Software Engineering Project

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What is a Version Control System (VCS)?

- Version control (source/revision) is about managing changes to documents (source code files)
- Logical way to organise and control versions
- VCS is an application (or part of) to manage the version control
  - Git, SVN, ...
  - Google Drive, Dropbox, Wikis

Why Use Version Control?

- Software exist in multiple versions
  - also deployed
- To maintain, important to access the right version
- Also, parallel development
  - features and/or fixes

Evolution of VCS

- Stage one, manual VCS
  - basically keep multiple copies of the source code (version)
  - distribute source files between developers, e.g., mail, floppies, etc.
  - track everything manually

Evolution of VCS

- Stage two, local VCS
  - SCCS and RCS
  - local file systems, and local locking

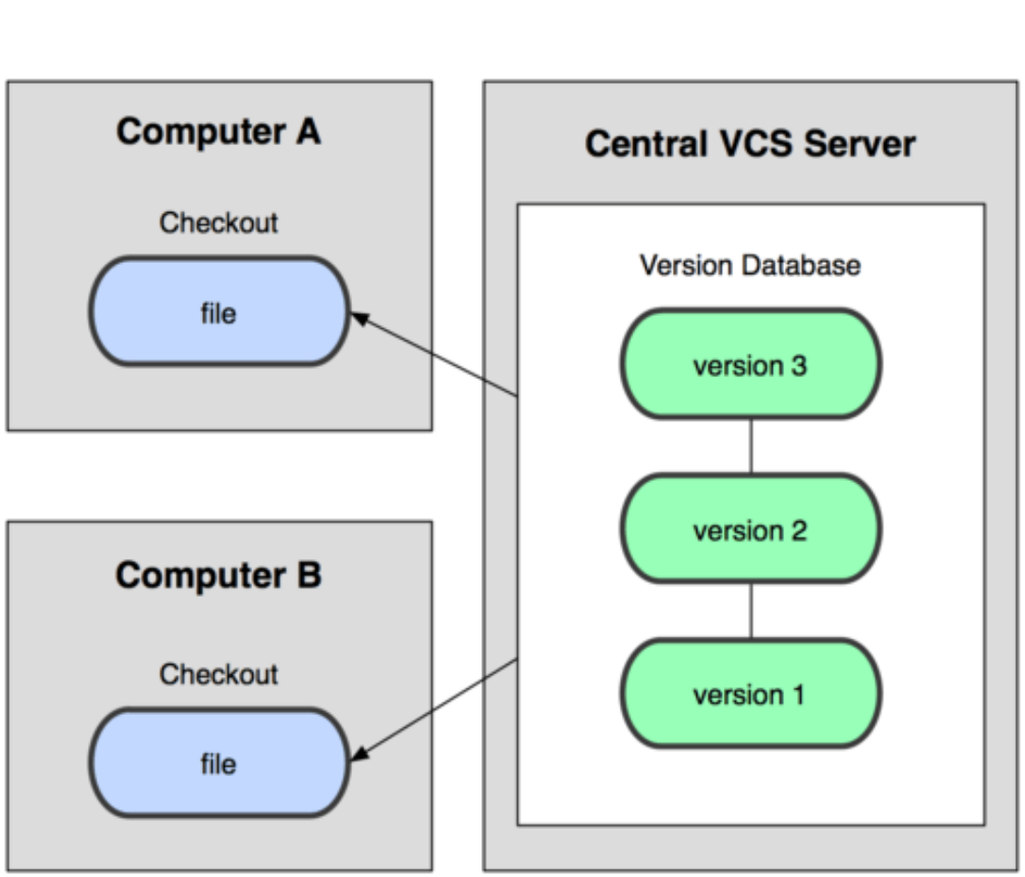
Evolution of VCS

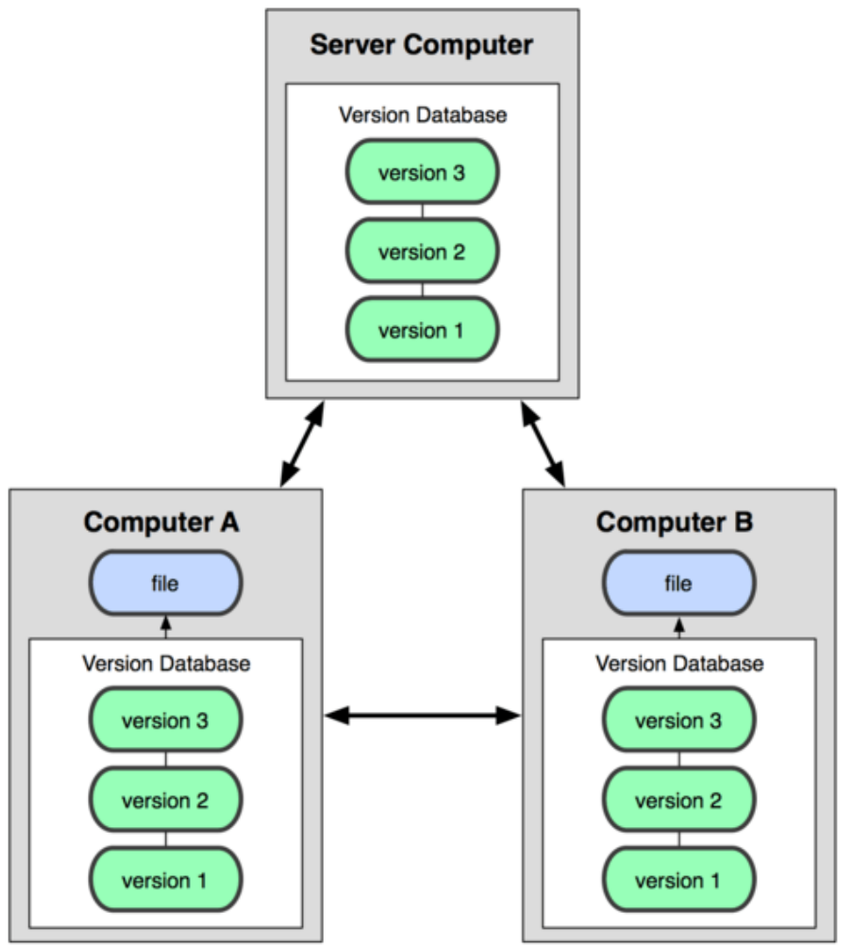
- Stage three, centralised VCS
  - CVS and SVN
    - all operations happen against a central server
    - local copy and remote repository

Evolution of VCS

- Stage four, decentralised VCS
  - Git, Mercurial, Bazaar
    - multiple "copies" of the repository that are kept in sync
    - "everything" is available locally

Evolution of VCS





Important Concepts

- Repository / Working Copy
- Change (List)
- Commit
- Trunk / HEAD
- Conflict / Merge
- History

Git

- Distributed version control
- Developed by Linus for Linux development

- Distributed
- Strong support for non-linear development
- Efficient for large projects

Getting Started

`git clone <url | path> [dir]`

- Clones a repository (more or less the entire project history)
- One of two ways to start using Git
- Locally (file system), or remotely (HTTPS, SSH, Git)

Git Basics

- Inspecting
  - status, log diff
- Modifying
  - add, rm, mv, commit
- Use `git help [<cmd>]` to get help!

