eawag
aquatic research

Best practice in scientific computing

Version control – `git`

Philipp Meier

December 5, 2014

Eawag: Swiss Federal Institute of Aquatic Science and Technology

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Today's workshop

1. Introduction to version control
2. Hands-on session: Installing and using `git`

Best practice in scientific computing

1. Write programs for people, not computers.
2. Let the computer do the work.
3. Make incremental changes.
4. Don't repeat yourself.
5. Plan for mistakes.
6. Optimize software only after it works correctly.
7. Document design and purpose, not mechanics.
8. Collaborate.

Wilson G., et al.: (2014) Best Practices for Scientific Computing. PLoS Biol 12(1), doi:10.1371/journal.pbio.1001745

Best practice in scientific computing

Where can version control help?

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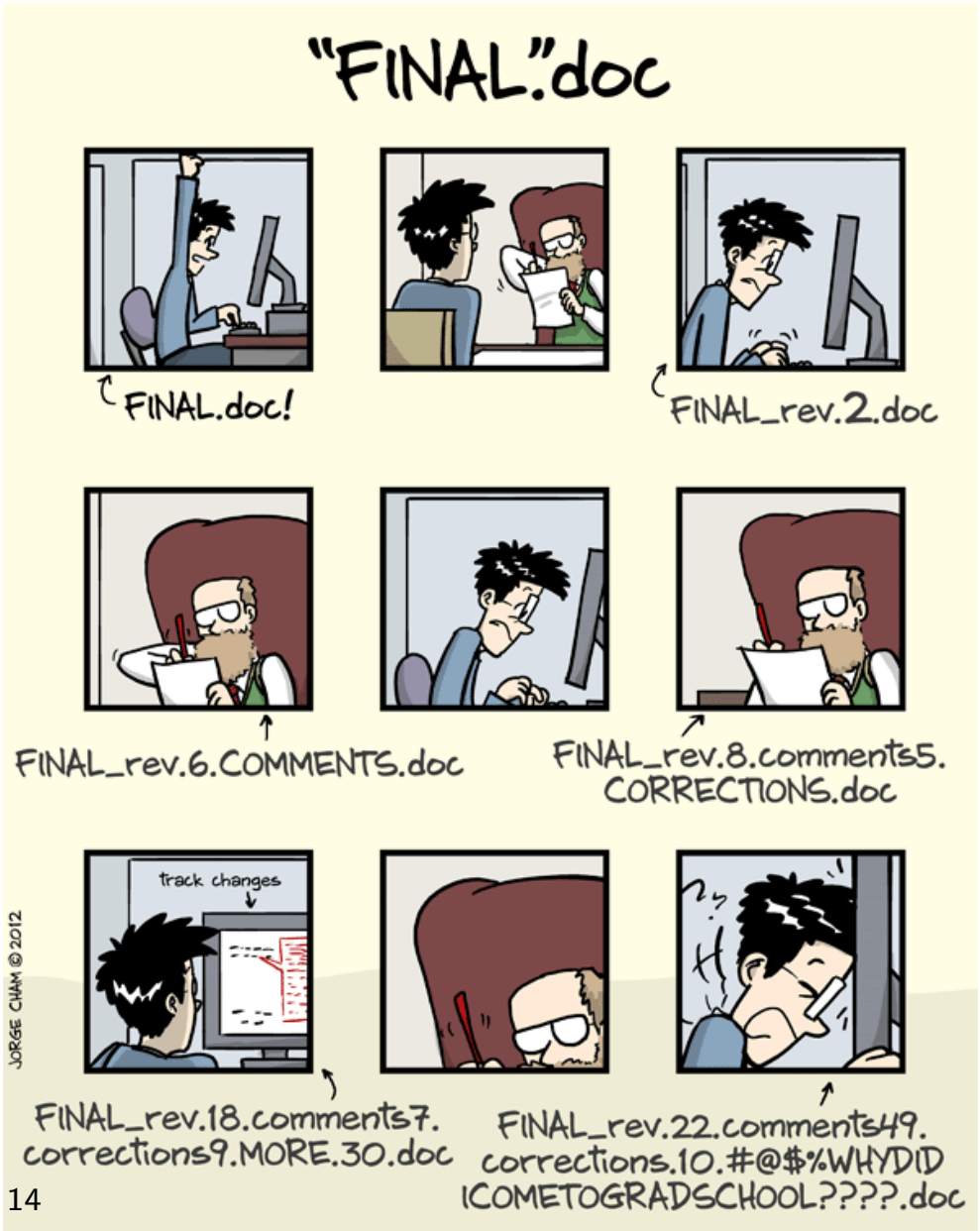
Version control: what is it?



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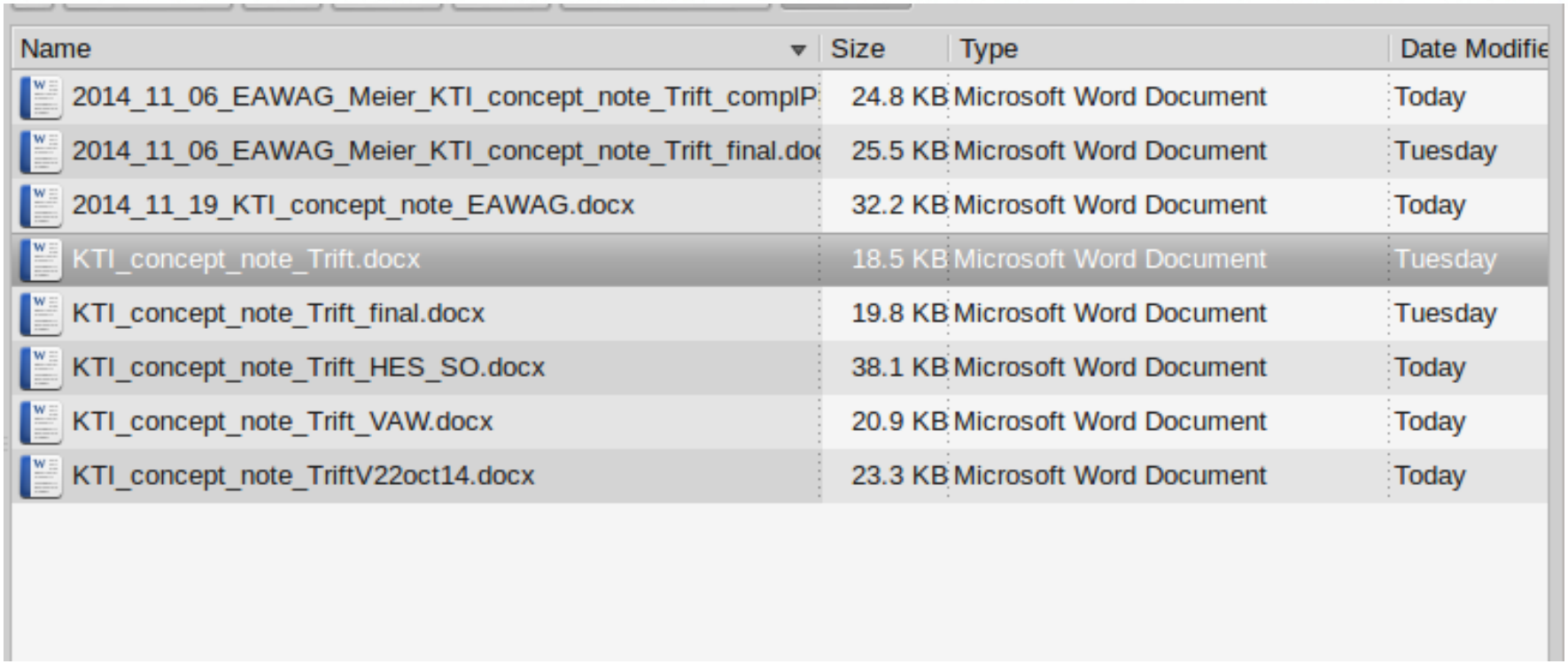

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KTI_concept_note_Trift.docx	18.5 KB	Microsoft Word Document	Tuesday
KTI_concept_note_Trift_final.docx	19.8 KB	Microsoft Word Document	Tuesday
KTI_concept_note_Trift_HES_SO.docx	38.1 KB	Microsoft Word Document	Today
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Version control: what is it?

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- A platform for collaboration

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  - Collaborators can work simultaneously on the same set of documents
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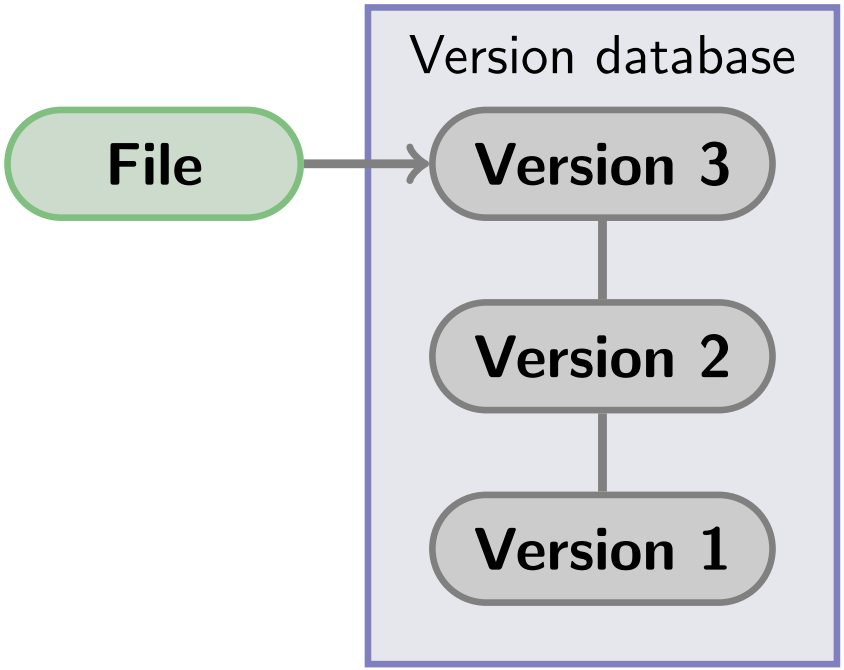

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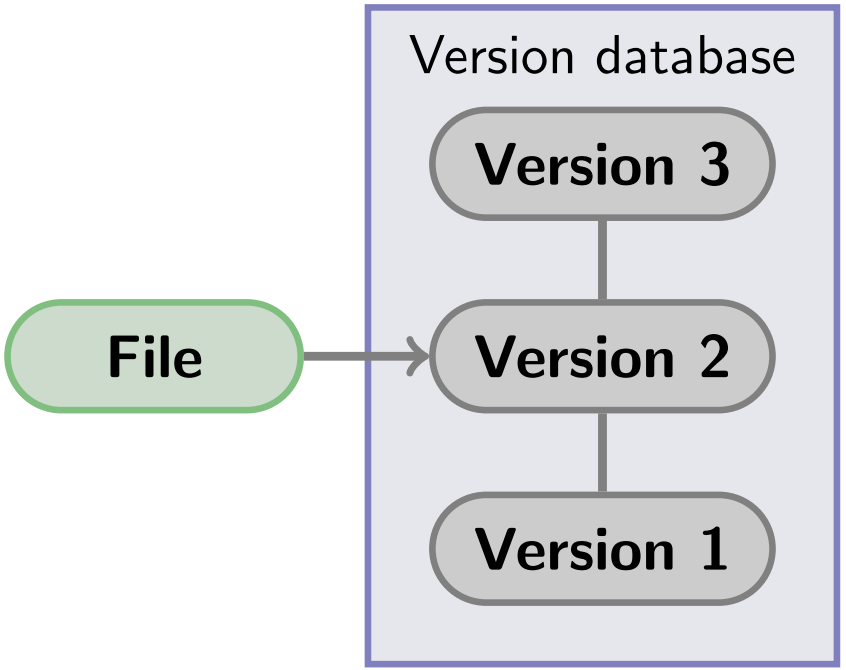

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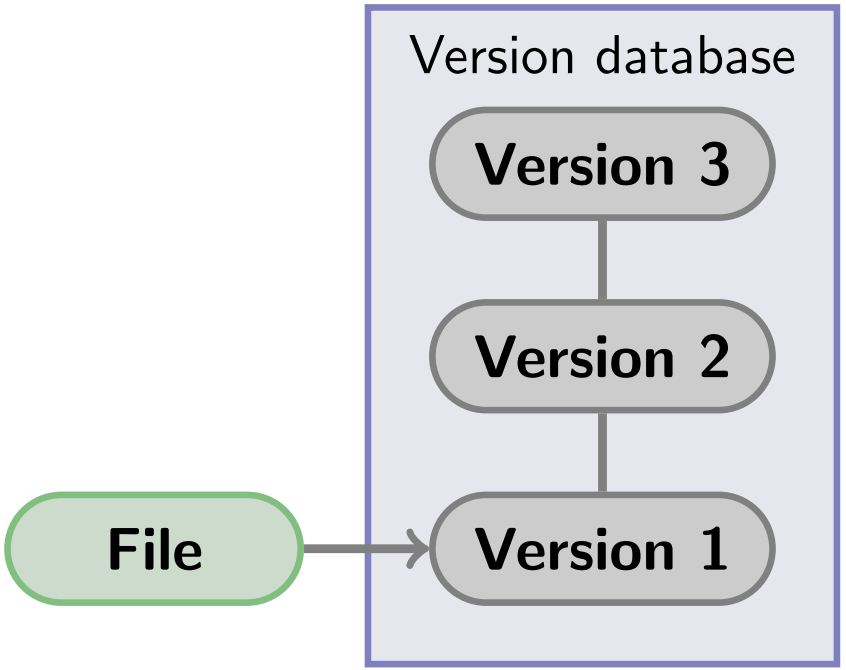
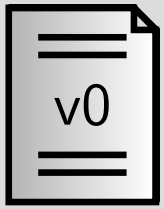


Version control: use case

Collaboration through e-mail:

Alice



Bob

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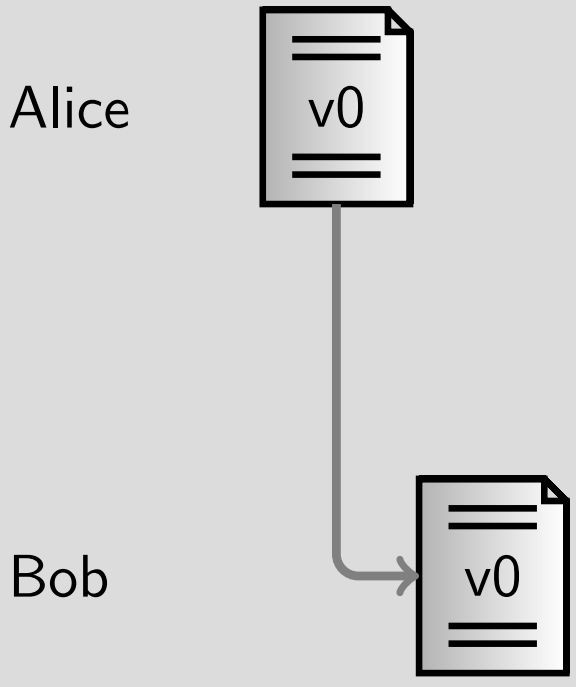

