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1 contributor

SPEAKER_NOTES.md - git

Speaker Notes for the 2016-01-11 Software Carpentry git lesson

TYPE ALL EXAMPLES AS YOU GO. THIS KEEPS THE SPEED SANE, AND ALLOWS YOU TO EXPLAIN EVERY STEP.

START SLIDES WITH `reveal-md slides.md --theme=white`

Version control with git

- SLIDE** (Version control with git)
- SLIDE** (Learning objectives)
- Talk around slide
- SLIDE** (Do you recognise this?)
- Talk around slide
 - **Things get much more complicated when more people are involved**
 - **Ask the audience**
 - Who has been in that situation?
 - How do you get round it?
 - MS Office: track changes
 - Office 365: simultaneous edits?
 - DropBox: now locks files in use
 - Google Docs: simultaneous editing
 - **Version control systems are a solution to this**
 - Excellent for code
 - Useful for most activities
 - **How version control works**
 - Keeps only one document
 - Saves records of all changes made to the document
 - Who made the changes, and when
 - Can reconstruct the entire editing history
- SLIDE** (How version control works)
- Talk around slide

SLIDE (Multiple editors - branching)

- Talk around slide

SLIDE (Combining changes - merging)

- Talk around slide

SLIDE (What version control systems do)

- Talk around slide

Setting up git

SLIDE (Setting up git)

SLIDE (Learning objectives)

- Talk around slide

SLIDE (Setting global options)

- Talk around slide
- **git command structure**
 - git <command> <options>
 - The name and email address will be associated with all our actions in git
 - It's helpful to have some colour to interpret git output
 - The --global flag means that every project on the computer will see these settings
- **Use your own name and email address!**

```
lpritch@Totoro:~$ git config --global user.name "Leighton Pritchard"
lpritch@Totoro:~$ git config --global user.email "leighton.pritchard@hutton.ac.uk"
lpritch@Totoro:~$ git config --global color.ui "auto"
lpritch@Totoro:~$ git config --global core.editor "nano -w"
(git config --global core.editor "'C:\Program Files (x86)\Notepad++\notepad++.exe' -multiInst -notabbar -nosession -r
```

- **Check settings at any time**
 - You can reset these settings at any point
 - check with git config --list

```
lpritch@Totoro:~$ git config --list
user.name=Leighton Pritchard
user.email=leighton.pritchard@hutton.ac.uk
push.default=simple
color.ui=auto
core.editor=emacs
```

Creating a repository

SLIDE (Creating a repository)

SLIDE (Learning objectives)

- Talk around slide

SLIDE (Creating a git repository)

- Talk around slide

- **Create a new directory to hold the project**

- Create it somewhere convenient for you

```
lprtc@Totoro:~$ cd
lprtc@Totoro:~$ mkdir planets
lprtc@Totoro:~$ cd planets
lprtc@Totoro:planets$
```

- **Make this directory a repository**

- Nothing appears to have changed, at first
- Using `ls -a` shows the hidden `.git` subdirectory
- All information about the repository is stored in this subdirectory

```
lprtc@Totoro:planets$ git init
Initialized empty Git repository in /Users/lprtc/planets/.git/
lprtc@Totoro:planets$ ls
lprtc@Totoro:planets$ ls -a
./  ../  .git/
```

- **Check all is well**

- Get a report on repository status
- We have not added or committed any files, so we get this statement

```
lprtc@Totoro:planets$ git status
# On branch master
#
# Initial commit
#
nothing to commit (create/copy files and use "git add" to track)
```

Tracking changes

SLIDE (Tracking changes)

SLIDE (Learning objectives)

- Talk around slide

My first git commit

SLIDE (My first untracked file)

- Talk around slide
- **Create a file**
 - We'll be discussing Mars' suitability as a base
 - Add some suitable text and save the file
 - We now have a single file in this directory

```
lprtc@Totoro:planets$ nano mars.txt
Cold and dry. Everything a nice colour. Matt Damon.
lprtc@Totoro:planets$ ls
mars.txt
lprtc@Totoro:planets$ cat mars.txt
Cold and dry. Everything a nice colour. Matt Damon.
```

- **Check repository status**

- Use `git status` to see what `git` thinks.
- It has noticed that the file exists

