

Version Control

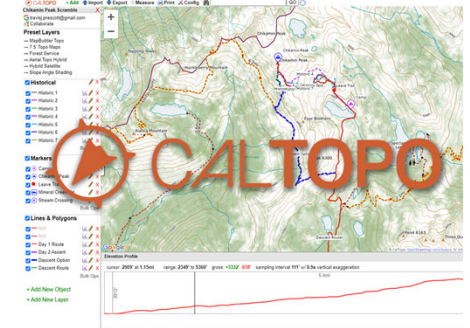
- FELIX VAKS, ACTUARY
- OFFICE OF THE CHIEF
ACTUARY
- SOCIAL SECURITY
ADMINISTRATION

Disclaimer


- The views presented here are mine and do not represent the Social Security Administration or the Office of the Chief Actuary within SSA.
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Strava



Outline

- Benefits of Version Control
 - Different Types of Version Control
 - Git
 - Sourcetree
- 

Version Control

Practice of tracking and managing changes to software code




Traditional Version Control

- You probably use version control already
- Documents, Spreadsheets, Presentations, Programs
- Annual Projects/Reports/Scenarios
- “Save As..”
- Subfolders (2011/2013/2016)
- Document.ver1.doc
- FinalBudgetVersion_ALT2_NewAssum_2ndDemo.xlsx


Version Control Software (VCS)

A system that records changes to a file or a set of files over time so that you can recall a specific version later.

Keep Track Of:

- Who made the change
 - When it was made
 - What was the change
 - Why it was made
- 

Benefits of Version Control Software

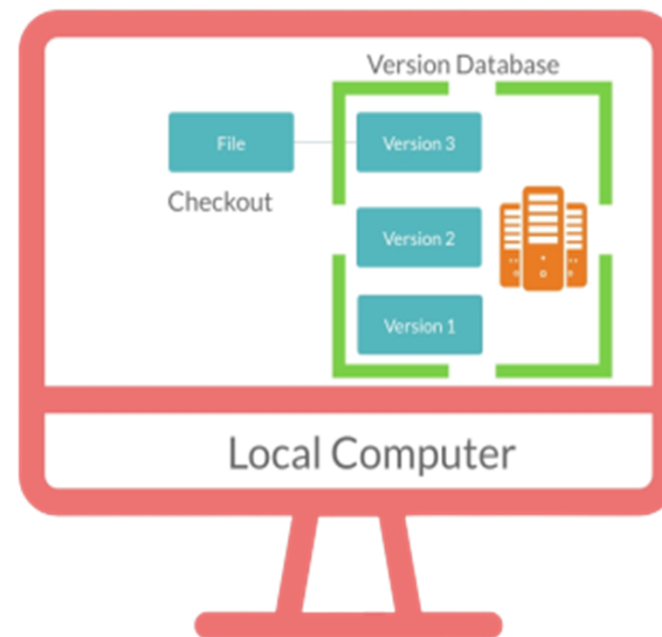
- Revert selected files back to a previous state
 - Revert the entire project back to a previous state
 - Compare changes over time
 - See who last modified something
 - Easy recovery from lost or modified files
 - Determine why you changed something
- 

1st Generation VCS – Local Version Control

Dates back to 70s

Very basic saving of code

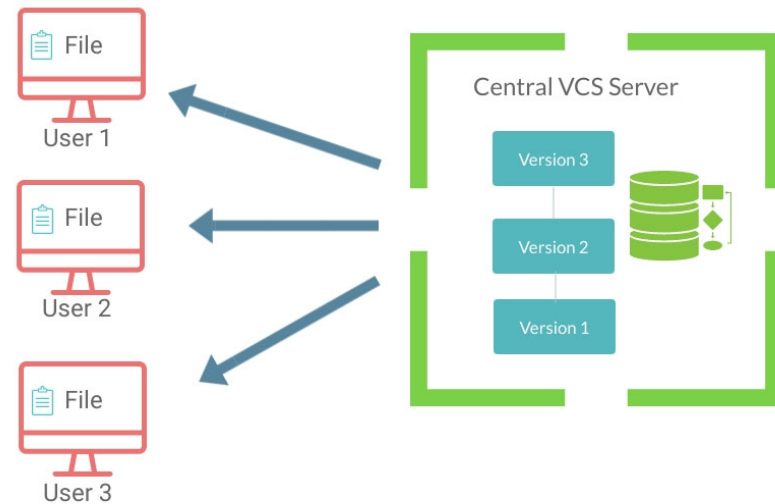
Single Computer



What if database needs to be used by several users?

2nd Generation VCS – Central Version Control

- Single Server that contains all the history.
- Each developer can “check out” files from this central server.
- Collaborate with developers on multiple computers.



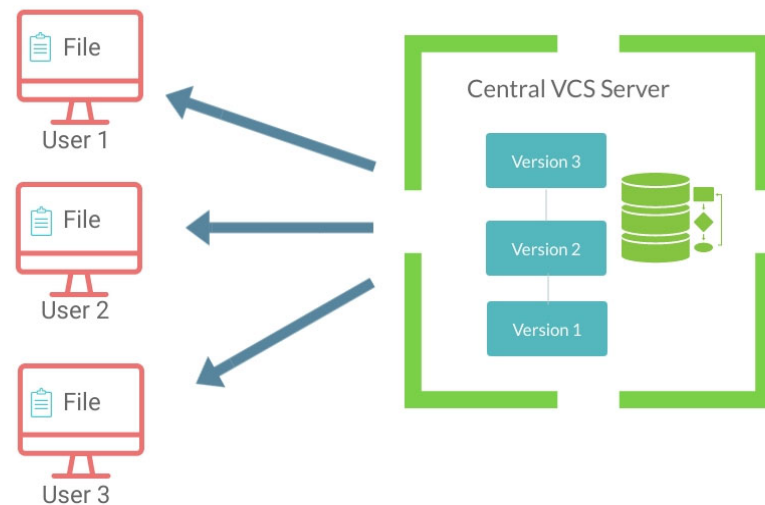
2nd Generation VCS – Central Version Control

