
Git Revision Control

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Abstract

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 is easy to learn and has a tiny footprint with lightning fast performance. It out-classes SCM tools like Subversion, CVS, Perforce, and ClearCase with features like cheap local branching, convenient staging areas, and multiple workflows.¹

¹Git - <https://git-scm.com/>

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List of Definitions and Abbreviations

- **Branch** - [FIXME: Need data]
- **Git** - Quoting Linus: I'm an egotistical bastard, and I name all my projects after myself. First 'Linux', now 'Git'. ('git' is British slang for "pig headed, think they are always correct, argumentative").²
- **Repo** - "The multiple repository tool. Repo is a tool that we built on top of Git. Repo helps us manage the many Git repositories, does the uploads to our revision control system, and automates parts of the Android development workflow. Repo is not meant to replace Git, only to make it easier to work with Git in the context of Android. The repo command is an executable Python script that you can put anywhere in your path."
<https://code.google.com/p/git-repo/>
- **Tag** - [FIXME: Need data]

²Git FAQ

https://git.wiki.kernel.org/index.php/GitFaq#Why_the_.27Git.27_name.3F

Introduction

[FIXME: Update with great git architecture details from:
<https://git-scm.com/book/en/v2/Getting-Started-Git-Basics>]

Git is a distributed revision control system with an emphasis on speed,³ data integrity,⁴ and support for distributed, non-linear workflows.⁵ Git was initially designed and developed by Linus Torvalds for Linux kernel development in 2005, and has since become one of the most widely adopted version control systems for software development.⁶

As with most other distributed revision control systems, and unlike most clientserver systems, every Git working directory is a full-fledged repository with complete history and full version-tracking capabilities, independent of network access or a central server.⁷ Like the Linux kernel, Git is free software distributed under the terms of the GNU General Public License version 2.⁸

Workflow

The usual git workflow looks like:

1. Do some programming.
2. `git status` to see what files I changed.
3. `git diff [file]` to see exactly what I modified.
4. `git commit -a -m [message]` to commit.

³ Torvalds, Linus (2005-04-07). “[Re: Kernel SCM saga...](#)” linux-kernel (Mailing list). “So I’m writing some scripts to try to track things a whole lot faster.”

⁴ Torvalds, Linus (2007-06-10). “[Re: fatal: serious inflate inconsistency](#)”. git (Mailing list). A brief description of Git’s data integrity design goals.

⁵Linus Torvalds (2007-05-03). [Google tech talk: Linus Torvalds on git](#). Event occurs at 02:30. Retrieved 2007-05-16.

⁶ “[Eclipse Community Survey 2014 results — Ian Skerrett](#)”. ianskerrett.wordpress.com. 2014-06-23. Retrieved 2014-06-23.

⁷Chacon, Scott (24 December 2014). [Pro Git](#) (2nd ed.). New York, NY: Apress. pp. 2930. ISBN 978-1484200773.

⁸Git (software), From Wikipedia, the free encyclopedia, [https://en.wikipedia.org/wiki/Git_\(software\)](https://en.wikipedia.org/wiki/Git_(software))

Repositories

The purpose of Git is to manage a project, or a set of files, as they change over time. Git stores this information in a data structure called a repository.⁹

A git repository contains, among other things, the following:

- A set of commit objects.
- A set of references to commit objects, called heads.

The Git repository is stored in the same directory as the project itself, in a subdirectory called `.git`. Note differences from central-repository systems like CVS or Subversion:

- There is only one `.git` directory, in the root directory of the project.
- The repository is stored in files alongside the project. There is no central server repository.

⁹Understanding Git: Repositories,
<http://getliner.com/qXYnW/>

Branching & Tagging

In short: Best practice is branch out, merge often and keep always in sync.

There are pretty clear conventions about keeping your code in a separate branches from master branch:

1. You are about to make an implementation of major or disruptive change
2. You are about to make some changes that might not be used
3. You want to experiment on something that you are not sure it will work
4. When you are told to branch out, others might have something they need to do in master

Rule of thumb is after branching out, you should keep in sync with the master branch. Because eventually you need to merge it back to master. In order to avoid a huge complicated mess of conflicts when merging back, you should commit often, merge often.¹⁰

¹⁰Git branching and tagging best practices
<http://programmers.stackexchange.com/questions/165725/git-branching-and-tagging-best-practices>

SSH

A common transport protocol for Git when self-hosting is over SSH. This is because SSH access to servers is already set up in most places and if it isn't, it's easy to do. SSH is also an authenticated network protocol; and because it's ubiquitous, it's generally easy to set up and use.