- Git says it is not 'tracking' the file - i.e. not recording changes

```
lpritch@Totoro:planets$ git status
# On branch master
#
# Initial commit
#
# Untracked files:
#   (use "git add <file>..." to include in what will be committed)
#
#   mars.txt
nothing added to commit but untracked files present (use "git add" to track)
```

SLIDE (My first git commit)

- Talk around slide
- **Tell git to track the file**
 - Git sees the new file as a 'change' that is not yet committed
 - The changes are **STAGED**

```
lpritch@Totoro:planets$ git add mars.txt
lpritch@Totoro:planets$ git status
# On branch master
#
# Initial commit
#
# Changes to be committed:
#   (use "git rm --cached <file>..." to unstage)
#
#   new file:   mars.txt
#
```

- **Commit the file to the repository**
 - Committing the change to the repository stores it
 - We add a message to keep notes on changes
 - We commit *all* current changes simultaneously
 - Note the short identifier for this commit

```
lpritch@Totoro:planets$ git commit -m "Start notes on Mars as a base"
[master (root-commit) d22195b] Start notes on Mars as a base
1 file changed, 2 insertions(+)
create mode 100644 mars.txt
lpritch@Totoro:planets$ git status
# On branch master
nothing to commit, working directory clean
```

- **Use git log to see the history**
 - git log shows commits in reverse chronological order
 - Note the full identifier for this commit
 - The log message is also included
 - Only the file exists in the current working directory - all the log information etc. is in `.git`

```
lpritch@Totoro:planets$ git log
commit d22195b9ec3c8fb4c2ce0f52f344b95ce5d0d0e3
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:05:57 2016 +0000
    Start notes on Mars as a base
lpritch@Totoro:planets$ ls
mars.txt
```

modify-add-commit

SLIDE (modify-add-commit)

- Talk around slide
- **Make some changes to the file**
 - git tracks mars.txt so sees the changes are made
 - Changed file is "not staged for commit"

```
lprtc@Totoro:planets$ nano mars.txt
lprtc@Totoro:planets$ cat mars.txt
Cold and dry. Everything a nice colour. Matt Damon.
Two moons. This may be an issue for werewolves!
lprtc@Totoro:planets$ 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:   mars.txt
#
no changes added to commit (use "git add" and/or "git commit -a")
```

- **Inspect changes since last commit**
 - git diff notes differences between the current version of the file in the working directory, and the latest in the repository
 - Line 1: output is similar to diff command
 - Line 2: unique identifiers for files being compared
 - Lines 3,4: which versions are compared (a: repo; b: directory)
 - The rest of the lines show what the differences are between the files (-: lines removed; +: lines added)

```
lprtc@Totoro:planets$ git diff
diff --git a/mars.txt b/mars.txt
index 87b4a99..96b2def 100644
--- a/mars.txt
+++ b/mars.txt
@@ -1,2 +1,2 @@
 Cold and dry. Everything a nice colour. Matt Damon.
-
+Two moons. This may be an issue for werewolves!
```

- **Commit the change**
 - git won't let us commit without staging
 - We don't always want to commit all changes to all files at the same time

```
lprtc@Totoro:planets$ git commit -m "Lycanthropy concerns"
# 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:   mars.txt
#
no changes added to commit (use "git add" and/or "git commit -a")
```

- **Stage the changes, then commit**

```
lprtc@Totoro:planets$ git add mars.txt
lprtc@Totoro:planets$ git commit -m "Lycanthropy concerns"
[master ea59e91] Lycanthropy concerns
 1 file changed, 1 insertion(+), 1 deletion(-)
```

- **Check the log**

```
lprtc@Totoro:planets$ git log
commit ea59e9169633eb7f9083ee79c2cc7ebf20efaf98
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:18:55 2016 +0000
    Lycanthropy concerns
commit d22195b9ec3c8fb4c2ce0f52f344b95ce5d0d0e3
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:05:57 2016 +0000
    Start notes on Mars as a base
```

- **Stage another change**

- This time, don't do `git diff` until after staging
- The file has changed, but `git diff` doesn't show this

```
lprtc@Totoro:planets$ nano mars.txt
lprtc@Totoro:planets$ cat mars.txt
Cold and dry. Everything a nice colour. Matt Damon.
Two moons. This may be an issue for werewolves!
Not much atmosphere, mind.
lprtc@Totoro:planets$ git add mars.txt
lprtc@Totoro:planets$ git diff
```