Examples: CVS, SVN, PTC Integrity (MKS)

Advantage: All users are in sync with all other computers

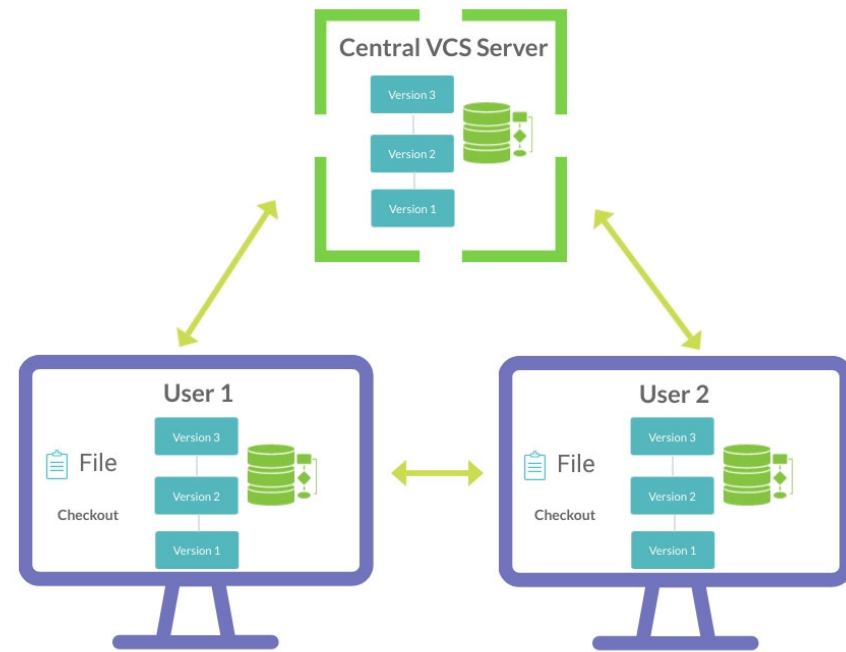
Disadvantage:

- Single point of failure
- Only one user can work on a specific file



3rd Generation VCS – Distributed Version Control

- Modern version control systems that are widely used today
- Instead of just checking out the latest versions of the files; you will be fully mirroring the central server including its full history.
- Its like having you own server locally, working in collaboration and in sync with other servers including the central server.



3rd Generation VCS – Distributed Version Control

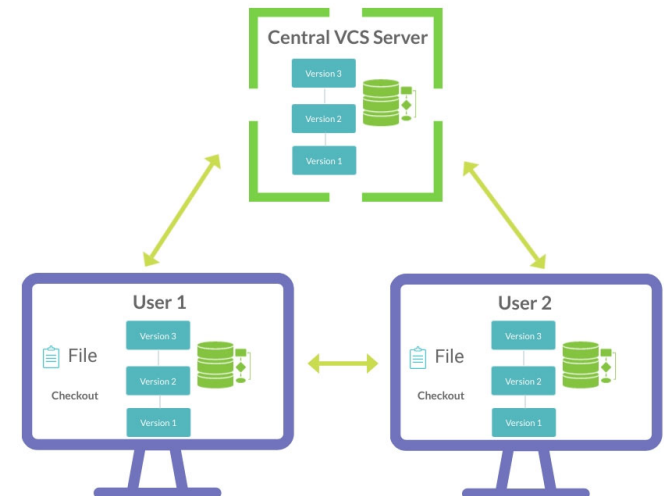
Examples: Git, Mercurial, etc.

Advantages:

- No need of active dependency with central server
- Easy backup (each computer is a backup)
- Easy branching and merging of code
- Allows multiple users to work on same file

Disadvantage:

- Does not work well with binary files (non-text files such as Word, Excel, PDF...)



Git LFS (Large Files Storage)

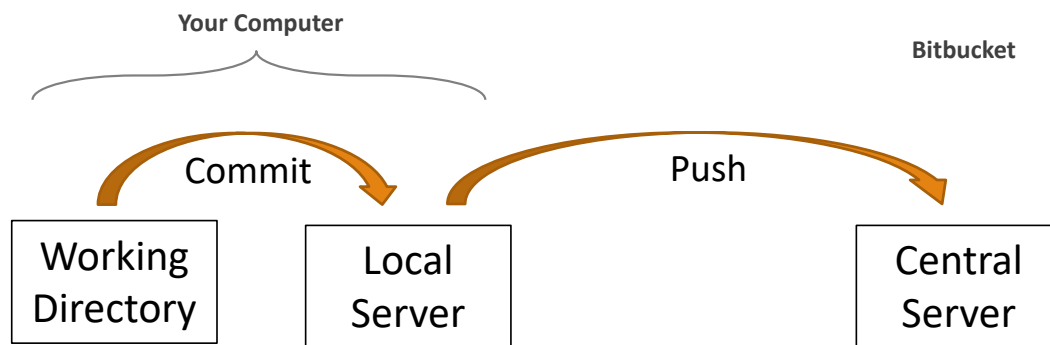
- Extension to Git for versioning large files
- Works exactly the same way as Git
- Replaces the large files in local history as tiny pointer files
- They point to a separate LFS server
- Git handles both LFS and non-LFS files smoothly

Advantages:

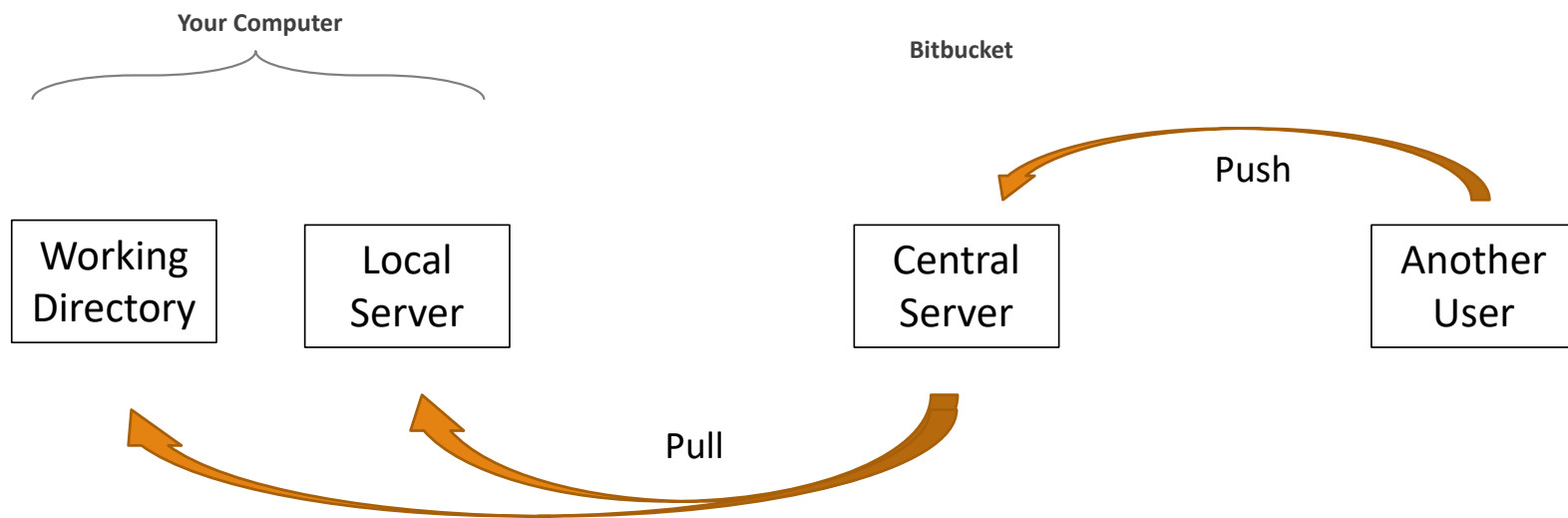
- Has all the features of git
- Can lock files to avoid merge conflicts



Git Workflow - Saving Changes



Git Workflow - Update Local Computer



Viewing Git on Central Server

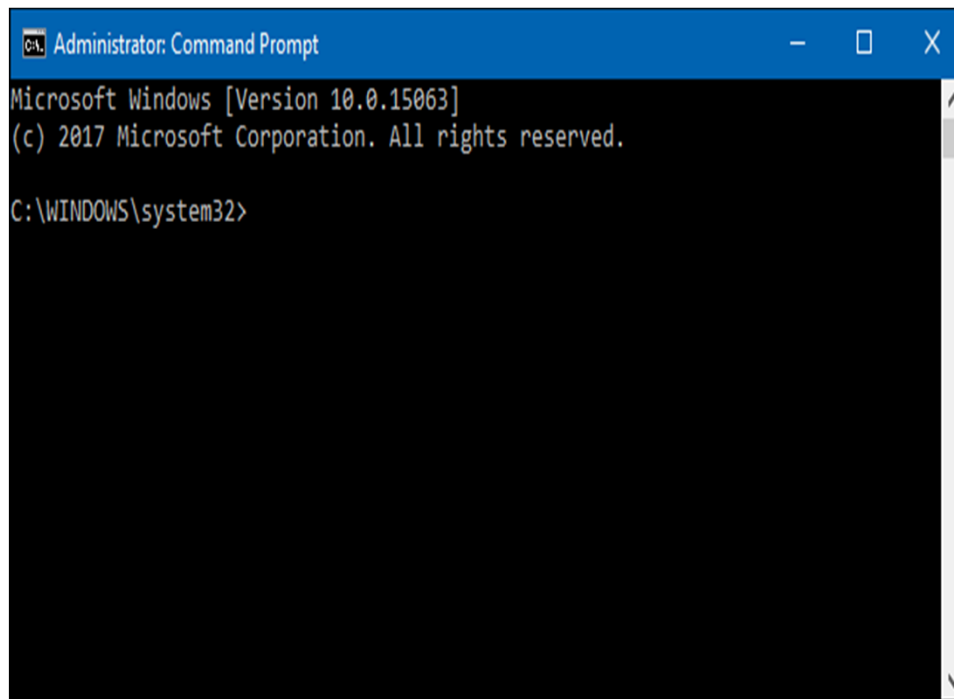
Office of the Actuary / GitTools
Tools to be used in Git (such as Sourcetree external diff and custom actions)

