Source Code Revision Control with Subversion

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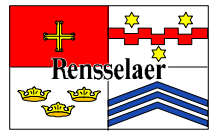

Why Revision Control?

- Provides a place to store your code
  - *Reduce clutter*
  - *Independent of individual accounts*
- Historical record of what was done over time
  - *Safety net*
- Synchronization between developers

Why Use Subversion?

- Functional superset of CVS
- Directory versioning (rename and moves)
- Atomic Commits
- File meta-data
- True client-server model
- Cross-platform, open-source

Subversion Architecture

- Each working copy has a .svn directory
  - *Similar to the CVS's CVS directory*
  - *Stores metadata about each file*
- Local or Network Repository
- Network access over HTTP or SSH
- Encrypted authentication
  - *Cleartext password stored in* `~/.subversion`
- Fine-grained authorization
- Command line client is `svn`

CVS vs SVN

- Most CVS commands exist in SVN
  - *Checkout, commit, update, status…*
- Arguments position matters in CVS

```
$ cvs -d /cvsroot update -d
```

- Not so in SVN

```
$ svn log -r 123 foo.c
$ svn log foo.c -r123
```

Revisions (1)

- Revision numbers are applied to an object to identify a unique version of that object.
- CVS
  - *Revision numbers are per file.*
  - *No connection between two files with the same revision number.*
  - *A commit only modifies the version number of the files that were modified.*
    - foo.c rev 1.2 and bar.c rev 1.10.
  - *After commit of bar.c:*
    - foo.c rev 1.2 and bar.c rev 1.11.

Revisions (2)

- Revision numbers are applied to an object to identify a unique version of that object.
- SVN
  - *Revision numbers are global across the whole repository.*
  - *Snapshot in time of the whole repository.*
  - *A commit modifies the version number of all the files.*
    - foo.c rev 25 and bar.c rev 25.
  - *After commit of bar.c:*
    - foo.c rev 26 and bar.c rev 26.
  - *foo.c rev 25 and 26 are identical.*

Basic Work Cycle (1)

- Checkout a working copy
- Update a working copy
- Make changes
- Examine your changes
- Commit your changes

Basic Work Cycle (2)

- Checkout a working copy

```
$ svn checkout \
> https://gforge.scorec.rpi.edu/svn/TEST/foo
$ cd foo
```

- Update a working copy
  - *Update all files*

```
$ svn update
```

  - *Update to an older revision*

```
$ svn update -r 45
```

  - *Update an older revision of* `bar.c`

```
$ svn update -r 23 bar.c
```

```
$ svn update -r 1
A  changepwd.form
D  trunk
D  branches
Updated to revision 1.
```

Basic Work Cycle (3)

- Update output
  - `U` *foo*
    - File *foo* was (U)pdated (pulled from repository)
  - `A` *foo*
    - File *foo* was (A)dded to your working copy
  - `D` *foo*
    - File *foo* was (D)eleted from your working copy
  - `R` *foo*
    - File *foo* was (R)eplaced, that is it was deleted and a new file with the same name was added.
  - `G` *foo*
    - File *foo* received new changes and was also changed in your working copy. The changes did not collide and so were mer(G)ed.
  - `C` *foo*
    - File *foo* received (C)onflicting changes from the server. The overlap needs to be resolved by you.

Basic Work Cycle (4)

- Make changes
  - *Add new files and directories*

```
$ touch README.txt
$ svn mkdir Presentations
$ touch Presentations/simple.txt
$ svn add Presentations/simple.txt README.txt
```

  - *Delete files*

```
$ svn rm foo
```

  - *Rename files*

```
$ svn mv README.txt README_OLD.txt
```

  - *Copy files and directories*

```
$ svn cp Presentations Presentation_new
```

Basic Work Cycle (5)

- Examine your changes
  - *svn status: list of changed files*

```
?      arcanum.pdf | File is not managed by svn
M      howto.tex   | File has local content modifications
A      howto.toc   | File is scheduled for addition
 M     arcanum.tex | File has properties by not content modification
D      Makefile    | File scheduled for deletion
```

