

# Distributed Version Control

## Who? When? Why?

Leon Tabak  
Cornell College  
l.tabak@ieee.org

12 September 2017

### 1 Where to look for more help

- [Git \(https://git-scm.com/\)](https://git-scm.com/)
- [Mercurial \(https://www.mercurial-scm.org/\)](https://www.mercurial-scm.org/)
- [Bitbucket \(https://bitbucket.org/product\)](https://bitbucket.org/product)
- [GitHub \(https://github.com/\)](https://github.com/)
- [Beginner's Guides to Mercurial \(https://www.mercurial-scm.org/wiki/BeginnersGuides\)](https://www.mercurial-scm.org/wiki/BeginnersGuides)

### 2 Example configuration file

```
[ui]
username = Leon Tabak <l.tabak@ieee.org>
editor = emacs

[merge-tools]
kdiff3.executable=/usr/bin/kdiff3
kdiff3.args = $base $local $other -o $output
kdiff3.priority = 1

[trusted]
users=+
groups=+
```

### 3 Annotated interactions with Mercurial

Create a folder (directory) for Don.

```
> mkdir don
```

Create a folder (directory) for Fred.

```
> mkdir fred
```

Create a folder (directory) for Richard.

```
> mkdir richard
```

Don initializes a repository.

```
> hg init
```

Don creates a file named 'book.tex'.

Here are the contents of the file book.tex.

---

```
\documentclass{article}
\title{Quotations}
\author{Don Knuth \ \ Fred Brooks \ \ Richard Feynman}
\date{12 September 2017}
\begin{document}
\maketitle

\begin{quotation}
  Mathematics is the art of giving the same name
  to different things.
\end{quotation}

\section{Wisdom}

\input{wisdom.tex}

\section{Inspiration}

\input{inspiration.tex}

\end{document}
```

---

Create a folder (directory) for chapter 1 (Wisdom).

```
> mkdir wisdom
```

Create a folder (directory) for chapter 2 (Inspiration).

```
> mkdir inspiration
```

Don creates an empty file in the wisdom folder.

```
> touch wisdom/wisdom.tex
```

Don creates an empty file in the inspiration folder.

```
> touch inspiration/inspiration.tex
```

Don adds book.tex, wisdom.tex, and inspiration.tex to the list of files to be tracked by Mercurial.

```
> hg add book.tex
> hg add wisdom/wisdom.tex
> hg add inspiration/inspiration.tex
```

Don commits the change that he has just made.

```
> hg commit -m 'start book and insert quotation about names'
```

Don examines the history of his project.

```
> hg log
```

---

```
changeset:  0:d350cbfe0050
tag:        tip
user:       Don Knuth <d.knuth@ieee.org>
date:       Mon Sep 11 18:57:10 2017 -0500
summary:    start book and insert quotation about names
```

---

Fred clones Don's project.

```
> hg clone ../don
```

---

```
destination directory: don
updating to branch default
3 files updated, 0 files merged, 0 files removed, 0 files unresolved
```

---

Fred edits his copy of wisdom.tex.

Here are the contents of the file wisdom/wisdom.tex.

---

'Obvious' is the most dangerous word in mathematics.

---

Fred commits the change he has just made.

```
> hg commit -m 'insert quotation about obvious'
```

Fred examines the history of his project.

```
> hg log
```

---

```
changeset: 1:ebf18cb1128c
tag:       tip
user:      Fred Brooks <f.brooks@ieee.org>
date:      Mon Sep 11 18:57:12 2017 -0500
summary:   insert quotation about obvious

changeset: 0:d350cbfe0050
user:      Don Knuth <d.knuth@ieee.org>
date:      Mon Sep 11 18:57:10 2017 -0500
summary:   start book and insert quotation about names
```

---

Fred edits his copy of wisdom.tex a second time.

Here are the contents of the file wisdom/wisdom.tex.

