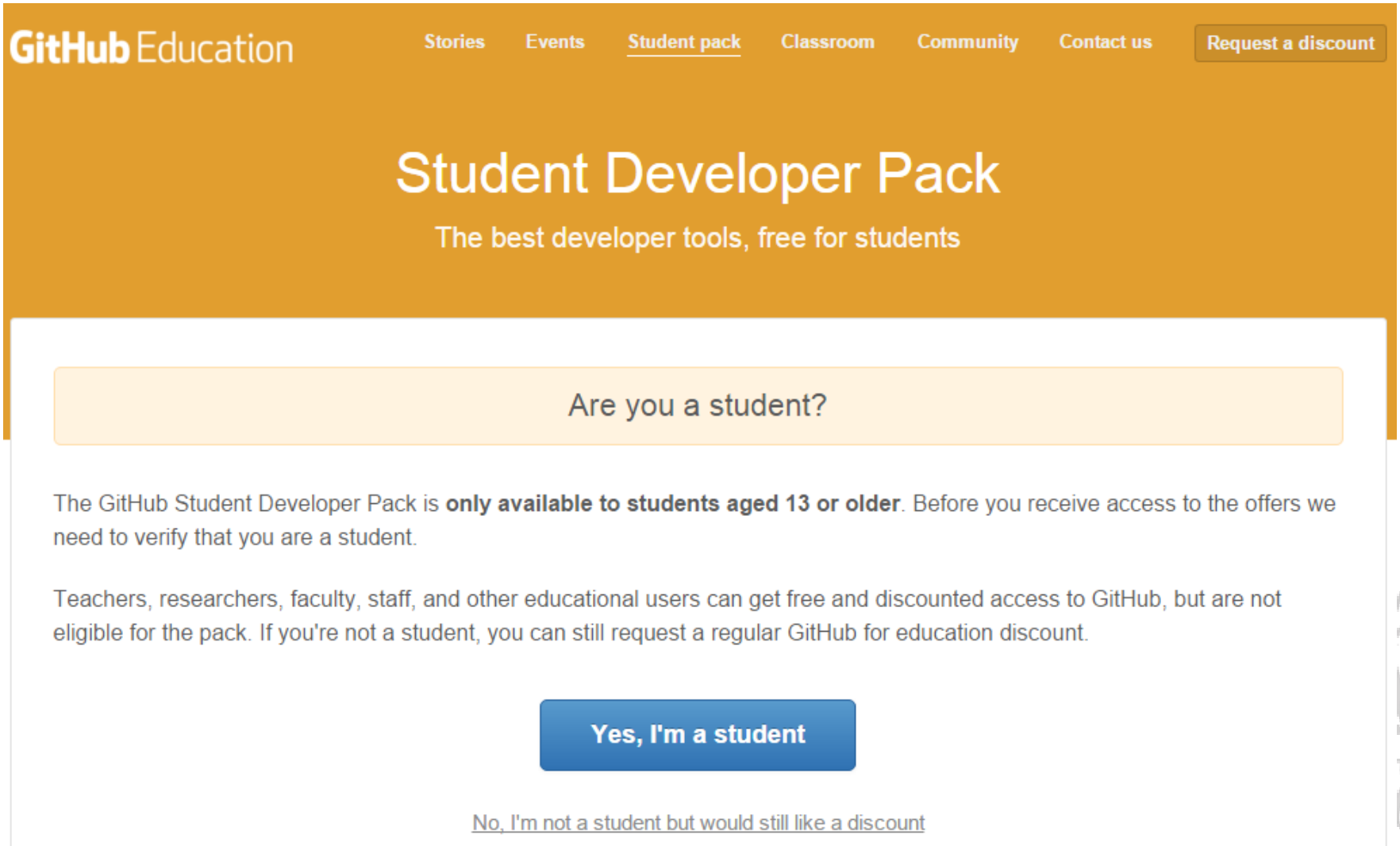
Developer	Team	Business	
$7	$9	$21	$21*
per month	per user / month	per user / month	per user / month
Includes:	**Includes:**	**Hosted on GitHub.com**	**GitHub Enterprise**
Personal account	Organization account	Organization account	Multiple organizations
Unlimited public repositories	Unlimited public repositories	SAML single sign-on	SAML, LDAP, and CAS
Unlimited private repositories	Unlimited private repositories	Access provisioning	Access provisioning
Unlimited collaborators	Team and user permissions	24/5 support with 8-hour response time	24/7 support for urgent issues
Free for students as part of the Student Developer Pack.	Starting at $25 / month which includes your first 5 users.	99.95% Uptime SLA	Advanced auditing
		Team sync (Coming 2017)	Host on your servers, AWS, Azure, or GCP

