Version Control and Issue Tracking (with thanks to James Hetherington, UCL RC)

- Managing code inventory
  - “When did I introduce this bug?”
  - Undoing mistakes
- Working with other programmers
  - How can I merge my work with Jim’s?
- What’s the most important bug to fix next?

What is version control? (Solo version)

- Do some programming
- `> my_vcs commit`
- Program some more
  - Realise mistake
- `> my_vcs rollback`
  - Mistake is undone

Syntax here is example only!

What is version control? (team version)

Sue

- Create some code
- `> my_vcs commit`
- …wait…
- …wait…
- …wait…
- …wait…
- `>my_vcs update`
- Do some programming
- … program some more
- `> my_vcs commit`
  - Oh Noes! Error message!
- `> my_vcs update`
- `> my_vcs merge`
- `> my_vcs commit`
- More programming…

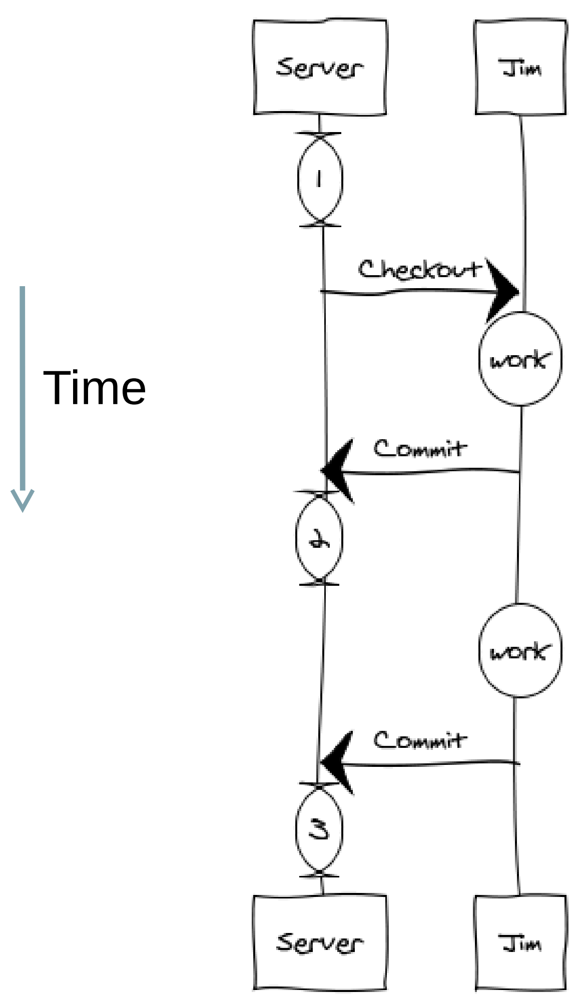
Jim

- … wait …
- … wait …
- Join the team
- `> my_vcs checkout`
- do some programming
- `> my_vcs commit`
- Do some programming
- … more programming…
- `> my_vcs commit`
- … more programming …
- … more programming …
- … more programming …
- … more programming …
- … more programming …
- `> my_vcs commit`
  - Error again…

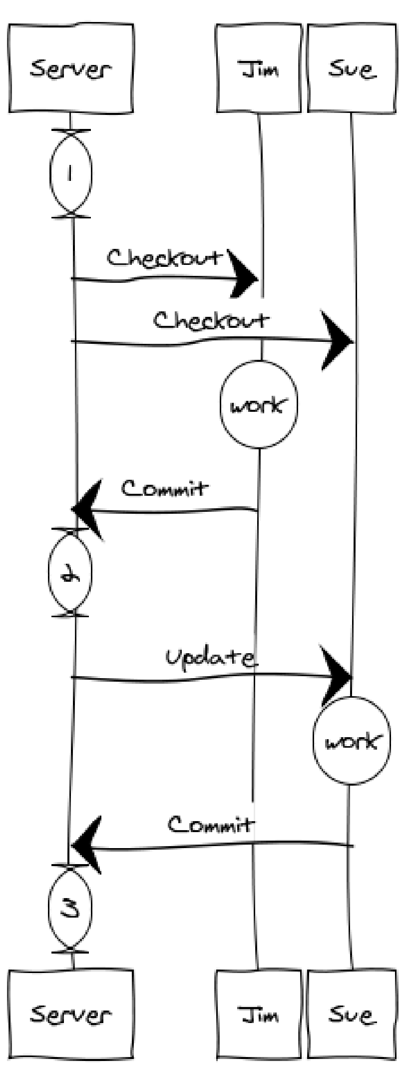
Centralised VCS concepts

- There is one, linear history of changes on the server or **repository**
    - Each revision has a unique identifier
- You have a **working copy**
- You **update** the working copy to match the state of the repository
- You **commit** your changes to the repository
- If you someone else has changed it you have to **resolve conflicts** between your changes and the repository, and then commit