If you have two-factor authentication¹¹ enabled, you must create a personal access token¹² to use instead of your GitHub password.¹³

To clone a Git repository over SSH, you can specify `ssh://` URL like this:

```
$ git clone ssh://user@server/project.git
```

Or you can use the shorter scp-like syntax for the SSH protocol:

```
$ git clone user@server:project.git
```

You can also not specify a user, and Git assumes the user you're currently logged in as.

The Pros The pros of using SSH are many. First, SSH is relatively easy to set up. SSH daemons are commonplace, many network admins have experience with them, and many OS distributions are set up with them or have tools to manage them. Next, access over SSH is secure: all data transfer is encrypted and authenticated. Last, like the HTTP/S, Git and Local protocols, SSH is efficient, making the data as compact as possible before transferring it.

The Cons The negative aspect of SSH is that you can't serve anonymous access of your repository over it. People must have access to your machine over SSH to access it, even in a read-only capacity, which doesn't make SSH access conducive to open source projects. If you're using it only within your corporate network, SSH may be the only protocol you need to deal with. If you want to allow anonymous read-only access to your projects and also want to use SSH, you'll have to set up SSH for you to push over but something else for others to fetch over.¹⁴

¹¹About Two-Factor Authentication, <https://help.github.com/articles/about-two-factor-authentication/>

¹²Creating an access token for command-line use to use instead of your GitHub password., <https://help.github.com/articles/creating-an-access-token-for-command-line-use/>

¹³Changing a remote's URL, <https://help.github.com/articles/changing-a-remote-s-url/>

¹⁴Ibid.

Commands

[FIXME: Need to update with commands (log, status, mv, rm, status, and commit from: <http://getliner.com/qXYnW/>)]

Command	Description
<code>add</code>	Add file contents to the index
<code>apply</code>	Apply a patch to files and/or to the index
<code>clone</code>	Get a complete copy of a repository
<code>commit</code>	Record changes to the repository
<code>diff</code>	Show changes between commits, commit and working tree, etc
<code>pull</code>	Fetch from and integrate with another repository or a local branch
<code>push</code>	Update remote refs along with associated objects
<code>rebase</code>	Forward-port local commits to the updated upstream head
<code>status</code>	Show the working tree status. See what files have changed.

Table 1: Commands

Add

Add file contents to the index

This command updates the index using the current content found in the working tree, to prepare the content staged for the next commit. It typically adds the current content of existing paths as a whole, but with some options it can also be used to add content with only part of the changes made to the working tree files applied, or remove paths that do not exist in the working tree anymore.¹⁵

Examples

Create and add `.repo/manifests/default.xml` file and `.repo/manifests/manifest.xml`

```
covellite:~/git/.repo/manifests$ git add default.xml
covellite:~/git/.repo/manifests$ git commit default.xml
covellite:~/git/.repo/manifests$ cd ..
covellite:~/git/.repo/$ ln -s manifests/default.xml manifest.xml
covellite:~/git/.repo/$ git add manifest.xml
covellite:~/git/.repo/$ git commit
```

¹⁵git-add - Add file contents to the index
<https://git-scm.com/docs/git-add>

Clone

To grab a complete copy of another user's repository, use `git clone` like this:

```
$ git clone https://github.com/USERNAME/REPOSITORY.git
# Clones a repository to your computer
```

When you run `git clone`, the following actions occur:

- > A new folder called `repo` is made
- > It is initialized as a Git repository
- > A remote named `origin` is created, pointing to the URL you cloned from
- > All of the repository's files and commits are downloaded there
- > The default branch (usually called `master`) is checked out

For every branch `foo` in the remote repository, a corresponding remote-tracking branch `refs/remotes/origin/foo` is created in your local repository. You can usually abbreviate such remote-tracking branch names to `origin/foo`.¹⁶

