CSE 390
Lecture 9

Version control and Subversion (svn)

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http://www.cs.washington.edu/390a/

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

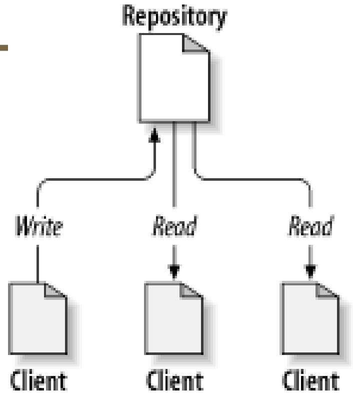
Software Version control

- 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.
  - **add**: 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

1. On `attu`, create the overall repository:

   -
     ```
     $ svnadmin create repopath
     ```
2. **(optional)** from `attu`, add initial files into the repo:

   -
     ```
     $ svn import –m “message” directoryOfFiles URLtorepopath
     ```
   - Example:
     ```
     $ svn import –m “importing initial files”
     someFilesOfMine  file:///homes/iws/rea/theRepo
     ```
3. 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. First cd to the place you would like to create your local working copy, then:

  -
    ```
    $ 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
    ```

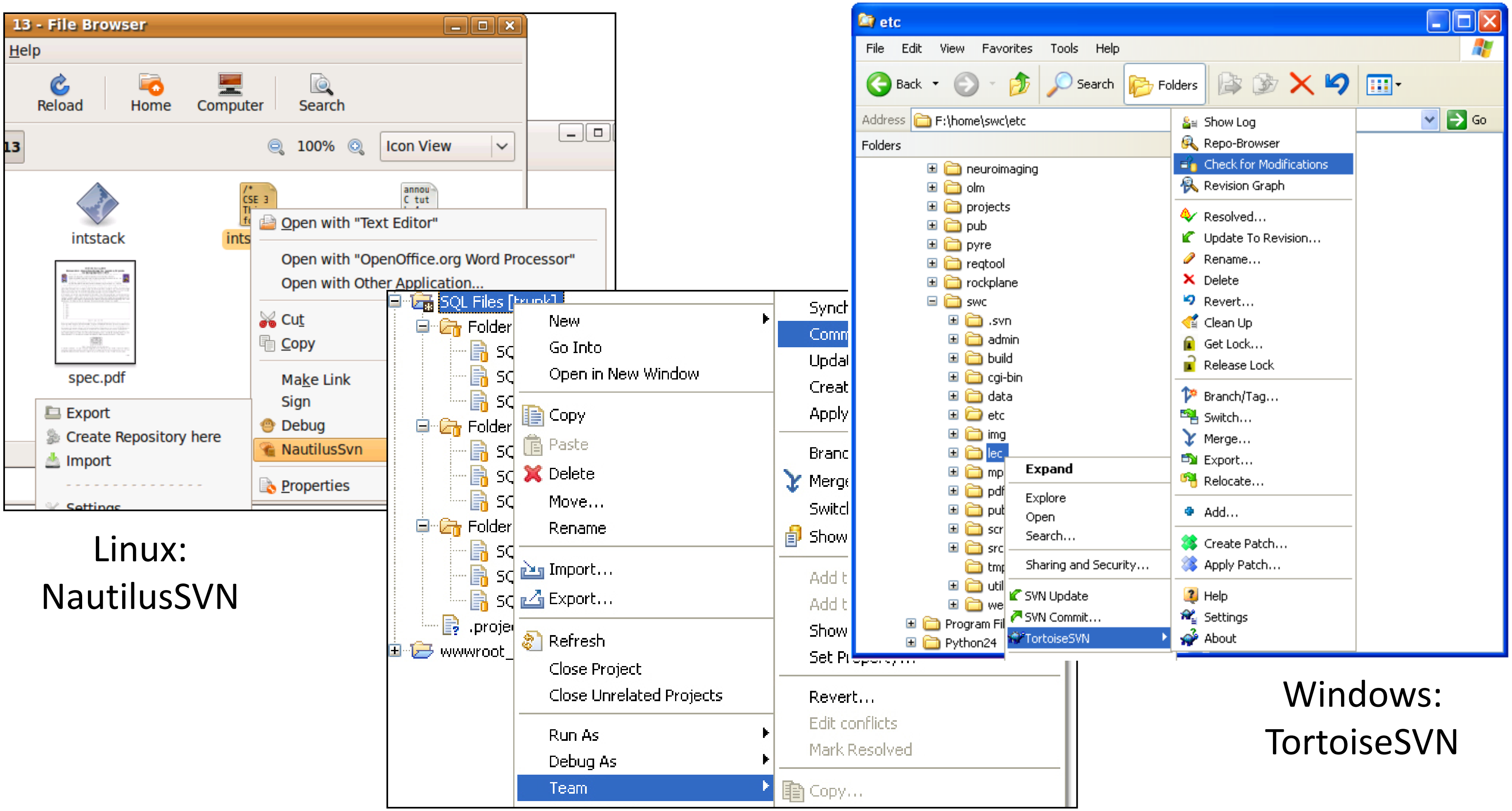
  -
    ```
    $ svn revert filename
    ```

