Source Code Management

- Also known as Configuration Mangagement
- Source code managers are tools that:
  - Allow many people to work on the same source base concurrently
  - Manage several different versions of the same source base
    - Preserve versions of code to reproduce later
    - Merge code from diverging source bases

How they work

- Central database of source code, documentation, build tools
- To make a change:
  - check out the latest version of a file
  - makes the change
  - update the database

What should be in the database?

- Source code
- Documentation
- Build tools
  - Often need old versions of the tools to build old versions of the software
  - Ensures software is rebuilt exactly as the version which shipped to the customer
- Test suites
- Anything else you might want later

Version control

- Companies ship several products from the same source base
  - Ex: NT and Win95/98 versions of MS Office
- When tracking down a defect, you want to examine the source code as it was when the product shipped

Code sharing

- Two people can work on the same source base without colliding
  1. Locks individual source files so only one person at a time can modify it
  2. Or: Allows two people to modify a source file and the system will automatically merge the changes (usually)

Locking

- Only one person can work on a file at once
- Works fairly well if developers work on different areas of the project and don‘t conflict often
- Problem 1: people forget to unlock files when done
- Problem 2: people work around locking by editing a private copy and checking that in when file is finally unlocked - easy to goof and lose changes

Merging

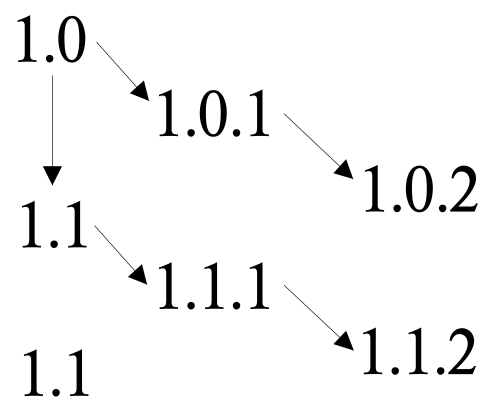
- Several people can work on a file at once
- Before committing changes, each user merges their copy with the latest copy in the database
  - This is done automatically by the system and usually works, but you should not blindly accept the result of the merge

Labelling

- Label all the files in the source base that make up a product at each milestone
  - Just before and just after a major change (e.g., changing several interfaces)
  - When a new version ships

Version trees

- Each file in the database has a version tree
- Can branch off the version tree so allow separate development paths
  - Typically, a main path (trunk) for the next major version and branches off of shipped versions for maintenance



Branching

- When a new version ships, typically create a branch in the version tree for maintenance
- Double update: fix a defect in the latest version and then merge the changes (often by hand) into the maintenance version
- Also create personal branches so you can make a change against a stable source base and then merge in the latest version later

Examples

- RCS
  - Solaris: man rcsintro
- CVS
  - Solaris: man cvs
  - www.cyclic.com/cvs/info.html
- Visual SourceSafe
  - msdn.microsoft.com/SSAFE
- ClearCase
  - www.rational.com

RCS

- File management only
- Transaction model
  - check out and lock
  - edit
  - check in and unlock
- Little support for binaries

CVS

- Built on top of RCS
  - Therefore little support for binaries
- Database can be remote
- No locking: merge before commit
- Fast
- Integrates with emacs

SourceSafe

- Microsoft‘s entry in the field
- Project-based
- Checkout-edit-checkin model
- Built-in web site creation tools
- Integrates with MSDEV

Clearcase

- Clearcase is configuration management on steroids
- You create a *view* of the database with a *config spec*, which describes how to select files from the database
- When you set a view, Clearcase creates a virtual filesystem containing only those versions of the files selected by the config spec

Clearcase Features

- Distributed system
  - Several groups at different locations can work on the same database
- Can install triggers
  - Example: email the the author of a file when some one makes a change to it
- Uses merging model like CVS, but can also lock files

More Clearcase Features

- Integrates with MSDEV
- Build management
  - Knows to rebuild out-of-date files, even if your makefile doesn‘t
- Slow and a bit buggy