Git Immersion

Rails Conf 2010 Tutorial

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EdgeCase
software artisans

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Setup

```
git config --global user.name "Jim Weirich"
git config --global user.email "jim.weirich@gmail.com"
```

also

```
git config --global core.autocrlf true     (Windows)
git config --global core.autocrlf input    (Unix/Mac)
git config --global core.safecrlf true
```

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Creating a Git Repo

```
$ mkdir demo
$ (edit files)
$ git init
```

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Checking In

```
$ git status
$ git add .
$ git commit -m "message"
```

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Labs Can be found at ...

http://onestepback.org/download/git_tutorial.zip

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Source Control Made Easy

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Why?

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What we are **not** going to talk about ...

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Your Mission

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Your Mission

Design and Build A Source Code Control System

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Custom Source Control

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Custom Source Control

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In the *Old Days* ...

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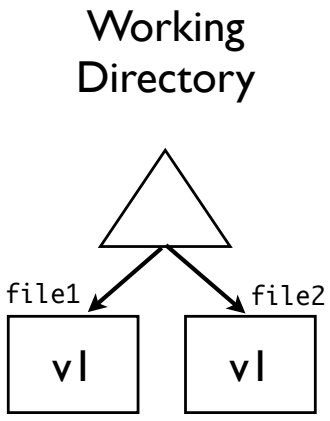

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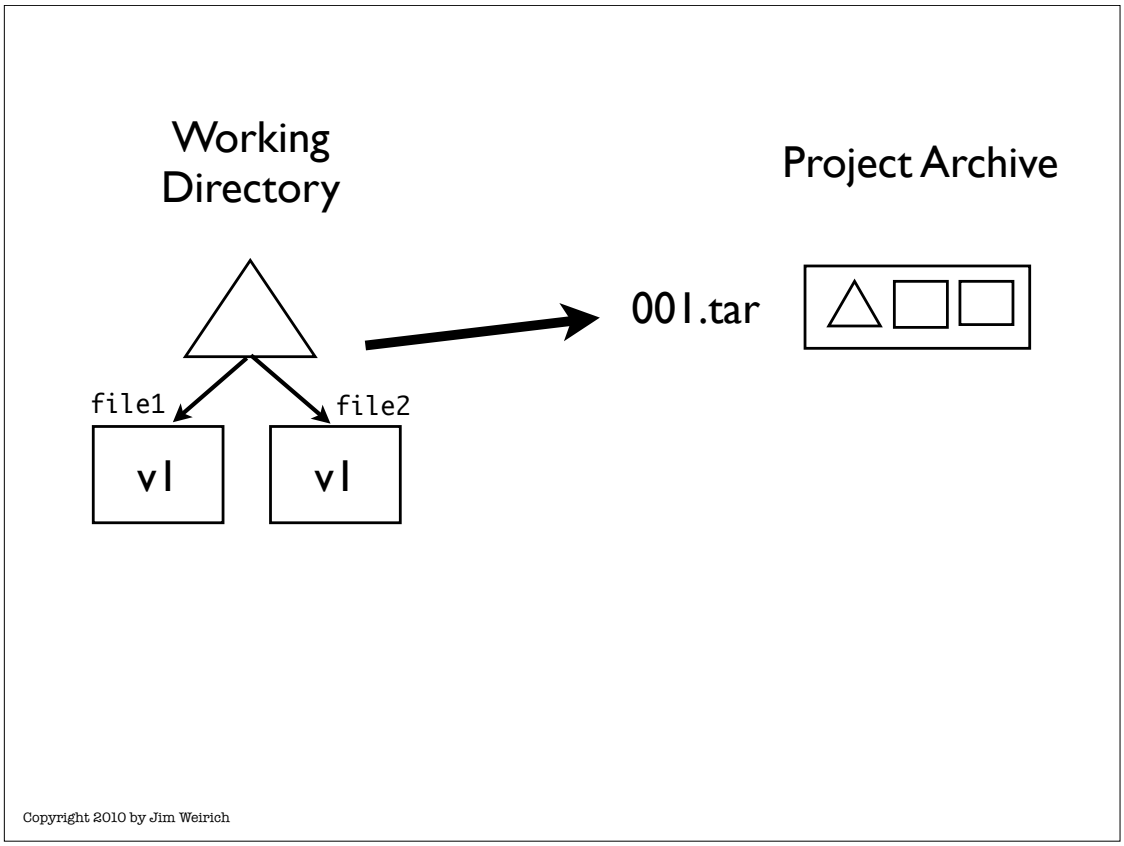

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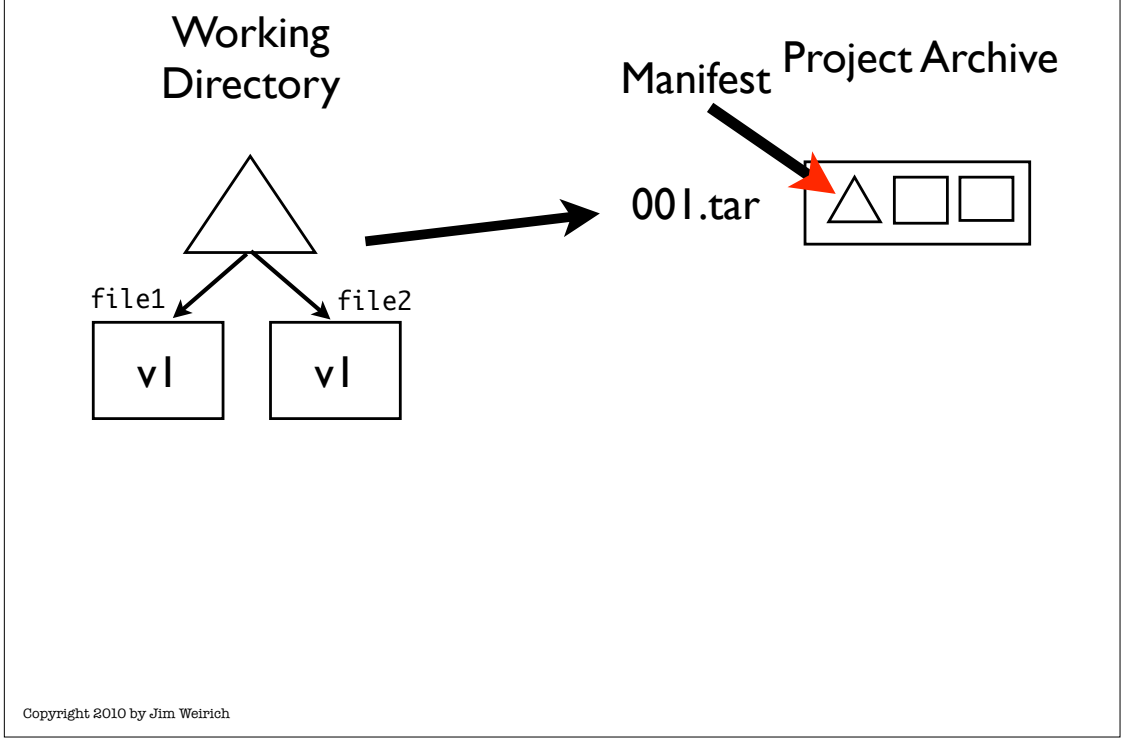

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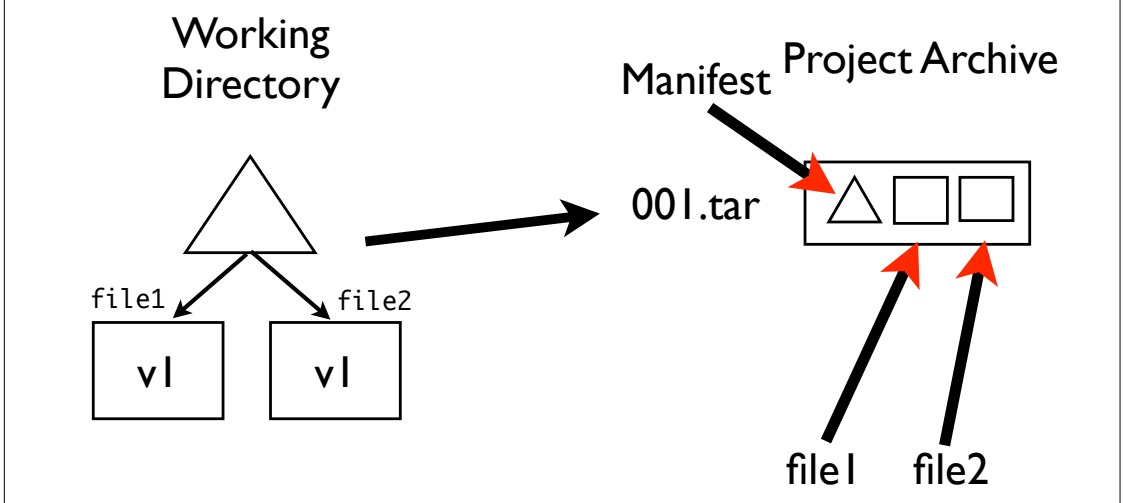

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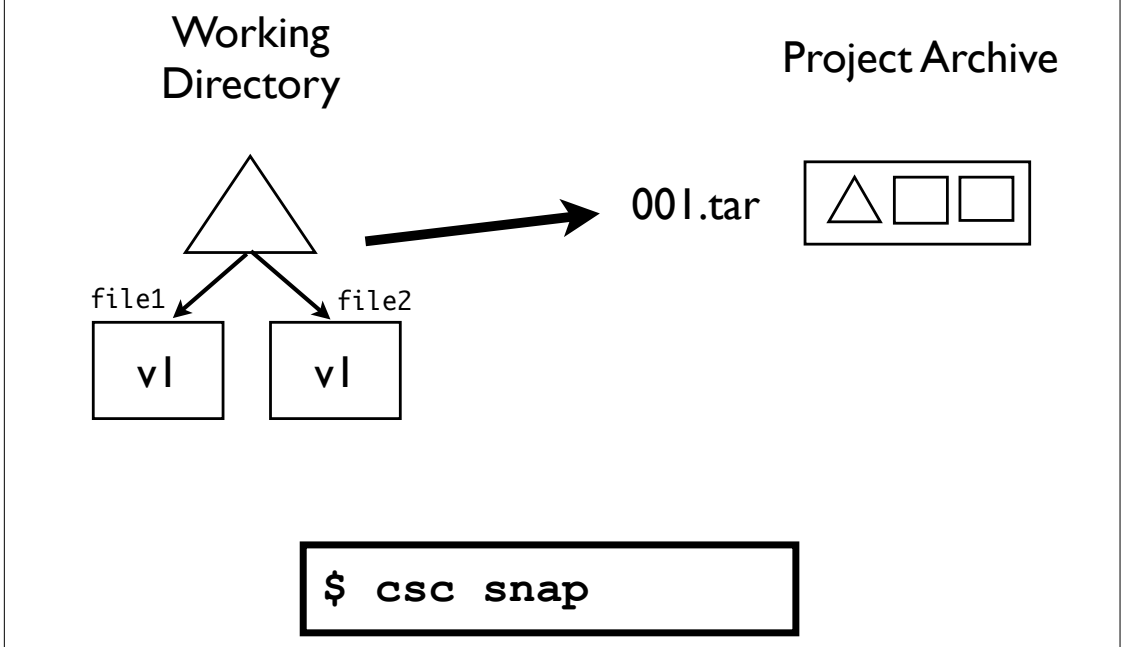

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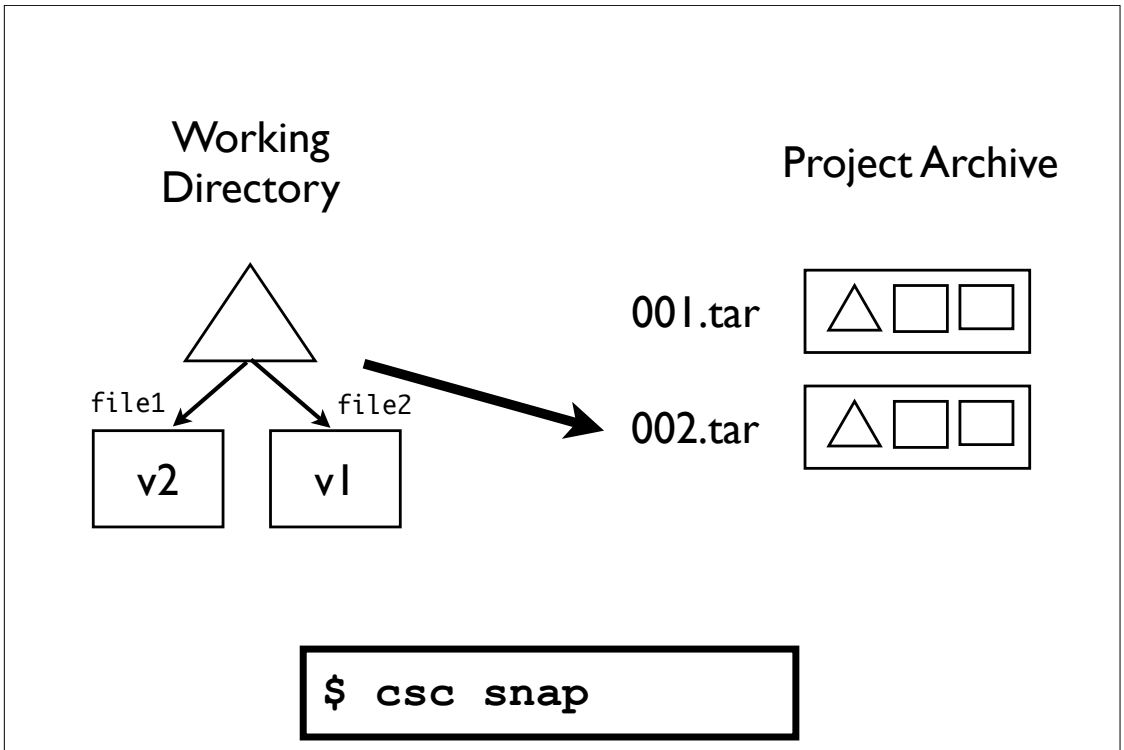

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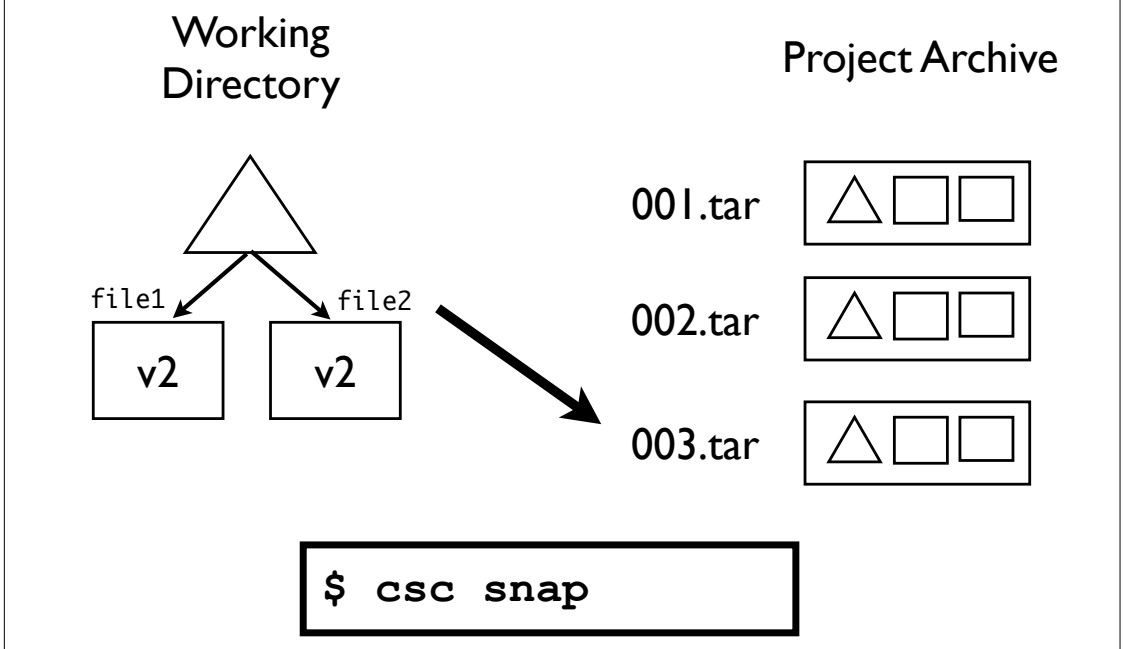

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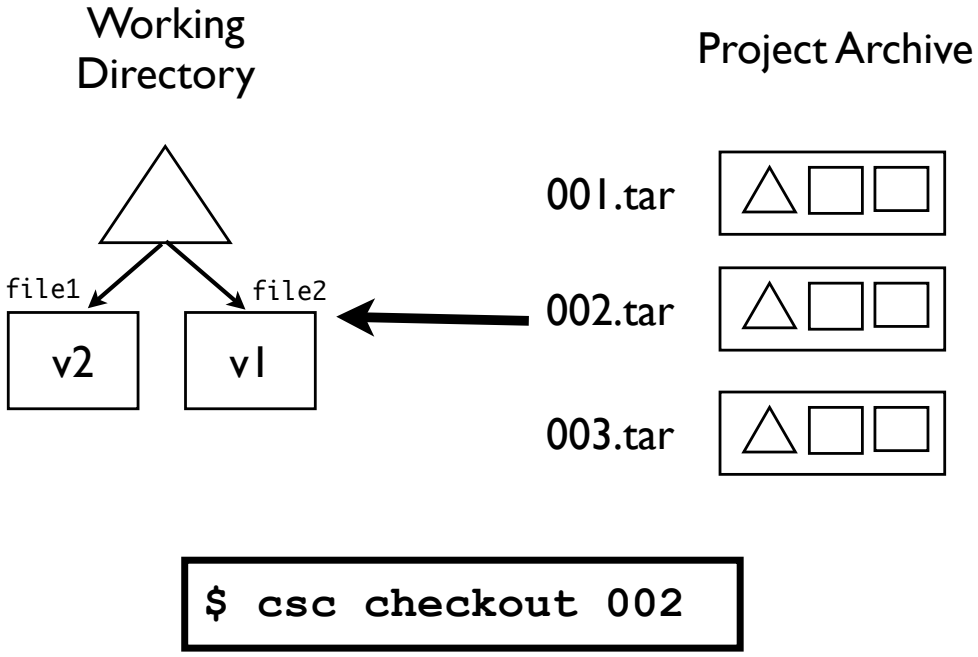

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Two Basic Commands

- Snap
- Checkout

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Very Easy / Very Simple

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Rather Wasteful

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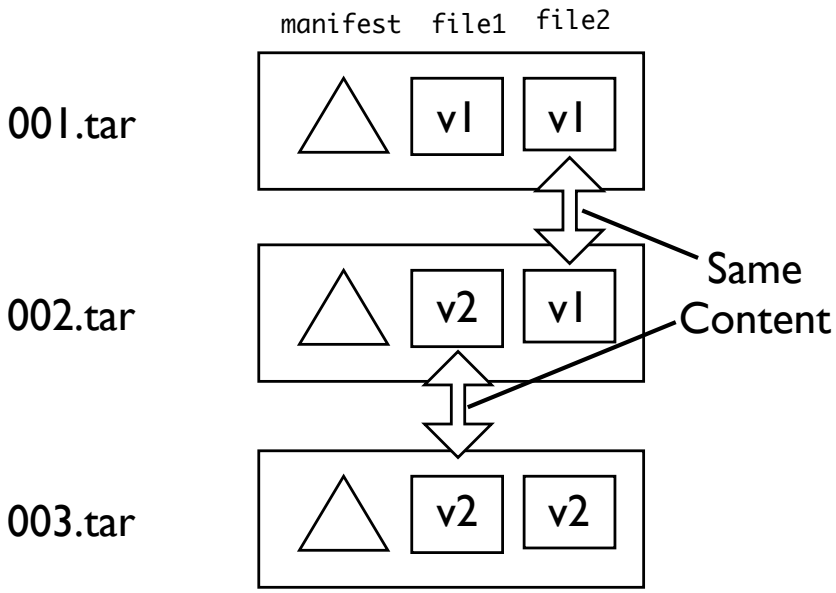

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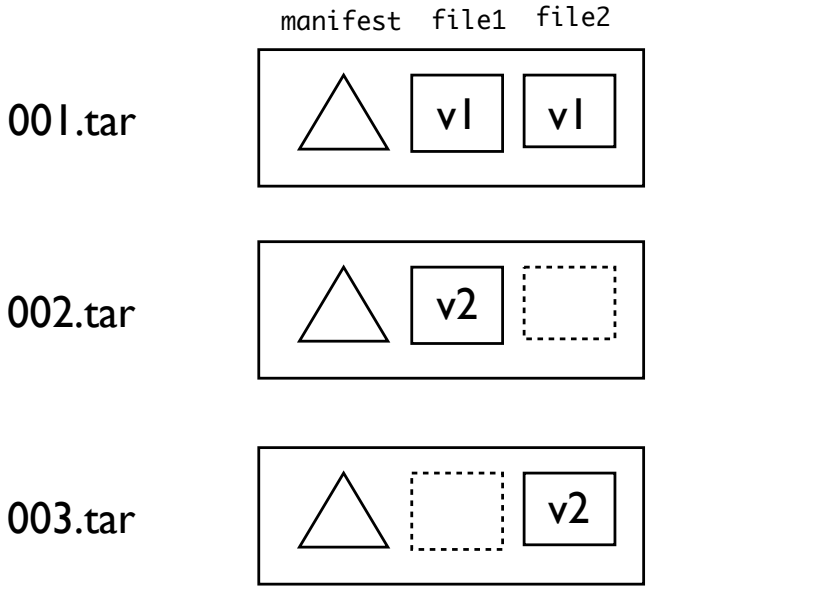

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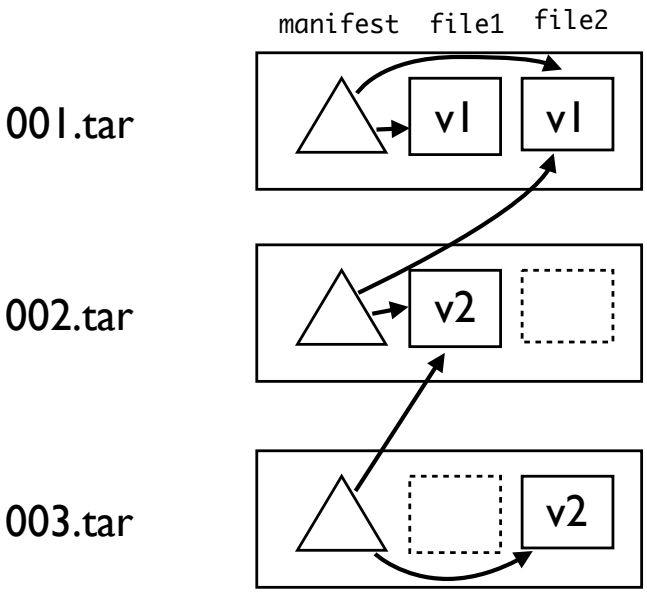

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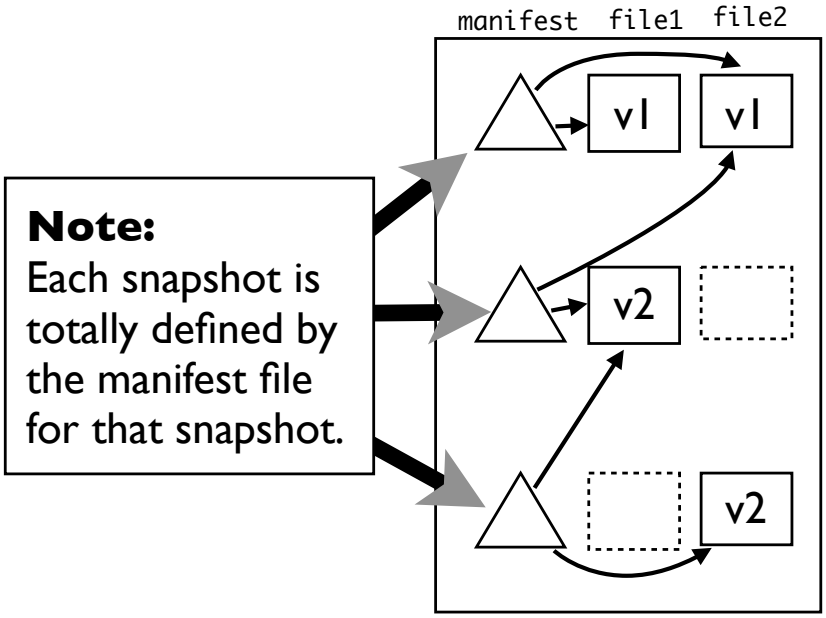

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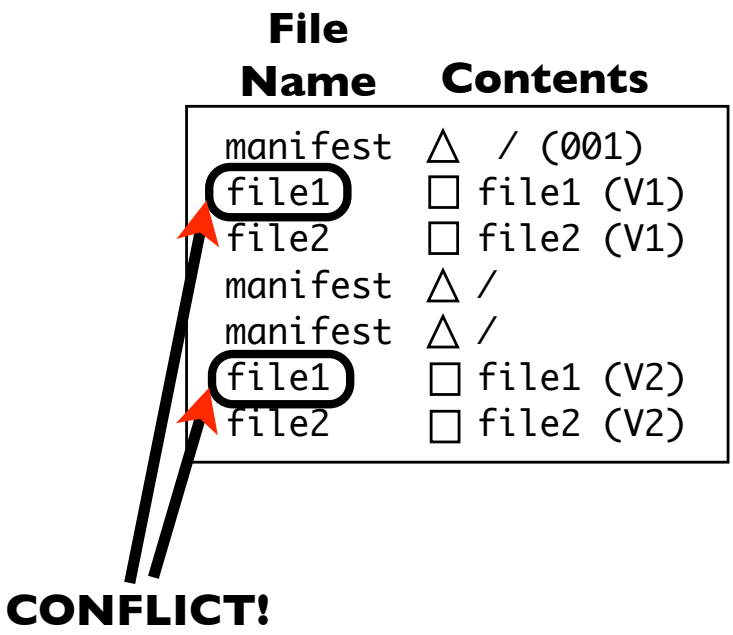