GitHub 가입

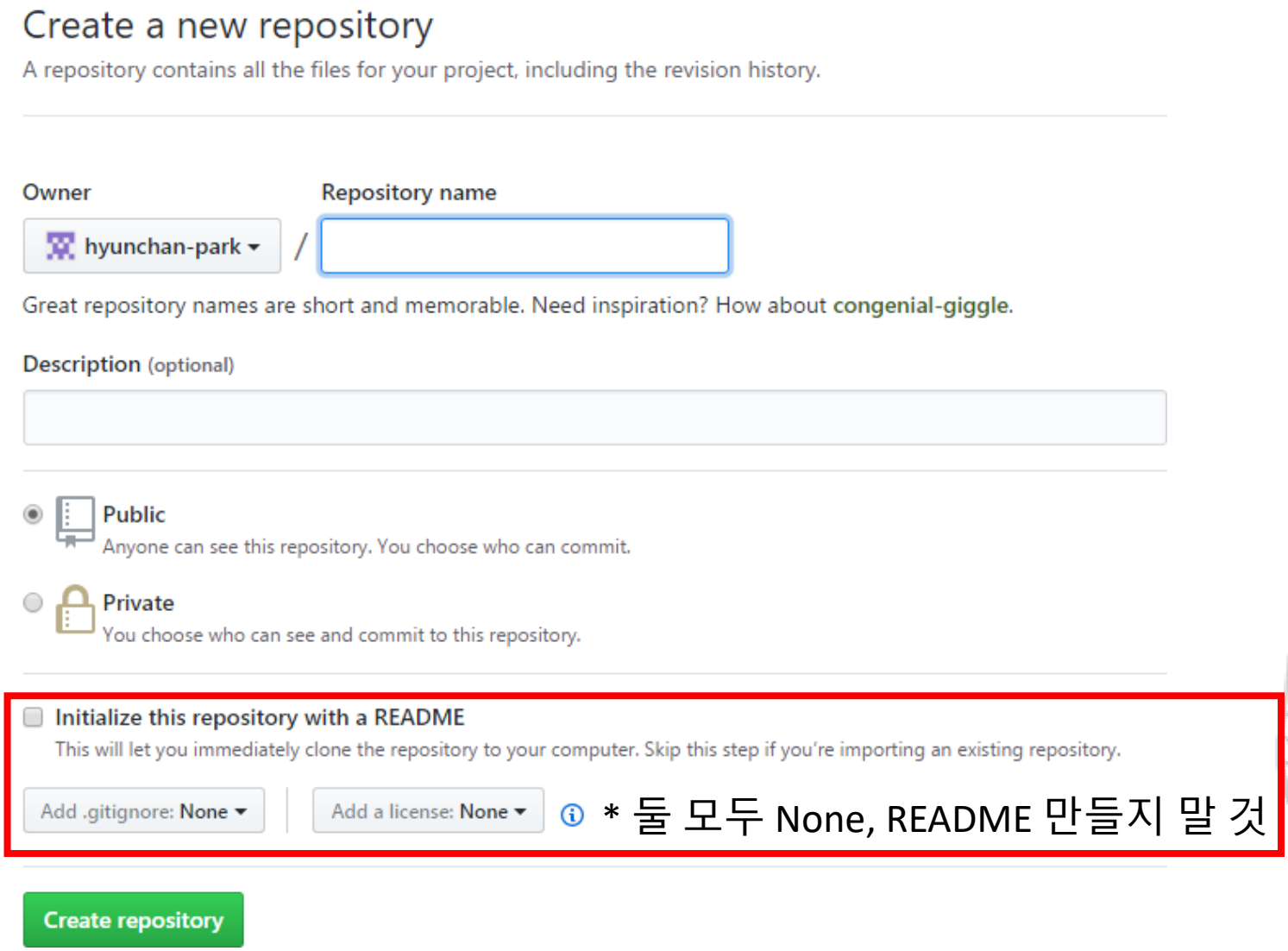
- https://github.com/



GitHub 학생용: free private repository



Repository 생성



Repository 생성 후

Quick setup — if you've done this kind of thing before

Set up in Desktop or HTTPS SSH https://github.com/hyunchan-park/swproject.git

We recommend every repository include a README, LICENSE, and .gitignore.

...or create a new repository on the command line

```
echo "# swproject" >> README.md
git init
git add README.md
git commit -m "first commit"
git remote add origin https://github.com/hyunchan-park/swproject.git
git push -u origin master
```

...or push an existing repository from the command line

```
git remote add origin https://github.com/hyunchan-park/swproject.git
git push -u origin master
```

...or import code from another repository

You can initialize this repository with code from a Subversion, Mercurial, or TFS project.