Syntax

Clone the required package by executing the following command:¹⁷

```
$ git clone [-b <Branch>] ssh://<Username>@review.tizen.org:\
29418/<Gerrit_Project> [<Local_Project>]
```

or

```
$ git clone ssh://<Username>@review.tizen.org:29418/pkg/a/avsystem
```

Examples

To clone repository named `git` from GitHub to local `covellite` workstation:

```
covellite:~$ git clone https://github.com/marcilr/git.git
Cloning into 'git'...
warning: You appear to have cloned an empty repository.
Checking connectivity... done.
covellite:~$
```

¹⁶Fetching a remote, `git clone`, `git fetch`, `git merge`, `git pull`,
<https://help.github.com/articles/fetching-a-remote/>

¹⁷Cloning Tizen Source,
<https://source.tizen.org/documentation/developer-guide/getting-started-guide/cloning-tizen-source>

Clone .repo repository into git/ directory:

```
covellite:~/git$ git clone https://github.com/marcilr/.repo
Cloning into '.repo'...
warning: You appear to have cloned an empty repository.
Checking connectivity... done.
covellite:~/git$
```

To clone a Git repository over SSH, you can specify ssh:// URL like this:

```
$ git clone ssh://user@server/project.git
```

Or you can use the shorter scp-like syntax for the SSH protocol:

```
$ git clone user@server:project.git
```

You can also not specify a user, and Git assumes the user you're currently logged in as.¹⁸

[FIXME: Need more commands here.]

Diff

Show changes between commits, commit and working tree, etc.

`git diff [file]` to see exactly what I modified.

Show changes between the working tree and the index or a tree, changes between the index and a tree, changes between two trees, changes between two blob objects, or changes between two files on disk.¹⁹

Synopsis

```
git diff [options] [<commit>] [--] [<path>...]
git diff [options] --cached [<commit>] [--] [<path>...]
git diff [options] <commit> <commit> [--] [<path>...]
git diff [options] <blob> <blob>
git diff [options] [--no-index] [--] <path> <path>
```

¹⁸ Git on the Server - The Protocols, The SSH Protocol,
<https://git-scm.com/book/en/v2/Git-on-the-Server-The-Protocols>

¹⁹ git-diff - Show changes between commits, commit and working tree, etc
<https://git-scm.com/docs/git-diff>

Push

Update remote refs along with associated objects

[FIXME: Need for data here]

You can only push to two types of URL addresses:²⁰

- > An HTTPS URL like `https://github.com/user/repo.git`
- > An SSH URL, like `git@github.com:user/repo.git`

²⁰About remote repositories, <https://help.github.com/articles/about-remote-repositories/>

Remotes

“To be able to collaborate on any Git project, you need to know how to manage your remote repositories. Remote repositories are versions of your project that are hosted on the Internet or network somewhere. You can have several of them, each of which generally is either read-only or read/write for you. Collaborating with others involves managing these remote repositories and pushing and pulling data to and from them when you need to share work. Managing remote repositories includes knowing how to add remote repositories, remove remotes that are no longer valid, manage various remote branches and define them as being tracked or not, and more. In this section, we’ll cover some of these remote-management skills.”²¹

A remote URL is Git’s fancy way of saying “the place where your code is stored.” That URL could be your repository on GitHub, or another user’s fork, or even on a completely different server.²²

Git associates a remote URL with a name, and your default remote is usually called `origin`.²³

Cloud Repository

A cloud repository provides easy access from distributed locations and alleviates backup issues. Candidates for a cloud repository include Bitbucket,²⁴ GitHub,²⁵ or Google Code.²⁶

²¹Git Basics - Working with Remotes,
<http://git-scm.com/book/en/v2/Git-Basics-Working-with-Remotes>

²²About remote repositories, <https://help.github.com/articles/about-remote-repositories/>

²³Ibid.

²⁴Bitbucket - Code, Manage, Collaborate, Bitbucket is the Git solution for professional teams
<https://bitbucket.org/>

²⁵GitHub - Where software is built
<https://github.com/>

²⁶Google Code - Provides a free collaborative development environment for open source projects.
<https://code.google.com/>

GitHub

[FIXME: Still need cli list, rename, and delete functionality.]

