

Version Control Introduction

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1 Motivation

Paper Example

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Introduction

How it Works

3 Git and GitHub

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Paper Workflow

A typical workflow of writing a paper:

- Start with an idea/outline
- Make a draft
- Proof
- Edit
- Repeat until done

Workflow Shortcomings

Individual paper:

- Forget what changes were and were not made
- Make big changes but like the way it was
- Want to use the material again but alter for a different audience, journal, etc.

Group paper:

- Don't know what changes were and were not made
- Not sure what version of the paper you or others have
- Not sure who or what was added to the version in-use

Solution

A common solution not using a version control system (VCS):

- Make a new directory and name appropriately
 - NuclearEngineeringAndDesign
 - AnnalsOfNuclearEnergy
- Make a new copy of the file and name it something different
 - AwesomePaper-Draft1.docx
 - AwesomePaper-AdvisorsNotes.docx
 - AwesomePaper-Draft2NeedCitations.docx
 - AwesomePaper-Final.docx
 - AwesomePaper-FinalAdvisorNotes.docx
 - AwesomePaper-FinalFinal.docx

Solution Shortcomings

- Proliferation of files and directories
- No automatic list of changes; “proper” naming attempts to correct this (e.g., Draft2NeedCitations)
- Ability to go back to an earlier version would complicate naming
- Collaboration issues still not addressed

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RELAP/MELCOR Inputs:

- Build the model by slowly adding control volumes and heat structures
- Adjust geometry input as more information becomes available
- Correct issues as they're discovered
- Might break things and need to find a older, working version
- **Re-use the input for multiple different simulations or numerical experiments**

Writing Programs

- Start simple and add more functionality
- Fix bugs as they're discovered
- Might break things and need to find a older, working version
- Someone else might want to leap off of the work already done but apply it differently

Same Problems

- These examples, and many more, all have the problems presented by the paper example.
- The problems only become worse as the work becomes larger or more people become involved.

What's the solution?

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What is it?

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

Features:

- Revert a file or an entire project back to a previous state
- Review changes made over time
- See who last modified something
- Create an off-shoot from a current project state (branching)
- Create a brand new project from a current project (forking)
- Work locally and save to an online system (distributed systems)

Advantages / Disadvantages

Advantages

- History of the project is automatically cataloged
- All versions of the project are saved and ID-ed automatically
- Line-by-line and person-by-person reviewable history.

Disadvantages:

- Can't see line-by-line changes for binary files (e.g., docx or image files)
- Not good for saving humongous files (large binary data files shouldn't be versioned)
- Requires discipline and effort to log and sync changes
- Becomes much, much more complicated for larger projects (not a worry for us)

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Definitions (Examples to follow)

Repository A directory that holds all project files and VCS information.

Commit A submission of changes from the user to the VCS; this creates a new version and saves the previous state in the history

Commit Message A short/long description of the changes present in the commit.

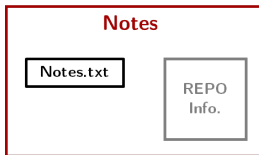
Branch A new, separate line of history starting from a certain version; changes can be made to a branch without affecting what it was branched from

Diff A comparison of two files with line-by-line differences highlighted

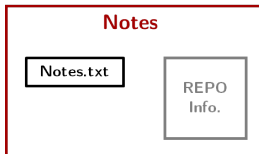
Sync/Push A synchronization of a local repository with a non-local one

History/Commit Example

Create repository called
"Notes".



Add a new file Notes.txt

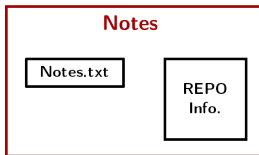


History:

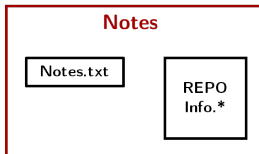
REPO Info. initially empty

History/Commit Example

Commit new file to VCS.



Add a new note to file.

