



Strong Engineering LLC

# Source Control

- Duane Strong
- Strong Engineering LLC
- [duanes@strongenging.com](mailto:duanes@strongenging.com)



# What is it?

- Manages what can easily become total chaos.
- Part of a larger concern called Software Configuration Management

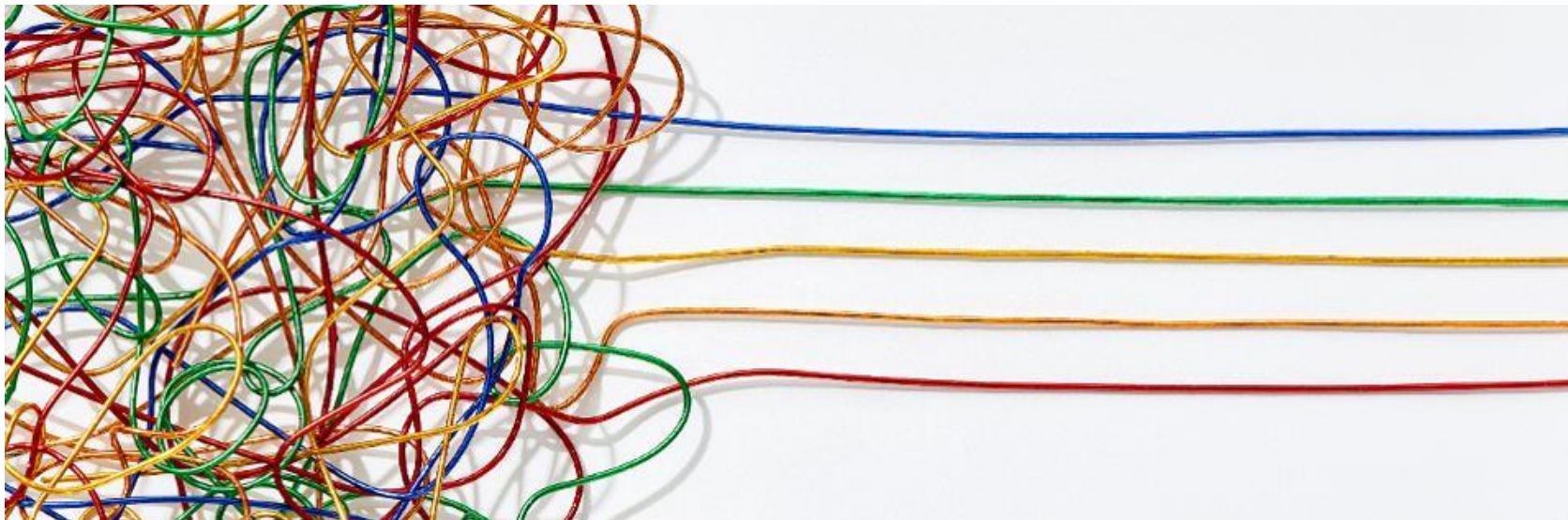
The task of tracking and controlling changes in the software. SCM practices include revision control and the establishment of baselines. If something goes wrong, SCM can determine what was changed and who changed it. If a configuration is working well, SCM can determine how to replicate it across many hosts.

- Provides traceability from feature or change request to implementation.
- Establishes tested baselines
- Establishes a set of requirements for change acceptance

# Why do we need it?

Any sufficiently large project becomes (mostly?) an exercise in containing complexity.

The nature of software development is such that it constantly tries to become just more complicated than humans can understand. Entropy is constant.



# Why do we need it?

- Team Co-ordination
- Provides an authoritative source
- Time Machine, can always get back to a prior version
- Back up
- Historian - Why did we do that?
  - Commit logs
  - Issue reference
- Branches - Multiple Development Timelines
  - Allows feature development and bug fixes without disturbing the main time line

# What do you put in it?

- Anything
  - Not just software
  - This presentation
  - Maybe not huge things
  - Once you get used to the safety net you want it
- Everything
  - Information radiator
  - Never have to ask someone for a document
  - Other tools might be better (wiki, ERP)
  - Not generated items
  - Not 3<sup>rd</sup> party SDKs, etc.