Import code

로컬 – 원격 저장소 간의 이동

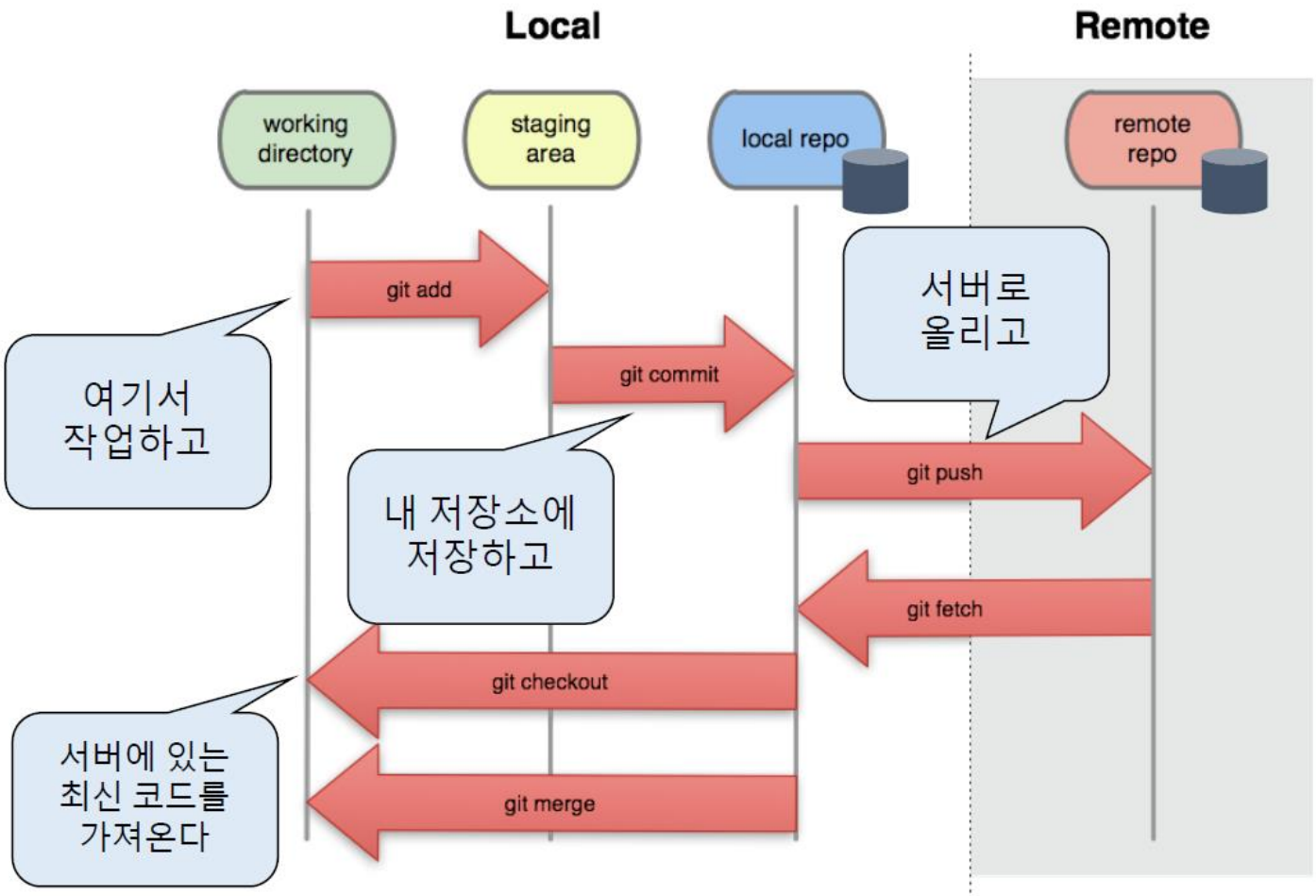


