G52GRP 2012–2013: Lecture 3

Project Site and Version Control with Subversion

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This Lecture

- Indefero project site
- Why use version control systems?
- Subversion
- Using Subversion
Sharing Code and Documents (1)
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- Passing copies from person to person using e.g. e-mail or USB memory sticks?
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- Who’s got the latest version?
- Who’s got the right to edit?
- How to ensure that everyone sees up-to-date versions of everything?

...
Sharing Code and Documents (2)

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  - Provides additional project management features beyond a shared repository.
  - The designated gp12–xxx Indefero project should (in most cases) be your central repository for code and documentation.

- Additionally, a Unix group has been created for each group on the School’s Linux servers.
Indefero Features (1)

- Project Management:
  - Project description (using Markdown syntax).
  - Access rights (who can access and change what: defaults should work for most groups).
  - Detailed configuration of many of the other features (e.g. “tags”, notification e-mails).
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• Source code repository:
  - Version control using Subversion.
  - Not just for code, but can also be used for reports, design documents, and more.
Indefero Features (2)

- Documentation
  - Detailed project description (including aims, vision), agendas, meeting minutes, design documents, QA plans, . . .
  - Hyperlinks between documents
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- Downloads
  - Various releases
  - Source, binaries for various platforms, . . .
Group Project Site Deliverable

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- Due 2 November
- Designed to get your project site off the ground and ensure everyone understands the basics of Indefero and Subversion
- Nominate a Project Site Master ASAP!
- See the Group Project Handbook for further details.
Other Ways To Share & Coordinate (1)

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- ...
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Other Ways To Share & Coordinate (2)

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- All documents and code **must** be backed up on School servers! Temporary unavailability of external hosting, or external host going out of business (or your own, private machines dying, getting stolen, ....), are **not** valid extenuating circumstances.
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- You may have to copy certain data across to the project site for submission purposes.
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- Consequently, lack key features like version control and issue tracking.
- Groups that *did* use Facebook reported that the social aspects were a constant source of distraction.
Why Use Version Control Systems? (1)

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Why Use Version Control Systems? (1)

OK, doc and code shared. Problem solved? No . . .

- If a team of people involved, how to coordinate the work on the shared source code and documentation?
- As the source and documentation evolves, how to
  - keep track of changes
  - keep track of consistent configurations
  - insulate against “work in progress”
  - . . .
Why Use Version Control Systems? (2)

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- but modern ones also provide very sophisticated support for
  - teams of programmers working on shared source and documentation
  - distributed teams of programmers (over the Internet)
Basic Model

(Pictures from Collins-Sussman, Fitzpatrick, Pilato: Version Control with Subversion.)
The Problem to Avoid

Two users read the same file

Harry

Sally

Read

Read

They both begin to edit their copies

Repository

A

Harry

Sally

A

A'

A''

Harry

Sally

Repository

Harry publishes his version first

Sally accidentally overwrites Harry's version

Write

Write

Write

Write

A

A'

A''

A'

A''

A'

A''
The Lock, Modify, Unlock Model

1. Harry "locks" file A, then copies it for editing.
2. While Harry edits, Sally’s lock attempt fails.
3. Harry writes his version, then releases his lock.
4. Now Sally can lock, read, and edit the latest version.
The Copy, Modify, Merge Model (1)

Two users copy the same file

Repository

Read

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Harry

Read

A

Sally

They both begin to edit their copies

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A

Harry

A'

Sally

A''

Sally publishes her version first

Repository

A''

Write

A'

Harry

A''

Sally

Harry gets an "out-of-date" error

Repository

A''

Write

A'

Harry

A''

Sally
The Copy, Modify, Merge Model (2)
Version Control

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- a “time travel” facility: arbitrary earlier versions of the repository can be retrieved
- facilities for supporting parallel, non-interfering development, e.g. through what looks like separate copies, . . .
- . . . while maximizing sharing and facilitating reintegration of lines of development.
What Is Subversion? (1)

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- Free, open-source version control system.
- Manages files *and directories*, allowing older versions of (a part of) a file hierarchy to be retrieved at any point in time, pinpointing changes, keeping track of metadata such as logs for information *about* changes, etc.
- Handles *both* text and binary data (like Word documents, images)
• Free, open-source version control system.
• Manages files and directories, allowing older versions of (a part of) a file hierarchy to be retrieved at any point in time, pinpointing changes, keeping track of metadata such as logs for information about changes, etc.
• Handles both text and binary data (like Word documents, images)
• Supports concurrent development (the Copy, Modify, Merge model), both locally and remotely (over a network).
Also does support locking (mainly intended for binary data that cannot easily be merged: images, Word documents, other application-specific binary data, ... )
What Is Subversion? (2)

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- Other helpful features like
  - file portability (e.g. transparent conversion between CR/LF and LF line ending conventions)
  - automation through hooks (e.g. sending e-mail after changes committed)
What Is Subversion? (3)

Main reference (freely available on-line):
Collins-Sussman, Fitzpatrick, Pilato:
Version Control with Subversion
Architecture of Subversion

- Client Library
  - Working Copy Management Library
    - Repository Access
      - DAV
      - SVN
      - LOCAL
    - Ye Olde Internet (Any TCP/IP Network)
    - Apache
      - mod_dav
      - mod_dev_svn
    - Repository Interface
    - Subversion Repository
      - Berkeley DB
      - FSFS