GitHub's collaborative approach to development depends on publishing commits from your local repository for other people to view, fetch, and update.²⁷

Pushing from local repository to GitHub hosted remote

You push your local repository to the remote repository using the `git push` command after first establishing a relationship between the two with the `git remote add [alias] [url]` command. If you visit your Github repository, it will show you the URL to use for pushing. You'll first enter something like:

```
git remote add origin git@github.com:username/reponame.git
```

Unless you started by running `git clone` against the remote repository, in which case this step has been done for you already.

And after that, you'll type:

```
git push origin master
```

After your first push, you can simply type:

```
git push
```

when you want to update the remote repository in the future.

edited Jul 10 '14 at 14:17 by thomio

answered May 13 '12 at 18:01 by larsks

...

Subversion implicitly has the remote repository associated with it at all times. Git, on the other hand, allows many “remotes”, each of which represents a single remote place you can push to or pull from.

You need to add a remote for the GitHub repository to your local repository, then use `git push <REMOTE>` or `git pull <REMOTE>` to push and pull respectively - or the GUI equivalents.

...

Once you have associated the two you will be able to push or pull branches.

answered May 13 '12 at 18:01

by Daniel Pittman

²⁷About remote repositories, <https://help.github.com/articles/about-remote-repositories/>

²⁷Pushing from local repository to GitHub hosted remote,
<http://stackoverflow.com/questions/10573957/pushing-from-local-repository-to-github-hosted-remote>

Caching your GitHub password in Git

If you're cloning GitHub repositories using HTTPS, you can use a credential helper to tell Git to remember your GitHub username and password every time it talks to GitHub.

If you clone GitHub repositories using SSH, then you authenticate using SSH keys instead of a username and password. For help setting up an SSH connection, see [Generating SSH Keys](#).²⁸

Turn on the credential helper so that Git will save your password in memory for some time. By default, Git will cache your password for 15 minutes.²⁹

1. In Terminal, enter the following:

```
$ git config --global credential.helper cache
# Set git to use the credential memory cache
```

2. To change the default password cache timeout, enter the following:

```
$ git config --global credential.helper 'cache --timeout=3600'
# Set the cache to timeout after 1 hour (setting is in seconds)
```

[FIXME: The GitHub user and pass got saved by alternate means. How was that done?]

Create a Github Repo from the Command Line

Creating a GitHub repository from the command line is incredibly convenient.

Googled up some simple shell script to create GitHub repo via command line:

```
"curl -u $username:$token" https://api.github.com/user/repos \
-d '{"name":"'$repo_name'"}'
```

To use, you could simply replace `$username` with your GitHub username, `$token` with a Personal Access Token³⁰ for the same user (available for generation in your GitHub Settings > Applications), and `$repo_name` with your desired new Repository name.³¹

Creating a repo from the command line is definitely faster than going to Github and using the web app to get the job done, but in order to truly make this task speedy, we need some Bash programming.

²⁸Generating SSH keys, <https://help.github.com/articles/generating-ssh-keys/>

²⁹Caching your GitHub password in Git, <https://help.github.com/articles/caching-your-github-password-in-git/>

³⁰GitHub supports Personal access tokens, under Settings, click Personal access tokens. Personal access tokens function like ordinary OAuth access tokens. They can be used instead of a password for Git over HTTPS, or can be used to authenticate to the API over Basic Authentication. I set mine to the usual: <https://github.com/settings/tokens>

³¹Create a Github Repo from the Command Line, by Eli Fatsi - Jan 29, 2014, <https://viget.com/extend/create-a-github-repo-from-the-command-line>

```

github-create() {
    repo_name=$1

    dir_name='basename $(pwd)'

    if [ "$repo_name" = "" ]; then
        echo "Repo name (hit enter to use '$dir_name')?"
        read repo_name
    fi

    if [ "$repo_name" = "" ]; then
        repo_name=$dir_name
    fi

    username='git config github.user'
    if [ "$username" = "" ]; then
        echo "Could not find username, run 'git config \
        --global github.user <username>'"
        invalid_credentials=1
    fi

    token='git config github.token'
    if [ "$token" = "" ]; then
        echo "Could not find token, run 'git config \
        --global github.token <token>'"
        invalid_credentials=1
    fi

    if [ "$invalid_credentials" == "1" ]; then
        return 1
    fi

    echo -n "Creating Github repository '$repo_name' ..."
    curl -u "$username:$token" https://api.github.com/user/repos \
    -d '{"name":"'$repo_name'"}' > /dev/null 2>&1
    echo " done."

    echo -n "Pushing local code to remote ..."
    git remote add origin git@github.com:$username/$repo_name.git \
    > /dev/null 2>&1
    git push -u origin master > /dev/null 2>&1
    echo " done."
}

```


Plop this function into your `~/.bash_profile`, open a new Terminal window or source `~/.bash_profile`, and the function will be loaded up and ready for use.