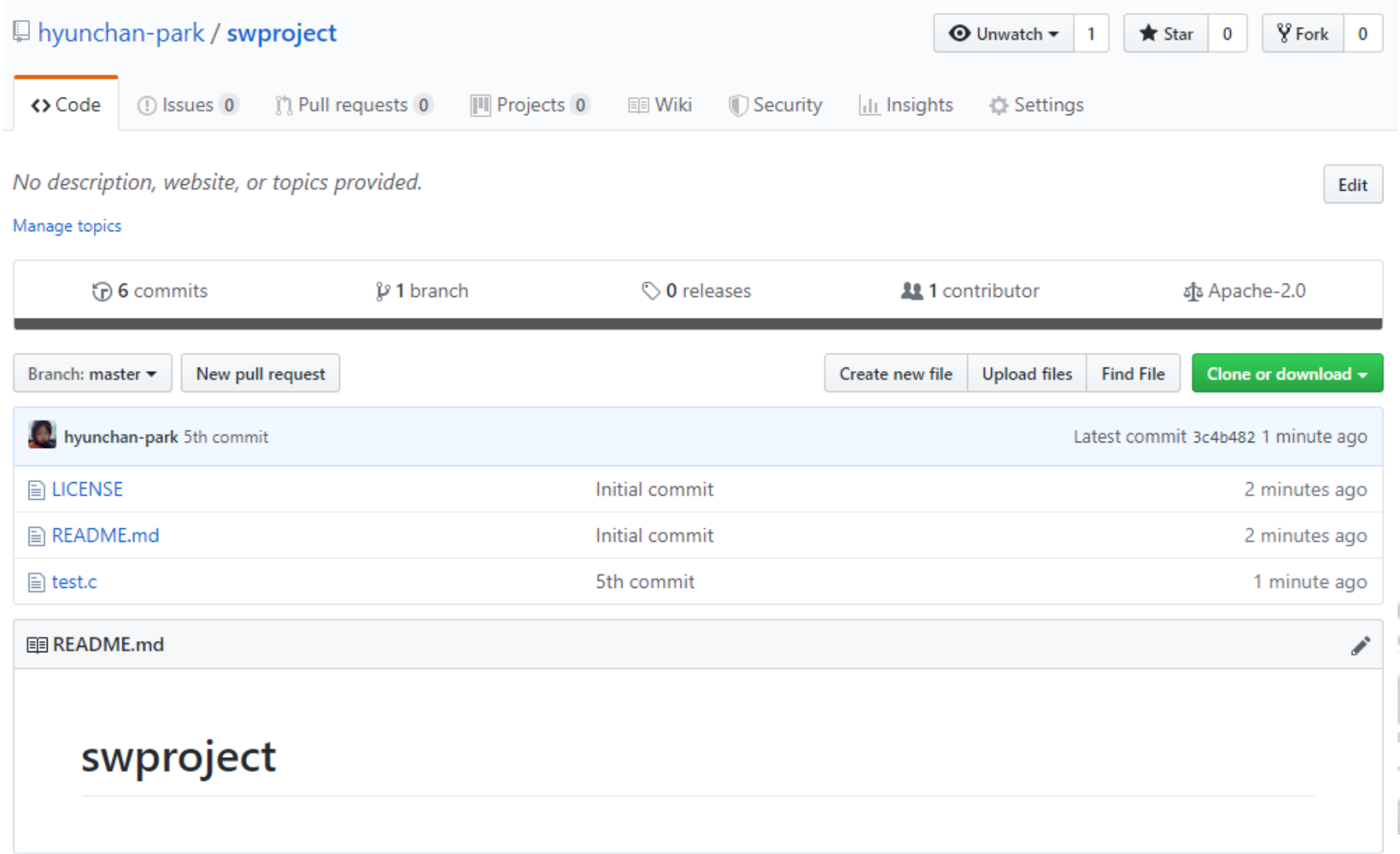
그림 출처 : http://pismute.github.io/whygitisbetter/#everything-is-local

