Introduction to Git –- Fall 2024

Lecture 1: Why use version control?

Slides: https://hackmd.io/@git-fall-2024/L1-motivation/

What is version control?

In software engineering, version control (also known as revision control, source control, or source code management) is a class of systems responsible for **managing changes** to computer programs, documents, large web sites, or other collections of information.

—- Wikipedia

Version control systems (VCS)

… systems responsible for **managing changes** …

Why use version control?

In an ideal world, things develop linearly:

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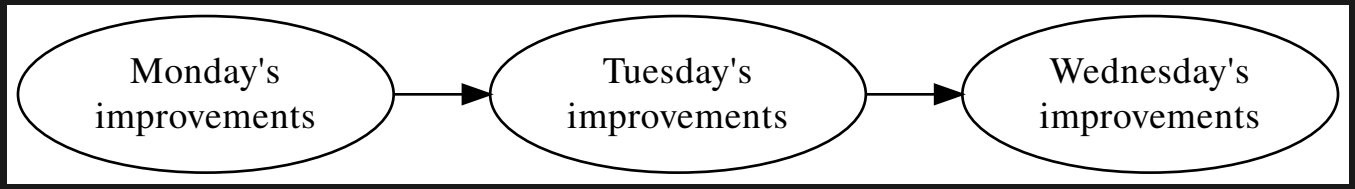

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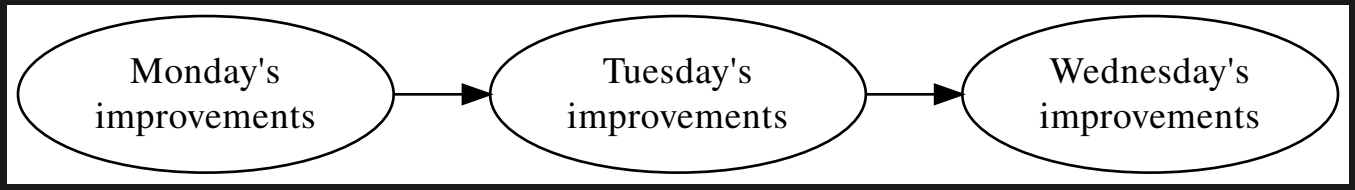

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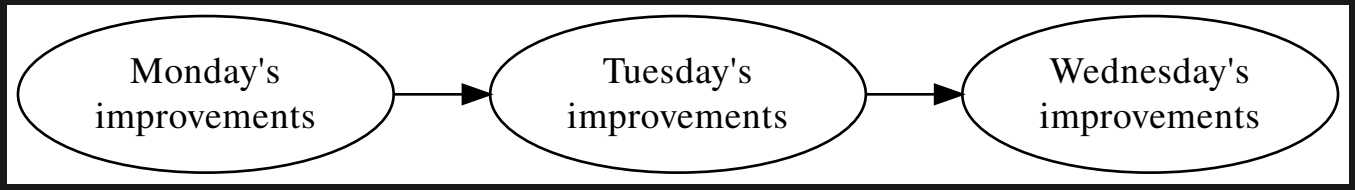

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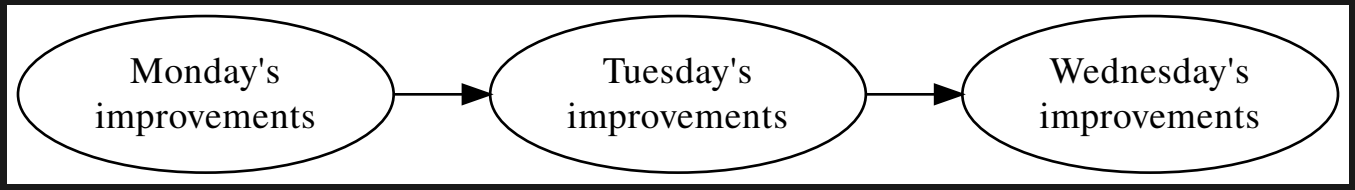
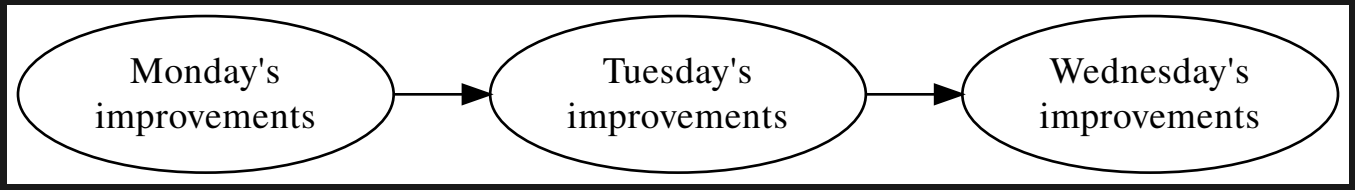


In an ideal world, things develop linearly:

- Every new version is an improvement upon the previous version.
  - No need to backtrack.
- Everyone knows what everyone else is doing
- In the end, things are simply finished.



