Introduction to Git

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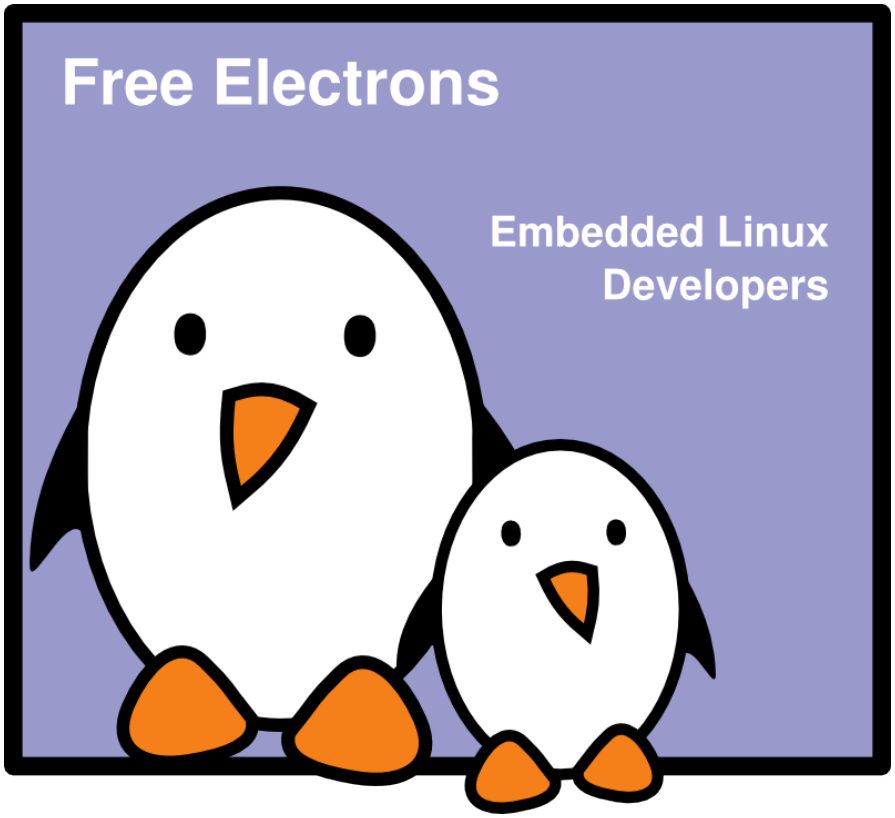


Latest update: Dec 24, 2009,
Document sources, updates and translations:
http://free-electrons.com/docs/git
Corrections, suggestions, contributions and translations are welcome!

What is Git?

- A version control system, like CVS, SVN, Perforce or ClearCase
- Originally developed for the Linux kernel development, now used by a large number of projects, including U-Boot, GNOME, Buildroot, uClibc and many more
- Contrary to CVS or SVN, Git is a *distributed* version control system
  - No central repository
  - Everybody has a local repository
  - Local branches are possible, and very important
  - Easy exchange of code between developers
  - Well-suited to the collaborative development model used in open-source projects

Install and setup

- Git is available as a package in your distribution
  `sudo apt-get install git-core`
- Everything is available through the `git` command
  - `git` has many commands, called using `git <command>`, where `<command>` can be `clone`, `checkout`, `branch`, etc.
  - Help can be found for a given `command` using
    `git help <command>`
- Setup your name and e-mail address
  - They will be referenced in each of your commits
  - `git config --global user.name 'My Name'`
  - `git config --global user.email me@mydomain.net`

Clone a repository

- To start working on a project, you use Git's `clone` operation.
- With CVS or SVN, you would have used the `checkout` operation, to get a working copy of the project (latest version)
- With Git, you get a full copy of the repository, including the history, which allows to perform most of the operations offline.
- Cloning Linus Torvalds' Linux kernel repository
  ```
  git clone git://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux-2.6.git
  ```
- `git://` is a special Git protocol. Most repositories can also be accessed using `http://`, but this is slower.
- After cloning, in `linux-2.6/`, you have the repository and a working copy of the *master* branch.

