Introduction to Git — Fall 2023

Lecture 1: Why use version control?

UMEÅ UNIVERSITET HPC2N UPPSALA UNIVERSITET NAISS

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.

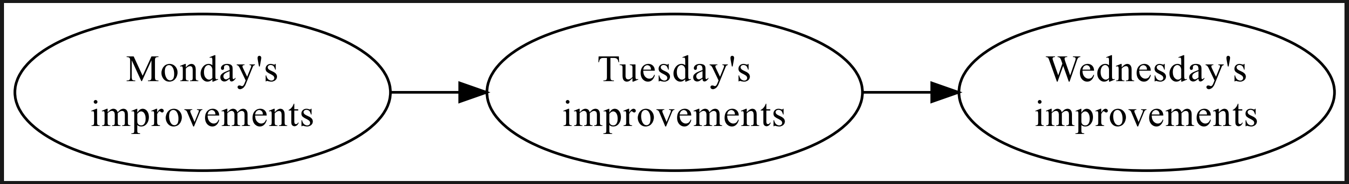
— Wikipedia

Version control systems (VCS)

… systems responsible for **managing changes** …

Why use version control?

In an ideal world, things develop linearly:



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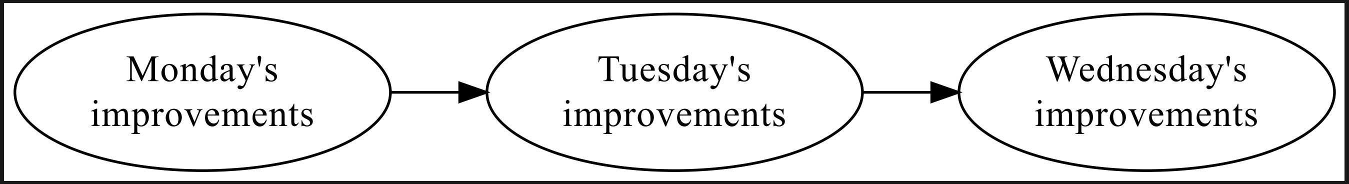

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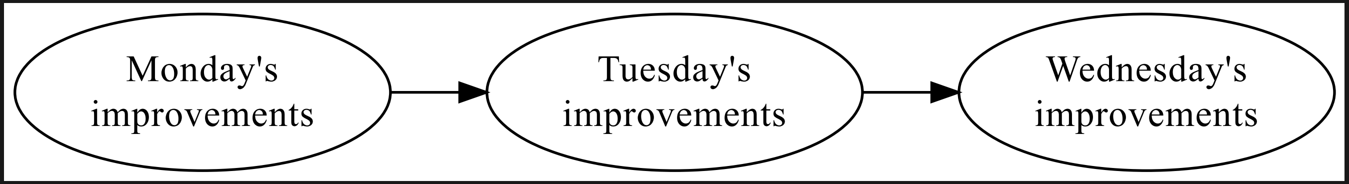

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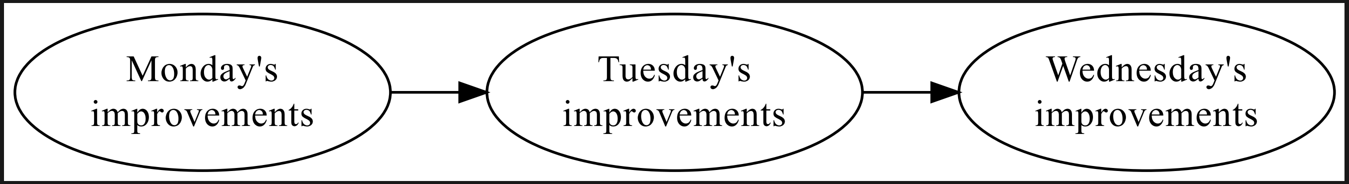
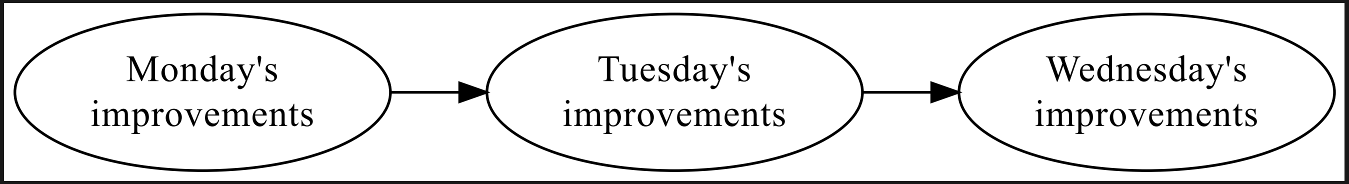


