

GIT

DISTRIBUTED IS THE NEW CENTRALISED

BEGINNER WORKSHOP

FETCH YOURSELF LAPTOP

INSTALLING

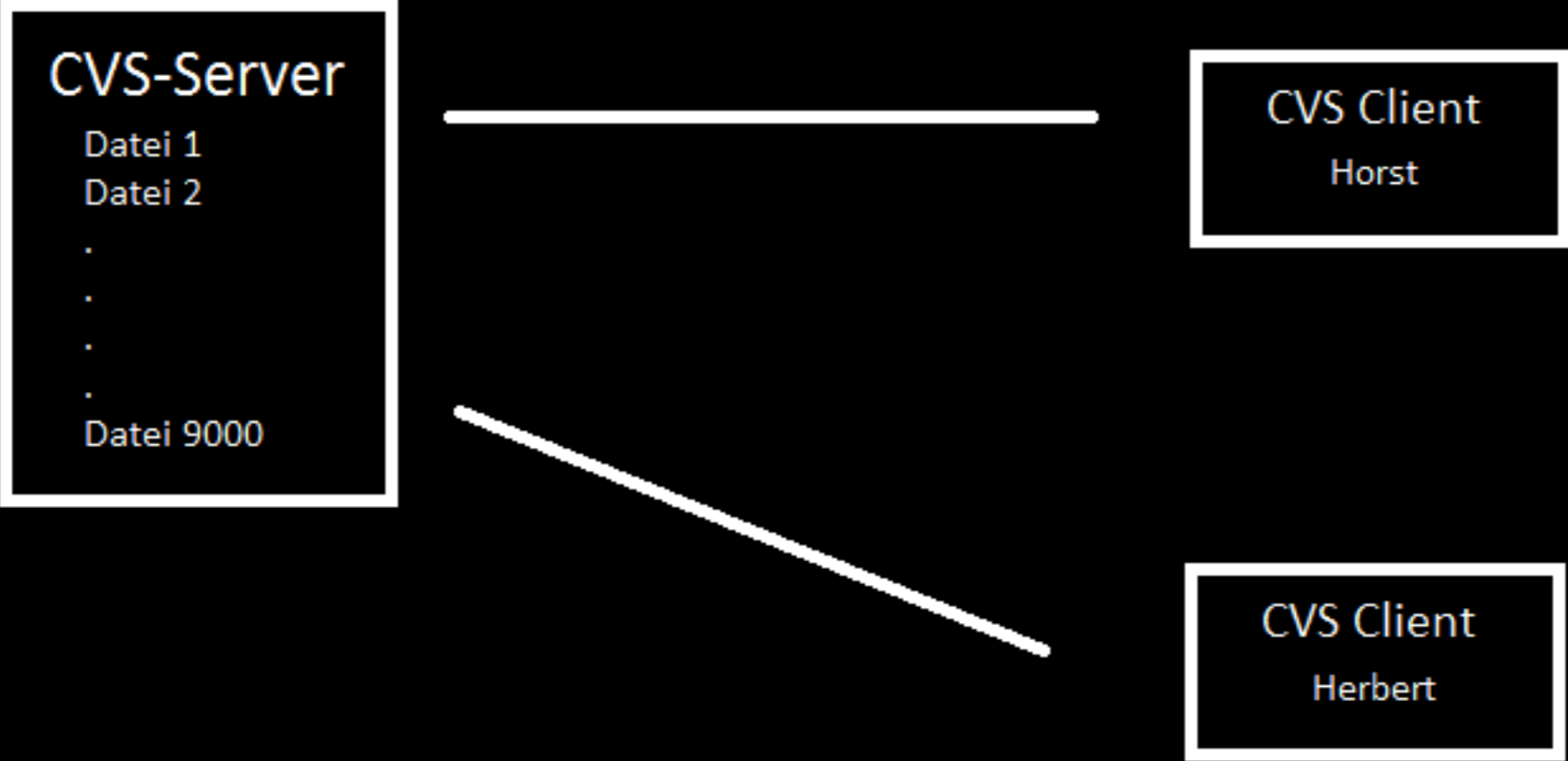
- linux: `sudo apt-get install git`
- linux: `sudo yum install git`
- osx: `brew install git`
- osx: `macports install git`
- windows: <https://msysgit.github.io>

