

Basics of Version Control Systems

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What are VCS

Software development perspective

Version control systems (VCS) (or Source Configuration Management (SCM) systems *) allow developers or authors to keep track of the history of their projects? source code. [source]

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Version control systems (VCS) (or Source Configuration Management (SCM) systems *) allow developers or authors to keep track of the history of their projects? source code. [source]

Generic view

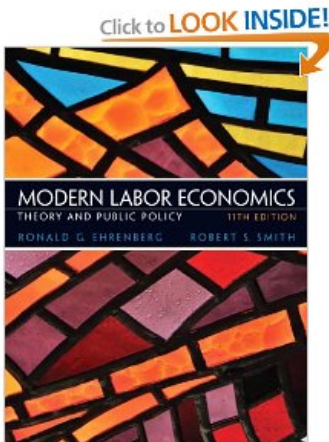
Detailed mechanism to manage different versions (historical, parallel) of documents, files, programs, etc.

You already have it

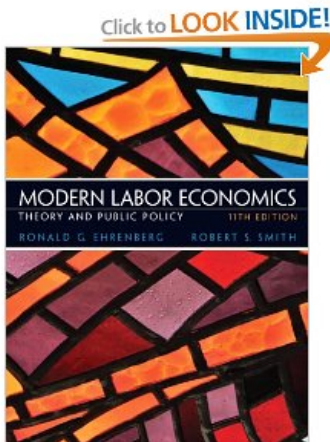
Implicit uses

- ▶ Backup systems (Apple Time Machine, others)
- ▶ Word processors (Undo feature, Track changes in Word, finer-grained features in content management systems: Google Docs, Blog software, etc.)
- ▶ Versioning filesystems
- ▶ Paper books!

Modern Labor Economics: Theory and Public Policy



Modern Labor Economics: Theory and Public Policy

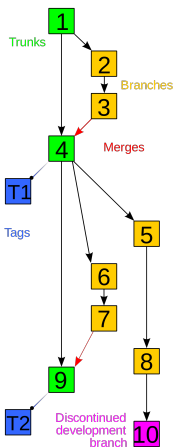


Preface

New to This Edition

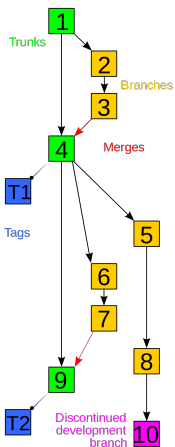
- This eleventh edition of *Modern Labor Economics* has been thoroughly updated in terms of both tabular material and references to the latest literature. Our goal in these updates is to make our textbook a comprehensive reference, for both students and professors, to critical factual information about the labor

Principal idea



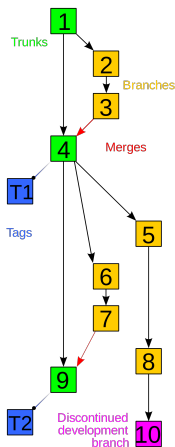
1 First edition

Principal idea



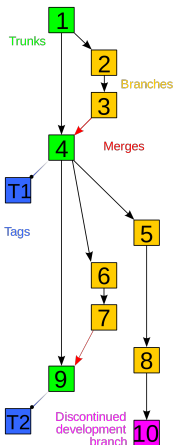
- 1 First edition
- 4 Second edition

Principal idea



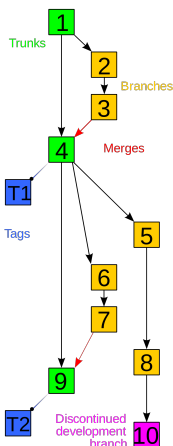
- 1 First edition
- 4 Second edition
- 5 Start of work on a Canadian edition

Principal idea



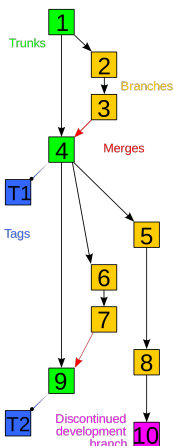
- 1 First edition
- 4 Second edition
- 5 Start of work on a Canadian edition
- 6 Start of work on the next US edition

