

# Git-based tools to ease your life

## Git-ify Your (digital) Life

May, 7th 2014 | Torbjörn Klatt <t.klatt@fz-juelich.de> | JSC Internal Seminar

# Overview

Git *a short review*  
etckeeper *keep your system's configs*  
vcsh *version your \$HOME*  
mr *my / multiple repositories*  
git-annex *so meta!*  
bup *backup with Git*  
gcrypt *GPG-encrypted Git repositories*  
Tipps *I can't resist ...*

# Git-based tools to ease your life

## Part I: Git

May, 7th 2014 | Torbjörn Klatt <t.klatt@fz-juelich.de>

# Version Control System *Git*

## A short overview

- decentralized / distributed  
alike Mercurial/hg or Bazar in contrast to CVS or Subversion
- works on deltas (diffs, patches) instead of whole files
- non-linear history  
*branching* and *merging* is easy and performant
- cryptological verification of revisions  
each revision (*commit*) has a unique SHA-1 hash computed from diff + meta info
- no need for a server / everything is locally available  
because of first point

# Git-based tools to ease your life

## Part II: etckeeper

May, 7th 2014 | Torbjörn Klatt <t.klatt@fz-juelich.de>

# etckeeper – Keep Your System's Configurations

1

- creates a Git (or Mercurial/Bazaar/Darcs) repo for `/etc`
- uses additional meta-file for remembering permissions for each file  
DVCSs usually don't track file owner info; only executable bit
- uses *pre-commit* hooks to fix file permissions
- hooks itself into package managers (e.g. *apt*, *zypper*) to auto-commit `/etc` before and after package changes
- manual commits also possible

---

<sup>1</sup> Windows users: sleep or think of moving to Linux

# etckeeper – Keep Your System's Configurations

## Example 1

### Initialization

```
etckeeper init
# after some time
cd /etc && git log --oneline
> 5bb2977 daily autocommit
> cdd9c8c yast update
> 9b76558 I added some cron jobs
> 711446f initial commit
```

# etckeeper – Keep Your System's Configurations

## Examples 1 & 2

### Initialization

```
etckeeper init
# after some time
cd /etc && git log --oneline
> 5bb2977 daily autocommit
> cdd9c8c yast update
> 9b76558 I added some cron jobs
> 711446f initial commit
```

### Switching setup

```
# on April first
git checkout april_first_joke_etc
etckeeper init
# day later
git checkout master
etckeeper init
```



# etckeeper – Keep Your System's Configurations

## Example 3

### Get difference between two system's configs

```
git remote add my-other-host ssh://my-other-host/etc
git fetch my-other-host
git diff my-other-host/master group | head
> diff --git a/group b/group
> index 0242b84..b5e4384 100644
> --- a/group
> +++ b/group
> @@ -5,21 +5,21 @@ sys:x:3:
> adm:x:4:joey
> tty:x:5:
> disk:x:6:
> -lp:x:7:cupsys
> +lp:x:7:
```

# Git-based tools to ease your life

## Part III: vcsh

May, 7th 2014 | Torbjörn Klatt <t.klatt@fz-juelich.de>

# vcsh – Version Control System for (your) \$HOME

version .profile, .{bash,zsh,vim}rc, ... — without pollution

- separate Git repositories for dotfiles  
without polluting \$HOME with .git directories
- easily migrate your personalized environment to other hosts  
clone your .vim repository on new host to have it synchronized
- allows for different branches for different hosts  
e.g. “tklatt-zamws”, “myself-laptop”, “su-myservers”
- *vcsh* is a single Shell script

# vcsh – Version Control System for (your) \$HOME

## Examples

One repository for your Vim config ...

```
vcsh init vim
vcsh vim add ~/.vimrc ~/.vim
vcsh vim commit -m "Initial commit of my Vim configuration"
vcsh vim remote add origin git@my-server.net:vim-repo
vcsh vim push -u origin master
```

# vcsh – Version Control System for (your) \$HOME

## Examples

### One repository for your Vim config ...

```
vcsh init vim
vcsh vim add ~/.vimrc ~/.vim
vcsh vim commit -m "Initial commit of my Vim configuration"
vcsh vim remote add origin git@my-server.net:vim-repo
vcsh vim push -u origin master
```

### ...another for Zsh

```
vcsh init zsh
vcsh zsh add ~/.zsh ~/.zshrc ~/.zshenv
vcsh zsh commit -m "Initial commit of my Zsh configuration"
vcsh zsh remote add origin git@my-server.net:zsh-repo
vcsh zsh push -u origin master
```