LINUS TORVALDS

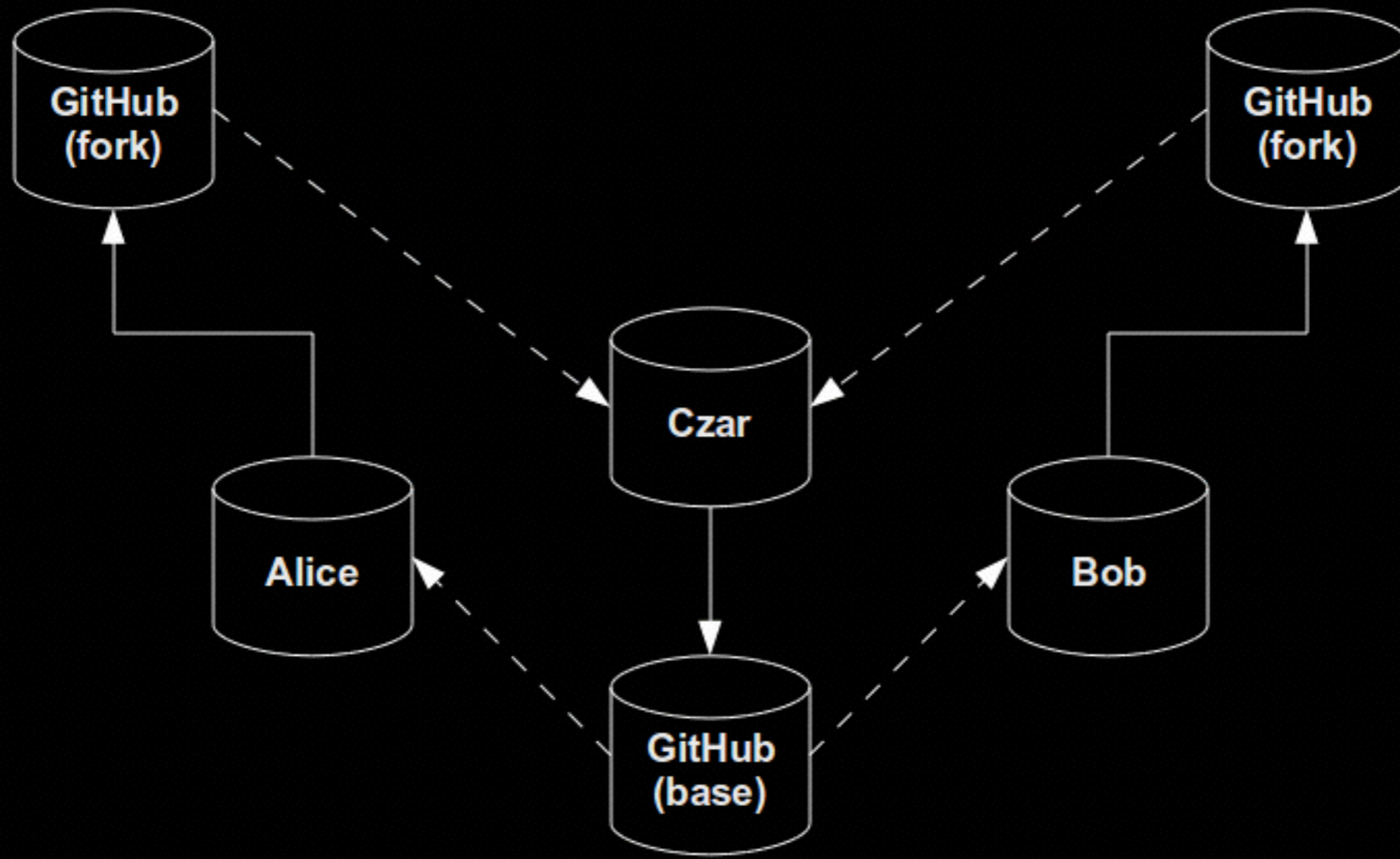
ORIGINAL AUTHOR, 2005

(D)CVS

(DISTRIBUTED) CONCURRENT VERSIONS SYSTEM



CVS

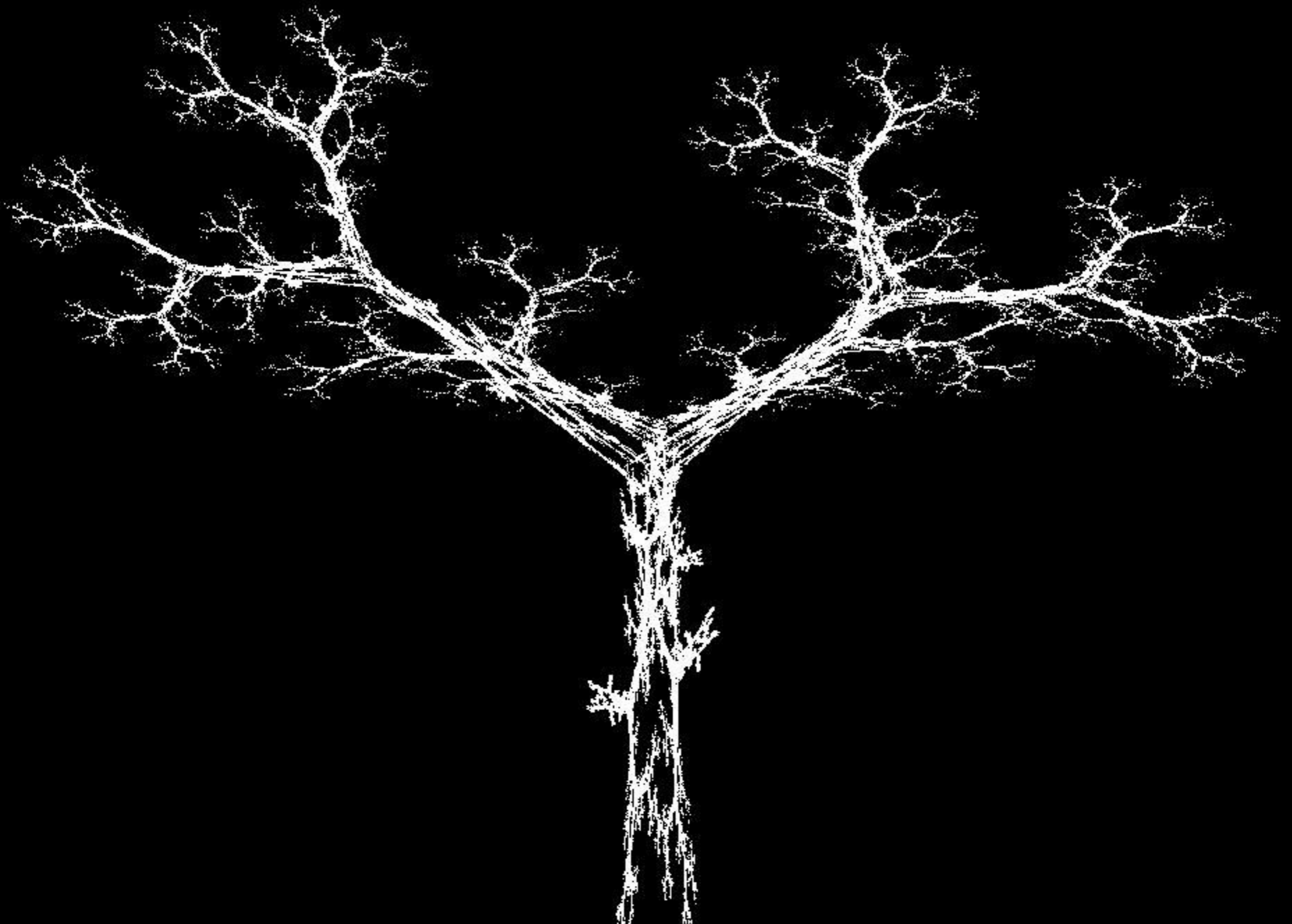


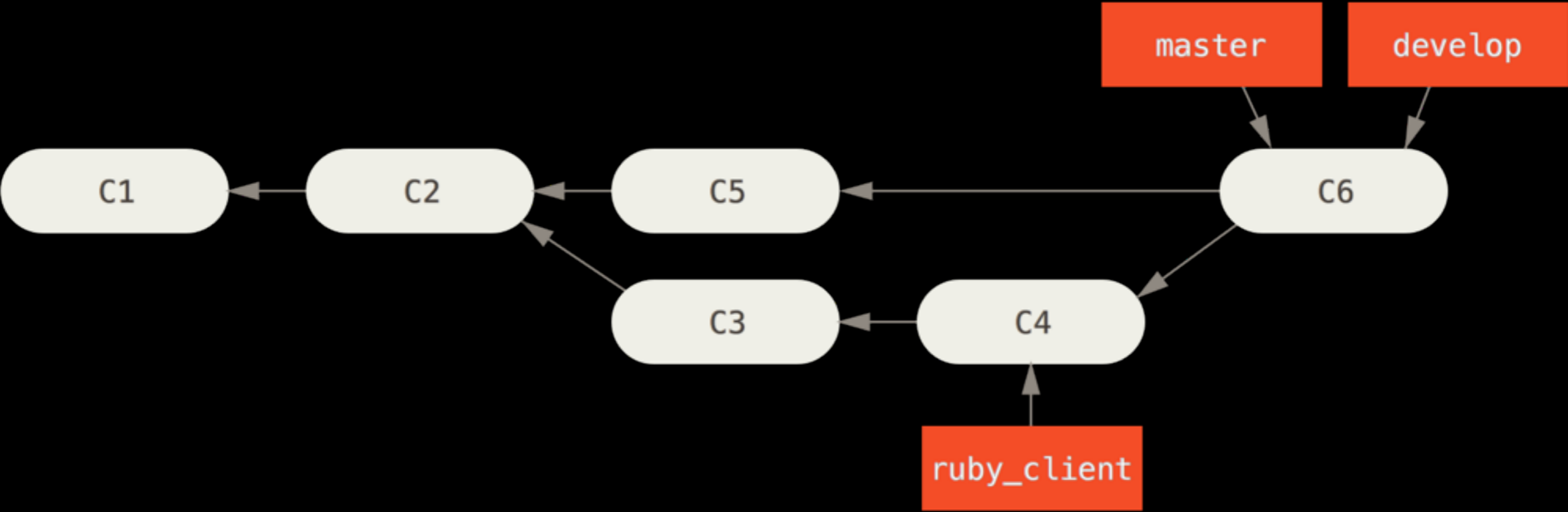
DCVS

- GITHUB
- BITBUCKET
- GITLAB
- GITOLITE
- GERRIT

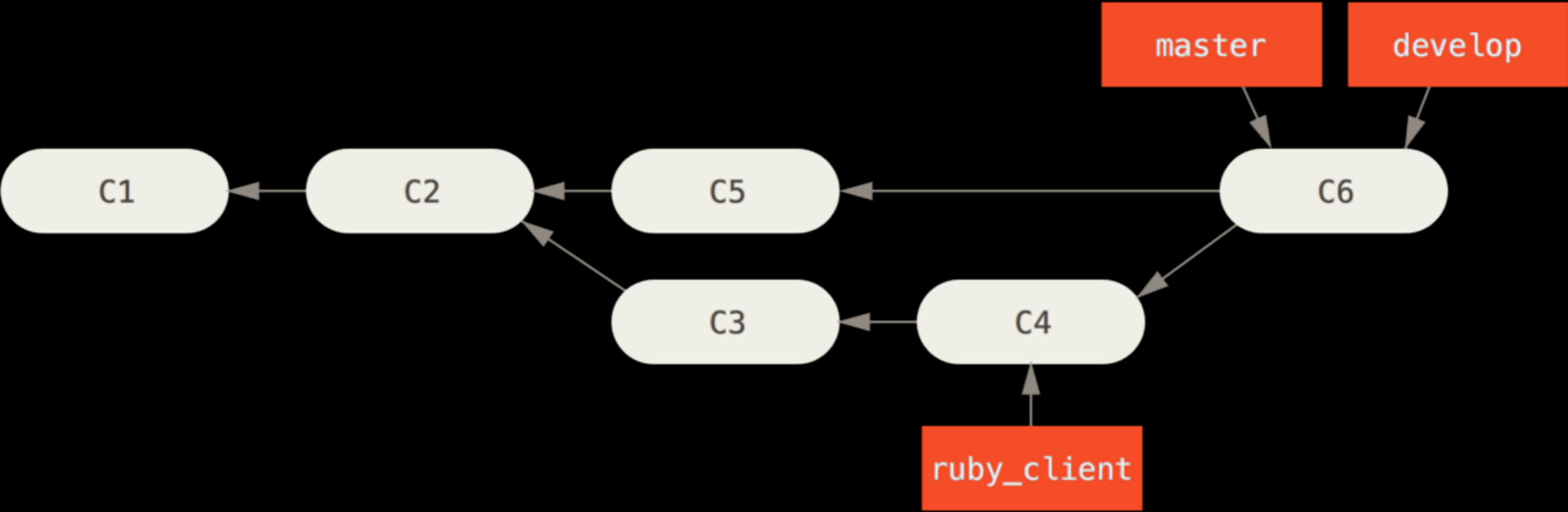
LEGEND

TREE





BRANCH



COMMIT

```
> git show ead328225dda88ac4c51c5ee3b2419b0d4f79869
commit ead328225dda88ac4c51c5ee3b2419b0d4f79869
Merge: da1423e 948d263
Author: Pavol Rusnak <stick@gk2.sk>
Date:   Fri Apr 22 04:28:09 2011 +0200
```

```
Merge branch 'master' of github.com:brmlab/brmbar
```


COMMIT ID

ead328225dda88ac4c51c5ee3b2419b0d4f79869

SHORT COMMIT ID

ead3282

REPOSITORY

.git/

```
> ls .git/  
index  
config  
hooks  
packed-refs  
objects  
refs  
logs  
info  
FETCH_HEAD  
description  
ORIG_HEAD  