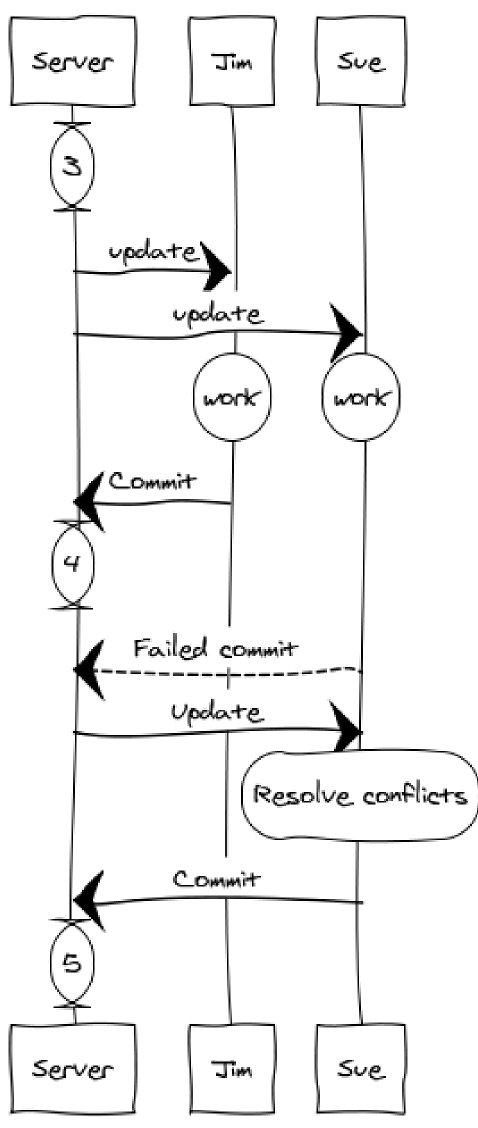
Centralised VCS solo workflow



Centralised VCS Team workflow: no conflicts



Centralised VCS with conflicts



Distributed and Centralized Version Control

- Centralized:
  - Some server contains the remote version
  - Your computer has your copy
  - To switch back to an old copy you need the internet
  - E.g. cvs, subversion (**svn**)
- Distributed:
  - Every user has a version of the full history
  - Users can synchronize their history with each other
  - Having a central “master” copy is a policy option
  - Most groups do this
  - E.g. **git**, mercurial (hg), bazaar (bzr)

Pragmatic distributed VCS

Git

```
git clone git@github.com:ucl/mycode.git

git commit -a
git push

git pull

git status

git diff
```