Diagram by Brian W. Fitzpatrick - fitz@red-bean.com
Getting Started

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• Check out a copy of the repository, e.g.:

  ```
  svn checkout \n  https://code.cs.nott.ac.uk/svn/gp12-nhn
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```

• Change directory: `cd gp12-nhn`. 
Accessing the Repository

The command-line Subversion client is called `svn`. It has many subcommands, e.g.:

- `svn list`
- `svn add`
- `svn copy`
- `svn commit`
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- `svn list`
- `svn add`
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- `svn commit`

It is always possible to get help, including on specific subcommands:

- `svn help`
- `svn help copy`
Let’s populate the repository with some initial structure. The Subversion book recommends three main directories for each project:
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- **branches**: for branched-off developments (may later be merged back into main branch)
- **tags**: named “snap shots” of the development; often a “release”.

Branches and Tags are created by copying: `svn copy`
Initial Repository Structure (2)

Under trunk we might want to have subdirectories for subprojects, e.g.:

- *src*: for source code
- *doc*: for documentation
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- **src**: for source code
- **doc**: for documentation

Subversion does not make any particular assumptions: the directory structure can be what you like.

AND! It is easy to change the structure later by simply moving around files and directories.
Let's create this directory structure:

```bash
marian$ mkdir trunk
marian$ mkdir branches
marian$ mkdir tags
marian$ mkdir trunk/src
marian$ mkdir trunk/doc
```
Initial Repository Structure (4)

Let’s tell subversion all these directories have been added:

```
marian$ svn add trunk
marian$ svn add branches
marian$ svn add tags
marian$ svn add trunk/src
marian$ svn add trunk/doc
```

Then, let’s commit to the central repository:

```
marian$ svn commit
```
Checking Out a Working Copy

Now *other* people can check out a working copy of the relevant part of the repository:

```
svn checkout \
https://code.cs.nott.ac.uk/svn/gp12-nhn/trunk
A trunk/doc
A trunk/src
```

Checked out revision 1.
Let's add a document:

```bash
isis-19% cd trunk/doc
isis-20% ooffice
isis-21% ls -l
-rw-r--r-- 1 henrik henrik 8192 Oct 23 01:45 design.doc
```

The location of the repository is stored with the working copy, so Subversion commands can now be given without giving the repository URL:

```bash
isis-49% svn status
? design.doc
```
Adding a File (2)

The status “?” indicates something which is unknown to Subversion. We need to tell Subversion about it:

```
isis-50% svn add design.doc
A (bin)  design.doc
```

**Important!** The new document is now added to the local working copy. But it (and other changes) will not be propagated to the central repository until we explicitly perform a **commit**.

```
isis-51% svn status
A    design.doc
```
Subversion correctly determined that our document is a *binary* file. (Could have been configured otherwise.)

```bash
isis-52% svn proplist design.doc
Properties on 'design.doc':
  svn:mime-type
isis-53% svn propget svn:mime-type \\n  design.doc
application/octet-stream
```
Adding a Directory

It is equally easy to add directories:

```bash
isis-54% mkdir Meeting-2012-10-23
isis-55% svn add Meeting-2012-10-23
A       Meeting-2012-10-23
isis-56% emacs Meeting-2012-10-23/ideas.txt
isis-57% svn add Meeting-2012-10-23/ideas.txt
A       Meeting-2012-10-23/ideas.txt
isis-58% svn status
A       design.doc
A       Meeting-2012-10-23
A       Meeting-2012-10-23/ideas.txt
```

Or use `svn mkdir`.
Committing

Time to propagate the changes to the central repository:

\texttt{isis-59\% \texttt{svn commit} \textbackslash \\
-m "System design and ideas from meeting 23 Oct"
Adding \texttt{doc/design.doc}
Adding \texttt{doc/Meeting-2012-10-23}
Adding \texttt{doc/Meeting-2012-10-23/ideas.txt}
Transmitting file data .
Committed revision 2.
Let’s assume a few typos in the design are fixed:

\texttt{isis-65\%\ svn status}
\texttt{M design.doc}
\texttt{isis-66\%\ svn commit -m "Fixed typos"}
Sending \texttt{doc/design.doc}
Transmitting file data .
Committed revision 3.
Assume someone else makes changes and commits. We can check the status against the repository and get log entries

```
isis-70% svn status -u
  * 2 design.doc

Status against revision: 3
isis-70% svn log -r 3 design.doc
```

r3 | nhn | 2012-10-24 09:51:00 +0100 (Wed, 24 Oct 2012)

Fixed typos
Propagating Changes (2)

Let’s bring our working copy up-to-date:

```bash
isis-71% svn update
U  design.doc
```

Updated to revision 3.

In general, it is good practice to bring everything up-to-date before starting to make any changes. Minimizes the risk of conflicts.
Conflicts (1)

What if someone else has committed changes before I commit?

Conflict! Text files can, however, be merged.

```
isis-92% svn commit
Sending Meeting-2012-10-23/ideas.txt
Transmitting file data .svn: Commit failed (details follow)
isis-83% svn update
C   ideas.txt
Updated to revision 7.
```
Conflicts (2)

The differences are marked in the file. Edit as necessary. Then:

`isis-93% svn resolved idead.txt`

Resolved conflicted state of `ideas.txt`

`isis-94% svn commit`

(Newer versions has a more sophisticated `svn resolve` command.)
Other useful Subversion commands

Some other commands:

- `svn delete`
- `svn copy`
- `svn diff`
- `svn revert`
- `svn lock`
- `svn unlock`

Be sure to read at least the introductory chapters of the Subversion book (very accessible) and do use `svn help`!