Source

master ... GitTools /

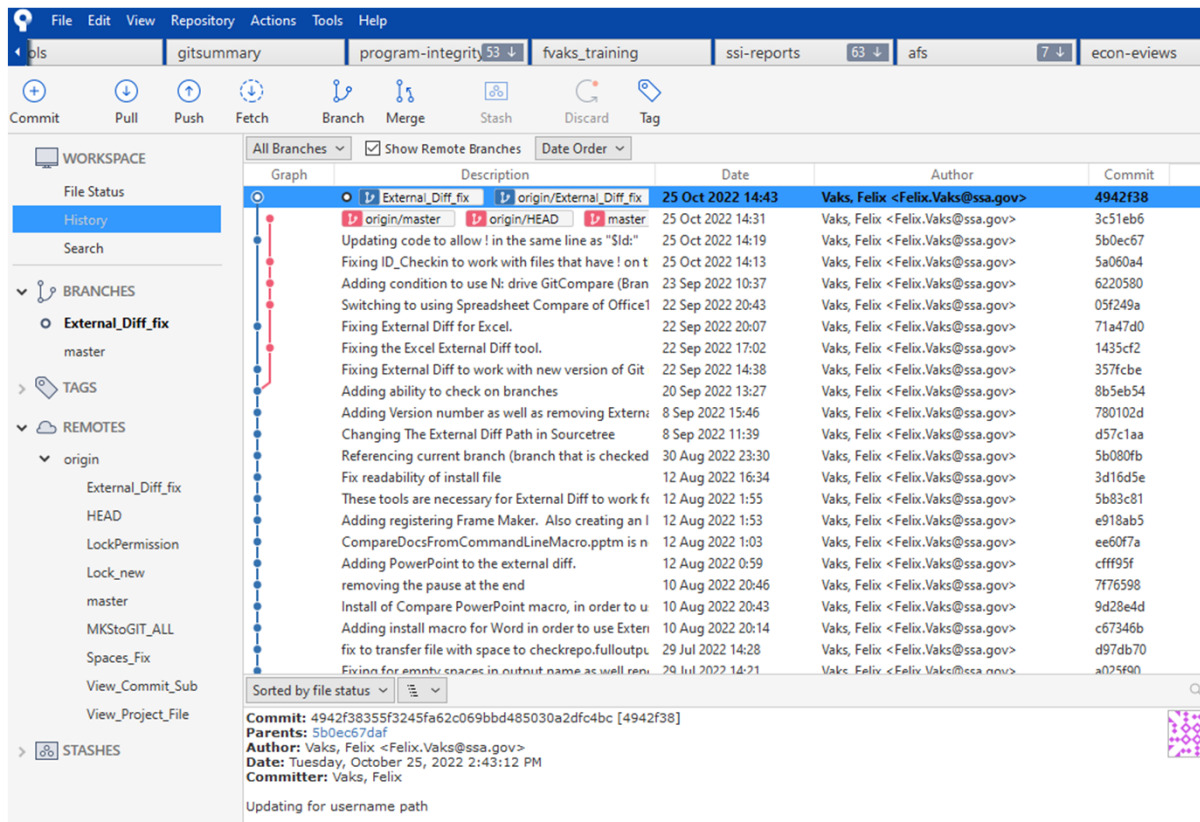
Source	Description	Size	Last Modified
DiffTools			
Install			
MKStoGIT			
.gitattributes	adding attributes from LFS files and git ignore for certain .fm files	362 B	13 December 2019 12:15 PM
.gitignore	adding attributes from LFS files and git ignore for certain .fm files	26 B	13 December 2019 12:15 PM
CheckRepo.bat	Adding ability to check on branches	5.43 KB	20 September 2022 01:27 PM
CheckRepo.fulloutput.bat	Fixing for empty spaces in output name as well repo path name	3.68 KB	29 July 2022 02:21 PM
commitmessage.hta	If there is nothing in the commit message then give an error message and don't close the HTA window.	2.88 KB	24 November 2020 05:39 PM
commitmessage.vbs	MKS checkin - added ability to add a commit message. If cancelled or no message then script is aborted.	287 B	12 December 2019 02:46 AM
download_commit.bat	Renaming view_project.bat to download_commit.bat to easier keep track of the programs.	845 B	14 May 2020 10:55 AM
download_commit.hta	view_project now references download_commit.hta (a new file which is similar to view_project.hta). Made the output more concise.	4.49 KB	13 May 2020 08:58 PM
ID_Checkin.bat	Changing the gittools path for the current user	5.99 KB	25 October 2022 02:31 PM
idstage.vbs	now works with \$Id and without	2.63 KB	30 August 2021 10:27 PM
lock_check.vbs	Now batch will search for filename and subfolder. VBS will only use the find in string to determine the permission.	1.07 KB	02 September 2021 01:24 PM
lock_few.bat	.gitattributes .gitignore and .gitlocks can now work properly	5.81 KB	21 July 2022 12:13 PM

Using Git to Save Changes



```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.15063]
(c) 2017 Microsoft Corporation. All rights reserved.
C:\WINDOWS\system32>
```

This may be hard for some people to use.



