

Version control

[git]

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Introduction

Outline

Version control

- ▶ What
- ▶ Why
- ▶ How (git)

Version control *What*

The modern scientist's lab notebook

- ▶ Keep track of changes in a project *as the occur*
- ▶ Document the changes
- ▶ Archive the history in a way that allows to easily roll back
- ▶ Tell differences with other versions (collaboration) and be able to merge them

Version control Why

- ▶ **Sanity:** nothing “committed” is lost
- ▶ **Archival:** keep record on when what changed how
- ▶ **Collaboration:** work simultaneously with colleagues, properly merge and manage conflicts

Very neat video exemplifying the concept

git

Today:

- ▶ Set up a new project
- ▶ Track changes as you work
- ▶ Examine the change history
- ▶ Compare different versions
- ▶ Restore old versions of a file
- ▶ Other tricks to better manage your git project

Not today (but you should check it out):

- ▶ Collaboration with git
- ▶ Conflicts in git

git - Requirements & Setup

Assuming you have git installed:

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

These are for attribution purposes only, it does not sign you up for any service

Additionally, you may want to set up a default editor (make sure you actually have it installed):

```
git config --global core.editor "vim"
```

Additional trick:

```
$ git config --global --add color.ui true
```

git - New project (repository)

Navigate to the folder where you want to create the new project and create the directory, naming it the way you prefer:

```
$ cd /path/to/folder  
$ mkdir my_new_folder  
$ cd my_new_folder
```

Then start tracking:

```
$ git init
```


git - New project (repository) (cnt.)

This will create a hidden folder called `.git`, which will store all the history (although you will never access it directly).

A very common command you will use repeatedly is `status`:

```
$ git status
```

```
# On branch master
```

```
#
```

```
# Initial commit
```

```
#
```

```
nothing to commit (create/copy files and use "git add" to t
```

git - Work...

Start, for example, with one text file. You can create it from the text editor of your preference, or you can create it using a command line editor, such as vim:

```
$ vim nobelp_paper.txt
```

And start working:

```
The world is flat.
```

git - Work... (cnt.)

Take a break. Save and quit the file. And now check the status of the git project:

```
$ git status
```

```
# On branch master
```

```
#
```

```
# Initial commit
```

```
#
```

```
# Untracked files:
```

```
#   (use "git add <file>..." to include in what will be com
```

```
#
```

```
#   nobelp_paper.txt
```

```
nothing added to commit but untracked files present (use "g
```

git - ... and track your work!

At this point, you want `nobelp_paper.txt` to be tracked as you work on it. This does *not* come automatically (like in Dropbox, for example), but you need to explicitly add the file:

```
$ git add nobelp_paper.txt
```

Now `git` knows it has to keep an eye on the file:

git - ... and track your work! (cnt.)

```
$ git status
```

```
# On branch master
```

```
#
```

```
# Initial commit
```

```
#
```

```
# Changes to be committed:
```

```
#   (use "git rm --cached <file>..." to unstage)
```

```
#
```

```
#   new file:   nobelp_paper.txt
```

```
#
```

To record the file at a given stage, you need to “commit” the changes. Include a (short) message describing the advancement:

```
$ git commit -m "Current state of knowledge about Earth"
```

Everything is properly recorded at this point.

git - Why add and commit?

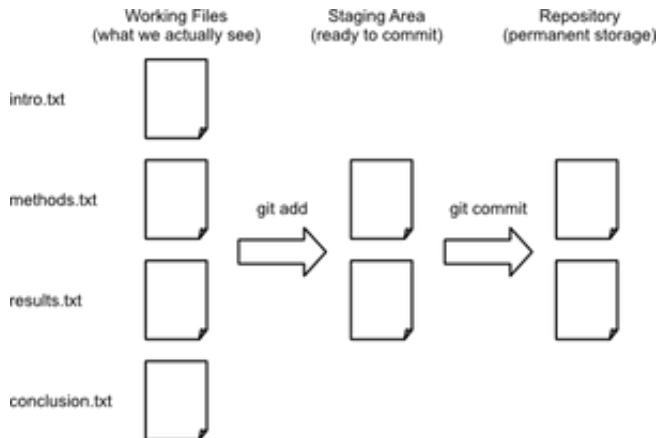


Figure 1: Local spaces

(Source: Software Carpentry)

git - Why add and commit? (cnt.)

```
$ git status
```

```
# On branch master
```

```
nothing to commit, working directory clean
```

It means you could keep working, not add, and, when you commit, only the added version will be tracked. Very useful when a project has **many files**!

git - Work, track, work, track...

```
$ vim nobelp_paper.txt
```

```
The world is NOT flat.
```

```
$ 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:   nobelp_paper.txt
```

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


git - Work, track, work, track... (cnt.)

Since the file is under tracking already, you can add and commit in a single shot:

```
$ git commit -am "Correcting view about Earth"
```

```
[master a643fa0] Correcting view about Earth  
1 file changed, 1 insertion(+), 1 deletion(-)
```

Repeat this process as many times as snapshots you want to record of your project.

git - Examine log

```
$ git log
```

```
commit a643fa0ca03291793cb432d799defd0f496b5c9a
Author: Dani Arribas-Bel <daniel.arribas.bel@gmail.com>
Date:   Thu Aug 28 10:50:01 2014 -0500
```

Correcting view about Earth

```
commit 6d119ff4a319650bfef06d279b000a56f5fe7759
Author: Dani Arribas-Bel <daniel.arribas.bel@gmail.com>
Date:   Thu Aug 28 10:36:36 2014 -0500
```

Current state of knowledge about Earth

git - Examine log (cnt.)