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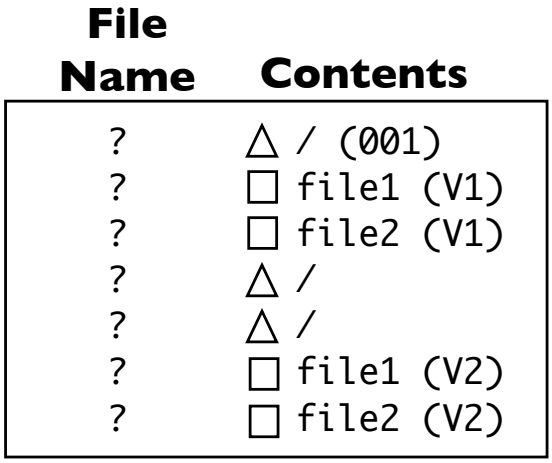

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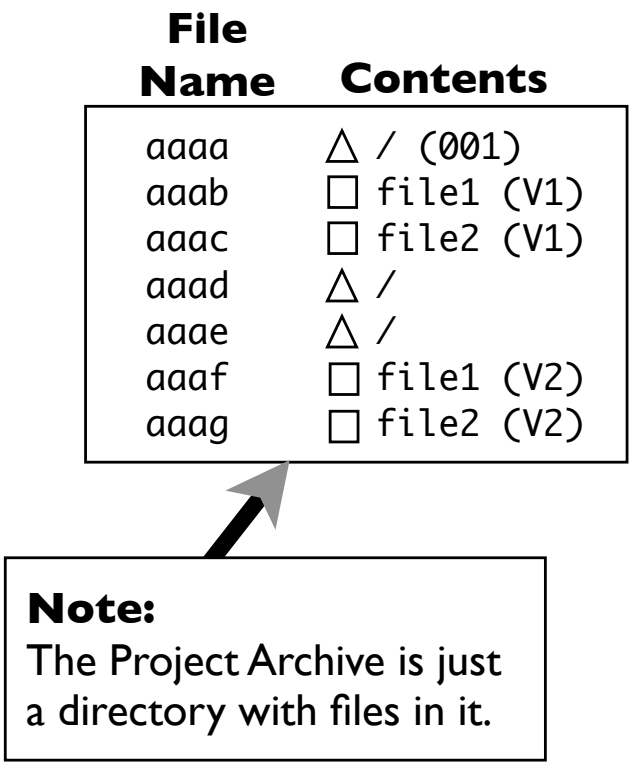

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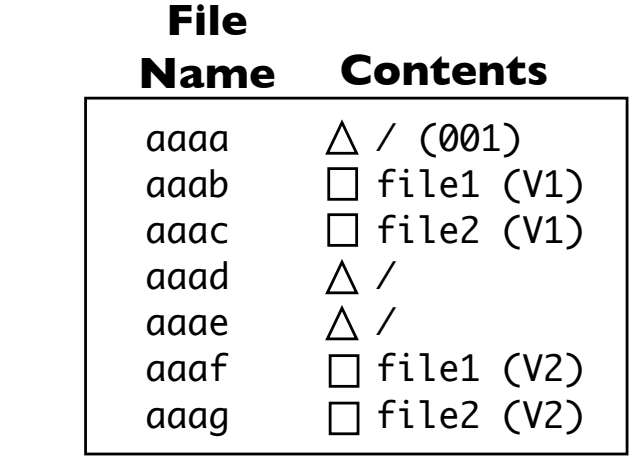


```
$ ls
aaaa  aaab  aaac  aaad  aaae  aaaf  aaag
```

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Project Archive

- Is just a **directory with files** in it
- The archive files have **arbitrary** names.
  - The file names can be anything as long as they are **unique**
- We track the **real file** names in the manifest files.

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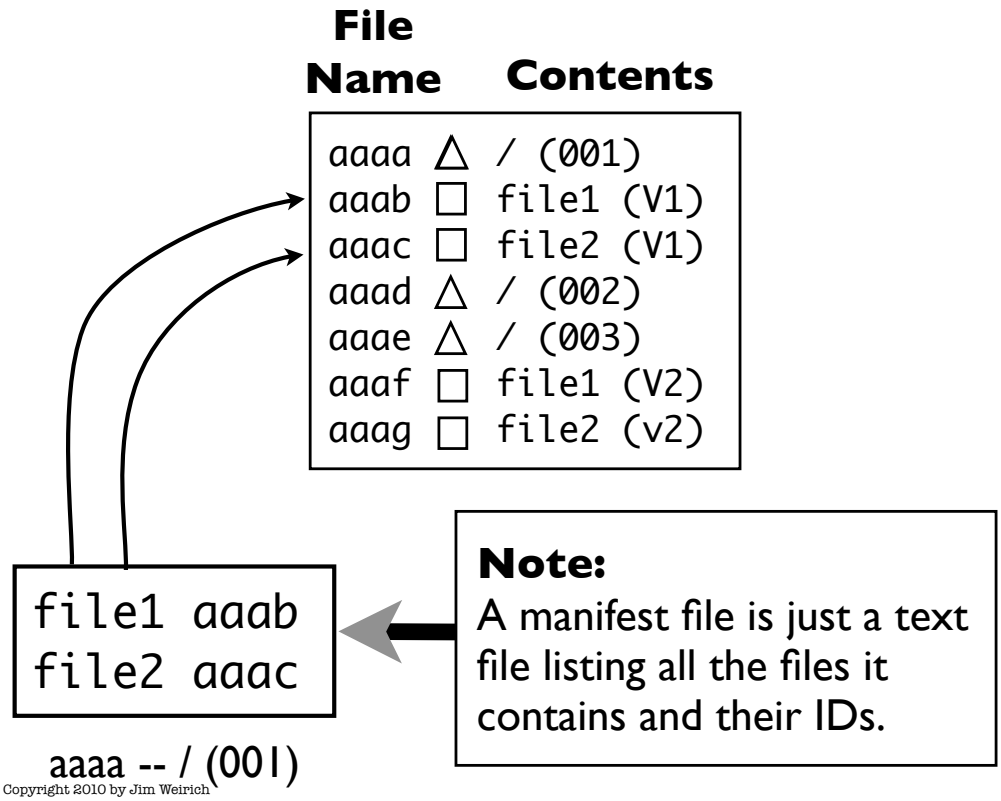

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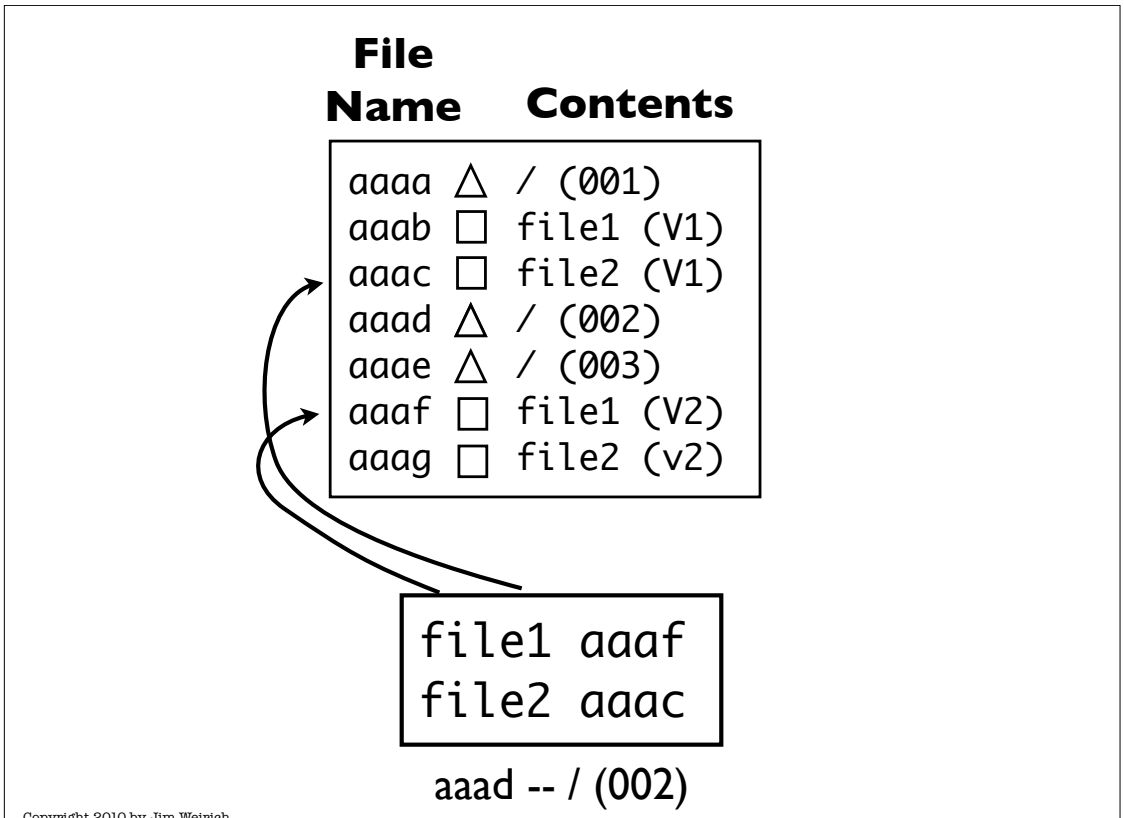

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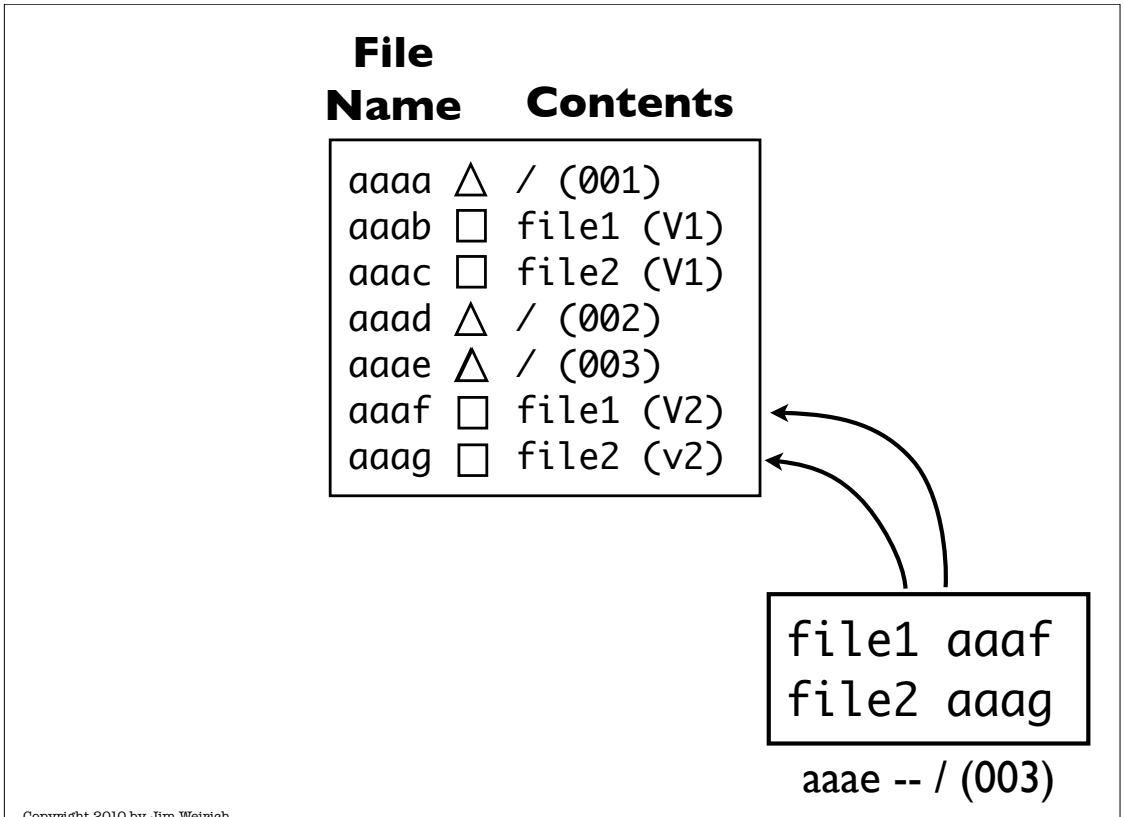

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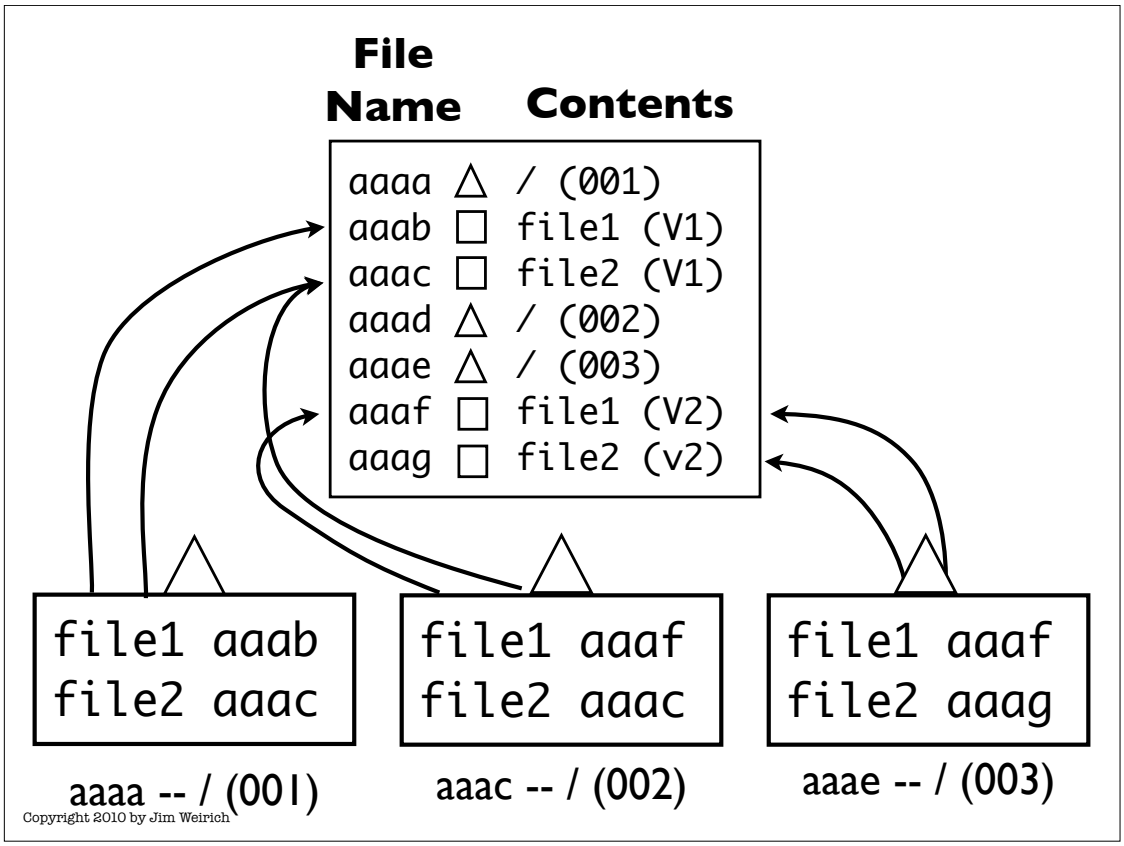

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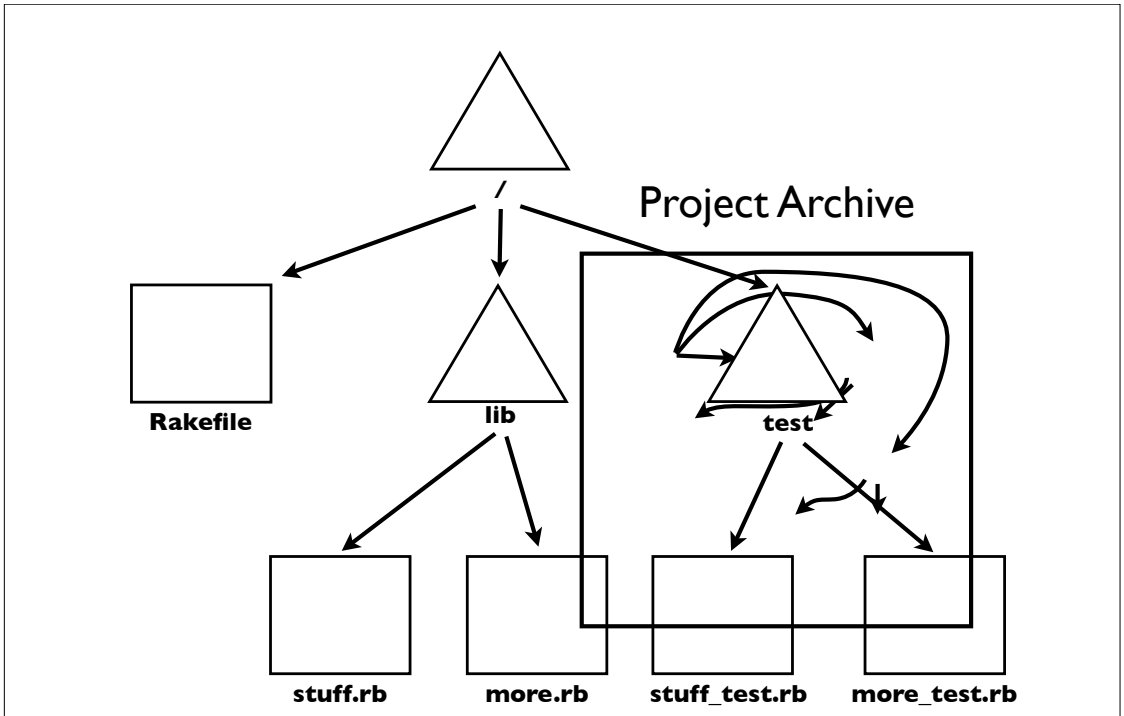

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Metadata would be nice

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What Metadata?

- The Root manifest of the snapshot
- Name/EMail of the person commiting the snapshot
- Date/Time of the snapshot
- Some comments describing the snapshot

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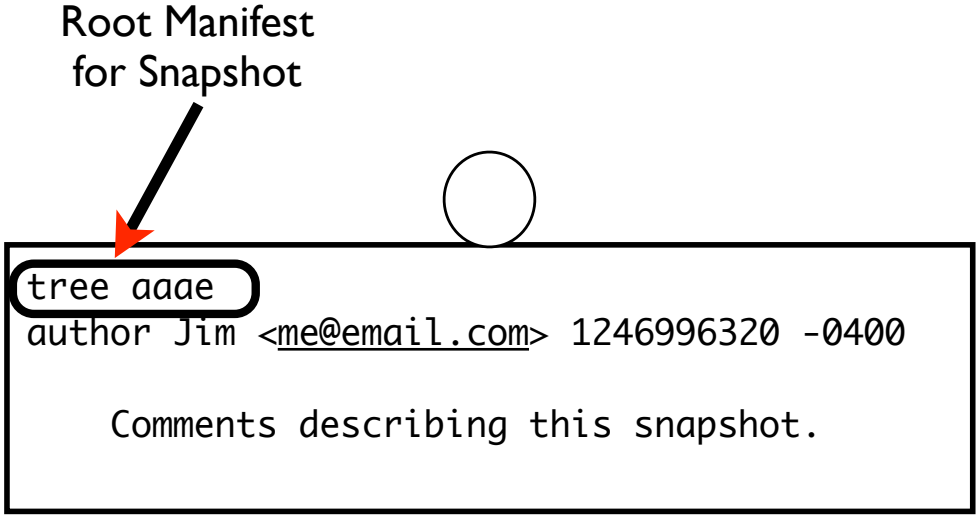

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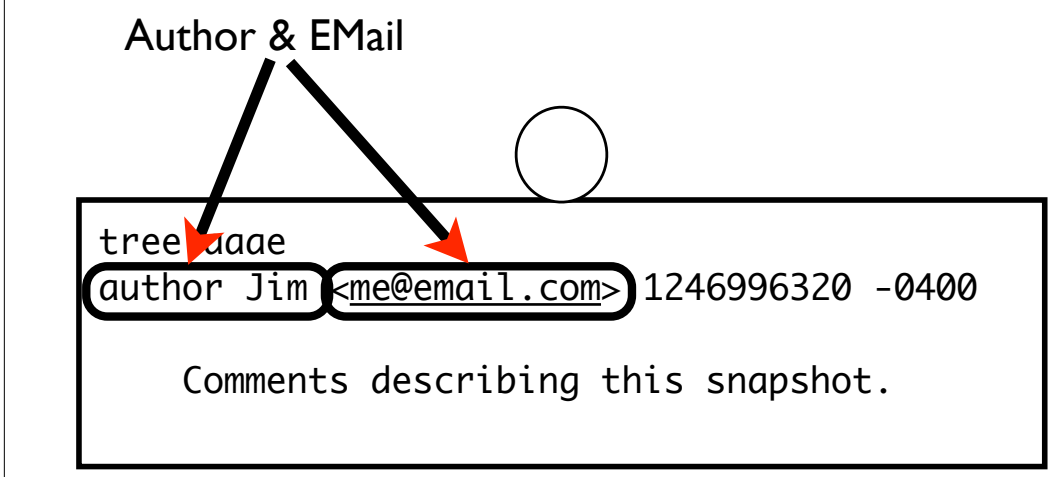

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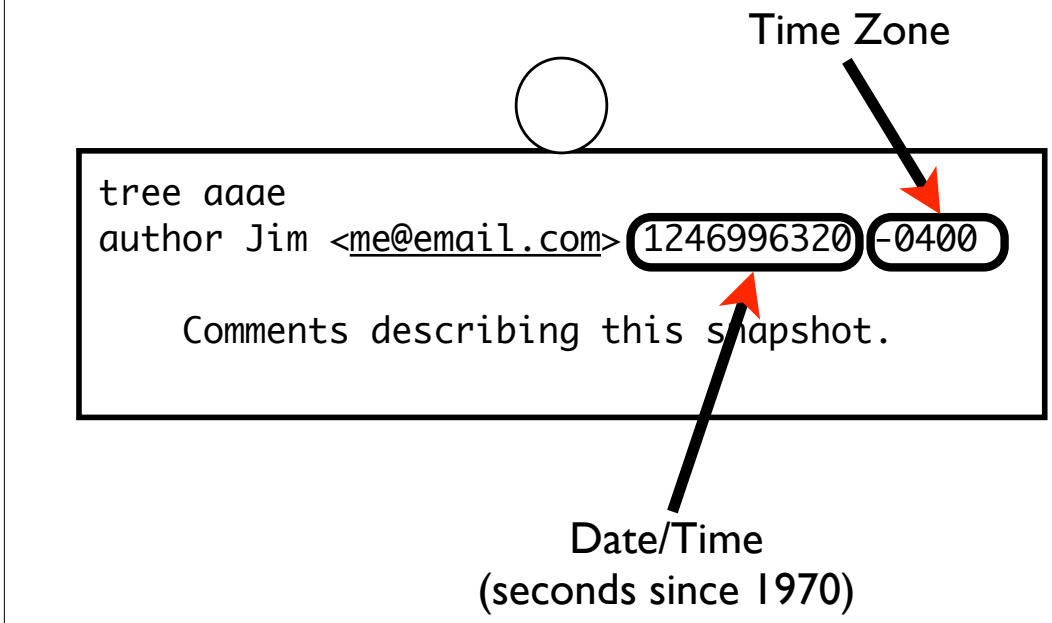

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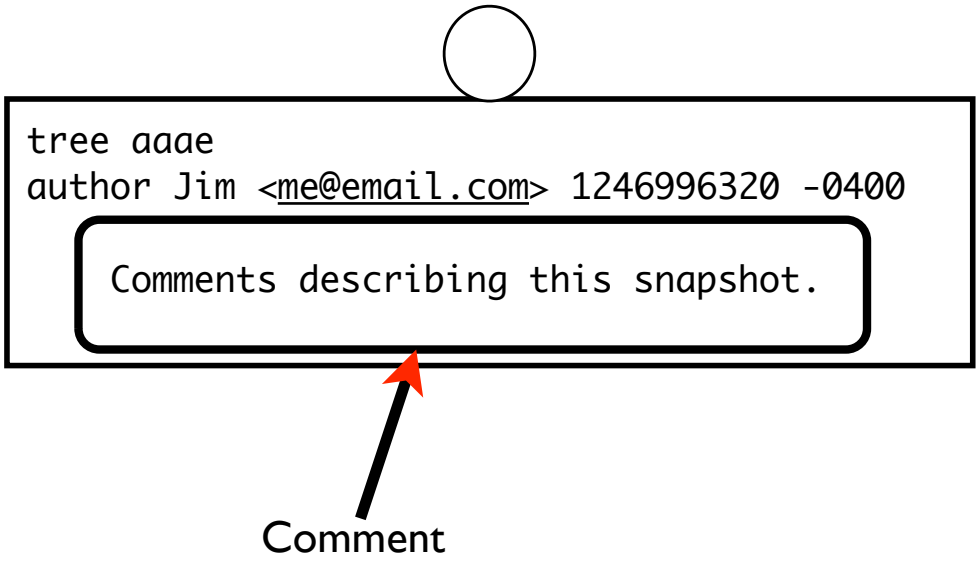