HEAD
```

GET
STARTED

```
> git help
```

```
> git help
```

```
usage: git [--version] [--help] [-C <path>] [-c name=value]
        [--exec-path[=<path>]] [--html-path] [--man-path] [--info-path]
        [-p | --paginate | --no-pager] [--no-replace-objects] [--bare]
        [--git-dir=<path>] [--work-tree=<path>] [--namespace=<name>]
        <command> [<args>]
```

The most commonly used git commands are:

add	Add file contents to the index
bisect	Find by binary search the change that introduced a bug
branch	List, create, or delete branches
checkout	Checkout a branch or paths to the working tree
clone	Clone a repository into a new directory
commit	Record changes to the repository
diff	Show changes between commits, commit and working tree, etc
fetch	Download objects and refs from another repository
grep	Print lines matching a pattern
init	Create an empty Git repository or reinitialize an existing one
log	Show commit logs
merge	Join two or more development histories together
mv	Move or rename a file, a directory, or a symlink
pull	Fetch from and integrate with another repository or a local branch
push	Update remote refs along with associated objects
rebase	Forward-port local commits to the updated upstream head
reset	Reset current HEAD to the specified state
rm	Remove files from the working tree and from the index
show	Show various types of objects
status	Show the working tree status
tag	Create, list, delete or verify a tag object signed with GPG

'git help -a' and 'git help -g' list available subcommands and some concept guides. See 'git help <command>' or 'git help <concept>' to read about a specific subcommand or concept.

```
> git help -a
```

