To Distribute or Not To Distribute

How to know your DVCS from your CVCS

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Aims of the Session

- Introduce the distributed and centralized models of version control.
- Convince people that distributed version control systems are superior in all ways to centralized version control systems.

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Structure of the Session

- Beginning.
- Middle.
- End – possibly.

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Begin

- Why use version control?
  - That's another talk...

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Begin Again

- Where are we, and how did we get here?
- Some contemporary version control systems.
- One or two systems in bit more depth.
- How does distributed version control work?
- Version control workflows.
- Opinion and prejudice unleashed: comments on systems we have used.

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Prehistory

- Card decks and paper tape store programs.
- Evolving code is hard enough without worrying about versions.
- Each program has maybe one client, no need for a publishing strategy.

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The Dark Ages

- Programs stored on disk or magnetic tape.
- Backups are taken – but this is for the operators' benefit.
- Evolving code is hard enough without worrying about versions.
- Each program has maybe one client, no need for a publishing strategy.

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The Middle Ages

- Programmers make errors and want to revert back to the old version...
- ...and thus did SCCS spring into being.

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SCCS and RCS

- Individual files are versioned.
- Entirely file system based.
- Network use problematic.
- Lock – edit – (commit –) unlock cycle.

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The Renaissance

- Concurrent edit and merge model of working.
- Client–server access.

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The Enlightenment

- Changesets
- Atomic commits

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The War Years

- Perforce in profit making organizations.
- CVS for FOSS.
  - CVS has too many problems...
  - ...enter Subversion.

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The Jet Age

- The rise of peer-to-peer.
- Operating without network connectivity – yes, it does happen!
- The fascism of centralization.

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The Second Renaissance

- Arch, TLA.
- BitKeeper and the Linux kernel.
- Monotone and Git.
- Bazaar and Mercurial.
- Darcs.

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Some Contemporary Version Control Systems

Centralized

- Subversion
- Perforce
- ClearCase
- Vesta

Distributed

- Bazaar
- Mercurial
- Git
- Darcs
- Aegis

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Two DVCS Systems In Action

- Bazaar In Action
- Mercurial in Action

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Distributed Version Control

How being distributed works

- Centralized Version Control is easy(ish) to comprehend:
  - Linear series of changes.
  - Each change has a context.
- In DVCS, every developer has their own branch(es).
- You can merge between any branch.
- You're going to need some decent merging then...

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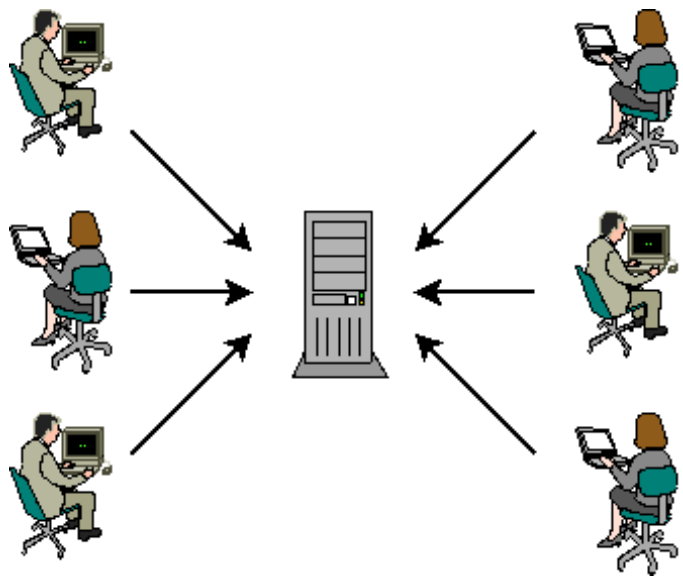
Workflow – Centralized

- Update/Edit/Update-Merge/Commit.
- Branch on server/Update checkout to branch.



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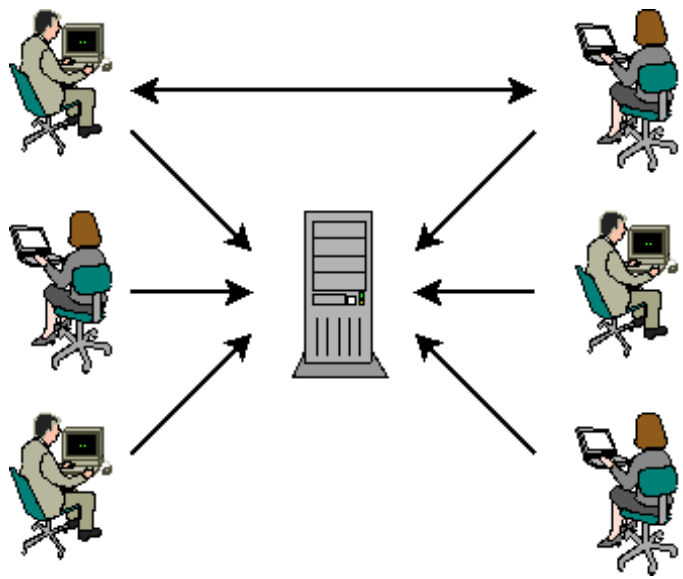
Workflow – Distributed as Centralized

- Pull/Update/Edit/Commit/Pull-Merge/Commit/Push.
- Branch on server/Pull branch/etc.