---

```
My belief is that nothing that can be expressed
by mathematics cannot be expressed by careful
use of literary words.
'Obvious' is the most dangerous word in mathematics.
```

---

Fred commits the change he has just made.

```
> hg commit -m 'insert quotation about literary words'
```

Fred examines the history of his project.

```
> hg log
```

---

```
changeset: 2:c15705b1953f
tag:       tip
user:      Fred Brooks <f.brooks@ieee.org>
date:      Mon Sep 11 18:57:14 2017 -0500
summary:   insert quotation about literary words

changeset: 1:ebf18cb1128c
user:      Fred Brooks <f.brooks@ieee.org>
date:      Mon Sep 11 18:57:12 2017 -0500
summary:   insert quotation about obvious

changeset: 0:d350cbfe0050
user:      Don Knuth <d.knuth@ieee.org>
date:      Mon Sep 11 18:57:10 2017 -0500
summary:   start book and insert quotation about names
```

---

Fred edits his copy of wisdom.tex a third time.

Here are the contents of the file wisdom/wisdom.tex.

---

My belief is that nothing that can be expressed  
by mathematics cannot be expressed by careful  
use of literary words.  
The art of doing mathematics consists in  
finding that special case which contains all  
the germs of generality.  
'Obvious' is the most dangerous word in mathematics.

---

Fred commits the change he has just made.

```
> hg commit -m 'insert quotation about generality'
```

Fred examines the history of his project.

```
> hg log
```

---

changeset: 3:b33d044a1bde  
tag: tip  
user: Fred Brooks <f.brooks@ieee.org>  
date: Mon Sep 11 18:57:16 2017 -0500  
summary: insert quotation about generality

changeset: 2:c15705b1953f  
user: Fred Brooks <f.brooks@ieee.org>  
date: Mon Sep 11 18:57:14 2017 -0500  
summary: insert quotation about literary words

changeset: 1:ebf18cb1128c  
user: Fred Brooks <f.brooks@ieee.org>  
date: Mon Sep 11 18:57:12 2017 -0500  
summary: insert quotation about obvious

changeset: 0:d350cbfe0050  
user: Don Knuth <d.knuth@ieee.org>  
date: Mon Sep 11 18:57:10 2017 -0500  
summary: start book and insert quotation about names

---

Richard clones Don's project.

```
> hg clone ../don
```

---

```
destination directory: don  
updating to branch default  
3 files updated, 0 files merged, 0 files removed, 0 files unresolved
```

---

Richard edits his copy of inspiration.tex.

Here are the contents of the file inspiration/inspiration.tex.

---

Mathematics is the most beautiful and  
most powerful creation of the human spirit.

---

Richard commits the change he has just made.

```
> hg commit -m 'insert quotation about human spirit'
```

Richard examines the history of his project.

```
> hg log
```

---

```
changeset: 1:c1eb4fbbb4d3
tag:       tip
user:      Richard Feynman <r.feynman@ieee.org>
date:      Mon Sep 11 18:57:18 2017 -0500
summary:   insert quotation about human spirit

changeset: 0:d350cbfe0050
user:      Don Knuth <d.knuth@ieee.org>
date:      Mon Sep 11 18:57:10 2017 -0500
summary:   start book and insert quotation about names
```

---

Richard edits his copy of inspiration.tex a second time.

Here are the contents of the file inspiration/inspiration.tex.

---

```
God used beautiful mathematics in creating the world.
Mathematics is the most beautiful and
most powerful creation of the human spirit.
```

---

Richard commits the change he has just made.

```
> hg commit -m 'insert quotation about creating the world'
```

Richard examines the history of his project.

```
> hg log
```

---

```
changeset: 2:6dce6f3dad4f
tag:       tip
user:      Richard Feynman <r.feynman@ieee.org>
date:      Mon Sep 11 18:57:20 2017 -0500
summary:   insert quotation about creating the world

changeset: 1:c1eb4fbbb4d3
user:      Richard Feynman <r.feynman@ieee.org>
date:      Mon Sep 11 18:57:18 2017 -0500
summary:   insert quotation about human spirit

changeset: 0:d350cbfe0050
user:      Don Knuth <d.knuth@ieee.org>
date:      Mon Sep 11 18:57:10 2017 -0500
summary:   start book and insert quotation about names
```

---

Richard edits his copy of inspiration.tex a third time.

Here are the contents of the file inspiration/inspiration.tex.