# A Little History

SCCS (1972) RCS (1982)

Like a library book

Where the term 'checkout' comes from.

- Files locked by one person at a time
- Hard to collaborate, usually not working on the same part of a file
- Promotes cheating



# A Little History

- CVS (1986) Multiple concurrent checkouts
  - No locking
  - Must 'update' prior to commit
  - Diffing, merging. Context aware diff
  - What is a conflict?
- SVN (2000) Improved CVS
  - Atomic commits
  - Change sets have versions not files
  - Database
  - Improved network transports

# A Little History

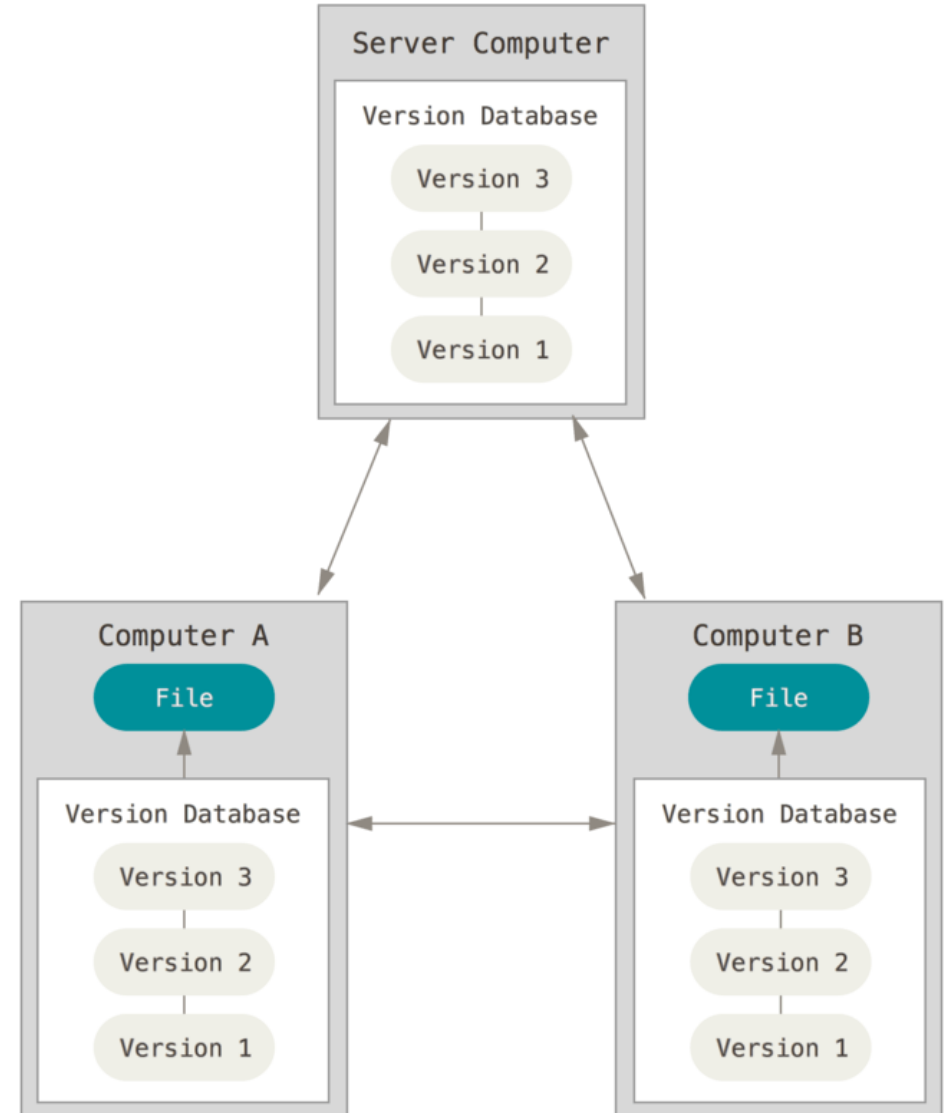
- Git (2005) Linus Torvalds
  - Distributed – everyone has an entire repository copy
  - No diffs, whole versions (storage is cheap)
  - Open source projects have special requirements
  - Distributed teams
  - Replicated repository, push/pull





