Seminar: Search and Optimization

4. An Introduction to Revision Control with Mercurial

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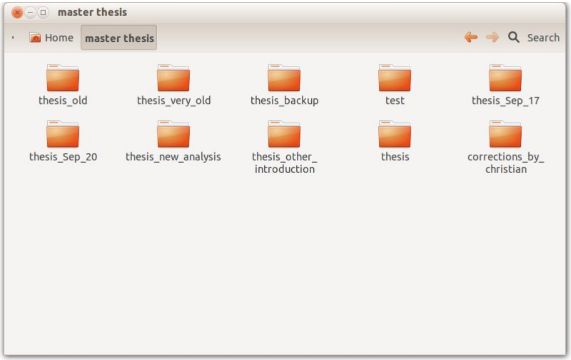
Revision Control

What’s Revision Control?

Manage multiple versions of files



Why should we use it?

- Track the history: Who made when what changes?
- Manage easily multiple versions of your work (e.g. when refactoring)
- Collaboration with others: Merging your work
- Backup in case of mistakes

Revision Control Systems

- CVS
  - old-style centralized revision control
  - cons: outdated dinosaur (don't use it)
- Subversion (svn)
  - old-style centralized revision control
  - pros: fine-grained access rights
  - cons: painful merging of changes; needs access to central server
- Git and Mercurial (Hg)
  - distributed revision control
  - pros: fast, flexible, intelligent merging, allows different models of collaboration
  - cons: not meant for fine-grained access-rights or sub-repositories (albeit possible)

Installing Mercurial

- Linux (Ubuntu):
  - Necessary: Mercurial
    `sudo apt-get install mercurial`
  - Optional: GUI
    TortoiseHg: `sudo apt-get install tortoisehg`
  - Optional: Graphical merge tool
    Meld: `sudo apt-get install meld` or
    Kdiff3: `sudo apt-get install kdiff3`
- Windows: TortoiseHg `http://tortoisehg.bitbucket.org/`
- Mac: for example MacHg
  `http://jasonfharris.com/machg/`

Test installation with `hg --version`

First steps

Creating a repository

- `hg init [DEST]`
  initialize new repository
  (create subdirectory `.hg` in [DEST])

Example

```
$ hg init
```

make current directory a repository

```
$ hg init project
```

start a repository in directory `project`
(create it if it does not exist)

Before we begin

Who made what changes?

▷ Mercurial needs to know who you are

Edit configuration file

- `pathtorepository/.hg/hgrc` for local settings
- `~/.hgrc` for global settings

Example (pathtorepository/.hg/hgrc)

```
[ui]
username = Gabi Roeger <gabriele.roeger@unibas.ch>
```

Adding files and commiting changes

- `hg add [OPTION]... [FILE]...`
  Puts file under revision control
- `hg commit [OPTION]... [FILE]...`
  commit changes of the specified files or all outstanding changes
  Option `-m`: specify log message (otherwise opens a text editor)

Example

```
$ echo "realy elaborated text" > important_text
$ hg add important_text
$ hg commit -m "added important text"
$ sed -i -e 's/realy/really/' important_text
$ hg commit -m "fixed typo"
```

Deleting files

- `hg remove [OPTION]... [FILE]...`
  `hg rm [OPTION]... [FILE]...`
  deletes from file system and repository control
- `hg forget [FILE]...`
  removes files from repository control (on the next commit)

Example

```
$ touch file1 file2
$ hg add file1 file2
$ hg commit -m "added files"
$ hg rm file1
$ hg forget file2
$ hg commit -m "removed some files"
```

Status of the working directory

```
hg status [OPTION]... [FILE]...
hg st [OPTION]... [FILE]...
```

show changed files in the working directory

Important flags:

A	added
M	modified
R	removed
!	missing
?	not tracked

Ignoring files

Patterns in file `pathtorepository/.hgignore` describe files that should not be considered by hg commands (eg., `hg st`):

- Syntax regexp: regular expressions, Python/Perl syntax (default)
- Syntax glob: shell-style glob

Example (pathtorepository/.hgignore)

```
syntax: regexp
program
\.o$
```

Example (pathtorepository/.hgignore)

```
syntax: glob
program
*.o
```

Reverting uncommited changes

`hg revert [OPTION]... [FILE]`
restore files to their checkout state
Option `--all`: revert all changes

▷ Modified files are saved with a .orig suffix before reverting.