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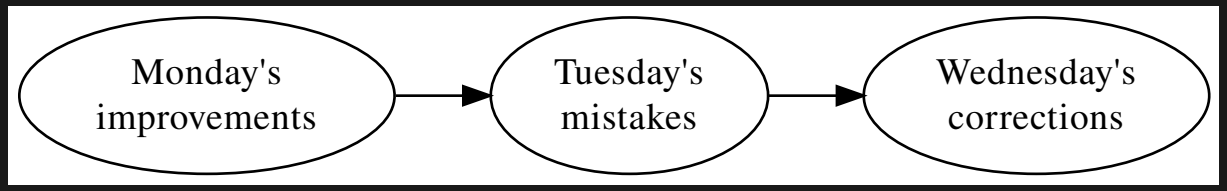

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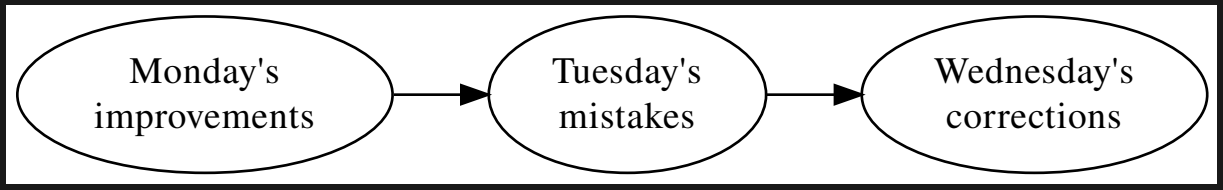

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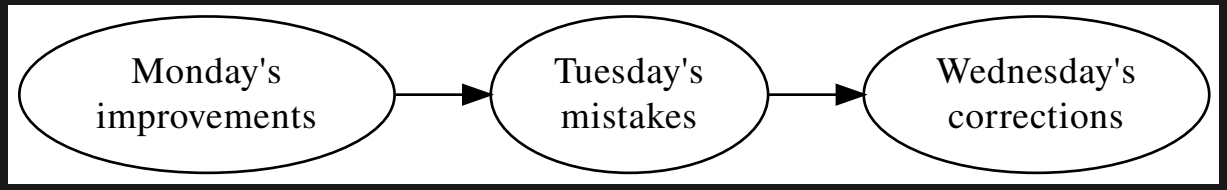

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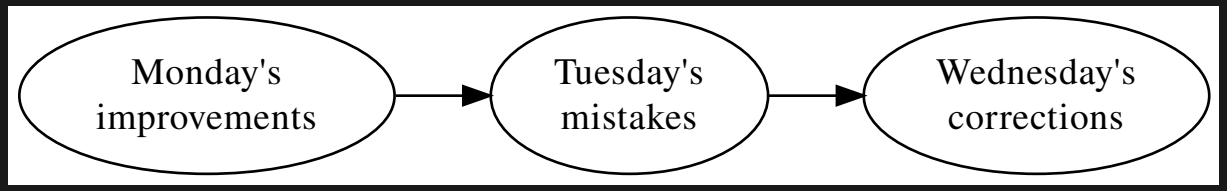
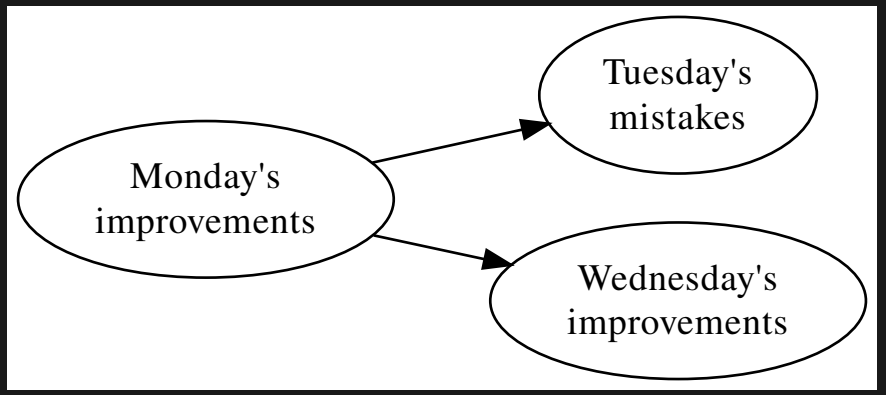


Going back to an earlier version

Sometimes, it is easier to simply backtrack to an *earlier version*…



Where is this *earlier version*?

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- my_file.txt, my_file.txt.old, …
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  - 2020-08-12/
  - 2020-08-13/
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  - …
- Daily home directory backup

Challenges and obstacles

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Overall, difficult to manage!