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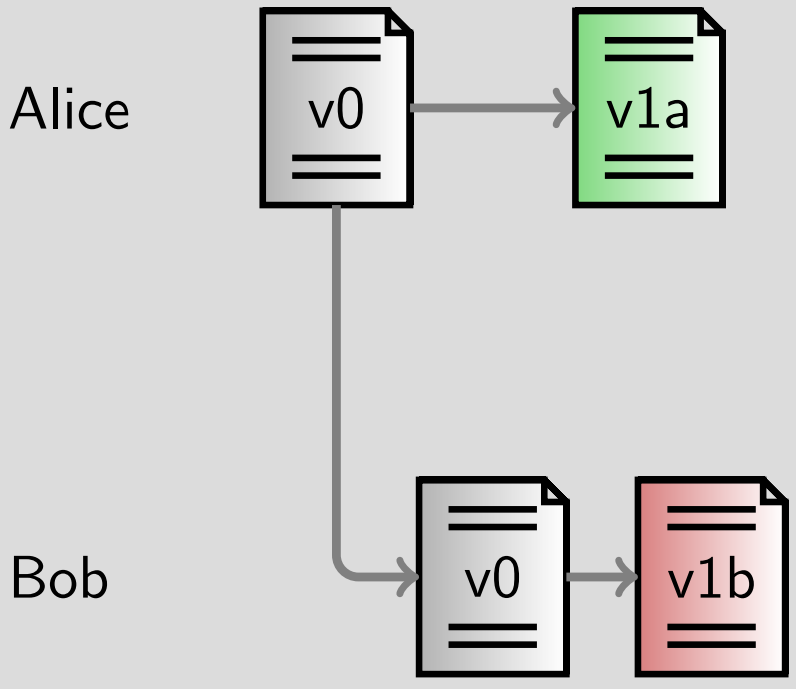

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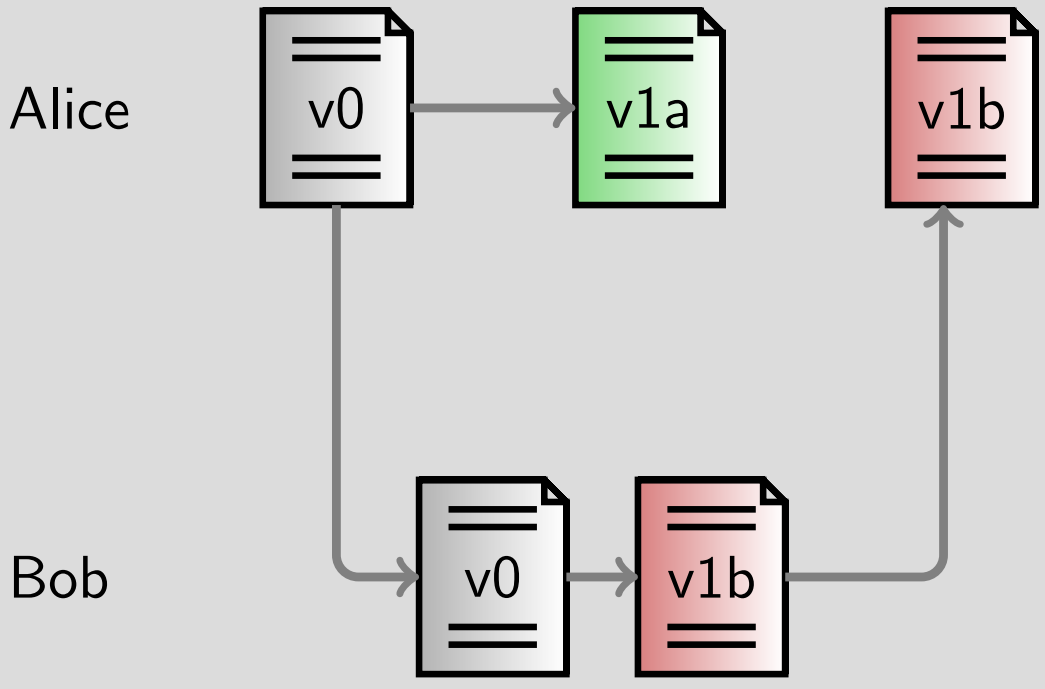

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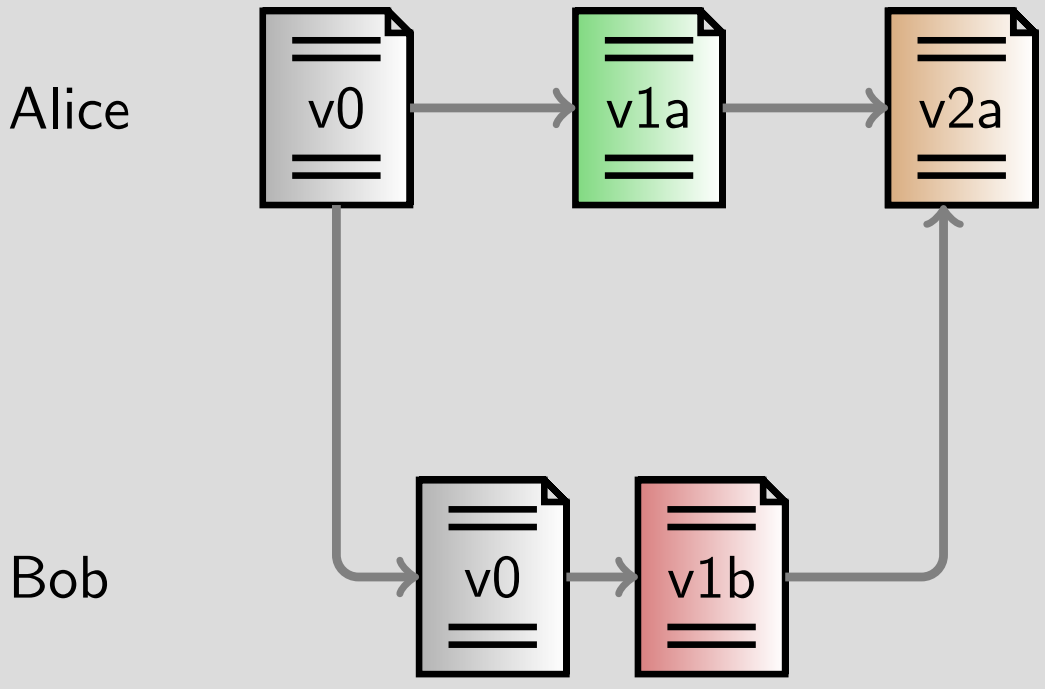

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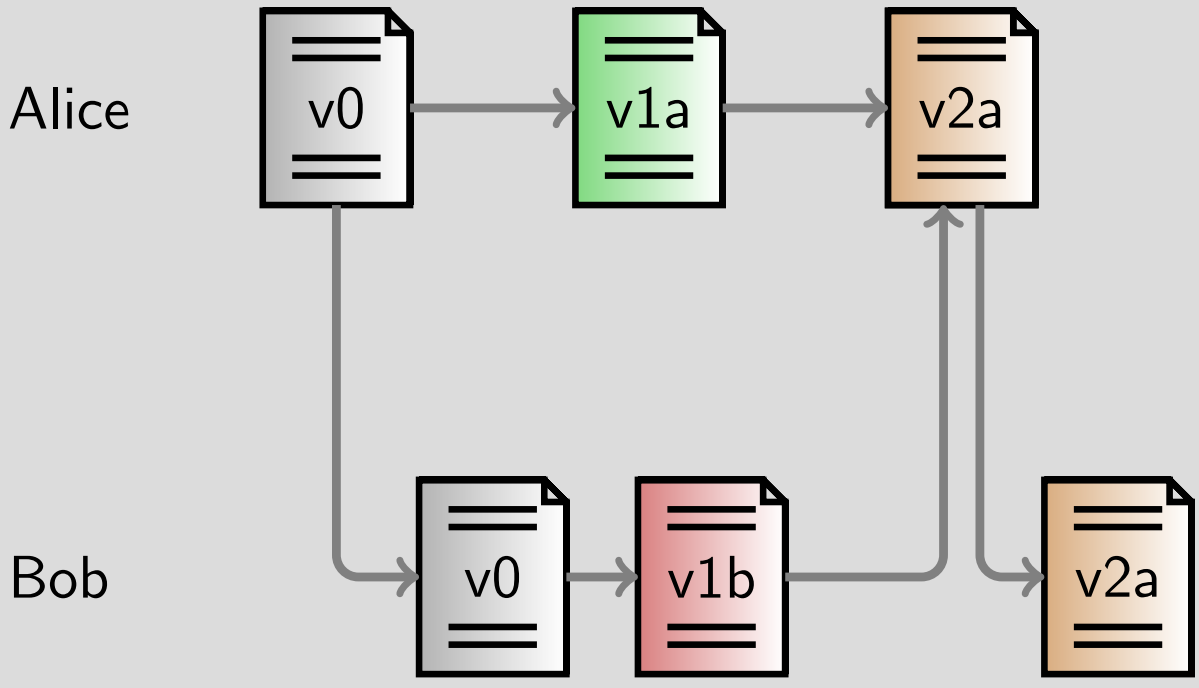

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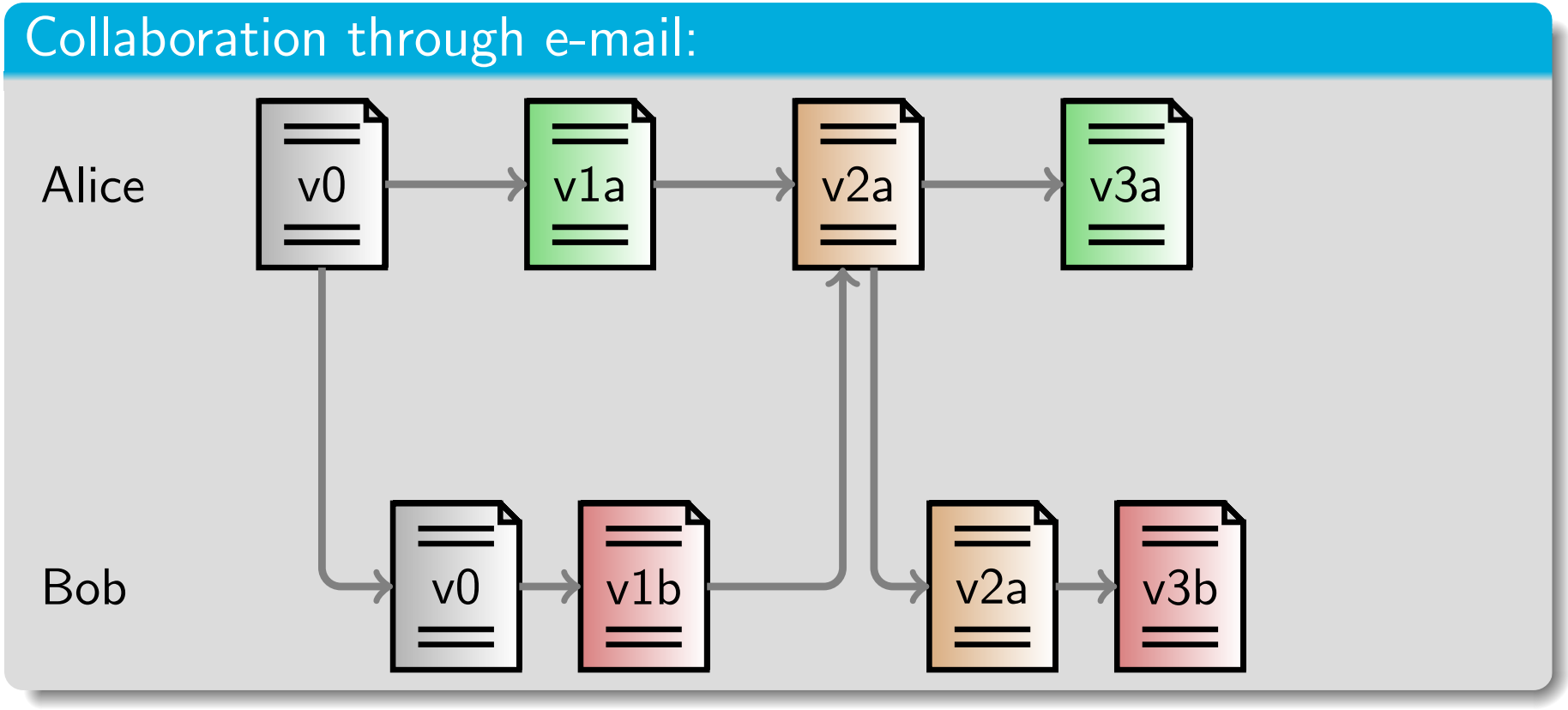

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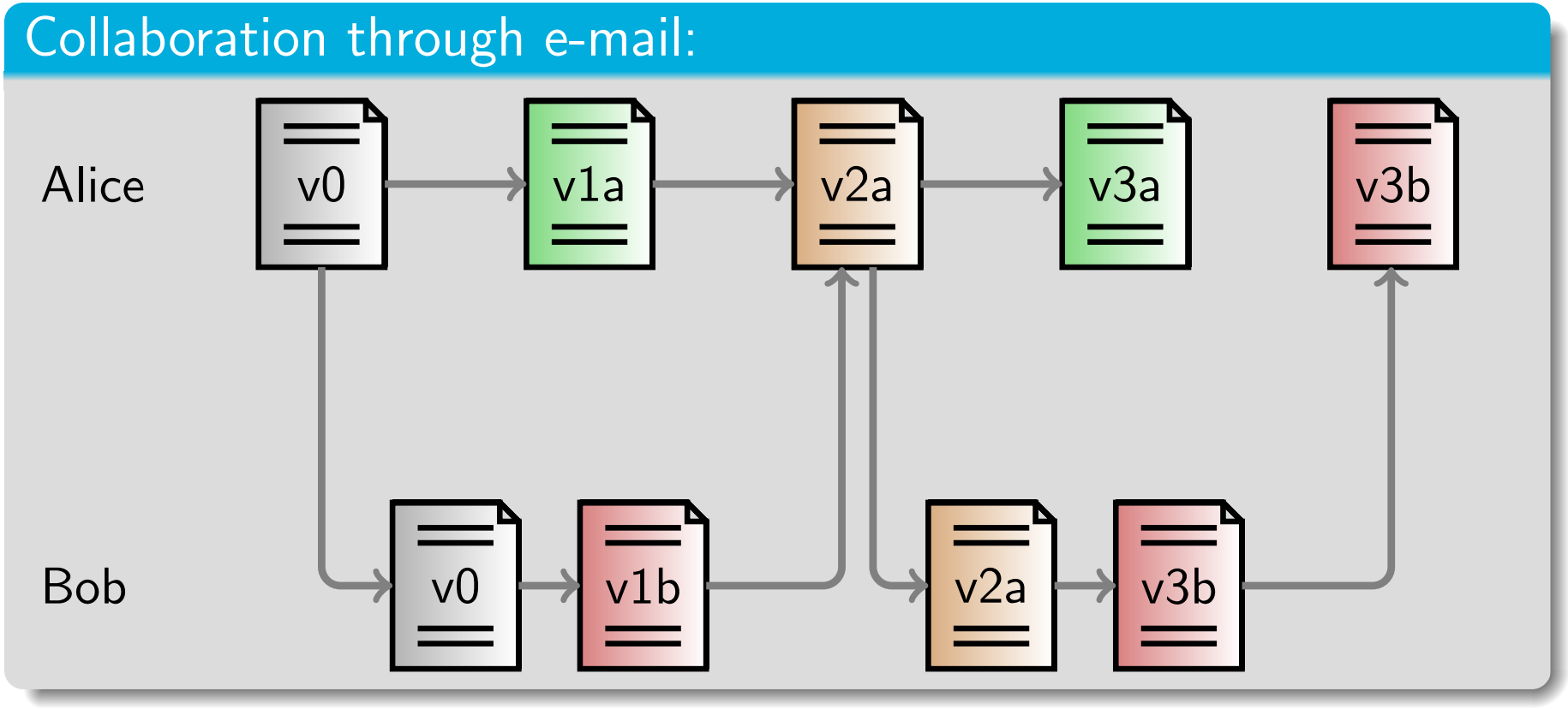