Explore the history

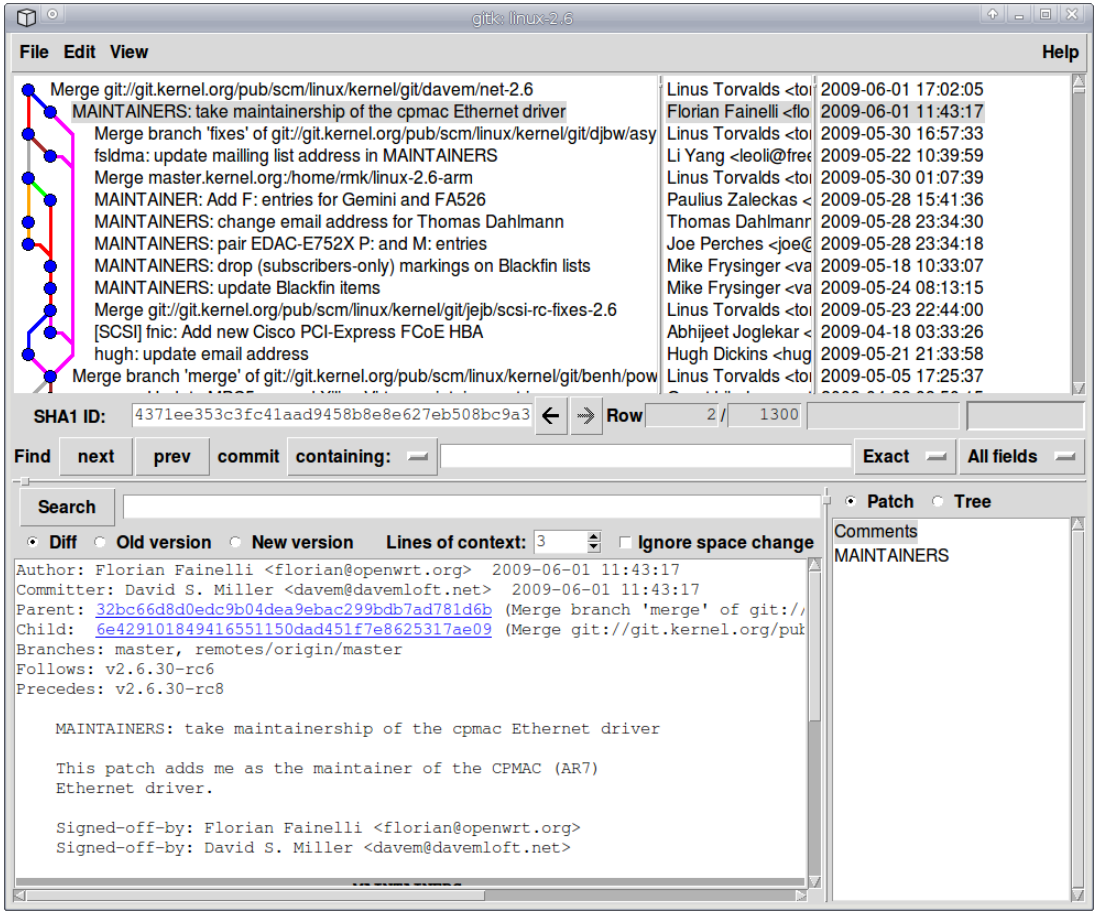
- `git log` will list all the commits. The latest commit is the first.

```
commit 4371ee353c3fc41aad9458b8e8e627eb508bc9a3
Author: Florian Fainelli <florian@openwrt.org>
Date:   Mon Jun 1 02:43:17 2009 -0700

    MAINTAINERS: take maintainership of the cpmac Ethernet driver

    This patch adds me as the maintainer of the CPMAC (AR7)
    Ethernet driver.

    Signed-off-by: Florian Fainelli <florian@openwrt.org>
    Signed-off-by: David S. Miller <davem@davemloft.net>
```

- `git log -p` will list the commits with the corresponding diff
- The history in Git is not linear like in CVS or SVN, but it is a graph of commits
  - Makes it a little bit more complicated to understand at the beginning
  - But this is what allows the powerful features of Git (distributed, branching, merging)

Visualize the history

- *gitk* is a graphical tool that represents the history of the current Git repository
- Can be installed from the `gitk` package



Visualize the history

- Another great tool is the Web interface to Git. For the kernel, it is available at http://git.kernel.org/

/pub/scm / linux/kernel/git/torvalds/linux-2.6.git / commitdiff git

summary | shortlog | log | commit | commitdiff | tree
raw (merge: 8623661 84047e3) commit search:

Merge branch 'tracing-urgent-for-linus' of git://git.kernel.org/pub/scm/linux/kernel ... master