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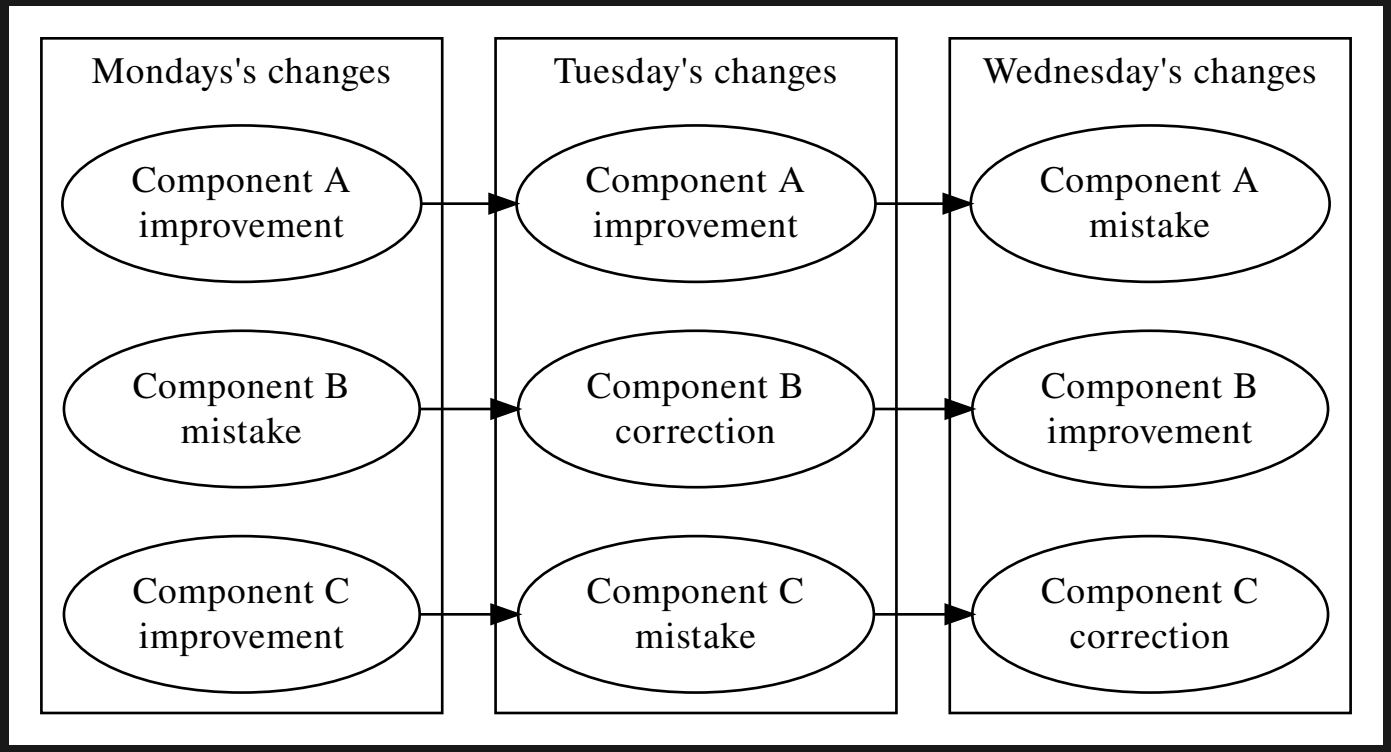
What about the granularity?



This compounds the problems!

How does VCS solve this?

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- Can handle multiple development paths (branches)

Comparing and joining

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- VCS also allows the joining (merging) of different snapshots
  - Easy to experiment with ideas

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- The contributions of several people can be merged

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- Globally, lost files can be recovered from the server

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  - HackMD, Overleaf, …
-
  - Store history, distribute, testing / continuous integration, bug reports, milestones, website, …

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Summing up

Version control systems

- keeps track of your files and other output
- tracks what is created and modified
- tracks who made the modifications
- tracks why the modifications were made (if you make good commit comments)

Practical use cases

What are the practical use cases for VCS?

Source code

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Latex files

- Track which version of a manuscript has been
  - submitted,
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  - accepted
- Collaboration between several authors

HPC: batch files and data

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  - Easy to check the used configuration afterwards
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  - Limited to smallish files

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- Track input and output files
  - Limited to smallish files

Examples of VCS

- SCCS: The first VCS. Created in 1972 at Bell Labs. Was available only for UNIX and worked with Source Code files only.
- RCS (Revision Control System): First release July 1985. Usually superseded by other systems such as CVS, which began as a wrapper on top of RCS.
- CVS (centralized version control system): First release July 1986; based on RCS. Expands on RCS by adding support for repository-level change tracking, and a client-server model.
- Apache Subversion (SVN): First release in 2004 by CVS developers with the goal of replacing CVS.
- BitKeeper: Initial release May 2000. Distributed version control. Was shortly used for developing the Linux kernel. Proprietary. No longer maintained.
- **Git**: Started by Linus Torvalds in April 2005, originally for developing the Linux kernel. Distributed version control. Open source.
- …