# Git-based tools to ease your life

## Part IV: mr

May, 7th 2014 | Torbjörn Klatt <t.klatt@fz-juelich.de>

## mr – my / multiple repositories

### One command to rule them all

- Problem: a bunch of *vcsh* repos are not very handy
- iterates over list of repos and runs same command on each
- can handle *Git*, *git-svn* and *vcsh* repos equally
- provides bootstrap command to setup/clone an environment on new host
- integrates well with *vcsh* (*mr* config directory can be a *vcsh* repo itself)
- a single Perl script

### Example 1: Cloning and Bootstrapping

```
vcsh list
> vim zsh git ssh bin
mr update      # runs 'git pull' or 'git clone' for each
# downloads named .mrconfig and clones all repos in there
mr bootstrap https://my-server.net/.mrconfig
```

# mr – my / multiple repositories

## Examples

### Status, Commit & Push

```
mr status
```

```
> mr status: /home/t.klatt/.config/vcsh/repo.d/git.git
> mr status: /home/t.klatt/.config/vcsh/repo.d/mr.git
> mr status: /home/t.klatt/.config/vcsh/repo.d/ssh.git
> mr status: /home/t.klatt/.config/vcsh/repo.d/vim.git
> M .vim/bundles.vim
> mr status: /home/t.klatt/.config/vcsh/repo.d/zsh.git
> M .zshrc
> mr status: finished (5 ok)
```

```
mr commit
```

```
# 'git commit -a' is called on every dirty repo
```

```
mr push
```

```
# 'git push' is called on every repo
```



# Git-based tools to ease your life

## Part V: git-annex

May, 7th 2014 | Torbjörn Klatt <t.klatt@fz-juelich.de>

# git-annex – Version Files Without Their Contents

So meta! <sup>2</sup>

- saves meta info (i.e. name, size, SHA-1) of files without their contents
- saves actual files read-only in `.git/annex/objects`  
symlinks them to original/real location
- keeps track of which remote has which files  
each remote identified by UUID
- designed for flaky connections  
uses *rsync* for data transfer

---

<sup>2</sup>Windows users: Wake up!

# git-annex – Version Files Without Their Contents

I mean, so really meta!

- written in Haskell
  - available for Linux, OSX, Android (beta), Windows (alpha)
- allows for special remotes
  - Amazon S3 / Glacier
  - WebDAV
  - rsync
  - the web (`http(s)://`, `ftp://`, `archive.org`, `arxiv.org/[format]/[ID]`, etc.)
  - podcast feeds
  - XMPP
  - simple directories
- example collection of some conference proceedings (slides + video recordings)  
`https://github.com/RichiH/conference\_proceedings`

# git-annex – Version Files Without Their Contents

## Example Szenario: The Archivist <sup>3</sup>

- annex all files
- actual files offline in special remotes on USB drives, tapes, etc.
- having full info about name, size and location of all files in one place at hand

### Example

```
git annex whereis
> whereis my_cool_big_file (1 copy)
>   7570b02e-15e9-11e0-adf0-9f3f94cb2eaa  -- backup drive
> whereis other_file (3 copies)
>   0c443de8-e644-11df-acbf-f7cd7ca6210d  -- here (laptop)
>   62b39bbe-4149-11e0-af01-bb89245a1e61  -- usb drive
>   7570b02e-15e9-11e0-adf0-9f3f94cb2eaa  -- backup drive
```

---

<sup>3</sup> taken from official website

# git-annex – Version Files Without Their Contents

## Example Szenario: The Nomad <sup>4</sup>

- keep copies of data online (on internet)
- sync several local devices for occasional backup
- add data locally while on the road
- sync data to online remotes while at Internet café or friend's place
- drop local copies, still have them online and knowing exactly where
- perfect for photos while traveling

---

<sup>4</sup> taken from official website

# Git-based tools to ease your life

## Part VI: bup

May, 7th 2014 | Torbjörn Klatt <t.klatt@fz-juelich.de>

## bup – Git for LARGE Files

- recap: Git is designed for plaintext files  
binary files are just a huge blob for Git; no diff possible
- uses Git object trees and replaces hashing and packing algorithms
- designed for space-saving incremental backups
- backups can be FUSE mounted
- can be a special remote for *git-annex*
- `bup web`: browse backup trees in web browser
- written in Python