- **Use the `--staged` flag**

- We need `git diff --staged` to see staged file differences
- Commit the change

```
lprtc@Totoro:planets$ git diff --staged
diff --git a/mars.txt b/mars.txt
index 96b2def..919cb89 100644
--- a/mars.txt
+++ b/mars.txt
@@ -1,2 +1,3 @@
Cold and dry. Everything a nice colour. Matt Damon.
Two moons. This may be an issue for werewolves!
+Not much atmosphere, mind.
lprtc@Totoro:planets$ git commit -m "Climate issues"
[master 43faba5] Climate issues
1 file changed, 1 insertion(+)
lprtc@Totoro:planets$ git log
commit 43faba5250cf67208f16e94f143a270f584a2e1b
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:27:29 2016 +0000
    Climate issues
commit ea59e9169633eb7f9083ee79c2cc7ebf20efaf98
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:18:55 2016 +0000
    Lycanthropy concerns
commit d22195b9ec3c8fb4c2ce0f52f344b95ce5d0d0e3
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:05:57 2016 +0000
    Start notes on Mars as a base
lprtc@Totoro:planets$ git status
# On branch master
nothing to commit, working directory clean
```

SLIDE (Challenge 1)

Solution:

```
lprtc@Totoro:planets$ nano mars.txt
lprtc@Totoro:planets$ cat mars.txt
Cold and dry. Everything a nice colour. Matt Damon.
Two moons. This may be an issue for werewolves!
Not much atmosphere, mind.
A bit dusty. Bring a Hoover.
lprtc@Totoro:planets$ nano earth.txt
```

```

lpritch@Totoro:planets$ cat earth.txt
Mostly harmless
lpritch@Totoro:planets$ 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:   mars.txt
#
# Untracked files:
#   (use "git add <file>..." to include in what will be committed)
#
#   earth.txt
no changes added to commit (use "git add" and/or "git commit -a")
lpritch@Totoro:planets$ git add mars.txt
lpritch@Totoro:planets$ git add earth.txt
lpritch@Totoro:planets$ git status
# On branch master
# Changes to be committed:
#   (use "git reset HEAD <file>..." to unstage)
#
#   new file:   earth.txt
#   modified:   mars.txt
#
lpritch@Totoro:planets$ git commit -m "Hoover needed. Ignore Earth."
[master 1f4de17] Hoover needed. Ignore Earth.
 2 files changed, 2 insertions(+)
 create mode 100644 earth.txt
lpritch@Totoro:planets$ git status
# On branch master
nothing to commit, working directory clean
lpritch@Totoro:planets$ git log
commit 1f4de176dc72c3ba0746e9e6a33b39f8f7e9fd75
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:34:09 2016 +0000
    Hoover needed. Ignore Earth.
commit 43faba5250cf67208f16e94f143a270f584a2e1b
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:27:29 2016 +0000
    Climate issues
commit ea59e9169633eb7f9083ee79c2cc7ebf20efaf98
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:18:55 2016 +0000
    Lycanthropy concerns
commit d22195b9ec3c8fb4c2ce0f52f344b95ce5d0d0e3
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:05:57 2016 +0000
    Start notes on Mars as a base

```

Exploring history

SLIDE (Exploring history)

SLIDE (Learning objectives)

- Talk around slide

SLIDE (Commit history)

- Talk around slide

SLIDE (History with `git diff`)

- Talk around slide
- **See differences between named commits**

```
lpritch@Totoro:planets$ git diff HEAD~1 mars.txt
```

```
diff --git a/mars.txt b/mars.txt
index 919cb89..dfd5875 100644
--- a/mars.txt
+++ b/mars.txt
@@ -1,3 +1,4 @@
Cold and dry. Everything a nice colour. Matt Damon.
Two moons. This may be an issue for werewolves!
Not much atmosphere, mind.
+A bit dusty. Bring a Hoover.
lpritch@Totoro:planets$ git diff HEAD~2 mars.txt
diff --git a/mars.txt b/mars.txt
index 96b2def..dfd5875 100644
--- a/mars.txt
+++ b/mars.txt
@@ -1,2 +1,4 @@
Cold and dry. Everything a nice colour. Matt Damon.
Two moons. This may be an issue for werewolves!
+Not much atmosphere, mind.
+A bit dusty. Bring a Hoover.
```

SLIDE (History with commit IDs)