---

```
God used beautiful mathematics in creating the world.
Mathematics is the most beautiful and
most powerful creation of the human spirit.
We are servants rather than masters in mathematics.
```

---

Richard commits the change he has just made.

```
> hg commit -m 'insert quotation about servants and masters'
```

Richard examines the history of his project.

```
> hg log
```

---

```
changeset: 3:7bdadd63e026
tag:       tip
user:     Richard Feynman <r.feynman@ieee.org>
date:     Mon Sep 11 18:57:23 2017 -0500
summary:  insert quotation about servants and masters

changeset: 2:6dce6f3dad4f
user:     Richard Feynman <r.feynman@ieee.org>
date:     Mon Sep 11 18:57:20 2017 -0500
summary:  insert quotation about creating the world

changeset: 1:c1eb4fbbb4d3
user:     Richard Feynman <r.feynman@ieee.org>
date:     Mon Sep 11 18:57:18 2017 -0500
summary:  insert quotation about human spirit

changeset: 0:d350cbfe0050
user:     Don Knuth <d.knuth@ieee.org>
date:     Mon Sep 11 18:57:10 2017 -0500
summary:  start book and insert quotation about names
```

---

Show history of Don's project.

```
> hg log
```

---

changeset: 0:d350cbfe0050  
tag: tip  
user: Don Knuth <d.knuth@ieee.org>  
date: Mon Sep 11 18:57:10 2017 -0500  
summary: start book and insert quotation about names

---

Show history of Fred's project.

> hg log

---

changeset: 3:b33d044a1bde  
tag: tip  
user: Fred Brooks <f.brooks@ieee.org>  
date: Mon Sep 11 18:57:16 2017 -0500  
summary: insert quotation about generality

changeset: 2:c15705b1953f  
user: Fred Brooks <f.brooks@ieee.org>  
date: Mon Sep 11 18:57:14 2017 -0500  
summary: insert quotation about literary words

changeset: 1:ebf18cb1128c  
user: Fred Brooks <f.brooks@ieee.org>  
date: Mon Sep 11 18:57:12 2017 -0500  
summary: insert quotation about obvious

changeset: 0:d350cbfe0050  
user: Don Knuth <d.knuth@ieee.org>  
date: Mon Sep 11 18:57:10 2017 -0500  
summary: start book and insert quotation about names

---

Show history of Richard's project.

> hg log

---

```
changeset: 3:7bdadd63e026
tag: tip
user: Richard Feynman <r.feynman@ieee.org>
date: Mon Sep 11 18:57:23 2017 -0500
summary: insert quotation about servants and masters

changeset: 2:6dce6f3dad4f
user: Richard Feynman <r.feynman@ieee.org>
date: Mon Sep 11 18:57:20 2017 -0500
summary: insert quotation about creating the world

changeset: 1:c1eb4fbbb4d3
user: Richard Feynman <r.feynman@ieee.org>
date: Mon Sep 11 18:57:18 2017 -0500
summary: insert quotation about human spirit

changeset: 0:d350cbfe0050
user: Don Knuth <d.knuth@ieee.org>
date: Mon Sep 11 18:57:10 2017 -0500
summary: start book and insert quotation about names
```

---

Don gets the work that Fred has done.

```
> hg pull ../fred/don
> hg update
```

---

```
pulling from ../fred/don
searching for changes
adding changesets
adding manifests
adding file changes
added 3 changesets with 3 changes to 1 files
(run 'hg update' to get a working copy)
1 files updated, 0 files merged, 0 files removed, 0 files unresolved
nothing changed
```

---

Here are the contents of the file book.tex.

---

```
\documentclass{article}
\title{Quotations}
\author{Don Knuth \ \ Fred Brooks \ \ Richard Feynman}
\date{12 September 2017}
\begin{document}
\maketitle

\begin{quotation}
  Mathematics is the art of giving the same name
  to different things.
\end{quotation}

\section{Wisdom}

\input{wisdom.tex}

\section{Inspiration}

\input{inspiration.tex}

\end{document}
```

---

Here are the contents of the file wisdom/wisdom.tex.

---

My belief is that nothing that can be expressed  
by mathematics cannot be expressed by careful  
use of literary words.  
The art of doing mathematics consists in  
finding that special case which contains all  
the germs of generality.  
'Obvious' is the most dangerous word in mathematics.

---

Here are the contents of the file inspiration/inspiration.tex.