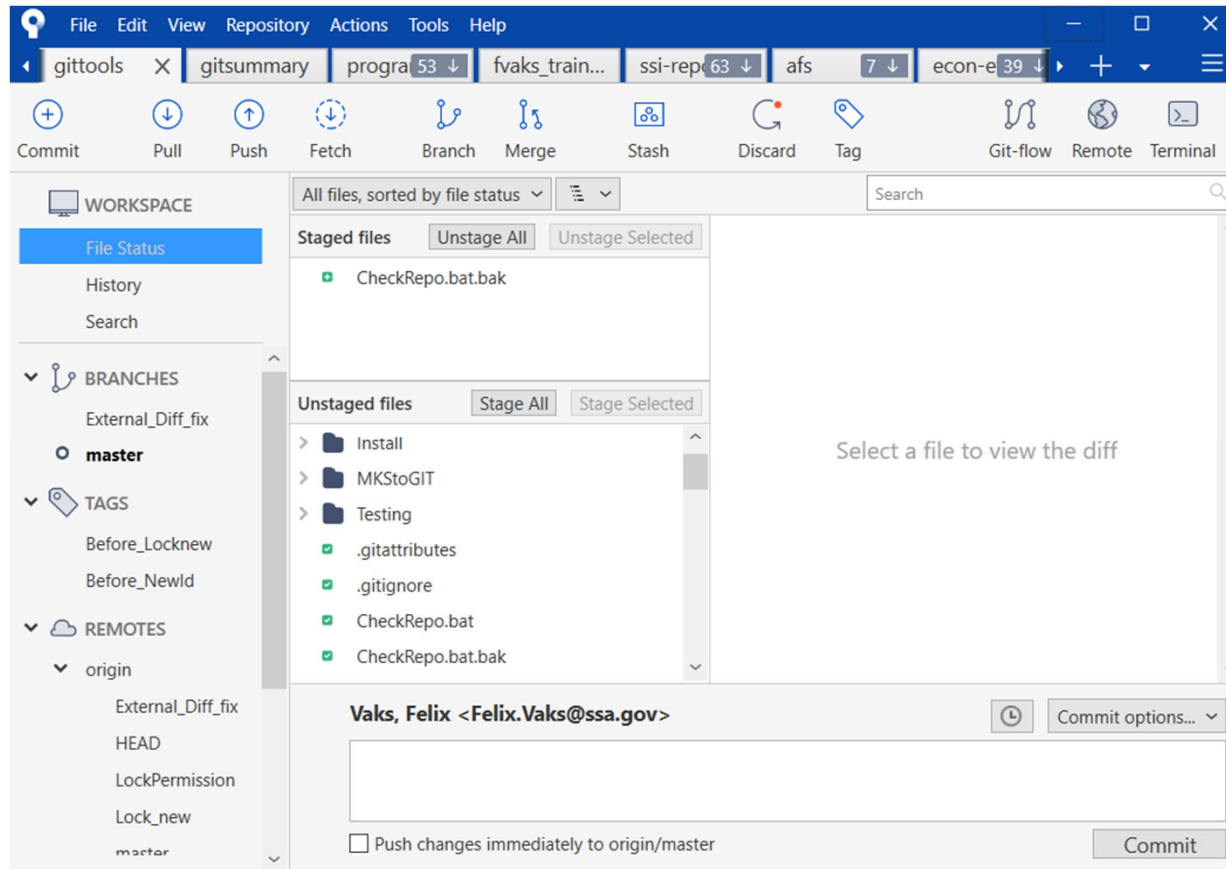
Sourcetree

- Sourcetree is a visual, easy-to-use interface with Git.
- No CMD line required (just point and click)
- Do need to have an understanding of what the git commands do

Benefits of Using Sourcetree

1. Process most git commands using point and click
2. Easily view history of individual files
3. Easily compare history at different points in time
4. External Diff to compare individual files
5. Blame
6. Search within history
7. Branch and merge
8. Custom Actions

1) Point and Click



Log: CheckRepo.bat

Description	Date	Author	Commit
Adding ability to check on branches	9/20/2022	Vaks, Felix	8b5eb54
fix to transfer file with space to checkre	7/29/2022	Vaks, Felix	d97db70
Fixing for empty spaces in output nam	7/29/2022	Vaks, Felix	a025f90
Changing Find command to %SystemR	11/25/2020	Vaks, Felix	7a3a104
Adding error if path of repo is not corre	8/26/2020	Vaks, Felix	4168211
Remove unused code	8/19/2020	Vaks, Felix	3d4ceff
Create an error code if Bitbucket is not	8/19/2020	Vaks, Felix	8c3e339
Can specify subdirectory of repo	7/15/2020	Vaks, Felix	5532494
Clean Up Short Output	6/26/2020	Vaks, Felix	1775e09
Output full version can now be used as	6/18/2020	Vaks, Felix	bbec24a
Diff in the short output works for files v	6/18/2020	Vaks, Felix	4502bc8
Allow of use for relative paths in fileout	6/11/2020	Vaks, Felix	4690b1c
Change E: to LR reference.	6/11/2020	Vaks, Felix	03b0c94
Fulloutput only works with switch /o (lc	6/11/2020	Vaks, Felix	cce6b87
Removing E: start adding some notes tc	6/8/2020	Vaks, Felix	477c2d5
Change to the FullOutput	6/8/2020	Vaks, Felix	79b5c77
Changed the diff code to have the path	6/3/2020	Vaks, Felix	9fb2902

Commit: 4168211357e28cbbd2245d274861637c65509399 [4168211]
Parents: 3d4ceffdea
Author: Vaks, Felix <Felix.Vaks@ssa.gov>
Date: Wednesday, August 26, 2020 3:45:29 PM
Committer: Vaks, Felix

Adding error if path of repo is not correct
error for wrong path is -2

Follow renamed files

CheckRepo.bat

Hunk 1: Lines 68-89

```

68 68 .....REM changing to the curre
69 69 .....cd /d !reporid!
70 70 .....
71 +.....REM setting the error lev
72 +.....
73 +.....set error=0
74 +.....if not "%errorlevel%"=="0
75 +.....
76 +.....REM echo -----err
77 +.....REM echo %errorlevel%
78 +.....
79 +.....REM echo !error!
80 +.....REM echo -----err
81 +.....
82 +.....
71 83 .....git fetch
72 84 .....
73 85 .....REM setting the error lev
74 86 .....set error=0
86 +.....
75 87 .....if not "%errorlevel%"=="0
76 88 .....
77 89 .....REM echo -----err

```

Hunk 2: Lines 191-197

```

179 191 ...:End
180 192 ...
181 193 ...If "!error!"=="-1" (EXIT /B !
194 + If "!error!"=="-2" (EXIT /B !
182 195 ...
183 196 ...Exit /B !changeount!
184 197 ...

```

Close

2) Individual File History

The screenshot shows the Git GUI interface with the commit history table and a diff view for the file `GitCompare.bat`.