Then while in an existing git project, running `github-create` will create the repo and push your master branch up in one shot. You will need to set some github config variables (instructions will be spit out if you don't have them). Heres an example:

```
BASH:projects $ rails new my_new_project
..... (a whole lot of generated things)
BASH:projects $ cd my_new_project/
BASH:my_new_project $ git init && git add . && git commit \
-m 'Initial commit'
..... (a whole lot of git additions)
BASH:my_new_project $ github-create
Repo name (hit enter to use 'my_new_project')?

Creating Github repository 'my_new_project' ... done.
Pushing local code to remote ... done.
```

Had I called the function with an argument `github-create my_project` then it would have used the argument and skipped the Repo name question.³²

On GCI Network Services, OSS `covellite` Debian `jessie` 8.2 workstation the `gtihub-create` did not execute. Put `github-create()` into a standalone `~/gtihub-create` script with call to `gtihub-create()` under main.

Tested with:

```
$ mkdir ~/quux
$ cd ~/quux
$ git init
Initialized empty Git repository in /home/marcilr/quux/.git/
$ github-create
Repo name (hit enter to use 'quux')?

Could not find username, run 'git config --global github.user <username>'
Could not find token, run 'git config --global github.token <token>'
$
```

³²Create a Github Repo from the Command Line, by Eli Fatsi - Jan 29, 2014,
<https://viget.com/extend/create-a-github-repo-from-the-command-line>

Configured the GitHub username and token to alleviate GitHub credential errors:

```
$ git config --global github.user marcilr  
$ git config --global github.token <token>
```

Was then able to run `~/github-create` successfully:

```
$ cd ~/quux/  
$ github-create  
Repo name (hit enter to use 'quux')? <enter>  
  
Creating Github repository 'quux' ... done.  
Pushing local code to remote ... done.  
$
```

Checking GitHub via online access I found the new `quux` repo.

[FIXME: Need Bitbucket vs. GitHub section]

Commands

Command	Description
<code>remote add</code>	Add a new remote in the directory your repository is stored at.
<code>remote set-url</code>	Change a remote's URL.
<code>remote rename</code>	Rename an existing remote.
<code>remote rm</code>	Remove a remote URL from your repository.

Table 2: Remote Commands

For further reading see “[Working with Remotes](#)” from the Pro Git book.³³

³³Pro Git book, <http://git-scm.com/book/en/Git-Basics-Working-with-Remotes>

git remote add

To add a new remote, use the `git remote add` command on the terminal, in the directory your repository is stored at.³⁴

The `git remote add` command takes two arguments:

```
$ git remote add <NAME> <REMOTE_URL>
```

Where:

- <NAME> - A remote name, for example, `origin`
- <REMOTE_URL> - A remote URL, for example, `https://github.com/user/repo.git`

Git associates a remote URL with a name, and your default remote is usually called `origin`.³⁵

Examples

```
# This associates the name origin with SSH URL for repo.git repository.
$ git remote add origin git@github.com:user/repo.git
```

Alternatively using https syntax:

```
$ git remote add origin https://github.com/user/repo.git
# Set a new remote

$ git remote -v
# Verify new remote
origin https://github.com/user/repo.git (fetch)
origin https://github.com/user/repo.git (push)
```

³⁴Adding a remote, <https://help.github.com/articles/adding-a-remote/>

³⁵About remote repositories, <https://help.github.com/articles/about-remote-repositories/>

git remote set-url

The `git remote set-url` command changes an existing remote repository URL.³⁶

The `git remote set-url` command takes two arguments:

- > An existing remote name. For example, `origin` or `upstream` are two common choices.
- > A new URL for the remote. For example:
 - > If you're updating to use HTTPS, your URL might look like:
`https://github.com/USERNAME/OTHERREPOSITORY.git`
 - > If you're updating to use SSH, your URL might look like:
`git@github.com:USERNAME/OTHERREPOSITORY.git`