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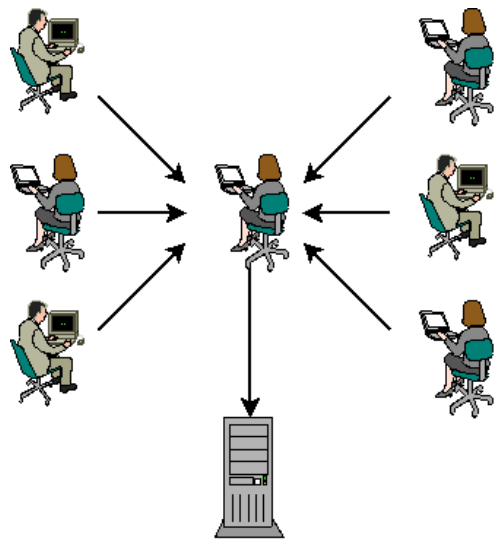
Workflow – Distributed, Centralist with Review

- Pull/Update/Edit/Commit/Pull-Merge. Inform reviewer who pulls, or email change bundle to reviewer. If review passed, reviewer commits in reviewed tree and pushes to master. Or authorizes direct push to master. Or something.



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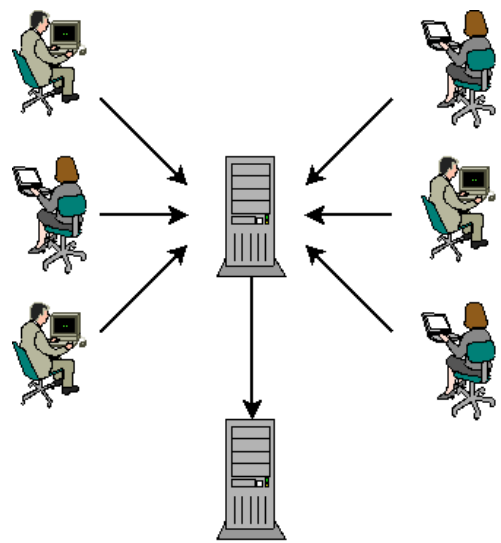
Workflow – Distributed, Centralist with Review

- The review gateway can be an automated process (e.g. Bazaar's PQM).
- Pull changes from a branch, make sure everything still builds and the test suite passes.
- Commit the changes and push to the master.



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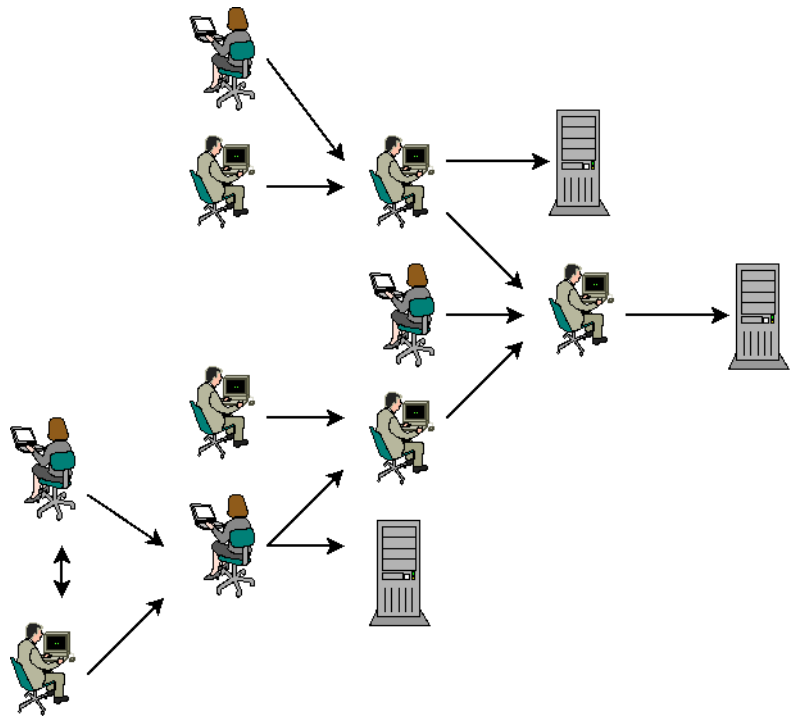
Workflow – Distributed, Disconnected Hierarchy

- Reviewers don't scale well.
- Answer – a tree of reviewers!



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Opinions – CVS

- In its time is was superb.
- Now a millstone – time has moved on.

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Opinions – Subversion

- Excellent – but only if everyone using a repository is connected to the repository at all times.
- Well actually will be excellent by v1.6, currently only good.
- Well, to be honest, totally useless for any form of distributed/virtual organization.

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Opinions – Perforce

- Payware – $800, then $160 per seat per anum.
- Long established and innovative.
- Highly portable.
- Fast.
- Excellent merge capabilities including merge tracking.
- Workspace can be loaded from multiple sources in repo.
- Work in progress tracked on server.
- Proxy servers, and access to remote servers.
- Nice centralized system. But we want distributed...