Local repository 를 GitHub remote로 push

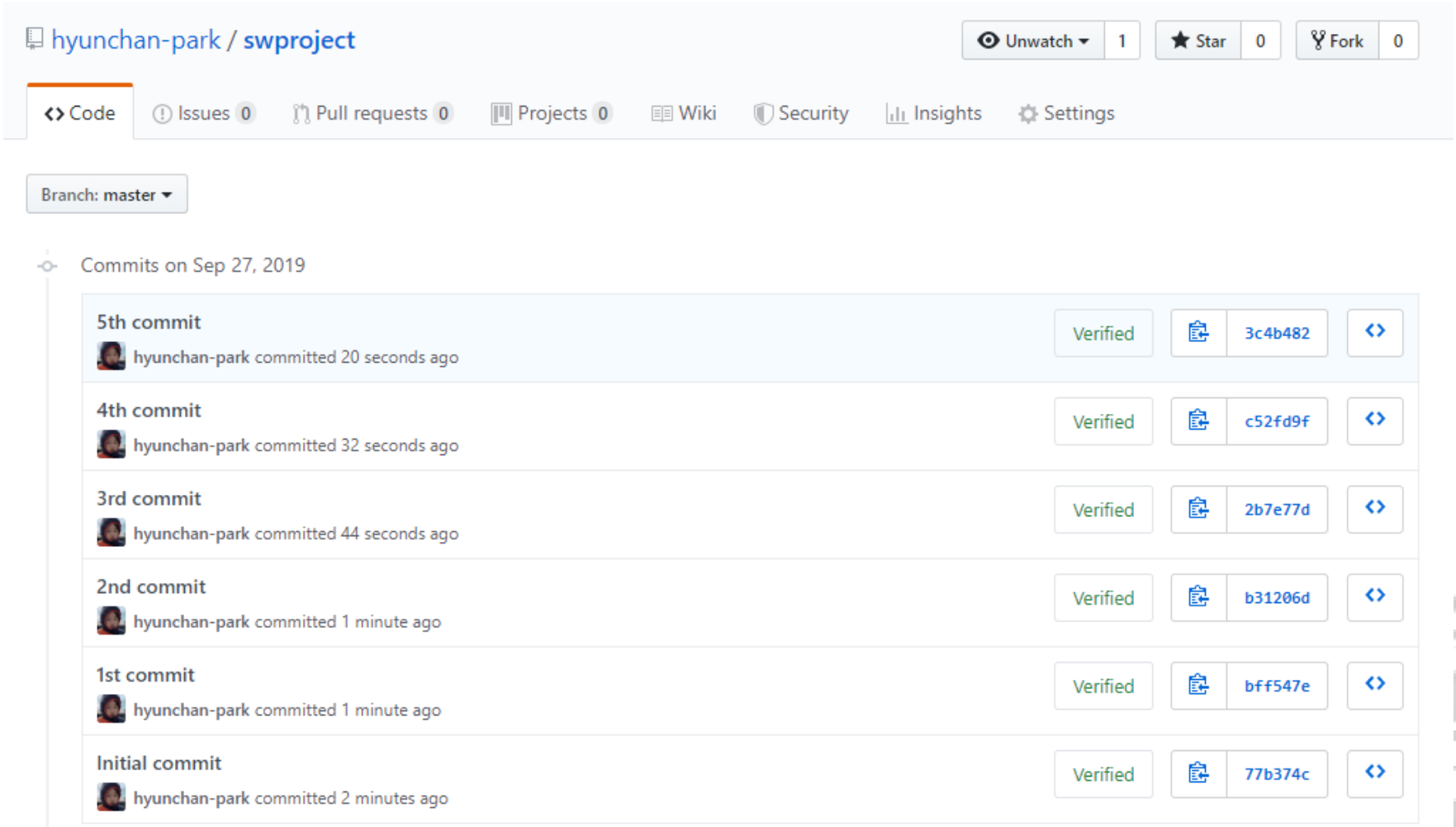
* GitHub 로그인 창이 뜰 수 있음

```
phcph@NOTE9 MINGW64 ~/tutorial ((v0.1))
$ git remote add origin https://github.com/hyunchan-park/swproject.git

phcph@NOTE9 MINGW64 ~/tutorial ((v0.1))
$git remote add origin https://github.com/hyunchan-park/swproject.git
fatal: remote origin already exists.

phcph@NOTE9 MINGW64 ~/tutorial ((v0.1))
$ git push -u origin master
Counting objects: 15, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (5/5), done.
Writing objects: 100% (15/15), 1022 bytes | 0 bytes/s, done.
Total 15 (delta 0), reused 0 (delta 0)
To https://github.com/hyunchan-park/swproject.git
 * [new branch]      master -> master
Branch master set up to track remote branch master from origin.

phcph@NOTE9 MINGW64 ~/tutorial ((v0.1))
$
```