Example

```
$ hg st
M foo.txt
$ hg revert foo.txt
$ hg st
? foo.txt.orig
```

History

- `hg log [OPTION]... [FILE]`
  show revision history of entire repository or files

Example

```
$ hg log
changeset:   3:a4a8975c32a8
tag:         tip
user:        Gabi Roeger <gabriele.roeger@unibas.ch>
date:        Tue Sep 25 16:28:14 2012 +0200
files:       file1 file2
description:
removed some files


changeset:   2:cc210a3f1a3e
...
```

Inspecting changes

```
hg diff ([-c REV] | [-r REV1 [-r REV2]]) [FILE]...
```

show diff for repository (or files)

Option `-c`: change made in revision

Option `-r`: difference between revision and working copy/other rev.

- two revision arguments: compares those revisions
- one revision argument: compares the revision to the working directory
- no revision argument: compares the parent revision to the working directory

Moving through time

- `hg update [[-r] REV]`
  `hg up [[-r] REV]`
  Switch working directory to revision (or newest revision)
- `hg parents [-r REV] [FILE]`
  Show parent revisions of working directory or revision

Getting help

Most commands have much more options than shown:

- `hg help COMMAND`
  show documentation for command

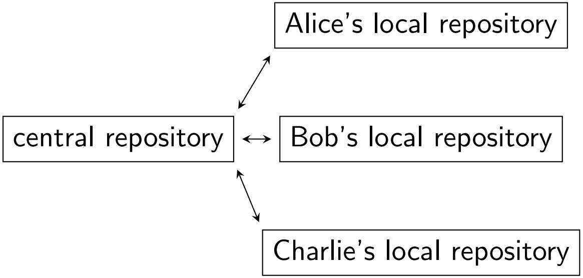
Example

```
$ hg help update
hg update [-c] [-C] [-d DATE] [[-r] REV]

aliases: up, checkout, co

update working directory (or switch revisions)

Update the repository's working directory to the
specified changeset. If no changeset is specified,
update to the tip of the current named branch.
(...)
```

Distributed development

Repository architecture

- Many possible alternatives
- Good option for small non-hierarchical group of developers:
  - ▷ One central repository:



Cloning

`hg clone SOURCE [DEST]`
create a copy of an existing repository

Example

```
$ hg clone ../project project-alice
$ hg clone http://hg.fast-downward.org fast-downward
```

Checking for incoming/outgoing changes

- `hg incoming [SOURCE]`
  `hg in [SOURCE]`
  show new changesets found in source
- `hg outgoing [DEST]`
  `hg out [DEST]`
  show changesets not found in the destination

Source or destination not specified
▷ default from `.hg/hgrc`

Transfering changes

- `hg pull [-u] [SOURCE]`
  pull changes from the specified source
  default: does not update the working directory
  option -u: automatically update after pulling
- `hg push [-f] [DEST]`
  push changes to the specified destination

Push aborts with error new remote head?

- Pull first and merge divergent changes (next slide)
- If you are sure that you actually want it and know why:
  Use `hg push -f` to force new head to destination repository

Resolving divergent history

If you have several heads in the repository (usually after a `pull`)

- `hg heads`
  show current repository heads
- `hg merge [REV]`
  update current working directory with all changes made in the requested revision since the last common predecessor.
  (If no revision is specified, the working directory's parent is a head revision, and the current branch contains exactly one other head, the other head is merged with by default.)
  - ▷ Automated merge if possible
  - ▷ Otherwise opens merge tool for manual merge
  - ▷ Don't forget to commit after merging

Finding the right contact person

`hg annotate [-u] [-n] [-r REV] FILE`
show changeset information by line for each file
Option `-u`: show user Option `-n`: show revision number

Example

```
$ hg annotate -un program.cpp
gabriele 1: #include <iostream>
gabriele 1:
gabriele 1: int main(int, char**)
     bob 5:     std::cout << "Bob and Alice say:";
     bob 8:     std::cout << "Hello world" << std::endl;
   alice 6:     std::cout << "The world says: Hello! ";
     bob 8:     std::cout << "Alice and Bob go home.";
gabriele 1:
```

Wrap-up

Characterization of commands

- Communicating with other repository
  - Only reporting: `incoming`, `outgoing`
  - Changing: `pull`, `push`
- Local commands
  - Only reporting: `annotate`, `diff`, `heads`, `help`, `id`, `log`, `status`
  - Changing: `add`, `commit`, `forget`, `init`, `merge`, `remove`, `revert`, `update`

Getting further

- Interesting next topics:
  - branching
  - tagging revisions
  - backout old changesets
- Tutorials and documentation:
  - `http://hginit.com`
    basic example-driven tutorial
  - `http://hgbook.red-bean.com`
    covering almost everything; also available as (printed) book
- Sharing a repository
  - Quick-and-dirty: `hg serve`
  - Long-term: Use hosting service (`https://bitbucket.org/`)
    or set up your own web-server accordingly