- Talk around slide
- **Get IDs with `git log`**
 - Use a long ID in same way as above
 - We don't want to have to type out 40char IDs all the time
 - Use two short IDs (different lengths)

```
lpritch@Totoro:planets$ git log
commit 1f4de176dc72c3ba0746e9e6a33b39f8f7e9fd75
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:34:09 2016 +0000
    Hoover needed. Ignore Earth.
commit 43faba5250cf67208f16e94f143a270f584a2e1b
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:27:29 2016 +0000
    Climate issues
commit ea59e9169633eb7f9083ee79c2cc7ebf20efaf98
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:18:55 2016 +0000
    Lycanthropy concerns
commit d22195b9ec3c8fb4c2ce0f52f344b95ce5d0d0e3
Author: Leighton Pritchard <leighton.pritchard@hutton.ac.uk>
Date:   Fri Jan 8 16:05:57 2016 +0000
    Start notes on Mars as a base
lpritch@Totoro:planets$ git diff d22195b9ec3c8fb4c2ce0f52f344b95ce5d0d0e3 mars.txt
diff --git a/mars.txt b/mars.txt
index 87b4a99..dfd5875 100644
--- a/mars.txt
+++ b/mars.txt
@@ -1,2 +1,4 @@
Cold and dry. Everything a nice colour. Matt Damon.
-
+Two moons. This may be an issue for werewolves!
+Not much atmosphere, mind.
+A bit dusty. Bring a Hoover.
lpritch@Totoro:planets$ git diff d221 mars.txt
diff --git a/mars.txt b/mars.txt
index 87b4a99..dfd5875 100644
--- a/mars.txt
+++ b/mars.txt
@@ -1,2 +1,4 @@
Cold and dry. Everything a nice colour. Matt Damon.
-
+Two moons. This may be an issue for werewolves!
+Not much atmosphere, mind.
+A bit dusty. Bring a Hoover.
lpritch@Totoro:planets$ git diff 43faba mars.txt
```



```
diff --git a/mars.txt b/mars.txt
index 919cb89..dfd5875 100644
--- a/mars.txt
+++ b/mars.txt
@@ -1,3 +1,4 @@
 Cold and dry. Everything a nice colour. Matt Damon.
 Two moons. This may be an issue for werewolves!
 Not much atmosphere, mind.
+A bit dusty. Bring a Hoover.
```

Restoring older versions

SLIDE (Restoring older versions)

- Talk around slide
- **Accidentally overwrite a file**
 - Once overwritten, `git status` says the changes were made, but not staged.

```
lprtc@Totoro:planets$ nano mars.txt
lprtc@Totoro:planets$ cat mars.txt
POTATOES!
lprtc@Totoro:planets$ 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:   mars.txt
#
no changes added to commit (use "git add" and/or "git commit -a")
```

- **Restore the last commit**
 - Use `git checkout HEAD`

```
lprtc@Totoro:planets$ git checkout HEAD mars.txt
lprtc@Totoro:planets$ cat mars.txt
Cold and dry. Everything a nice colour. Matt Damon.
Two moons. This may be an issue for werewolves!
Not much atmosphere, mind.
A bit dusty. Bring a Hoover.
```

SLIDE (`git checkout`)

- Talk around slide

SLIDE (Question)

Solution: 2 & 4

Ignoring things

SLIDE (Ignoring things)

SLIDE (Learning objectives)

- Talk around slide

SLIDE (Not all files are useful)

- Talk around slide
- **Create dummy files**

- Create dummy files and subdirectory
- These files are no use to us
- `git` says they're not being tracked

```
lprtc@Totoro:planets$ mkdir results
lprtc@Totoro:planets$ touch a.dat b.dat c.dat results/a.out results/b.out
lprtc@Totoro:planets$ ls
a.dat      b.dat      c.dat      earth.txt  mars.txt   results/
lprtc@Totoro:planets$ ls results/
a.out  b.out
lprtc@Totoro:planets$ git status
# On branch master
# Untracked files:
#   (use "git add <file>..." to include in what will be committed)
#
#   a.dat
#   b.dat
#   c.dat
#   results/
nothing added to commit but untracked files present (use "git add" to track)
```

SLIDE (.gitignore)