# Git – how does it work?

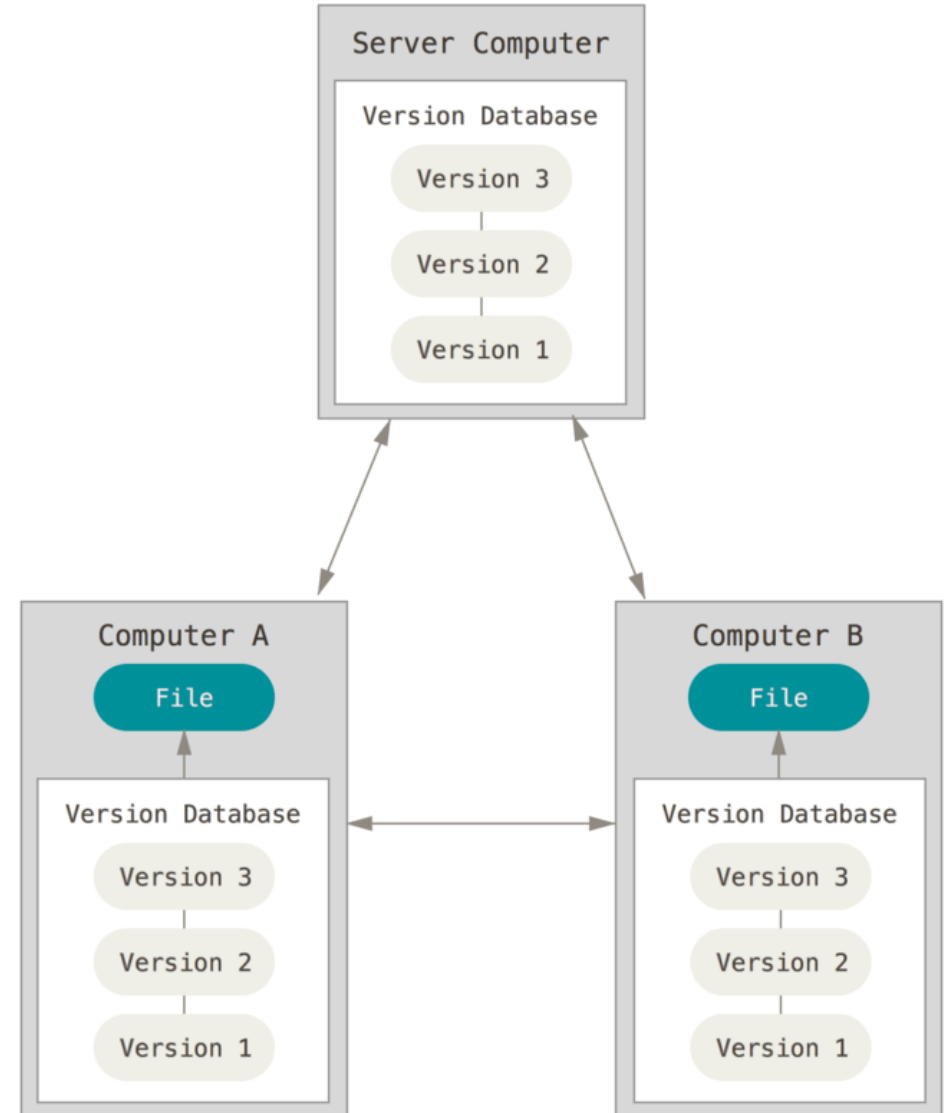
- Clone local copy of the repo (.git)
- Central server not required
- Not delta based
- Every change is an entire new copy



