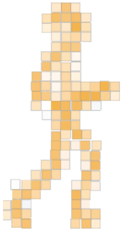
Fast, Flexible and Fun: Revision Control with Mercurial

Martin Geisler
⟨mg@aragost.com⟩

IBM Research – Zurich
September 16th, 2010



About the Speaker

Martin Geisler:

- core Mercurial developer:
  - reviews patches from the community
  - helps users in our IRC channel
- PhD in Computer Science from Aarhus University, DK
  - exchange student at ETH Zürich in 2005
  - visited ZRL for three months in 2008
- now working at aragost Trifork, Zürich

Outline

Outline

What is Mercurial?

Main features:

- fast, distributed revision control system
- robust support for branching and merging
- very flexible and extensible

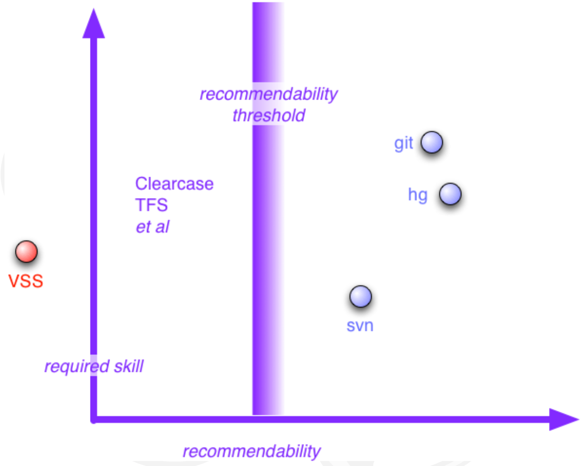
Who is Using it?

Mercurial is used by:

- Oracle for Java, OpenSolaris, NetBeans, OpenOffice, . . .
- Mozilla for Firefox, Thunderbird, . . .
- Google
- many more. . .

Testimonials

Martin Fowler, 2010: http://martinfowler.com/



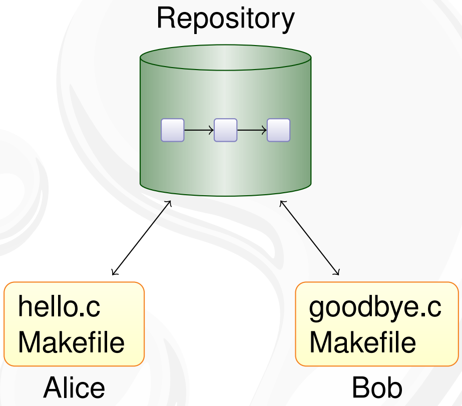
Testimonials

Joel Spolsky, 2010: http://www.joelonsoftware.com/

> Mercurial is better than Subversion.
> It is a better way of working on source code with a team. It is a better way of working on source code by yourself.
> It is just better.

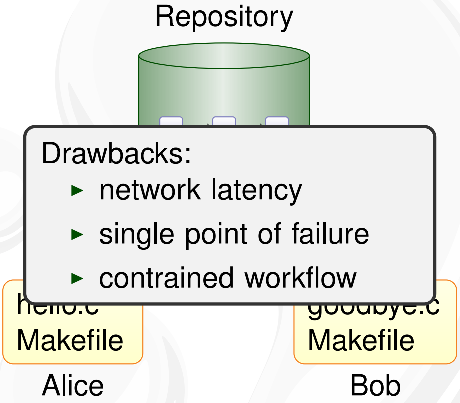
Centralized Revision Control

Single repository, multiple working copies:



Centralized Revision Control

Single repository, multiple working copies:

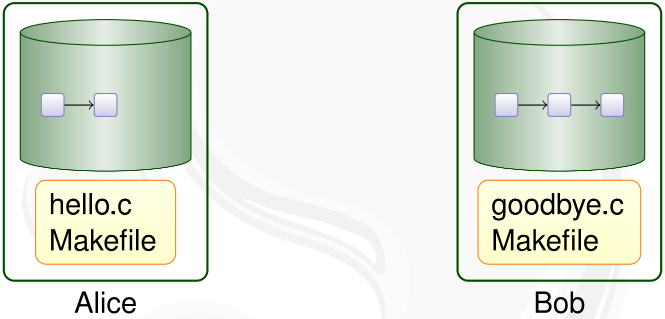


Drawbacks:

- network latency
- single point of failure
- contrained workflow

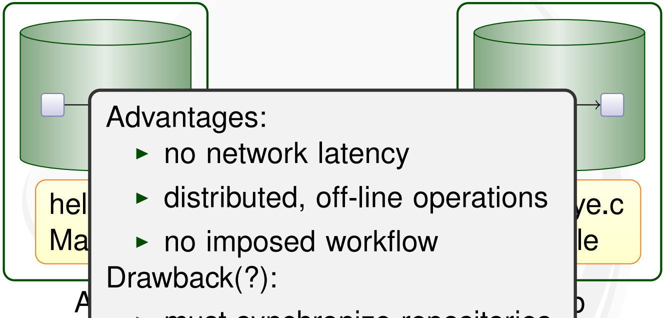
Distributed Revision Control

Mercurial duplicates the history on many servers:



Distributed Revision Control

Mercurial duplicates the history on many servers:



Advantages:

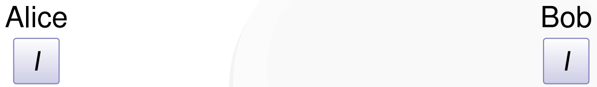
- no network latency
- distributed, off-line operations
- no imposed workflow

Drawback(?):

- must synchronize repositories

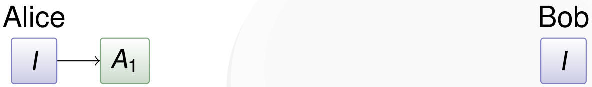
Moving Changesets Around

Pull and merge:



Moving Changesets Around

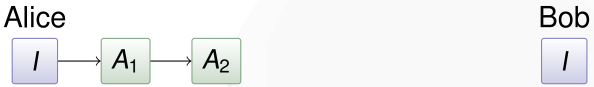
Pull and merge:



$$\begin{tikzcd} \boxed{I} \arrow[r] & \boxed{A_1} \end{tikzcd} \qquad \boxed{I}$$

Moving Changesets Around

Pull and merge:



$$\begin{tikzcd} I \arrow[r] & A_1 \arrow[r] & A_2 & & & I \end{tikzcd}$$

Moving Changesets Around

Pull and merge:

Alice

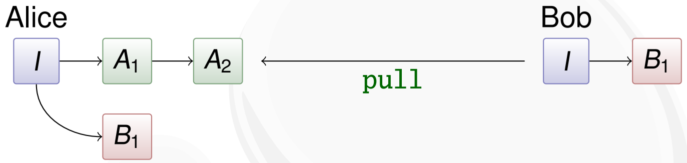
$$\begin{tikzcd} \boxed{I} \arrow[r] & \boxed{A_1} \arrow[r] & \boxed{A_2} \end{tikzcd}$$

Bob

$$\begin{tikzcd} \boxed{I} \arrow[r] & \boxed{B_1} \end{tikzcd}$$

Moving Changesets Around

Pull and merge:



Moving Changesets Around

Pull and merge:

$$\begin{tikzcd}
\text{Alice} & & & \texttt{merge} \\
I \arrow[r] \arrow[dr, bend right] & A_1 \arrow[r] & A_2 \arrow[r] & A_3 \\
& B_1 \arrow[urr, bend right] & &
\end{tikzcd}$$

$$\begin{tikzcd}
\text{Bob} & \\
I \arrow[r] & B_1
\end{tikzcd}$$

Moving Changesets Around

Pull and merge:

Alice

$$\begin{tikzcd}
I \arrow[r] \arrow[dr, bend right] & A_1 \arrow[r] & A_2 \arrow[r] & A_3 \\
& B_1 \arrow[urr, bend right] & &
\end{tikzcd}$$

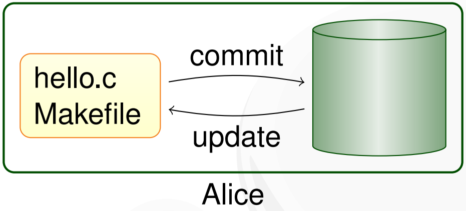
Bob

$$\begin{tikzcd}
I \arrow[r] & B_1
\end{tikzcd}$$

Merging:

- find common ancestor of A_2 and B_1: I
- compute differences between I and B_1
- apply them to A_2, taking renames into account

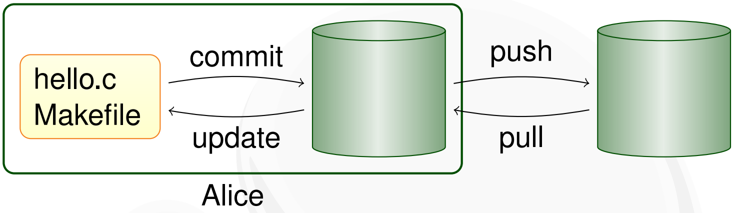
Key Mercurial Commands



Local commands:

- `hg commit`: save a snapshot into the current repository
- `hg update`: checkout revision into working directory
- `hg merge`: join different lines of history

Key Mercurial Commands



Local commands:

- `hg commit`: save a snapshot into the current repository
- `hg update`: checkout revision into working directory
- `hg merge`: join different lines of history

Network commands:

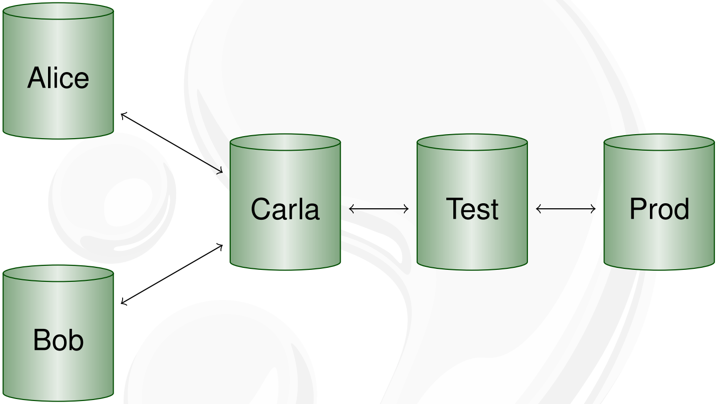
- `hg pull`: retrieve changesets from another repository
- `hg push`: send your changesets to another repository

Outline

Outline

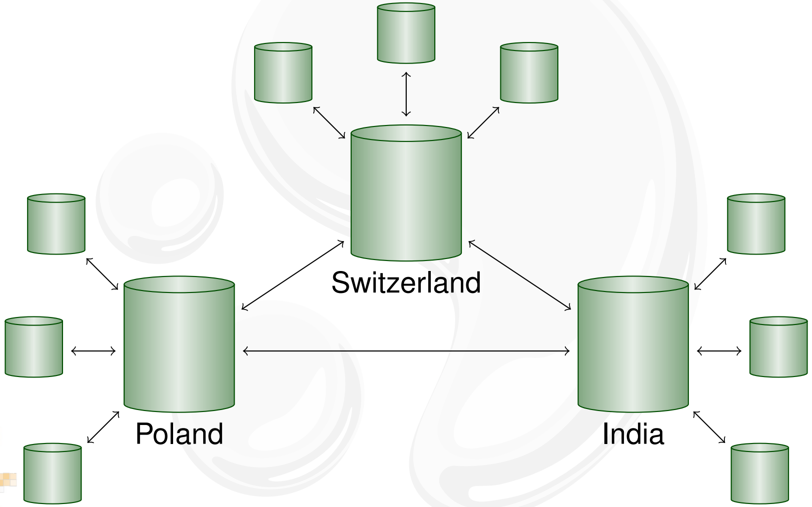
Workflow in a Team

Mercurial scales from a single team. . . :



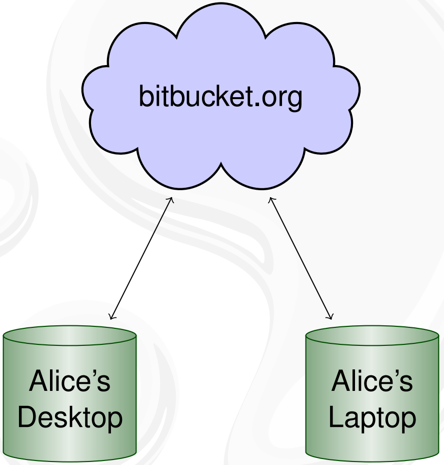
Workflow Between Company Divisions

...to enterprise-wide development...:



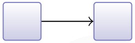
Workflow Between Two Computers

. . . to working with yourself:

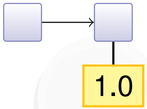


Outline

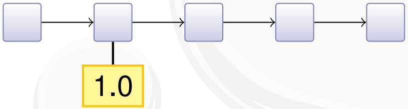
Release Branches



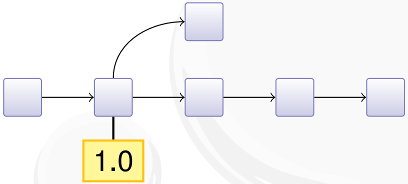
Release Branches



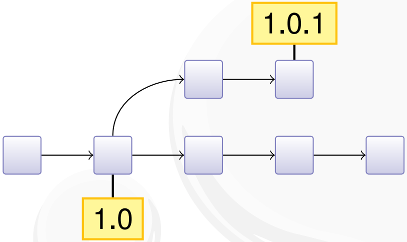
Release Branches



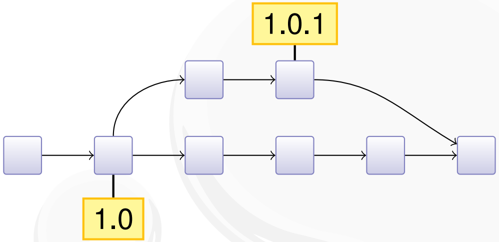
Release Branches



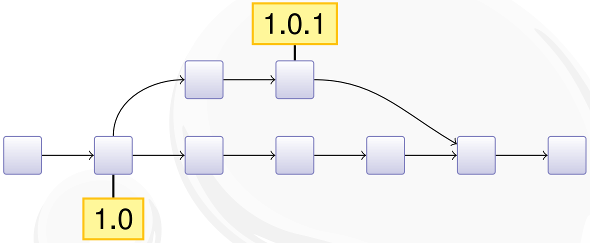
Release Branches



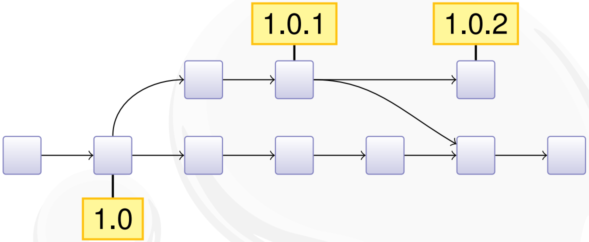
Release Branches



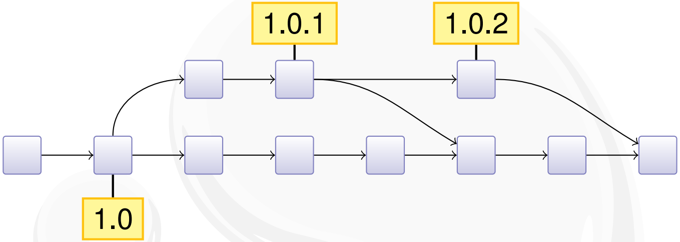
Release Branches



Release Branches



Release Branches



Branches in SVN

Subversion knows nothing about branches!

- but SVN has a cheap copy mechanism
- used for tags and branches

Branches in SVN

Subversion knows nothing about branches!

- but SVN has a cheap copy mechanism
- used for tags and branches

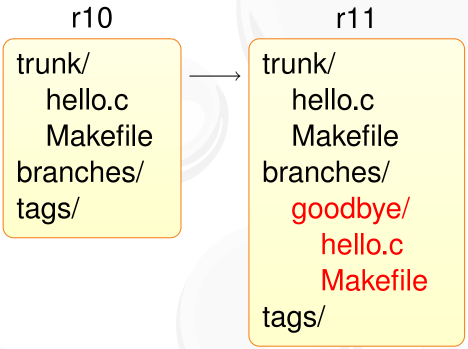
r10

```
trunk/
   hello.c
   Makefile
branches/
tags/
```

Branches in SVN

Subversion knows nothing about branches!

- but SVN has a cheap copy mechanism
- used for tags and branches



```
r10
trunk/
    hello.c
    Makefile
branches/
tags/
```

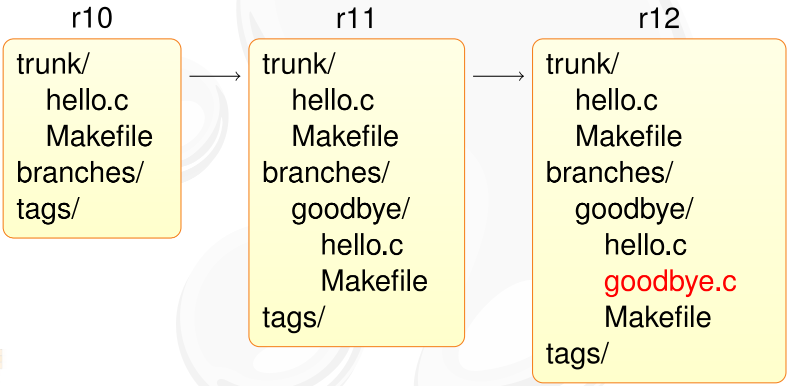
$\longrightarrow$

```
r11
trunk/
    hello.c
    Makefile
branches/
    goodbye/
        hello.c
        Makefile
tags/
```

Branches in SVN

Subversion knows nothing about branches!

