# Source Control Systems Git & Svn

DevOps Training

# BASIC INTRO TO GIT

- Discuss how Git differs from Subversion
- Discuss the basic Git model
- Pull/clone files from a  repository on github
- Edit files in your own local Git repo
- Push files to a repo on github

# VERSION CONTROL SYSTEMS

- Version control (or revision control, or source control) is all about managing multiple versions of documents, programs, web sites, etc.
  - Almost all "real" projects use some kind of version control
  - Essential for team projects, but also very useful for individual projects
- Some well-known version control systems are CVS, Subversion, Mercurial, and Git
  - CVS and Subversion use a "central" repository; users "check out" files, work on them, and "check them in"
  - Mercurial and Git treat all repositories as equal
- Distributed systems like Mercurial and Git are are gradually replacing centralized systems like CVS and Subversion

# WHY VERSION CONTROL?

- For working by yourself:

  Gives you a "time machine" for going back to earlier versions

  Gives you great support for different versions (standalone, web app, etc.) of the same basic project

- For working with others:

  Greatly simplifies concurrent work, merging changes

# FEATURES OF VERSION CONTROL

Manages file sharing for
**Concurrent Development**

Keeps track of changes and Copies with
**Version Control**

# CONCURRENT DEVELOPMENT

- Server holds all original files of a project
- Gives out copies to participants (clients)
- Participants modify their copies & Submit their changes to server
- Automatically merges changes into original files. Huge!
- Conflicts only occur when modifications are done
  - by more then one participant
  - at the same location in their respective copies.
  - Then participants have to manually resolve such conflicts. Rare!
- Powerful edit and merge tools help make this task easy

# SVN V/S GIT

SVN:

- central repository approach – the main repository is the only "true" source, only the main repository has the complete file history
- Users check out local copies of the current version

Git:

- Distributed repository approach – every checkout of the repository is a full fledged repository, complete with history
- Greater redundancy and speed
- Branching and merging repositories is more heavily used as a result

# GIT HISTORY

Came out of Linux development community

Linus Torvalds, 2005

Initial goals:

- Speed
- Support for non-linear development (thousands of parallel branches)
- Fully distributed
- Able to handle large projects like Linux efficiently

# GIT RESOURCES

At the command line: (where verb = config, add, commit, etc.)

```
$ git help <verb>
$ git <verb> --help
$ man git-<verb>
```

Free on-line book: http://git-scm.com/book

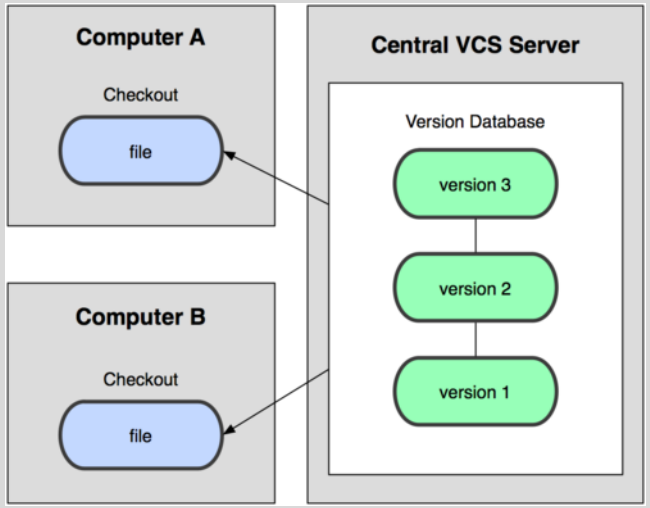
Git tutorial: http://schacon.github.com/git/gittutorial.html