Graph	Description	Date	Author	Commit
	Referencing current branch (branch that is check	30 Aug 2022 23:30	Vaks, Felix	5b080fb
	Fix readability of install file	12 Aug 2022 16:34	Vaks, Felix	3d16d5e
	These tools are necessary for External Diff to wo	12 Aug 2022 1:55	Vaks, Felix	5b83c81
	Adding registering Frame Maker. Also creating	12 Aug 2022 1:53	Vaks, Felix	e918ab5
	CompareDocsFromCommandLineMacro.pptm is	12 Aug 2022 1:03	Vaks, Felix	ee60f7a
	Adding PowerPoint to the external diff.	12 Aug 2022 0:59	Vaks, Felix	cff95f
	removing the pause at the end	10 Aug 2022 20:46	Vaks, Felix	7f76598
	Install of Compare PowerPoint macro, in order tr	10 Aug 2022 20:43	Vaks, Felix	9d28e4d
	Adding install macro for Word in order to use Ex	10 Aug 2022 20:14	Vaks, Felix	c67346b
	fix to transfer file with space to checkrepo.fullou	29 Jul 2022 14:28	Vaks, Felix	d97db70
	Fixing for empty spaces in output name as well	29 Jul 2022 14:21	Vaks, Felix	a025f90

The diff view for `DiffTools/GitCompare.bat` shows the following changes:

```

163 197 .....
198 + :ErrorMSPowerPointVersion
199 + echo.
200 + echo Error.
201 + echo Could not find location of Micro
202 + echo.
203 + pause
204 + goto End
205 + .....
206 + .....
164 207 .....:copyfiles
165 208 ..... set MKS_DOC1=%1
166 209 ..... set MKS_DOC1=%~nx1
  
```

3) Comparing History Between Different Timepoints

4) Using External Diff (WinMerge)

```
WinMerge - [1_GitCompare.bat - 2_GitCompare.bat]
File Edit View Merge Tools Plugins Window Help

1_GitCompare.bat - 2_GitCompare.bat
C:\Users\770499\AppData\Local\Temp\GitTemp\1_GitCompare.bat
C:\Users\770499\AppData\Local\Temp\GitTemp\2_GitCompare.bat

REM If filepath for arg 2 is blank that means that it's a rename or move of file.
REM Sourcetree will try to open up two compares
REM 1) old file and "nul"
REM 2) "nul" and new file
REM This program (GitCompare.bat) will actually be activated twice. This is a bug in
Sourcetree. To work around this bug we are going to copy the two files and change the
reference of the compare.
REM If arg 2 is "nul" then we are going to copy the first file and exit. If arg 1 is
"nul" then we are going to copy the second file and try to compare the last two files
created in "AppData\Local\Temp\GitTemp" folder

REM "E:\usr\fvaks\Work\GIT\gittools\message.vbs" %2 %CD%

REM If GitTemp folder doesn't exist then created
if not exist %USERPROFILE%\AppData\Local\Temp\GitTemp (
  mkdir %USERPROFILE%\AppData\Local\Temp\GitTemp
)

if /I "%~x2"==".doc" goto CompareWord
if /I "%~x2"==".docx" goto CompareWord

if /I "%~x2"==".xls" goto CompareExcel
if /I "%~x2"==".xlsx" goto CompareExcel
if /I "%~x2"==".xlsm" goto CompareExcel

if /I "%~x2"==".fm" goto CompareFM
if /I "%~x2"==".book" goto CompareFM
if /I "%~x2"==".pdf" goto ComparePDF

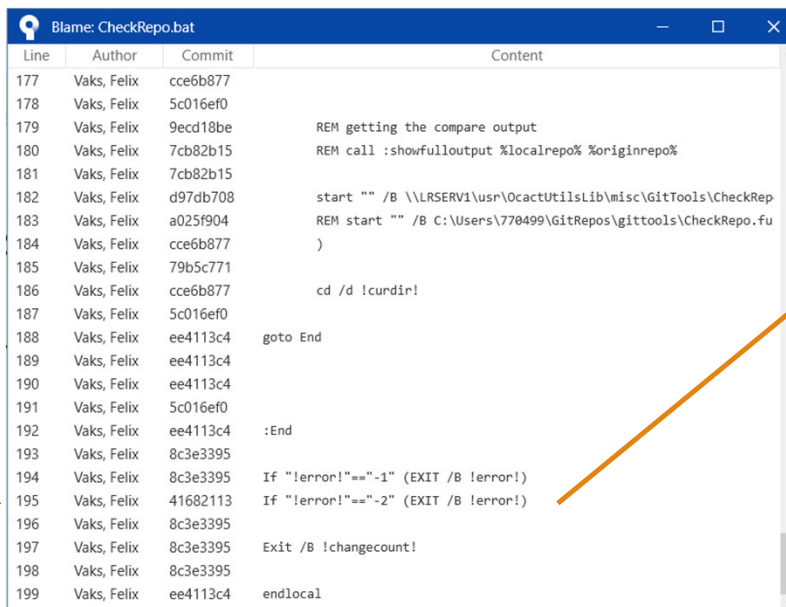
REM "E:\usr\fvaks\Work\GIT\gittools\message.vbs" %2 %CD%

REM If GitTemp folder doesn't exist then created
if not exist %USERPROFILE%\AppData\Local\Temp\GitTemp (
  mkdir %USERPROFILE%\AppData\Local\Temp\GitTemp
)

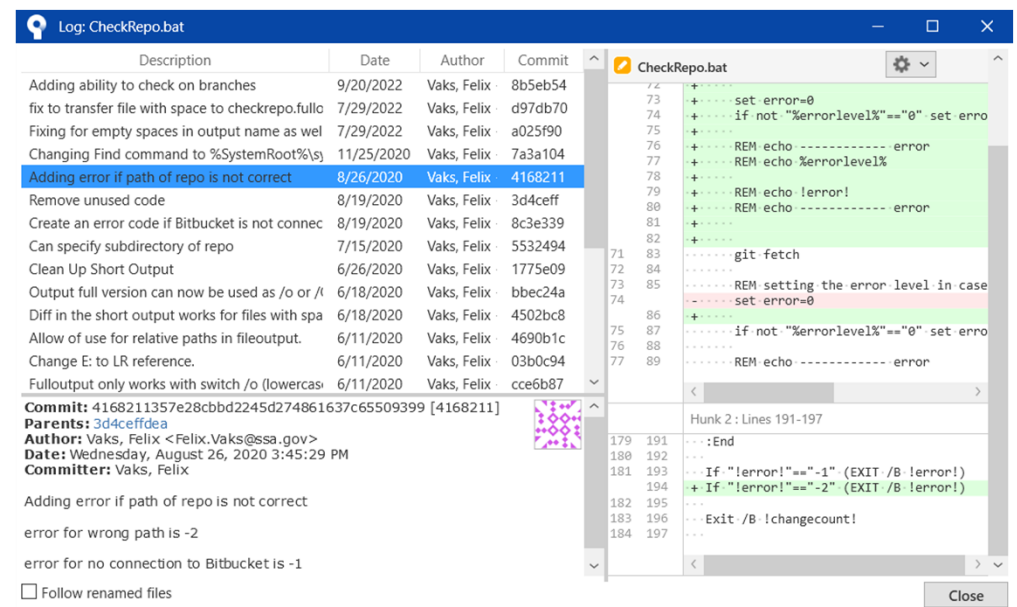
if /I "%~x2"==".doc" goto CompareWord
if /I "%~x2"==".docx" goto CompareWord
if /I "%~x2"==".docm" goto CompareWord
if /I "%~x2"==".dot" goto CompareWord
if /I "%~x2"==".dotm" goto CompareWord
if /I "%~x2"==".xls" goto CompareExcel
if /I "%~x2"==".xlsx" goto CompareExcel
if /I "%~x2"==".xlsm" goto CompareExcel
if /I "%~x2"==".xlsb" goto CompareExcel
if /I "%~x2"==".xlt" goto CompareExcel
if /I "%~x2"==".xltn" goto CompareExcel
if /I "%~x2"==".fm" goto CompareFM
if /I "%~x2"==".book" goto CompareFM
if /I "%~x2"==".pdf" goto ComparePDF
if /I "%~x2"==".ppt" goto ComparePP
if /I "%~x2"==".pptx" goto ComparePP
if /I "%~x2"==".pptm" goto ComparePP
```