WILL SHOW ALL CURRENTLY AVAILABLE COMMANDS
COMMANDS DIFFER BETWEEN GIT VERSIONS AND CONFIGURATIONS


```
> git help -a
```

```
usage: git [--version] [--help] [-C <path>] [-c name=value]
        [--exec-path[=<path>]] [--html-path] [--man-path] [--info-path]
        [-p | --paginate | --no-pager] [--no-replace-objects] [--bare]
        [--git-dir=<path>] [--work-tree=<path>] [--namespace=<name>]
        <command> [<args>]
```

```
available git commands in '/usr/lib/git-core/'
```

add	credential-store	imap-send	pack-refs	shell
add--interactive	cvsexportcommit	index-pack	patch-id	shortlog
am	cvsimport	init	prune	show
annotate	cvsserver	init-db	prune-packed	show-branch
apply	daemon	instaweb	pull	show-index
archimport	describe	interpret-trailers	push	show-ref
archive	diff	log	quiltimport	stage
bisect	diff-files	ls-files	read-tree	stash
bisect--helper	diff-index	ls-remote	rebase	status
blame	diff-tree	ls-tree	receive-pack	strip-space
branch	difftool	mailinfo	reflog	submodule
bundle	difftool--helper	mailsplit	relink	svn
cat-file	fast-export	merge	remote	symbolic-ref
check-attr	fast-import	merge-base	remote-ext	tag
check-ignore	fetch	merge-file	remote-fd	unpack-file
check-mailmap	fetch-pack	merge-index	remote-ftp	unpack-objects
check-ref-format	filter-branch	merge-octopus	remote-ftps	update-index
checkout	fmt-merge-msg	merge-one-file	remote-http	update-ref
checkout-index	for-each-ref	merge-ours	remote-https	update-server-info
cherry	format-patch	merge-recursive	remote-testsvn	upload-archive
cherry-pick	fsck	merge-resolve	repack	upload-pack
citool	fsck-objects	merge-subtree	replace	var
clean	gc	merge-tree	request-pull	verify-commit
clone	get-tar-commit-id	mergetool	rerere	verify-pack
column	grep	mktag	reset	verify-tag
commit	gui	mktree	rev-list	web--browse
commit-tree	gui--askpass	mv	rev-parse	whatchanged
config	hash-object	name-rev	revert	write-tree
count-objects	help	notes	rm	
credential	http-backend	p4	send-email	
credential-cache	http-fetch	pack-objects	send-pack	
credential-cache--daemon	http-push	pack-redundant	sh-118n--envsubst	

CREATE
FIRST
REPOSITORY

```
> git init
```

CREATE REPOSITORY IN CURRENT FOLDER

```
> git init
```

```
Initialized empty Git repository in /tmp/repository/.git/
```

DOWNLOAD REPOSITORY

```
> git clone http://...
```

CREATE COPY OF REPOSITORY FROM URL

```
> git clone https://github.com/brmlab/brmbar .  
Cloning into '.'...  
remote: Counting objects: 1077, done.  
remote: Total 1077 (delta 0), reused 0 (delta 0), pack-reused 1077  
Receiving objects: 100% (1077/1077), 282.15 KiB | 0 bytes/s, done.  
Resolving deltas: 100% (654/654), done.  
Checking connectivity... done.
```

CLONE (COPY)
REPOSITORY


```
> git clone /home/folder
```

CREATE CLONE OF REPOSITORY ON FILESYSTEM
ALSO WORKS WITH WINDOWS PATHS

```
> mkdir /tmp/repository2
> cd /tmp/repository2
> git clone /tmp/repository/
Cloning into 'repository'...
warning: You appear to have cloned an empty repository.
done.
```

```
> rm -rf /tmp/repository2
> mkdir /tmp/repository2
> cd /tmp/repository2
> git clone /tmp/repository _
Cloning into '.'...
done.
```

DOES
IT
WORK?

> git status

GET INFORMATION ABOUT REPOSITORY

```
> cd /tmp/repository2
```

```
> git status
```

```
On branch master
```

```
Your branch is up-to-date with 'origin/master'.
```

```
nothing to commit, working directory clean
```

CHANGE
SOMETHING !

```
> git add
```

ADD MODIFIED OR NEW FILES TO INDEX


```
> cd /tmp/repository2/
```

```
> touch NEW_FILE
```

```
> git status
```

```
On branch master
```

```
Your branch is up-to-date with 'origin/master'.
```

```
Untracked files:
```

```
(use "git add <file>..." to include in what will be committed)
```

```
NEW_FILE
```

```
nothing added to commit but untracked files present (use "git add" to track)
```

```
> git add NEW_FILE
```

```
> git status
```

```
On branch master
```

```
Your branch is up-to-date with 'origin/master'.
```

```
Changes to be committed:
```

```
  (use "git reset HEAD <file>..." to unstage)
```

```
new file:   NEW_FILE
```

```
> cd /tmp/repository2/
```

```
> touch NEW_FILE
```

```
> git status
```

```
On branch master
```

```
Your branch is up-to-date with 'origin/master'.
```

```
Untracked files:
```

```
  (use "git add <file>..." to include in what will be committed)
```

```
NEW_FILE
```

```
nothing added to commit but untracked files present (use "git add" to track)
```

```
> git add --all
```