- 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

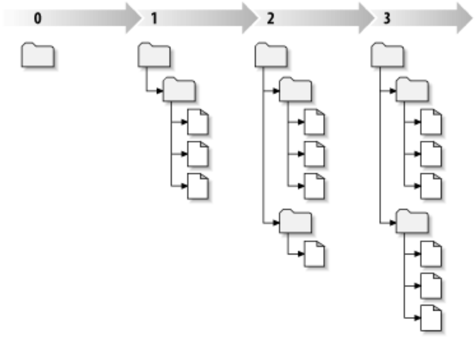
Eclipse:
Subclipse

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

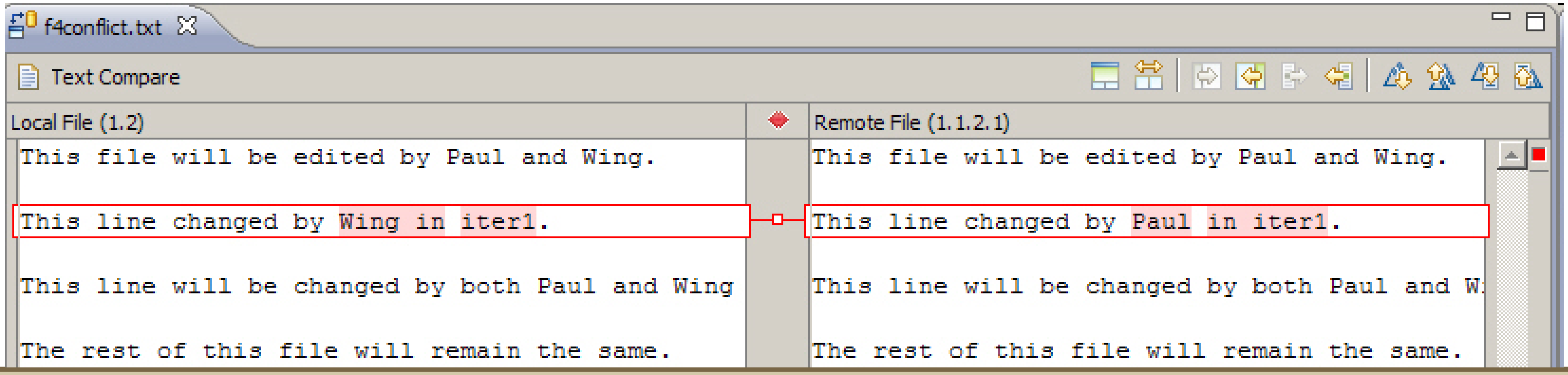
What's actually going on?



- 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)

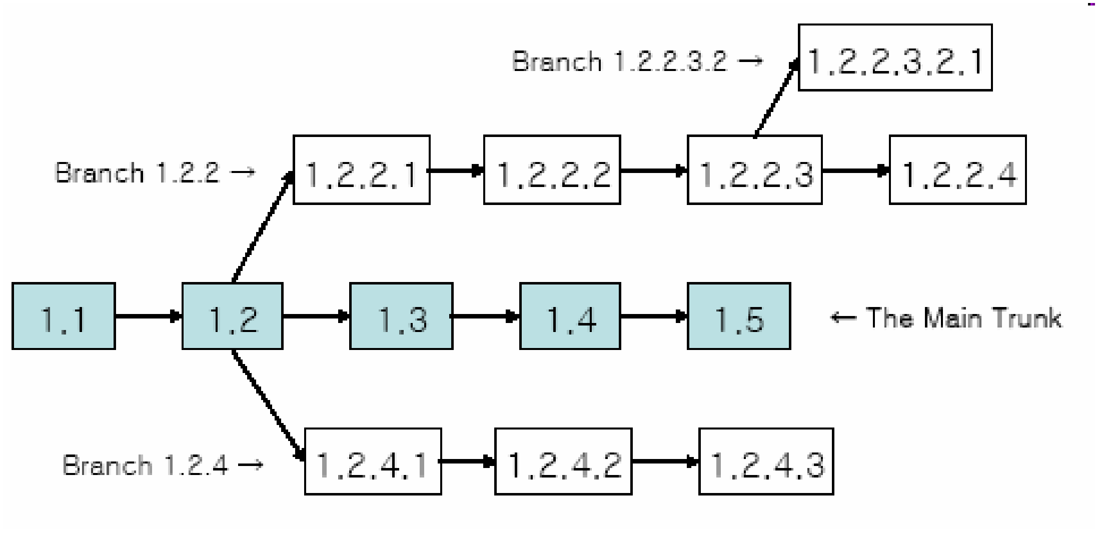


```
This file will be edited by Paul and Wing.

This line changed by Wing in iter1.

This line will be changed by both Paul and Wing

The rest of this file will remain the same.
```

```
This file will be edited by Paul and Wing.

This line changed by Paul in iter1.

This line will be changed by both Paul and W

The rest of this file will remain the same.
```

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
  - You probably won't have a 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?