

Revision control

Introduction to **git**

Waterford Institute of Technology

September 23, 2016

John Fitzgerald

Presentation outline

Estimated duration presentation

Questions at end presentation

Topics discussed:

- Introduction to Git
- Git commandline
- Git GUIs
- Git on the server
- Basic commands
- How to manage sole-developer project
- Commit logs
- Tags
- One approach to learning Git

Revision control

What is it?

Also known as

- version control
- source control

Application to keep track of changes to file system

- your BlueJ projects
 - single developer
 - code on single machine
- managing app development
 - large developer team
 - same code base on multiple machines

Where's my file?



Revision control

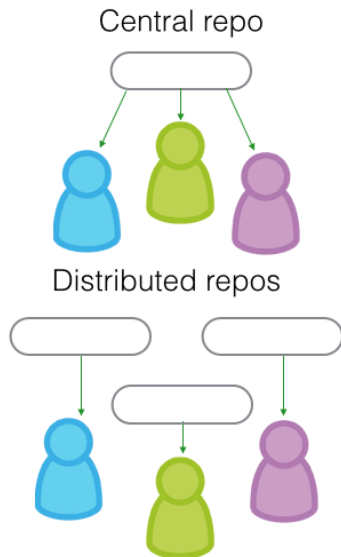
Centralized v Distributed

Centralized

- single data store, the repository
- files checked in and out
- checked-out files locked
- merging files non-trivial

Distributed

- no central repo
- each developer has copy
- merging files easier



Distributed Versioning Application

Git

Initially designed & developed by
Linus Torvalds

- Became available 2005
- Supported by large developer community
- Free open source
- Extremely popular
- April 2014: 37% repos use *git*



git for the true beginner

For a single-developer team

This presentation and accompanying lab designed for beginner

- Using command line git.
- Several GUIs exist (ignored).
 - Egit for Eclipse
 - SourceTree
 - GitHub

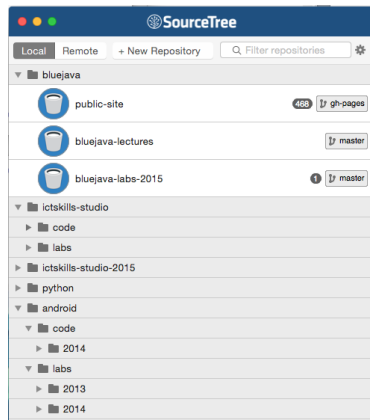


Developing with *git*

Graphical User Interfaces (gui)

Atlassian SourceTree

- Free Git client for Windows & Mac
- Helps organise your repos
 - Say goodbye to cli
 - Or use combination gui-cli



Developing with *git*

Graphical User Interfaces (gui)

GitHub

- Free Git client for Windows & Mac
- Manages repositories
- SourceTree competitor



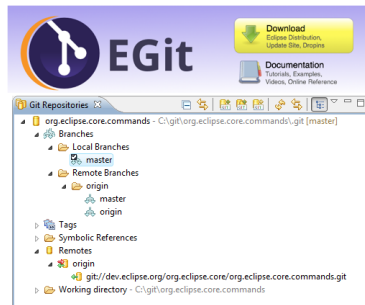
GitHub

Developing with git

Graphical User Interfaces (gui)

EGit: an Eclipse git gui plugin

- Free Git client for Eclipse IDE



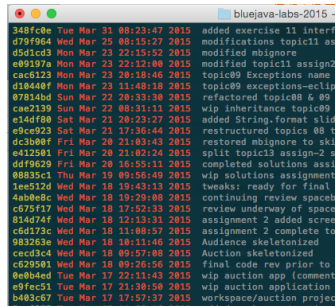
git for the true beginner

Using command line git

Why command line line *git*?

Why not begin with a git gui?

- Acquire deeper understanding
- Easier to learn
- Start with small set commands
- Follow simple procedure initially
- Gradually extend knowledge
- Beware: steep learning curve
- Fallback recommended



A screenshot of a terminal window titled "bluejava-labs-2015 -". The terminal displays a list of git commit messages, each preceded by a commit hash, a date, and a time. The messages include "added exercise 11 interf", "modifications topic11 as", "modified mbignore", "modified topic11 assign2", "topic09 Exceptions name", "topic09 exceptions-eclip", "refactored topic08 & 09", "wip inheritance topic09", "added String.format slid", "restructured topics 08 t", "restored mbignore to skl", "split topic13 assign-2 s", "completed solutions assi", "wip solutions assignment", "tweaks: ready for final", "continuing review spaceb", "review underway of space", "assignment 2 added scre", "assignment 2 complete to", "Audience skeletonized", "Auction skeletonized", "final code rev prior to", "wip auction app (comment", "wip auction application", and "workspace/auction projec".

