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 other kinds too.
Version-control systems

- There are plenty: scss (historical), rcs (mostly historical), cvs (built on top of rcs), subversion, git (much more distributed), 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 some cvs shortcomings – 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 ssh authentication (password or other)
  - Suggestion: experiment on a local machine first then try remote access if you want
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 file:///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

- Check out a copy of the project to a *working directory*
  
  `cd working-directory`

  `svn checkout file:///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.