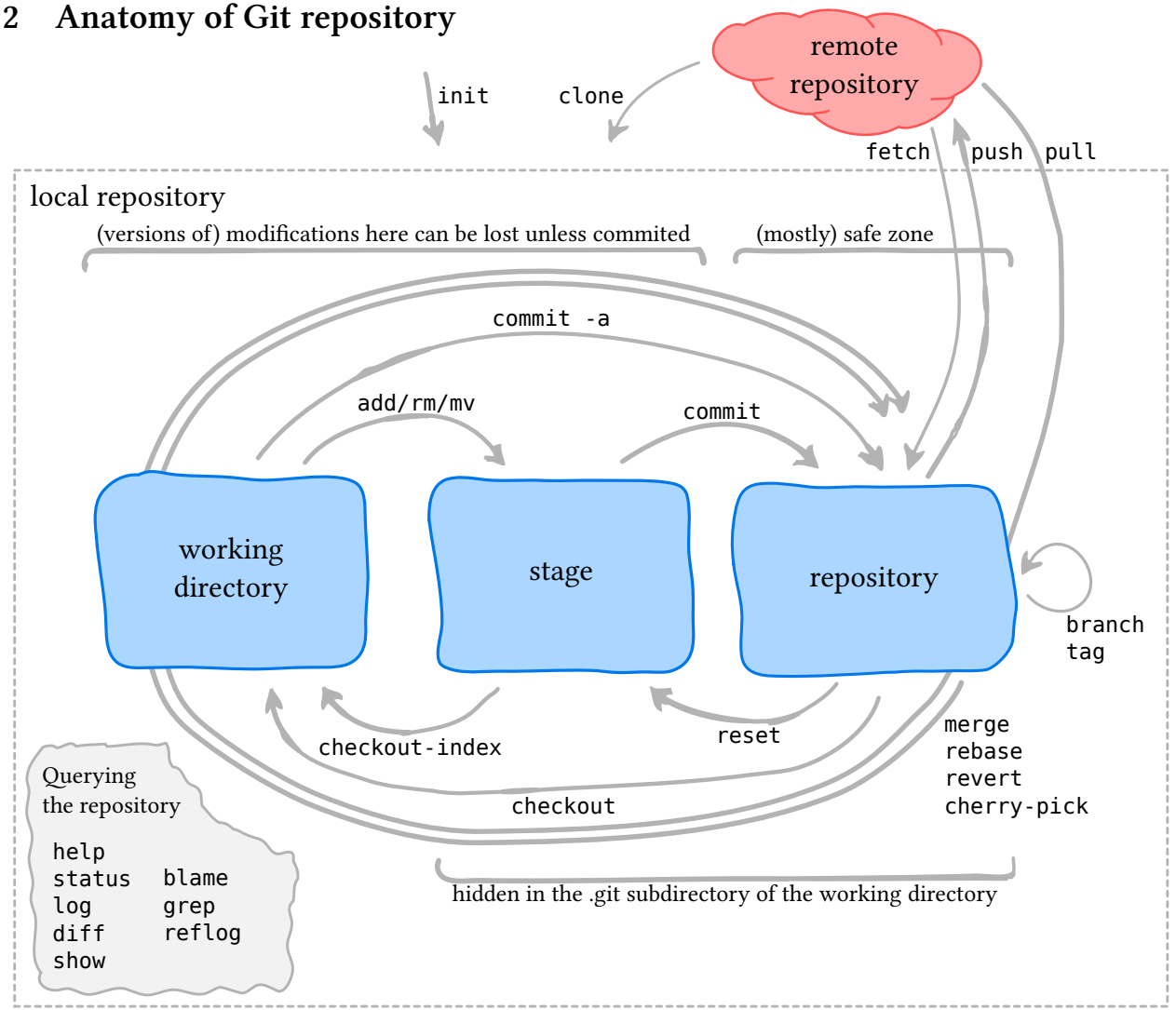
Git handout – Tomi Peltola, Henri Seijo, Arno Solin – last update December 19th 2012

"Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency." – git-scm.com

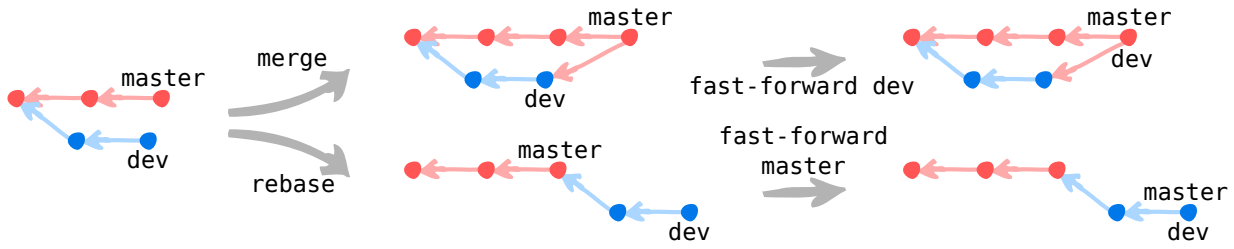
1 Terminology

- **repository** (repo): a database holding different versions (history) of files under version control
- **working directory**: holds files, which are worked on
- **commit**: a snapshot of the files under version control
- **to commit**: to save a snapshot of the current state of files to the repository
- **stage** (index): composing area for commits; committing records the modifications in stage to a commit
- **to stage**: to add modified files from working directory to stage
- **branch**: named lineage of commits; multiple branches allow for isolated, parallel lines of development
- **to branch**: to diverge a new branch from a parent branch
- **conflict**: overlapping modifications in parallel branches
- **merge**: a commit, which handles possible conflicts between branches and joins the branches
- **to merge**: to bring the contents of another branch into the current branch
- **fast-forward merge**: merging of branches, where the merged branch is a linear continuation of the parent branch; commits in the merged branch are included in the parent branch as such
- **remote repository**: a copy of the repository, which can be accessed over network or filesystem
- **to clone**: make an independent copy of a repository
- **to push**: to sync repos by sending commits from the local repo to a remote repo
- **to pull**: to sync repos by getting commits from a remote repo
- **tag**: a nickname usually for a commit, e.g. v3.4.2
- **bare repository**: a repository without working files