Configuring Git

```
git config [--global] <key> <value>
```

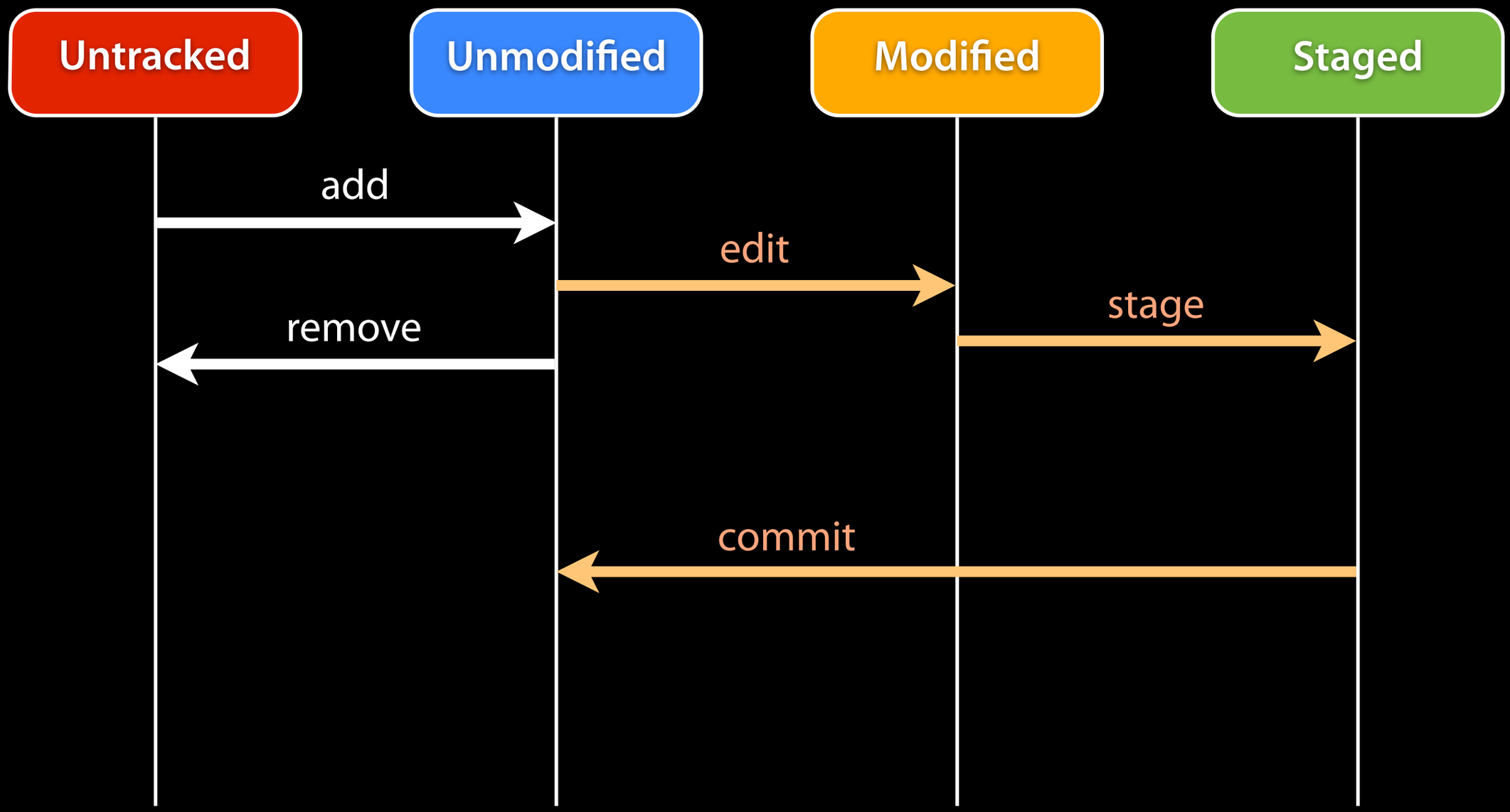
- Allows you to change settings, such as identity, editor, etc.
- Use `--global` to set information across all your repositories

Demo

File States

- **Untracked**: not managed by Git
- **Unmodified**: tracked, but not changed
- **Modified**: tracked and changed since last commit
- **Staged**: will be saved at next commit

Work Flow / Concepts



Add to the Repo

- Use `git add` to add files to the staging area (index)
- A staged file will be "saved" the next time you commit (basically create a snapshot of your repo)
- You can add files or directories, several at a time (and as many times as you like)

Committing Your Changes

- Saves a snapshot of your current repository
- Staged files become tracked by Git and are now considered "unmodified"
- When you commit, Git will ask you to comment on your changes

Removing and Moving Files

- You can also remove files ...
  - `git rm`
- ... and move files
  - `git mv`
- Note that when you remove a file, you will remove the local copy (as well)

Logging and Diffing

- You can use `git log` to show the commit history
  - so, good commit messages are important!
- And, you can use `git diff` to see changes between current and commit or local and remote

.gitignore

- The `.gitignore` file allows you to specify files that should never be tracked by Git
  - such as `.class` files or `.DS_Store`
  - Text file that lives in your repository
    - with a list of patterns of files and directories to ignore
  - Github can help you generate sane defaults!

Branches

- A branch is a copy of the project state at a specific time
  - a fork
- There is a main branch, master (or trunk)
  - and as many branches as you create

Why Branch

- Feature development
  - maintain a stable version while you work on something experimental
- Bug fixes
- Release management
  - the DAT255 repo has a VT2013 branch

Branching

- Use `git branch` to manage branches
  - `git branch <name>`
- Use `git checkout` to switch branches
- Other commands work as expected with branches

Merging

- When we want to integrate or incorporate changes across branches, we merge
  - `git merge <branch_to_merge>`
- There can be conflicts
  - that you might have to resolve manually

Playing With Others

- Use `git clone` to get started
- To update to or from a remote repository
  - `git fetch`, `git push` and `git pull`
  - note, pull fetches and merges
- Use `git remote` to check / manage remote repositories