Reference page for Git: http://gitref.org/index.html

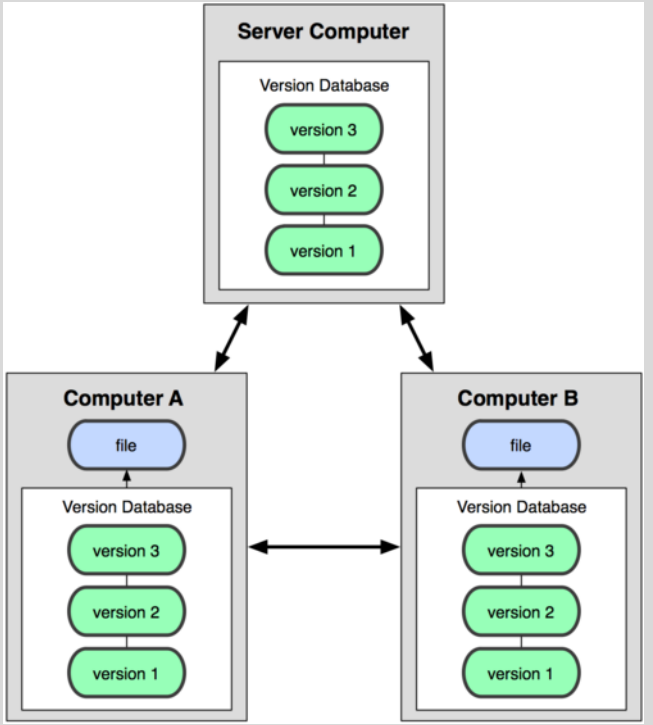
Git website: http://git-scm.com/

# GIT USES A DISTRIBUTED MODEL

Centralized Model

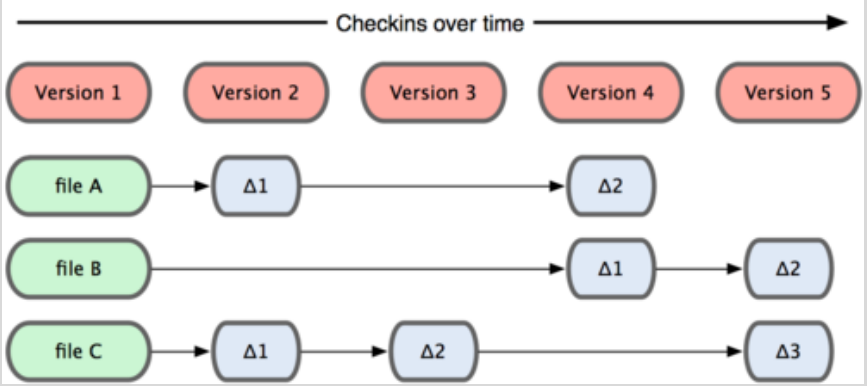



Distributed Model

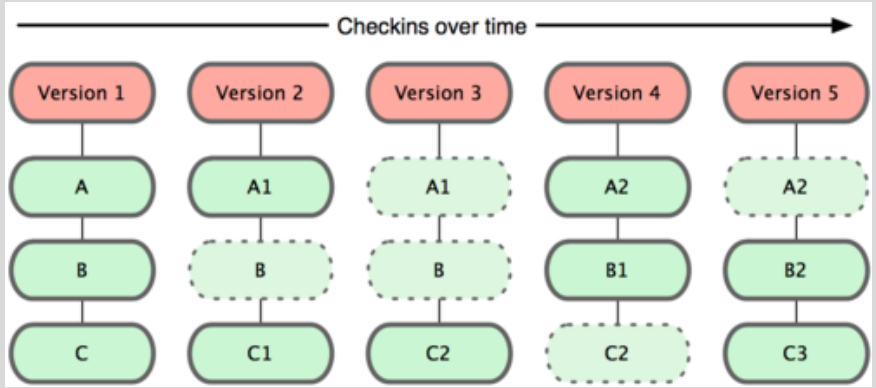


# GIT TAKES SNAPSHOTS

Subversion




Git



# GIT USES CHECKSUMS

In Subversion each modification to the **central** repo incremented the version # of the overall repo.

How will this numbering scheme work **when each user has their own copy of the repo**, and commits changes to their local copy of the repo before pushing to the central server?????