Or a more compressed view...

```
$ git log --pretty=oneline
```

```
a643fa0ca03291793cb432d799defd0f496b5c9a Correcting view about Earth  
6d119ff4a319650bfef06d279b000a56f5fe7759 Current state of knowledge a
```

Or more detailed:

```
$ git log --pretty=format:"%h - %a, %ar : %s"
```

```
a643fa0 - %a, 17 minutes ago : Correcting view about Earth  
6d119ff - %a, 30 minutes ago : Current state of knowledge a
```

See more details about tweaking git log in this link.

git - Compare versions

Current version from last one tracked (HEAD):

```
$ vim nobelp_paper.txt
```

```
The world is NOT flat at all.
```

```
$ git diff
```

```
diff --git a/nobelp_paper.txt b/nobelp_paper.txt
index 5a35641..3215244 100644
--- a/nobelp_paper.txt
+++ b/nobelp_paper.txt
@@ -1, +1 @@
-The world is NOT flat.
+The world is NOT flat at all.
```

git - Compare versions (cnt.)

You can go back in time n revisions (HEAD~ n):

```
$ git commit -am "Reaffirming myself about Earth's non-flat"
```

```
$ git diff HEAD~2 nobelp_paper.txt
```

```
diff --git a/nobelp_paper.txt b/nobelp_paper.txt
index 3fa4573..3215244 100644
--- a/nobelp_paper.txt
+++ b/nobelp_paper.txt
@@ -1,1 +1,1 @@
-The world is flat.
+The world is NOT flat at all.
```

git - Compare versions (ctd.)

Or compare with a specific revision (check log for that):

```
$ git diff 6d119ff nobelp_paper.txt
```

```
diff --git a/nobelp_paper.txt b/nobelp_paper.txt
index 3fa4573..3215244 100644
--- a/nobelp_paper.txt
+++ b/nobelp_paper.txt
@@ -1,1 @@
-The world is flat.
+The world is NOT flat at all.
```

git - Compare versions (cnt.)

Or compare two previous versions:

```
$ git diff 6d119ff a643fa0 nobelp_paper.txt
```

```
diff --git a/nobelp_paper.txt b/nobelp_paper.txt
index 3fa4573..5a35641 100644
--- a/nobelp_paper.txt
+++ b/nobelp_paper.txt
@@ -1,1 @@
-The world is flat.
+The world is NOT flat.
```

git - Restore older version

Suppose we delete the file by accident:

```
$ rm nobelp_paper.txt
```

Bringing the last version back is straightforward:

```
$ git checkout HEAD nobelp_paper.txt
```

Also works if you decide to go back to a previous version of the file:

```
$ git checkout HEAD~2 nobelp_paper.txt
```


git - Restore older version (cnt.)

These modifications act as if you had edited the file:

```
$ git status
```

On branch master

Changes to be committed:

(use "git reset HEAD <file>..." to unstage)

```
    modified:   nobelp_paper.txt
```

So if you want to save the project at that stage again, commit:

```
$ git commit -am "Going back to original ideas"
```

git - Several files

- ▶ git tracks “**snapshots**” of the project, rather than changes in particular files.
- ▶ Extending this process to several files in the project is straightforward
- ▶ The previous workflow favors keeping things organized in **different files**. Although you can manage everything in one master file, having the sections of a paper split into different files makes going back and forth in time much easier and flexible.

Exercise

- ▶ Create a new file with some text and include in the tracking.
- ▶ Make a change in the file and commit it.
- ▶ Bring the project to a state where `nobelp_paper.txt` is in the initial version and the new file is at the latest.

Exercise (suggested) result

```
$ vim corollary.txt
```

```
I am not really sure about Earth's flatness.
```

```
$ git add corollary.txt
```

```
$ git commit -am "Adding corollary"
```

```
$ vim corollary.txt
```

```
I am not really sure about Earth's flatness, it depends.
```

```
$ git commit -am "Introducing uncertainty to corollary"
```

Exercise (suggested) result (cnt.)

```
$ git log --pretty=oneline nobelp_paper.txt
```

```
25acad2069d72947e5aa2e21ddfe4509205ded88 Going back to original  
cfccca975f95ba6588ce07360f4507d5a796b20a Reaffirming myself  
a643fa0ca03291793cb432d799defd0f496b5c9a Correcting view about  
6d119ff4a319650bfef06d279b000a56f5fe7759 Current state of knowledge
```

```
$ git checkout 6d119ff4a319650bfef06d279b000a56f5fe7759 nobelp_paper.txt
```

```
$ git commit -am "Completing exercise"
```

git - Get selective on a project

- ▶ A project might have several files (we've seen how to deal with that)
- ▶ Some of those you might prefer to exclude (or not care to include)
- ▶ By default they will not be tracked
- ▶ You can create a `.gitignore` file in the root folder listing files to be explicitly excluded from tracking

```
$ vim .gitignore
```

```
$ git add .gitignore
```

```
$ git commit -m "Adding ignore file"
```

git - Get selective on a project (cnt.)

```
*.aux
```

```
$ vim something.aux
```

```
$ git status
```

```
On branch master
```

```
nothing to commit, working directory clean
```



Figure 2: FOSTER

Based on content by Dani Arribas-Bel and Thomas De Graaff, licensed under Creative Commons Attribution 4.0 International License.

For this session, we have borrowed important amounts of inspiration and material from **Software Carpentry**'s session on git and the