5) Using "Blame"

Quickly view who and when created the code (who is to "blame" for that code)



Line	Author	Commit	Content
177	Vaks, Felix	cce6b877	
178	Vaks, Felix	5c016ef0	
179	Vaks, Felix	9ecd18be	REM getting the compare output
180	Vaks, Felix	7cb82b15	REM call :showfulloutput %localrepo% %originrepo%
181	Vaks, Felix	7cb82b15	
182	Vaks, Felix	d97db708	start "" /B \\LRSERV1\usr\0cactUtilsLib\misc\GitTools\CheckRep
183	Vaks, Felix	a025f904	REM start "" /B C:\Users\778499\GitRepos\gittools\CheckRepo.fu
184	Vaks, Felix	cce6b877)
185	Vaks, Felix	79b5c771	
186	Vaks, Felix	cce6b877	cd /d !curdir!
187	Vaks, Felix	5c016ef0	
188	Vaks, Felix	ee4113c4	goto End
189	Vaks, Felix	ee4113c4	
190	Vaks, Felix	ee4113c4	
191	Vaks, Felix	5c016ef0	
192	Vaks, Felix	ee4113c4	:End
193	Vaks, Felix	8c3e3395	
194	Vaks, Felix	8c3e3395	If "!error!"=="-1" (EXIT /B !error!)
195	Vaks, Felix	41682113	If "!error!"=="-2" (EXIT /B !error!)
196	Vaks, Felix	8c3e3395	
197	Vaks, Felix	8c3e3395	Exit /B !changeount!
198	Vaks, Felix	8c3e3395	
199	Vaks, Felix	ee4113c4	endlocal



Description	Date	Author	Commit
Adding ability to check on branches	9/20/2022	Vaks, Felix	8b5eb54
fix to transfer file with space to checkrepo.full	7/29/2022	Vaks, Felix	d97db70
Fixing for empty spaces in output name as wel	7/29/2022	Vaks, Felix	a025f90
Changing Find command to %SystemRoot%\s	11/25/2020	Vaks, Felix	7a3a104
Adding error if path of repo is not correct	8/26/2020	Vaks, Felix	4168211
Remove unused code	8/19/2020	Vaks, Felix	3d4ceff
Create an error code if Bitbucket is not connec	8/19/2020	Vaks, Felix	8c3e339
Can specify subdirectory of repo	7/15/2020	Vaks, Felix	5532494
Clean Up Short Output	6/26/2020	Vaks, Felix	1775e09
Output full version can now be used as /o or /f	6/18/2020	Vaks, Felix	bbec24a
Allow of use for relative paths in fileoutput.	6/11/2020	Vaks, Felix	4502bc8
Change E: to LR reference.	6/11/2020	Vaks, Felix	4690b1c
Fulloutput only works with switch /o (lowercas	6/11/2020	Vaks, Felix	03b0c94
			cce6b87

Commit: 4168211357e28cbbd2245d274861637c65509399 [4168211]
Parents: 3d4ceffdea
Author: Vaks, Felix <Felix.Vaks@ssa.gov>
Date: Wednesday, August 26, 2020 3:45:29 PM
Committer: Vaks, Felix

```
Adding error if path of repo is not correct
error for wrong path is -2
error for no connection to Bitbucket is -1
```

6) Search History

The screenshot shows the TortoiseSVN Search History window. The main pane displays a list of commits with columns for Description, Date, Author, and Commit. The commit with ID 4168211 is selected and highlighted in blue. Below the list, the commit details for 4168211 are shown, including the commit message "Adding error if path of repo is not correct" and the file "CheckRepo.bat". The diff view for "CheckRepo.bat" is displayed, showing a hunk of code with line numbers 68-89. The diff highlights the changes made in the selected commit.