Linus Torvalds [Thu, 11 Jun 2009 02:58:10 +0000 (19:58 -0700)]

```
* 'tracing-urgent-for-linus' of git://git.kernel.org/pub/scm/linux/kernel/git/tip/linux-2.6-tip:
  function-graph: always initialize task ret_stack
  function-graph: move initialization of new tasks up in fork
  function-graph: add memory barriers for accessing task's ret_stack
  function-graph: enable the stack after initialization of other variables
  function-graph: only allocate init tasks if it was not already done

Manually fix trivial conflict in kernel/trace/ftrace.c
```

kernel/fork.c	patch | blob | history
kernel/trace/ftrace.c	patch | blob | history
kernel/trace/trace_functions_graph.c	patch | blob | history

diff --git a/kernel/fork.c b/kernel/fork.c

```
index 5449efb..bb762b4 100644 (file)
--- a/kernel/fork.c
+++ b/kernel/fork.c
@@ -981,6 +981,8 @@ static struct task_struct *copy_process(unsigned long clone_flags,
        if (!p)
                goto fork_out;

+       ftrace_graph_init_task(p);
+
        rt_mutex_init_task(p);

 #ifdef CONFIG_PROVE_LOCKING
```

Update your repository

- The repository that has been cloned at the beginning will change over time
- Updating your local repository to reflect the changes of the remote repository will be necessary from time to time
- `git pull`
- Internally, does two things
  - Fetch the new changes from the remote repository (`git fetch`)
  - Merge them in the current branch (`git merge`)

Tags

- The list of existing tags can be found using
  `git tag -l`
- To check out a working copy of the repository at a given tag
  `git checkout <tagname>`
- To get the list of changes between a given tag and the latest available version
  `git log v2.6.30..master`
- List of changes with diff on a given file between two tags
  `git log v2.6.29..v2.6.30 MAINTAINERS`
- With gitk
  `gitk v2.6.30..master`

Branches

- To start working on something, the best is to make a branch
  - It is local-only, nobody except you sees the branch
  - It is fast
  - It allows to split your work on different topics, try something and throw it away
  - It is cheap, so even if you think you're doing something small and quick, do a branch
- Unlike other version control systems, Git encourages the use of branches. Don't hesitate to use them.

Branches

- Create a branch
  `git branch <branchname>`
- Move to this branch
  `git checkout <branchname>`
- Both at once (create and switch to branch)
  `git checkout -b <branchname>`
- List of local branches
  `git branch -l`
- List of all branches, including remote branches
  `git branch -a`

Making changes

- Edit a file with your favorite text editor
- Get the status of your working copy
  `git status`
- Git has a feature called the *index*, which allows you to stage your commits before committing them. It allows to commit only part of your modifications, by file or even by chunk.
- On each modified file
  `git add <filename>`
- Then commit. No need to be online or connected to commit.
  `git commit`
- If all modified files should be part of the commit
  `git commit -a`

Sharing changes by e-mail

- The simplest way of sharing a few changes is to send patches by e-mail
- First step is to generate the patches
  `git format-patch -n master..<yourbranch>`
  - Will generate one patch for each of the commits done on `<yourbranch>`
  - The patch files will be 0001-...., 0002-...., etc.
- Second step is to send these patches
  `git send-email --compose --to email@domain.com 00*.patch`
  - Assumes that the local mail system is properly configured
    Needs the `git-email` package in Ubuntu.
  - Or `git config` allows to set the SMTP server, port, user and password if needed

Sharing changes: your own repository

- If you do a lot of changes and want to ease collaboration with others, the best is to have your own repository
- Create a *bare* version of your repository
```
cd /tmp
git clone --bare ~/project project.git
touch project.git/git-daemon-export-ok
```
- Transfer the contents of `project.git` to a publicly-visible place (reachable read-only by HTTP for everybody, and read-write by you through SSH)
- Tell people to clone http://yourhost.com/path/to/project.git
- Push your changes using
```
git push ssh://yourhost.com/path/toproject.git
srcbranch:destbranch
```

Tracking remote trees

- In addition to the official Linus Torvalds tree, you might want to use other development or experimental trees
  - The OMAP tree at `git://git.kernel.org/pub/scm/linux/kernel/git/tmlind/linux-omap-2.6.git`
  - The realtime tree at `git://git.kernel.org/pub/scm/linux/kernel/git/rostedt/linux-2.6-rt.git`
- The `git remote` command allows to manage remote trees

```
git remote add rt \
git://git.kernel.org/pub/scm/linux/kernel/git/rostedt/linux-2.6-rt.git
```