2 Anatomy of Git repository



3 Merging strategies



4 Usage reference

All commands should be prefixed with `git`, e.g., `git help`.

- **help**
  `help` *# lists common commands*
  `help config` *# help on a particular command (here `config`)*

4.1 Configuration

- **set name and email**
  `config --global user.name Jane Smith`
  `config --global user.email jane.smith@aalto.fi`
- **set editor and coloring of output**
  `config --global core.editor nano` *# or vim, emacs etc.*
  `config --global color.ui true`

  Without `--global` option the commands affect only the repository in the current directory.

4.2 Creating or getting a repository

- **create a new repository to current directory**
  `init`

  Add `--shared` option to create a repository, which handles read and write permissions for unix group.
- **clone an existing repository**
  `clone /local/path/repo.git` *# clones to repo subdir.*
  `clone https://github.com/JuliaLang/julia.git jul` *# use jul subdirectory instead of julia*

  Add `--bare` option after `init` or `clone` to create a bare repository. Note: `--shared` with `clone` is not the same option as with `init`.

4.3 Querying information

- **current status of repository**
  `status`
- **log**
  `log`
  `log --oneline --graph` *# brief version showing branching*
  `log --name-status` *# show which files changed*
- **differences between versions of files**
  `diff` *# between working directory and stage*
  `diff --staged` *# between stage and the latest commit*
  `diff --color-words` *# show diff of words instead of lines*
  `diff 11c38af a68db70 -- readme.txt` *# between the listed commits, only in readme.txt*
- **who changed and when the lines of a file**
  `blame readme.txt`
- **show the message and changes of a commit**
  `show 6dbe052`

4.4 Basic workflow

- **stage files and modifications**
  `add .` *# stage all files in the directory*
  `add readme.txt` *# listing multiple files works also*
  `add -p readme.txt` *# interactively select which modifications are staged; -p works also with many other commands*
  `rm readme.txt` *# removal; removes the file from filesystem*
  `mv readme.txt readme.md` *# rename*
- **unstage**
  `reset readme.txt`
- **commit**
  `commit` *# commit the staged modifications*
  `commit -m "My commit message"`
  `commit -a` *# commit modifications in all tracked files (skips staging)*
- **get an older version of a file**
  `checkout 6dac6bf -- readme.txt` *# take from 6dac6bf*
- **revert a commit**
  `revert 47410c4` *# makes a new commit reverting 47410c4*
- **get files from stage to working directory**
  `checkout-index readme.txt`
- **apply the changes in a commit**
  `cherry-pick 7360d6a` *# makes a new commit with the changes in 7360d6a*
- **tag**
  `tag v1.0` *# name the latest commit v1.0*

4.5 Branching and merging

- **list, create and delete branches**
  `branch -a` *# list*
  `branch dev` *# diverge a new branch with name dev*
  `checkout -b dev` *# create a new branch and change to it*
  `checkout -b dev origin/dev` *# create a local branch from a fetched remote branch (see below)*
  `branch -d dev` *# delete*
- **change to a branch**
  `checkout dev` *# change to branch dev*
- **merge branches**
  `merge dev` *# merges dev branch to current branch*

  Note: branch name is a reference to the latest commit in the branch. `HEAD` is a reference to the latest commit in the current branch. `FETCH_HEAD` is a reference to the latest commit in a fetched remote branch (see below).

4.6 Synchronizing with remote repositories

- **list, add and remove remotes**
  `remote -v` *# list remotes*
  `remote add becs`
  `ssh://jsmith@url.aalto.fi/path/to/repo.git`
  # add with name becs; use ssh with username jsmith
  `remote rm becs` *# remove*
- **fetch changes from a remote**
  `fetch becs master` *# fetch master branch from becs; do not merge the changes*
- **pull changes from a remote**
  `pull becs master` *# tries to also merge the changes*
- **push changes to a remote**
  `push becs master` *# pushes master branch*

  Note: remote `origin` is automatically added on clone.

4.7 Rewriting history

Never rewrite shared history!

- **amend a previous commit or change its message**
  `commit --amend` *# after, e.g., adding a forgotten file to stage*
- **rebase a branch to include the progress in a parent branch**
  `rebase master` *# assuming master is the parent branch*
- **combine, remove and edit commits**
  `rebase -i fe18b87` *# prompt for commits after fe18b87*

5 Resources

- **Git homepage**: git-scm.com
- **Pro Git book**: git-scm.com/book
- **Stackoverflow**: stackoverflow.com/questions/tagged/git
- **GitHub**: github.com – popular Git hosting on web
- **Bitbucket**: bitbucket.org – popular Git hosting on web