Principal idea



- 1 First edition
- 4 Second edition
- 5 Start of work on a Canadian edition
- 6 Start of work on the next US edition
- 9 Third edition

Principal idea



- 1 First edition
- 4 Second edition
- 5 Start of work on a Canadian edition
- 6 Start of work on the next US edition
- 9 Third edition
- 10 First Canadian edition

File-system based versioning

The most common method... Also used in email versioning...

Remember this?

```
01_01_readBLS.R  
02_01_readCensus.R  
02_02_prepareCensus.R  
03_01_create_analysis_data.R  
04_01_runOLS.sas  
README.txt
```

File-system based versioning

The most common method... Also used in email versioning...

What if I make changes?

```
01_01_readBLS.R  
02_01_readCensus.R  
02_02_prepareCensus.R  
03_01_create_analysis_data.R  
04_01_runOLS.sas  
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```

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02_02_prepareCensus.R  
03_01_create_analysis_data.R  
04_01_runOLS.sas  
README.txt  
02_01_readCensus.R.bak
```

File-system based versioning

The most common method... Also used in email versioning...

What if I make changes?

```
01_01_readBLS.R
02_01_readCensus.R
02_02_prepareCensus.R
03_01_create_analysis_data.R
04_01_runOLS.sas
README.txt
02_01_readCensus.R.bak
02_01_readCensus_V2.R
```


File-system based versioning

The most common method... Also used in email versioning...

What if I make changes?

```
01_01_readBLS.R
02_01_readCensus.R
02_02_prepareCensus.R
03_01_create_analysis_data.R
04_01_runOLS.sas
README.txt
02_01_readCensus.R.bak
02_01_readCensus_V2.R
02_01_readCensus_V3.R
```

File-system based versioning

The most common method... Also used in email versioning...

What if I make changes?

```
01_01_readBLS.R
02_01_readCensus.R
02_02_prepareCensus.R
03_01_create_analysis_data.R
04_01_runOLS.sas
README.txt
02_01_readCensus.R.bak
02_01_readCensus_V2.R
02_01_readCensus_V3.R
02_01_readCensus_V3-jma.R
```

File-system based versioning

The most common method... Also used in email versioning...

What if I make changes?

```
01_01_readBLS.R
02_01_readCensus.R
02_02_prepareCensus.R
03_01_create_analysis_data.R
04_01_runOLS.sas
README.txt
02_01_readCensus.R.bak
02_01_readCensus_V2.R
02_01_readCensus_V3.R
02_01_readCensus_V3-jma.R
02_01_readCensus_V3-jma-rm.R
```

Better way

Is there a better way?

History

LEHD Code Repository

logged in as vilhuber | [Logout](#) | [Help/Guide](#) | [Preferences](#) | [About Trac](#)

[Wiki](#) | [Browse Source](#) | [View Tickets](#) | [New Ticket](#) | [Timeline](#) | [Roadmap](#) | [Rev Tree](#) | [Search](#) | [Admin](#)

root / trunk / ehf / library / sasprogs / 01_ehf.sas [View Latest Revision](#)

■ Added ■ Modified ■ Copied or renamed

Revision Log Mode:

 Stop on copy
 Follow copies
 Show only adds and deletes

View log starting at and back to

Show at most revisions per page.