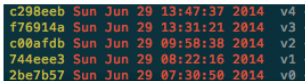
Keeping track of changes

Homespun approach

- Create archives during dev cycle
- Apply time stamp & version
- Cumbersome but effective
- Also provides fallback
- Disadvantage: File proliferation
- Contrast *git*: One file



A screenshot of a file explorer window showing a directory of zip files. The files are listed in a single column, each preceded by a small folder icon. The filenames are: donation-201503.01.zip, donation-201503.02.zip, donation-201503.03.zip, donation-201504.01.zip, donation-201504.02.zip, donation-201505.01.zip, and donation-201506.01.zip.



A screenshot of a terminal window displaying a list of git commits. Each line shows a commit hash, the date and time, and the version number. The commits are: c298eeb (Sun Jun 29 13:47:37 2014 v4), f76914a (Sun Jun 29 13:31:21 2014 v3), c00afdb (Sun Jun 29 09:58:38 2014 v2), 744eee3 (Sun Jun 29 08:22:16 2014 v1), and 2be7b57 (Sun Jun 29 07:30:50 2014 v0).

Using *git* from command line

Summary

Associated lab provides detailed instructions on what follows.

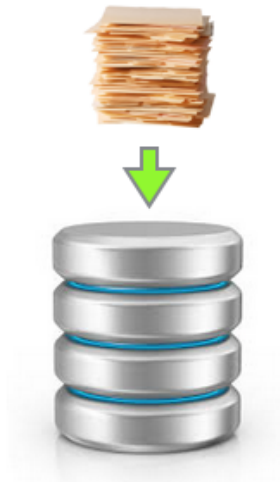
- Download and install *git* app
- *cd* to project folder
- create local repo
 - *git init*
 - created in folder *.git*
- create a *.gitignore* file
 - exclude nominated files



Using *git* from command line

Add project to local repo

- stage project
 - `git add -all`
- commit the staged files to repo
 - `git commit -m 'baseline project'`
- copy project now in local repo



BitBucket.org

Push project to remote repo

Register an account & create a repo, example *donation*

In your project folder execute:

```
git remote add origin git@bitbucket.org:<yourdomain>/donation.git  
git push -u origin -all
```

Response should be similar to this:

```
$ git push -u origin --all  
Counting objects: 3, done.  
Writing objects: 100% (3/3), 217 bytes | 0 bytes/s, done.  
Total 3 (delta 0), reused 0 (delta 0)  
To git@bitbucket.org:<yourdomain>/donation.git  
 * [new branch]      master -> master  
Branch master set up to track remote branch master from origin.
```

BitBucket.org

Clone the remote repo

Exact copy of repo now exists on BitBucket

Verify this as follows:

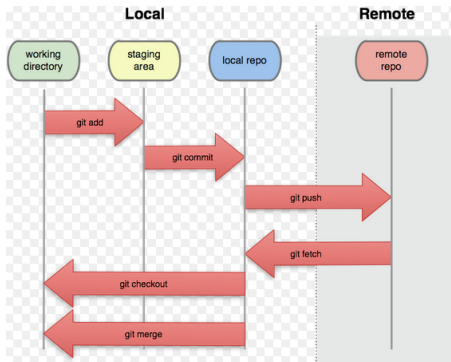
- cd to a new temp folder
- Clone the repo
- Check content of cloned folder
- Should match pushed *donation* project
- Try exercise on different computer

```
$ git clone git@bitbucket.org:<yourdomain>/donation.git
Cloning into 'donation'...
remote: Counting objects: 351, done.
remote: Compressing objects: 100% (324/324), done.
remote: Total 351 (delta 136), reused 0 (delta 0)
Receiving objects: 100% (351/351), 1000.35 KiB | 120.00 KiB/s, done.
Resolving deltas: 100% (136/136), done.
Checking connectivity... done.
```

Developing with *git*

Frequently-used commands

- `git status`
- `git commit`
- `git push`
- `git pull`
- `git log`



Developing with *git*: a simplified approach

First session

- Create local repo
- Stage and commit file system
- Create remote repo
- Push local to remote
- Ensure working directory clean at end session

```
$ git status
On branch master
Your branch is up-to-date with 'origin/master'.
nothing to commit, working directory clean
```