Description	Date	Author	Commit
Adding install macro for Word in order to use External Diff in Sourcetree for word docu	10 Aug 2022 20:14	Vaks, Felix <Felix.Vaks@	c67346b
Closes Sourcetree if already open so that Sourcetree can reload the correct Custom Act	19 Jul 2022 13:28	Vaks, Felix <Felix.Vaks@	1de985d
Adding Diff tool of Comparing PDF	28 Jun 2022 15:20	Vaks, Felix <Felix.Vaks@	88e5c01
Adding error if path of repo is not correct	26 Aug 2020 15:45	Vaks, Felix <Felix.Vaks@	4168211
Updating for LR reference.	2 Jun 2020 16:16	Vaks, Felix <Felix.Vaks@	6a2d1bd
Now can open and copy selected files.	19 Mar 2020 0:39	Vaks, Felix <Felix.Vaks@	b501d1f
Sending the file name to a separate batch file.	16 Mar 2020 0:00	Vaks, Felix <Felix.Vaks@	4dd3598
Git FrameMaker Diff tool.	24 Feb 2020 21:18	Vaks, Felix <Felix.Vaks@	407aee4
Removing Compare_Word.bat and GITWordDiff.bat since they are not necessary. They	5 Jan 2020 22:22	Vaks, Felix <Felix.Vaks@	1a4d526
committing different files	21 Nov 2019 23:45	Vaks, Felix <Felix.Vaks@	8e1ea6b

Commit: 4168211357e28cbbd2245d274861637c65509399 [4168211]
Parents: 3d4ceffdea
Author: Vaks, Felix <Felix.Vaks@ssa.gov>
Date: Wednesday, August 26, 2020 3:45:29 PM
Committer: Vaks, Felix

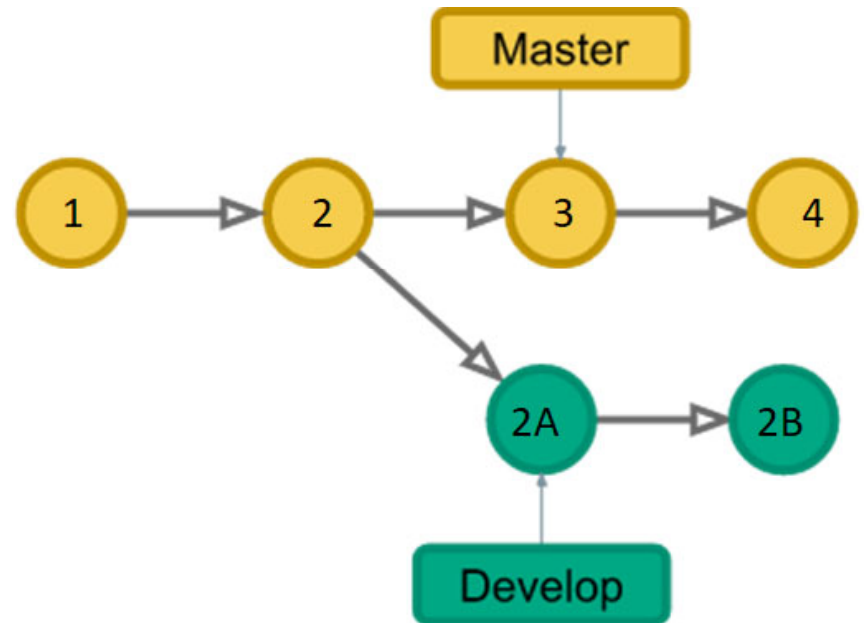
Adding error if path of repo is not correct

CheckRepo.bat

```
68 68 ..... REM changing to the current directory
69 69 ..... cd /d !repodir!
70 70 .....
71 + ..... REM setting the error_level if repo directory doe
72 + .....
73 + ..... set error=0
74 + ..... if not "%errorlevel%"=="0" set error=-2
75 + .....
76 + ..... REM echo ----- error
77 + ..... REM echo %errorlevel%
78 + .....
79 + ..... REM echo !error!
80 + ..... REM echo ----- error
81 + .....
```

7) Branching

- Best feature of Git
- Off to the side model
- Different groups can work on same project




Basic Branch and Merge

Graph	Description	Date	Author	Commit
	Replacing regular Custom Actions script paths in	18 Jul 2022 16:01	Vaks, Felix	96044df
	Program to replace path for custom actions from	18 Jul 2022 12:34	Vaks, Felix	8e5490a
	Merge branch 'Spaces_Fix'	28 Jun 2022 15:22	Vaks, Felix	4dcfaaa
	Adding Diff tool of Comparing PDF	28 Jun 2022 15:20	Vaks, Felix	88e5c01
	origin/Spaces_Fix Fixing bug where if the f	27 Jun 2022 21:48	Vaks, Felix	6e26a9f
	Working with spaces in file name and file path.	16 Jun 2022 13:20	Vaks, Felix	c07b4e6
	Converting Econ EcoDev MKS project to Git. Ver	13 Jun 2022 11:47	Vaks, Felix	a81e1af
	Program to add list of branches to current repo.	13 Jun 2022 9:35	Vaks, Felix	74de9be
	Making the format neater. Now it splits into nar	16 May 2022 23:36	Vaks, Felix	e040c8f
	Changing link from C: to LRSERV1	13 May 2022 15:31	Vaks, Felix	99f098b
	It now lists the locked files in a hta window. Mu	10 May 2022 13:54	Vaks, Felix	b78931b
	Creating a custom action that opens up the rem	5 May 2022 14:12	Vaks, Felix	fcad959
	Updating documentation	5 May 2022 13:54	Vaks, Felix	fc07116

8) Custom Actions

Can add helpful tools that are not found in Sourcetree

- Lock files
 - See which files are locked
 - Download files from history
 - View all the files from a certain point in time
- 

Summary

- Benefits of Version Control
 - Different Types of Version Control
 - Git
 - Sourcetree
-
- Use version control to travel further (Hike the Mountains)



Resources

Version Control - <https://www.atlassian.com/git/tutorials/what-is-version-control>

Git - <https://git-scm.com>

Sourcetree - <https://www.sourcetreeapp.com/>

Questions?