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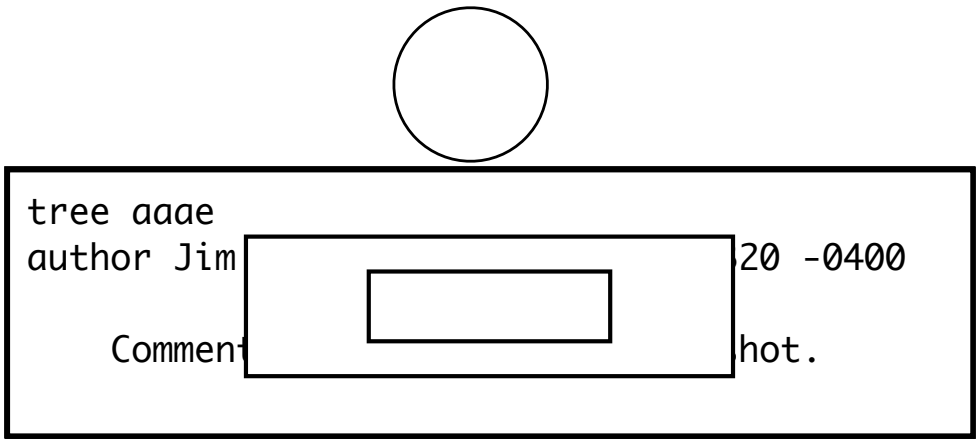

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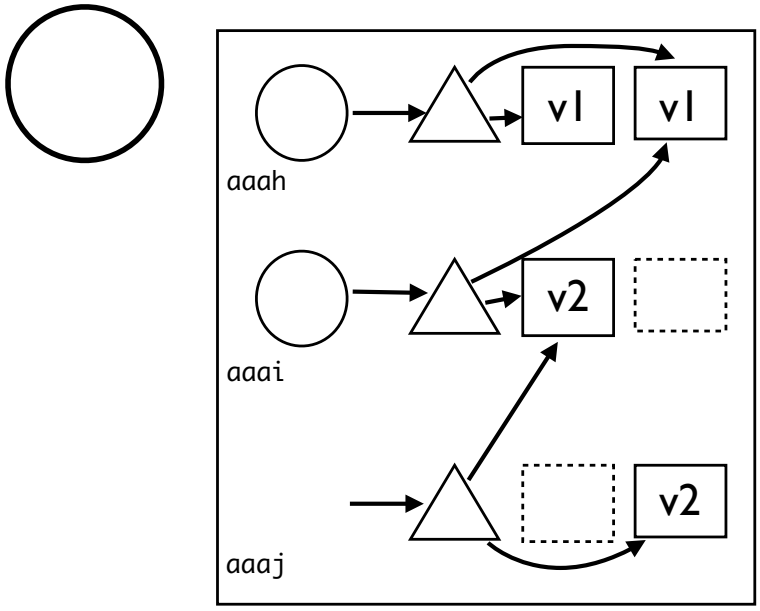

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```
tree aaae
author Jim <me@email.com> 1246996320 -0400

    Comments describing this snapshot.
```

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previous snapshot

```
tree aaae
parent aaai
author Jim <me@email.com> 1246996320 -0400

    Comments describing this snapshot.
```

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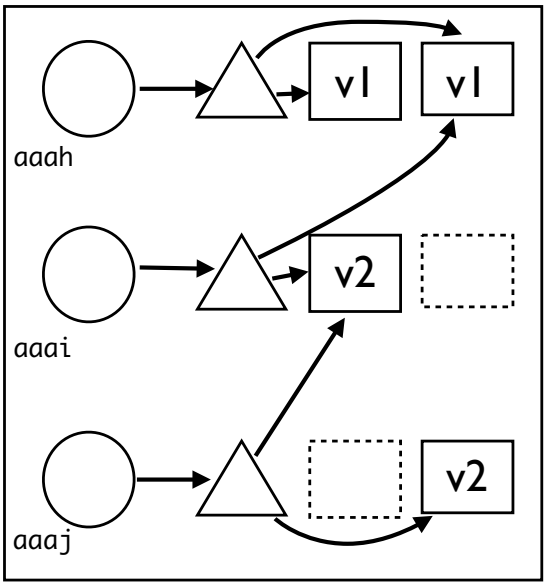
Project Archive



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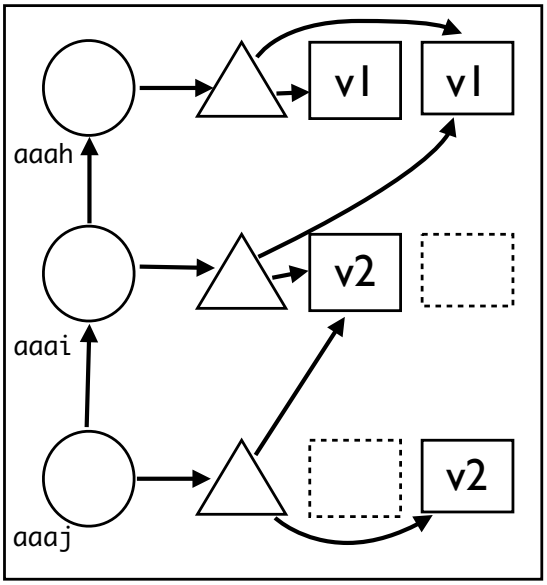

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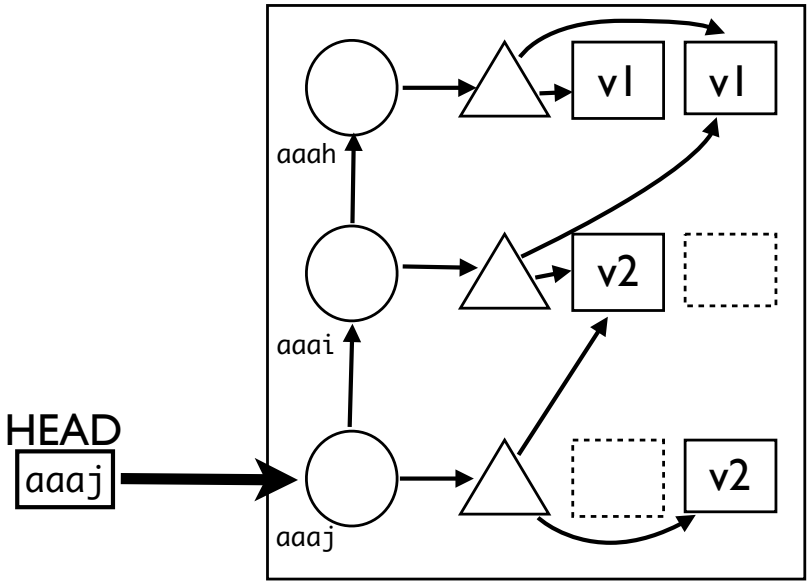

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Summary So Far ...

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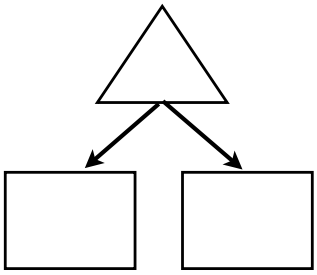
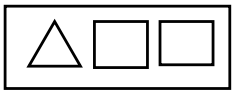
Working Directory

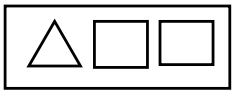


Project Archive

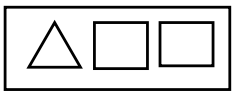
001.tar



002.tar



003.tar



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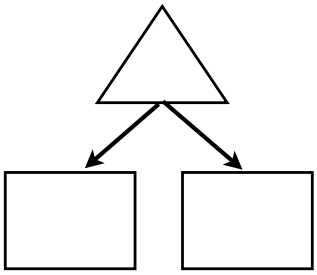

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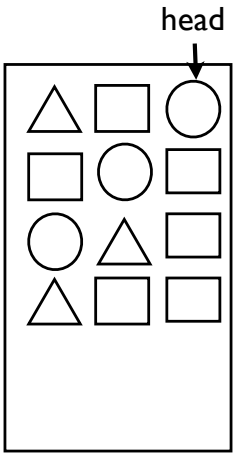

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How do we create a snapshot now?

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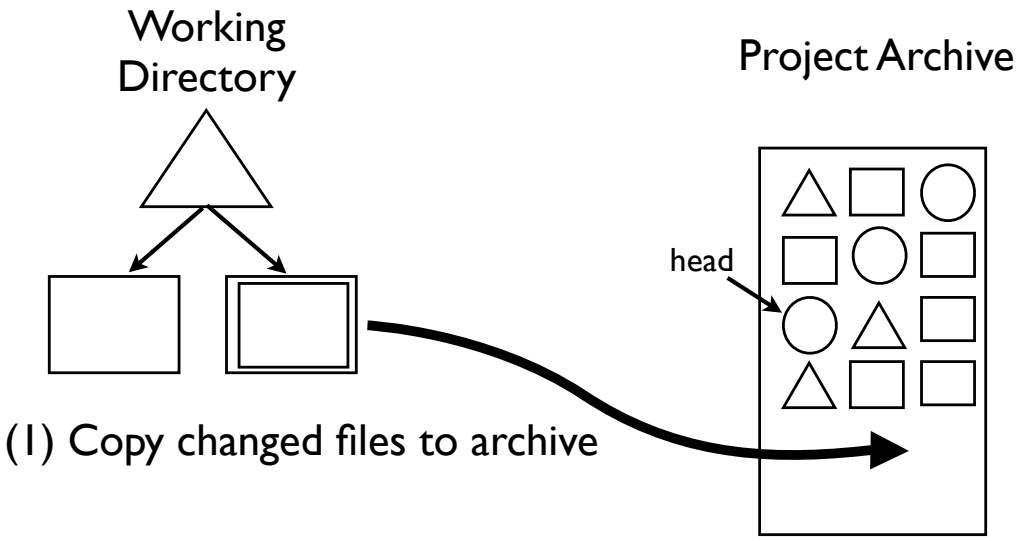

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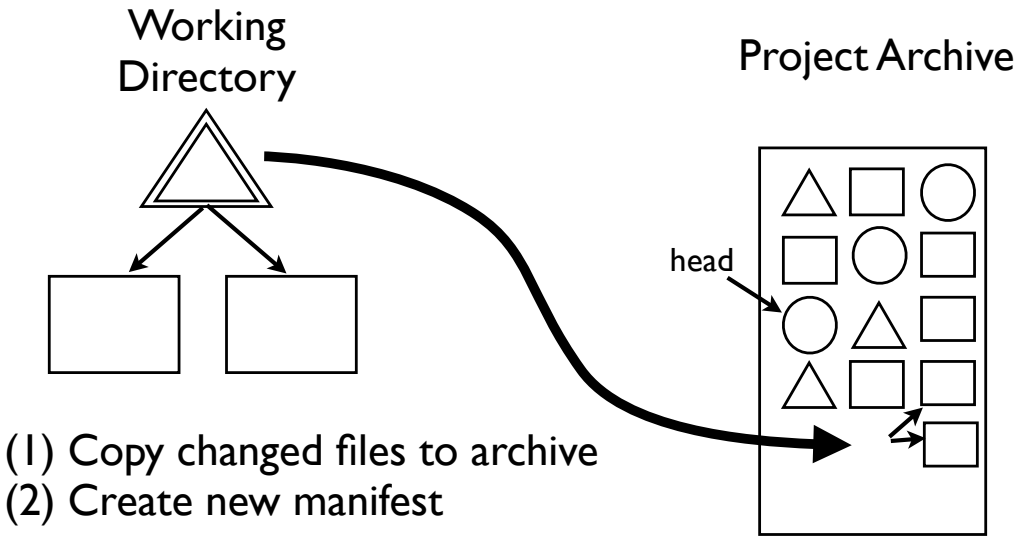

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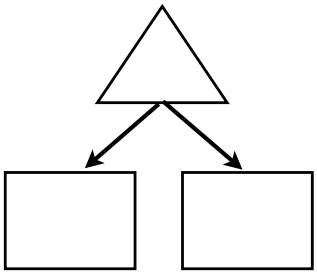

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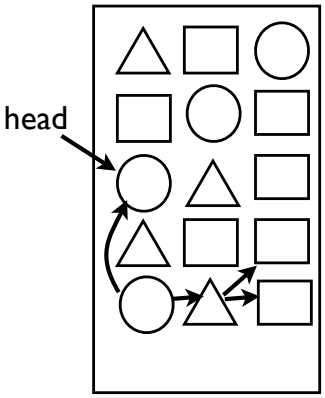

(1) Copy changed files to archive
(2) Create new manifest
(3) Create new snapshot record

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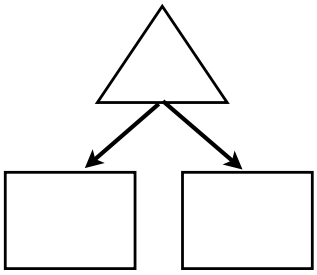
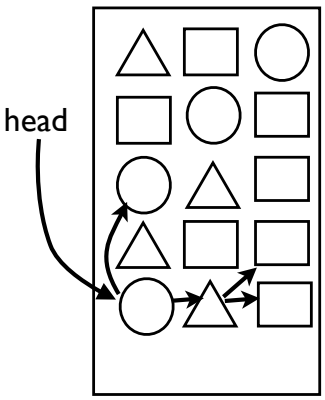
Working Directory



Project Archive



(1) Copy changed files to archive
(2) Create new manifest
(3) Create new snapshot record
(4) Readjust HEAD

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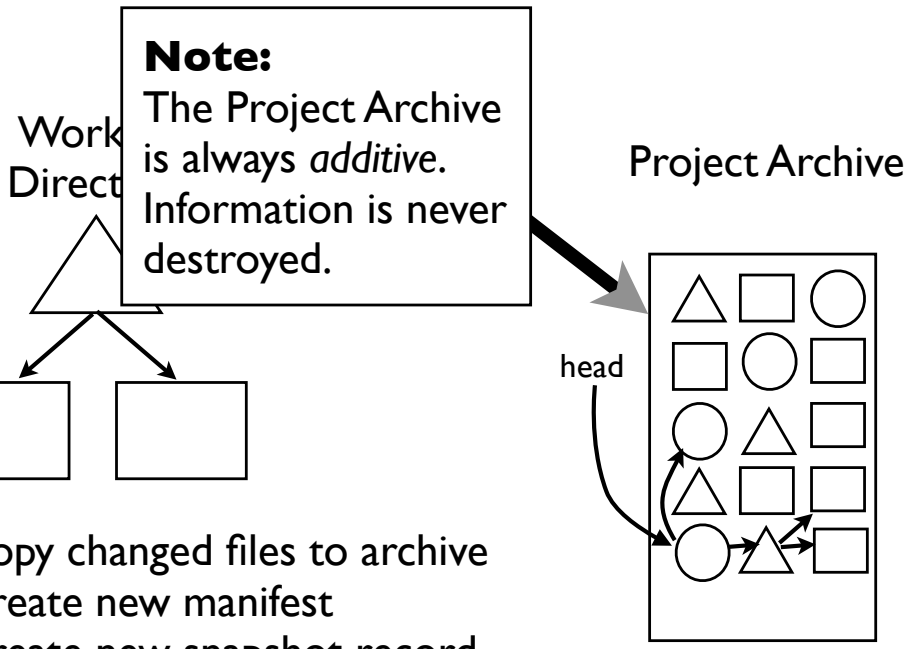

(1) Copy changed files to archive
(2) Create new manifest
(3) Create new snapshot record
(4) Readjust HEAD

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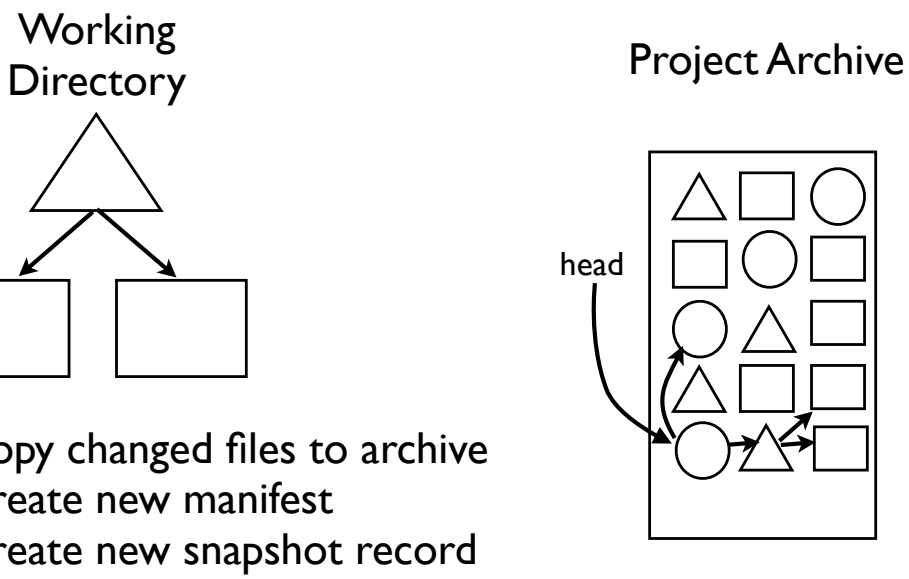

(1) Copy changed files to archive
(2) Create new manifest
(3) Create new snapshot record
(4) Readjust HEAD

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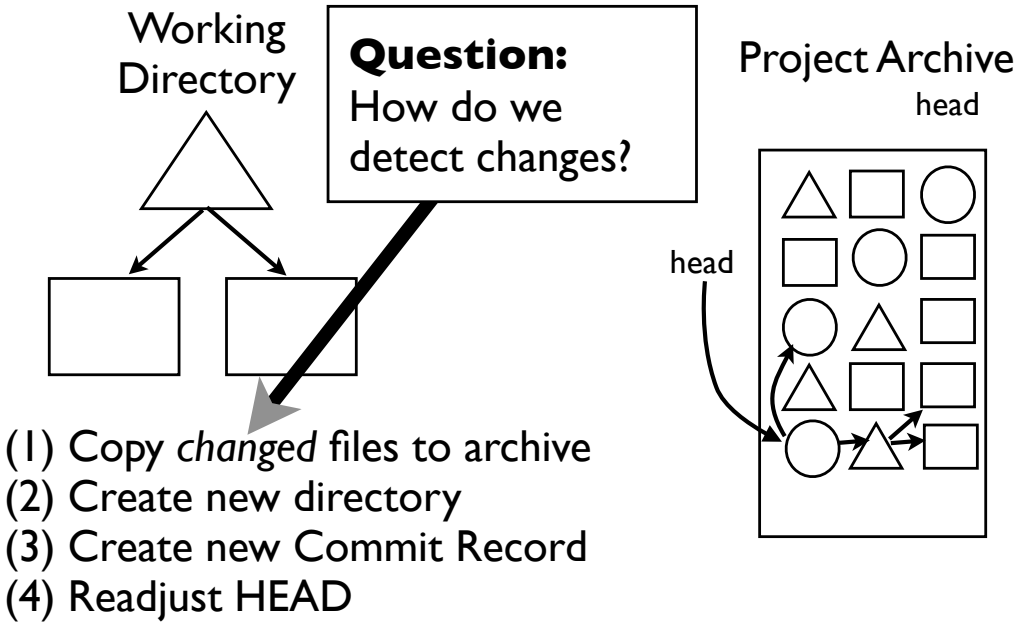

(1) Copy *changed* files to archive
(2) Create new directory
(3) Create new Commit Record
(4) Readjust HEAD

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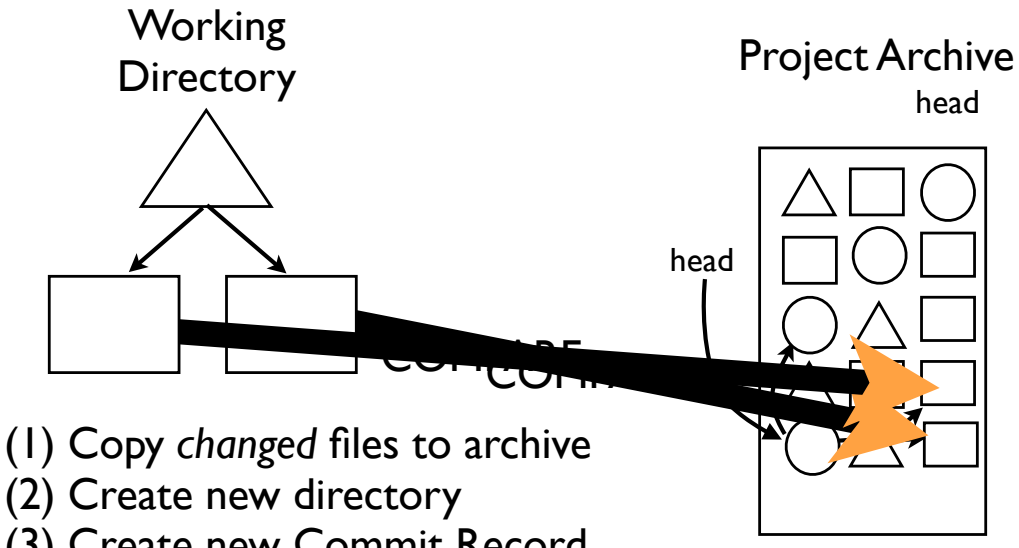

(1) Copy *changed* files to archive
(2) Create new directory
(3) Create new Commit Record
(4) Readjust HEAD

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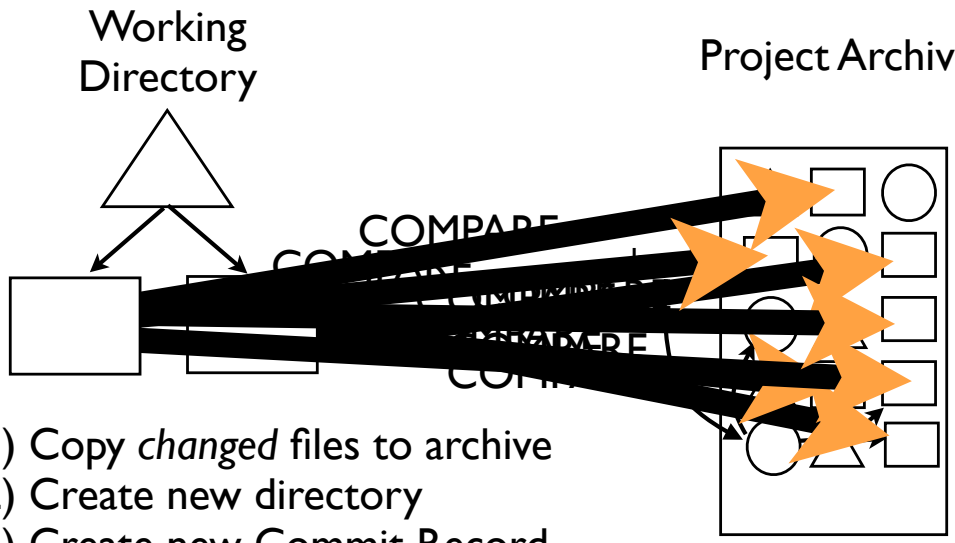

(1) Copy *changed* files to archive
(2) Create new directory
(3) Create new Commit Record
(4) Readjust HEAD

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Detecting Duplication

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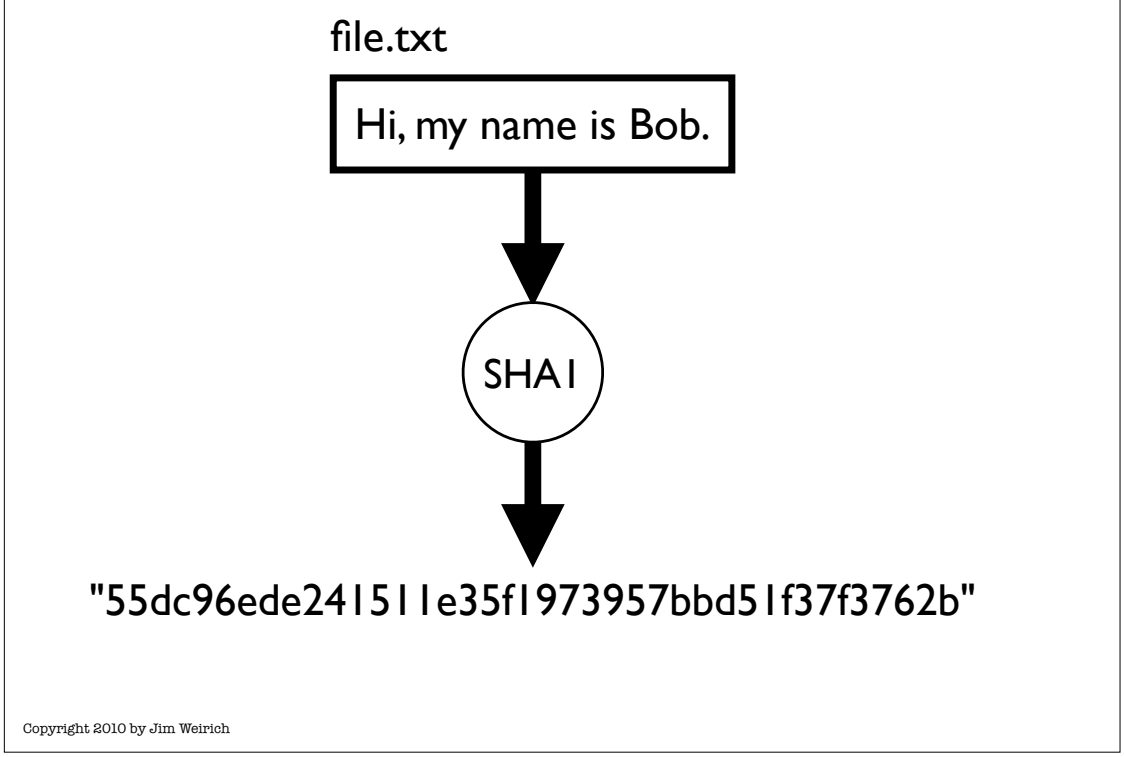

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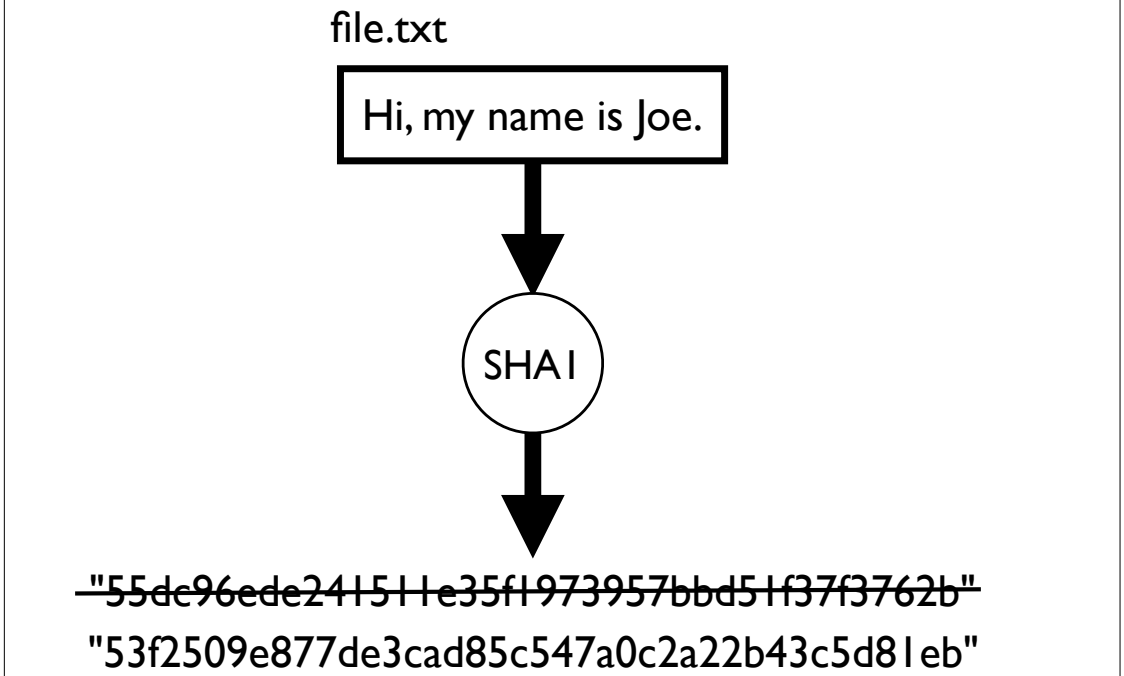

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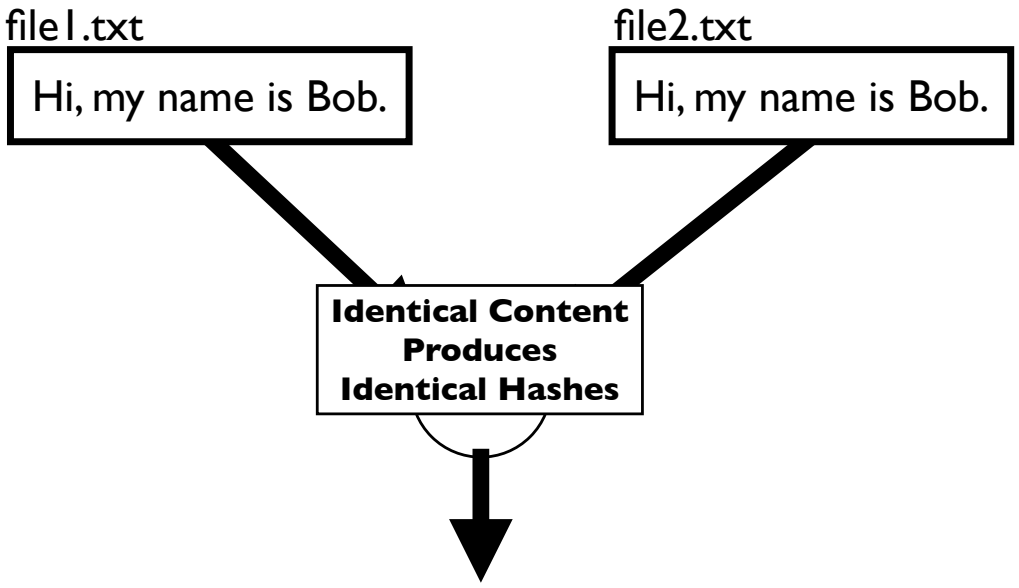

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File Names in the Archive

- Arbitrary
- Unique

