CSE 390
Lecture 9

Version control and Subversion (svn)

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Working Alone

- Ever done one of the following?
  - Had code that worked, made a bunch of changes and saved it, which broke the code, and now you just want the working version back…
  - Accidentally deleted a critical file, hundreds of lines of code gone…
  - Somehow messed up the structure/contents of your code base, and want to just "undo" the crazy action you just did
  - Hard drive crash!!!! Everything's gone, the day before deadline.

- Possible options:
  - Save as (MyClass-old.java)
    - Ugh. Just ugh. And now a single line change results in duplicating the entire file…
  - RAID to protect your files
    - That's one pricey laptop

Working in teams

- Whose computer stores the "official" copy of the project?
  - Can we store the project files in a neutral "official" location?
- Will we be able to read/write each other's changes?
  - Do we have the right file permissions?
  - Lets just email changed files back and forth! Yay!
- What happens if we both try to edit the same file?
  - Bill just overwrote a file I worked on for 6 hours!
- What happens if we make a mistake and corrupt an important file?
  - Is there a way to keep backups of our project files?
- How do I know what code each teammate is working on?

Solution: Version Control

- **version control system**: Software that tracks and manages changes to a set of files and resources.

- You use version control all the time
  - Built into word processors/spreadsheets/presentation software
    - The magical "undo" button takes you back to "the version before my last action"
  - Wiki's
    - Wiki's are all about version control, managing updates, and allowing rollbacks to previous versions

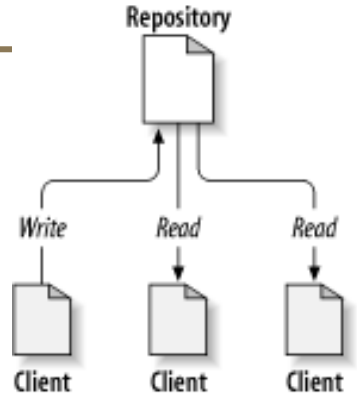
Software Version control

- Many version control systems are designed and used especially for software engineering projects
  - examples: CVS, **Subversion (SVN)**, Git, Monotone, BitKeeper, Perforce

- helps teams to work together on code projects
  - a shared copy of all code files that all users can access
  - keeps current versions of all files, and backups of past versions
  - can see what files others have modified and view the changes
  - manages conflicts when multiple users modify the same file

  - not particular to source code; can be used for papers, photos, etc.
    - but often works best with plain text/code files

Repositories



- **repository**: Central location storing a copy of all files.
  - **check in**: adding a new file to the repository
  - **check out**: downloading a file from the repo to edit it
    - you don't edit files directly in the repo; you edit a local **working copy**
    - once finished, the user checks in a new version of the file
  - **commit**: checking in a new version of a file(s) that were checked out
  - **revert**: undoing any changes to a file(s) that were checked out
  - **update**: downloading the latest versions of all files that have been recently committed by other users

Repository Location

- Can create the repository anywhere
  - Can be on the same computer that you're going to work on, which might be ok for a personal project where you just want rollback protection
- But, usually you want the repository to be robust:
  - On a computer that's up and running 24/7
    - Everyone always has access to the project
  - On a computer that has a redundant file system (ie RAID)
    - No more worries about that hard disk crash wiping away your project!
- Hint: attu satisfies both of these

Subversion

command	description
`svnadmin`	make administrative changes to an SVN repository
`svn`	interact with an SVN repository

- **Subversion**: created to repair problems with older CVS system
  - supports directories, better renaming, atomic commits, good branching
  - currently the most popular free open-source version control system
- installing in Ubuntu:

```
$ sudo apt-get install subversion
```

- installing in Fedora:

```
System->Administration->Add/Remove Software
Search for "subversion"
```

SVN commands

command	description
`svn add files`	schedule files to be added at next commit
`svn ci [files]`	commit / check in changed files
`svn co repo`	check out
`svn help [command]`	get help info about a particular command
`svn import directory repo`	adds a directory into repo as a project
`svn merge source1 source2`	merge changes
`svn revert files`	restore local copy to repo's version
`svn resolve files`	resolve merging conflicts
`svn update [files]`	update local copy to latest version
others: `blame`, `changelist`, `cleanup`, `diff`, `export`, `ls/mv/rm/mkdir`, `lock/unlock`, `log`, `propset`	

Setting up a repo

- on `attu`, create the overall repository:
  - `$ svnadmin create` ***`repopath`***
- from `attu`, add initial files into the repo (optional):
  - `$ svn import` ***`directory repo`***
- give the repo read/write permissions to your `project` group
  - `$ chgrp -R` ***`myprojectgroup repopath`***
  - `$ chmod -R g+rwX,o-rwx` ***`repopath`***
- *Exercise:* Create a repository on attu