# Git – how does it work?

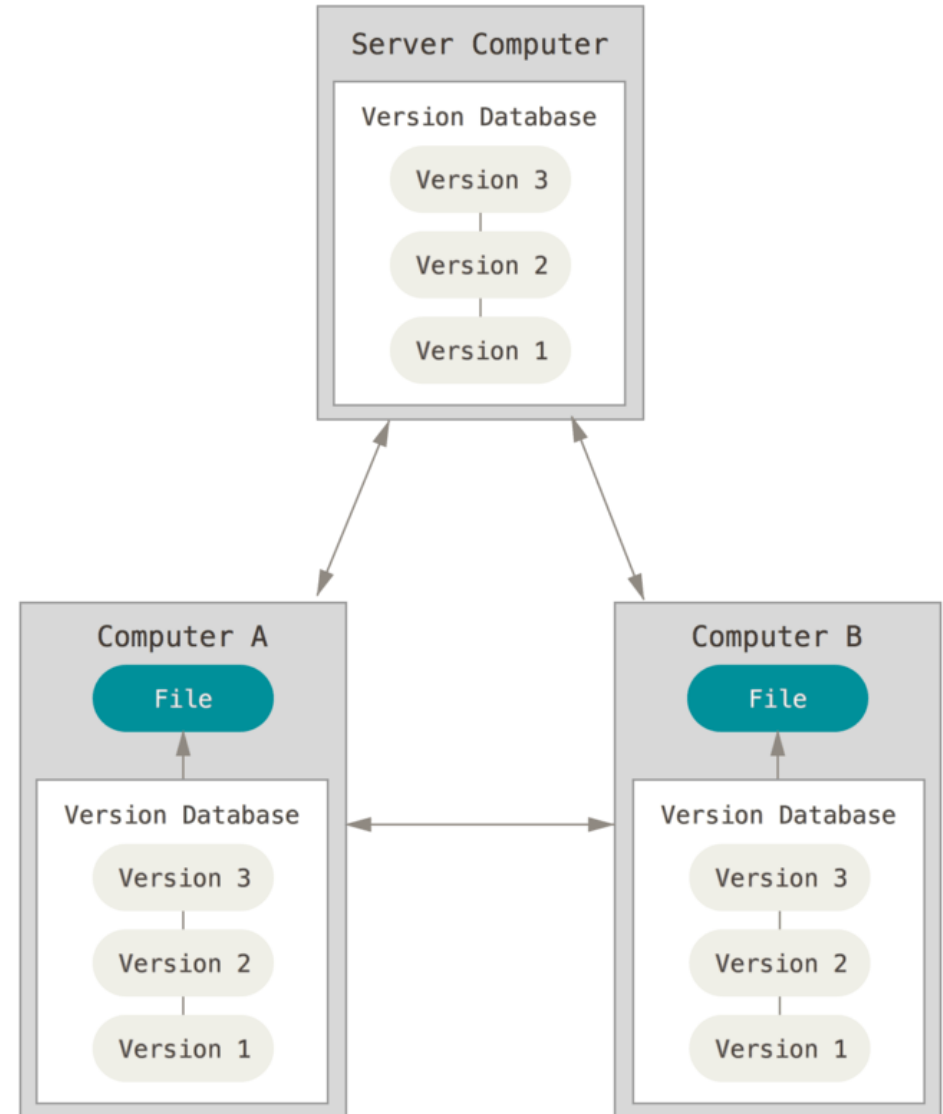
- Blobs and the magic of SHA
  - 160 bits long about  $10^{48}$

A trillion people generating a trillion new blobs per second for a trillion years is only  $10^{43}$
- Associative memory
- What is a blob?
  - Files
  - Trees
  - Commits
  - Tags
- Instantaneous branching