```
aaaa    △ / (001)
aaab    □ file1 (V1)
aaac    □ file2 (V1)
aaad    △ /
aaae    △ /
aaaf    □ file1 (V2)
aaag    □ file2 (V2)
```

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Idea:

Use the SHA1 Hash for the File Name

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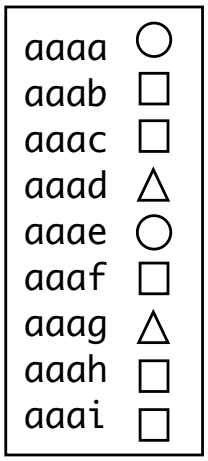

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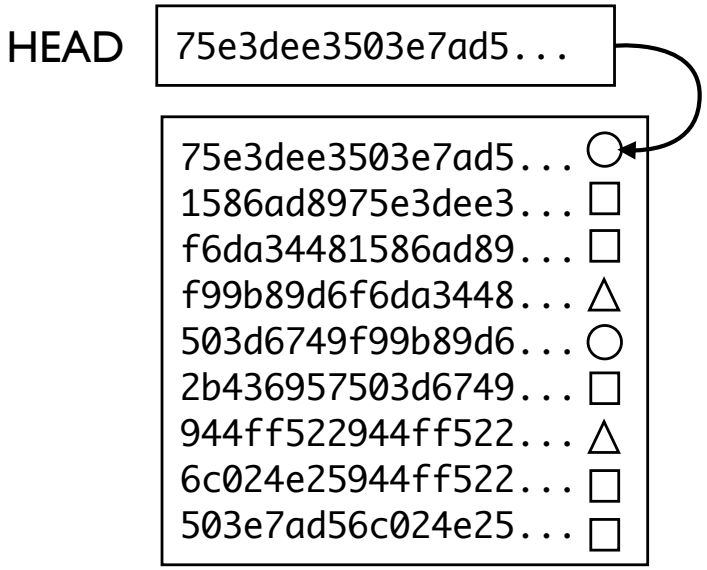

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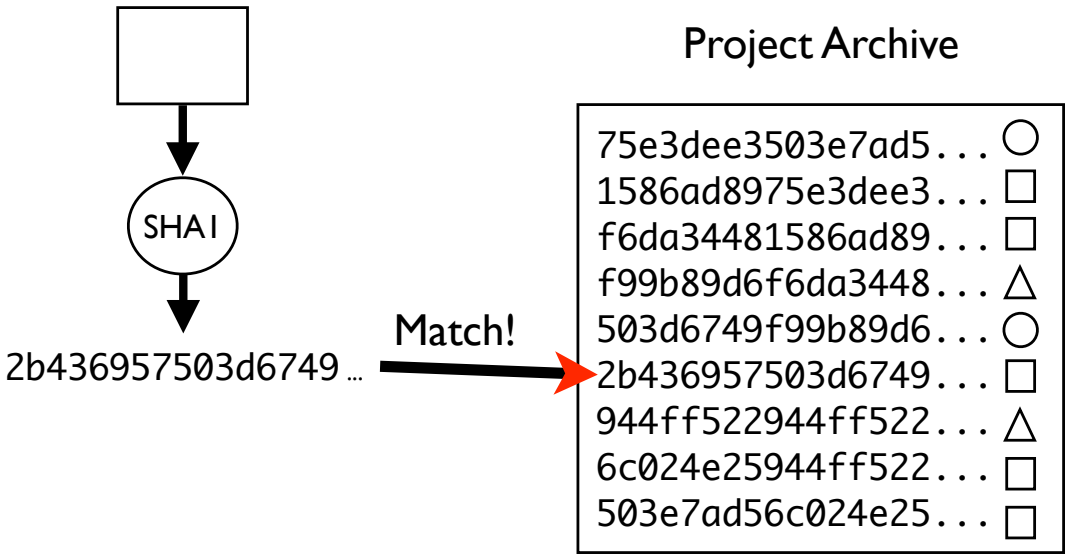

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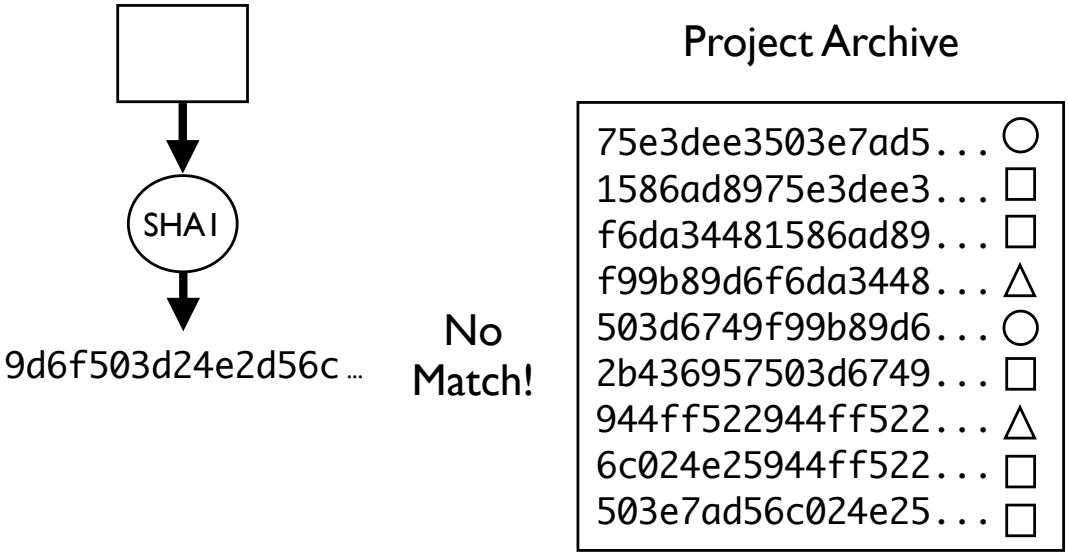

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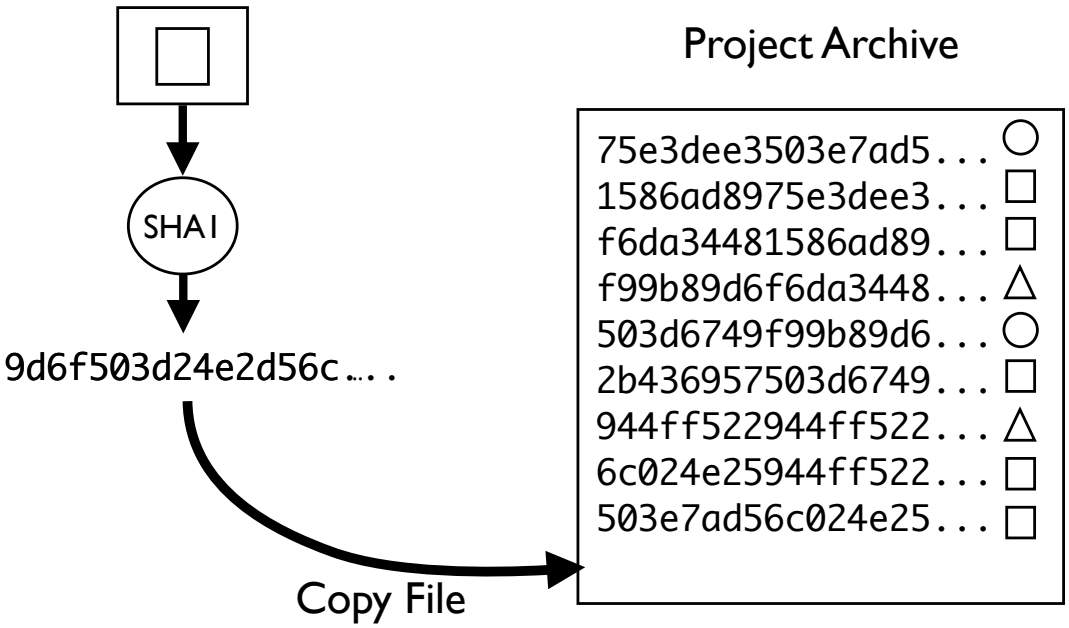

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Project Archive Integrity

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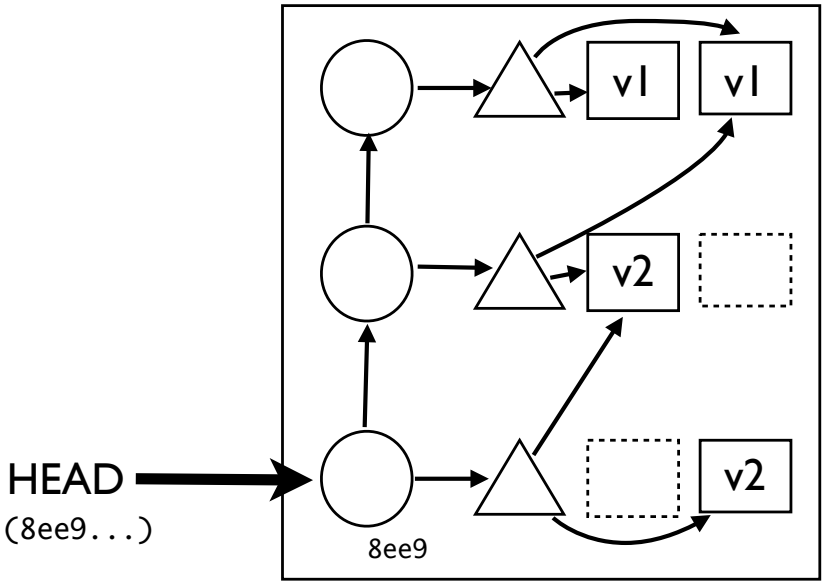
Project Archive



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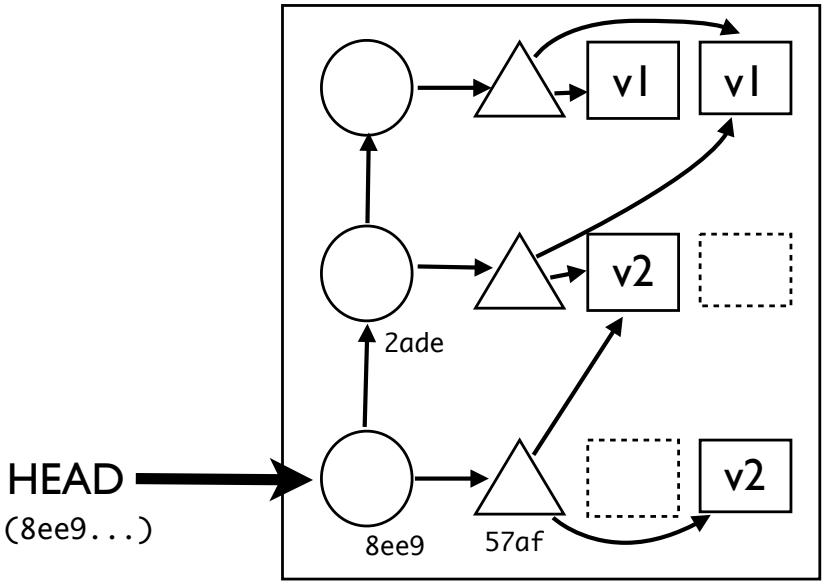

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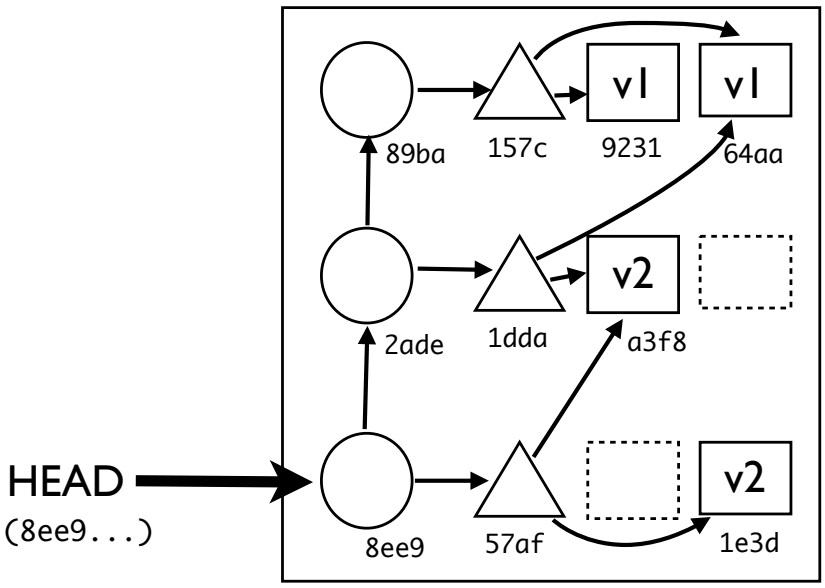

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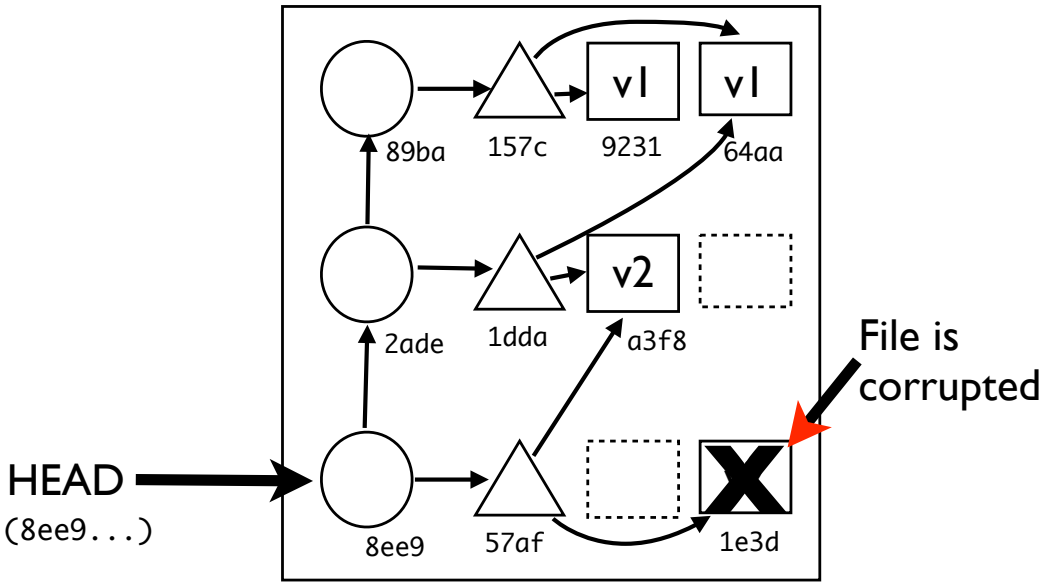

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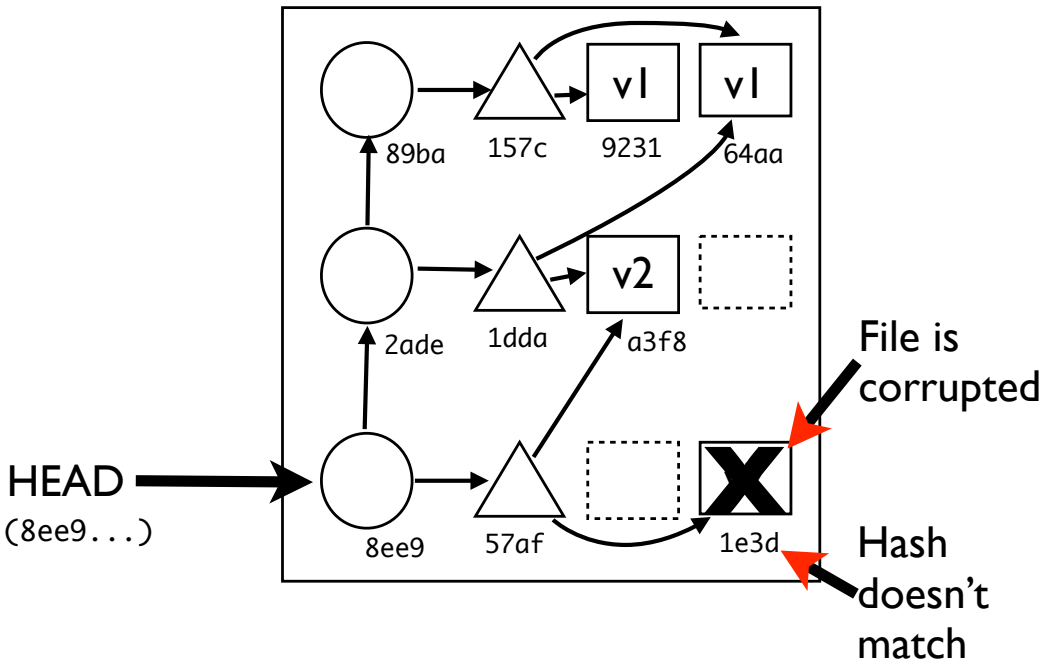

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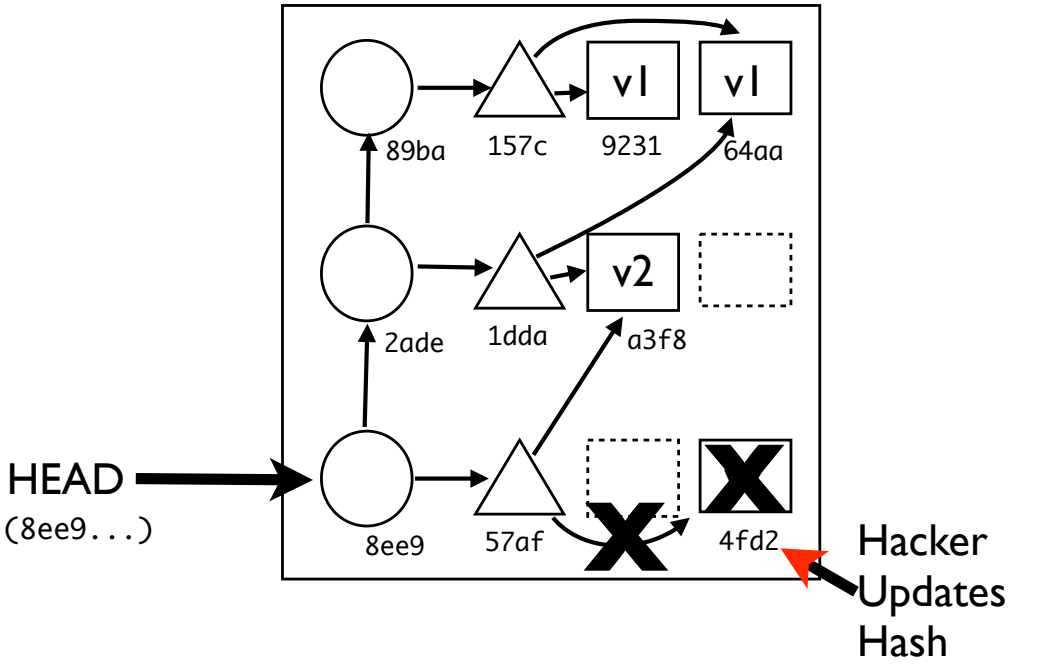

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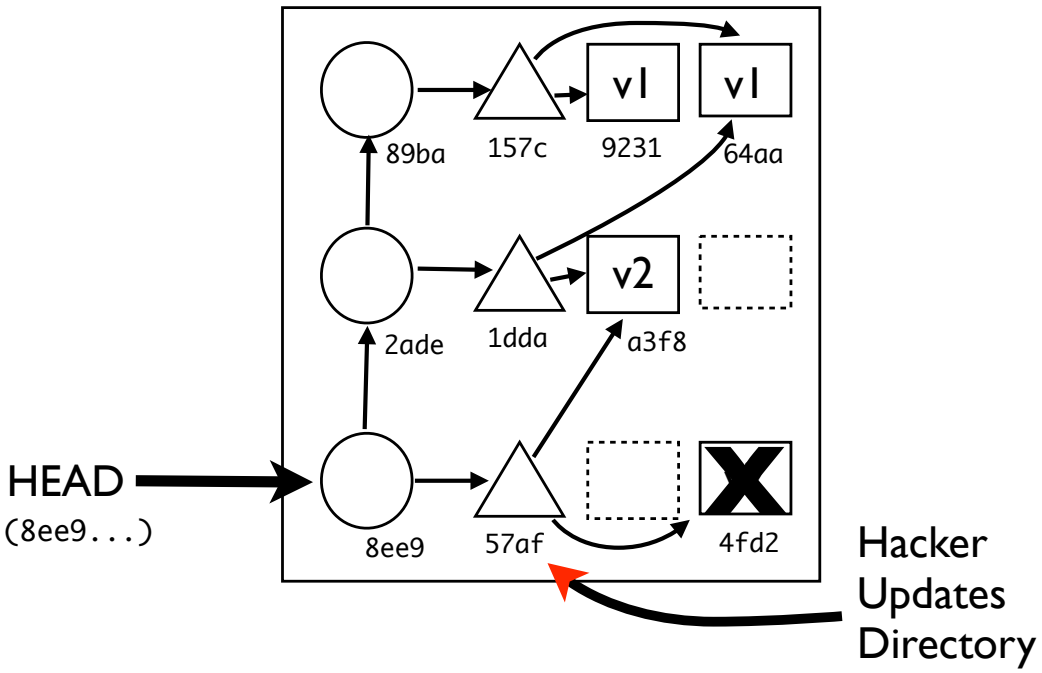

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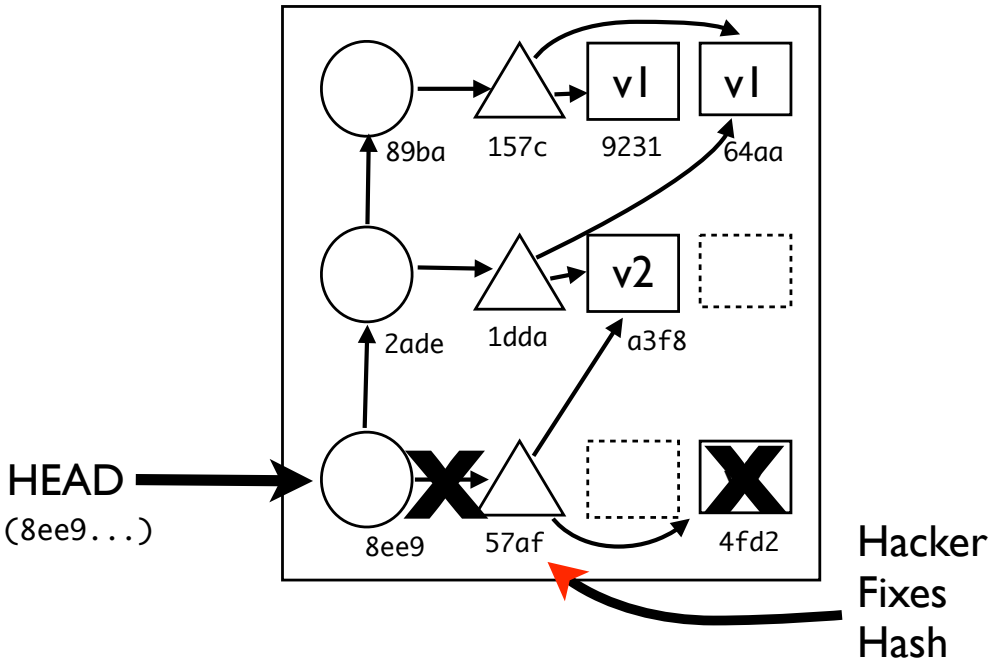

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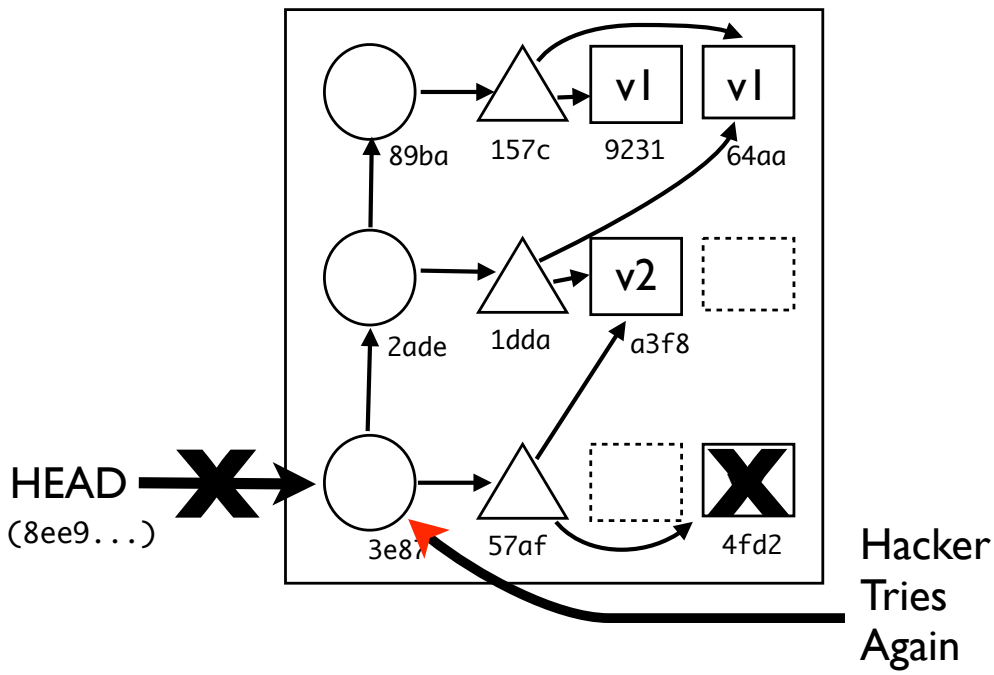

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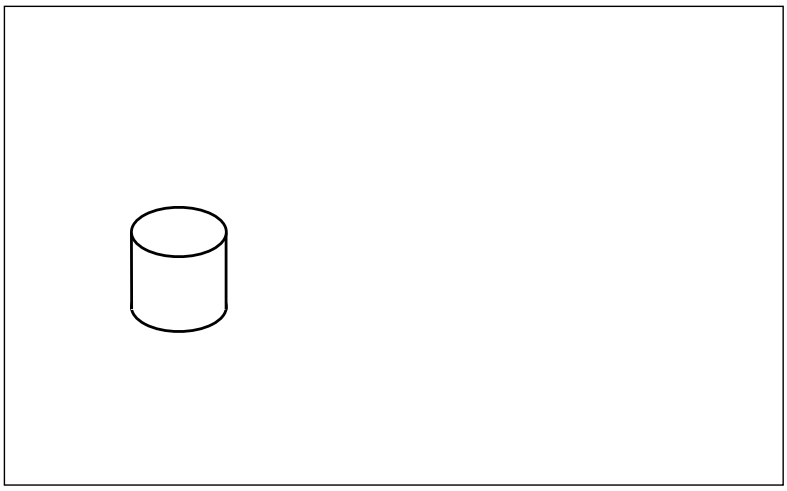

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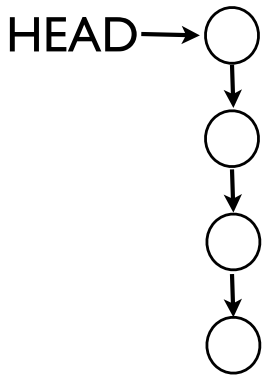

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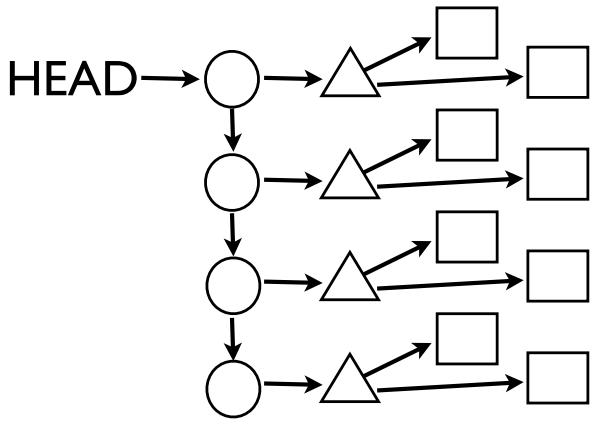

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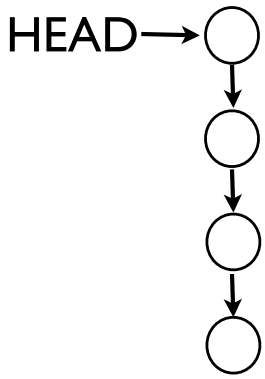

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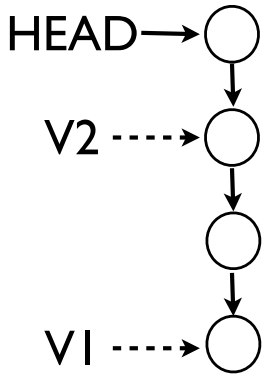

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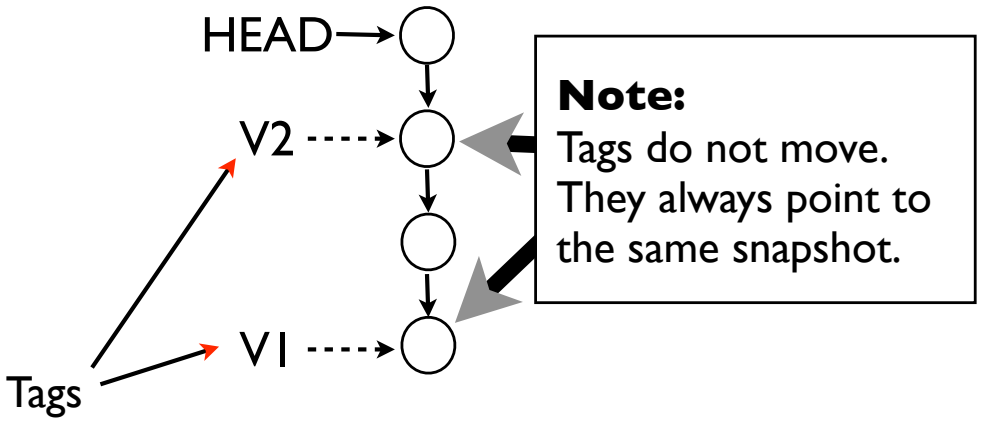

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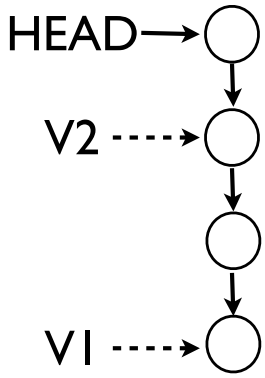

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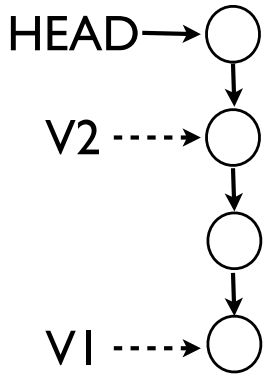

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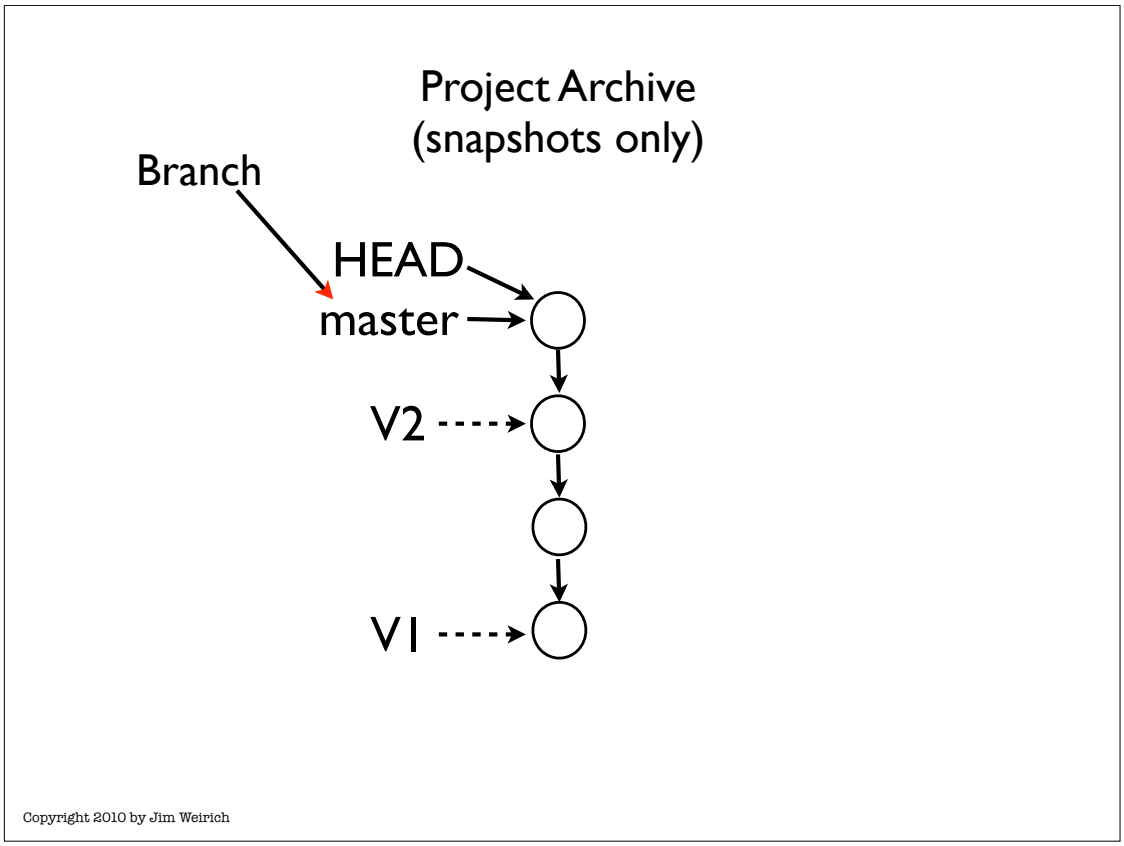

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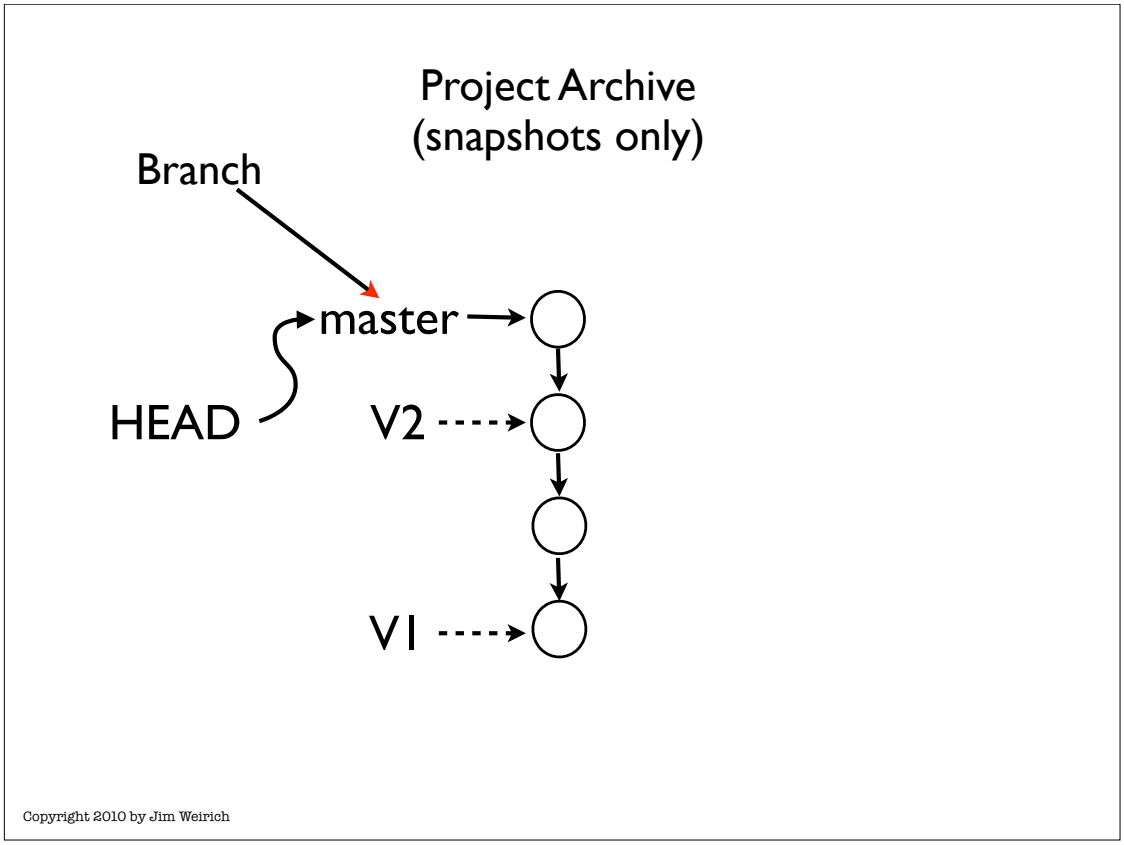

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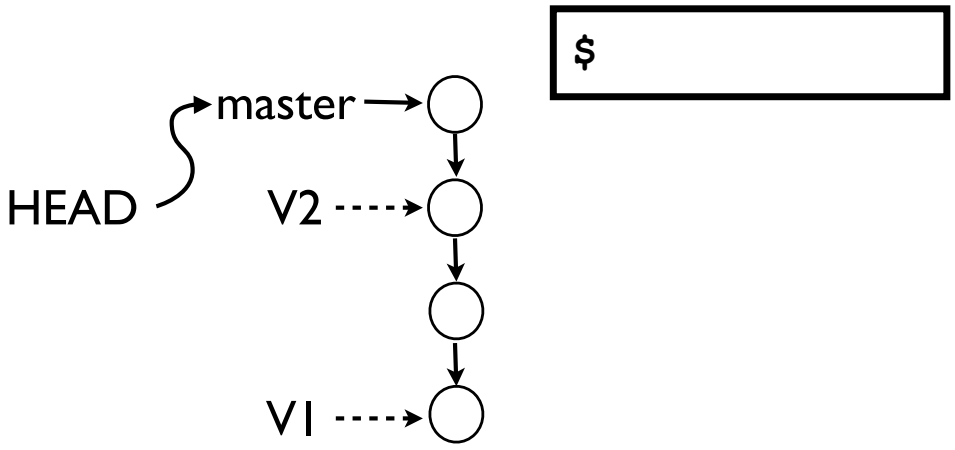

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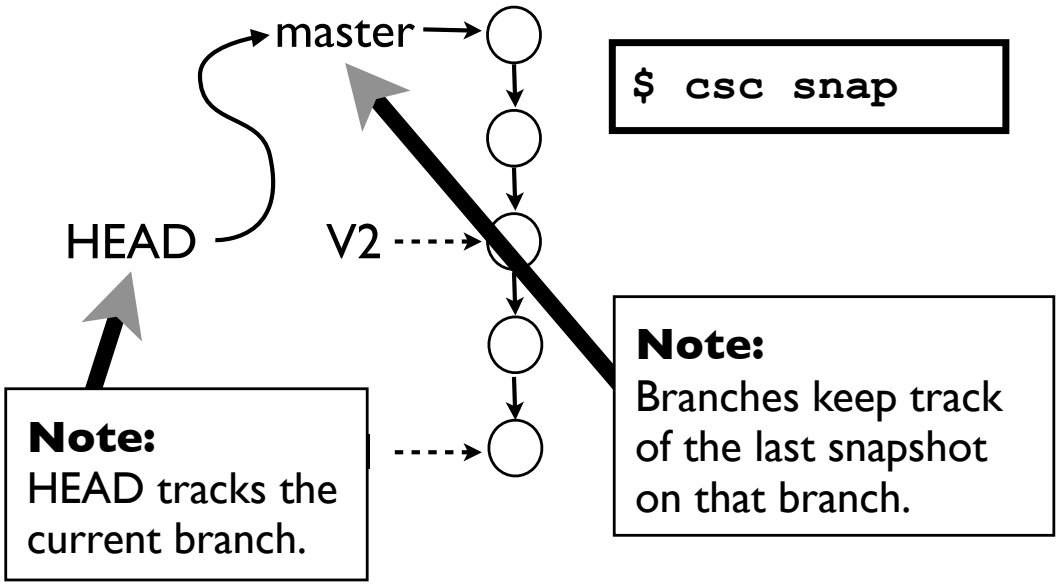

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Oops! We found a bug

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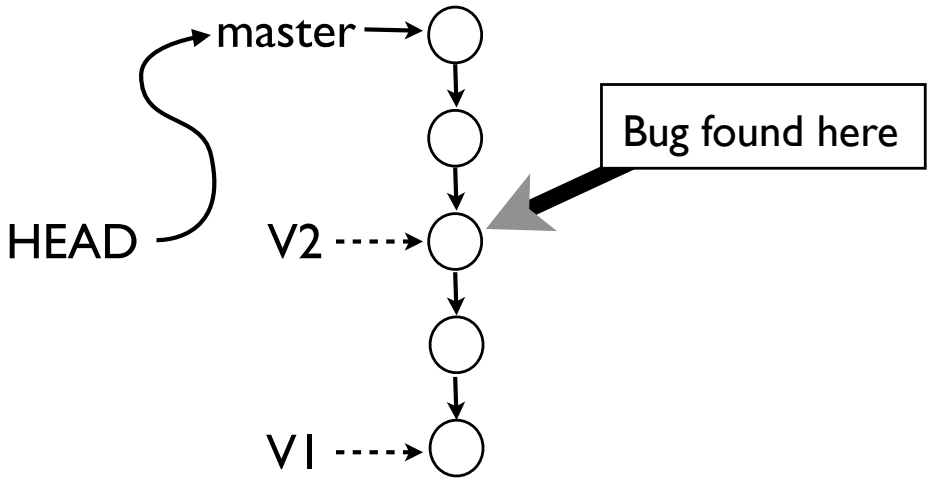

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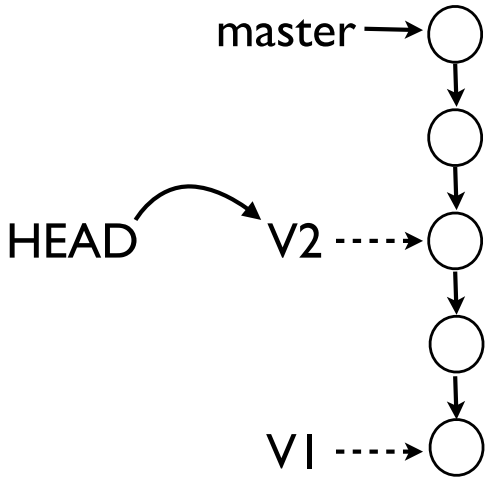