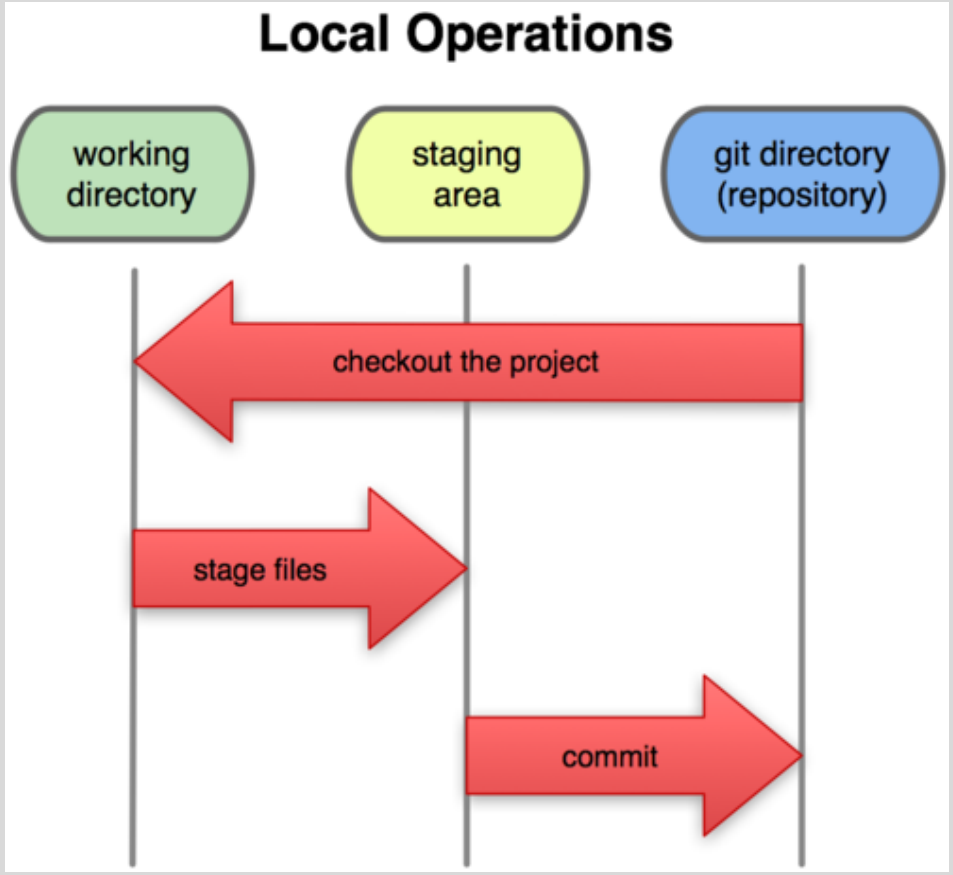
Instead, Git generates a unique SHA-1 hash – 40 character string of hex digits, for every commit. Refer to commits by this ID rather than a version number. Often we only see the first 7 characters:

1677b2d Edited first line of readme

258efa7 Added line to readme

0e52da7 Initial commit

# A LOCAL GIT PROJECT HAS THREE AREAS



# BASIC WORKFLOW

Basic Git workflow:

1. **Modify** files in your working directory.
2. **Stage** files, adding snapshots of them to your staging area.
3. Do a **commit**, which takes the files as they are in the staging area and stores that snapshot permanently to your Git directory.

# WHAT IS GITHUB?

GitHub.com is a site for online storage of Git repositories.

Many open source projects use it, such as the Linux kernel.

You can get free space for open source projects or you can pay for private projects.

**Question**: Do I have to use github to use Git?

**Answer**: No!

you can use Git completely locally for your own purposes, or

you or someone else could set up a server to share files, or

you could share a repo with users on the same file system

# GET READY TO USE GIT!

1. Set the name and email for Git to use when you commit:

```
$ git config --global user.name “firstname lastname”
$ git config --global user.email @gmail.com
```

You can call **`git config –list`** to verify these are set.

These will be set globally for all Git projects you work with.

You can also set variables on a project-only basis by not using the **`--global`** flag.