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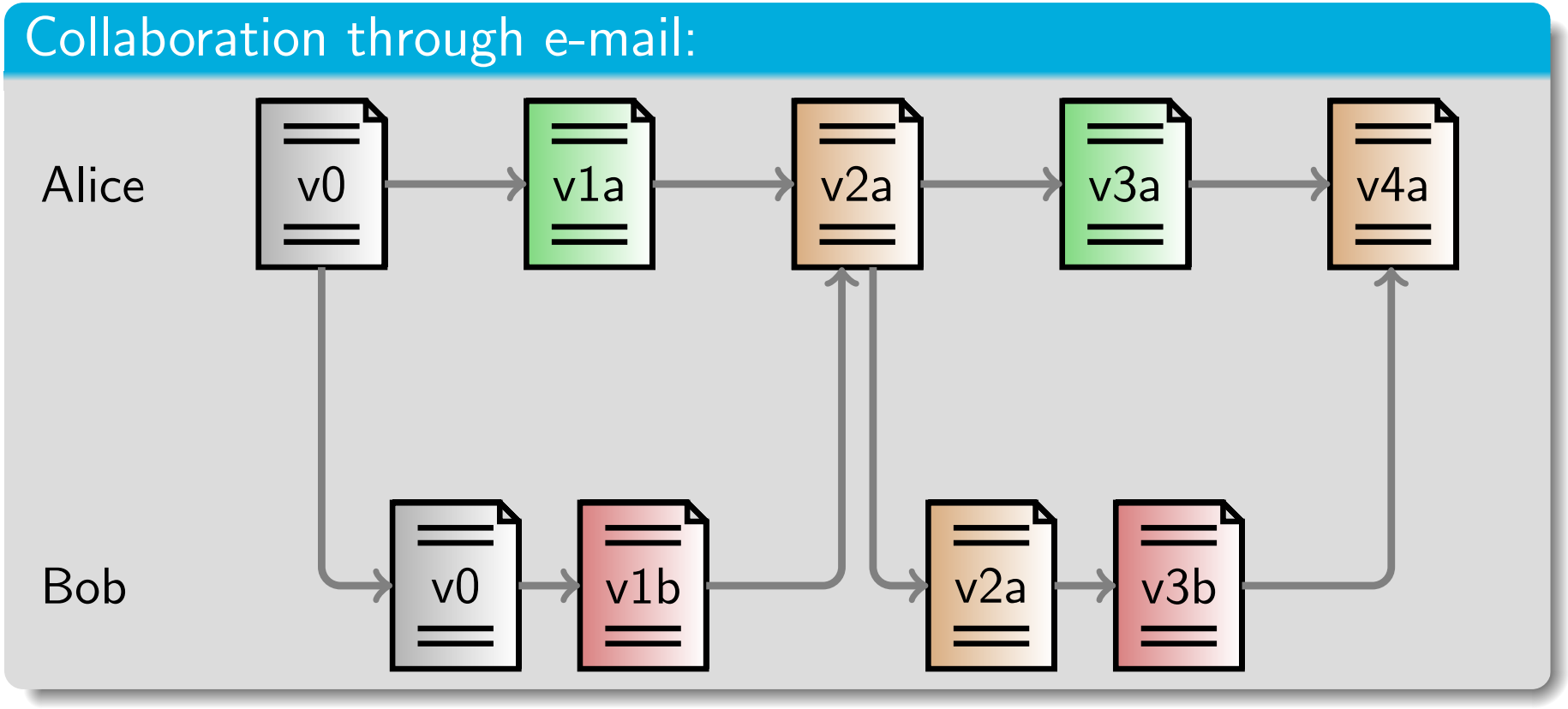

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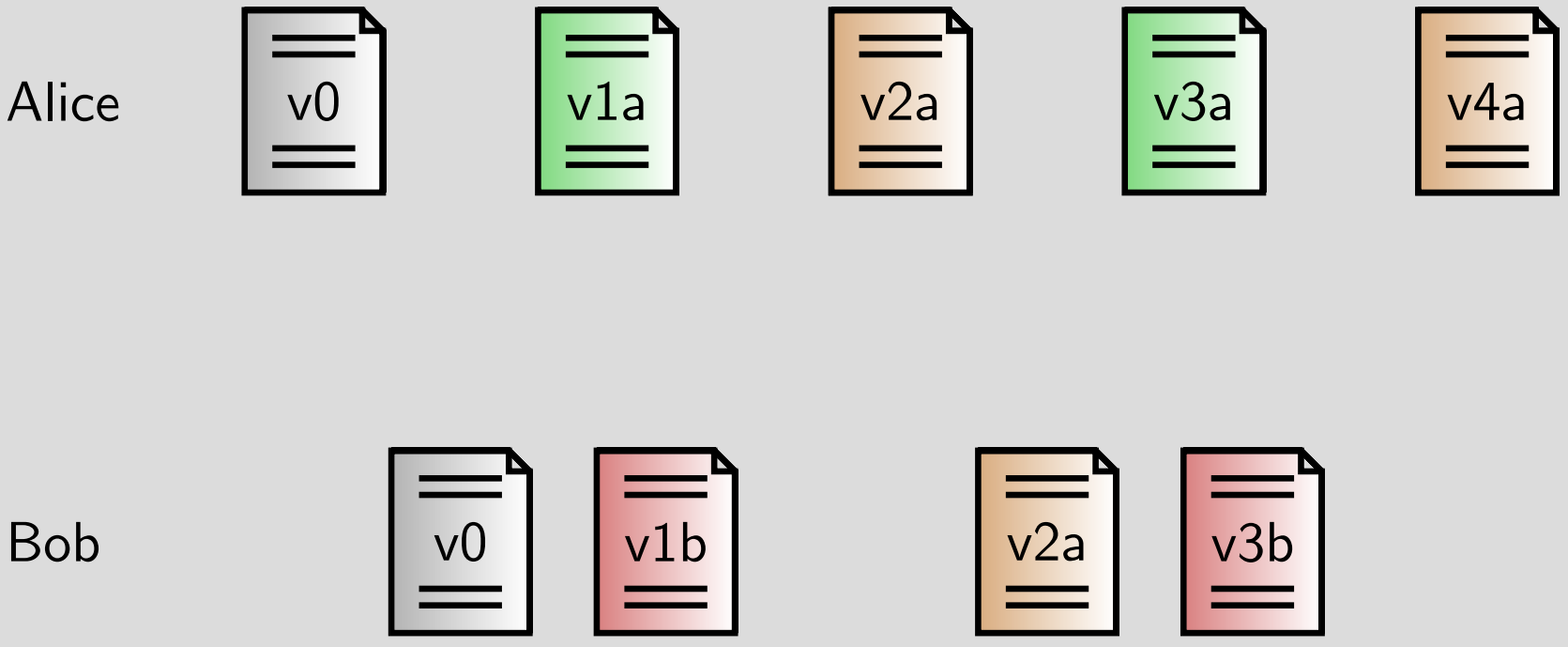
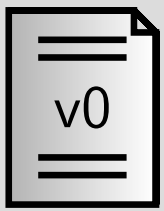


Version control: use case

Collaboration through central data storage:

Alice

Server 

Bob

Version control: use case

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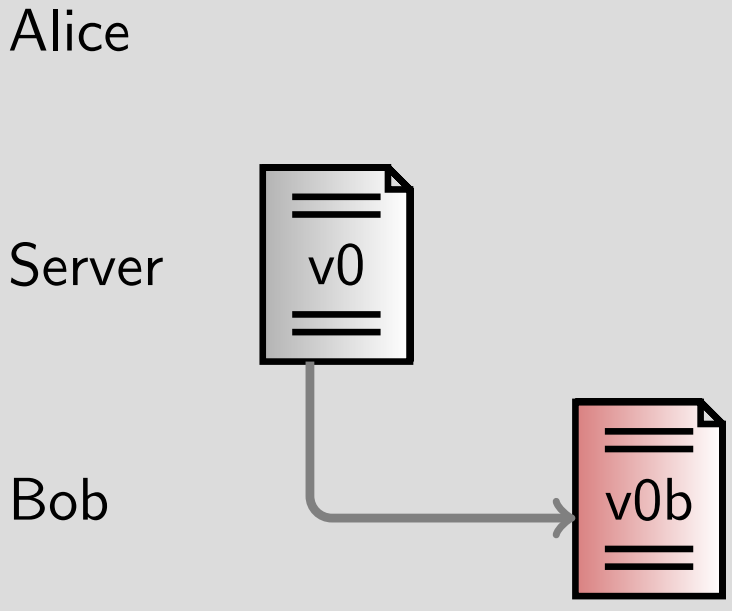

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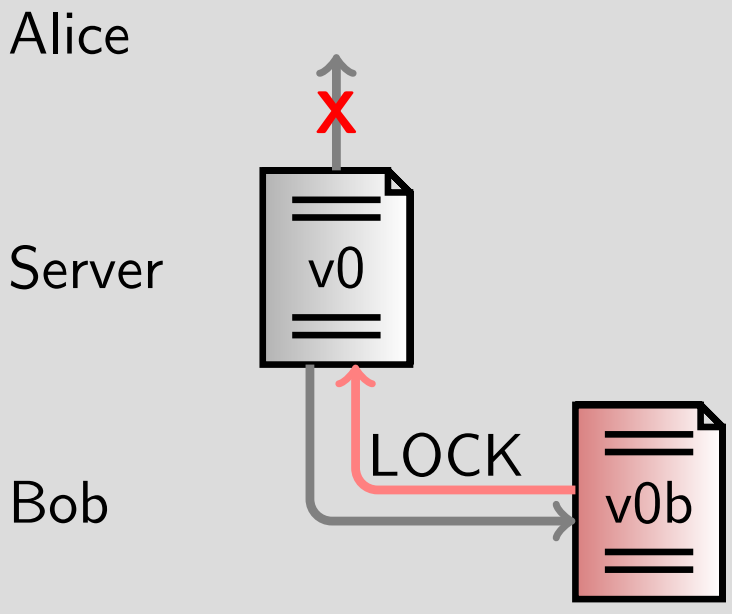

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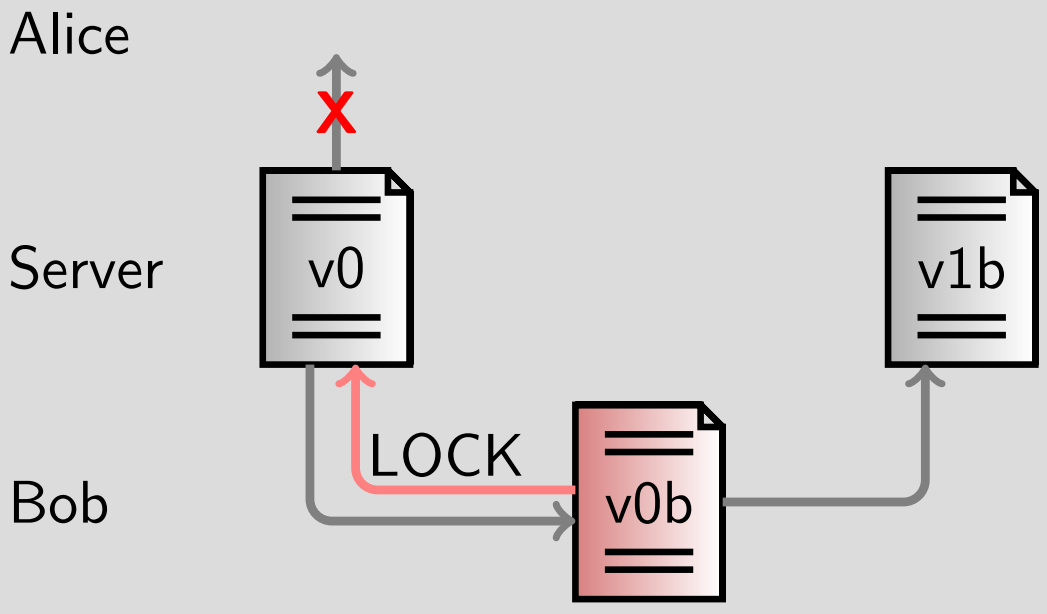

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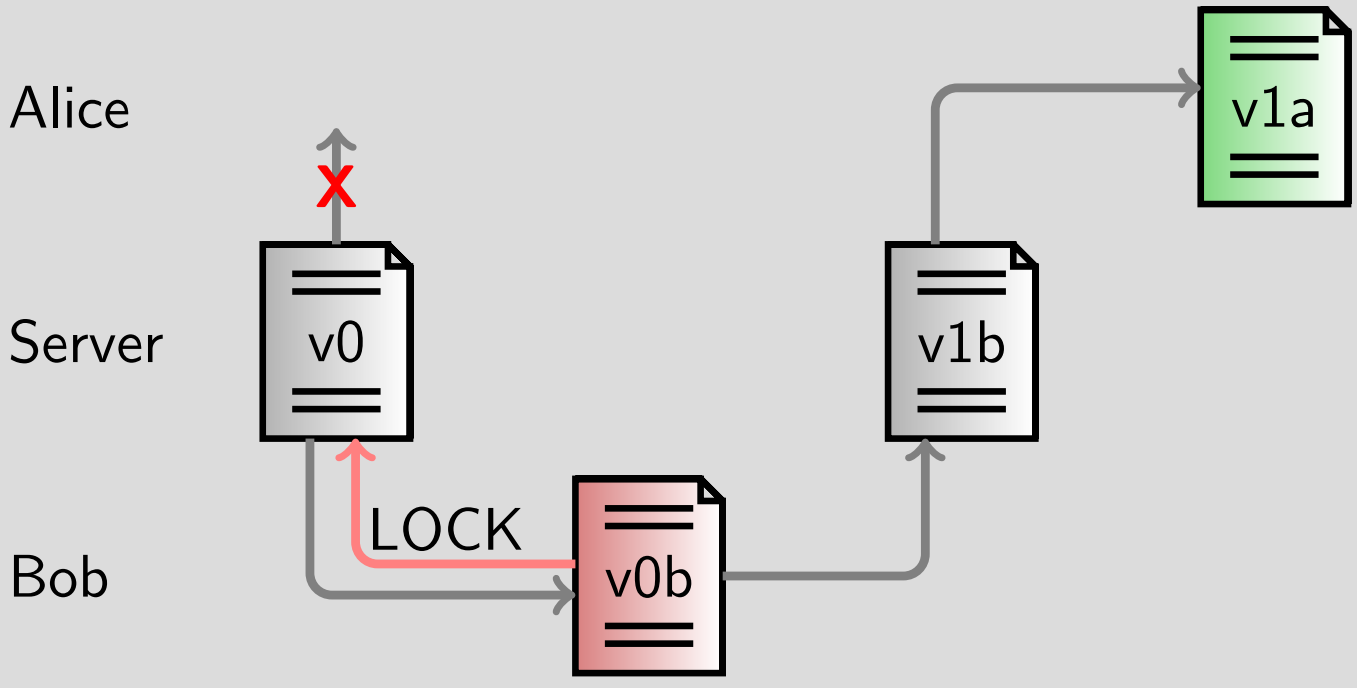