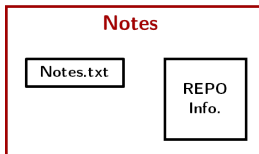


History:

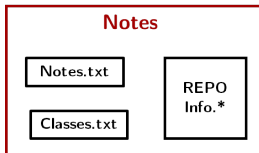
- ① 'Notes.txt' created.

History/Commit Example

Commit new line to VCS.



Add a new file.

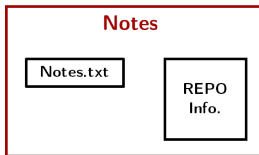


History:

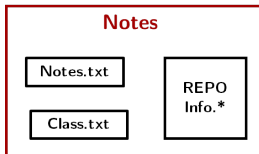
- ① 'Notes.txt' created.
- ② Added new note to 'Notes.txt'.

History/Commit Example

Commit new file to VCS.



And so on ...













History:

- ① 'Notes.txt' created.
- ② Added new note to 'Notes.txt'.
- ③ Added new file 'Classes.txt'.

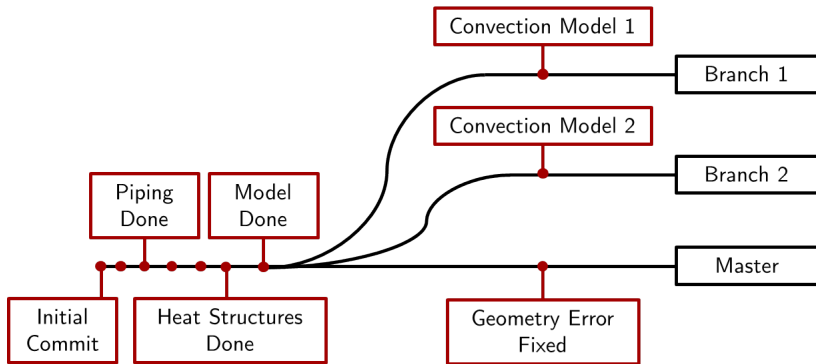
History of This Presentation

History

	Troy Haskin Created Graphics directory; finished Workflow.	just now
	Troy Haskin Started VCS How it works; added workflow PNGs	25 minutes ago
	Troy Haskin Adjusted WiscRed definition	1 hour ago
	Troy Haskin Completed subsection: VCS->Intro	1 hour ago
	Troy Haskin Removed Section: Outline	21 hours ago
	Troy Haskin Completed section: Motivation	21 hours ago
	Troy Haskin Added crests/logos and changed the footline	1 day ago
	Troy Haskin Updated .gitignore	1 day ago
	Troy Haskin Created UWMadBeamer class	1 day ago
	Troy Haskin Initial push to GitHub	1 day ago

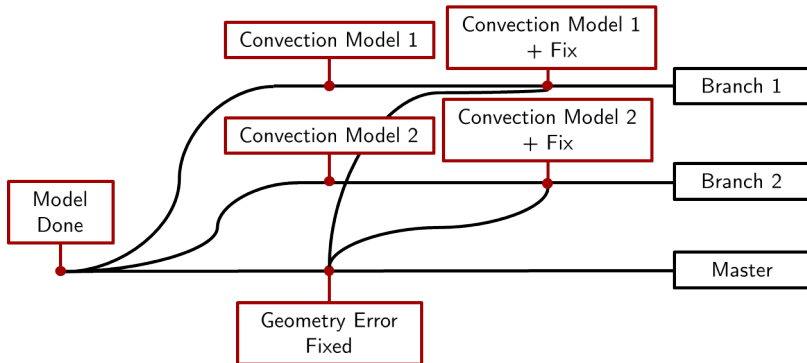
Branching Example

Branches share a common ancestor but can have different histories after the branch commit.



Merge Example

It is possible to **merge** histories in branches but can lead to **conflicts** (mismatched or ambiguous histories that require resolution).



Ignoring Files

As was stated before, versioning large binary files is not good practice. Large restart or plot files should be stored elsewhere.