In an ideal world, things develop linearly:

- 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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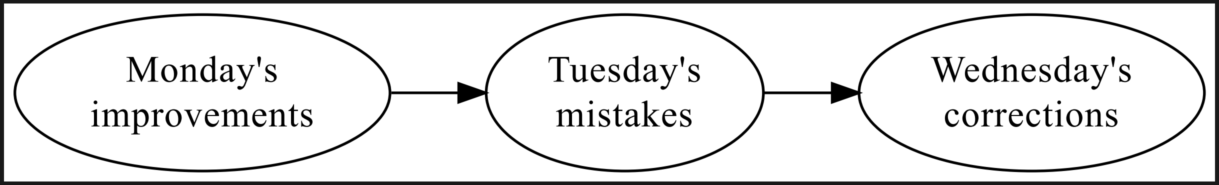

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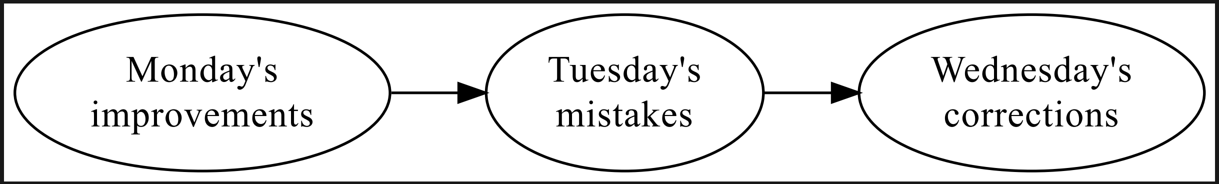

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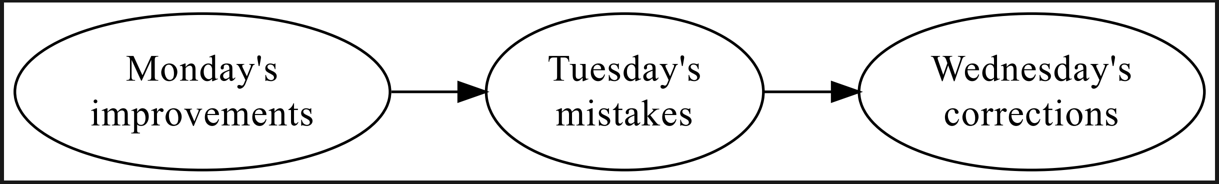

In the real world, things develop non-linearly:

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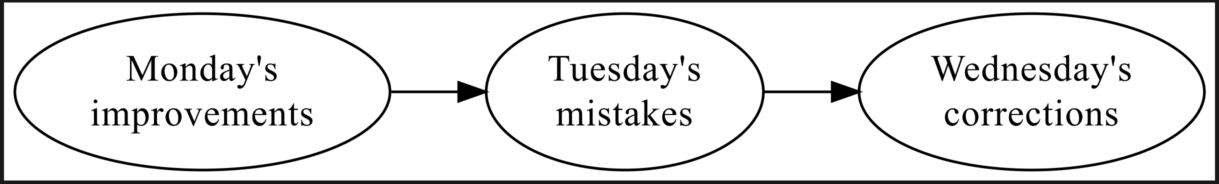
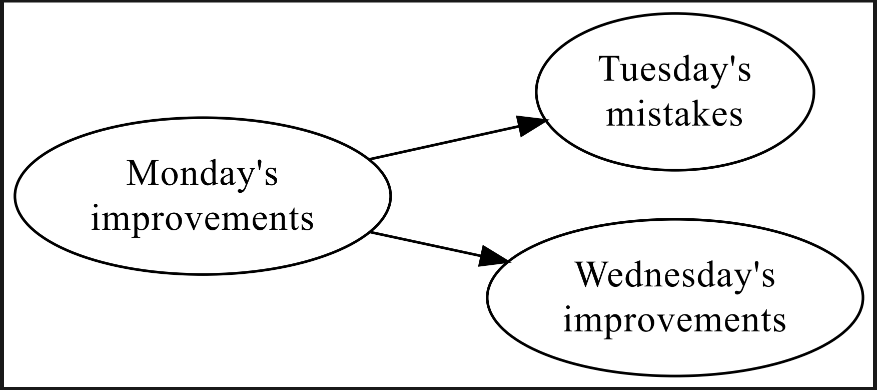
- People do not know what others are doing
- Sometimes we are simply fixing earlier mistakes…