ADD ALL CHANGES IN REPOSITORY TO INDEX

```
> touch MY_FILE
> git status
On branch master
Your branch is up-to-date with 'origin/master'.
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    new file:   NEW_FILE

Untracked files:
  (use "git add <file>..." to include in what will be committed)

    MY_FILE

> git add --all
> git status
On branch master
Your branch is up-to-date with 'origin/master'.
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

    new file:   MY_FILE
    new file:   NEW_FILE
```

SAVE
CHANGES

```
> git commit
```

WILL SAVE CHANGES IN THE INDEX TO REPOSITORY
WILL PROMPT YOU FOR COMMIT "MESSAGE" (DESCRIPTION)

```
> git commit -m "..."
```

WILL SAVE CHANGES IN THE INDEX TO REPOSITORY
WILL ADD TEXT BETWEEN PARENTHESES AS COMMIT MESSAGE (DESCRIPTION)


```
> git commit -m "Commit Description"
[master 2ea706d] Commit Description
 2 files changed, 0 insertions(+), 0 deletions(-)
 create mode 100644 MY_FILE
 create mode 100644 NEW_FILE
```

```
> git status
On branch master
Your branch is ahead of 'origin/master' by 1 commit.
  (use "git push" to publish your local commits)
nothing to commit, working directory clean
```

REVERT
CHANGES

```
> git reset
```

REMOVE INDEXED CHANGES

```
> rm MY_FILE
```

```
> git status
```

```
On branch master
```

```
Your branch is ahead of 'origin/master' by 1 commit.
```

```
(use "git push" to publish your local commits)
```

```
Changes not staged for commit:
```

```
(use "git add/rm <file>..." to update what will be committed)
```

```
(use "git checkout -- <file>..." to discard changes in working directory)
```

```
deleted:    MY_FILE
```

```
no changes added to commit (use "git add" and/or "git commit -a")
```

```
> git reset
```

```
Unstaged changes after reset:
```

```
D MY_FILE
```

```
> git status
```

```
On branch master
```

```
Your branch is ahead of 'origin/master' by 1 commit.
```

```
(use "git push" to publish your local commits)
```

```
Changes not staged for commit:
```

```
(use "git add/rm <file>..." to update what will be committed)
```

```
(use "git checkout -- <file>..." to discard changes in working directory)
```

```
deleted:    MY_FILE
```

```
no changes added to commit (use "git add" and/or "git commit -a")
```

REVERT
CHANGES !

```
> git reset --hard
```

REMOVES ALL NOT COMMITTED CHANGES IN CURRENT REPOSITORY
BE CAREFUL !

```
> git reset --hard
HEAD is now at 2ea706d Commit Description
> git status
On branch master
Your branch is ahead of 'origin/master' by 1 commit.
  (use "git push" to publish your local commits)
nothing to commit, working directory clean
```


DISTRIBUTE CHANGES

```
> git remote -v
```

SHOW KNOWN REPOSITORIES THAT HAS COMMON ROOT

```
> cd /tmp/repository2/  
> git remote -v  
origin /tmp/repository (fetch)  
origin /tmp/repository (push)
```

```
> cd /tmp/repository/  
> git remote -v  
origin https://github.com/brmlab/brmbar (fetch)  
origin https://github.com/brmlab/brmbar (push)
```

```
> git push
```

WILL PUSH LOCAL CHANGES TO SPECIFIC REMOTE

```
> git push {remote} {branch}
```

WILL PUSH LOCAL CHANGES TO SPECIFIC REMOTE

```
> cd /tmp/repository2/
> git push origin master
Counting objects: 3, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 286 bytes | 0 bytes/s, done.
Total 3 (delta 1), reused 0 (delta 0)
remote: error: refusing to update checked out branch: refs/heads/master
remote: error: By default, updating the current branch in a non-bare repository
remote: error: is denied, because it will make the index and work tree inconsistent
remote: error: with what you pushed, and will require 'git reset --hard' to match
remote: error: the work tree to HEAD.
remote: error:
remote: error: You can set 'receive.denyCurrentBranch' configuration variable to
remote: error: 'ignore' or 'warn' in the remote repository to allow pushing into
remote: error: its current branch; however, this is not recommended unless you
remote: error: arranged to update its work tree to match what you pushed in some
remote: error: other way.
remote: error:
remote: error: To squelch this message and still keep the default behaviour, set
remote: error: 'receive.denyCurrentBranch' configuration variable to 'refuse'.
To /tmp/repository
 ! [remote rejected] master -> master (branch is currently checked out)
error: failed to push some refs to '/tmp/repository'
```

DOWNLOAD
REMOTE
CHANGES

```
> git pull {remote}
```

DOWNLOAD REMOTE CHANGES TO LOCAL REPOSITORY


```
> cd /tmp/repository/
> git remote -v
origin https://github.com/brmlab/brmbar (fetch)
origin https://github.com/brmlab/brmbar (push)
> git remote add local /tmp/repository2
> git pull local
From /tmp/repository2
 * [new branch]      master      -> local/master
You asked to pull from the remote 'local', but did not specify
a branch. Because this is not the default configured remote
for your current branch, you must specify a branch on the command line.
```

```
> git fetch {remote}
```