- Talk around slide
- **Create .gitignore file**
 - Two patterns: `*.dat` , `results/` (all files below this point)
 - `git` now ignores the new files, but notices `.gitignore`

```
lprtc@Totoro:planets$ nano .gitignore
lprtc@Totoro:planets$ cat .gitignore
# Exclude all files ending in .dat
*.dat
# Exclude all files below results/
results/
lprtc@Totoro:planets$ git status
# On branch master
# 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)
```

- **Commit .gitignore**

```
lprtc@Totoro:planets$ git add .gitignore
lprtc@Totoro:planets$ git commit -m "Added .gitignore file"
[master f0232b1] Added .gitignore file
1 file changed, 5 insertions(+)
create mode 100644 .gitignore
lprtc@Totoro:planets$ git status
# On branch master
nothing to commit, working directory clean
```

- **List ignored files**

```
lprtc@Totoro:planets$ git status --ignored
# On branch master
# Ignored files:
#   (use "git add -f <file>..." to include in what will be committed)
#
#   a.dat
#   b.dat
#   c.dat
#   results/
```

nothing to commit, working directory clean

- **Add an ignored file**

- `git` will refuse
- Can override with `-f`, `--force`

```
lpriti@Totoro:planets$ git add b.dat
The following paths are ignored by one of your .gitignore files:
b.dat
Use -f if you really want to add them.
fatal: no files added
```

Remotes in GitHub

SLIDE (Remotes in GitHub)

SLIDE (Learning objectives)

- Talk around slide

Remote repositories

SLIDE (Remote repositories)

- Talk around slide

SLIDE (Log in to GitHub)

- Talk around slide

SLIDE (Create a remote repository)

- **Create new repository**

- `+(create new) -> New Repository`
- Repository name: `planets`
- Create repository
- We then see a page of quick setup hints

SLIDE (A freshly-made GitHub repository)

- Talk around slide

SLIDE (Connecting local and remote repositories)

- Talk around slide

- **Get remote repository URL**

- Copy the `https://` link
- Add the remote repository (`git remote add origin`)
- Check it worked (`git remote -v`)

```
lpriti@Totoro:planets$ git remote add origin https://github.com/widdowquinn/planets.git
lpriti@Totoro:planets$ git remote -v
origin https://github.com/widdowquinn/planets.git (fetch)
origin https://github.com/widdowquinn/planets.git (push)
```

- **Push to remote repo**

- `master` refers to the *branch* we're on

```
lpriti@Totoro:planets$ git push origin master
Username for 'https://github.com': widdowquinn
```

```
Password for 'https://widdowquinn@github.com':
Counting objects: 16, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (12/12), done.
Writing objects: 100% (16/16), 1.48 KiB | 0 bytes/s, done.
Total 16 (delta 2), reused 0 (delta 0)
To https://github.com/widdowquinn/planets.git
* [new branch]      master -> master
```

SLIDE (Remote GitHub repo after first push)

- Talk around slide

SLIDE (My first remote *pull*)

- Talk around slide
- **Pull from remote repo**
 - `git` confirms we're up to date

```
lprtc@Totoro:planets$ git pull origin master
From https://github.com/widdowquinn/planets
* branch      master      -> FETCH_HEAD
Already up-to-date.
```

GitHub collaboration

SLIDE (GitHub collaboration)

SLIDE (Learning objectives)

- Talk around slide

SLIDE (Starting a collaboration)

- **Pair off learners**
- **Demonstrate giving a colleague access**
 - Settings -> Collaborators - add your partner's username/ID
 - `cd` to a new directory (e.g. `tmp/`)
 - clone *your colleague's* repo
 - Check the remote repo location with `git remote -v`

```
lprtc@Totoro:planets$ cd /tmp/
lprtc@Totoro:tmp$ git clone https://github.com/widdowquinn/planets.git
Cloning into 'planets'...
remote: Counting objects: 16, done.
remote: Compressing objects: 100% (10/10), done.
remote: Total 16 (delta 2), reused 16 (delta 2), pack-reused 0
Unpacking objects: 100% (16/16), done.
Checking connectivity... done
lprtc@Totoro:tmp$ ls planets/
earth.txt  mars.txt
lprtc@Totoro:planets$ git remote -v
origin  https://github.com/widdowquinn/planets.git (fetch)
origin  https://github.com/widdowquinn/planets.git (push)
```

SLIDE (Make a collaborative change)

- Talk around slide
- **Make a new file**

```
lprtc@Totoro:tmp$ cd planets
lprtc@Totoro:planets$ nano pluto.txt
lprtc@Totoro:planets$ cat pluto.txt
Never a planet. Lovely, but not a planet.
```