# Git - terminology

- Cloning
- Origins
- Remote tracking branches
- Master branch
- Feature/Issue branch
- Working directory



# Git Terminology

- Staging
- Commit
- Push
- Pull (Fetch + Update)
- Refs
  - HEAD
  - Tags
  - Remotes

# Git

- Staging changes
  - `git add` (new and modified)
  - `git rm`
  - `git mv` (not really necessary)
- Commit
  - Atomic
  - `git commit`
  - Enter meaningful commit messages. Not "updated" or "fixed".
- Push
  - `git push`

# Git

- `git status`
- `.gitignore`
  - Cascades
- **Branching**
  - `git branch`
  - `git checkout`

Checkout changes files in your working directory – tries to not let you mess up

# Git

- Stashes
- Merging
  - `git merge`
- Conflicts

```
<<<<<<< HEAD:index.html
```

```
<div id = footer> contact : email.support@github.com</div>
```

```
=====
```

```
<div id = footer>
```

```
  please contact us at email.support@github.com</div>
```

```
</div>
```

```
>>>>>>> mybranch:index.html
```

# Git Frontends

- Command line 'porcelain'
  - I almost never use
- Visual Studio
- Eclipse eGit
- SourceTree
- Tortoise
- Github / Gitlab web interfaces



File Explorer showing project structure:

- FoxOTWAppRemote [master] - /Users/duanestrong/Documents/workspace-fox/FoxOTWAppRemote/.git
- LIVE-Valve-eMTB-Demo [master] - /Users/duanestrong/Documents
- LIVE-Valve-MTB-Controller [master] - /Users/duanestrong/Docume
- LIVE-Valve-MTB-Controller.wiki [master] - /Users/duanestrong/Docun
- LIVE-Valve-MTB-MY18-Bootloader [master] - /Users/duanestrong/l
- Nordic-NRF52 [keegan] - /Users/duanestrong/Documents/workspa
- Nordic-NRF52.wiki [master] - /Users/duanestrong/Documents/work
- pc-nrfutil [master] - /Users/duanestrong/Documents/workspace-fo
- Testing-Software [master] - /Users/duanestrong/Documents/worksp

Branches:

- Local
  - GenerateSlotHex-Tool 48979dc Create GenerateSlotHex.py
  - Issue-#26 8d730b0 Added readme
  - Issue-#126-Add-session-cancel-button 9c7d473 Issue #12
  - Issue-#288-installer d3c7f76 Temporarily added a dialog to
  - master b8ad46c v0.2.23 - fixes for issue #288 - installer
  - Support-fox-service-IO 7379bec Cleaned up message hand
  - Work\_on\_#6\_#12\_#14\_#30 2dce0ee Added global logfuncti
- Remote Tracking
- Tags
- References
- Remotes
  - origin
    - https://github.com/ridefox/Testing-Software.git
    - https://github.com/ridefox/Testing-Software.git
- Stashed Commits
- Working Tree - /Users/duanestrong/Documents/workspace-fox/Te

```
757 top_level = top
758 root = top
759
760 root.title("Live E1 Connect " + versionString )
761
762 if os.path.isfile('fox-logo.ico'):
763     root.iconbitmap(default='fox-logo.ico')
764
765 # connect the peers list box up to the PeersScrolledlistboxVar variable
766 global PeersScrolledlistboxVar
767 PeersScrolledlistboxVar = tk.StringVar()
768 w.PeersScrolledlistbox.configure(listvariable=PeersScrolledlistboxVar)
769
770 # connect the text entry box to the SendTextVar variable
771 global SendTextVar
772 SendTextVar = tk.StringVar()
773 w.NusEntry.configure(textvariable=SendTextVar)
774 # also bind to return key
775 root.bind('<Returns>', do_send)
776
777 # initial widget states
778 w.SendTButton.state(['disabled'])
779 w.ConnectTButton.state(['disabled'])
780 w.DeleteBondsTButton.state(['disabled'])
781 w.DisconnectTButton.state(['disabled'])
782
783 w.ReadFileTButton.state(['disabled'])
784 w.WriteFileTButton.state(['disabled'])
785 w.DefaultsTButton.state(['disabled'])
786 w.ActivateTButton.state(['disabled'])
787 w.ResetTimeTButton.state(['disabled'])
788 w.CalibrateTButton.state(['disabled'])
789 w.RebootTButton.state(['disabled'])
790 w.DFUTButton.state(['disabled'])
```