Branches

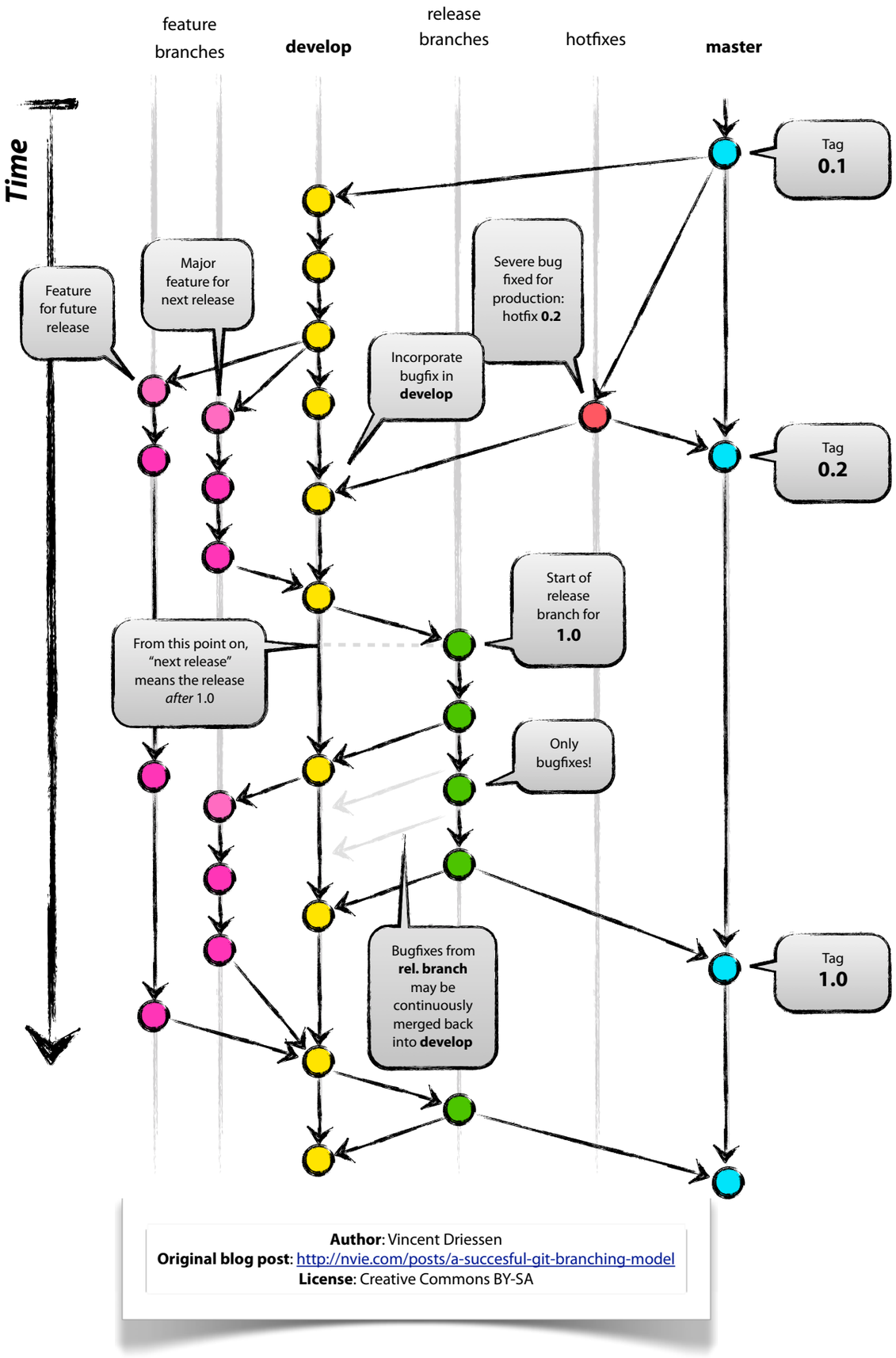
- Branches makes it more complicated, and working with other developers usually means more branches
- Remote branches are local but cannot be modified
  - you need to create a local branch to change / modify it

Releasing (and Tagging)

- A release often has a name or a version attached to it
- Use tags to mark specific commits
  - light-weight and annotated
  - `git tag [-a] <tagname> <commit>`
- Use annotated tags for releases
- Tags are not pushed by default (use `--tags`)

Best Practice

- The VCS can be a powerful tool or just another obligation (in this course)
- To make it powerful
  - set it up properly
  - find a good structure
  - embarace branching



- Do not use *master* for everything!
- Use development, feature, fixes and release branches
- Tag the various releases
- Keep the branches as part of the history/log!

Demo