- **Commit the file**

```
lprtc@Totoro:planets$ git add pluto.txt
lprtc@Totoro:planets$ git commit -m "Notes on Pluto"
[master 4907645] Notes on Pluto
1 file changed, 1 insertion(+)
create mode 100644 pluto.txt
```

- **Push the change to GitHub**

```
lprtc@Totoro:planets$ git push origin master
Username for 'https://github.com': widdowquinn
Password for 'https://widdowquinn@github.com':
Counting objects: 4, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 316 bytes | 0 bytes/s, done.
Total 3 (delta 1), reused 0 (delta 0)
To https://github.com/widdowquinn/planets.git
f0232b1..4907645 master -> master
```

- **View the change on your own GitHub repo as *host***
 - Talk through changes on GitHub

SLIDE (Pull a collaborator's changes)

- Talk around slide
- **Pull the new change to your repository as host**
 - Change directory to your host repository
 - Check it's the right one with `git remote -v`
 - `git status` does not show remote changes
 - Sync with `git pull`

```
lprtc@Totoro:planets$ cd ~/planets/
lprtc@Totoro:planets$ git remote -v
origin https://github.com/widdowquinn/planets.git (fetch)
origin https://github.com/widdowquinn/planets.git (push)
lprtc@Totoro:planets$ git status
# On branch master
nothing to commit, working directory clean
lprtc@Totoro:planets$ git pull origin master
From https://github.com/widdowquinn/planets
* branch          master       -> FETCH_HEAD
Updating f0232b1..4907645
Fast-forward
 pluto.txt | 1 +
1 file changed, 1 insertion(+)
create mode 100644 pluto.txt
```

Resolving git conflicts

SLIDE (Resolving git conflicts)

SLIDE (Learning objectives)

- Talk around slide

SLIDE (Why conflicts occur)

- Talk around slide
- **git encourages ways of working**
 - modular structure - small files (reusability)
 - small, incremental changes (reproducibility)
 - good planning
 - interaction/communication

Creating a conflict

SLIDE (Let's make a conflict)

- Talk around the slide
- **Create the host conflict**
 - Check you're in the right repo
 - Add a line to `mars.txt`
 - Commit and push

```
lprtc@Totoro:planets$ git remote -v
origin  https://github.com/widdowquinn/planets.git (fetch)
origin  https://github.com/widdowquinn/planets.git (push)
lprtc@Totoro:planets$ nano mars.txt
lprtc@Totoro:planets$ git add mars.txt
lprtc@Totoro:planets$ git commit -m "Slandering Pluto"
[master d83cb5a] Slandering Pluto
 1 file changed, 1 insertion(+)
lprtc@Totoro:planets$ git push origin master
Username for 'https://github.com': widdowquinn
Password for 'https://widdowquinn@github.com':
Counting objects: 5, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 341 bytes | 0 bytes/s, done.
Total 3 (delta 2), reused 0 (delta 0)
To https://github.com/widdowquinn/planets.git
 4907645..d83cb5a  master -> master
```

- **Create the collaborator conflict**
 - Change to collaborator repo
 - Check with `git remote -v`
 - Add a line to `mars.txt`
 - Commit the change

```
lprtc@Totoro:planets$ git remote -v
origin  https://github.com/widdowquinn/planets.git (fetch)
origin  https://github.com/widdowquinn/planets.git (push)
lprtc@Totoro:planets$ cd /tmp/planets/
lprtc@Totoro:planets$ nano mars.txt
lprtc@Totoro:planets$ git add mars.txt
lprtc@Totoro:planets$ git commit -m "Praising Pluto"
[master 60f892f] Praising Pluto
 1 file changed, 1 insertion(+)
```

- **Push the change**
 - This should raise a conflict!

```
lprtc@Totoro:planets$ git push origin master
Username for 'https://github.com': widdowquinn
Password for 'https://widdowquinn@github.com':
```

```
To https://github.com/widdowquinn/planets.git
! [rejected]        master -> master (fetch first)
error: failed to push some refs to 'https://github.com/widdowquinn/planets.git'
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.
```

SLIDE (The conflict message)

- Talk around the slide

SLIDE (The conflicting changes)

- Talk around the slide

Resolving a conflict

SLIDE (Resolving a conflict)