Don gets the work that Richard has done.

```
> hg pull ../richard/don
> hg update
```

---

```
pulling from ../richard/don
searching for changes
adding changesets
adding manifests
adding file changes
added 3 changesets with 3 changes to 1 files (+1 heads)
(run 'hg heads' to see heads, 'hg merge' to merge)
1 files updated, 0 files merged, 0 files removed, 0 files unresolved
(branch merge, don't forget to commit)
```

---

Here are the contents of the file book.tex.

---

```
\documentclass{article}
\title{Quotations}
\author{Don Knuth \ \ Fred Brooks \ \ Richard Feynman}
\date{12 September 2017}
\begin{document}
\maketitle

\begin{quotation}
  Mathematics is the art of giving the same name
  to different things.
\end{quotation}

\section{Wisdom}

\input{wisdom.tex}

\section{Inspiration}

\input{inspiration.tex}

\end{document}
```

---

Here are the contents of the file wisdom/wisdom.tex.

---

My belief is that nothing that can be expressed  
by mathematics cannot be expressed by careful  
use of literary words.  
The art of doing mathematics consists in  
finding that special case which contains all  
the germs of generality.  
'Obvious' is the most dangerous word in mathematics.

---

Here are the contents of the file inspiration/inspiration.tex.

---

God used beautiful mathematics in creating the world.  
Mathematics is the most beautiful and  
most powerful creation of the human spirit.  
We are servants rather than masters in mathematics.

---

Fred gets the latest from Don.

```
> hg pull ../../don}
> hg update
> hg commit -m 'get latest from Don'
```

---

```
pulling from ../../don
searching for changes
adding changesets
adding manifests
adding file changes
added 4 changesets with 3 changes to 1 files
(run 'hg update' to get a working copy)
1 files updated, 0 files merged, 0 files removed, 0 files unresolved
nothing changed
```

---

Here are the contents of the file book.tex.

---

```
\documentclass{article}
\title{Quotations}
\author{Don Knuth \ \ Fred Brooks \ \ Richard Feynman}
\date{12 September 2017}
\begin{document}
\maketitle

\begin{quotation}
  Mathematics is the art of giving the same name
  to different things.
\end{quotation}

\section{Wisdom}

\input{wisdom.tex}

\section{Inspiration}

\input{inspiration.tex}

\end{document}
```

---

Here are the contents of the file wisdom/wisdom.tex.

---

My belief is that nothing that can be expressed  
by mathematics cannot be expressed by careful  
use of literary words.  
The art of doing mathematics consists in  
finding that special case which contains all  
the germs of generality.  
'Obvious' is the most dangerous word in mathematics.

---

Here are the contents of the file inspiration/inspiration.tex.

---

God used beautiful mathematics in creating the world.  
Mathematics is the most beautiful and  
most powerful creation of the human spirit.  
We are servants rather than masters in mathematics.

---

Richard gets the latest from Don.

```
> hg pull ../../don}
> hg update
> hg commit -m 'get latest from Don'
```

---

```
pulling from ../../don
searching for changes
adding changesets
adding manifests
adding file changes
added 4 changesets with 3 changes to 1 files
(run 'hg update' to get a working copy)
1 files updated, 0 files merged, 0 files removed, 0 files unresolved
nothing changed
```

---

Here are the contents of the file book.tex.

---

```
\documentclass{article}
\title{Quotations}
\author{Don Knuth \ \ Fred Brooks \ \ Richard Feynman}
\date{12 September 2017}
\begin{document}
\maketitle

\begin{quotation}
  Mathematics is the art of giving the same name
  to different things.
\end{quotation}

\section{Wisdom}

\input{wisdom.tex}

\section{Inspiration}

\input{inspiration.tex}

\end{document}
```

---

Here are the contents of the file wisdom/wisdom.tex.

---

My belief is that nothing that can be expressed  
by mathematics cannot be expressed by careful  
use of literary words.  
The art of doing mathematics consists in  
finding that special case which contains all  
the germs of generality.  
'Obvious' is the most dangerous word in mathematics.

---

Here are the contents of the file inspiration/inspiration.tex.

---

God used beautiful mathematics in creating the world.  
Mathematics is the most beautiful and  
most powerful creation of the human spirit.  
We are servants rather than masters in mathematics.

---