```
$ csc checkout V2
```

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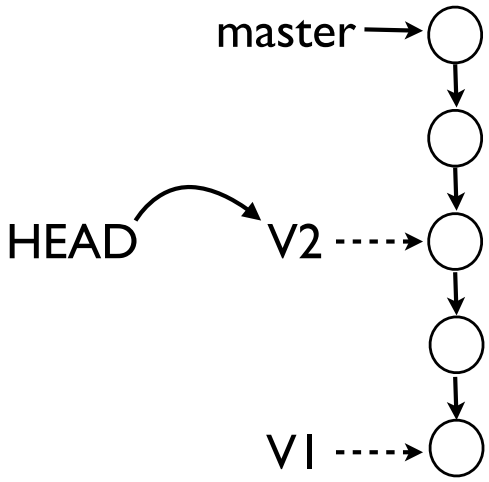


```
$ csc checkout V2
$ edit files
```

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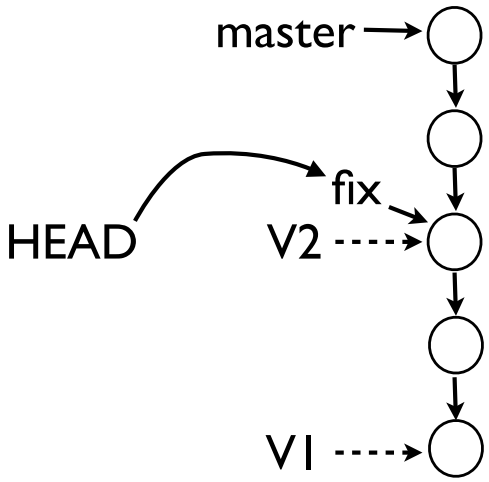


```
$ csc checkout V2
$ edit files
$ csc branch fix
```

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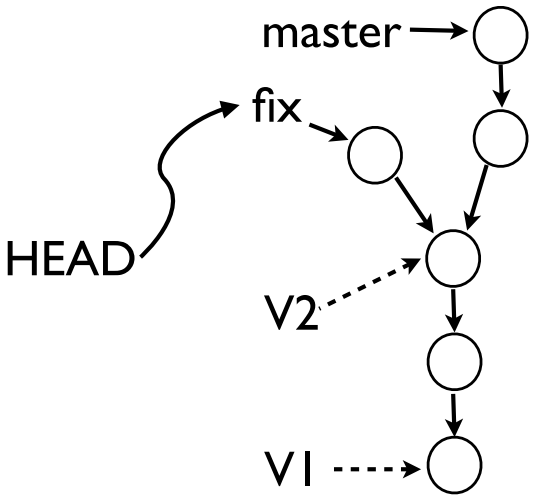


```
$ csc checkout V2
$ edit files
$ csc branch fix
$ csc snap
```

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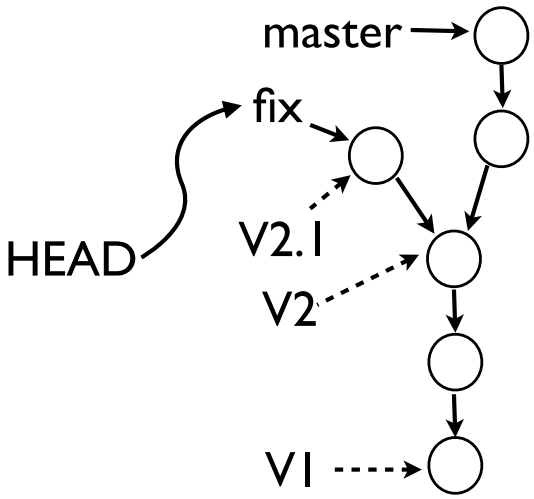