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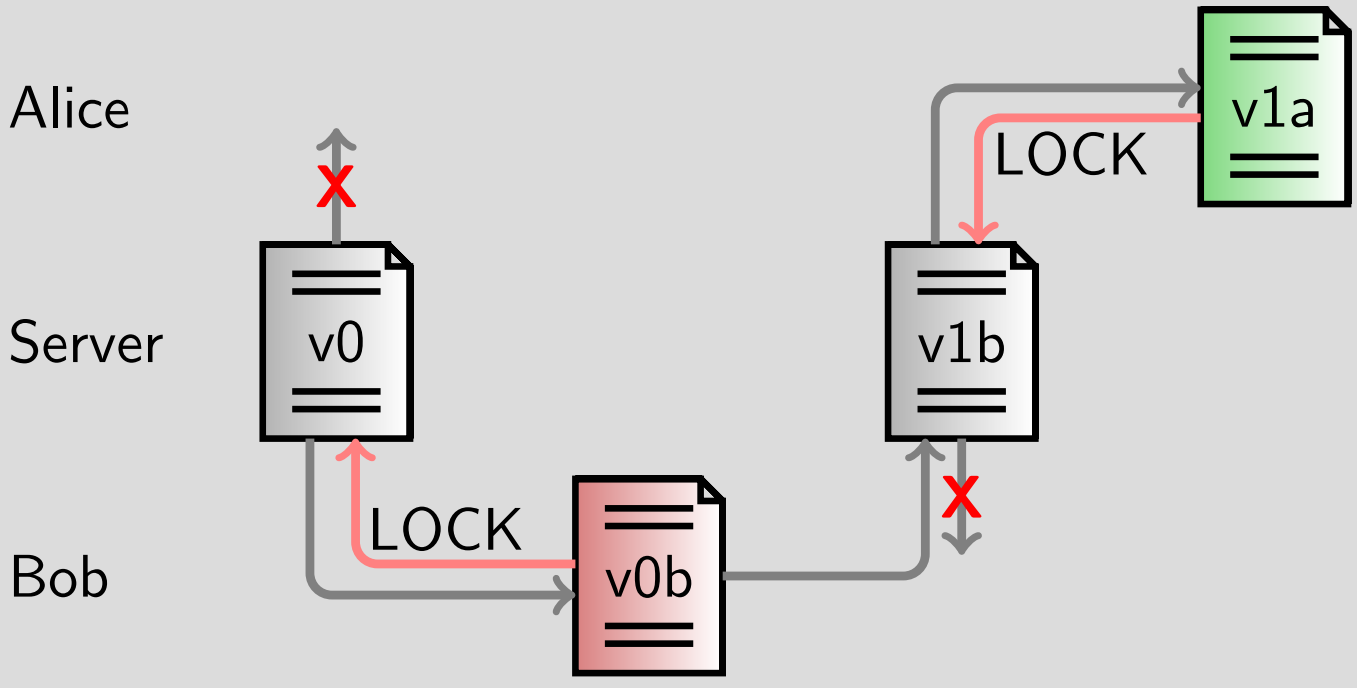

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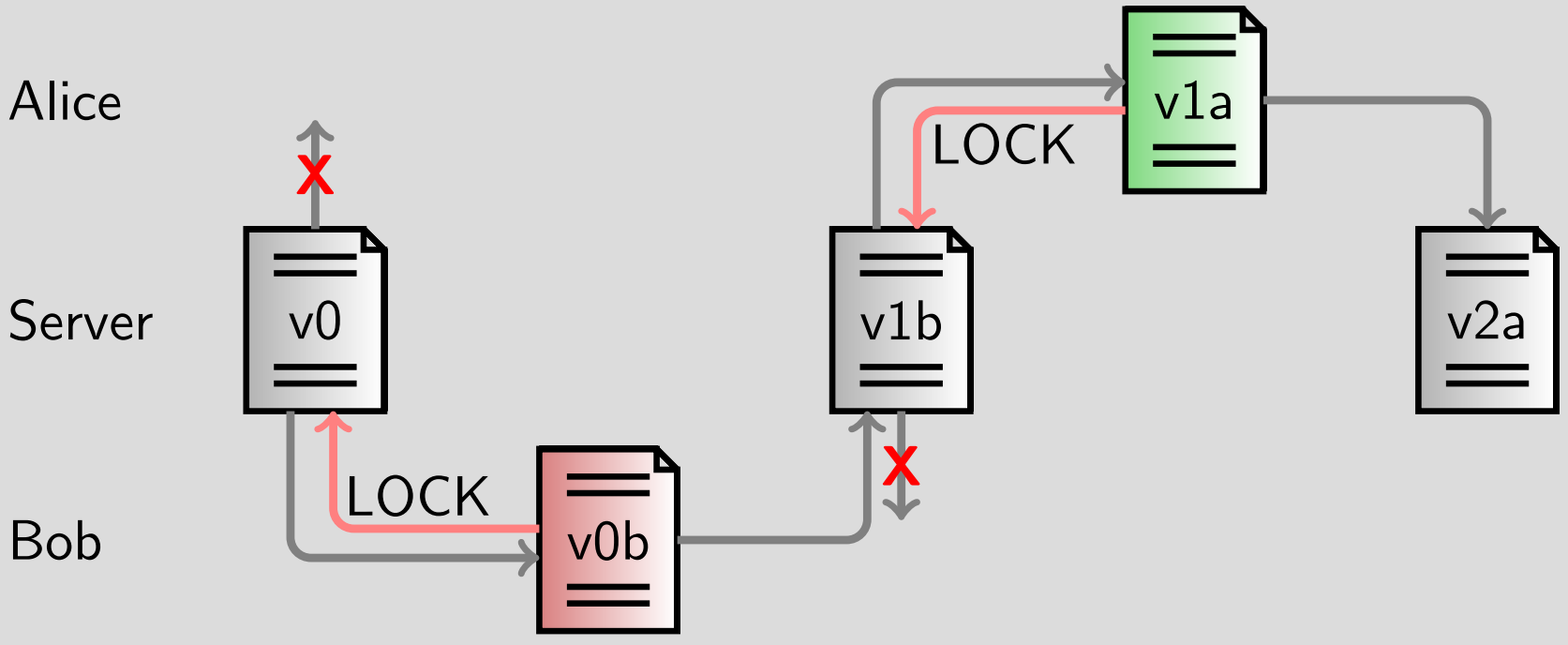

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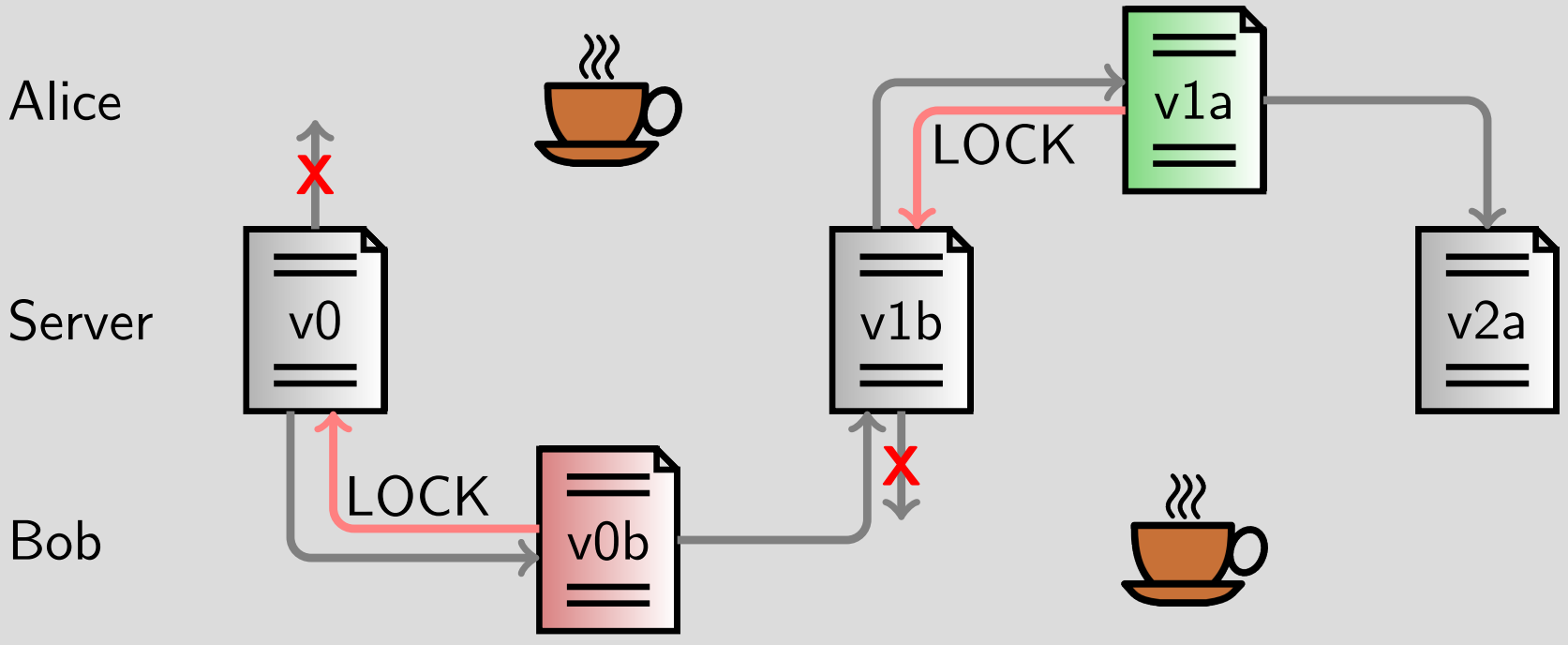

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Alice

Server 

Bob

Version control: use case

Collaboration with version control system:

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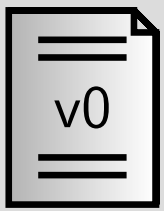
Version control



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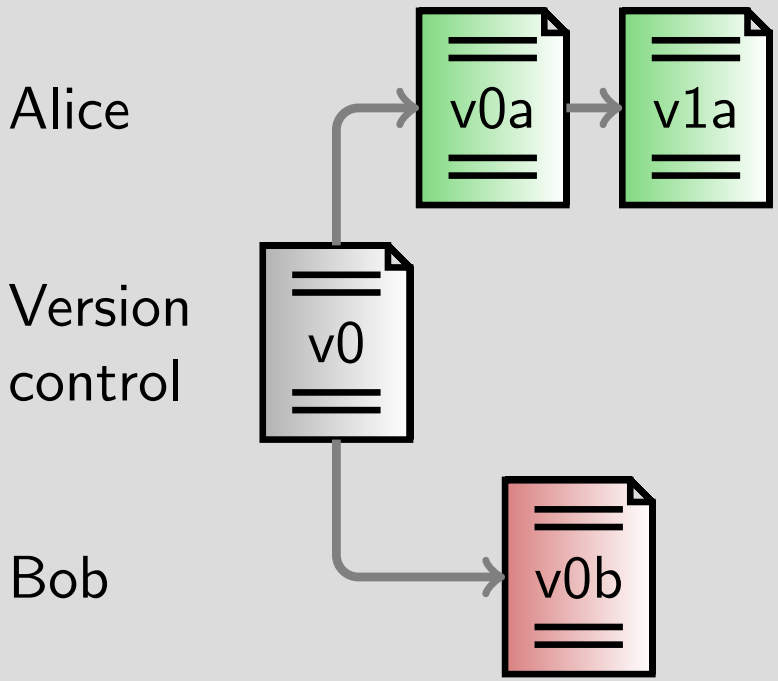

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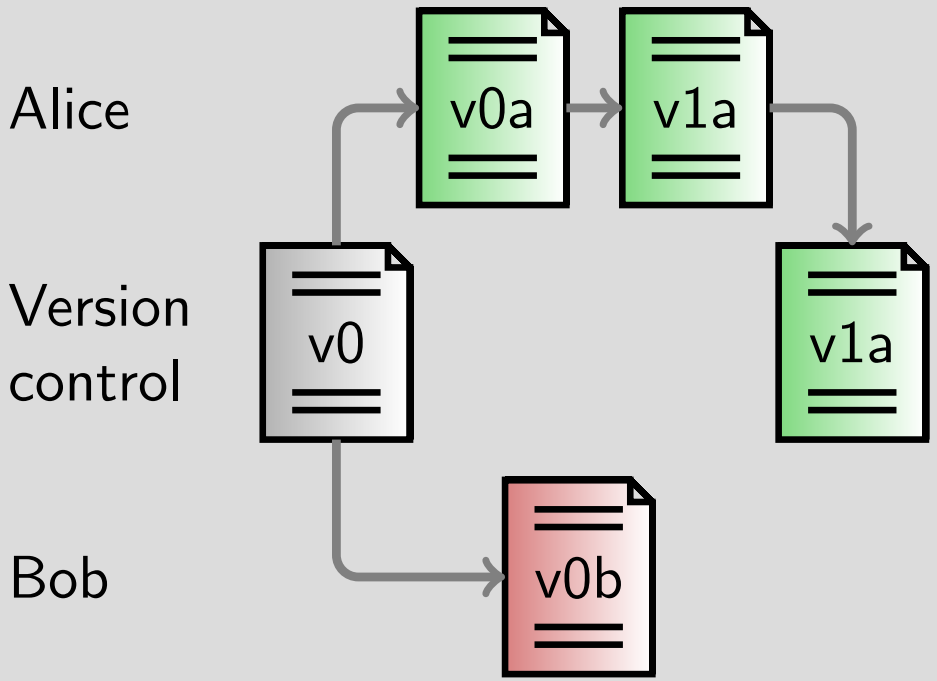

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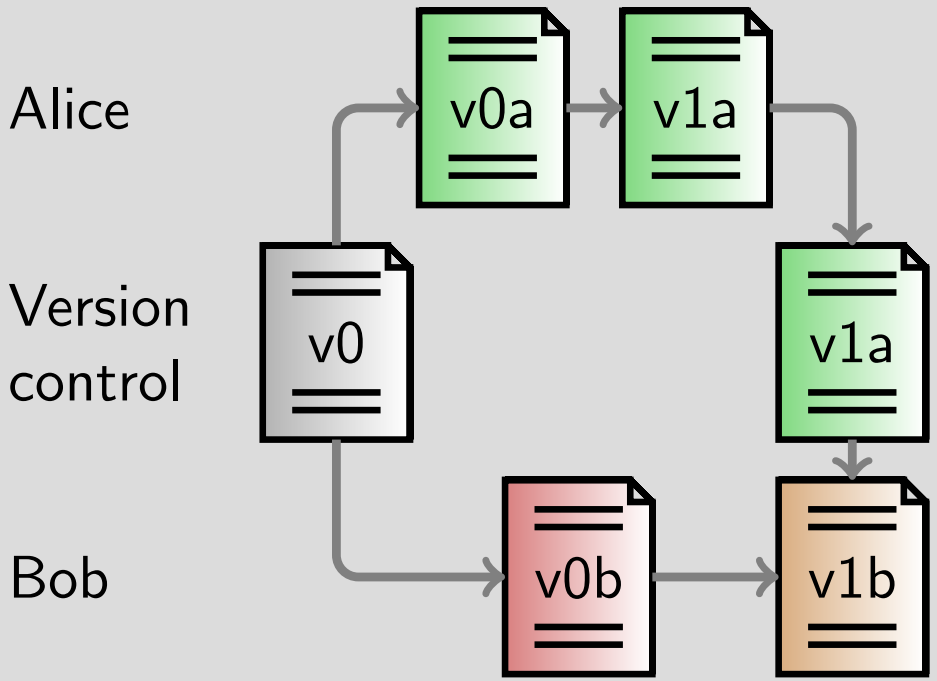