- but SVN has a cheap copy mechanism
- used for tags and branches



```
r10
trunk/
    hello.c
    Makefile
branches/
tags/
```

```
r11
trunk/
    hello.c
    Makefile
branches/
    goodbye/
        hello.c
        Makefile
tags/
```

```
r12
trunk/
    hello.c
    Makefile
branches/
    goodbye/
        hello.c
        goodbye.c
        Makefile
tags/
```

Merging Branches in SVN

The support is incomplete and fragile:

- renamed files are not merged correctly
- old clients will not update the merge info

Merging Branches in SVN

The support is incomplete and fragile:

- renamed files are not merged correctly
- old clients will not update the merge info

From the SVN Book:

> The bottom line is that Subversion's merge-tracking feature has an extremely complex internal implementation, and the `svn:mergeinfo` property is the only window the user has into the machinery. Because the feature is relatively new, a numbers of edge cases and possible unexpected behaviors may pop up. —*Version Control with Subversion*

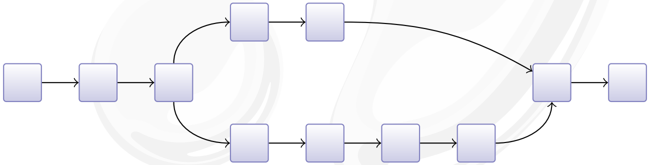
(Mercurial has robust built-in support for merging branches.)

Outline

The Underlying Model

A Mercurial changeset conceptually consist of:

- 0–2 parent changeset IDs:
  - root changeset has no parents
  - normal changesets have one parent
  - merge changesets have two parents
- date, username, commit message
- difference from first parent changeset
- changeset ID is computed as SHA-1 hash of the above
- makes it impossible to inject malicious code on server



Outline

Browsing the History of a File

The `hg annotate` command is invaluable:

- you see when each line was introduced
- you can quickly jump back to earlier versions

History of Mercurial's README file:

```
3942: Basic install:
 445:
3942:  $ make              # see install targets
3942:  $ make install      # do a system-wide install
3942:  $ hg debuginstall # sanity-check setup
3942:  $ hg                # see help
   0:
# ...
```

Better interface in `hg serve`

Searching File Content

Ever wondered when a function was introduced?

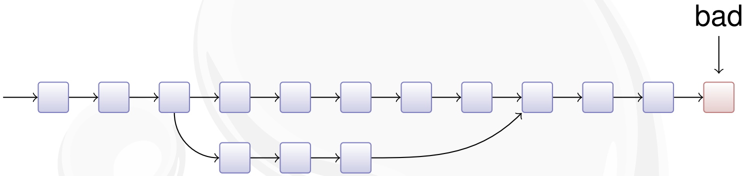
- `hg grep` can help you!

Example: When was `hg forget` introduced?

```
% hg grep --all 'def forget' commands.py
commands.py:8902:+:def forget(ui, repo, *pats, **opts):
commands.py:3522:-:def forget(ui, repo, *pats, **opts):
commands.py:814:-:def forget(ui, repo, file1, *files):
commands.py:814:+:def forget(ui, repo, *pats, **opts):
# ...
```

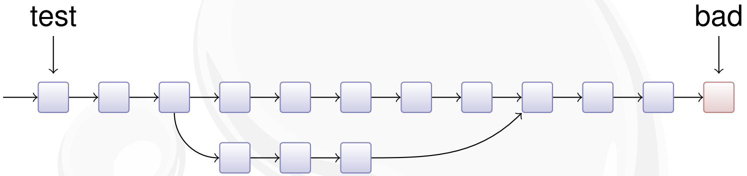
Revision Graph Bisection

You've found a bug! When was it first introduced?
Use `hg bisect` to mark good and bad revisions:



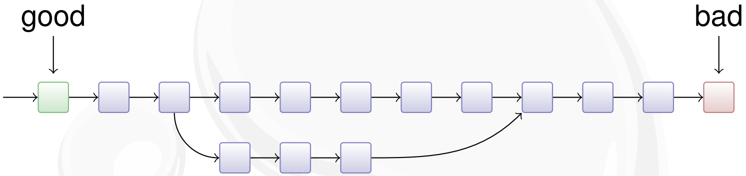
Revision Graph Bisection

You've found a bug! When was it first introduced?
Use `hg bisect` to mark good and bad revisions:



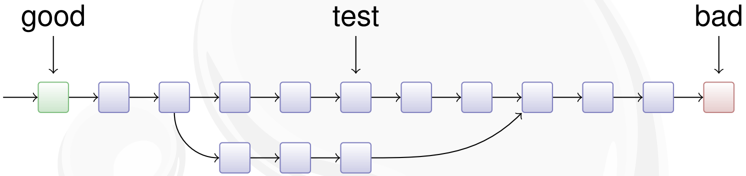
Revision Graph Bisection

You've found a bug! When was it first introduced?
Use `hg bisect` to mark good and bad revisions:



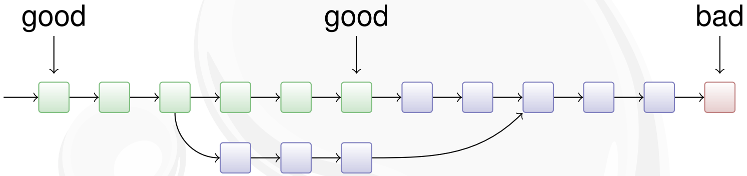
Revision Graph Bisection

You've found a bug! When was it first introduced?
Use `hg bisect` to mark good and bad revisions:



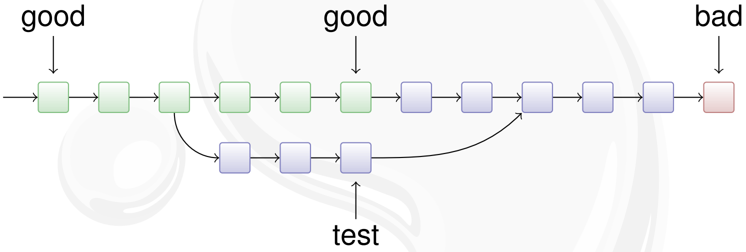
Revision Graph Bisection

You've found a bug! When was it first introduced?
Use `hg bisect` to mark good and bad revisions:



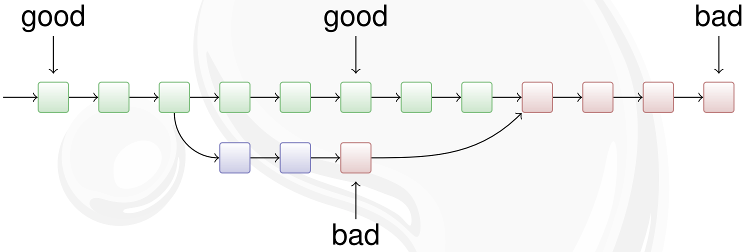
Revision Graph Bisection

You've found a bug! When was it first introduced?
Use `hg bisect` to mark good and bad revisions:



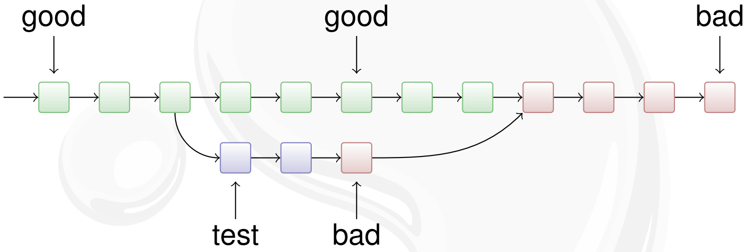
Revision Graph Bisection

You've found a bug! When was it first introduced?
Use `hg bisect` to mark good and bad revisions:



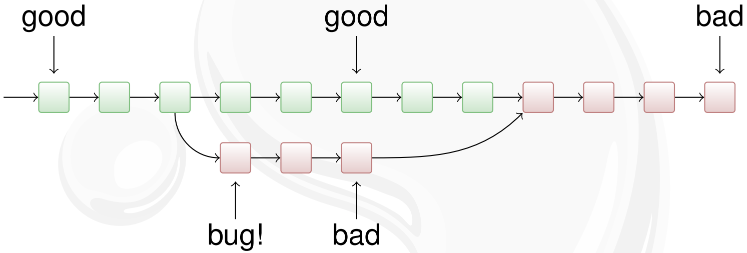
Revision Graph Bisection

You've found a bug! When was it first introduced?
Use `hg bisect` to mark good and bad revisions:



Revision Graph Bisection

You've found a bug! When was it first introduced?
Use `hg bisect` to mark good and bad revisions:



Outline

Mercurial is Extensible

You can add new functionality to Mercurial:

- ships with 30+ extensions
- wiki lists 75+ extensions
- extensions can change basically everything
- helps to keep the core small and focused

Outline

Moving Changesets Around

Tired of all those merges? Use the `rebase` extension!

- Revision graph:

$$\begin{tikzcd} \boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} \end{tikzcd}$$

Moving Changesets Around

Tired of all those merges? Use the `rebase` extension!

- Revision graph:

$$\begin{tikzcd} A \arrow[r] & B \arrow[r] & C \arrow[r] & D \arrow[r] & E \end{tikzcd}$$

Moving Changesets Around

Tired of all those merges? Use the `rebase` extension!

- Revision graph:

$$\begin{tikzcd}
A \arrow[r] & B \arrow[r] & C \arrow[r] \arrow[dr, bend right] & D \arrow[r] & E \\
 & & & X \arrow[r] & Y \arrow[r] & Z
\end{tikzcd}$$

Moving Changesets Around

Tired of all those merges? Use the `rebase` extension!