```
$ csc checkout V2
$ edit files
$ csc branch fix
$ csc snap
$ csc tag V2.1
```

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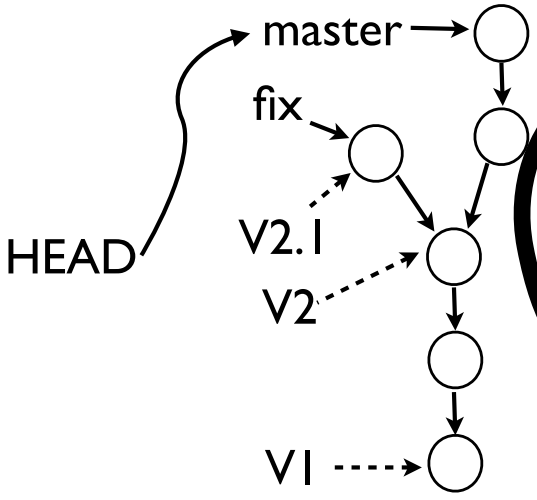


```
$ csc checkout V2
$ edit files
$ csc branch fix
$ csc snap
$ csc tag V2.fix
$ csc checkout master
```

Note:
We didn't create a branch until after we edited files.

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Merge Bug Fixes to Master

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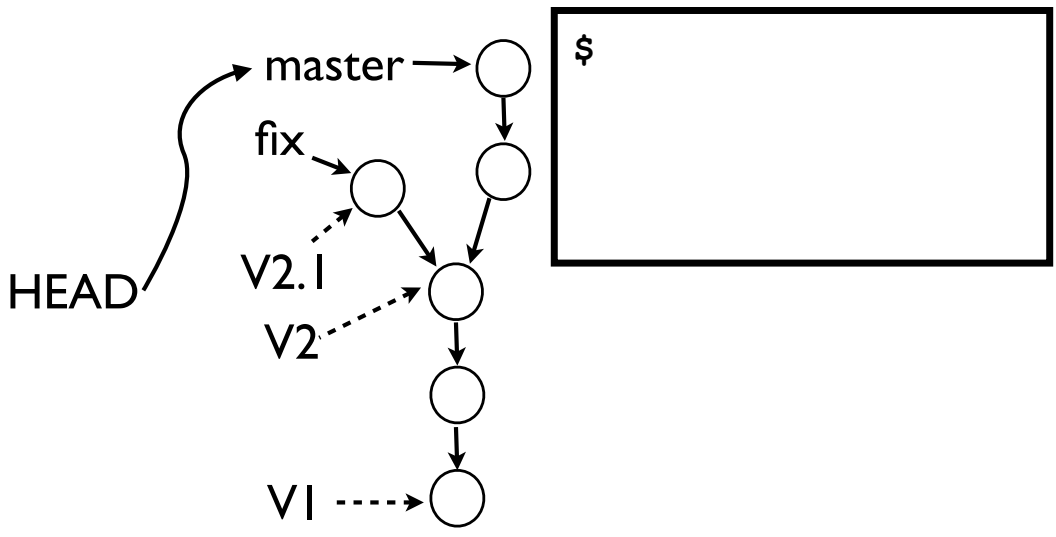

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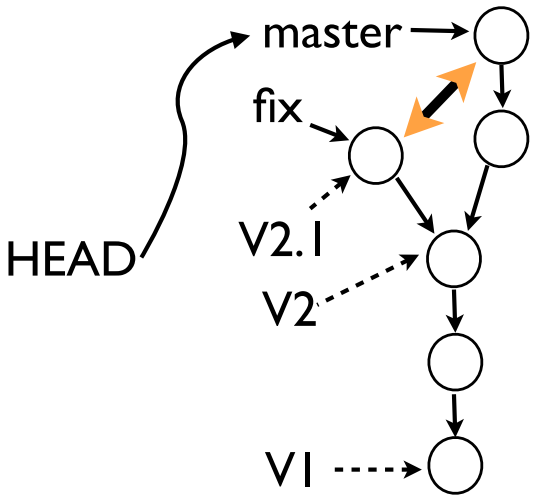


```
$ csc merge fix
```

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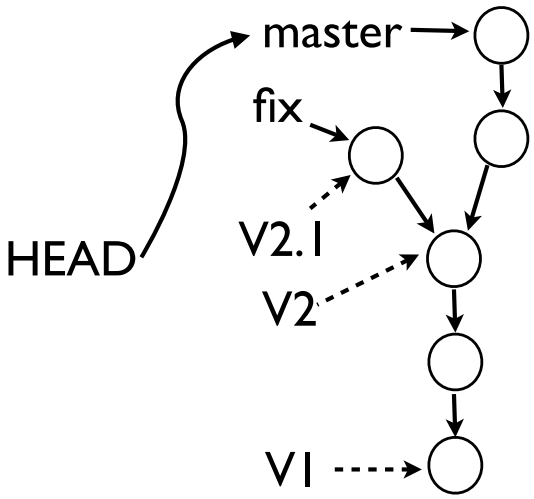


```
$ csc merge fix
(resolve conflict)
```

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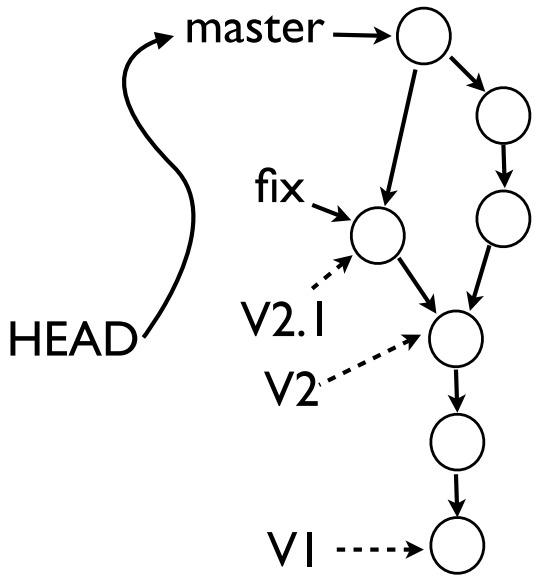


```
$ csc merge fix
(resolve conflict)
$ csc snap
```

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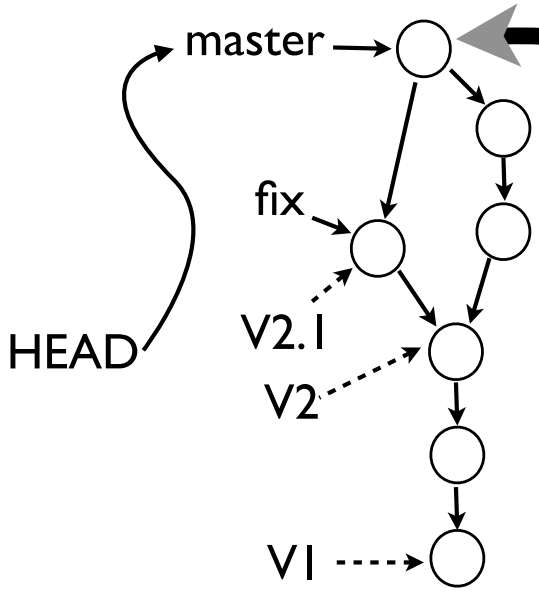


```
$ csc merge fix
(resolve conflict)
$ csc snap
```

Note:
This snapshot has two parents. The changes from both parents have been merged together.

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Sharing Code

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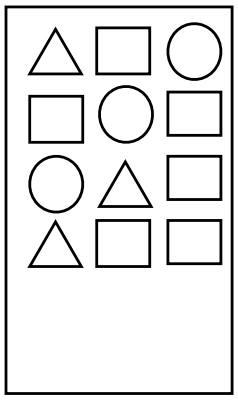
My Archive



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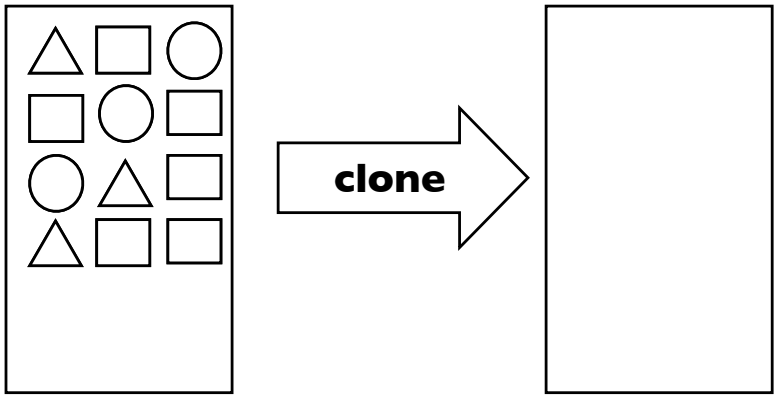
My Archive

Your Archive




```
you$ csc clone url_for_my_repo
```

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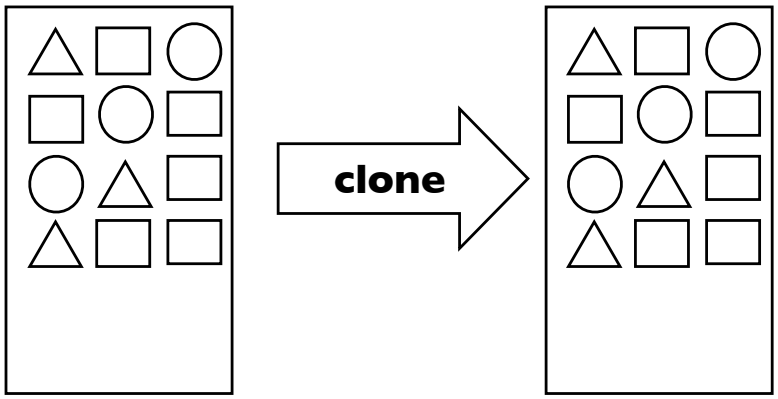
My Archive

Your Archive




```
you$ csc clone url_for_my_repo
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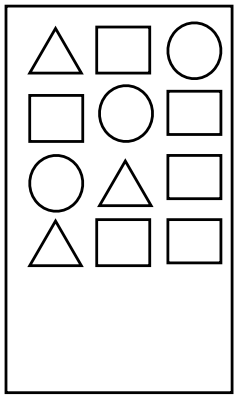
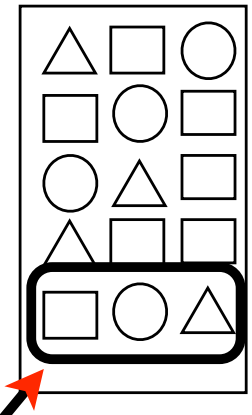
Your Archive





You make changes

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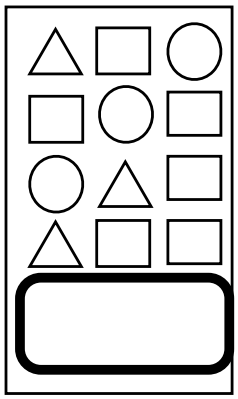
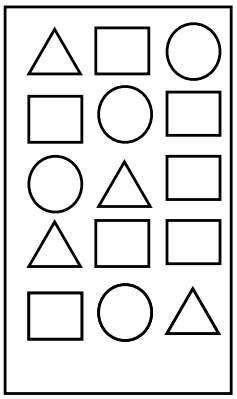
Your Archive



pull



```
me$ csc pull url_for_my_repo
```

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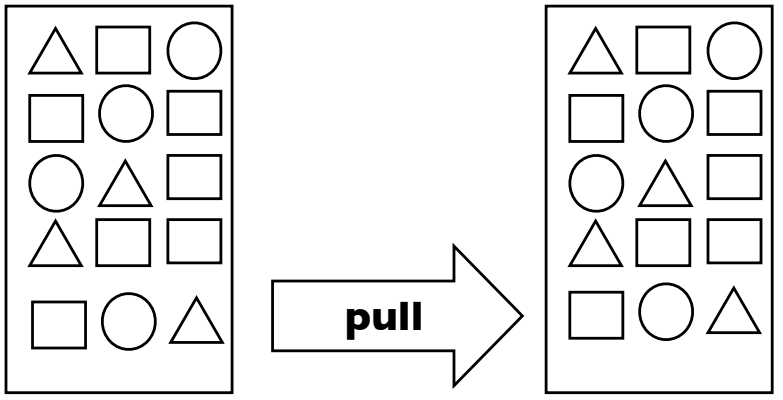
My Archive

Your Archive




```
you$ csc pull url_for_my_repo
```

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Common Remote Uses

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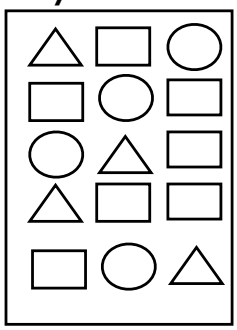
My Archive



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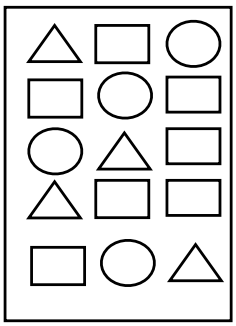
Remote Archive



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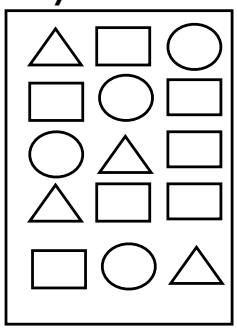

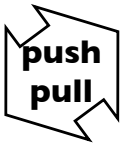

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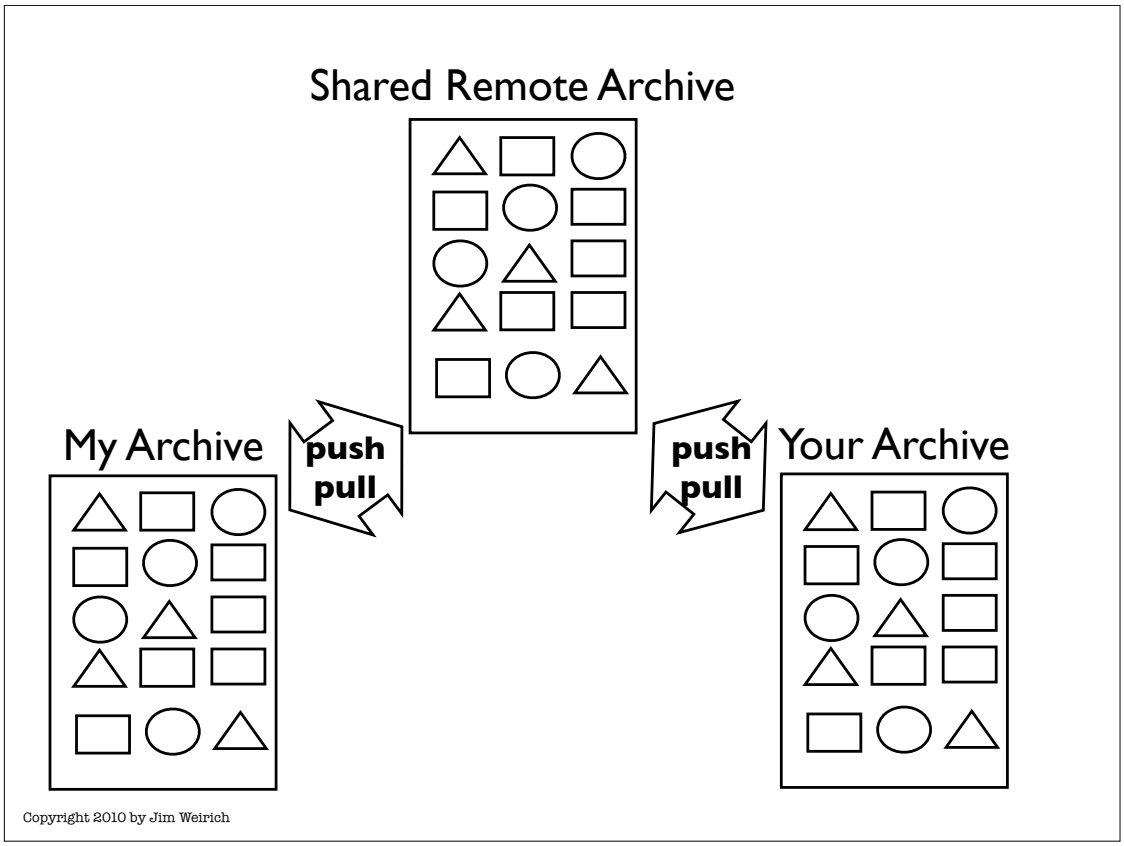

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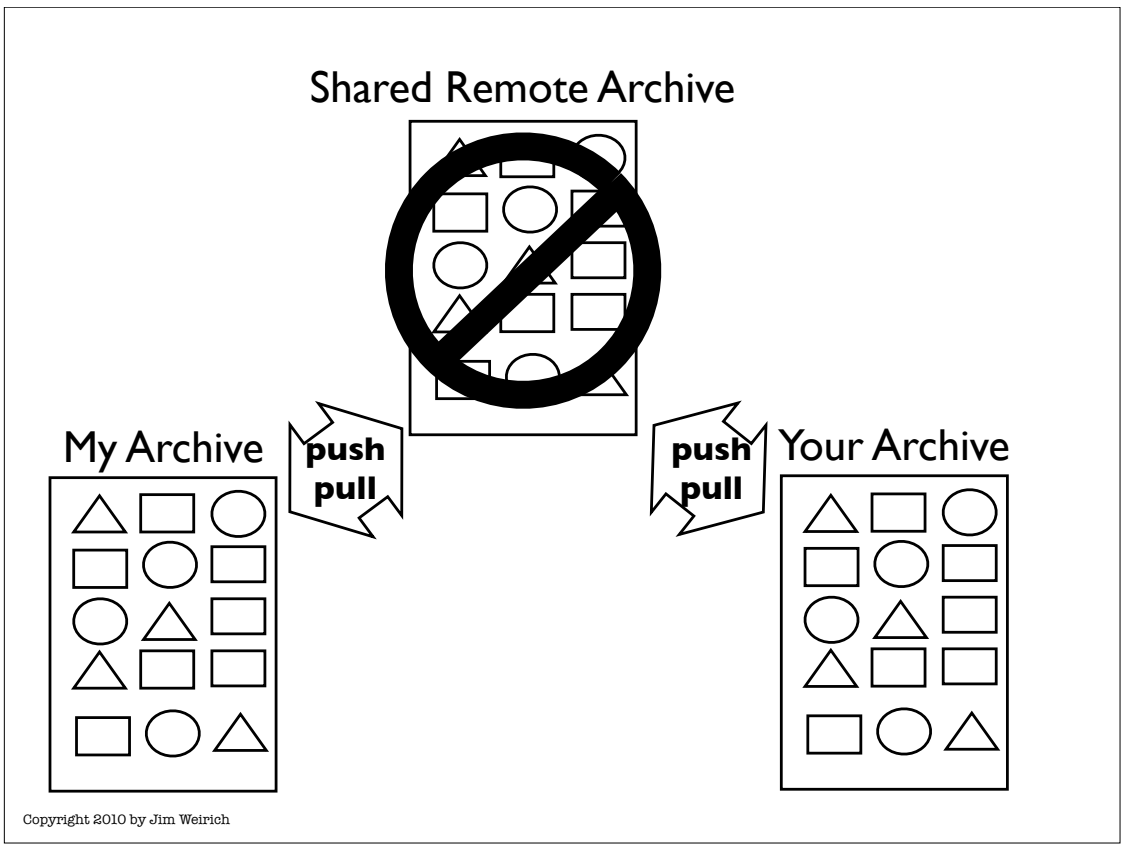

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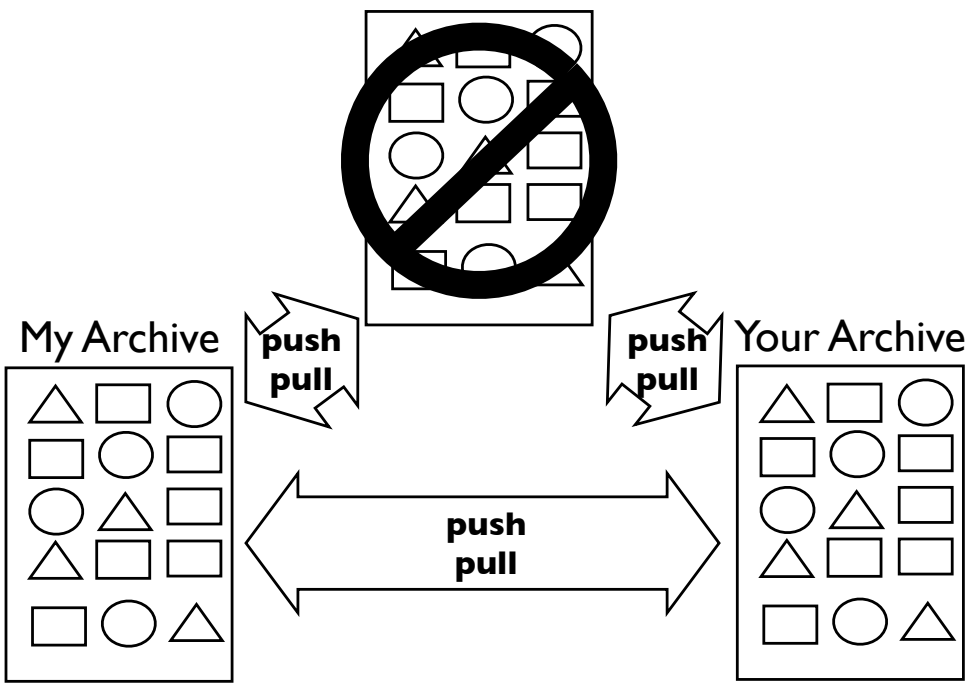

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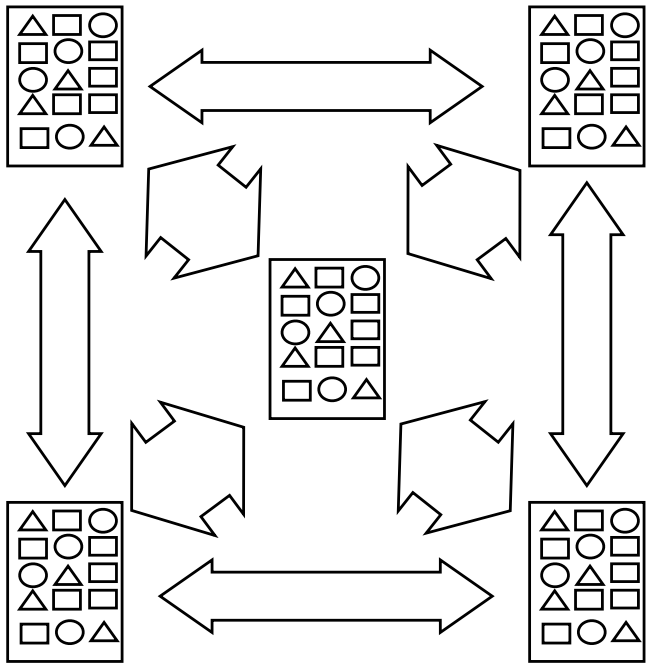

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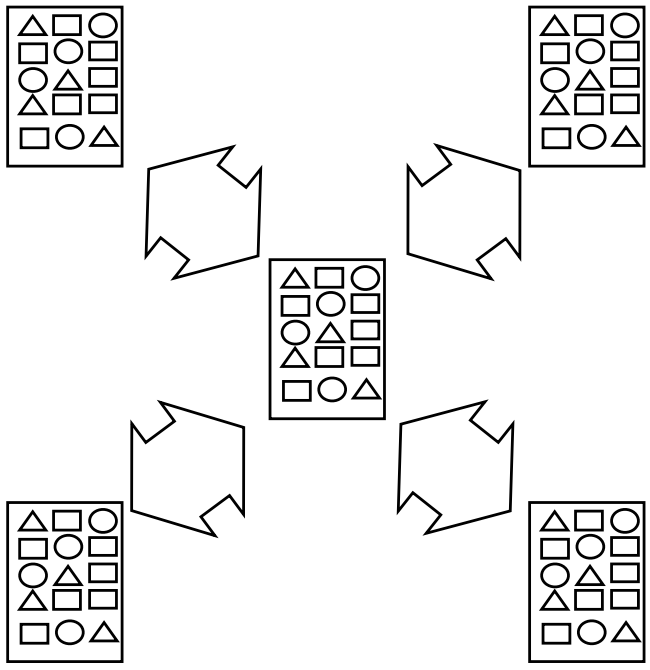

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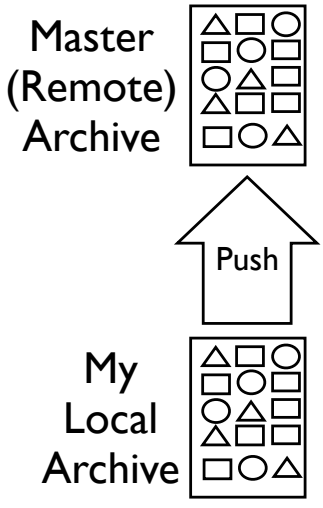

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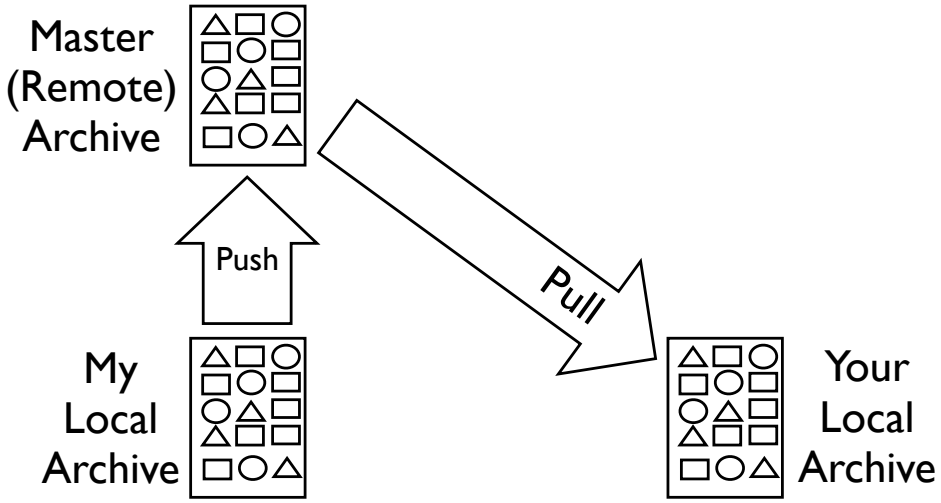