- Get the contents of the tree

```
git fetch rt
```

- Switch to one of the branches

```
git checkout rt/master
```

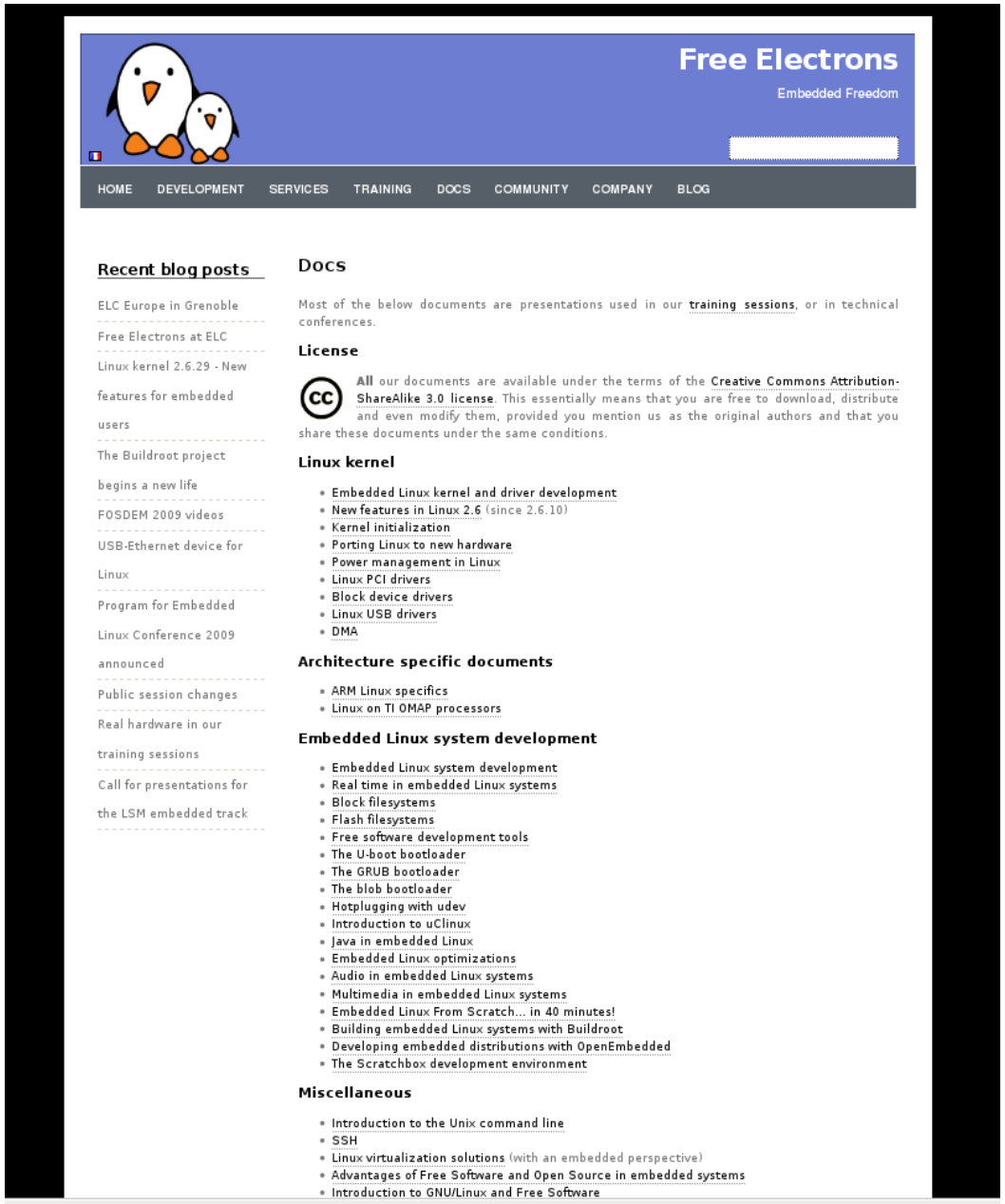
About Git

- We have just seen the very basic features of Git.
  A lot more interesting features are available (rebasing, bisection, merging and more)
- References
  - Git Manual
    http://www.kernel.org/pub/software/scm/git/docs/user-manual.html
  - Git Book
    http://book.git-scm.com/
  - Git official website
    http://git-scm.com/
  - James Bottomley's tutorial on using Git
    http://free-electrons.com/pub/video/2008/ols/ols2008-james-bottomley-git.ogg

Practical lab – Git

- Clone a Git repository and explore history
- Make and share changes to a project managed in Git

Related documents



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