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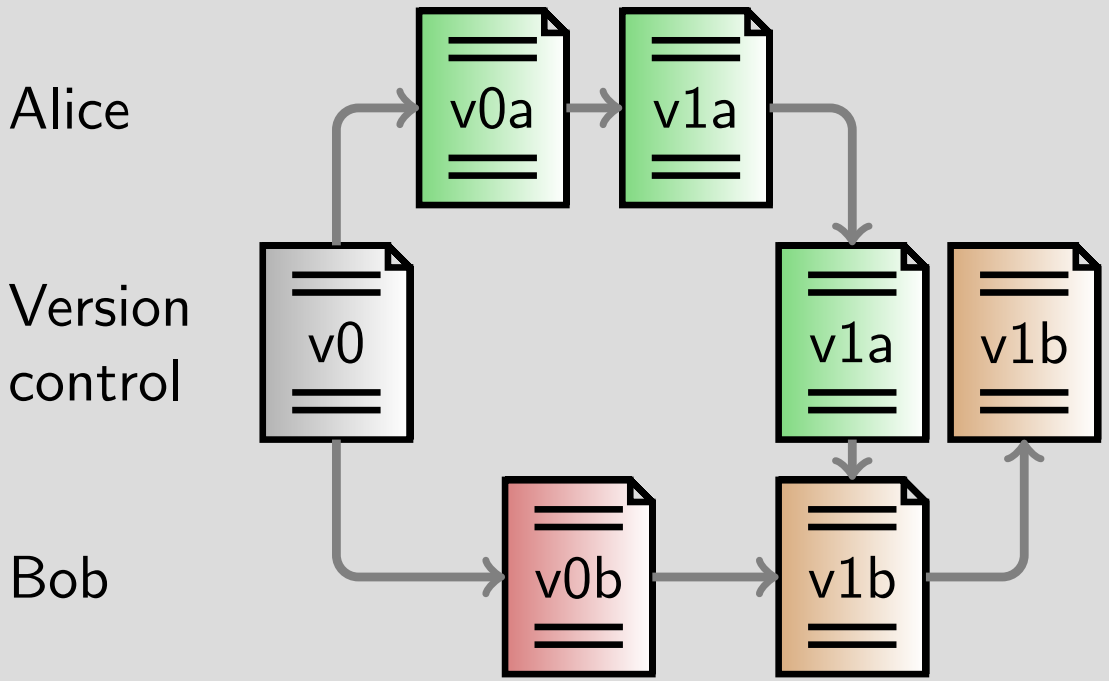

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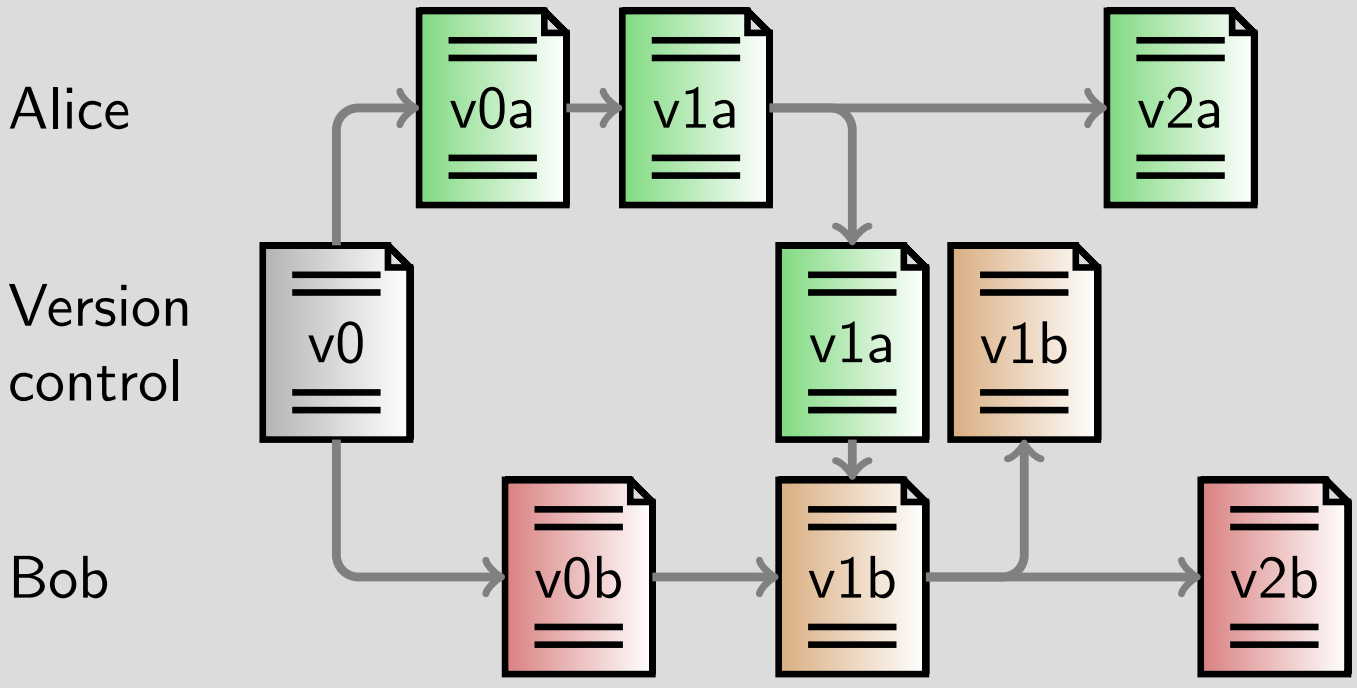

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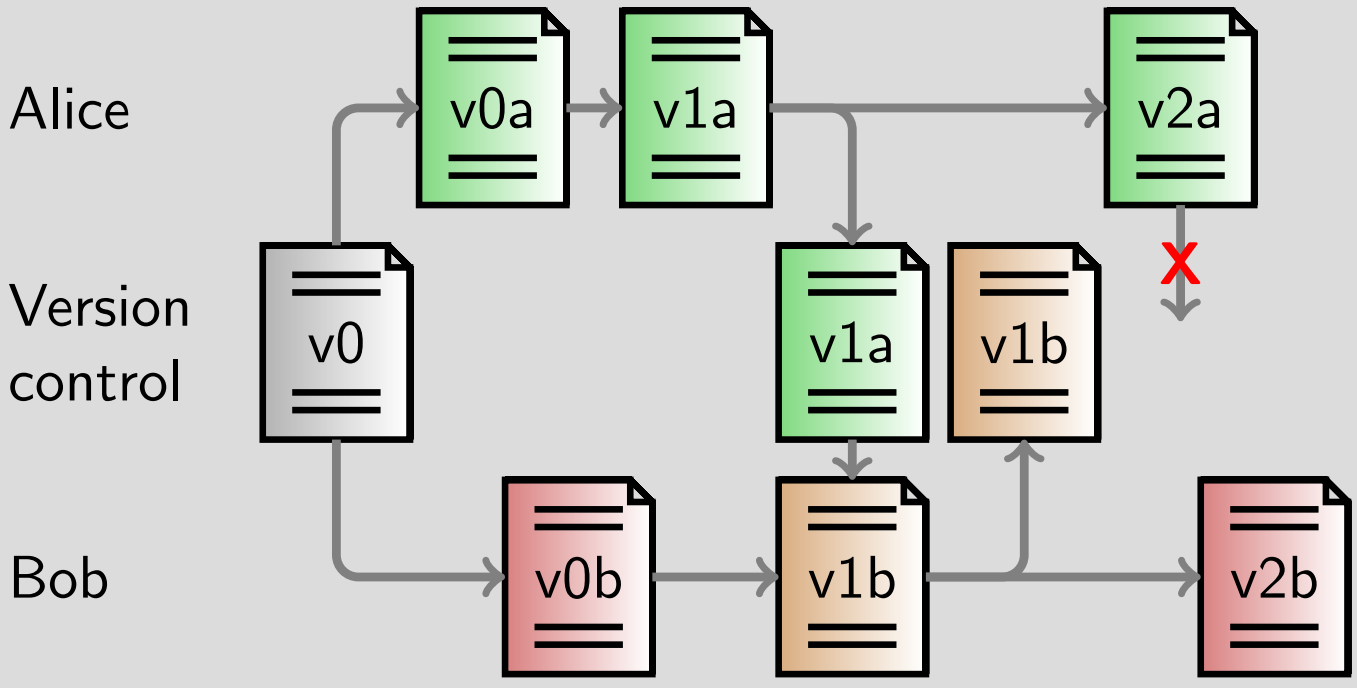

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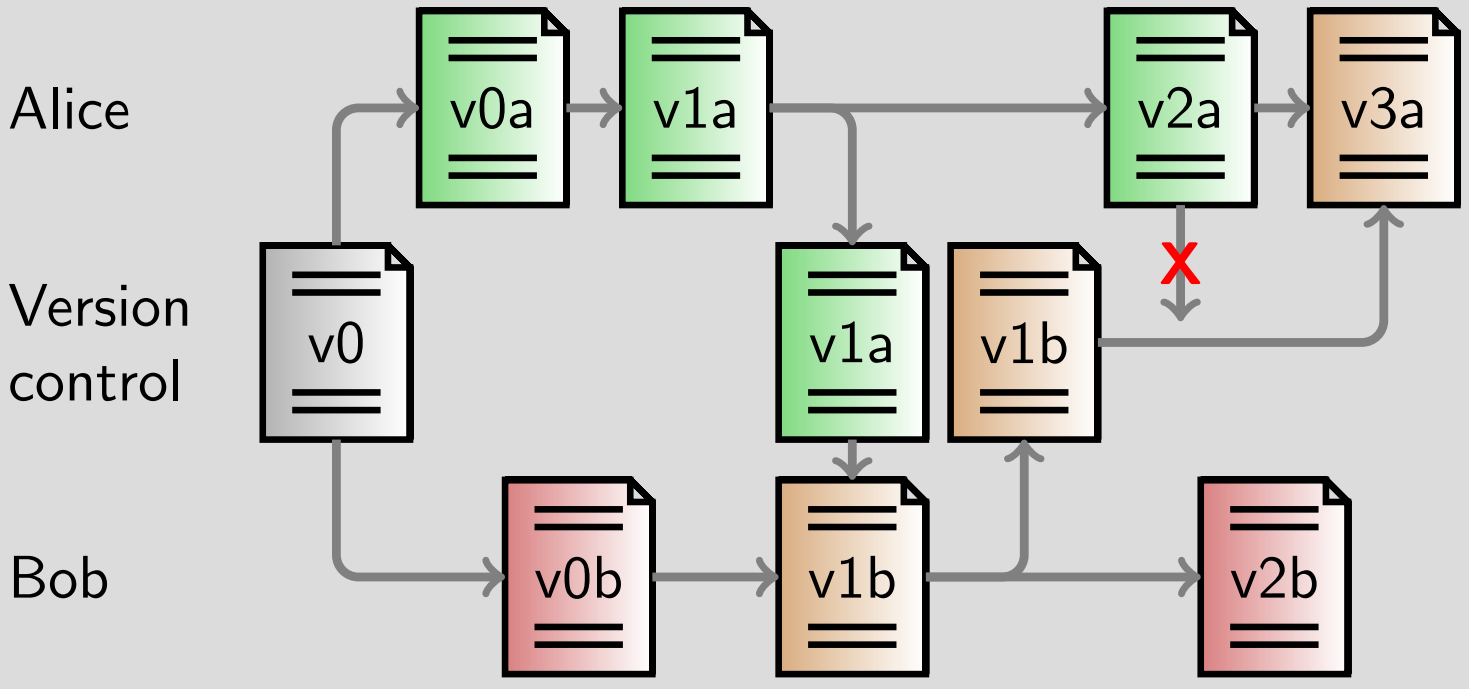

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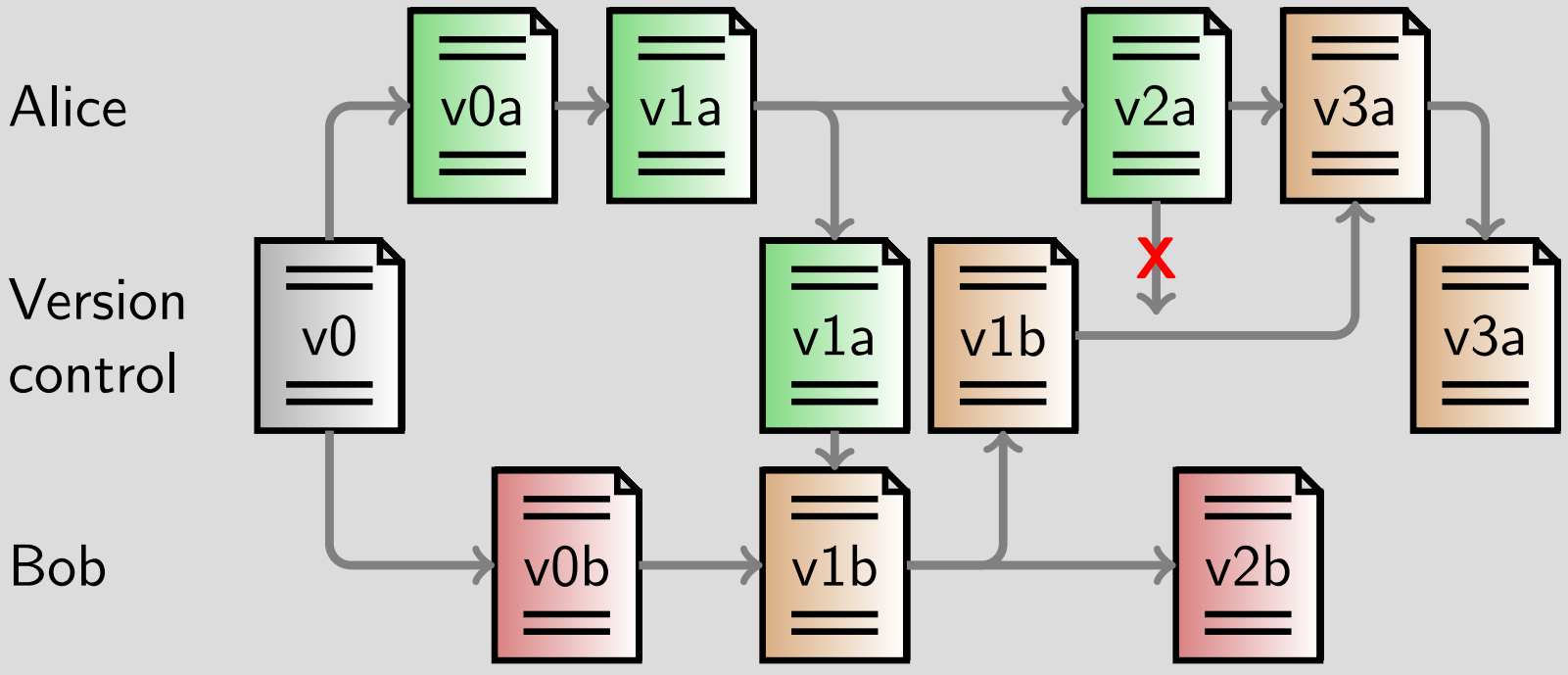