Testing-Software [master]

Unstaged Changes (1)

- Testing-Software.wiki

Staged Changes (0)

Empty area for staged changes.

Commit Message

Empty text area for commit message.

Author: Duane Strong <duanes@strongenging.com>  
Committer: Duane Strong <duanes@strongenging.com>

File: Testing-Software/Python/LiveE1Connect/LiveE1ConnectGUI\_support.py [Testing-Software]

Id	Message	Author	Authored Date	Committer	Committed Date
4497114	v0.2 - ready for APG testing	ridefox-tpickett	9 weeks ago	ridefox-tpickett	9 weeks ago
1b53f35	No More Reponse	ridefox-mfraguglia	9 months ago	ridefox-mfraguglia	9 months ago
6b144f5	(origin/Fix_file...) Fix filedialog import	ridefox-mfraguglia	12 months ago	ridefox-mfraguglia	12 months ago
2269609	Merge branch 'master' into Issue-#32-89-124-178-read-write-flash	ridefox-tpickett	12 months ago	GitHub	12 months ago
d2d7b9d	v1.1.1 - Completed issues #32, #124, #188	ridefox-tpickett	12 months ago	ridefox-tpickett	12 months ago
939dd3e	(origin/Open/Sav...) Small fixes	ridefox-mfraguglia	12 months ago	ridefox-mfraguglia	12 months ago
90ca36e	Bump Version	ridefox-mfraguglia	12 months ago	ridefox-mfraguglia	12 months ago
8278373	Add Dialogs to select files to read/write from in file explorer	ridefox-mfraguglia	12 months ago	ridefox-mfraguglia	12 months ago
65a4682	v1.1.0 - Note - broke the build with this commit. write to disk not working. Need to check in so I can revert and work forward to	ridefox-tpickett	12 months ago	ridefox-tpickett	12 months ago
21e5bd4	Merge pull request #186 from ridefox/working_on_#10_#27_#32_read_write_settings	ridefox-tpickett	1 year ago	GitHub	1 year ago
8c8eef7	(origin/working_...) Added some comments	ridefox-tpickett	1 year ago	ridefox-tpickett	1 year ago
35124b2	(origin/Issue-#1...) Issue #182 update to protocol version 1.3	Duane Strong	1 year ago	Duane Strong	1 year ago
59034ff	v1.6 - fixed #180	ridefox-tpickett	1 year ago	ridefox-tpickett	1 year ago
51ec0cd	LiveE1Connect - fixed #180 Tester - continuing with write settings to flash	ridefox-tpickett	1 year ago	ridefox-tpickett	1 year ago
6a9b5c3	LiveE1Connect v1.5 - finished conversion to yaml	ridefox-tpickett	1 year ago	ridefox-tpickett	1 year ago
f43ca1c	Working on #174 - all settings in one file - in the middle of implementing YAML	ridefox-tpickett	1 year ago	ridefox-tpickett	1 year ago
b84ef1d	(origin/working_...) Updates for #174 Read/Write settings - Allow 1 or all slots to be updated on controller - Allow each additional seridefox-tpickett	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
8c99abe	More fixes for #174: - Lost textvariable SlotSpinbox when I updated the GUI. Added it back - multiple updates in do_write_1_file().	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
1cbc6d0	- Changed slot_no = SlotSpinbox.get() to slot_no = int(SlotSpinbox.get()) - in read_run_after(), changed	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
558a1cd	- Changes per Duane's input on PR #175, - modified UI to allow user to write all slots or just 1 slot's settings to controller along withridefox-tpickett	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
54e8f4a	Continuing on #174 - keeping the checkboxes for writing to controller makes sense	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
4137cd7	GUI updates for #174 - read/write 1 json file	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
256c486	Final changes to complete read/write one "all_settings.json" file	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
063a016	Working on reading all settings json file, writing all to controller	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
0a01a0f	LiveE1Connect issue #174 updates: Now writing to 1 file. Starting to work on reading from 1 file	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
327fcf	v1.3 - added buttons to read and write all settings to/from json file. First step - read and save all slot files	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
c32ed8b	Saving unfinished work so I can switch to another branch	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
d1c856e	Initial GUI changes for 1 JSON file read/write	ridefox-tpickett	1 year, 1 month ago	ridefox-tpickett	1 year, 1 month ago
db2a492	Issue #77 added delete bonds button	Duane Strong	1 year, 2 months ago	Duane Strong	1 year, 2 months ago
47597dc	(origin/Issue-#4...) Changes for EP	Duane Strong	1 year, 3 months ago	Duane Strong	1 year, 3 months ago
e4f4fce	Fix for issue #47 central_version() not robust	Duane Strong	1 year, 3 months ago	Duane Strong	1 year, 3 months ago
b9a807d	Fixed some LiveConnect bugs	Duane Strong	1 year, 3 months ago	Duane Strong	1 year, 3 months ago
7379bec	(Support-fox-ser...) (origin/Support-...) Cleaned up message handler	Duane Strong	1 year, 4 months ago	Duane Strong	1 year, 4 months ago
0f92c6f	Write commands working	Duane Strong	1 year, 4 months ago	Duane Strong	1 year, 4 months ago
8168d3e	All reads working	Duane Strong	1 year, 4 months ago	Duane Strong	1 year, 4 months ago
b7e0e16	Added read	Duane Strong	1 year, 4 months ago	Duane Strong	1 year, 4 months ago
86f0f3f	Fox service send working	Duane Strong	1 year, 4 months ago	Duane Strong	1 year, 4 months ago
4957ba7	Changed name of launcher to LiveE1Connect	Duane Strong	1 year, 4 months ago	Duane Strong	1 year, 4 months ago