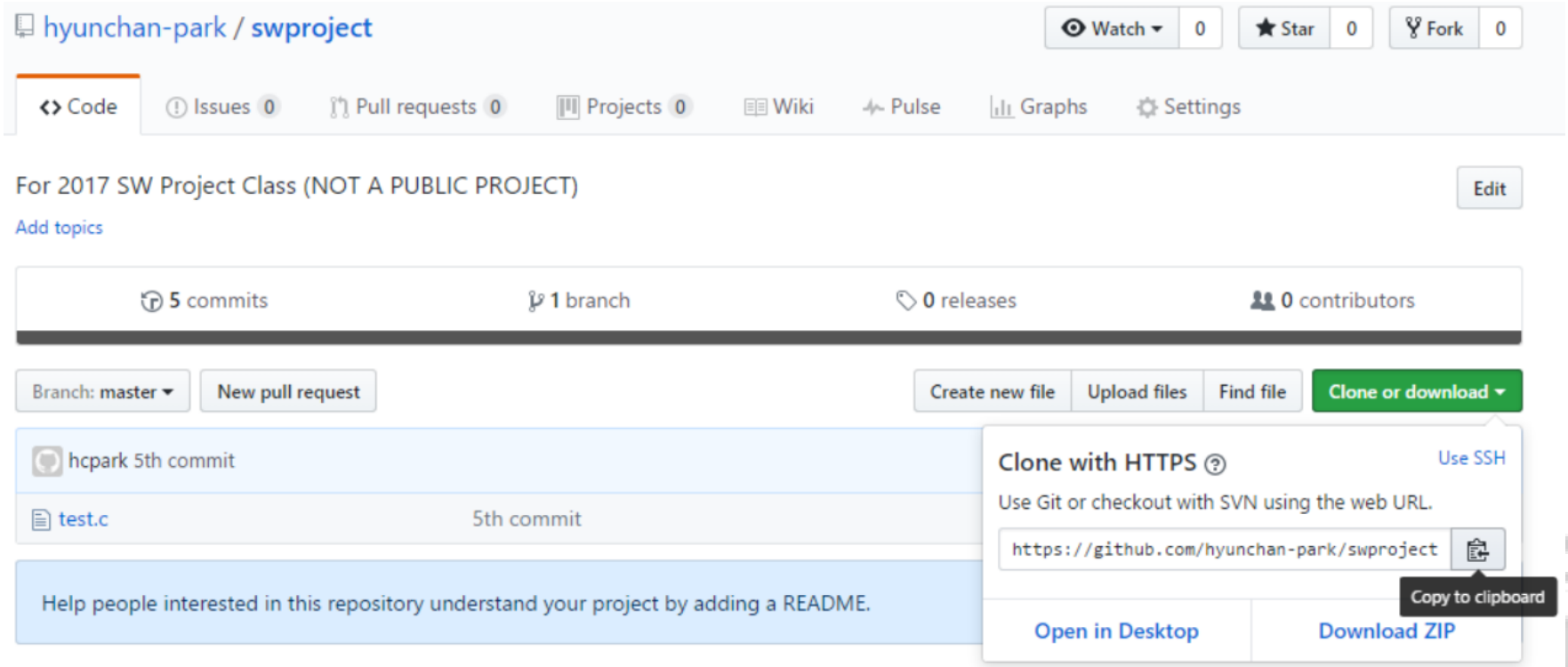
Push 완료 후 GitHub 확인



GitHub commit history 확인



다른 Local repository 생성 및 GitHub clone



다른 Local repository 생성 및 GitHub clone

- git clone https://github.com/hyunchan-park/swproject.git <folder>

```
phcph@NOTE9 MINGW64 ~
$ mkdir test

phcph@NOTE9 MINGW64 ~
$ cd test

phcph@NOTE9 MINGW64 ~/test
$ git clone git://github.com/hyunchan-park/swproject.git .
Cloning into '.'...
remote: Counting objects: 15, done.
remote: Compressing objects: 100% (5/5), done.
remote: Total 15 (delta 0), reused 15 (delta 0), pack-reused 0
Receiving objects: 100% (15/15), done.

phcph@NOTE9 MINGW64 ~/test (master)
$
```

* GitHub 로그인 창이 뜰 수 있음

- git config --global http.sslVerify false
- git remote set-url origin https://github.com/hyunchan-park/swproject.git

GitHub 충돌 관리

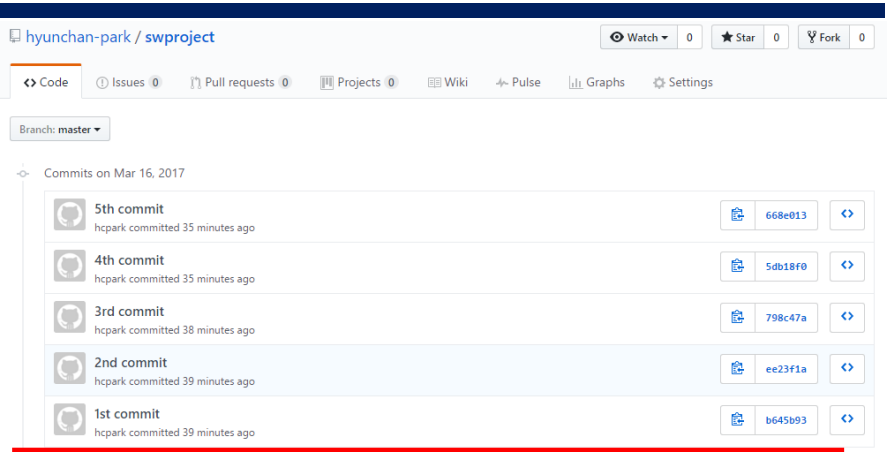
- 새로운 local repo TEST 에서 파일 수정 후 commit, push 수행
  - $ git push origin master
    - Local repository의 commit 내역을 remote로 전송

- 기존 local repo Tutorial 에서 파일 수정 후 commit, push 수행
  - 결과는?