- Talk around slide
- **Pull the remote changes**
 - `git` tries to merge automatically, and will if it can
 - If not, it marks the conflict in the affected file

```
lprtc@Totoro:planets$ git pull origin master
remote: Counting objects: 3, done.
remote: Compressing objects: 100% (1/1), done.
remote: Total 3 (delta 2), reused 3 (delta 2), pack-reused 0
Unpacking objects: 100% (3/3), done.
From https://github.com/widdowquinn/planets
 * branch            master      -> FETCH_HEAD
  4907645..d83cb5a   master      -> origin/master
Auto-merging mars.txt
CONFLICT (content): Merge conflict in mars.txt
Automatic merge failed; fix conflicts and then commit the result.
```

- **Explain conflict syntax**
 - The local change in `HEAD` is preceded by `<<<<<<`
 - Then there's a separator
 - Then the remote change, followed by `>>>>>>`
 - We have to decide which change to keep (if either)

```
lprtc@Totoro:planets$ cat mars.txt
Cold and dry. Everything a nice colour. Matt Damon.
Two moons. This may be an issue for werewolves!
Not much atmosphere, mind.
A bit dusty. Bring a Hoover.
<<<<<< HEAD
I wish Pluto was a planet, like this one.
=====
But at least it's a planet, unlike Pluto.
>>>>>> d83cb5a5ef115c4718a685121182c27a874143a8
```

- **Edit the file to resolve the change**
 - Until you add/commit, `git status` will warn about "unmerged paths"

```
lprtc@Totoro:planets$ nano mars.txt
lprtc@Totoro:planets$ cat mars.txt
Cold and dry. Everything a nice colour. Matt Damon.
Two moons. This may be an issue for werewolves!
```

```

Not much atmosphere, mind.
A bit dusty. Bring a Hoover.
But at least it's a planet, unlike Pluto. Which is definitely interesting.
lprtc@Totoro:planets$ git status
# On branch master
# Your branch and 'origin/master' have diverged,
# and have 1 and 1 different commit each, respectively.
# (use "git pull" to merge the remote branch into yours)
#
# You have unmerged paths.
# (fix conflicts and run "git commit")
#
# Unmerged paths:
# (use "git add <file>..." to mark resolution)
#
# both modified:      mars.txt
#
no changes added to commit (use "git add" and/or "git commit -a")

```

• Add and commit, then push

```

lprtc@Totoro:planets$ git add mars.txt
lprtc@Totoro:planets$ git commit -m "merged changes from GitHub"
[master 665ed3f] merged changes from GitHub
lprtc@Totoro:planets$ git status
# On branch master
# Your branch is ahead of 'origin/master' by 2 commits.
# (use "git push" to publish your local commits)
#
nothing to commit, working directory clean
lprtc@Totoro:planets$ git push origin master
Username for 'https://github.com': widdowquinn
Password for 'https://widdowquinn@github.com':
Counting objects: 10, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (6/6), done.
Writing objects: 100% (6/6), 671 bytes | 0 bytes/s, done.
Total 6 (delta 4), reused 0 (delta 0)
To https://github.com/widdowquinn/planets.git
d83cb5a..665ed3f master -> master

```

• Change back to your host repo, and pull

- Check with `git remote -v`
- The conflict is resolved

```

lprtc@Totoro:planets$ cd ~/planets/
lprtc@Totoro:planets$ git remote -v
origin https://github.com/widdowquinn/planets.git (fetch)
origin https://github.com/widdowquinn/planets.git (push)
lprtc@Totoro:planets$ git pull origin master
remote: Counting objects: 6, done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 6 (delta 4), reused 6 (delta 4), pack-reused 0
Unpacking objects: 100% (6/6), done.
From https://github.com/widdowquinn/planets
* branch      master      -> FETCH_HEAD
d83cb5a..665ed3f master    -> origin/master
Updating d83cb5a..665ed3f
Fast-forward
 mars.txt | 2 +-
 1 file changed, 1 insertion(+), 1 deletion(-)
lprtc@Totoro:planets$ cat mars.txt
Cold and dry. Everything a nice colour. Matt Damon.
Two moons. This may be an issue for werewolves!
Not much atmosphere, mind.
A bit dusty. Bring a Hoover.
But at least it's a planet, unlike Pluto. Which is definitely interesting.

```


Wrapping up

- Talk around slide