DOWNLOAD REMOTE CHANGES TO LOCAL REPOSITORY

```
> git fetch local
remote: Counting objects: 3, done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 1), reused 0 (delta 0)
Unpacking objects: 100% (3/3), done.
From /tmp/repository2
* [new branch]      master      -> local/master
```

```
> git merge {remote}/{branch}
```

COMBINE TWO REPOSITORIES STATES INTO ONE

```
> git branch -a
* master
  remotes/local/master
  remotes/origin/HEAD -> origin/master
  remotes/origin/brmbar3
  remotes/origin/db-reconnect
  remotes/origin/master
  remotes/origin/test_cache
```

```
> git merge local/master
Updating 84881de..2ea706d
Fast-forward
 MY_FILE    | 0
NEW_FILE    | 0
2 files changed, 0 insertions(+), 0 deletions(-)
create mode 100644 MY_FILE
create mode 100644 NEW_FILE
```

DOES IT
WORK?

```
> git status
```

```
On branch master
```

```
Your branch is ahead of 'origin/master' by 1 commit.
```

```
(use "git push" to publish your local commits)
```

```
nothing to commit, working directory clean
```



```
> git diff origin/master
diff --git a/MY_FILE b/MY_FILE
new file mode 100644
index 0000000..e69de29
diff --git a/NEW_FILE b/NEW_FILE
new file mode 100644
index 0000000..e69de29
```

EXTRA
SAUSAGES

```
> git log
```

GET HISTORY OF CURRENT REPOSITORY+BRANCH COMMITS

```
* 549230620dd028246b06657cb8cf46bf3145f0c5 Merge branch 'master' of https://github.com/brmlab/brmbar
| \
| * 81defee782627b022eb530525311f063c4c18141 added more items
* | 4d23ff7e7a4622963c91892d3e3c506bb872f833 Added simple pixel graphics
| /
* a251f6682c2d5a63df3a99ff24086f03a3db6bf3 Merge branch 'master' of https://github.com/brmlab/brmbar
| \
| * d86b9763c09a771a069845f705705bae3d48b5cf use abs for values
| * 3cbb55a2be86ac1a16c2ac6f55cb54fe8d8c49d1 barcodes
| * 4986b6c2882459c3362384ee8ce15d2cb0081b2c add barcode generator
| * 0ed434d9d215f5c02351da07b05192aba439a22f code done
| * dd772c2ea32e21fffd887f6c7f57a3038a2e9fad Merge branch 'master' of github.com:brmlab/brmbar
| \
| * \ ead328225dda88ac4c51c5ee3b2419b0d4f79869 Merge branch 'master' of github.com:brmlab/brmbar
| | \
| * | | da1423ee1c6f11aef0e98ade4fcecbe1a63f3772 fix applogic
* | | | 70468b2fddade9048f21e7e29ec12a0c6f2eede9 Items: Added all the items that we have here now
| | /
| /
* | | d8f8458dee1ef5f44faffa963a24ea031d63c256 dataio.c: Modification by zero only reads the current credit
| /
| \
* | 948d2630a46242dec0df92d8fcb456f1abba9923 Added dataio.h/c
| /
* 3d8cbd98b41e9e075adac411cd72aff96eb747c7 Merge branch 'master' of github.com:brmlab/brmbar
| \
| * 8b49a62f9eb149f9e1ab3ef87bdb503ccdc395 Itemio: Items can be loaded from the data file
| * bf838ea04649d03c4eb4980ba7b46b33eef1c44 Separated I/O operations into itemio.c
* | d0dffee14d36f3aebbbdef42fa7fa9081b2b7e1d wip
* | 521af62b2435e3ebd54407f01c8b2b9c4f6c2ce9 Merge branch 'master' of github.com:brmlab/brmbar
| \
| \
| * 842a6eb13fc8a3f7bedeb66becb8569ab50ad4dd Makefile: Added defines.h to dependencies for brmbar.c
| * 564f8ab87c35ea42e993837d5555b1b919056b59 brmbar.c uses definitions now
| * 56c86964b2497b68ad29a6d0e7501d892b570522 Added defines.h
* | 3fac0f79d247ee6f8ee5a47b15d03a0b15fa1dc0 reading items wip
| /
* 0c25b1467c1cccc5cb25eb1d3cad9e110d0c1da5 fill items
* cd804dcd45ed386d6279000b761384f59055516c small changes
* f5fe42ab86f7a4b08bffdb37fdd4d7e669065414 init
```

```

*      a251f66 2011-04-22 Merge branch 'master' of https://github.com/brmlab/brmbar (Cestmir Houska)
| \
| *      d86b976 2011-04-22 use abs for values (Pavol Rusnak)
| *      3cbb55a 2011-04-22 barcodes (Pavol Rusnak)
| *      4986b6c 2011-04-22 add barcode generator (Pavol Rusnak)
| *      0ed434d 2011-04-22 code done (Pavol Rusnak)
| *      dd772c2 2011-04-22 Merge branch 'master' of github.com:brmlab/brmbar (Pavol Rusnak)
| \
| *      ead3282 2011-04-22 Merge branch 'master' of github.com:brmlab/brmbar (Pavol Rusnak)
| \
| *      da1423e 2011-04-22 fix applogic (Pavol Rusnak)
| *      70468b2 2011-04-22 Items: Added all the items that we have here now (Cestmir Houska)
| \
| *      d8f8458 2011-04-22 dataio.c: Modification by zero only reads the current credit (Cestmir Houska)
| \
| *      948d263 2011-04-22 Added dataio.h/c (Cestmir Houska)
| \
| *      3d8cbd9 2011-04-22 Merge branch 'master' of github.com:brmlab/brmbar (Pavol Rusnak)
| \
| *      8b49a62 2011-04-22 Itemio: Items can be loaded from the data file (Cestmir Houska)
| *      bf838ea 2011-04-22 Separated I/O operations into itemio.c (Cestmir Houska)
| *      d0dffee 2011-04-22 wip (Pavol Rusnak)
| *      521af62 2011-04-22 Merge branch 'master' of github.com:brmlab/brmbar (Pavol Rusnak)
| \
| *      842a6eb 2011-04-22 Makefile: Added defines.h to dependencies for brmbar.c (Cestmir Houska)
| *      564f8ab 2011-04-22 brmbar.c uses definitions now (Cestmir Houska)
| *      56c8696 2011-04-22 Added defines.h (Cestmir Houska)
| *      3fac0f7 2011-04-22 reading items wip (Pavol Rusnak)
| \
| *      0c25b14 2011-04-22 fill items (Pavol Rusnak)
| *      cd804dc 2011-04-22 small changes (Pavol Rusnak)
| *      f5fe42a 2011-04-22 init (Pavol Rusnak)