GitHub 충돌 관리

local repo TEST

```
phcph@NOTE9 MINGW64 ~/test (master)
$ vi test.c

phcph@NOTE9 MINGW64 ~/test (master)
$ git add .

phcph@NOTE9 MINGW64 ~/test (master)
$ git commit -m "6th commit"
[master 030bee4] 6th commit
 1 file changed, 1 insertion(+), 1 deletion(-)

phcph@NOTE9 MINGW64 ~/test (master)
$ git log
commit 030bee4f22445f87379d9a50438ff2d6afba947c
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 21:54:58 2017 +0900

    6th commit

commit 668e0135fad439bc1b876131de3704ac8cd934f2
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:49:56 2017 +0900

    5th commit

commit 5db18f0156c68db7e4e181569b4822c8d1d134d3
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:49:35 2017 +0900

    4th commit

commit 798c47abffd84e764492e2f83aa8876feadf681f
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:46:31 2017 +0900

    3rd commit

commit ee23f1a1f351bea6b19caba6ff656461fcbe0758
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:46:04 2017 +0900

    2nd commit

commit b645b93df906e3e37bf7853790e9ae5796e933ca
Author: hcpark <hcpark.class@gmail.com>
```



local repo TUTORIAL

```
phcph@NOTE9 MINGW64 ~/tutorial ((v0.2))
$ git log
commit 668e0135fad439bc1b876131de3704ac8cd934f2
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:49:56 2017 +0900

    5th commit

commit 5db18f0156c68db7e4e181569b4822c8d1d134d3
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:49:35 2017 +0900

    4th commit

commit 798c47abffd84e764492e2f83aa8876feadf681f
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:46:31 2017 +0900

    3rd commit

commit ee23f1a1f351bea6b19caba6ff656461fcbe0758
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:46:04 2017 +0900

    2nd commit

commit b645b93df906e3e37bf7853790e9ae5796e933ca
Author: hcpark <hcpark.class@gmail.com>
Date:   Thu Mar 16 20:45:28 2017 +0900

    1st commit
```

GitHub 충돌 관리

```
phcph@NOTE9 MINGW64 ~/test (master)
$ git push origin master
Counting objects: 3, done.
Writing objects: 100% (3/3), 235 bytes | 0 bytes/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://github.com/hyunchan-park/swproject.git
   668e013..030bee4  master -> master

phcph@NOTE9 MINGW64 ~/test (master)
$
```

```
phcph@NOTE9 MINGW64 ~/tutorial ((4adbac1...))
$ git push origin master
To https://github.com/hyunchan-park/swproject.git
 ! [rejected]        master -> master (fetch first)
error: failed to push some refs to 'https://github.com/hyunchan-park/swproject.g
it'
hint: Updates were rejected because the remote contains work that you do
hint: not have locally. This is usually caused by another repository pushing
hint: to the same ref. You may want to first integrate the remote changes
hint: (e.g., 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.

phcph@NOTE9 MINGW64 ~/tutorial ((4adbac1...))
$
```

GitHub 충돌 관리: 새로운 파일이 추가되면?

```
phcph@NOTE9 MINGW64 ~/tutorial (master)
$ touch another.c

phcph@NOTE9 MINGW64 ~/tutorial (master)
$ git add .

phcph@NOTE9 MINGW64 ~/tutorial (master)
$ git commit -m "file added"
[master 90d69cb] file added
 1 file changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 another.c

phcph@NOTE9 MINGW64 ~/tutorial (master)
$ git push origin master
To https://github.com/hyunchan-park/swproject.git
 ! [rejected]        master -> master (fetch first)
error: failed to push some refs to 'https://github.com/hyunchan-park/swproject.g
it'
hint: Updates were rejected because the remote contains work that you do
hint: not have locally. This is usually caused by another repository pushing
hint: to the same ref. You may want to first integrate the remote changes
hint: (e.g., 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.

phcph@NOTE9 MINGW64 ~/tutorial (master)
$
```