Examples

Switching remote URLs from SSH to HTTPS

1. Open Terminal (for Mac and Linux users) or the command prompt (for Windows users).³⁷
2. Change the current working directory to your local project.
3. List your existing remotes in order to get the name of the remote you want to change.

```
$ git remote -v
# origin  git@github.com:USERNAME/REPOSITORY.git (fetch)
# origin  git@github.com:USERNAME/REPOSITORY.git (push)
```

4. Change your remote's URL from SSH to HTTPS with the `git remote set-url` command.

```
$ git remote set-url origin \
https://github.com/USERNAME/OTHERREPOSITORY.git
```

5. Verify that the remote URL has changed.

```
$ git remote -v
# Verify new remote URL
# origin  https://github.com/USERNAME/OTHERREPOSITORY.git (fetch)
# origin  https://github.com/USERNAME/OTHERREPOSITORY.git (push)
```

³⁶Changing a remote's URL, <https://help.github.com/articles/changing-a-remote-s-url/>

³⁷Switching remote URLs from HTTPS to SSH, <https://help.github.com/articles/changing-a-remote-s-url/>

Switching remote URLs from HTTPS to SSH

1. Open Terminal (for Mac and Linux users) or the command prompt (for Windows users).³⁸
2. Change the current working directory to your local project.
3. List your existing remotes in order to get the name of the remote you want to change.

```
$ git remote -v
origin  https://github.com/USERNAME/REPOSITORY.git (fetch)
origin  https://github.com/USERNAME/REPOSITORY.git (push)
```

4. Change your remote's URL from HTTPS to SSH with the git remote set-url command.

```
$ git remote set-url origin \
git@github.com:USERNAME/OTHERREPOSITORY.git
```

5. Verify that the remote URL has changed.

```
$ git remote -v
# Verify new remote URL
origin  git@github.com:USERNAME/OTHERREPOSITORY.git (fetch)
origin  git@github.com:USERNAME/OTHERREPOSITORY.git (push)
```

³⁸Switching remote URLs from HTTPS to SSH, <https://help.github.com/articles/changing-a-remote-s-url/>

git remote rename

Use the git remote rename command to rename an existing remote.³⁹

The git remote rename command takes two arguments:

- > An existing remote name, for example, origin
- > A new name for the remote, for example, destination

Example

The examples below assume you're cloning using HTTPS, which is recommended.

```
$ git remote -v
# View existing remotes
origin  https://github.com/OWNER/REPOSITORY.git (fetch)
origin  https://github.com/OWNER/REPOSITORY.git (push)

$ git remote rename origin destination
# Change remote name from 'origin' to 'destination'

$ git remote -v
# Verify remote's new name
destination  https://github.com/OWNER/REPOSITORY.git (fetch)
destination  https://github.com/OWNER/REPOSITORY.git (push)
```

³⁹Renaming a remote, <https://help.github.com/articles/renaming-a-remote/>

git remote rm

Use the `git remote rm` command to remove a remote URL from your repository.⁴⁰

The `git remote rm` command takes one argument:

> A remote name, for example, destination

Example

The examples below assume you're cloning using HTTPS, which is recommended.

```
$ git remote -v
# View current remotes
origin  https://github.com/OWNER/REPOSITORY.git (fetch)
origin  https://github.com/OWNER/REPOSITORY.git (push)
destination  https://github.com/FORKER/REPOSITORY.git (fetch)
destination  https://github.com/FORKER/REPOSITORY.git (push)

$ git remote rm destination
# Remove remote
$ git remote -v
# Verify it's gone
origin  https://github.com/OWNER/REPOSITORY.git (fetch)
origin  https://github.com/OWNER/REPOSITORY.git (push)
```

Note: `git remote rm` does not delete the remote repository from the server. It simply removes the remote and its references from your local repository.

⁴⁰Removing a remote, <https://help.github.com/articles/removing-a-remote/>

Repo

“Repo is a repository management tool that we built on top of Git. Repo unifies the many Git repositories when necessary, does the uploads to a revision control system, and automates parts of the development workflow. Repo is not meant to replace Git, only to make it easier to work with Git in the context of Android. The `repo` command is an executable Python script that you can put anywhere in your path. In working with source files, you will use Repo for across-network operations. For example, with a single Repo command you can download files from multiple repositories into your local working directory.”⁴¹

[FIXME: The above repo quote has been heavily modified. Need to rewrite with original verbage.]