Adding files to a repo

- on your computer, set up a local copy of the repo
  - **`$ svn co svn+ssh://attu.cs.washington.edu/`*`foldername`***
  - or, if you're setting up your local copy on `attu` as well:
    `$ svn co file:///homes/iws/`*`username/foldername`*
  - after checkout, your local copy "remembers" where the repo is

- now copy your own files into the repo's folder and add them:
  - **`$ svn add `*`filename`***
  - *common error*: people forget to add files (won't compile for others)

- added files are not really sent to server until commit
  - **`$ svn ci `*`filename`*` -m "`*`checkin message`*`"`**
  - put source code and resources into repo (no `.o` files, executables)

Committing changes

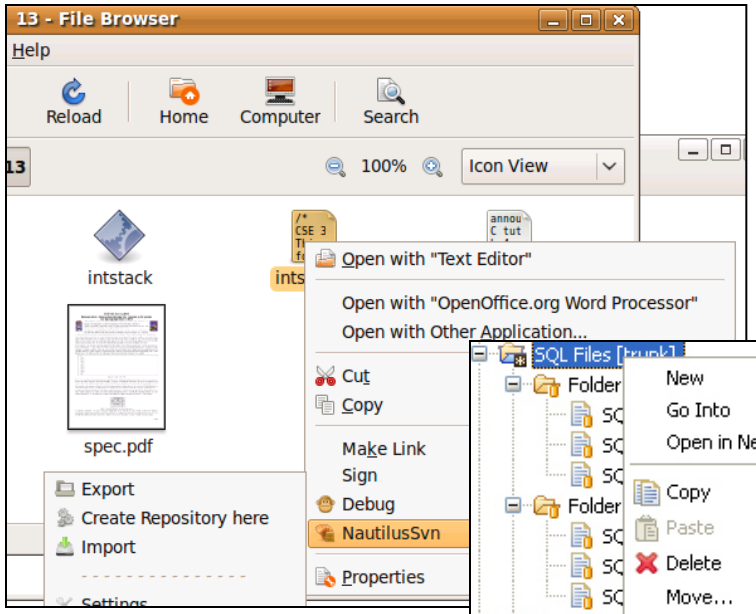
- updating (to retrieve any changes others have made):
  - `$ svn update`

- examining your changes before commit:
  - `$ svn status`
  - `$ svn diff` *`filename`*
  - `$ svn revert` *`filename`*

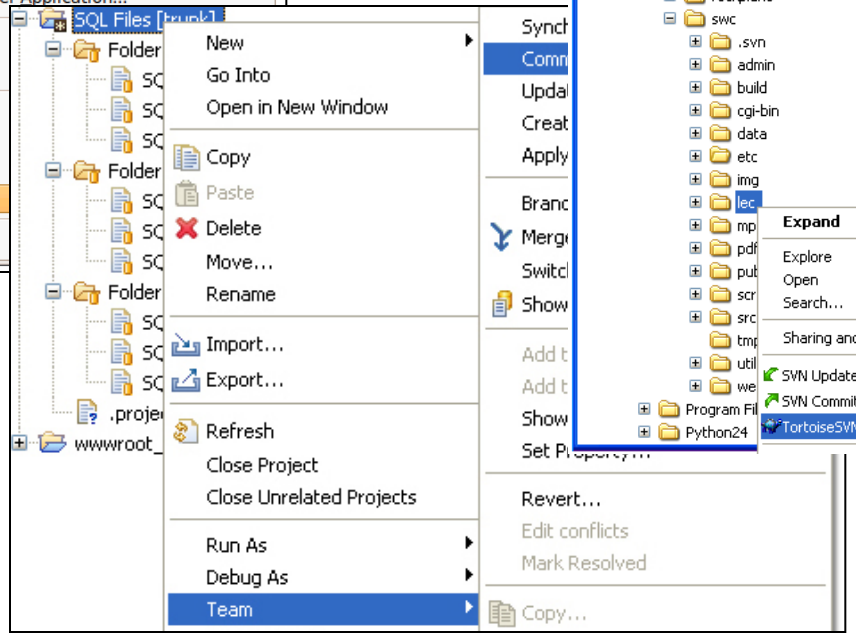
- committing your changes to the server:
  - `$ svn ci -m "added O(1) sorting feature"`
  - Version control tip: use good commit messages!