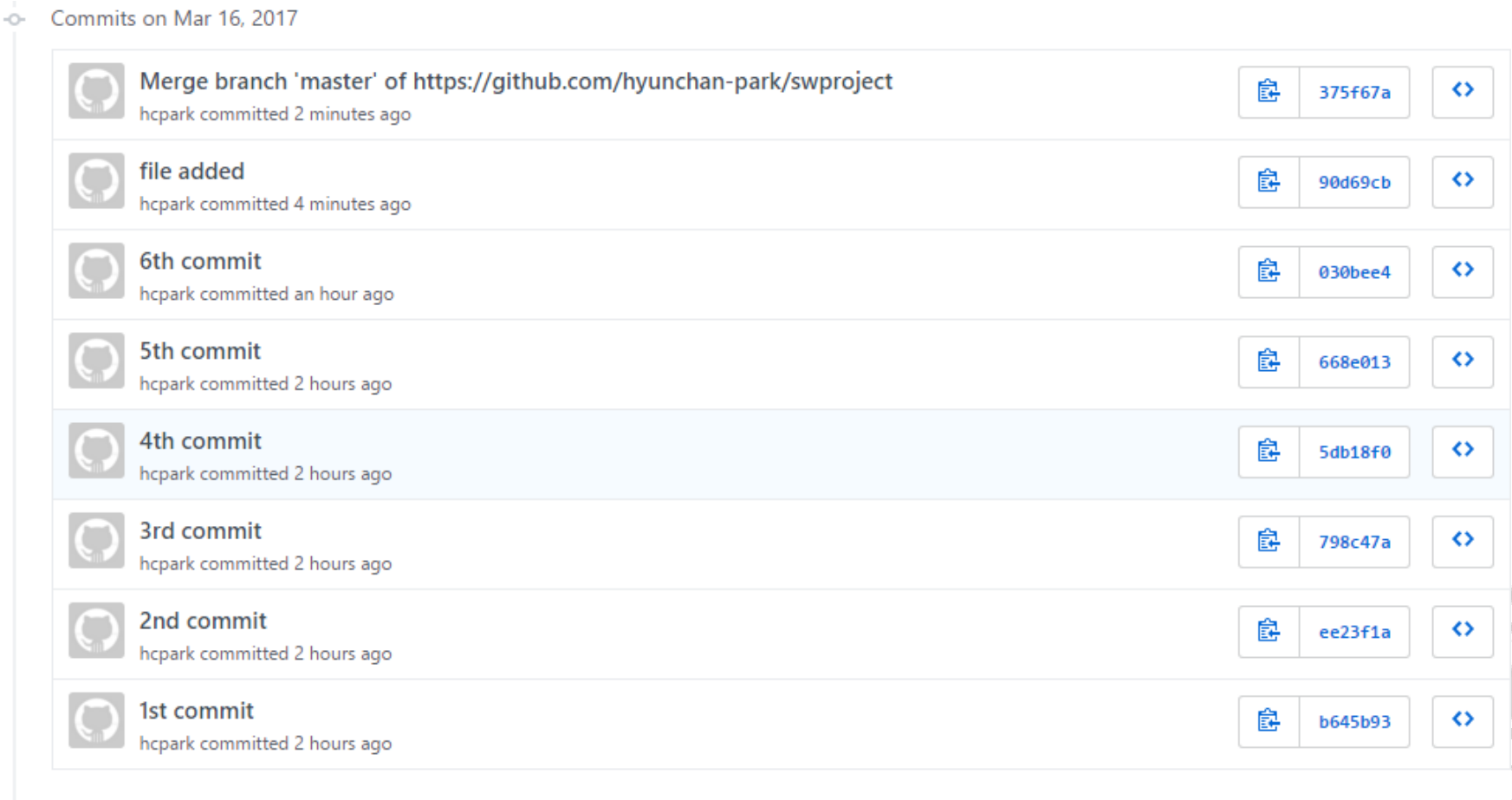
Git 충돌 관리: pull before push

- Remote repository를 중앙 서버처럼 이용하고 있으므로
  - git pull : 타 사용자의 작업 내용을 local 에 반영하여,
  - 최종 상태로 업데이트 후에 내 변경 내용을 push

```
phcph@NOTE9 MINGW64 ~/tutorial (master)
$ git pull
Merge made by the 'recursive' strategy.
 test.c | 2 +-
 1 file changed, 1 insertion(+), 1 deletion(-)

phcph@NOTE9 MINGW64 ~/tutorial (master)
$ cat test.c
6

phcph@NOTE9 MINGW64 ~/tutorial (master)
$
```

```
phcph@NOTE9 MINGW64 ~/tutorial (master)
$ git push origin master
Counting objects: 5, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (4/4), done.
Writing objects: 100% (5/5), 566 bytes | 0 bytes/s, done.
Total 5 (delta 0), reused 0 (delta 0)
To https://github.com/hyunchan-park/swproject.git
   030bee4..375f67a  master -> master

phcph@NOTE9 MINGW64 ~/tutorial (master)
$
```

Git 충돌 관리: 최종 결과 GitHub에서 확인



실습 과제 (git 개인 실습 #2)

- GitHub Desktop 설치하고, 두 개의 local repo 를 이용, 충돌 시연
  - Slide #51 의 화면처럼 각각의 repo 에서 git log 수행 후, 캡처
    - git log 캡처: log.jpg
  - Slide #52 처럼, Test 에서 먼저 push 한 후, tutorial 에서 push 오류 확인
    - crash.jpg
  - Slide #53,54 처럼, tutorial 에서 새로운 파일 추가 후, pull 하고, 다시 test.c 내용 확인 한 후, push 수행
    - pull.jpg

- 제출 기한:
  - 10/20 (일) 23:59
  - 지각 감점: 5%p / day (3주 내 제출해야 함)