- Even more details with `-v`
  - *Revision numbers*
  - *Who made last modification*
- Status of repository with `-u`
  - *Shows changes in repository as well*

Basic Work Cycle (6)

- Examine your changes
  - *svn diff: shows your modifications*
  - *In your local working copy*

```
$ svn diff
```

  - *Between a repository revision and your local copy*

```
$ svn diff -r 34 foo.c
```

  - *Between two repository revisions*

```
$ svn diff -r 2:5 foo.c
```

- Revert your changes

```
$ svn revert foo.c
```

Basic Work Cycle (7)

- Commit your changes
  - `$ svn commit`
- Will open an editor to type in change log
- Alternatively, short logs can be input inline

```
$ svn commit -m "my short log"
```

- *Logs can be retrieved for a file or a tree*

```
$ svn log foo.c
```

Conflict Resolution

- Look for "C" when you update
- Better than CVS:
  - *Conflict markers are placed in the file to display the overlap (just like CVS).*
  - *Three* tmp *files are created. these are the original three files that could not be merged.*
  - *SVN will not allow you to commit files with conflicts.*
- Solutions to resolve
  - *Hand-merge the files*
  - *copy one of the* tmp *files on top of your working copy*
  - `svn revert` *to toss out your changes*
- Once resolved, you need to tell svn about it

```
$ svn resolve foo.c
```

File & Directory Properties (1)

- Each file and directory has a list of properties associated with it
- Arbitrary properties & values
- Subversion defines some properties:
  - svn:ignore
  - svn:eol-style
  - svn:mime-type
  - svn:executable
  - svn:keywords
- Listing properties

```
$ svn proplist README.txt
Properties on 'README.txt':
  svn:mime-type
  svn:eol-style
```

File & Directory Properties (2)

- Getting a property value

```
$ svn propget svn:mime-type README.txt
```

- Setting a property

```
$ svn propset svn:eol-style native README.txt
```

Dealing with binary files

- Subversion is optimized for dealing with text files (source code, LaTeX documents, etc)
- But, it can deal with binary files
  - *Will not diff nor merge*
  - *Will not change EOL nor apply keywords*
- SVN has a binary detection algorithm, but it sometimes fails (PDF have a text header)
  - *Need to set* svn:mime-type *property manually to application/octet-stream*

Repository Organization

- Per-project directories
- Three subdirectories per project:
  - *trunk, tags, branches*
- Trunk is for main development
- Tags is for read-only snapshots
- Branches is a work area

Working with Branches

- Create a new branch (NOTE. Replace TEST by the module that you want to work with)

```
$ svn cp https://gforge.scorec.rpi.edu/svn/TEST/trunk \
> https://gforge.scorec.rpi.edu/svn/TEST/branches/duprec-work
Commited revision 6
$ svn co https://gforge.scorec.rpi.edu/svn/TEST/branches/duprec-work
```

- Make Changes...
- Merge trunk changes into branch

```
$ svn merge -r 6:HEAD \
> https://gforge.scorec.rpi.edu/svn/TEST/trunk .
```

- Test merged branch
- Merge branch into trunk

```
$ cd trunk
$ svn merge -r 6:HEAD \
> https://gforge.scorec.rpi.edu/svn/TEST/branches/duprec-work .
```

Best Practices

- Commit early, commit often
- Commit logical changesets
- Track merges manually
  - *When committing the result of a merge, write a descriptive log*

```
Merged revisions 3490:4120 of /branches/foobranch to /trunk
```

- Be patient with large files and repositories
- Know when to create branches
- Trunk should be *stable*

Subversion at SCOREC

- CVS migration to SVN
  - *Will be done project by project*
- SVN repositories URL:

  https://gforge.scorec.rpi.edu/svn/SCOREC

  https://gforge.scorec.rpi.edu/svn/TSTT

  https://gforge.scorec.rpi.edu/svn/TEST
  - *More can be created*
- Web-based access

  https://gforge.scorec.rpi.edu/wsvn

For More Information

- Subversion project home
  - http://subversion.tigris.org
- Subversion online book
  - http://svnbook.red-bean.com
- Subversion QuickRef
  - http://subversion.tigris.org/files/documents/15/177/svn-ref.ps