Revision control systems (RCS)

and

Subversion
Problem area

- Software projects with multiple developers need to coordinate and synchronize the source code
Approaches to version control

• Work on same computer and take turns coding
  – Nah...

• Send files by e-mail or put them online
  – Lots of manual work

• Put files on a shared disk
  – Files get overwritten or deleted and work is lost, lots of direct coordination

• In short: Error prone and inefficient
The preferred solution

• Use a revision control system (like Subversion)
• RCS - software that allows for multiple developers to work on the same codebase in a coordinated fashion
• Can manage any sorts of files
• Alternatives are Bazaar, Git, Mercurial
How it works

**Repository:**
Central storage of the source code at a server

**Working copy:**
Local copy of the source code residing on the developer’s computer (a client)

**Some actions:**
- Import (check out)
- Read (update)
- Write (commit)

synchronize
The repository

- A central store of data
- Stores information in a virtual filesystem tree
- Remembers every change ever written to it
- Clients can check out an independent, private copy of the filesystem called a *working copy*
- Clients connect to the repository and read or write to the filesystem
Working copies

- Ordinary directory tree
- Each directory contains an administrative directory named .svn
- Changes are not incorporated or published until you tell it to do so
- A working copy corresponds to a subtree of the repository
Revisions

• Every commit creates a new *revision*, which is identified by a unique revision number
• Every revision is remembered by the RCS and forms a revision history
• Every revision can be checked out independently
• The current revision can be roll-backed to any revision
• Commits are *atomic*
Work cycle

1) Development: The developer makes changes to the working copy

2) Update: The developer receives changes made by other developers and synchronizes his local working copy with the repository

3) Resolve conflicts: When a developer has made local changes that won’t merge nicely with other changes, conflicts must be manually resolved

4) Commit: The developer makes changes and writes or merges them back into the repository

Initial check out: The developer checks out the source code from the repository
Trunk and Branches

- Trunk is the original main line of development
- A branch is a copy of trunk which exists independently and is maintained separately
- Useful in several situations:
  - Large modifications which takes long time and affects other parts of the system (safety, flexibility, transparency)
  - Different versions for production and development
  - Customised versions for different requirements
Conflicts

- Arises if several developers edit the same part of a file
- Solution in Subversion: ”Copy-modify-merge”

1) Developer A makes a change to Code.java and commits

2) Developer B makes a change to Code.java and tries to commit, but gets an ”out-of-date” warning.

3) Developer B updates his working copy. He will be noticed that Code.java is in a state of conflict.

4) Developer B edits and resolves the conflicts, and commits the file back in the repository.
Conflicts

• Changes that do not overlap are merged automatically
• 4 solutions are provided in conflict situations:
  – Use ”mine” version – the developers local copy
  – Use ”their” version – the copy in the repository
  – Use ”base” version – the file before you started editing
  – Use the original file with conflict markers and edit the conflict manually before committing
• Subversion must be told that the conflict is resolved
  – Will remove the temporary files and let you commit
Advantages of RCS

• Concurrent development by multiple developers
• Possible to roll-back to earlier versions if development reaches a dead-end
• Allows for multiple versions (branches) of a system
• Logs useful for finding bugs and monitoring the development process
• Works as back-up
Good practises

• Update, build, test, *then* commit
  – Do not break the checked in copy

• Update out of habit before you start editing
  – Reduce your risk for integration problems

• Commit often
  – Reduce others risk for integration problems

• Check changes (diff) before committing
  – Don’t commit unwanted code in the repo

• Do not use locking
  – Obstructs collaboration
What to add to the repository

- Source code including tests
- Resources like configuration files

- What to *not* add:
  - Compiled classes / binaries (target folder)
  - IDE project files
  - Third party libraries

- Add sources, not products (generated files)!
Subversion online commands

- Checkout a working copy:
  - $ svn checkout http://svn.example.com/scm

- Update a working copy:
  - $ svn update

- Commit your changes:
  - $ svn commit –m "a log message"

- Create a branch
  - $ svn copy http://svn.example.com/scm/trunk http://svn.example.com/scm/branches/my-branch
Subversion offline commands

- Add a file to the working copy:
  - `$ svn add Code.java`
- Delete a file from the working copy:
  - `$ svn delete Code.java`
- Move a file:
  - `$ svn move Code.java dir/Code.java`
- Compare working copy with repository on file-level:
  - `$ svn status`
- Compare working copy with repository on code-level:
  - `$ svn diff`
- Revert a file to the state from last commit
  - `$ svn revert Code.java`
Create a repository

/home/projects $ svnadmin create assignment1

/myhome/assignment1 $ svn checkout svn+ssh://username@svn.server.url/home/projects/assignment1

/home/projects/assignment1

/myhome/assignment1/...
Summary

- Revision control systems enable multiple developers to work on the same code base
- Subversion uses a client/server system with a repository and working copies
- Every commit generates a new revision, which can be checked out independently
- Projects have a trunk version and might have multiple branches
Resources

• "Version control with Subversion"
  – Free PDF book online
  – http://svnbook.red-bean.com/

• Subversion home page
  – http://subversion.tigris.org/

• Subversion help command
  – $ svn help <command>

• TortoiseSVN – Graphical user interface for Subversion
  – http://tortoisesvn.tigris.org