- Revision graph:

$$\begin{tikzcd}
A \arrow[r] & B \arrow[r] & C \arrow[r] \arrow[dr, bend right] & D \arrow[r] & E & \\
 & & & X \arrow[r] & Y \arrow[r] & Z
\end{tikzcd}$$

- Merge:

$$\begin{tikzcd}
A \arrow[r] & B \arrow[r] & C \arrow[r] \arrow[dr, bend right] & D \arrow[r] & E \arrow[rr] & & M \\
 & & & X \arrow[r] & Y \arrow[r] & Z \arrow[ur, bend right] &
\end{tikzcd}$$

Moving Changesets Around

Tired of all those merges? Use the `rebase` extension!

- Revision graph:

$$\begin{tikzcd}
A \arrow[r] & B \arrow[r] & C \arrow[r] \arrow[dr, bend right] & D \arrow[r] & E \\
& & & X \arrow[r] & Y \arrow[r] & Z
\end{tikzcd}$$

- Merge:

$$\begin{tikzcd}
A \arrow[r] & B \arrow[r] & C \arrow[r] \arrow[dr, bend right] & D \arrow[r] & E \arrow[rr] & & M \\
& & & X \arrow[r] & Y \arrow[r] & Z \arrow[ur, bend right] &
\end{tikzcd}$$

- Rebase:

$$\begin{tikzcd}
A \arrow[r] & B \arrow[r] & C \arrow[r] \arrow[dr, bend right] & D \arrow[r] & E \\
& & & X \arrow[r] & Y \arrow[r] & Z \arrow[r] & D' \arrow[r] & E'
\end{tikzcd}$$

Moving Changesets Around

Tired of all those merges? Use the `rebase` extension!

- Revision graph:

$$\begin{tikzcd}
A \arrow[r] & B \arrow[r] & C \arrow[r] \arrow[dr, bend right] & D \arrow[r] & E \\
 & & & X \arrow[r] & Y \arrow[r] & Z
\end{tikzcd}$$

- Merge:

$$\begin{tikzcd}
A \arrow[r] & B \arrow[r] & C \arrow[r] \arrow[dr, bend right] & D \arrow[r] & E \arrow[rr] & & M \\
 & & & X \arrow[r] & Y \arrow[r] & Z \arrow[ur, bend right] &
\end{tikzcd}$$

- Rebase:

$$\begin{tikzcd}
A \arrow[r] & B \arrow[r] & C \arrow[r] \arrow[dr, bend right] & D \arrow[r] & E \\
 & & & X \arrow[r] & Y \arrow[r] & Z \arrow[r] & D' \arrow[r] & E'
\end{tikzcd}$$

- Beware: public changes should never be rebased.

Editing History

Inspired by `git rebase -i`, `histedit` lets you

- reorder changesets:

$$\begin{tikzcd} \boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} \arrow[r, squiggly] & \boxed{A} \arrow[r] & \boxed{C'} \arrow[r] & \boxed{B'} \end{tikzcd}$$

Editing History

Inspired by `git rebase -i`, `histedit` lets you

- reorder changesets:

$$\begin{tikzcd}\boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} & \rightsquigarrow & \boxed{A} \arrow[r] & \boxed{C'} \arrow[r] & \boxed{B'}\end{tikzcd}$$

- fold changesets:

$$\begin{tikzcd}\boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} & \rightsquigarrow & \boxed{A} \arrow[r] & \boxed{BC}\end{tikzcd}$$

Editing History

Inspired by `git rebase -i`, `histedit` lets you

- reorder changesets:

$$\begin{tikzcd} \boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} \arrow[r, phantom, "\rightsquigarrow"] & \boxed{A} \arrow[r] & \boxed{C'} \arrow[r] & \boxed{B'} \end{tikzcd}$$

- fold changesets:

$$\begin{tikzcd} \boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} \arrow[r, phantom, "\rightsquigarrow"] & \boxed{A} \arrow[r] & \boxed{BC} \end{tikzcd}$$

- drop changesets:

$$\begin{tikzcd} \boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} \arrow[r, phantom, "\rightsquigarrow"] & \boxed{A} \arrow[r] & \boxed{C'} \end{tikzcd}$$

Editing History

Inspired by `git rebase -i`, `histedit` lets you

- reorder changesets:

$$\begin{tikzcd} \boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} & \rightsquigarrow & \boxed{A} \arrow[r] & \boxed{C'} \arrow[r] & \boxed{B'} \end{tikzcd}$$

- fold changesets:

$$\begin{tikzcd} \boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} & \rightsquigarrow & \boxed{A} \arrow[r] & \boxed{BC} \end{tikzcd}$$

- drop changesets:

$$\begin{tikzcd} \boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} & \rightsquigarrow & \boxed{A} \arrow[r] & \boxed{C'} \end{tikzcd}$$

- edit changesets:

$$\begin{tikzcd} \boxed{A} \arrow[r] & \boxed{B} \arrow[r] & \boxed{C} & \rightsquigarrow & \boxed{A} \arrow[r] & \boxed{X} \arrow[r] & \boxed{B'} \arrow[r] & \boxed{C'} \end{tikzcd}$$

Outline

Migrating History

The `convert` extension can import history:

- CVS, SVN, Git, Bazaar, Darcs, ...
- incremental conversion
- many options for fiddling with branches, authors, ...