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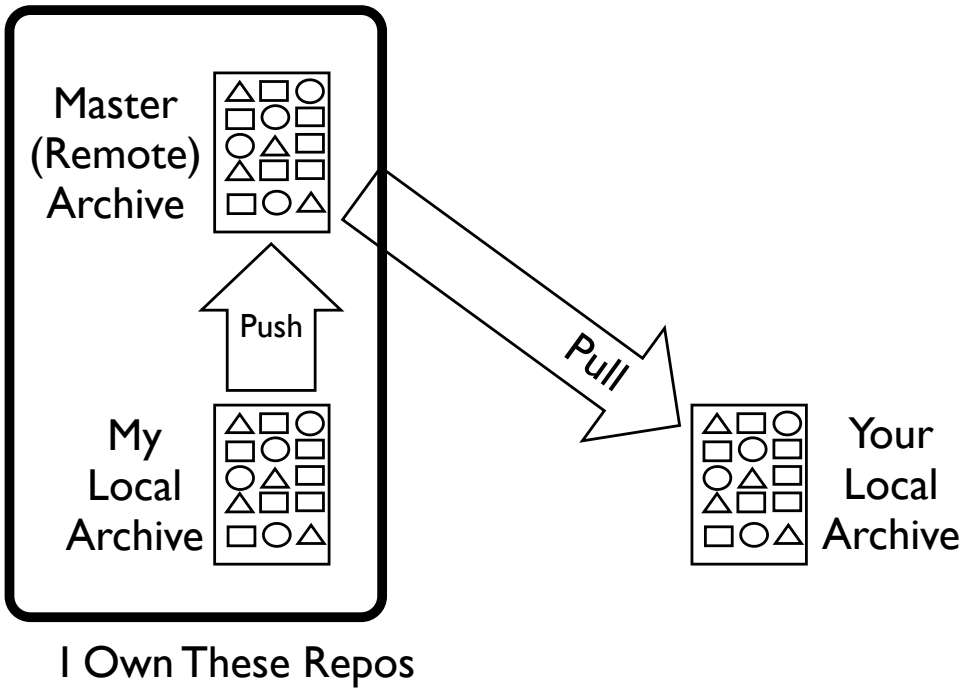

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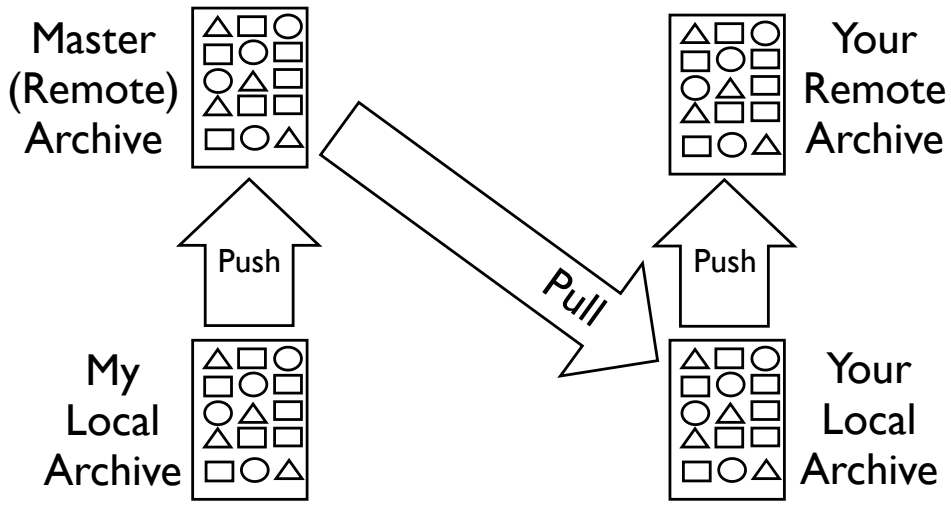

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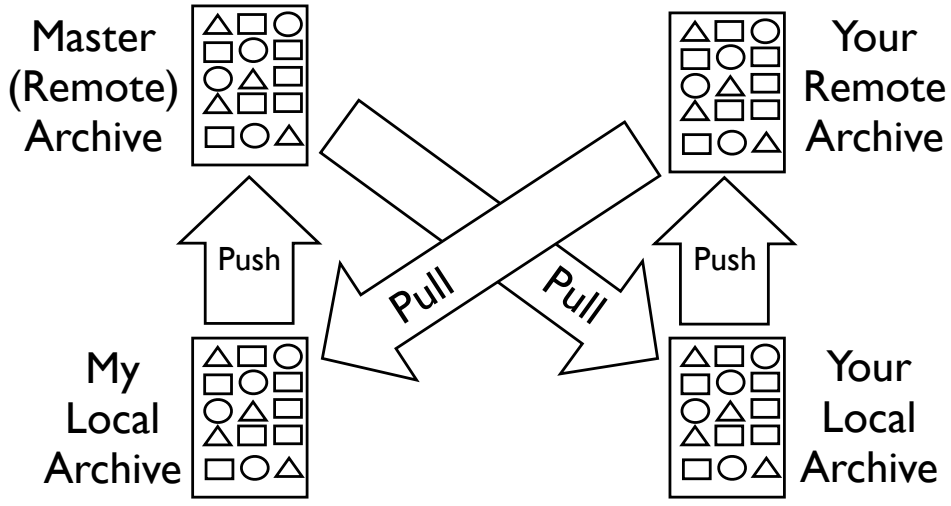

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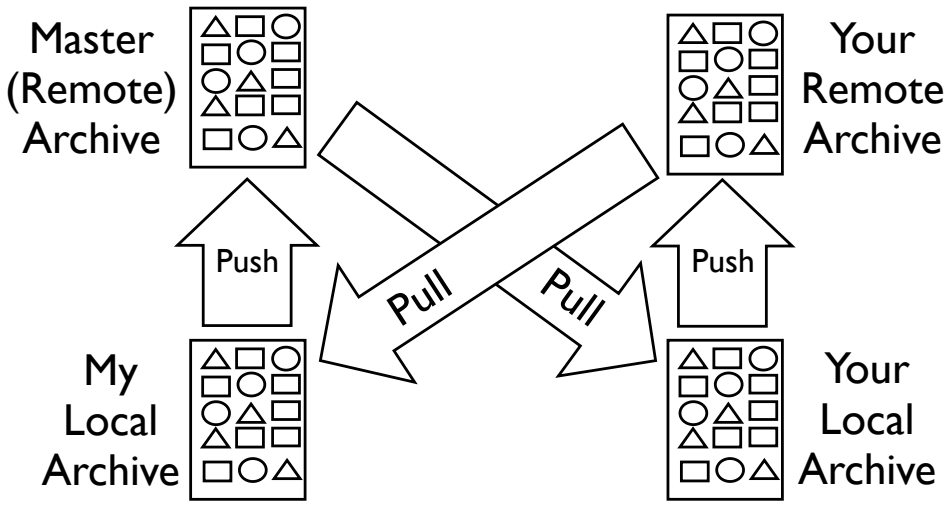

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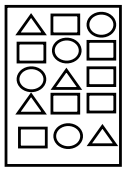
Master
Project
Archive



owned by
Benevolent Dictator

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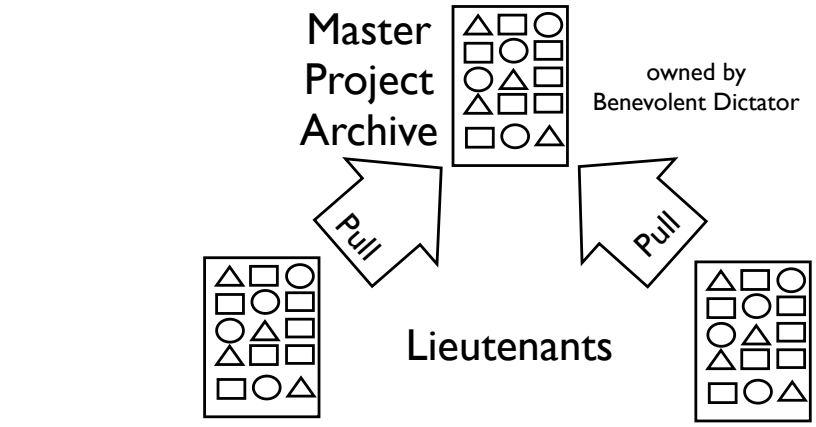

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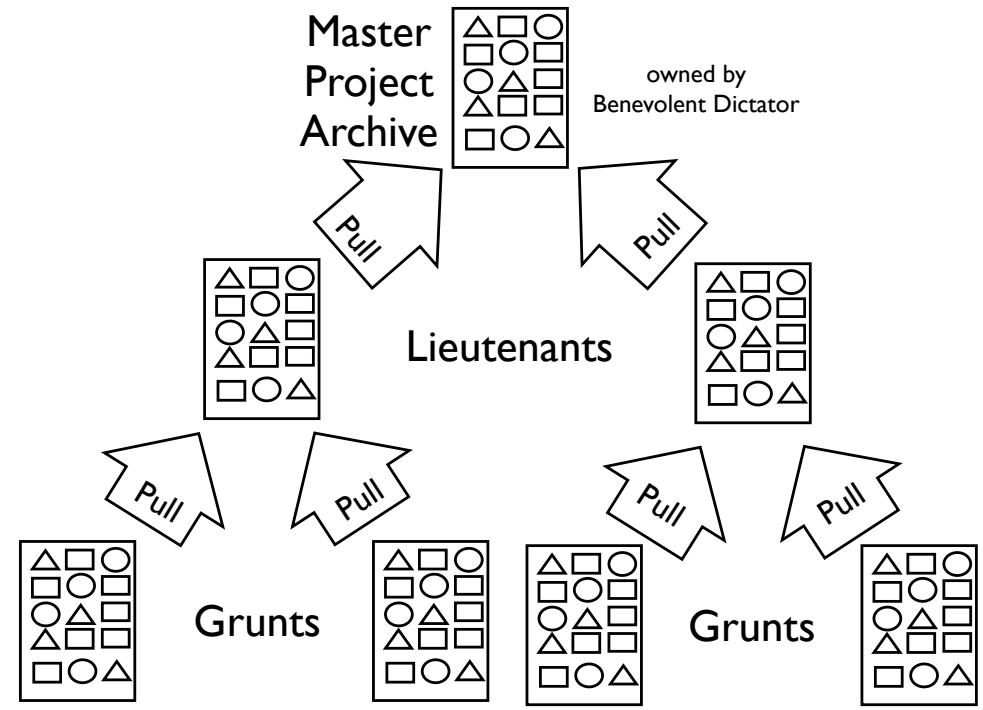

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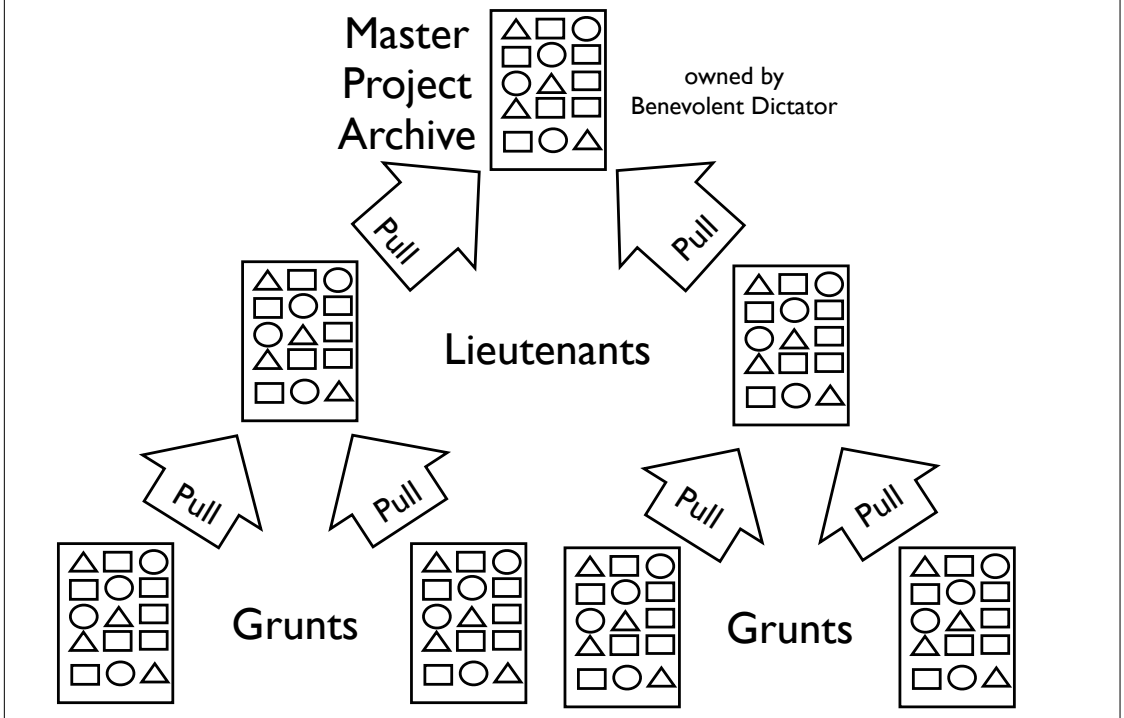

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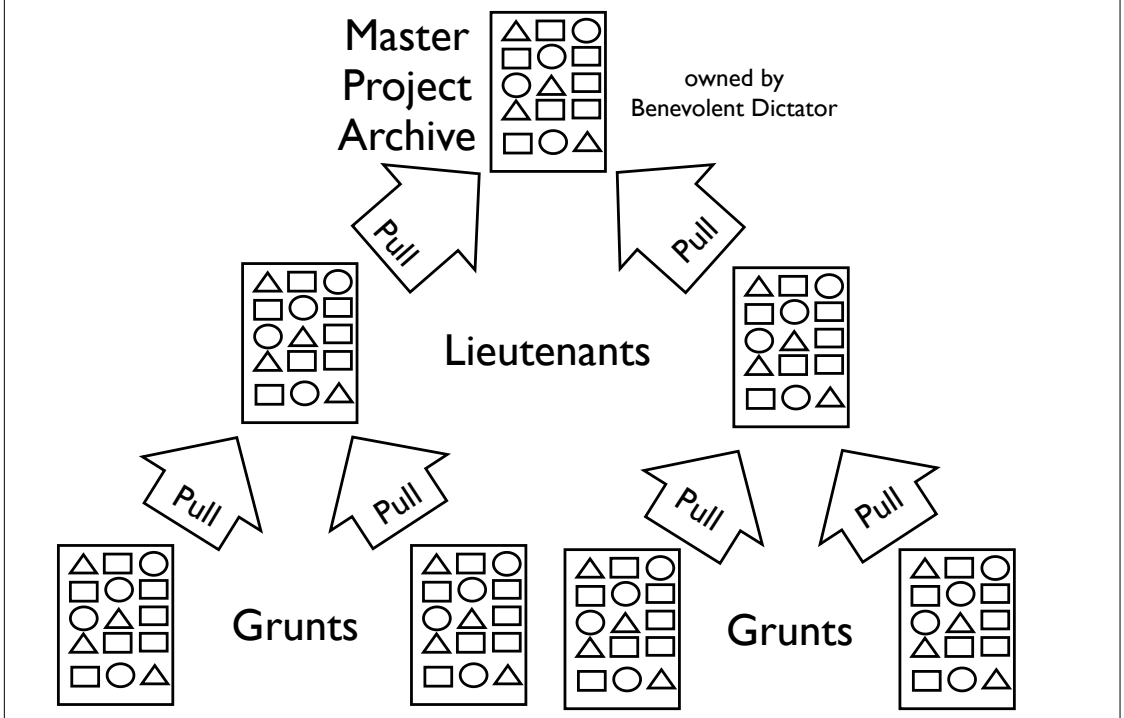

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Wrap Up

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CSC Features

- Complete revision history
- Efficient Storage
  - very lightweight project archives
- Guaranteed integrity
- Flexible Sharing
- Cheap Branching
- Easy Tagging

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CSC Features

- Complete revision history
- Efficient Storage
  - very lightweight project archives
- Guaranteed integrity
- Flexible Sharing
- **Cheap Branching**
- Easy Tagging

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Sounds Like ...

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CSC

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GIT

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csc == git
snapshot == commit
project archive == repository
manifest == tree (or directory)

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csc snap == git commit -a
csc checkout *name* == git checkout *name*
csc branch *name* == git checkout -b *name*
csc tag *tagname* == git tag *tagname*

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Differences from Git

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Differences

Csc

- We have only:
  - Working Directory
  - Repository (project archive)

Git

- Git Uses
  - Working Directory
  - Staging Area
  - Repository

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Differences

Csc

- We have only:
  - Working Directory
  - Repository (project archive)
- File Based

Git

- Git Uses
  - Working Directory
  - Staging Area
  - Repository
- Content Based

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Differences

Csc

- One level object file storage

Git

- Files stored in .git/objects
  - Uses a 2-level directory
  - SHA1 hash is the directory/file name

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Differences

Csc	Git

• One level object file storage	• Files stored in .git/objects
	  • Uses a 2-level directory
	  • SHA1 hash is the directory/file name

• Plain Files	• Encoded/Compressed files

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Differences

Csc	Git
• Just the basic features	• init/log/status/diff • reset/rebase • cherry-pick • bisect • ... lots of others

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References

- Git from the Bottom Up (John Wiegley)
  - http://ftp.newartisans.com/pub/git.from.bottom.up.pdf
- Git Internals -- PeepCode PDF (Scott Chacon)
  - http://peepcode.com/products/git-internals-pdf
- Any presentation by Scott Chacon
  - http://github.com/schacon/git-presentations

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Pragmatic Bookselft Screen Cast

Available at:

http://pragprog.com/screencasts/v-jwsceasy/source-control-made-easy

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Questions?

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Labs

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Labs Can be found at ...

http://onestepback.org/download/git_tutorial.zip

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Appendix A -- Reset

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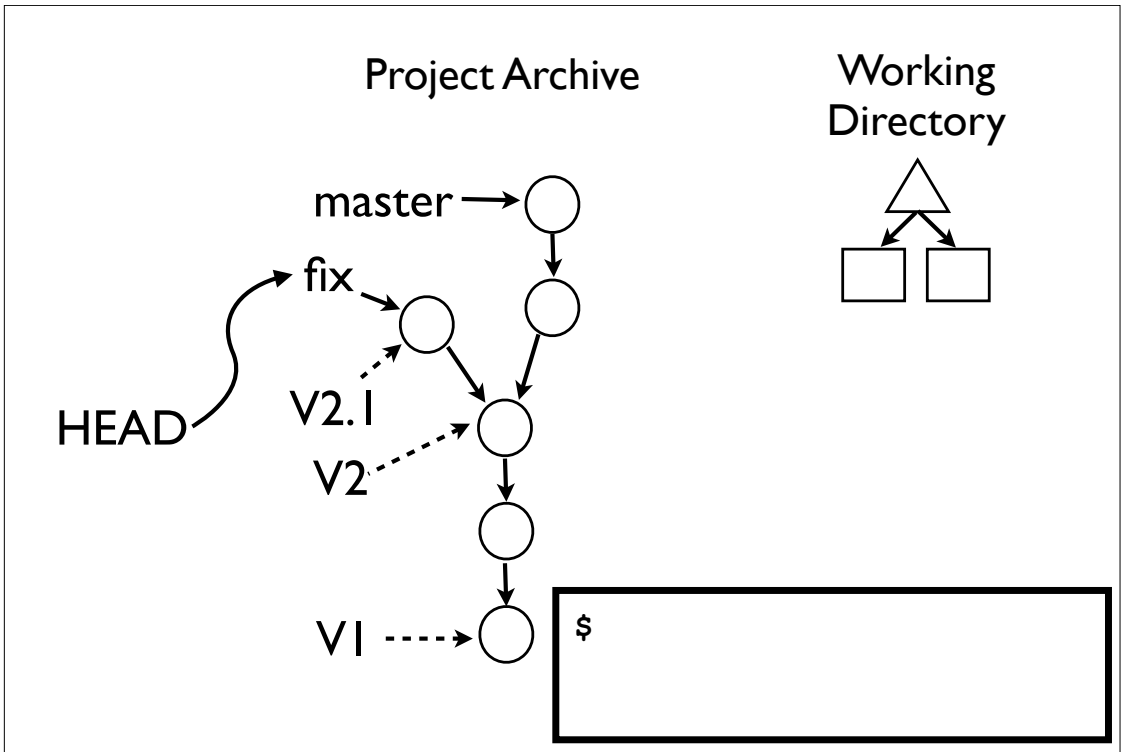

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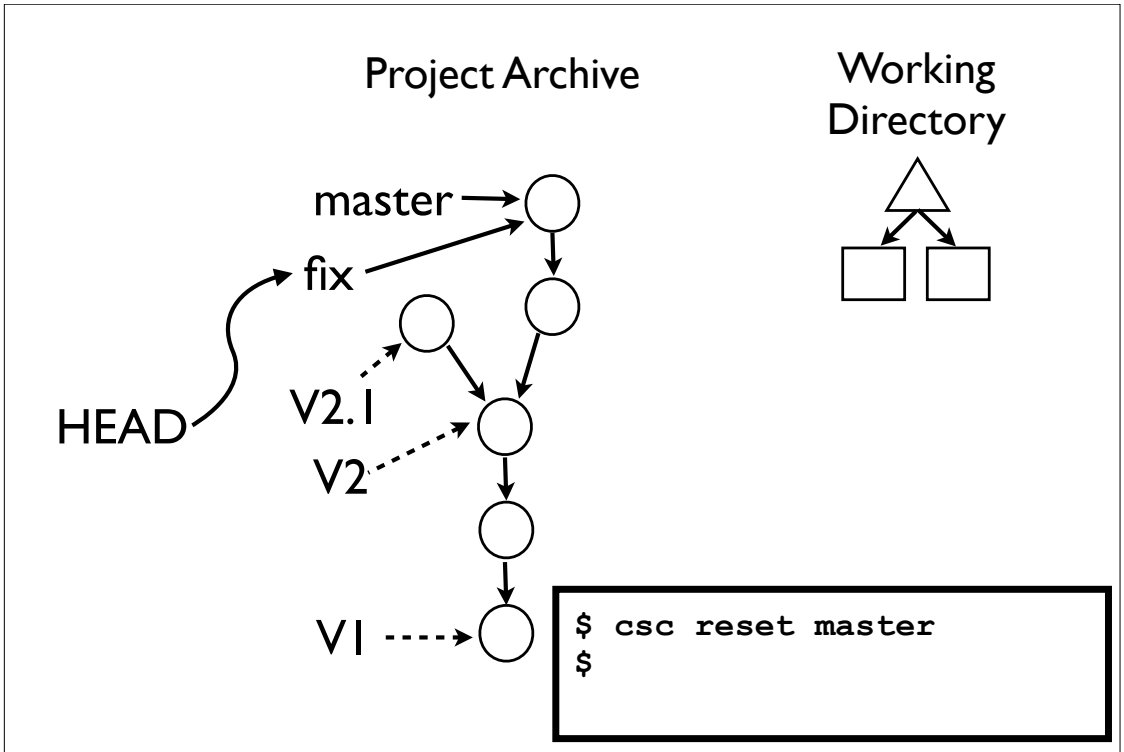

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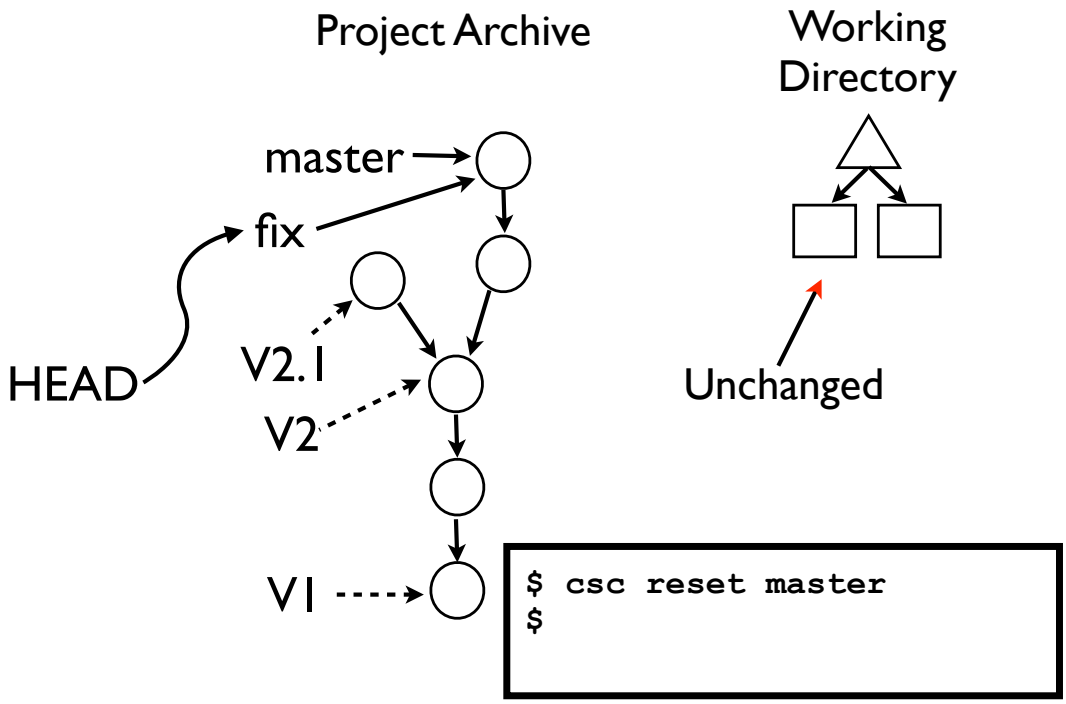