You can also set the editor that is used for writing commit messages:
$ git config --global core.editor emacs (it is vim by default)

# GIT COMMANDS

| command | description |
|---|---|
| `git clone` ***`url [dir]`*** | copy a git repository so you can add to it |
| `git add` ***`files`*** | adds file contents to the staging area |
| `git commit` | records a snapshot of the staging area |
| `git status` | view the status of your files in the working directory and staging area |
| `git diff` | shows diff of what is staged and what is modified but unstaged |
| `git help` ***`[command]`*** | get help info about a particular command |
| `git pull` | fetch from a remote repo and try to merge into the current branch |
| `git push` | push your new branches and data to a remote repository |
| others: `init, reset, branch, checkout, merge, log, tag` | |

# COMMITTING FILES

The first time we ask a file to be tracked, *and* **every time before we commit a file** we must add it to the staging area:

```
$ git add README.txt hello.java
```

This takes a snapshot of these files at this point in time and adds it to the staging area.

To move staged changes into the repo we commit:

```
$ git commit –m “Fixing bug #22”
```

Note: To unstage a change on a file before you have committed it:

```
$ git reset HEAD  --  filename
```

Note: To unmodify a modified file:

```
$ git checkout  --  filename
```

**Note**: These commands are just acting on **your local version of repo**.

# STATUS AND DIFF

To view the **status** of your files in the working directory and staging area:

```
$ git status
```
or
```
$ git status -s
```
(`-s` shows a short one line version similar to svn)

To see what is modified but unstaged:

```
$ git diff
```

To see staged changes:

```
$ git diff --cached
```

# VIEWING LOGS

To see a log of all changes in your local repo:

`$ git log` or

`$ git log --oneline` (to show a shorter version)

1677b2d Edited first line of readme

258efa7 Added line to readme

0e52da7 Initial commit

`git log -5` (to show only the 5 most recent updates, etc.)

Note: changes will be listed by commitID #, (SHA-1 hash)

Note: changes made to the remote repo before the last time you cloned/pulled from it will also be included here

# PULLING AND PUSHING

Good practice:

1. **Add** and **Commit** your changes to your local repo
2. **Pull** from remote repo to get most recent changes (fix conflicts if necessary, add and commit them to your local repo)
3. **Push** your changes to the remote repo

To fetch the most recent updates from the remote repo into your local repo, and put them into your working directory:

```
$ git pull origin master
```

To push your changes from your local repo to the remote repo:

# PULLING AND PUSHING [CONTINUE]

```
git push origin master
```

Notes: **`origin`** = an alias for the URL you cloned from

**`master`** = the remote branch you are pulling from/pushing to, (the local branch you are pulling to/pushing from is your current branch)

Note: On attu you will get a Gtk-warning, you can ignore this

# BRANCHING

To create a branch called experimental:

```
$ git branch experimental
```

To list all branches: (* shows which one you are currently on)

```
$ git branch
```

To switch to the experimental branch:

```
$ git checkout experimental
```

Later on, changes between the two branches differ, to merge changes from experimental into the master:

```
$ git checkout master
$ git merge experimental
```

Note: **`git log --graph`** can be useful for showing branches.

Note: These branches are in *your local repo*!

# HANDS ON 1

1. **$ git config --global user.name “Your Name”**
2. **$ git config --global user.email youremail@whatever.com**
3. **$ git clone https://github.com/PROJ/REPO.git**

Then try:

1. **$ git log, $ git log --oneline**
2. Create a file named *userID*.txt (e.g. rea.txt)
3. **$ git status, $ git status –s**
4. Add the file: **$ git add *userID*.txt**

# HANDS ON 2

**$ git status, $ git status -s**

1. Commit the file to your local repo:
   **$ git commit -m “added rea.txt file”**
2. **$ git status, $ git status -s, $ git log --oneline**

***WAIT, DO NOT GO ON TO THE NEXT STEPS UNTIL YOU ARE TOLD TO!!**

1. Pull from remote repo: **$git pull <GITHUB> master**
2. Push to remote repo: **$git push <GITHUB> master**


# THANK YOU!

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