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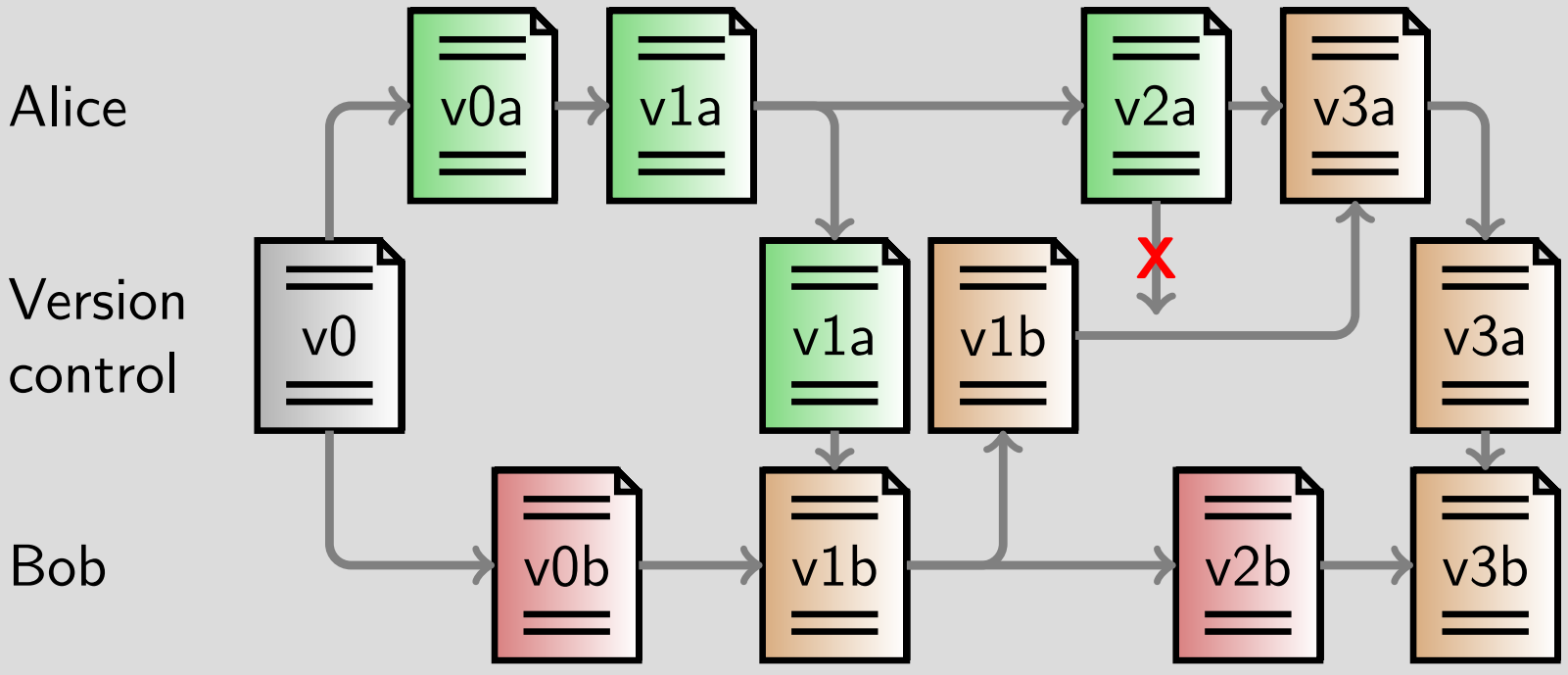

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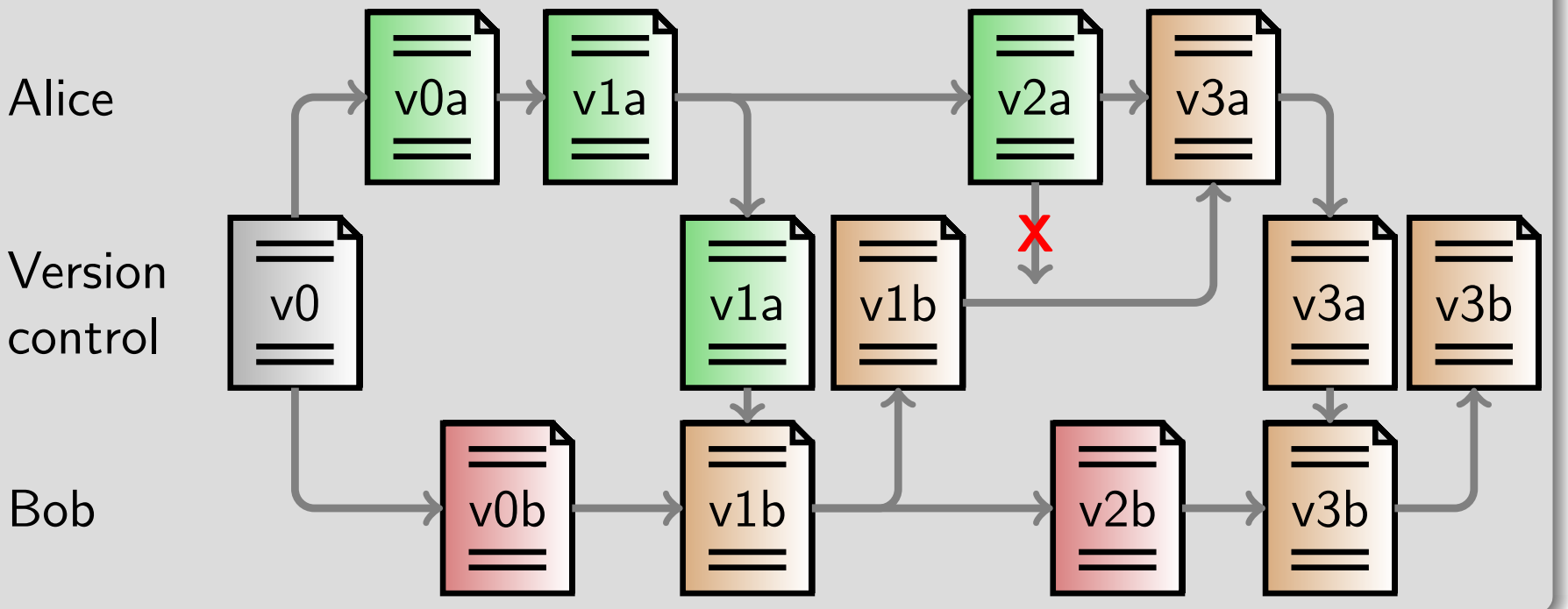
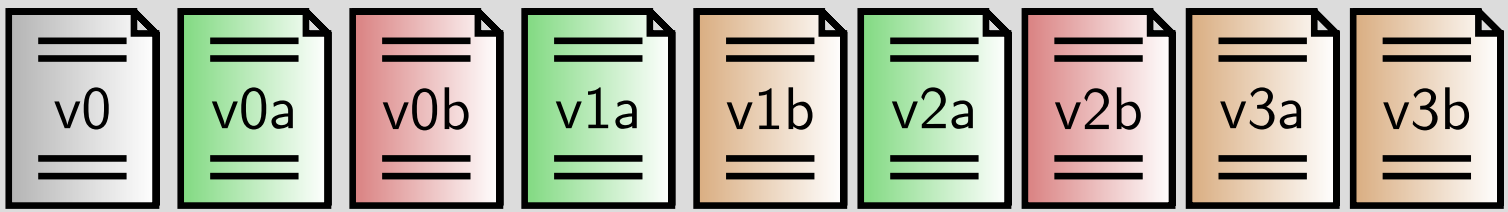


Version control: use case

Collaboration with version control system:

Alice

Version control



Bob

git

What is git?

- Built as version control tool for the Linux kernel
  - Built for speed
  - Designed for large projects
  - Designed for many collaborators
- Distributed version control system
  - Fast: all operations are performed locally
  - No backup needed: every copy holds the full database
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- Records a snapshot for each version of files
  - Files can be reverted to any state
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- Works best with line based text files
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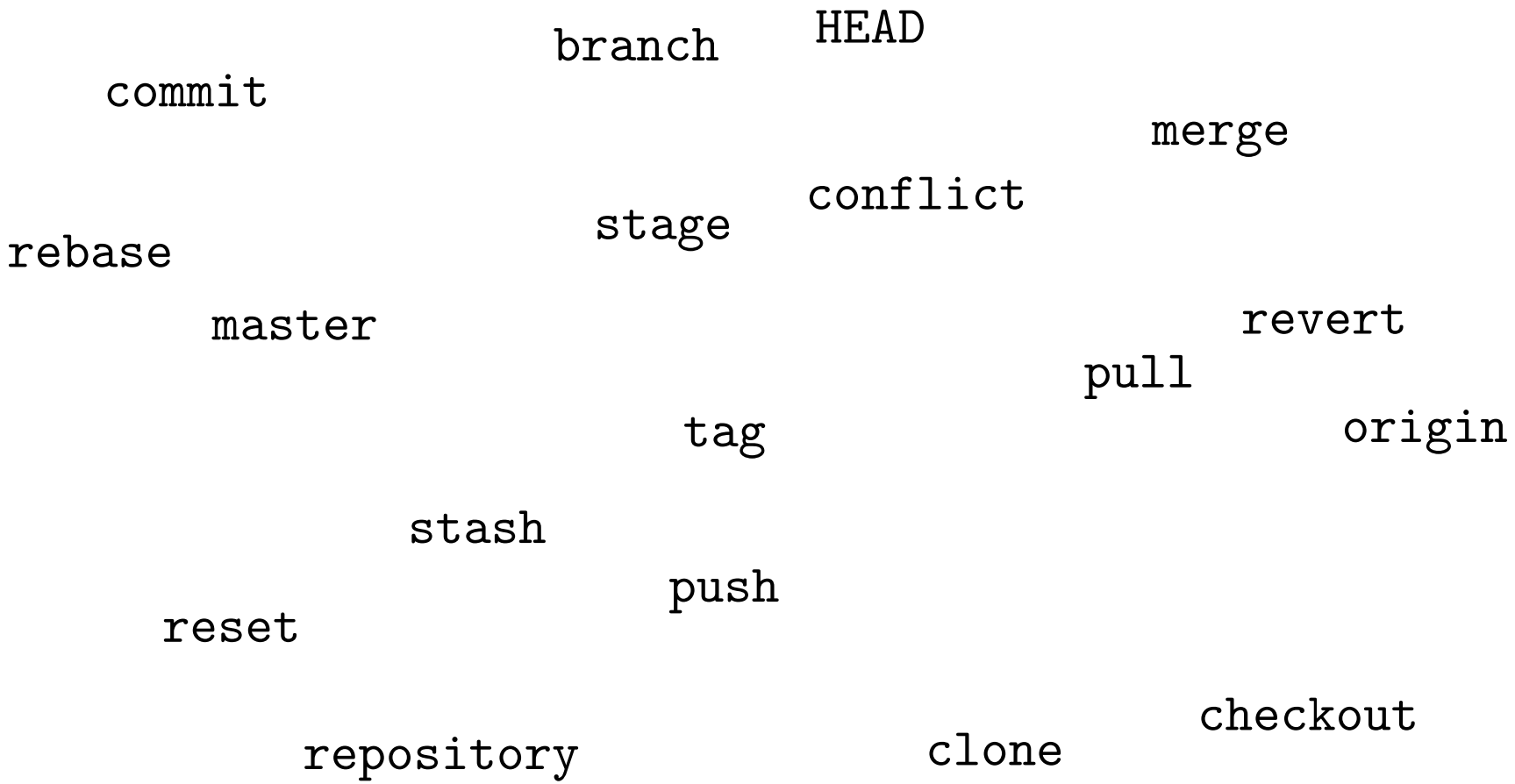
- A commandline tool ...
  - ... but GUIs exist

Version control: a secret language?



Fundamental concepts

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- Every user has a complete copy of the repository
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- State of a directory or file at a given point in time

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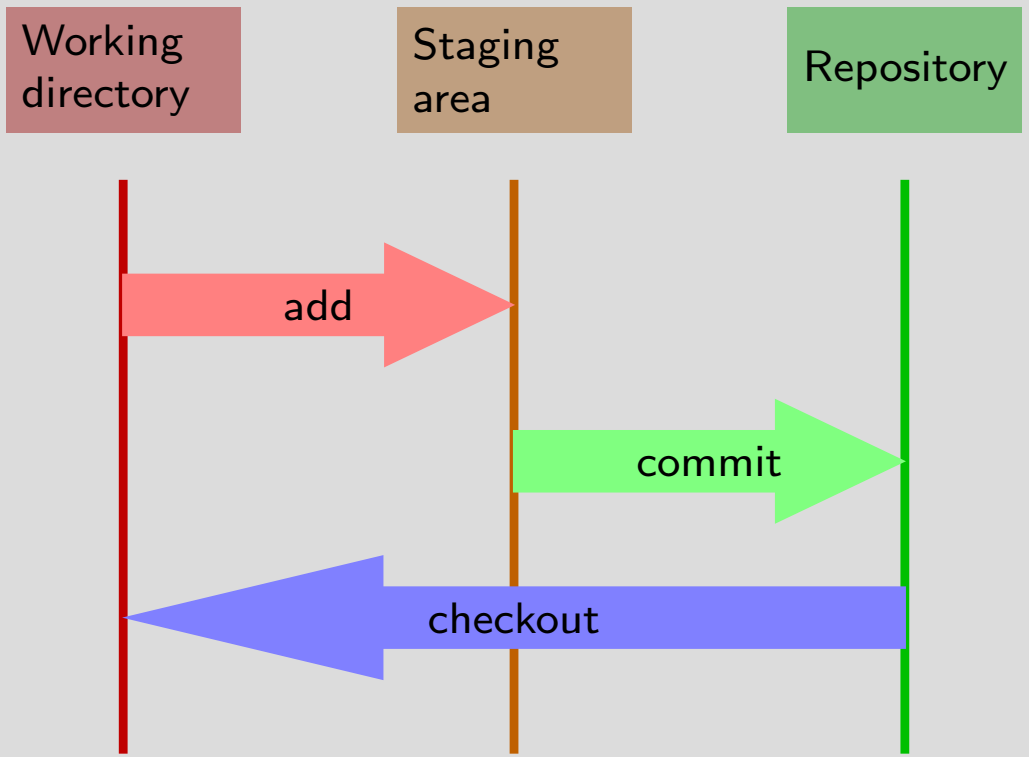
Staging