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Opinions – Bazaar

- Simple and usable.
- It works.
- High-profile backers – e.g. Canonical.
- Eclipse Integration.
- Works well as a front end to Subversion as well as being an excellent centralist of distributed version control system.
- Compared to Git and Mercurial, Bazaar is slow.

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Opinions – Mercurial

- Simple and usable.
- It works.
- Fast (includes a few C modules for speed).
- High-profile users, e.g. Sun.
- Integrated 'MQ'quilt-like system.
- Has a Good Book.
- TortoiseHg Windows integration.
- NetBeans integration.

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Opinions – Git

- By Linux hackers for Linux hackers.
- Complex but very flexible.
- Plumbing and Porcelain.
- Great for working with Subversion repositories!

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Opinions – SVK

- OK if what you want is disconnected working with a Subversion repository.
- It's in Perl...
- Actually Bazaar and Git are better.
- Except that SVK is a Subversion store whilst Bazaar and Git are not.
- Cannot be used in a fully-distributed way.

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Opinions – ClearCase

- Reminder – we've still never used ClearCase.
  - We are still going to express an opinion even though we have only done some reading.
  - If you have real knowledge, please share.
- Data repository holds:
  - Current and historical source.
  - 'Derived objects'.
  - Accounting data - who created what, why? What is in a build? etc.
- Each source tree or subtree can be a separate VOB.
- VOBs distributed over LAN, can be linked into single logical tree.
- User access via *views*. VOBs appear as trees in views.
- Work on own branch.
- Good merging.

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Opinions – ClearCase

- ClearCase MultiSite
  - Site gets a branch writable by that site only.
  - All other branches visible, but read-only.
  - Off-network working not possible.
- No atomic commits.
- Expensive, in resources in $$$.
- BigCo stuff.
- From our point of view, not a true DVCS.

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Opinions – Microsoft Foundation Team Server

- Reminder – we've never used it.
- Team Foundation Version Control.
- Changeset based.
- Looks similar to ClearCase.
- Off-network working not possible (as far as we can tell).
- From our point of view, not a true DVCS.

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Rounding Off

- Centralized systems such as Subversion are yesterday's version control systems.
- Distributed systems such as Bazaar, Mercurial and Git are today's and tomorrow's systems.

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How Mercurial Works

Introduction

- `http://hgbook.red-bean.com/hgbookch4.html`, `http://www.selenic.com/mercurial`
- Revlog – thing that holds a file and its changes
- NodeId – SHA1 hash of current file contents and NodeId(s) of parent(s)
- So, NodeIds match iff file states are identical and the file has the same history

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How Mercurial Works

The Manifest

- List of all files in the project with their current NodeIds.
- Manifest is held in a revlog.
- Manifest NodeId identifies project filesystem at a particular point.

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How Mercurial Works

The Changeset

- Atomic collection of changes to a repository leading to new revision.
- Manifest NodeId.
- Timestamp and committer ID.
- List of changed files.
- NodeId of parent changeset(s).
- Changelog is a revlog of the changesets.

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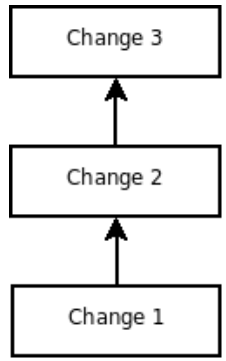
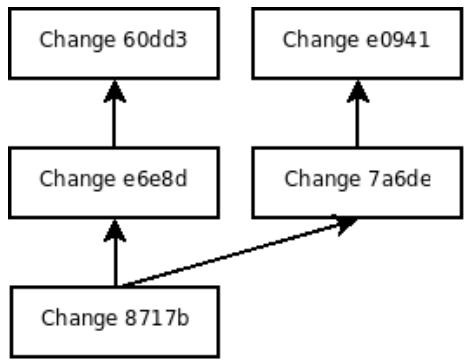
How Mercurial Works

Pushing and pulling

- Copy changes from one repository to another



- Find common ancestor
- Create parallel track/head/branch from common ancestor



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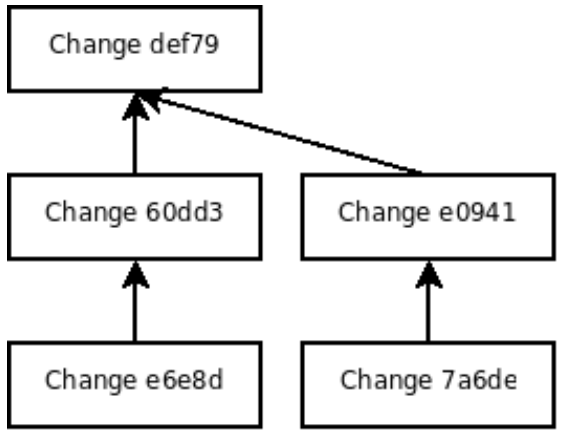
How Mercurial Works

Merging

- Merge two heads
- Merge creates a change
- Human resolves conflicts
- Committing change collapses two heads into one



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