 Show full log messages

Diff	Rev	Chgset	Date	Author	Log Message
	@7220	[7220]	17 months	beauz001	Re #272 , #593 , #761 . Merge into trunk changes for getting EIN info from ...
	@695	[695]	8 years	lv39	Moving EHF to trunk
copied from merge_ehf/trunk/ehf/library/sasprogs/01_ehf.sas:					
	@676	[676]	8 years	vilhuber	Legacy change EHF 3.1.126-Jars
	@670	[670]	8 years	vilhuber	Legacy change EHF 3.1.123
	@644	[644]	8 years	vilhuber	Legacy change EHF 3.1.110
	@640	[640]	8 years	vilhuber	Legacy change EHF 3.1.108
	@635	[635]	8 years	vilhuber	Legacy change EHF 3.1.105
	@629	[629]	8 years	vilhuber	Legacy change EHF 3.1.102
	@627	[627]	8 years	vilhuber	This is a legacy commit of ehf 3.1.01

Note: See [TracRevisionLog](#) for help on using the revision log.

Download in other formats:
 RSS Feed | [ChangeLog](#)

Two major types of version-management

Centralized model

Server-client approach, editors check out a copy, modify it, and check it back in. Multiple editors:

- ▶ *File locking*: only one person can check out any given file
- ▶ *Version merging*: discrepancies are handled upon checkin

Two major types of version-management

Centralized model

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Distributed model

There is no central server (prescribed by software). Every editor has a full copy of all version, synchronisation occurs by exchanging patches.

Focus in this class

We will focus on Git:

- ▶ Subversion (centralized) - still broadly in use, but no longer supported at Cornell
- ▶ Git (decentralized) - Hautahi

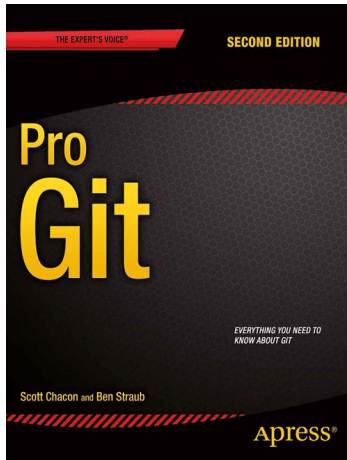
Windows TortoiseGit (free)

OSX installed (Xcode) upon first use

Linux typically integrated

with various semi-specialized graphical versions (Github client, etc.)

THE reference for Git



git-scm.com/book/en/v2

Learning more

Numerous resources on the web

- ▶ `https://try.github.io/`
- ▶ `https://www.atlassian.com/git/tutorials`

Tracking history

What happened? And who did what?

One of the key advantages of using version control systems is ... to control versions.

- ▶ Straightforward to view multiple versions of a file (assuming proper usage)
- ▶ Possibility to view who changed what (“blame” or “annotate”)

Tracking using web interfaces: SVN

LEHD Code Repository

logged in as vilhuber | Logout | Help/Guide | Preferences | About Trac

Wiki | Browse Source | View Tickets | New Ticket | Timeline | Roadmap | Rev Tree | Search | Admin

Subversion Location | Last Change | Revision Log

root / trunk

Visit: View revision:

Name ▲	Size	Rev	Age	Last Change
./				
admin		8646	7 months	beauz001: Copy physical parms file during refresh dev. Re. #957
bls		9187	4 months	beauz001: Move macros to global process. Update Trunk. Re #995
brb		1492	7 years	vilhuber: Re-establishing fully tested trunk as per production 2006-10-03 and prior
control		9727	3 weeks	beauz001: Updating Trunk. Modify code_copy and check_versions to read the correct ...
cpr		4524	3 years	vilhuber: Re #463 ; this switches the preprocess parameter to preprocess=yes, as per ...
doc		9368	4 months	beauz001: This is the Quality Audit Template that has all of the standards that the ...
ecf		9712	3 weeks	beauz001: Updating trunk. Read new format for GALID. Re. #997 #1001 #1022 #1033 ...
edf		8101	10 months	beauz001: Cleanup process directory. Re. #898
ehf		8102	10 months	beauz001: Cleanup process directory. Re. #898
ctrlprogs		7220	17 months	beauz001: Re #272 , #593 , #781 . Merge into trunk changes for getting EIN info from ...
control_ehf.sas	17.4 KB	7220	17 months	beauz001: Re #272 , #593 , #781 . Merge into trunk changes for getting EIN info from ...
parameters_ehf.sas	1.8 KB	7220	17 months	beauz001: Re #272 , #593 , #781 . Merge into trunk changes for getting EIN info from ...
doc		8102	10 months	beauz001: Cleanup process directory. Re. #898
library		7649	14 months	beauz001: Change methodology for creating ehf_<state>_ui_ein. Re: #870 .
macros		7649	14 months	beauz001: Change methodology for creating ehf_<state>_ui_ein. Re: #870 .
sasprogs		7220	17 months	beauz001: Re #272 , #593 , #781 . Merge into trunk changes for getting EIN info from ...
01_ehf.sas	2.5 KB	7220	17 months	beauz001: Re #272 , #593 , #781 . Merge into trunk changes for getting EIN info from ...
01_ehfqa.sas	7.9 KB	4028	3 years	vilhuber: Re #629 . Based on ticket-629/ehf (r3067:3910). New QA test by Stephen
02_ehf.sas	3.2 KB	7220	17 months	beauz001: Re #272 , #593 , #781 . Merge into trunk changes for getting EIN info from ...
02_ehfqa.sas	2.7 KB	4028	3 years	vilhuber: Re #629 . Based on ticket-629/ehf (r3067:3910). New QA test by Stephen
03_ehf.sas	1.7 KB	687	8 years	vilhuber: Legacy change EHF 3.1.30 Time-stamp: <04/08/26 16:43:07 vilhu001> * added ...
03_ehfqa.sas	0.7 KB	4028	3 years	vilhuber: Re #629 . Based on ticket-629/ehf (r3067:3910). New QA test by Stephen
04_ehf.sas	1.7 KB	687	8 years	vilhuber: Legacy change EHF 3.1.30 Time-stamp: <04/08/26 16:43:07 vilhu001> * added ...
04_ehfqa.sas	1.1 KB	4028	3 years	vilhuber: Re #629 . Based on ticket-629/ehf (r3067:3910). New QA test by Stephen
05_ehf.sas	5.3 KB	7220	17 months	beauz001: Re #272 , #593 , #781 . Merge into trunk changes for getting EIN info from ...
05_ehfqa.sas	0.7 KB	4028	3 years	vilhuber: Re #629
06_ehf.sas	2.7 KB	7220	17 months	beauz001: Re #272 , #593 , #781

enhancem FIRST_RUN

Vilhuber Basics of VCS

Tracking using web interfaces: SVN

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root / trunk / ehf / library / sasprogs / 01_ehf.sas View Latest Revision

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copied from merge_ehf/trunk/ehf/library/sasprogs/01_ehf.sas:					
	@676 [676]		8 years	vilhuber	Legacy change EHF 3.1.26-Jars
	@670 [670]		8 years	vilhuber	Legacy change EHF 3.1.23
	@644 [644]		8 years	vilhuber	Legacy change EHF 3.1.10
	@640 [640]		8 years	vilhuber	Legacy change EHF 3.1.08
	@635 [635]		8 years	vilhuber	Legacy change EHF 3.1.05
	@629 [629]		8 years	vilhuber	Legacy change EHF 3.1.02
	@627 [627]		8 years	vilhuber	This is a legacy commit of ehf 3.1.01

Note: See [TracRevisionLog](#) for help on using the revision log.

Download in other formats:

RSS Feed
 ChangeLog

Tracking using web interfaces: SVN

Update

Unmodified Added Removed Modified

trunk/qwi/library/sasprogs/01_qwi.sas

Tabular | Unified

• Property svn:keywords set to Id URL

Revision 552	Revision 9714
1 /* +--< LEHD-QWI qwi 3.1.10 2003-11-10 schwa305 >--	1 /* \$Id\$ */
2 /* +--< Location: /programs/production/current/qwi/ >--	2 /* \$URL\$ */
3 /* +--< File: library/sasprogs/01_qwi.sas >--	3 /* Author:*/
4	4 /* Time-stamp: */
5 *****	5 *****
6 * Time-stamp: <03/06/08 01:11:28 steph305>	6 * Time-stamp: <04/06/17 12:28:14 vilhuber>
7 * Author: Simon Woodcock	7 * Author: Simon Woodcock
8 * Based on part of Jobflow01 by John Abowd, Karen Conneely,	8 * Based on part of Jobflow01 by John Abowd, Karen Conneely,
9 * Robert Pedace, and Paul Lengermann	9 * Robert Pedace, and Paul Lengermann
10 *	10 *
11 * Initial processing of individual and employment history master	11 * Initial processing of individual and employment history master
12 * files	12 * files
13 *	13 *
14 * QWI STEP 1: BUILD THE PERSON HISTORY FILE	14 * QWI STEP 1: BUILD THE PERSON HISTORY FILE
15	15
16	16
17 * INSTRUCTIONS:	17 * INSTRUCTIONS:
18 * Create soft link to this file and MACROLIST.SAS in state-	18 * Create soft link to this file and MACROLIST.SAS in state-
19 * specific	19 * specific
20 * directory, create CONFIG_ST.SAS in same directory, and run.	20 * directory, create CONFIG_ST.SAS in same directory, and run.
21	21
22	22
23 * REQUIRES-SAS: macrolist.sas	23 * REQUIRES-SAS: macrolist.sas
24 * REQUIRES-SAS: config_st.sas	24 * REQUIRES-SAS: config_st.sas
25	25
26	26
27 * REQUIRES-DATA: ehf_[st].sas7bdat (all states but MN)	27 * REQUIRES-DATA: ehf_[st].sas7bdat (all states but MN)
28 * REQUIRES-DATA: ehf_seinunit_en.sas7bdat (MN only)	28 * REQUIRES-DATA: ehf_seinunit_en.sas7bdat (MN only)
29 * REQUIRES-DATA: [st]_u2wi.sas7bdat	29 * REQUIRES-DATA: [st]_u2wi.sas7bdat
30	30
31	31
32 * PROVIDES-DATA: phf_[st]_a.sas7bdat	32 * PROVIDES-DATA: phf_[st]_a.sas7bdat
33	33
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Vilhuber

Basics of VCS

Tracking using web interfaces: SVN

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root / trunk / qwi / library / sasprogs / 01_qwi.sas @ 9714

[Subversion Location](#) | [Last Change](#) | [Normal](#) | [Revision Log](#)

Visit: View revision:

Revision 9714, 1.8 KB (checked in by beauz001, 3 weeks ago)

Updating Trunk. Re: #433 #554 #1003 #1010 #1016 #1020 #1021 #1026 #1031 #1032 #1044 #1054 #1056

Property svn:executable set to *


Property svn:keywords set to Id URL

Rev	Line
[7204]	1 /* \$Id\$ */
[6793]	2 /* \$URL\$ */
	3 /* Author:*/
	4 /* Time-stamp: */
[598]	5 *****
[576]	6 * Time-stamp: -04/05/17 12:28:14 vilhuber>
[598]	7 * Author: Simon Woodcock
	8 * Based on part of Jobflow01 by John Abowd, Karen Conneely,
	9 * Robert Pedace, and Paul Lengermann
	10 *
	11 * Initial processing of individual and employment history master files
	12 *
	13 * QWI STEP 1: BUILD THE PERSON HISTORY FILE
	14 *
	15 *
	16 * REQUIRES-DATA: ehf_[st].sas7bdat (all states but MN)
	17 * REQUIRES-DATA: ehf_seinunit_mn.sas7bdat (MN only)
	18 * REQUIRES-DATA: [st]_u2wi.sas7bdat
	19 *
	20 * PROVIDES-DATA: phf_[st]_a.sas7bdat
	21 *
	22 *
	23 * REVISION HISTORY:
	24 *
	25 * 2003-05-19: options statement moved to CONFIG_ST.SAS, comments updated by Simon
	26 * 2003-05-30: Bryce added x command to make soft links to output files
	27 * 2003-06-07: Bryce modified filling of earnings array to include only values in the valid QWI processing range
[9714]	28 * 2013-05-23: Cleanup commented out code. (Added comment for Stephen Tibbets change.)
[590]	29 *****
	30 *
	31 *
	32 title1 "Create the Person History File (PHF)";
	33 title2 "/programs/projects/EDE/v3.0/6st/.01.create_phf.sas";
	34
	35