Local

Remote

working directory

staging area

local repo

remote repo

git add

git commit -a

git com

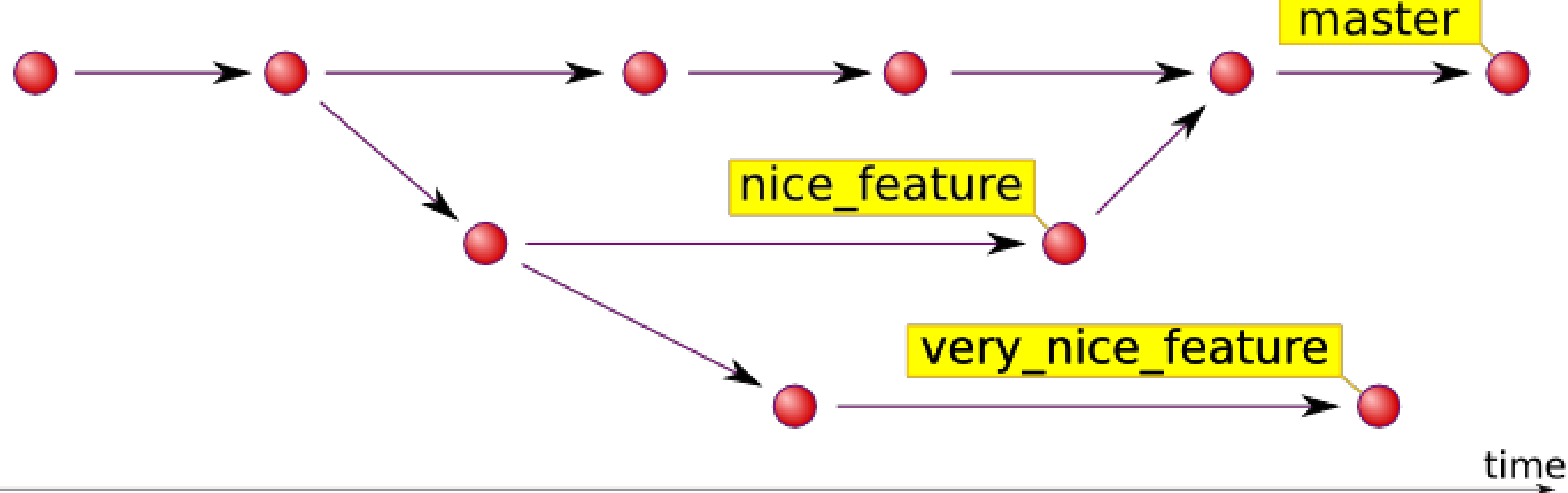
git push

git fetch

git checkout

git merge

Working with branches



Working with branches in git

```
> git branch
  * master
> git checkout -b experiment
> git branch
  master
  * experiment
```

Sharing branches in git

```
git push origin experiment
```

publish the branch to remote

```
git push -u origin experiment
```

publish the branch to remote(first time)

```
git checkout origin/experiment
```

get a new branch from a remote

Merging and deleting branches

`git checkout master`

switch back to master branch

`git merge experiment`

take all the changes from experiment into master

exactly like merging someone else's work

`git branch -d experiment`

the experiment is done, get rid of local branch

`git push --delete experiment`

git rid of the branch on the remote

Working with branches

- You should have a development branch and a stable branch
- You should create temporary branches for experimental changes
- If you release code to others, you should make a release branch
  - Then you can make fixes to bugs they find
  - And control which of your work goes in the release

Tag
0.1

Author: Vincent Driessen
Original blog post: http://nvie.com/archives/323
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master

hotfixes

release
branches

Incorporate
bugfix in
develop

develop

Major
feature for
next
release

feature
branches

Time

Tagging

- You should tag working versions
- You should produce real science only with specific tagged versions, and note which one

Tagging

`git tag v1.3`

add a tag, labelling last commit

`git tag v1.3 ab48dc`

tag an old commit

`git push --tags`

publish the tags to origin

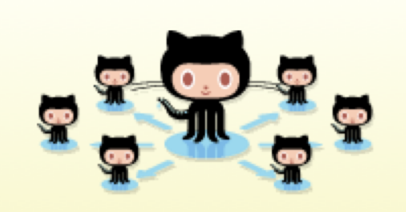
Working with GitHub

GitHub Bootcamp If you are still new to things, we've provided a few walkthroughs to get you started.

Set Up Git
A quick guide to help you get started with Git.

Create A Repository
Create the place where your commits will be stored.

Fork a Repository
Copy a repo to create a new, unique project from its contents.



Be social
Follow a friend.
Watch a project.

Set up ssh keys

SSH Keys — Add SSH key

Key	
jamespjh@plinian (ce:f6:e2:64:22:15:75:66:43:f5:66:5b:63:18:f6:37)	Delete
GitHub for Mac - szilard (0d:f3:58:37:b9:a7:3d:50:a8:c1:b7:50:51:41:3b:93)	Delete
jamespjh@szilard (d1:81:7e:58:16:30:00:50:33:1e:76:f1:57:29:dd:39)	Delete

Add an SSH Key

Title

Key

Add key

Match case

Create repository

Owner **Repository name**

PUBLIC jamespjh / example

Great repository names are short and memorable. Need inspiration? How about **cloaked-nemesis**.

Description (optional)

Public
Anyone can see this repository. You choose who can commit.

Private
You choose who can see and commit to this repository.

Initialize this repository with a README
This will allow you to `git clone` the repository immediately.

Add .gitignore: **None**

Create repository

Conclusions

- Tools can make your development easier, safer, more reliable, more correct, and more collaborative
- They can be complicated and take time to learn
- Learn by practicing
  - Use the tools
  - Pick an open source project on github or bitbucket and start contributing

http://git-scm.com/book/

http://svnbook.red-bean.com/

Key commands

- git clone git@github.com:*username/repo.git*
- git add *filename*
- git commit -a -m “*message*”
- git push
- git pull
- git checkout -b *branchname*
- git push -u origin *branchname*
- git checkout *branchname*
- git merge *branchname*