- *Exercise:* check out the repository, add some files, and commit them

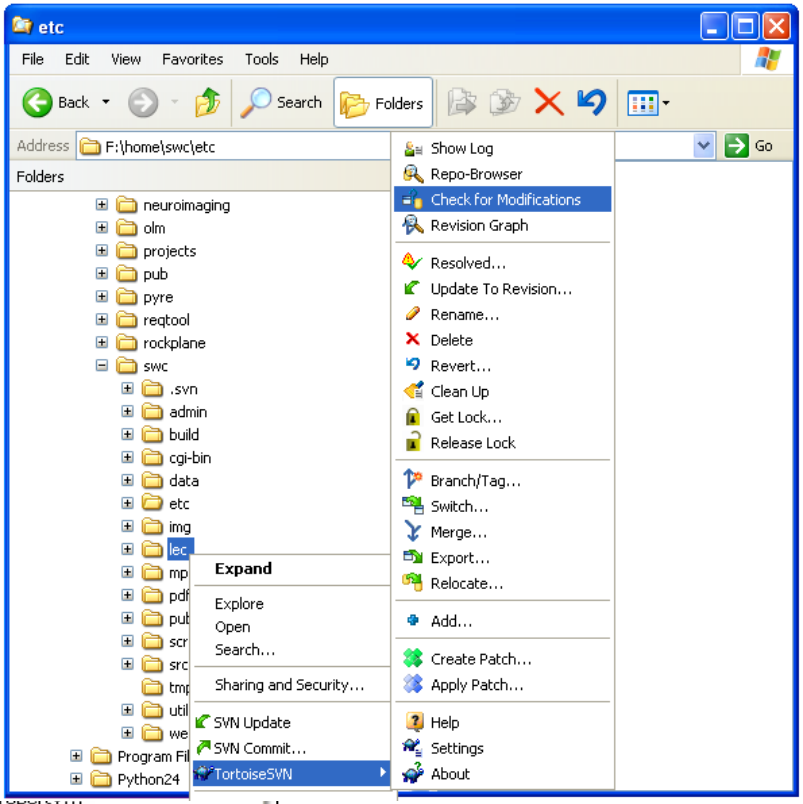
Shell/IDE integration



Linux:
NautilusSVN



Eclipse:
Subclipse



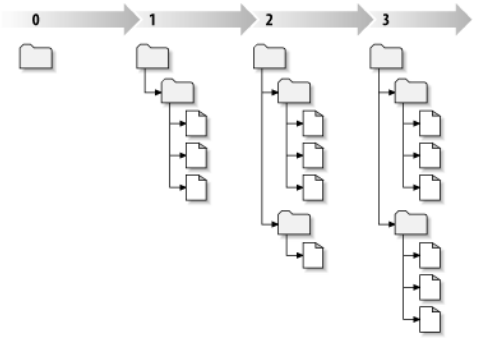
Windows:
TortoiseSVN

TortoiseSVN

- Available at http://tortoisesvn.net/
- Nice graphical interface for windows users
- To use on a repository located on attu:
  - Need to use the svn+ssh syntax:
    - svn+ssh://***username***@attu.cs.washington.edu/***repopath***
- *Exercise:* Check out our repository, modify a file, add a file, and commit our changes

What's actually going on?

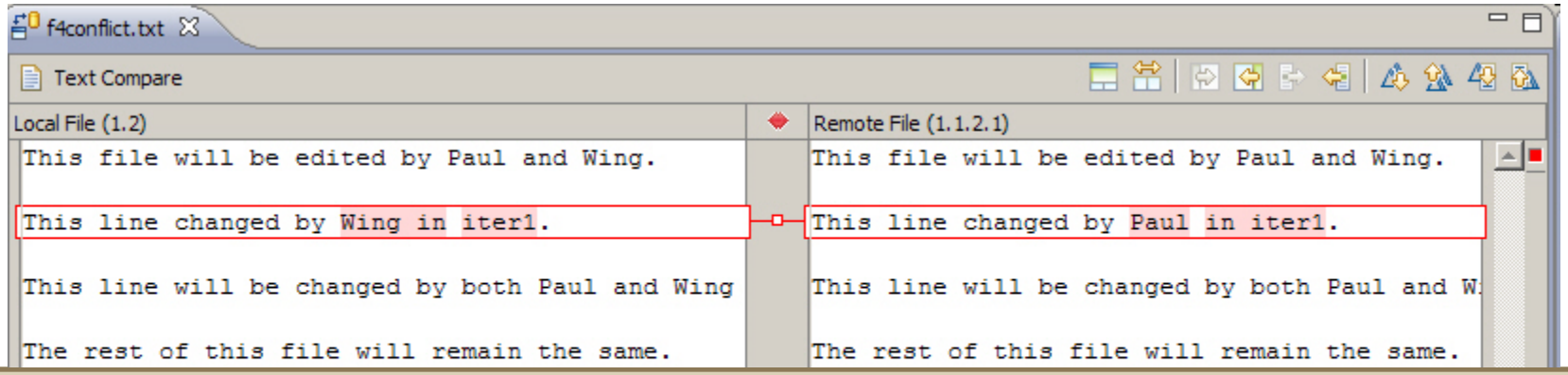
- Take a look inside the svn project folder…
  - Where the heck are our committed files?
  - Take a look at the readme…



- Everything is stored in SVN's database structure
  - So, even though you might have 100 versions of a file, there's not 100 copies of that file
    - Database stores the diff from version to version
    - Helps more efficiently store a large codebase across hundreds of versions
  - Don't worry about the details. Just don't mess with the repository directly!