The power of git

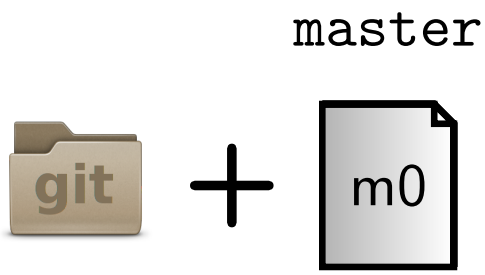
The power of git

- `init`

The power of git

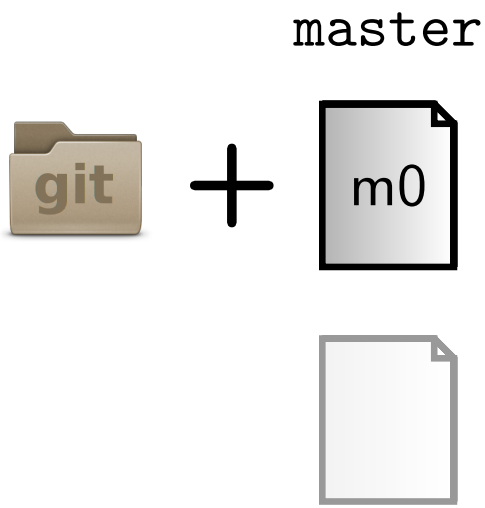
- `init`
- `add`

The power of git



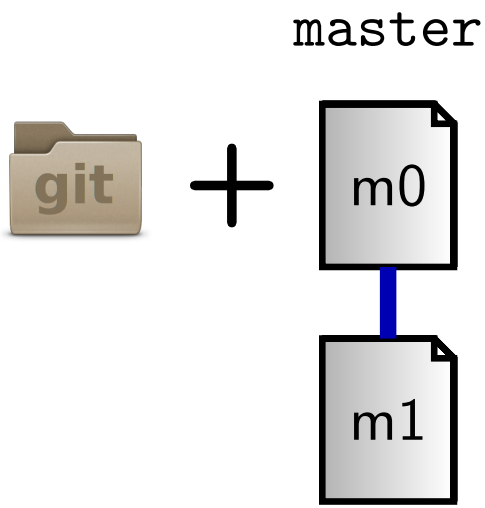
- `init`
- `add`
- `commit`

The power of git



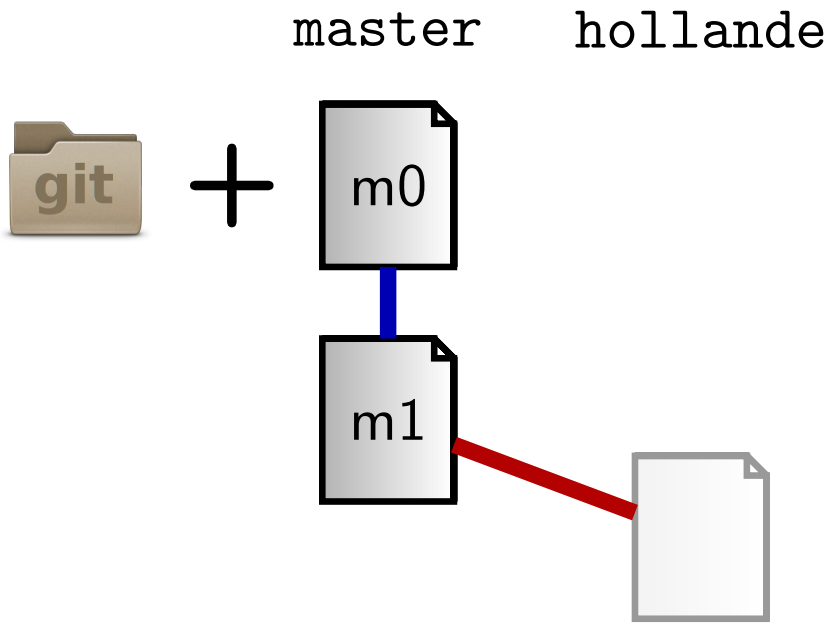
- `init`
- `add`
- `commit`

The power of git



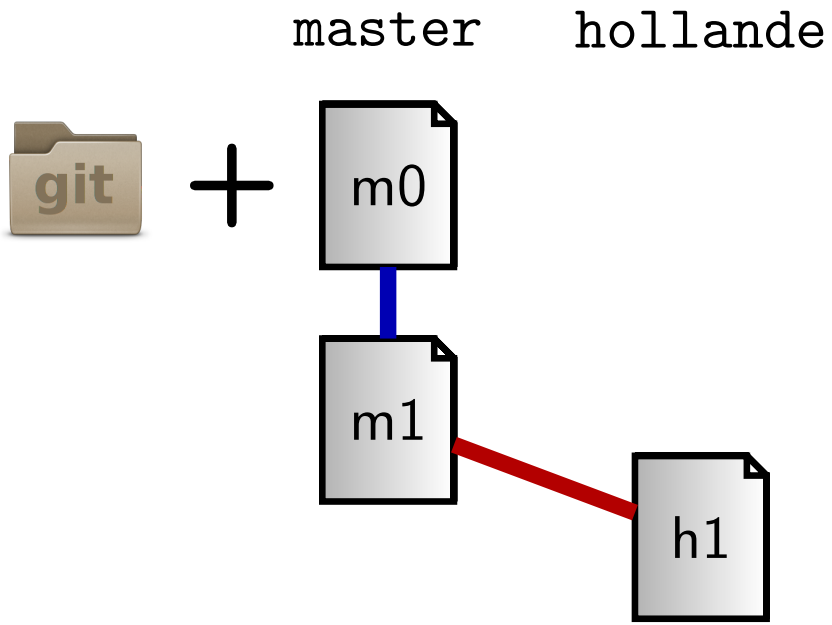
- `init`
- `add`
- `commit`

The power of git



- `init`
- `add`
- `commit`
- `branch`
- `checkout`

The power of git



- `init`
- `add`
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- `branch`
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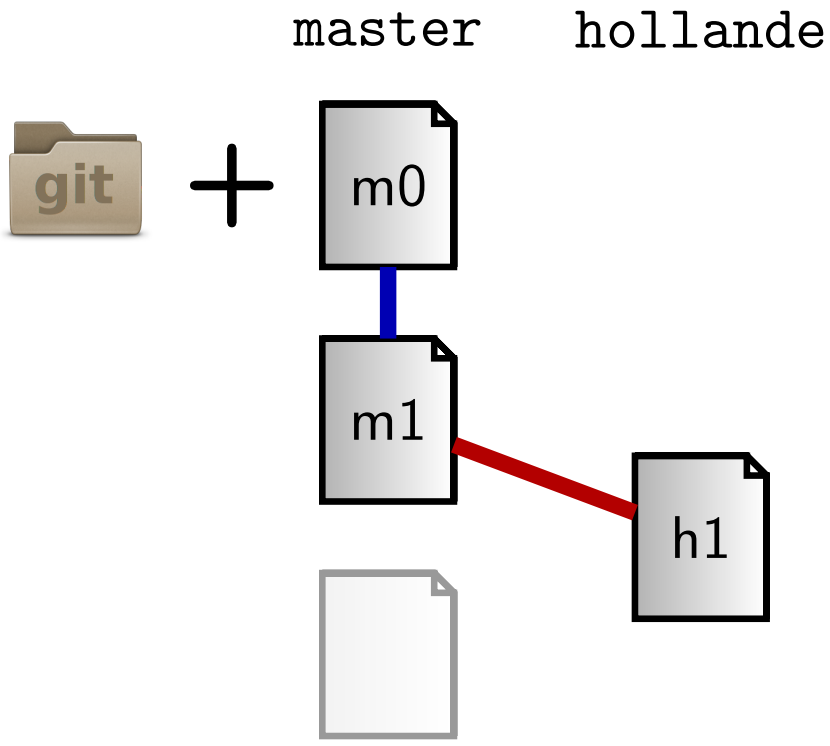
The power of git



- `init`
- `add`
- `commit`
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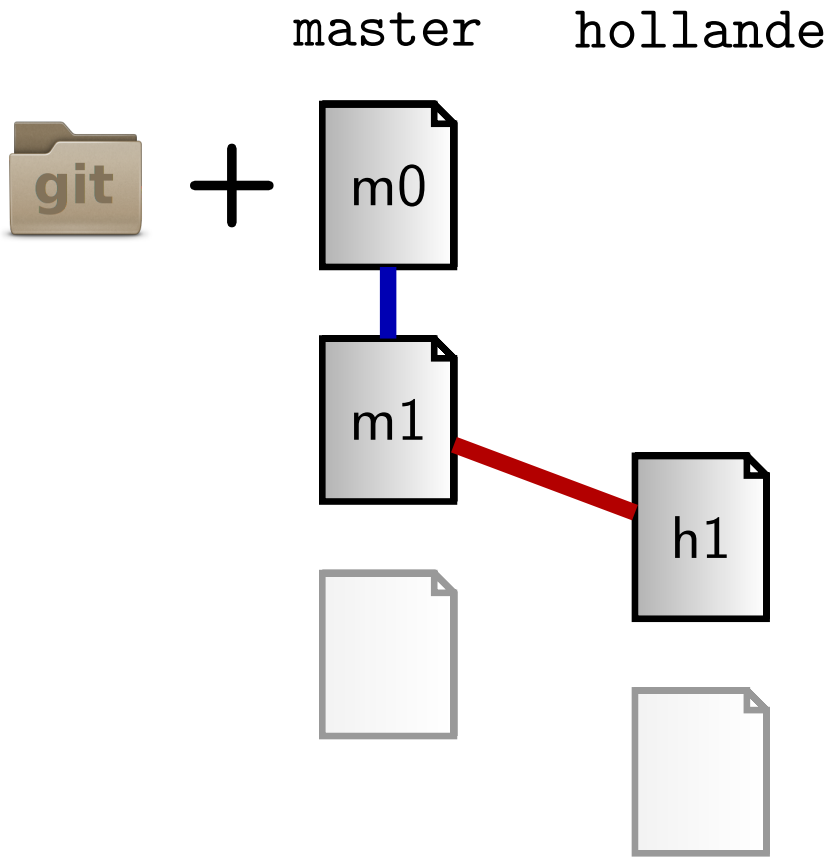
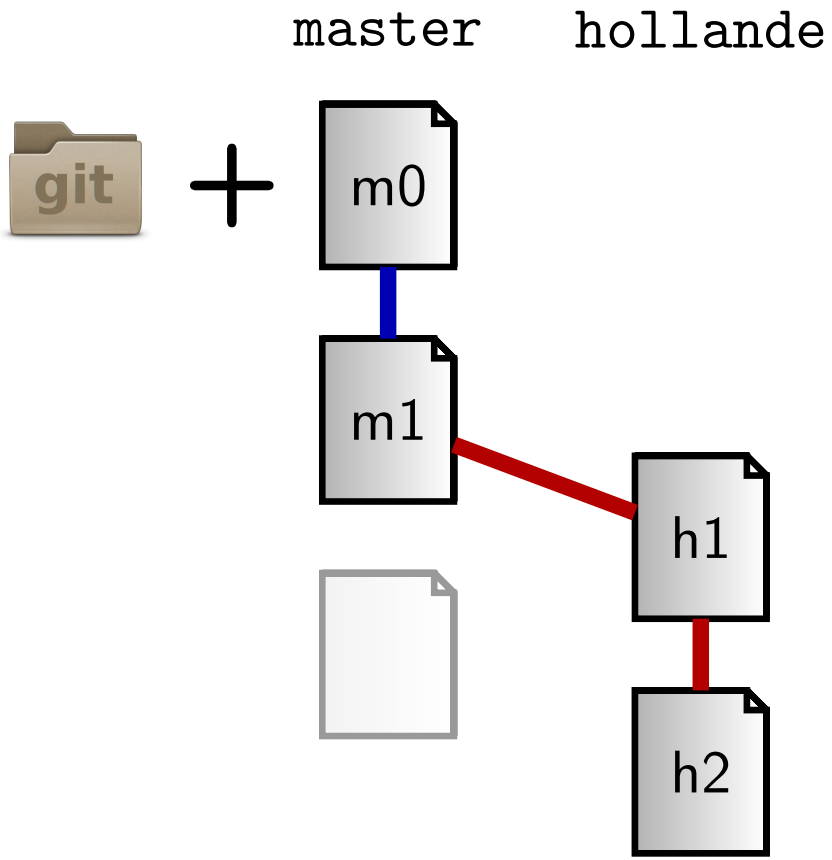
The power of git



- `init`
- `add`
- `commit`
- `branch`
- `checkout`
- `stash`

The power of git



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- `branch`
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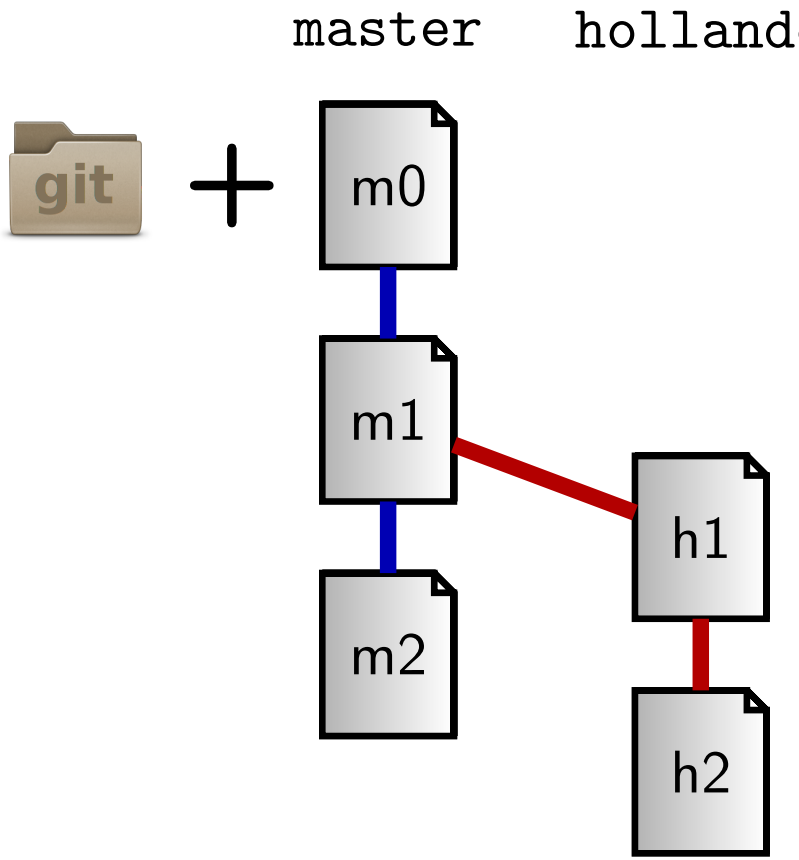
- `stash`