# Workflows

- Never commit directly to master branch.
  - Create branch for an issue
- All work reviewed by at least one other pair of eyes
  - Bugs are exponentially more expensive to fix the farther down the process they live
  - Keeps at least one other team member in the loop
- All work should be traceable back to an issue.
- Merge to master branch
  - Use tools to enforce an acceptance criteria

# Don't be one of those people

- Learn your tools well and know what they can do for you.
- Enter meaningful commit messages. Not "updated" or "fixed".
- Don't commit junk files (.o .bin)
  - Use .gitignores to filter out files/directories that should not be checked in
  - .gitignore is applied cascading down the directory hierarchy. It is considered rude to filter out generic names at the root folder.
- Don't commit settings that are particular to your workstation (install paths etc.).

# Don't be one of those people

- Have healthy respect (fear?) when pushing. You are affecting others lives.
- Don't just add all to git staging. Carefully pick the files to stage. Diff them to head to make sure you didn't leave something in you did not mean to.
- If you break the build you will be in the dog house. Most projects have multiple dependencies.

# Mono repo vs. multi repos

- How much do I put into one repo?
- Cross project commits / code sharing / code access
- Atomic commits
- Submodules
  - Another repo as a subdir
  - Tracks at what commit that repo should be
  - Not really connected to each other
- Subtrees
  - Another repo as a subdir
  - Requires user to not mix commits
  - Requires multiple steps for merge
- Side by side repos – not a repo

Q & A