In order to accomplish this, all VCSs have a manner of ignoring files.

For Git, what we will cover next, it involves editing the `.gitignore` file.

That's it

And that covers the broad introduction.

There is more, of course, but that will wait for later.

The Program and the Website

Git My VCS program of choice; created to manage one of the largest collaborative projects in history — the Linux Kernel.

GitHub A website that allows online hosting of repositories and uses Git as its VCS. Public repositories are completely free; private repositories cost money.

GitHub Applications

GitHubWindows An application for Windows 7/8 that syncs repositories between a computer and GitHub

GitHubMac An application for OSX 10.7+ that syncs repositories between a computer and GitHub

Both programs allow for creation, commits, branching, merging, and more.

My GitHub For Windows

The screenshot shows the GitHub Desktop application interface. On the left, the 'Local' sidebar lists 'repositories' (selected), 'GitHub', and 'ThermalHydraulicsLab'. The main area displays a list of repositories under the 'Filter repositories' search bar. The repository 'troyhaskin/UW-MadisonExperiment-MELCOR' is highlighted. To the right, the details for this repository are shown, including the title 'UW-Madison RCCS Experiment: MELCOR Model', the maintainer 'Troy C. Haskin', contributors 'Troy C. Haskin', a 'Purpose' section describing the repository's focus on cataloging the development of a thermohydraulic model, and a 'To do List' with a single item '[] Documentation'.

Local

repositories

GitHub

troyhaskin

ThermalHydraulicsLab

Filter repositories

+ create ↻ refresh ⚙ tools

troyhaskin/Dissertation	🔗 →
troyhaskin/LaTeXTalks	🔗 →
troyhaskin/MatlabToolbox	🔗 →
troyhaskin/UW-MadisonThesisClass	🔗 →
troyhaskin/WisconsinWaterPropertyPackage	🔗 →
troyhaskin/Resume	→
troyhaskin/StabilityCode	→
troyhaskin/ThermohydraulicModelingNotes	→
troyhaskin/UWMadisonExperiment-MELCOR	→
troyhaskin/UWMadisonExperiment-RELAP5	→
troyhaskin/VCSIntroduction	→

UW-Madison RCCS Experiment: MELCOR Model

Maintainer: [Troy C. Haskin](#)

Contributors: [Troy C. Haskin](#)

Purpose

This repository focuses on cataloging the development of a thermohydraulic model of an experiment at the UW-Madison. The experiment is a closed-loop, natural circulation system with water as a working fluid. The model is written for a safety analysis program called [MELCOR](#).

To do List

- [] Documentation

My GitHub For Windows

← troyhaslin/VCSIntroduction

No uncommitted changes

History

Commit	Author	Time
Troy Haskin Added a README(.md)	Troy Haskin	1 minute ago
Troy Haskin Finished Section: VCS	Troy Haskin	21 minutes ago
Troy Haskin Added History and Branch example PNGs	Troy Haskin	1 hour ago
Troy Haskin Created Graphics directory; finished Workflow.	Troy Haskin	3 hours ago
Troy Haskin Started VCS How it works: added workflow PNGs	Troy Haskin	3 hours ago
Troy Haskin Adjusted WiscRed definition	Troy Haskin	4 hours ago
Troy Haskin Completed subsection: VCS->Intro	Troy Haskin	4 hours ago
Troy Haskin Removed Section: Outline	Troy Haskin	1 day ago
Troy Haskin Completed section: Motivation	Troy Haskin	1 day ago
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Troy Haskin Initial push to GitHub	Troy Haskin	1 day ago

Files

- Graphics\GitHubForWindowsMain.png NEW
- README NEW
- README.md NEW
- VCSIntroduction.pdf
- VCSIntroduction.tex

Thank You!

Links:

- [Troy's GitHub Page](#)
- [THL's GitHub Page](#)
- [GitHubWindows](#)
- [GitHubMac](#)
- [RELAP/MELCOR .gitignore file](#)