Going back to an earlier version

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



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    - 2020-08-12/
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    - …
- Daily home directory backup

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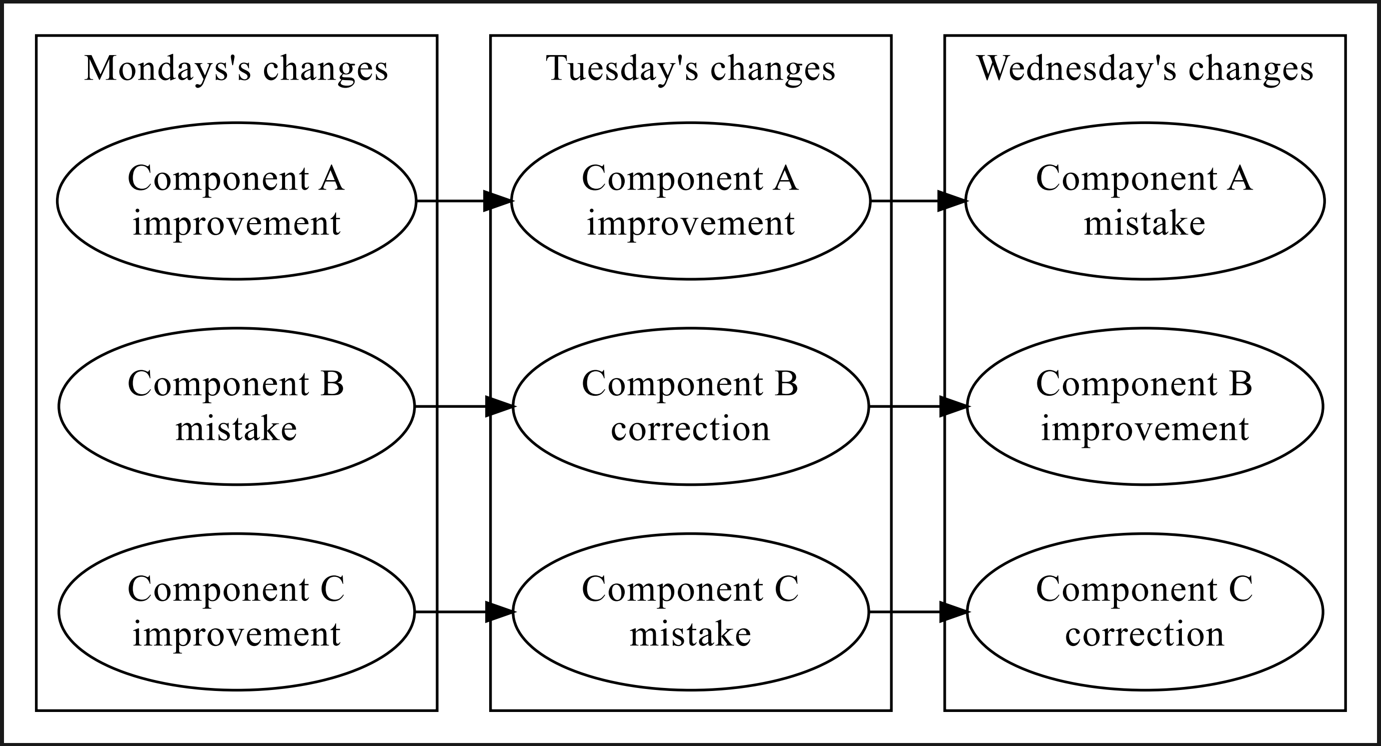
Overall, difficult to manage!

What about the granularity?



This compounds the problems!

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- Can handle different degrees of granularity
- Can handle multiple development paths (branches)

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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, …
- Services such as GitHub can do almost everything for you
    - Store history, distribute, testing / continuous integration, bug reports, milestones, website, …

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?

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- But also for: writers, artists, composers…

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    - submitted,
    - revised and/or
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- Collaboration between several authors

HPC: batch files and data

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- Track different version of your batch scripts
  - Easy to check the used configuration afterwards
- 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.
- …