CSE 374
Programming Concepts & Tools

Hal Perkins
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Lecture 16 – Version control and svn
Where we are

• Learning tools and concepts relevant to multi-file, multi-person, multi-platform, multi-month projects.

• Today: Managing source code
  – Reliable backup of hard-to-replace information (i.e., sources)
  – Tools for managing concurrent and potentially conflicting changes from multiple people
  – Ability to retrieve previous versions

• Note: None of this has anything to do with code. Like make, version-control systems are typically not language-specific.
  – Many people use version control systems for everything they do (code, papers, slides, letters, drawings, pictures, . . . )

• Traditional systems are best at text files (comparing differences, etc.); newer ones are better with others too.
Version-control systems

- There are plenty: scss (historical), rcs (mostly historical), cvs (built on top of rcs), subversion, git (much more distributed), mercurial, sourcesafe, …
- The terminology and commands aren’t particularly standard, but once you know one, the others aren’t difficult – the basic concepts are the same
- cvs had the biggest mind-share for about a decade (particularly in the open-source community)
- svn improves on several cvs shortcomings and is widely used – we’ll learn basic svn
The setup

• There is a svn repository, where files (and past versions) are reliably stored.
  – Hopefully the repository files are backed up, but that’s not svn’s problem.
• You do not edit files in the repository directly. Instead:
  – You check-out a working copy and edit it.
  – You commit changes back to the repository.
• You use the svn program to perform any operations that need the repository.
• One repository may hold many projects. A subversion repository is just a database of projects and files.
  – Looks like a filesystem tree of project directories
Tasks

Learn the common cases; look up the uncommon ones. In a production shop...

• Create
  – a repository (rare – every few years)
  – a new project (infrequent – once or twice a year)
  – a working copy of a project (every few weeks or months?)

• Working with files
  – Get updates, add or remove files, commit changes to repository (daily)
  – Check version history, differences (as needed)

• Branches, locks, watches, others (every now and then)

Basic command structure is the same for all
  `svn svn-options cmd cmd-options files...`
Repository access

A repository can be:

• Local: specify repository directory root via a regular file path name url

• Remote: specify user-id and machine
  – Must have svn and ssh installed locally
  – Need authentication (ssh password or other)

• Suggestion: experiment on a local machine

• Next homework will use remote access to a server
Getting started

• Set up a repository (your choice of name, location)
  svnadmin create path/svnrepos
• Put initial version of project directory in repository
  svn import projdir svn://path/svnrepos/proj -m msg
  – Commands that update a repository require a message (msg) that should briefly document the change
  – Once a project is imported, *never* use the original directory again
  – Path depends on kind of access (local/remote)
• Check out a copy of the project to a *working directory*
  cd working-directory
  svn checkout svn://path/svnrepos/proj proj
  – Working directory remembers repository location for future checkin, update, etc.
File manipulation

- Add files with `svn add`
- Bring local working copy up to date with `svn update` (get changed files from repository)
- Commit local changes with `svn commit`
  - Any number of files including subdirectories recursively
    if no filename specified
  - Files not actually added to repository until here
- Commit messages are mandatory
  - `–m “short message”`
  - `–F filename-containing-message`
  - Else pop up editor if EDITOR or VISUAL environment variable is set
  - Else complain
Some examples

- Update local working directory to match repository
  
  `svn update`

- Make changes (use `svn` instead of local file commands so repository will also change on commit)

  `svn add file.c`
  `svn move oldfile.c newfile.c`
  `svn delete obsoletefile`

- Commit changes

  `svn commit -m "this is much better"`

- Examine your changes

  `svn status`
  `svn diff file.c`
  `svn revert file.c`
Conflicts

• This all works great if there is one working-copy. With multiple working-copies there can be conflicts:
  1. Your working-copy checks out version 17 of foo
  2. You edit foo
  3. Somebody else commits a new version (18) of foo
• Subversion tries to merge changes automatically; if it can’t you must resolve the conflict. If svn commit fails:
  – Do svn update to get repository version and attempt merge
    • “G” means the automatic merge succeeded
    • “C” means you have to resolve the conflict
  – Merging is line-based, which is why svn is better for text files
  – Conflicts indicated in the working-copy file (search for <<<<<<<<)
  – Newer versions of svn handle more of this automatically or interactively
svn gotchas

• Do not forget to add files or your group members will be very unhappy.
• Keep in the repository exactly (and only) what you need to build the application!
  – Yes: foo.c foo.h Makefile
  – No: foo.o a.out
  – You don’t want versions of .o files:
    • Replaceable things have no value
    • They change a lot when .c files change a little
    • Developers on other machines can’t use them
Summary

• Another tool for letting the computer do what it’s good at:
  – Much better than manually emailing files, adding dates to filenames, etc.
  – Managing versions, storing the differences
  – Keeping source-code safe.
  – Preventing concurrent access, detecting conflicts.