Migrating History

The `convert` extension can import history:

- CVS, SVN, Git, Bazaar, Darcs, ...
- incremental conversion
- many options for fiddling with branches, authors, ...

Interestingly, `convert` can import from Mercurial:

- `--filemap` lets you exclude and rename files
- `--branchmap` lets you rename branches

Interfacing with Subversion

The `hgsubversion` extension let's you:

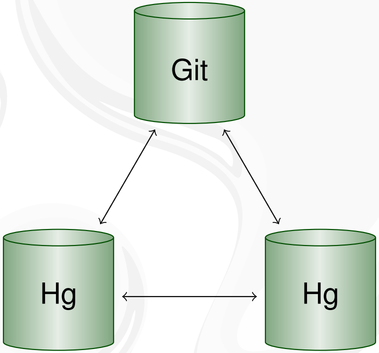
- use `hg clone` on a SVN URL
- use `hg pull` to convert new SVN revisions
- use `hg push` to commit changesets to SVN server

Goal: make `hg` a better Subversion client than `svn`!

Interfacing with Git

Need to work on a Git repository? Try `hg-git`!

- Mercurial extension: you get the nice `hg` command line
- round-tripping: changeset hashes are preserved



Outline

Third-Party Tools

Tools with Mercurial support:

- Shell integration: TortoiseHg (Windows, Mac, Linux)
- IDEs: Eclipse, NetBeans, IntelliJ, Visual Studio, Emacs…
- Project Support: Trac, JIRA, Maven, Hudson, BuildBot…

Outline

Mercurial in a Nutshell

Mercurial changes the way you develop:

- simple yet strong model for both branching and merging
- power tool instead of necessary evil
- light-weight and snappy

More Information

- Mercurial homepage:
  http://mercurial.selenic.com/
- *Mercurial: The Definitive Guide*:
  http://hgbook.red-bean.com/
- Getting Started:
  http://mercurial.aragost.com/kick-start/
  http://mercurial.ch/
  http://hginit.com/
- Some free Mercurial hosting sites:
  http://bitbucket.org/
  http://code.google.com/
  http://sourceforge.net/
  http://www.codeplex.com/

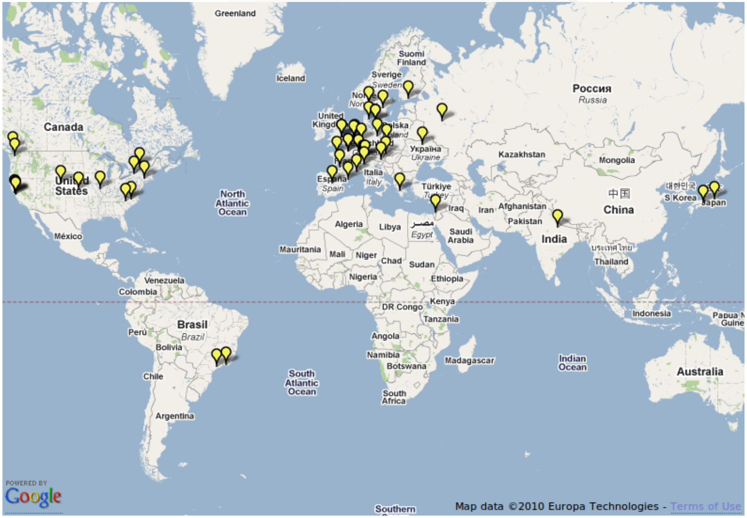
Contact

Please get in touch if you have more questions or have considered using Mercurial in your organization:

- Email: `mg@aragost.com`
- IRC: `mg` in `#mercurial` on `irc.freenode.net`

Mercurial Contributors

From `http://ohloh.net/p/mercurial/map`:



Showing 50 of 325 contributors.

Mercurial Contributors

From `http://ohloh.net/p/mercurial/map`:

Thank you!
Greenland
Iceland
Canada
United States
México
North Atlantic Ocean
Россия
Russia
Kazakhstan
Mongolia
China
S Korea
Japan
India
Brasil
Brazil
Australia
Indian Ocean
South Atlantic Ocean
Map data ©2010 Europa Technologies - Terms of Use
Showing 50 of 325 contributors.