Configuration

The `repo` utility requires a `.repo` directory containing `manifest.xml` listing repositories to manage.

`.repo` directory

The `.repo/` directory, located in the repository base, holds repo configuration. The configuration includes a manifest with information about all the projects and where their associated git repositories are located.

Files within the `.repo/` subdirectory includes:

```
manifests/  
manifests.git  
manifest.xml -> manifests/default.xml  
project-objects  
projects/  
repo/
```

To create the `.repo/` subdirectory:

```
$ cd <my_repo>  
$ mkdir .repo/  
$
```

⁴¹Developing – <http://source.android.com/source/developing.html>

Manifest

The repo keeps a manifest, “within the hidden directory named ‘.repo’,” in “a git project named ‘manifests’ which usually contains a file named ‘default.xml’. This file contains information about all the projects and where their associated git repositories are located. This file is also versioned thus when you use the ‘repo init -b XYZ’ command it will be reverted and you can back to older branches that may have added/removed git projects compared to the head.”⁴²

The default.xml file is symlinked to .repo/manifest.xml and is created when the repo was initialized using:

```
repo init -u <manifest path>
```

Examples

Following is a manifest, in .repo/manifests/default.xml file, showing use of GitHub with username, ssh:// URL syntax, and 3 project repos with different usernames:⁴³

```
<?xml version="1.0" encoding="UTF-8"?>
<manifest>
  <remote name="origin" fetch="ssh://git@github.com/" />
  <default revision="master" remote="origin" />

  <project path="lib/plist-lib"
    name="keiji/AndroidPListLib.git" remote="origin" />

  <project path="lib/json-pull-parser"
    name="vvakame/JsonPullParser.git" remote="origin" />

  <project path="apps/twicca_megane_plugin"
    name="zaki50/TwiccaMeganePlugin.git" remote="origin" />
</manifest>
```

⁴²How does the Android repo manifest repository work?

<http://stackoverflow.com/questions/6149725/how-does-the-android-repo-manifest-repository-work>

⁴³Keiji Ariyama, <https://github.com/keiji/repo-sample/blob/master/default.xml>

Commands

Repo usage takes the following form:⁴⁴

```
repo <COMMAND> <OPTIONS>
```

Optional elements are shown in brackets []. For example, many commands take a project list as an argument. You can specify project-list as a list of names or a list of paths to local source directories for the projects:

```
repo sync [<PROJECT0> <PROJECT1> <PROJECTN>]  
repo sync [</PATH/TO/PROJECT0> ... </PATH/TO/PROJECTN>]
```

Once Repo is installed, you can find the latest documentation starting with a summary of all commands by running:

```
repo help
```

You can get information about any command by running this within a Repo tree:

```
repo help <COMMAND>
```

NOTE: For `repo` commands without syntax here see the Repo command reference.⁴⁵

⁴⁴Repo command reference

<https://source.android.com/source/using-repo.html#help>

⁴⁵Ibid.

Command	Description
abandon	Permanently abandon a development branch
branch	View current topic branches
branches	View current topic branches
checkout	Checkout a branch for development
cherry-pick	Cherry-pick a change
diff	Show changes between commit and working tree
diffmanifests	Manifest diff utility
download	Download and checkout a change
grep	Print lines matching a pattern
forall	Executes the given shell command in each project. ⁴⁶
help	Display detailed help on a command
info	Get info on the manifest branch, current branch or unmerged branches
init	Install repo in the current working directory
list	List projects and their associated directories
overview	Display overview of unmerged project branches
prune	Prune (delete) already merged topics
rebase	Rebase local branches on upstream branch
start	Start a new branch for development
status	Show the working tree status
sync	Update working tree to the latest revision
upload	Upload changes for code review

Table 3: Repo Commands

init

[FIXME: Good init syntax here:

<https://source.tizen.org/documentation/developer-guide/getting-started-guide/cloning-tizen-source>]

```
$ repo init -u <URL> [<OPTIONS>]
```

Installs Repo in the current directory. This creates a `.repo/` directory that contains Git repositories for the Repo source code and the standard Android manifest files. The `.repo/` directory also contains `manifest.xml`, which is a symlink to the selected manifest in the `.repo/manifests/` directory.⁴⁷

Command	Description
-u	Specify a URL from which to retrieve a manifest repository. The common manifest can be found at: https://android.googlesource.com/platform/manifest
-m	Select a manifest file within the repository. If no manifest name is selected, the default is <code>default.xml</code> .
-b	Specify a revision, i.e., a particular manifest-branch.