Vilhuber
Basics of VCS

Tracking using web interfaces: git

Bitbucket Repositories Create ?

 **Computing for Economists**
 computing4economists Share

Clone Fork Compare Pull request

Overview **Source** Commits Pull requests Downloads 1

master Computing for Economists / web / mk_pgms.sh Source Diff History

baa15b6 5 minutes ago Full commit Blame Raw Edit

```

1  #!/bin/bash
2  outfile=programs.md
3  cat > $outfile << EOF
4  High-performance computing for Economists - Programs
5  =====
6  EOF
7
8  function add_day {
9  cat >> $outfile << EOF
10
11  Day $1
12  ----
13  EOF
14  for file in $(find ../programs/day$1 -name \*sh -o -name \*R -o -name \*sas| sort)
15  do
16     echo "+ [${file##*/}](${file})" >> $outfile
17  done
18  }
19
20  add_day 1
21  add_day 2
22  add_day 3
23
24  multinarndown $outfile > ${basename $outfile .md}.html
25  git add $outfile ${basename $outfile .md}.html
  
```


Tracking using web interfaces: git

The screenshot shows the Bitbucket web interface for a repository named 'Computing for Economists'. The repository is owned by 'computing4economists'. The current branch is 'master', and the selected file path is 'Computing for Economists / web / mk_pgms.sh'. The commit history table shows two recent commits by Lars Vilhuber.

Bitbucket Repositories **Create**

Computing for Economists Clone Fork Compare Pull request

Overview **Source** Commits Pull requests Downloads **1**

master

Author	Revision	Message	Date
Lars Vilhuber	baa15b6	Added a function in bash	6 minutes ago
Lars Vilhuber	c581940	Switching the tex files to use package lstlisting, adding separate directory for downloadable	22 minutes ago

Tracking using web interfaces: git

master | Computing for Economists / web / mk_pgms.sh

Source Diff History

Diff from [c581940](#) 22 minutes ago to [baa15b6](#) 6 minutes ago

web/mk_pgms.sh Side-by-side diff

```

3 3 cat > $outfile << EOF
4 4 High-performance computing for Economists - Programs
5 5 =====
6 6 +EOF
7 7 +
8 8 +function add_day {
9 9 +cat >> $outfile << EOF
6 10
7 10 -Day 1
11 11 +Day $1
8 12 -
9 13 EOF
10 10 -
11 11 -for file in $(find ../programs/day1 -name \*sh -o -name \*R -o -name \*sas| sort)
14 14 +for file in $(find ../programs/day$1 -name \*sh -o -name \*R -o -name \*sas| sort)
12 15 do
13 16 echo '* [${file##*/}](${file})' >> $outfile
14 17 done
18 18 +}
19 19 +
20 20 +add_day 1
21 21 +add_day 2
22 22 +add_day 3
15 23
16 24 multimarkdown $outfile > $(basename $outfile .md).html
17 25 git add $outfile $(basename $outfile .md).html
  
```

VCS infrastructure

At Cornell

Cornell Sourceforge (obsolete as of Sept 30, 2018)

Elsewhere

- ▶ GitHub (Git, subversion, free for open-source and academic users)
- ▶ BitBucket (Git, no subversion, free for academic users)
- ▶ Roll your own: no server required for Git on your PC

- ▶ [Git command-line cheat sheet](#)
- ▶ [Xcode cheat sheet \(for Mac users\)](#)