```

```
> git config --local -l
```

LIST CONFIGURATION OF CURRENT REPOSITORY

```
> git config -l --local
core.repositoryformatversion=0
core.filemode=true
core.bare=false
core.logallrefupdates=true
core.ignorecase=true
core.precomposeunicode=true
remote.origin.url=https://github.com/brmlab/brmbar
remote.origin.fetch=+refs/heads/*:refs/remotes/origin/*
branch.master.remote=origin
branch.master.merge=refs/heads/master
remote.local.url=/tmp/repository2
remote.local.fetch=+refs/heads/*:refs/remotes/local/*
```

```
> git config --global -l
```

LIST CONFIGURATION OF CURRENT REPOSITORY


```
> git config -l --global
user.name=My Name
user.email=my.email@domain.tld
core.excludesfile=/home/username/.gitignore_global
core.editor=nano
core.autocrlf=input
core.savercrlf=false
merge.tool=meld
push.default=matching
```

```
> git clone --bare {URL}
```

CREATE BARE COPY OF REMOTE REPOSITORY

```
> git clone --bare https://github.com/brmlab/brmbar .  
Cloning into bare repository '.'...  
remote: Counting objects: 1077, done.  
remote: Total 1077 (delta 0), reused 0 (delta 0), pack-reused 1077  
Receiving objects: 100% (1077/1077), 282.15 KiB | 0 bytes/s, done.  
Resolving deltas: 100% (654/654), done.  
Checking connectivity... done.
```

```
> find . -maxdepth 1
```

```
.  
./config  
./description  
./HEAD  
./hooks  
./info  
./objects  
./packed-refs  
./refs
```

GIT HOOKS

HOOKS EXECUTED ON VARIOUS REPOSITORY ACTIONS

```
> ls -lsa .git/hooks
.  
..  
applypatch-msg.sample  
commit-msg.sample  
post-update.sample  
pre-applypatch.sample  
pre-commit.sample  
pre-push.sample  
pre-rebase.sample  
prepare-commit-msg.sample  
update.sample
```

REPOSITORY STRUCTURE

```
> find .git/refs/  
.git/refs/  
.git/refs/heads  
.git/refs/heads/master  
.git/refs/remotes  
.git/refs/remotes/local  
.git/refs/remotes/local/master  
.git/refs/remotes/origin  
.git/refs/remotes/origin/HEAD  
.git/refs/tags
```



```
> find .git/objects/
.git/objects/
.git/objects/2e
.git/objects/2e/a706dbc96e1fa451a4f7b7156c80faca55d401
.git/objects/9f
.git/objects/9f/b33adf91bcf4c91ba62246e1744f14acece2d9
.git/objects/e6
.git/objects/e6/9de29bb2d1d6434b8b29ae775ad8c2e48c5391
.git/objects/info
.git/objects/pack
.git/objects/pack/pack-6e351fb5c3fe0006cb683cf362ce88127c01a255.idx
.git/objects/pack/pack-6e351fb5c3fe0006cb683cf362ce88127c01a255.pack
```

```
> git gc
```

COLLECT GARBAGE WITHIN REPOSITORY

```
> git gc
```

```
Counting objects: 1080, done.
```

```
Delta compression using up to 4 threads.
```

```
Compressing objects: 100% (410/410), done.
```

```
Writing objects: 100% (1080/1080), done.
```

```
Total 1080 (delta 655), reused 1076 (delta 654)
```