Table 4: init Options

Examples

This will create a new place to hold your local copy of the source tree. The `url` should point to a Manifest repository that describes the whole sources. It is a special project with a file (`default.xml`) that lists all the projects that Android is made of. In the Manifest file, each projects has attributes about: where to place it in the tree, where to download it from (git server), revision that will be used (usually a branch name, tag or commit sha-id).⁴⁸

```
repo init -u <url> -b <branch>
```

Note: For all remaining Repo commands, the current working directory must either be the parent directory of `.repo/` or a subdirectory of the parent directory.⁴⁹

[FIXME: Need example of GitHub checkout]

⁴⁷Repo command reference – <https://source.android.com/source/using-repo.html>

⁴⁸Repo: Tips & Tricks,
<http://xda-university.com/as-a-developer/repo-tips-tricks>

⁴⁹Repo command reference – <https://source.android.com/source/using-repo.html>

Appendix

A successful Git branching model

by Vincent Driessen on Tuesday, January 05, 2010

Fine branching diagram here.

<http://nvie.com/posts/a-successful-git-branching-model/>

Bitbucket vs. GitHub: Which project host has the most?

The right choice boils down to a number of factors – you might even consider using both

<http://www.infoworld.com/article/2611771/application-development/application-development-bitbucket-vs-github-which-project-host-has-the-most->

Developing

Has Repo and Gerrit details with syntax and examples.

<http://source.android.com/source/developing.html>

Fetching a remote

```
> git clone
```

```
> git fetch
```

```
> git merge
```

```
> git pull
```

<https://help.github.com/articles/fetching-a-remote/>

Git

<https://git-scm.com/>

Git (software)

From Wikipedia, the free encyclopedia

[https://en.wikipedia.org/wiki/Git_\(software\)](https://en.wikipedia.org/wiki/Git_(software))

Git About

<https://git-scm.com/about>

Git branching and tagging best practices

Excellent details and semantics.

<http://programmers.stackexchange.com/questions/165725/git-branching-and-tagging-best-practices>

Git FAQ

<https://git.wiki.kernel.org/index.php/GitFaq>

Git on the Server - The Protocols, The SSH Protocol

The Git Book

<https://git-scm.com/book/en/v2/Git-on-the-Server-The-Protocols>

Git (software)
From Wikipedia, the free encyclopedia
[https://en.wikipedia.org/wiki/Git_\(software\)](https://en.wikipedia.org/wiki/Git_(software))

Git repositories on Gerrit
<https://gerrit.googlesource.com/>

GitHub
Project host
<https://github.com/>

How does the Android repo manifest repository work?
<http://stackoverflow.com/questions/6149725/how-does-the-android-repo-manifest-repository-work>

Installing Repo
<http://source.android.com/source/downloading.html#installing-repo>

Managing Remotes
<https://help.github.com/categories/managing-remotes/>

Manifest Format for repo
<https://gerrit.googlesource.com/git-repo/+master/docs/manifest-format.txt>

Pro Git (the git book)
Available as [pdf](#), [epub](#), [mobi](#), and [html](#).
<http://git-scm.com/book/en/v2/>

Re: repo + private repositories in github
Details on manifest for google repo use.
<https://groups.google.com/forum/embed/?#!topic/repo-discuss/kCXO-NdFvj4>

Repo Command Reference
Using Repo and Git - very useful details here.
<http://source.android.com/source/using-repo.html>

Repo: Tips & Tricks
<http://xda-university.com/as-a-developer/repo-tips-tricks>

repo - The multiple repository tool
<https://code.google.com/p/git-repo/>

Set Up Git
>Creating a repository
>Forking a repository

>Being social

<https://help.github.com/articles/set-up-git/>