# bup – Git for LARGE Files

## Examples

### Initialization

```
bup init
> Initialized empty Git repository in /backup/homebck
bup index /home/t.klatt # took a few seconds
bup save --name zamws-home-tklatt /home/t.klatt # took about 3min
> Reading index: 203502, done.
> Saving: 100.00% (14743111/14743111k, 203502/203502 files), done.
```

### Browsing

```
# after some time (and daily cron job for backup)
bup ls zamws-home-tklatt | grep -ce '^2014-.*'
> 71
du -sh /home/t.klatt $BUP_DIR
> 18G    /home
> 24G    /backup/homebck
bup web # opens web browser
```



# THE CRASH

*or stupid action (cd ~ && rm -rf \*) while drunk*

[t.klatt@zam]>\_

# bup – Git for LARGE Files

## Example

### Backup Recovering

```
cd /home/t.klatt
export BUP_DIR=/backup/homebck
bup restore -C . zamws-home-tklatt/latest/home/t.klatt/
> Restoring ... # takes some time; much longer than 'bup init & bup save'
```

# Git-based tools to ease your life

## Part VII: gcrypt

May, 7th 2014 | Torbjörn Klatt <t.klatt@fz-juelich.de>

## gcrypt – GPG-encrypted Git remotes

- implements a git-remote-handler to deal with `gcrypt : remotes` transport via *rsync*, *sftp* or *git*
- remote repository is GPG-encrypted for one or multiple participants
- each pack is encrypted with a symmetric key stored in a asymmetric encrypted manifest file
- can be a special remote for *git-annex*
- Hint: use it as a remote for your *etckeeper*'s repo
- Remark: You might want to use Joey "joeyh" Hess' fork of *gcrypt*<sup>5</sup>

---

<sup>5</sup><https://github.com/joeyh/git-remote-gcrypt> because it has some bugfixes not yet merged upstream

# gcrypt – GPG-encrypted Git remotes

## Example

### Initialization and Committing

```
git init & git add my_secret_file & git commit -m "secret file"
git remote add secret-server gcrypt::git@my-server.net:secret-repo
git push secret-server master
```

### Cloning as Participant

```
git clone git@my-server.net:secret-repo
ls -lA secret-repo
> -rw----- 1 t.klatt users 303 Jan 15 09:24 0153f2b0...ea5f861d
> -rw----- 1 t.klatt users 1.4K Jan 15 09:24 91bd0c09...4881aa0a
> drwx----- 1 t.klatt users 138 Jan 15 09:25 .git
gpg -d 91bd0c09...4881aa0a
> fc564bef...94c3ff80 refs/heads/master
> pack :SHA256:0153f2b0...ea5f861d w+bxes2v...1MCkGi8+
> repo :id:3lmzxTGoXJVMHPtfaf0Tf
```

# Git-based tools to ease your life

## Part VIII: Tipps

May, 7th 2014 | Torbjörn Klatt <t.klatt@fz-juelich.de>

# Tipps

## I can't resist ...

- portable GUI for Git (browsing and actions): *git-cola*<sup>6</sup>
- *Zsh* as the main Shell on Unix and OSX
  - very powerful built-in completion for most programs (Git: incl. selecting branches/tags)
  - prompt-integrated info about current VCS working copy
  - highly customizable prompt (left and right)
  - can mimic Bash, Ksh, tcsh (never tried it myself)

---

<sup>6</sup><https://github.com/git-cola/git-cola>

Finally ...

You cannot time travel in real-life.  
But you can in your digital life.  
Selectively. Everywhere.



## Project Links

`etckeeper` <https://github.com/agimenez/etckeeper>

`vcsh` <https://github.com/RichiH/vcsh>

`mr` <https://github.com/joeyh/myrepos>

`git-annex` <https://git-annex.branchable.com/>

`bup` <https://github.com/bup/bup>

`gcrypt` <https://github.com/blake2-ppc/git-remote-gcrypt>

## Sources

- This talk is heavily inspired by Richard “*RichiH*” Hartman’s talk at *Linuxtag 2013*<sup>7</sup>
- official and unofficial documentation of named tools
- (long-term) experiments with named tools

---

<sup>7</sup> <http://www.linuxtag.org/2013/de/program/mittwoch-22-mai-2013.html?eventid=147>

# Thank you for your interest!

## Questions?

(now or later)

Building 16.3

Room 022

Tel 96452

eMail [t.klatt@fz-juelich.de](mailto:t.klatt@fz-juelich.de)

PGP-Key 0x64216AF3

Fingerprint 7176 4979 01E4 C412 BCCC  
B403 F4E5 CF72 6421 6AF3