The power of git



- `init`
- `add`
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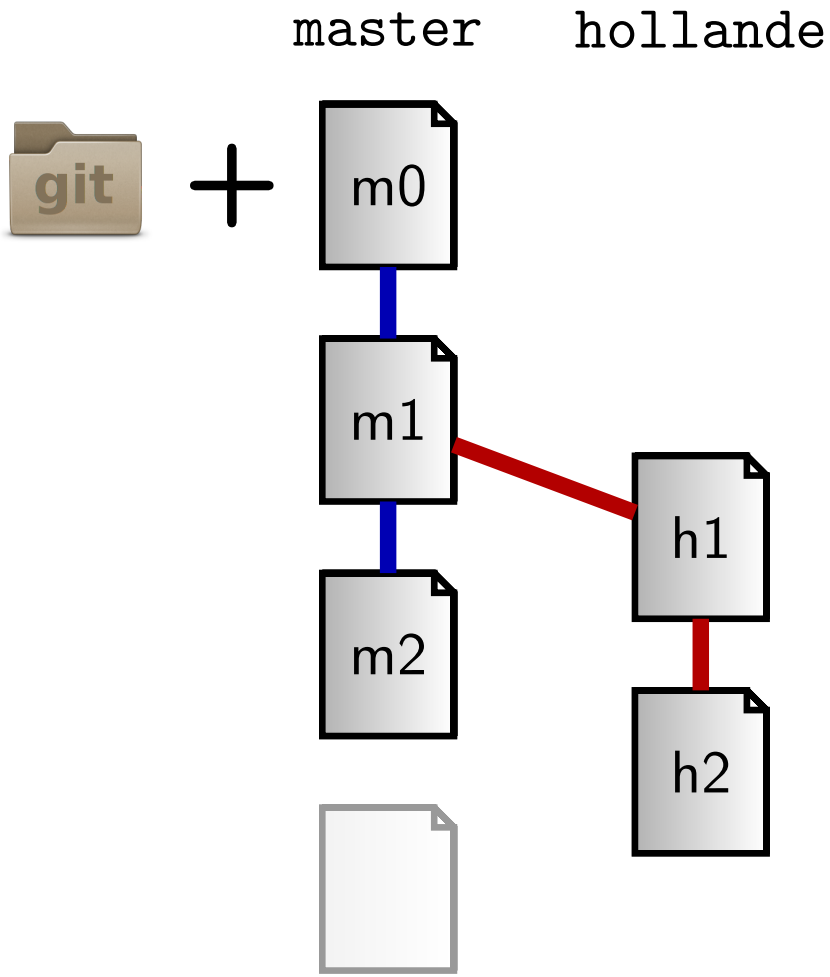
- `branch`
- `checkout`
- `stash`

The power of git



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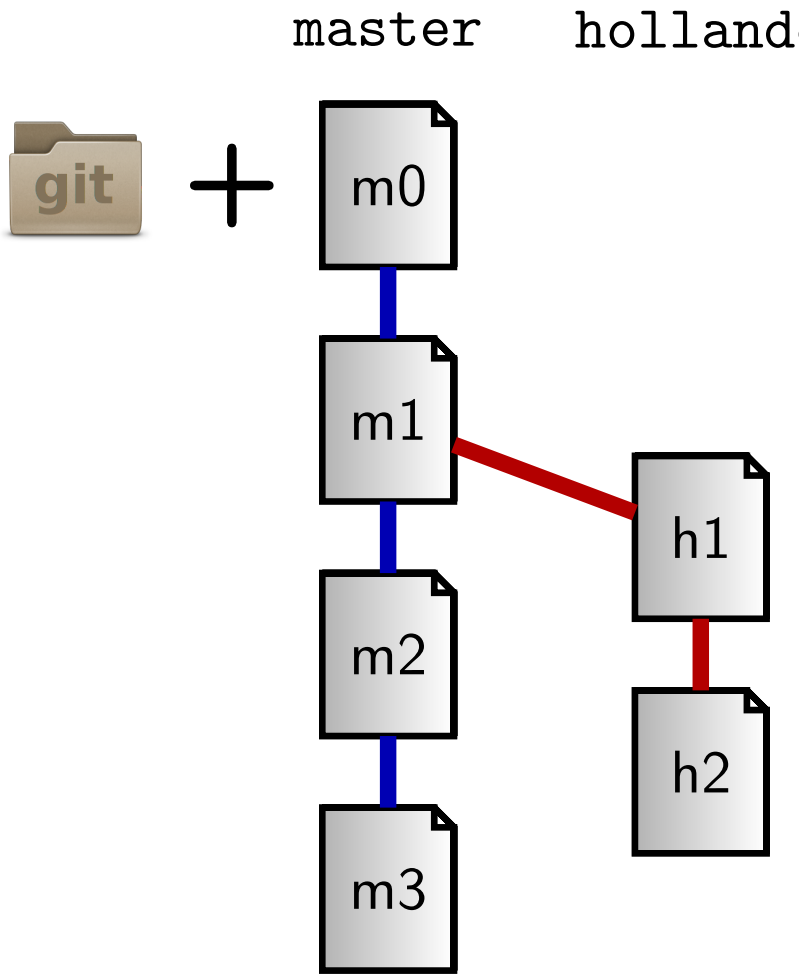
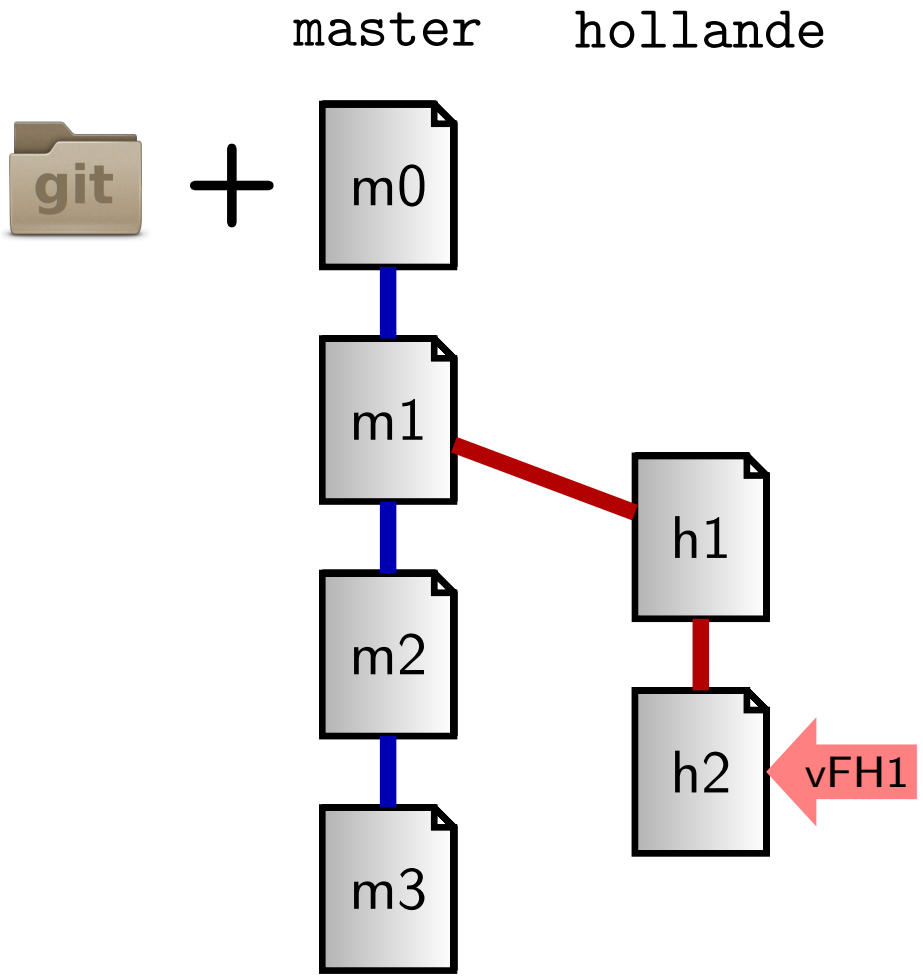
The power of git



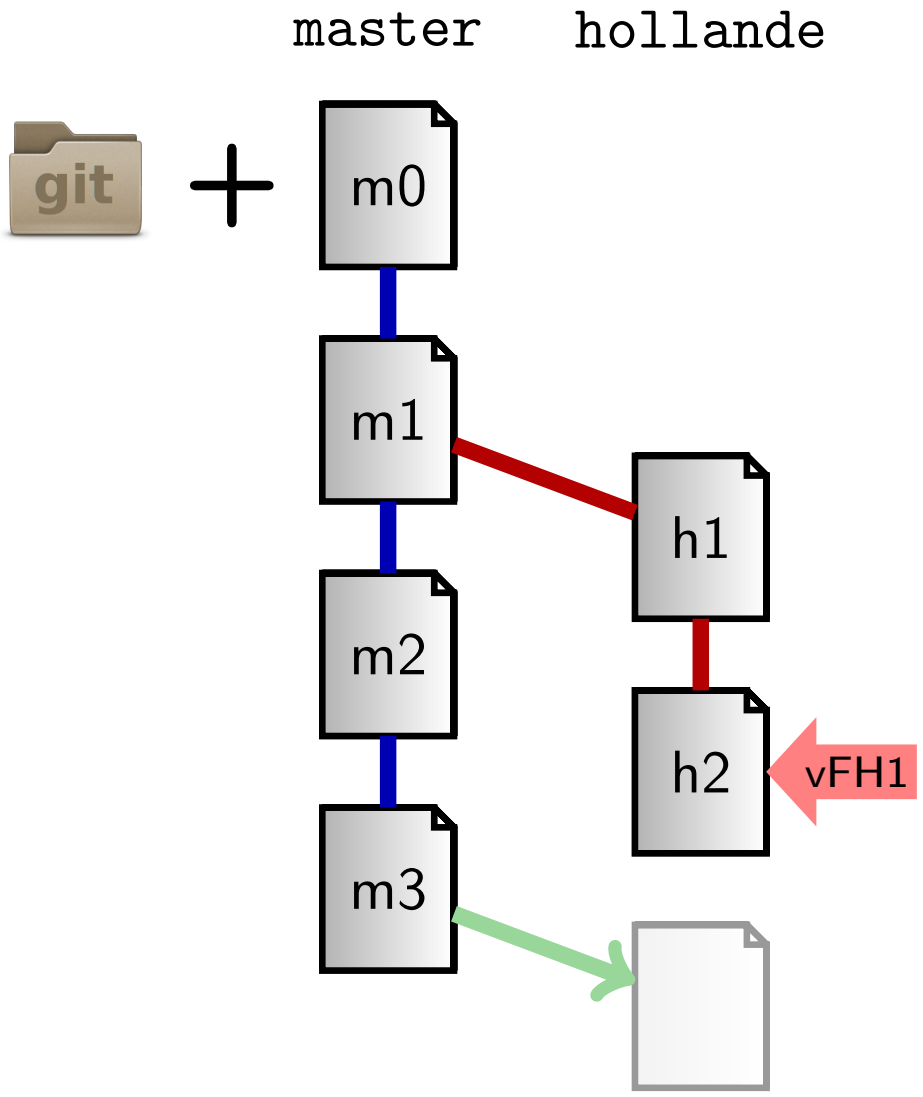
- `init`
- `add`
- `commit`
- `branch`
- `checkout`
- `stash`

The power of git



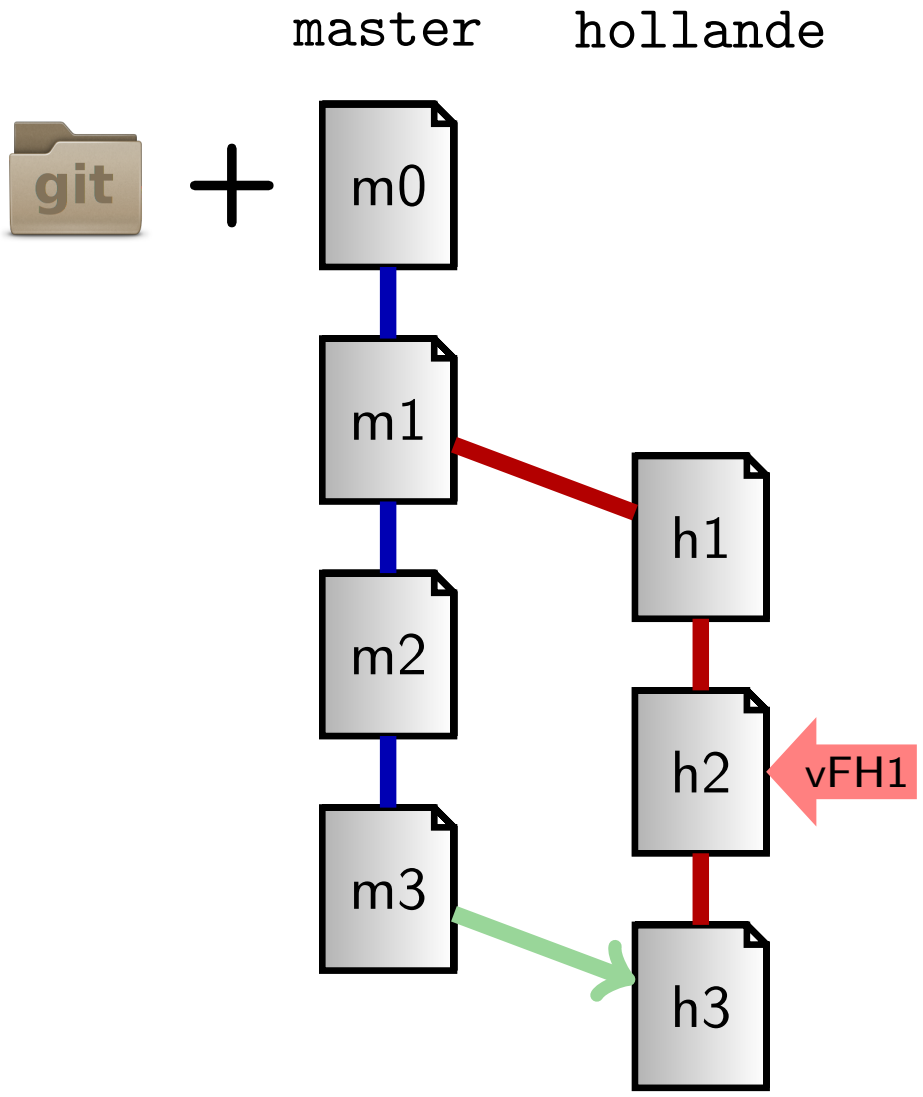
- `init`
- `add`
- `commit`
- `branch`
- `checkout`
- `stash`
- `tag`

The power of git



- `init`
- `add`
- `commit`
- `branch`
- `checkout`
- `stash`
- `tag`
- `merge`

The power of git



- `init`
- `add`
- `commit`
- `branch`
- `checkout`
- `stash`
- `tag`
- `merge`

Frequently used commands

Create repository

```
git init
```

Add files

```
git add <file>
```

Revert changes

```
git reset --hard
```

Show status

```
git status
```

Stash changes

```
git stash
git stash list
git stash apply
```

Commit

```
git commit -m "Commit message."
```

Commit all changes:

```
git commit -a -m "Commit message."
```

Create branch

```
git branch <branch name>
```

Merge

```
git merge <other branch>
```

Create tag

```
git tag -a <tag> -m"Description"
git tag
```

Switch version

```
git checkout <branch>
git checkout <tag>
git checkout <version>
```

Links

git: `http://git-scm.com/`
GitHub: `http://github.com`

GUIs:

- **TortoiseGit**: `https://code.google.com/p/tortoisegit/`
- **SmartGit**: `http://www.syntevo.com/smartgit/`

Editors:

- **Vim**: `http://www.vim.org/`
- GitGutter for vim:
  `https://github.com/airblade/vim-gitgutter`
- **Sublime**: `http://www.sublimetext.com/`
- GitGutter for sublime:
  `https://github.com/jisaacks/GitGutter`