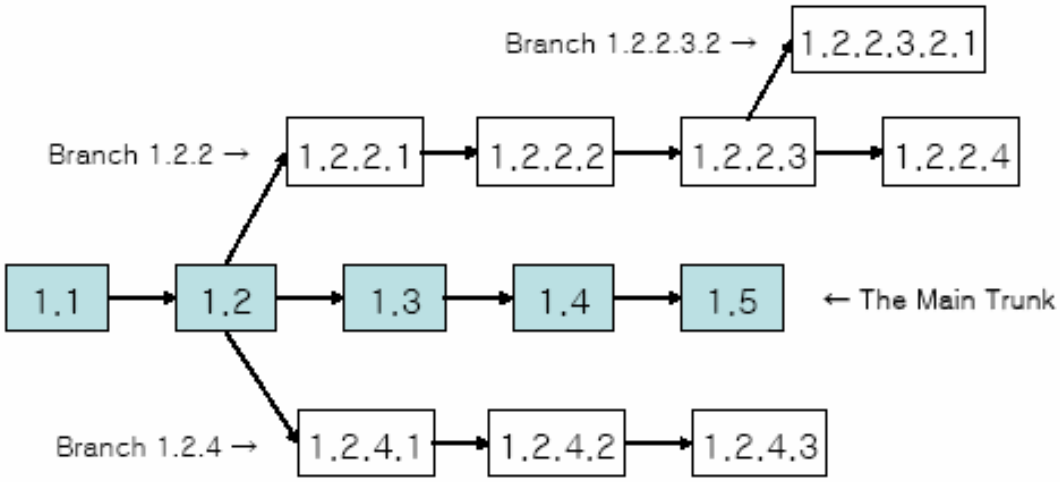
Merging and conflicts

- **merge**: Two sets of changes applied at same time to same files
  - happens when two users check out same file(s), both change it, and:
    - both commit, or
    - one changes it and commits; the other changes it and does an *update*
- **conflict**: when the system is unable to reconcile merged changes
  - **resolve**: user intervention to repair a conflict. Possible ways:
    - combining the changes manually in some way
    - selecting one change in favor of the other
    - reverting both changes (less likely)



Branches

- **branch** (fork): A second copy of the files in a repository
  - the two copies may be developed in different ways independently
  - given its own version number in the version control system
  - eventually be merged
  - **trunk** (mainline, baseline): the main code copy, not part of any fork



A Day in the Life of SVN

- At the beginning of the day/work session, update working copy
  - `svn update`
- Make changes
  - `svn add`, `svn delete`, `svn copy`, `svn move`
- Review changes
  - `svn status`, `svn diff`
- Fix mistakes
  - may need to start from scratch: `svn revert`
- Get ready to commit changes
  - `svn update`, `svn resolve`
- Commit changes
  - `svn commit`
- Repeat many, many times
  - best practice: commit as soon as changes make a logical unit; commit often

Learn what you need

- Creating branches and using merge tools are usually more than you need for any curriculum projects
  - Conflict resolution tools can be confusing
    - May be easier to back up my conflicted file, update so I now have the current version, then manually merge my changes with the updated files
  - I've never had any good reason to create a branch in a department project
- But, they are definitely used in industry, and you should at least know about them

Another view: Git

- Git is another popular version control system.
- Main difference:
  - SVN:
    - central repository approach – the main repository is the only "true" source, only the main repository has the complete file history
    - Users check out local copies of the current version
  - Git:
    - Distributed repository approach – every checkout of the repository is a full fledged repository, complete with history
    - Greater redundancy and speed
    - Branching and merging repositories is more heavily used as a result
- Takeaway: There are differences beyond just differently named commands, learn about a tool before using it on a critical project!

Wrap-up

- You *will* use version control software when working on projects, both here and in industry
  - Rather foolish not to
  - Advice: just set up a repository, even for small projects, it will save you time and hassle
- Lots of online options for free open source code hosting
  - Google code, Git hub, JavaForge, SourceForge…
  - All use version control to manage the code database
- Any experiences with version control, positive/negative?