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Now the --hard way

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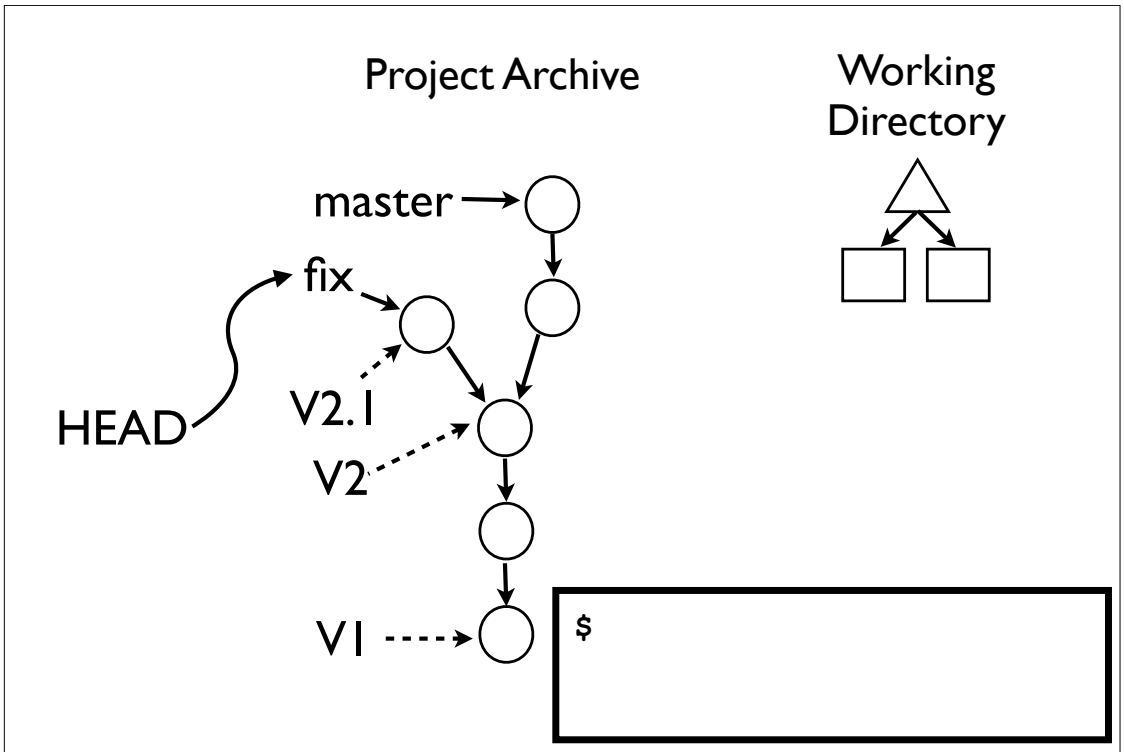

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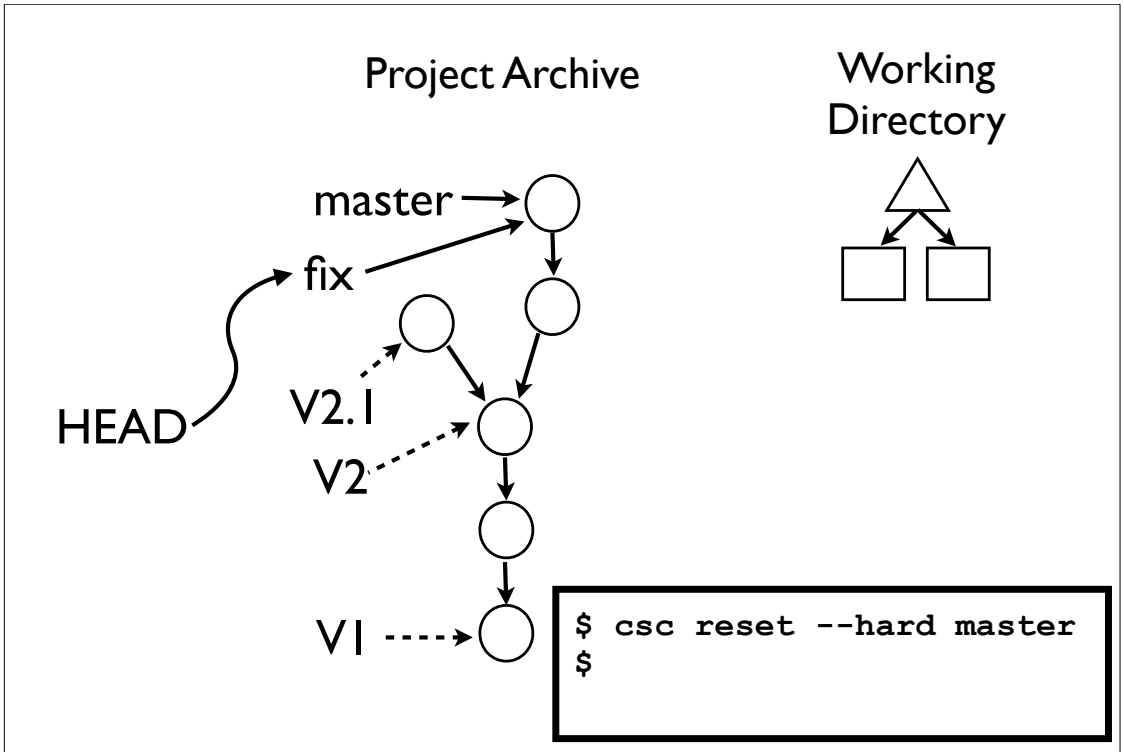

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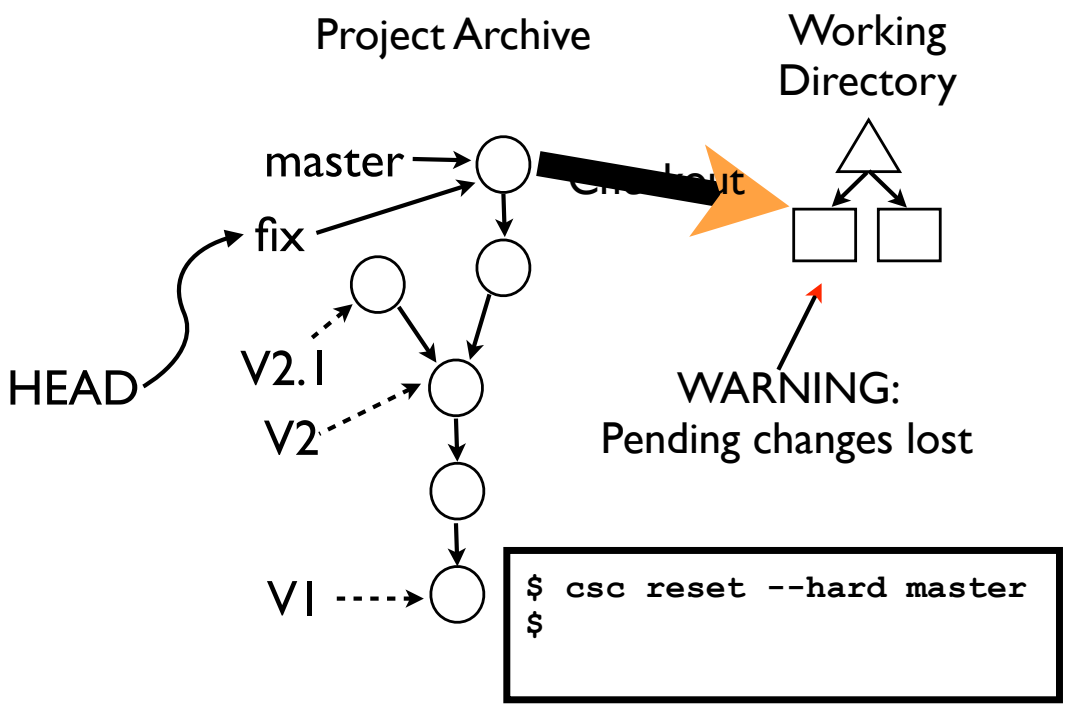

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Appendix B -- Rebase

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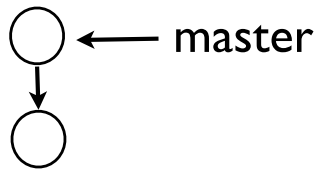
Rebase (setup)



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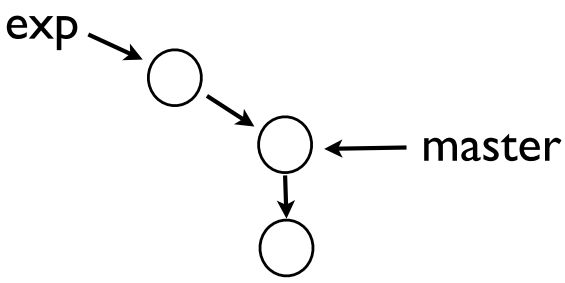
Rebase (setup)



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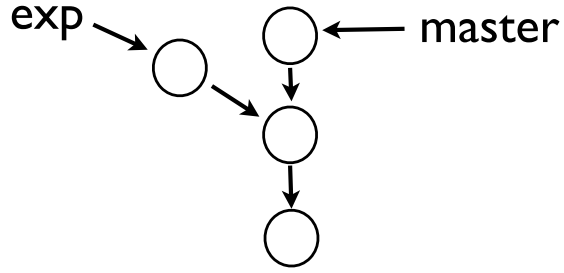
Rebase (setup)



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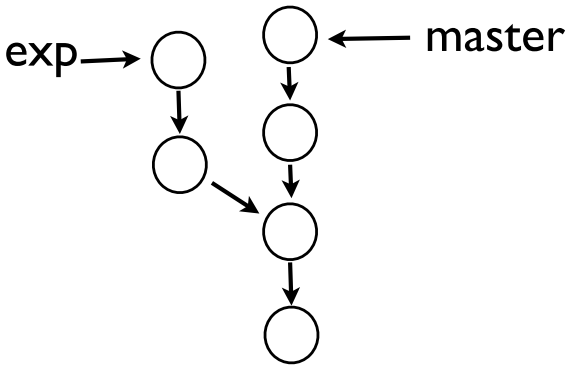
Rebase (setup)



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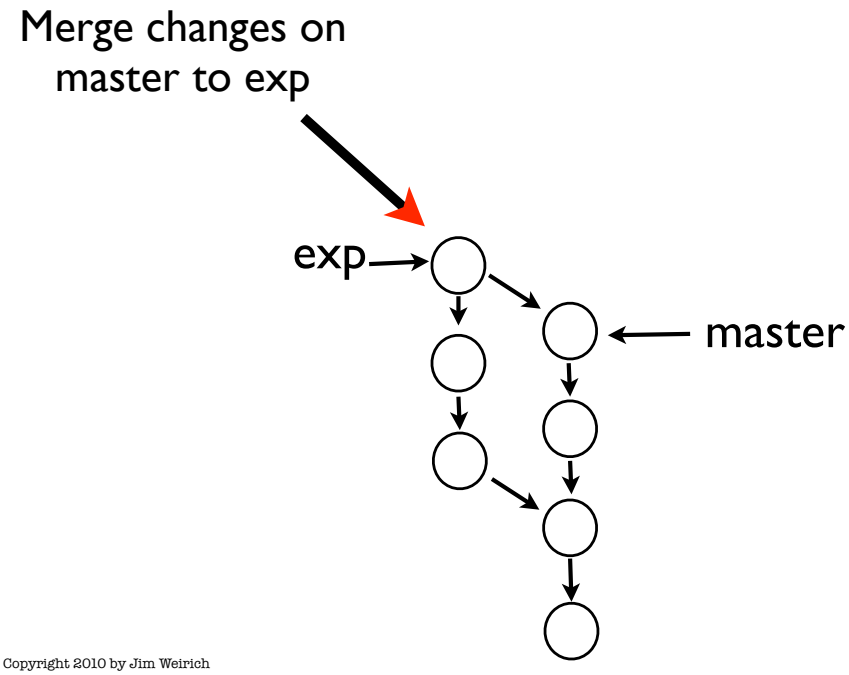
Rebase (merging option)



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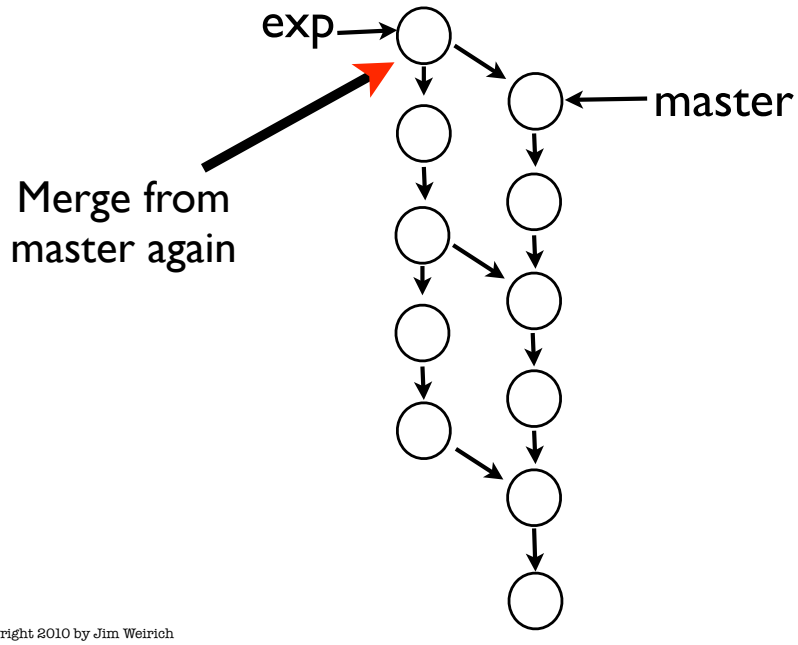
Rebase (merging option)



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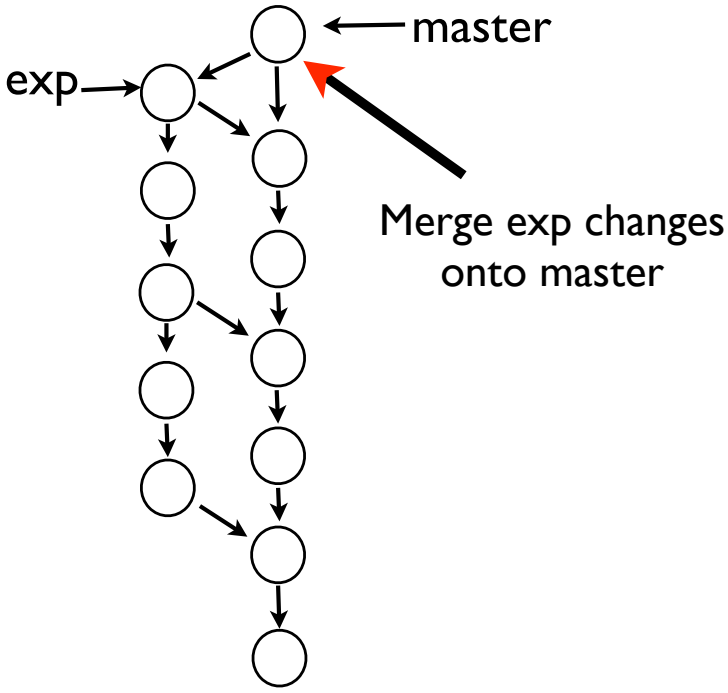
Rebase (merging option)



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Rewind !

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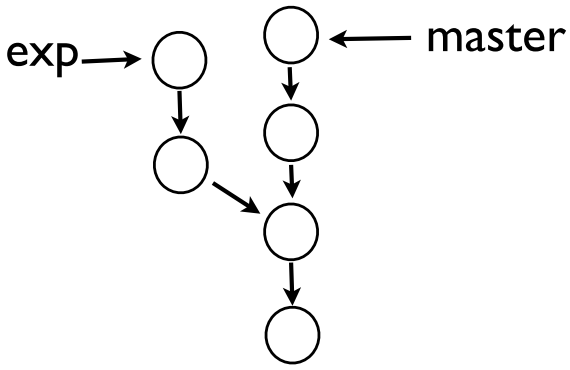
Rebase



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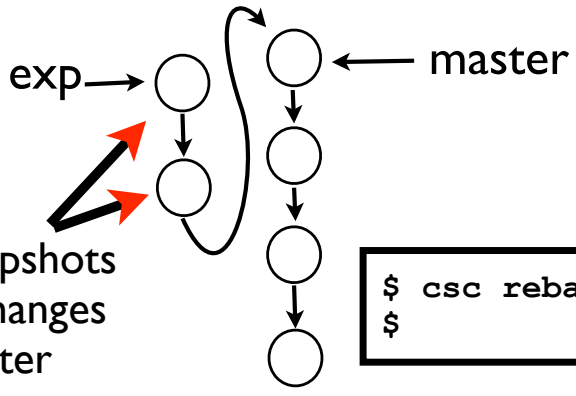
Rebase



Rewrites Snapshots to include changes from master

```
$ csc rebase master
$
```

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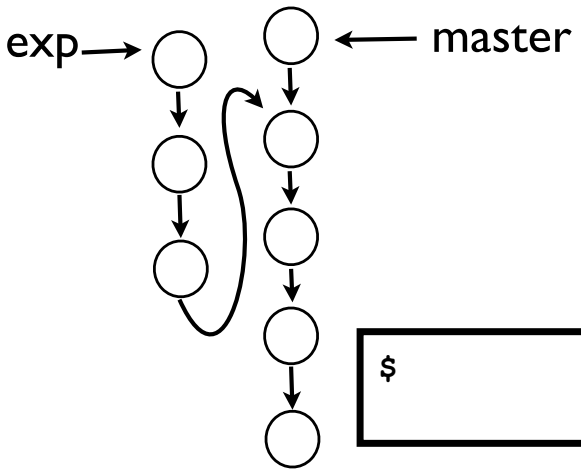
Rebase




```
$
```

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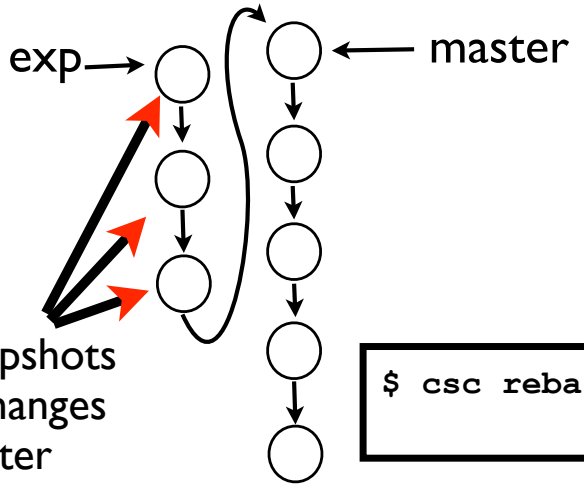
Rebase



Rewrites Snapshots to include changes from master

```
$ csc rebase master
```

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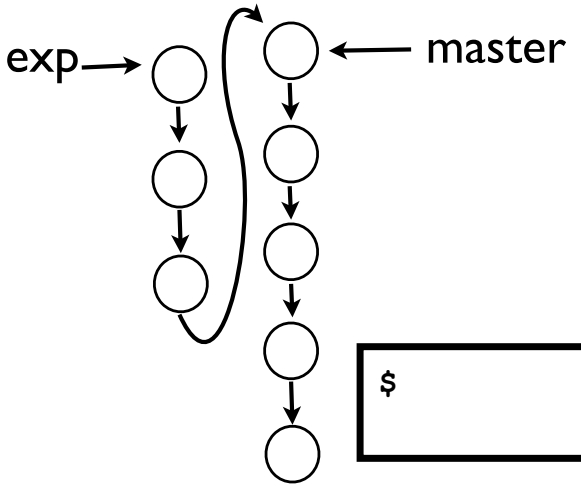
Rebase




```
$
```

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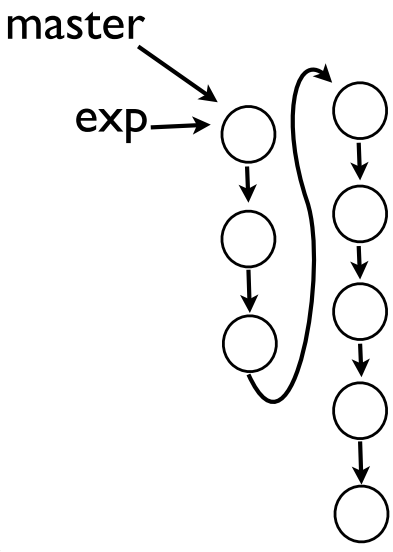
Rebase




```
$ csc checkout master
$ csc merge exp
```

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WARNING:

Conflicts may occur during rebase

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WAIT!

Rebase rewrites history?
Isn't that dangerous?

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Yes and No

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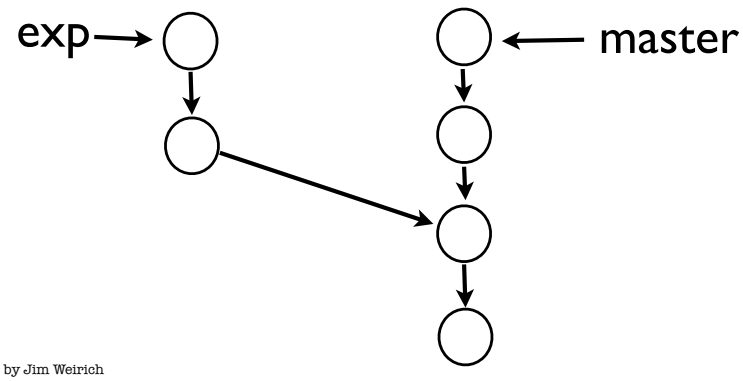
Rebase



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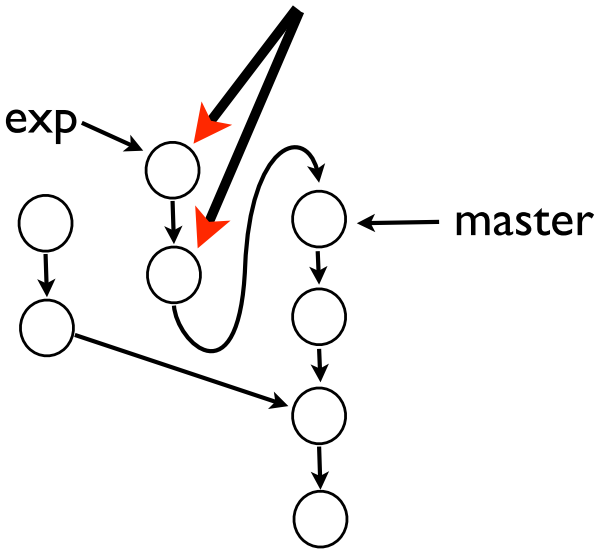
Rebase

These snapshots are rewritten from scratch



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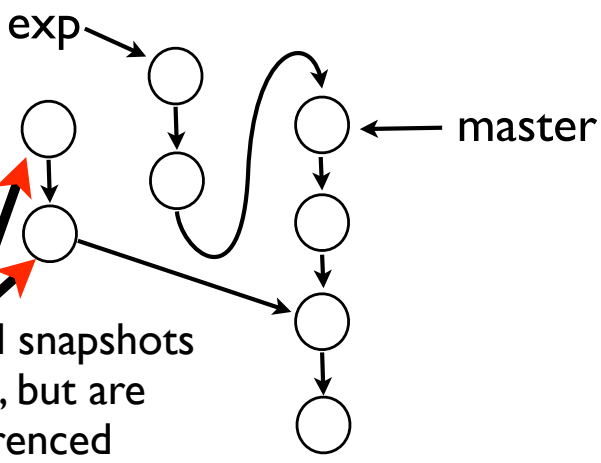
Rebase



The original snapshots still exist, but are unreferenced

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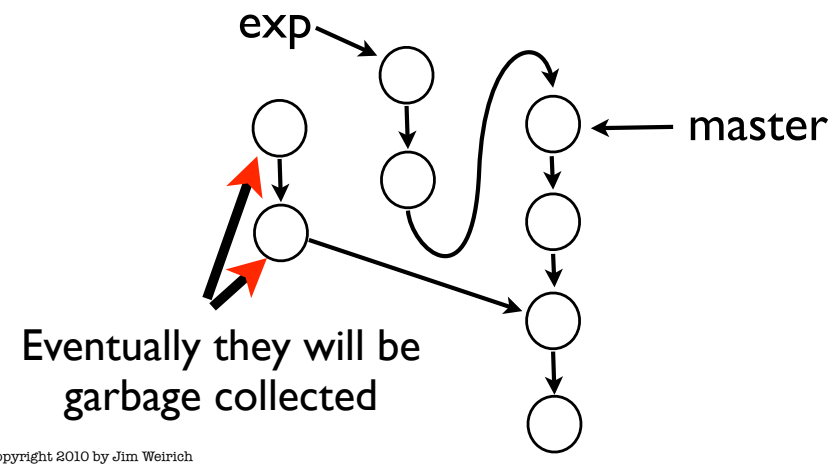
Rebase



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WARNING:

Do **not** rebase shared branches!

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