Source code management

COMP8440: FOSSD Lecture 3



Early approaches

Simple tools

- diff, patch and tar
- Patches sent by email
- Each developer maintains their own tree
- Distribution by ftp and usenet

Patches

- Basic tool of code exchange
 - several formats available unidiff now the norm
 - contains short context for each change
 - main tools: diff, patch, diffstat

Sending patches

Common rules

- use diff -up, exclude generated files
- include diffstat output
- include an explanation of your patch
- [PATCH] at start of subject
- use inline or plain text encoding for patch
- don't send html encoded email!
- break up your patches on logical boundaries
- use a patch series if needed
- check you've followed the project coding style
- be sure you are sending to the right place
- be patient, and follow up if need be
- Add Signed-off-by (for some projects)

Let's look at some examples on the kernel list ...

First generation SCM systems

RCS and SCCS

- Manages files individually
- Only one person editing at a time
- No merge capability
- Provides development history
- Key data is who, what and when

The rise of CVS

- Concurrent Versions System
 - Built on top of RCS
 - Allowed for parallel development
 - Included merge and conflict resolution
 - based on diff/patch
- Hugely popular in the FOSS world
 - Dominated FOSS development from 1991 to 2005
 - Still very widely used, but less so each year
- Many limitations
 - Poor rename and directory support
 - Contacts centralised server for most operations
 - Poor branch merging support

Centralised vs Distributed

- Where is the project hosted?
 - CVS hosts in a central fashion
 - Each developer has a 'checkout'
 - Most project meta-data is only stored on the central server
- Distributed version control
 - All project history is locally available to all developers
 - Most systems aim for easy branching/merging

Subversion

'CVS done right'

- Attempt to re-invent centralised source code control
- Fixes many of the limitations in CVS
- Adds project-wide revisions
- Widely chosen to replace CVS in FOSS projects from 2001 onwards
- Still very widely used

Centralised design

- Use of non-distributed design has been criticised
- Distributed add-ons available (svk), but not widely used

Distributed Systems

Early systems

- Code Co-Op (windows based) in 1997
- GNU Arch (aka TLA or Tom Lord's Arch) in 2001

Bitkeeper

- Adopted by Linux kernel in 2002
- Unusual licensing model
- Huge impact on speed of kernel development

Newer systems

- Lots of new systems starting in 2003
- bazaar, darcs, mecurial, git, monotone
- git has gained widest following

Bitkeeper and git

Controversial choice

- Linux kernel adopted bitkeeper in 2002
- Led to acceleration of kernel development
- Proprietary tool, with freeware client
- License terms included a strong non-compete clause

Move to git

- Makers of bitkeeper disapproved of free client
- Free bitkeeper withdrawn in 2005
- Replaced by new system 'git' in June 2005

SCM Interfaces

Command line dominates

- Most FOSS users use command line interfaces
- Tools aim to produce a very fast workflow
- Most SCM tools also offer GUI or editor interfaces

Web Interfaces

- Many SCM tools provide web interfaces
- Mostly used to browse development history
- cvsweb, svnweb and gitweb are very popular
- Custom web interfaces are often built

Interfaces with other systems

- Tools to integrate with bug tracking systems
- Integration with build management and build farms

Build Farms

- Integrating SCM with testing
 - Automating testing can help find bugs faster
 - Especially important for portability
- A build farm
 - Wide range of machines/OS's
 - Automatically run regression tests on commit
 - Usually results are available publicly
 - Build/test failures may be reported by email
- Examples
 - Tinderbox
 - Samba build farm
 - Build-bot

Public SCM Hosting

Canned hosting

- Many/most FOSS projects use a canned hosting solution
- Canned project hosting can make project maintenance much easier
- usually less flexible than running your own

DVCS public hosting

- DVCS workflow created a demand for easier hosting
- Many sites have sprung up for all the DVCS systems
- See for example
 - Git: repo.oz.cz, github.com
 - Hg: bitbucket.org, freehg.org
 - bzr: launchpad.net

SCM Compatibility

Two SCMs, one project

- Some projects offer multiple SCMs for the same code
- Gateway tools offer interoperability
- As a new developer, choose the SCM that most of the existing developers in the project use

Conversion tools

- Many newer SCMs offer automated conversion
- Allows project history to be preserved
- Often requires some manual tweaking
- Best known general converter is 'tailor'

Builtin converters

- some SCM tools have builtin access to other tools
- "git svn" is paricularly useful