Developing with *git*: a simplified approach

Resuming session

- cd to working folder
- git status to verify working directory clean
- git pull to update working tree
- Continue dev session
- At conclusion session add, commit and push to remote

```
$ git push origin master
Counting objects: 9, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (8/8), done.
Writing objects: 100% (9/9), 126.26 KiB | 0 bytes/s, done.
Total 9 (delta 4), reused 0 (delta 0)
To git@bitbucket.org:witpress/donation.git
11f8391..b99ee02 master -> master
```

Developing with *git*: a simplified approach

Check logs

- Basic command *git log*
- More sophisticated formatting available:

```
git log --pretty=oneline --max-count=10
```

```
d5d1cd3771f59a01b7bff67b962f33efe97a41a0 modified mbignore  
e09197ab28989686f4ecedff277eee2df7727993 modified topic11 assign2  
d10440fa3da18ec536771a687939461c2ebeaaa1 topic09 exceptions-eclipse lab  
07814bd0608c1ed8ee1d328535cdf9ff180f7cb5 refactored topic08 & 09 done
```

```
git log --pretty=format:'%C(yellow)%h %Cred%ad %Creset%s' --date=local
```

```
d5d1cd3 Mon Mar 23 22:15:52 2015 modified mbignore  
e09197a Mon Mar 23 22:12:00 2015 modified topic11 assign2  
cd10440f Mon Mar 23 11:48:18 2015 topic09 exceptions-eclipse lab  
07814bd Sun Mar 22 20:33:30 2015 refactored topic08 & 09
```

Developing with *git*: a simplified approach

Tags

Tags may be used to denote specific points in the project history

- List tags: *git tag*
- List tags + messages: *git tag -n*
- Add local tag: *git tag -a tagName -m 'message'*
- Push tags to remote: *git push -tags*
- Add tag to specific commit: *git tag -a v0 ecc947 -m "message"*
- Delete tag locally: *git tag -d tagName*
- Then from remote repo: *git push origin :refs/tags/tagName*
- List remote tags: *git ls-remote*

Developing with *git*: a simplified approach

Checkout earlier commit

- Using tag
 - `git checkout tagName`
- Using hash
 - `git checkout cd10440f`
- Roll back to last commit
 - `git checkout -f`

```
git checkout cd10440f
```

d5d1cd3	Mon Mar 23 22:15:
e09197a	Mon Mar 23 22:12:
cd10440f	Mon Mar 23 11:48:
07814bd	Sun Mar 22 20:33:

Developing with *git*: a simplified approach

Disaster recovery: scenario 1

Roll back to an archived version - the fallback.

- Unarchive the backup
- Delete all files and folders from working tree
 - Exceptions: `.git` folder & `.gitignore`
- Copy backup to working folder
- Add all, commit and push



Developing with *git*: a simplified approach

Disaster recovery: scenario 2

Roll back to an earlier commit

- Checkout the commit you wish to revert to
- Copy the working tree to a recovery folder
 - Do not copy .git folder
- *git checkout master*
- Delete contents working tree
 - Do not delete .git folder
- Copy backup to working folder
- Add all, commit and push



GitHub

Clone the programming course repo

GitHub a competitor to BitBucket

Private repos free on BitBucket

Public repos free on GitHub

Programming course hosted on GitHub in public repo

```
git clone https://github.com/usplitu/programming.git
Cloning into 'programming'...
remote: Counting objects: 1814, done.
Receiving objects: 11% (211/1814), 4.52 MiB | 229.00 KiB/s
```


There may be trouble ahead...
So use zip files as fallback
Until competence acquired
Else you'll be obliged to face the music
And have teardrops to shed

- donation_20150331.01.zip
- time stamp + daily version



- This has been very brief intro
 - Sufficient for one-person development
- Steep learning curve
 - Use continuously
 - Be prepared for hiccups
 - Have file retrieval plan
 - Learn by doing

Summary basic Git commands

- `git init`
- `git remote add origin <host><domain><reponame>.git`
- `git add .`
- `git commit -m <commit message>`
- `git status`
- `git push`
- `git pull`
- `git log // Use customized pretty printing`
- `git checkout -f // Overwrite sandbox changes`
- `git tag`

Summary

- Git introduction
 - Background
 - Alternative systems
 - Commandline
 - GUIs
- Getting started
 - Initialize local repository
 - Add files
 - Commit
 - Add tags
 - Print commit logs
 - Push to server
 - Pull to update local repo
- One approach to learning Git
 - Adopt transitional approach
 - Back up iterations as local archives
 - Anticipate disasters
 - Practice recovery

Referenced Material

1. Pro Git by Scott Chacon & Ben Straub

<https://git-scm.com/book/en/v2> [Accessed 2016-04-27]