CHAPTER 1

Intro to Git & Git Basics

Sharif University of Technology
Computer Engineering Department
Presented By S. M. Masoud Sadrnezhaad
Source: Michael Koby

What We'll Cover

- What is Version Control
- Why You Should Use Version Control
- Types of Version Control
- Overview of How Version Control Works

What is Version Control?

...a system that lets you track
changes in your source code
by "checking in" your code
into the system.

Version Control Allows You To

- Keep track of changes you've made to a project over time

Version Control Allows You To

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- Create a branch of code to allow you to experiment without effecting your working program

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- Make collaboration on your projects easier to handle

Version Control Allows You To

- Keep track of changes you've made to a project over time
- Create a branch of code to allow you to experiment without effecting your working program
- Make collaboration on your projects easier to handle
- And many other tasks associated with source code (tagging, blaming, release branches, etc)

Why You Should Use Version Control

Why You Should Use Version Control

- Track Your Changes

Why You Should Use Version Control

- Track Your Changes
- Get Back to Working Code More Quickly

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- Get Back to Working Code More Quickly
- Easier Collaboration

Why You Should Use Version Control

- Track Your Changes
- Get Back to Working Code More Quickly
- Easier Collaboration
- Easier Backups

Why You Should Use Version Control

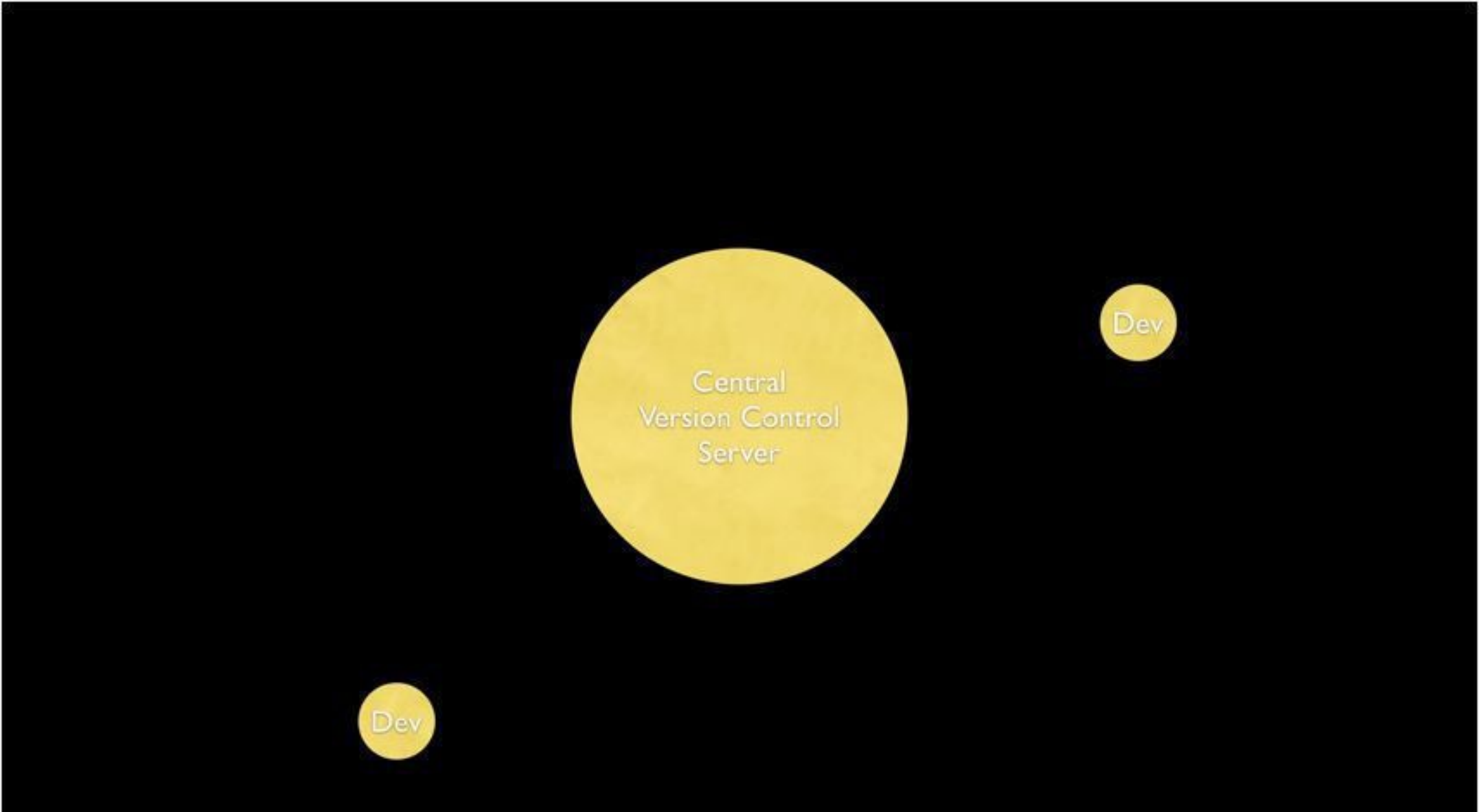
- Track Your Changes
- Get Back to Working Code More Quickly
- Easier Collaboration
- Easier Backups
- Sandboxing

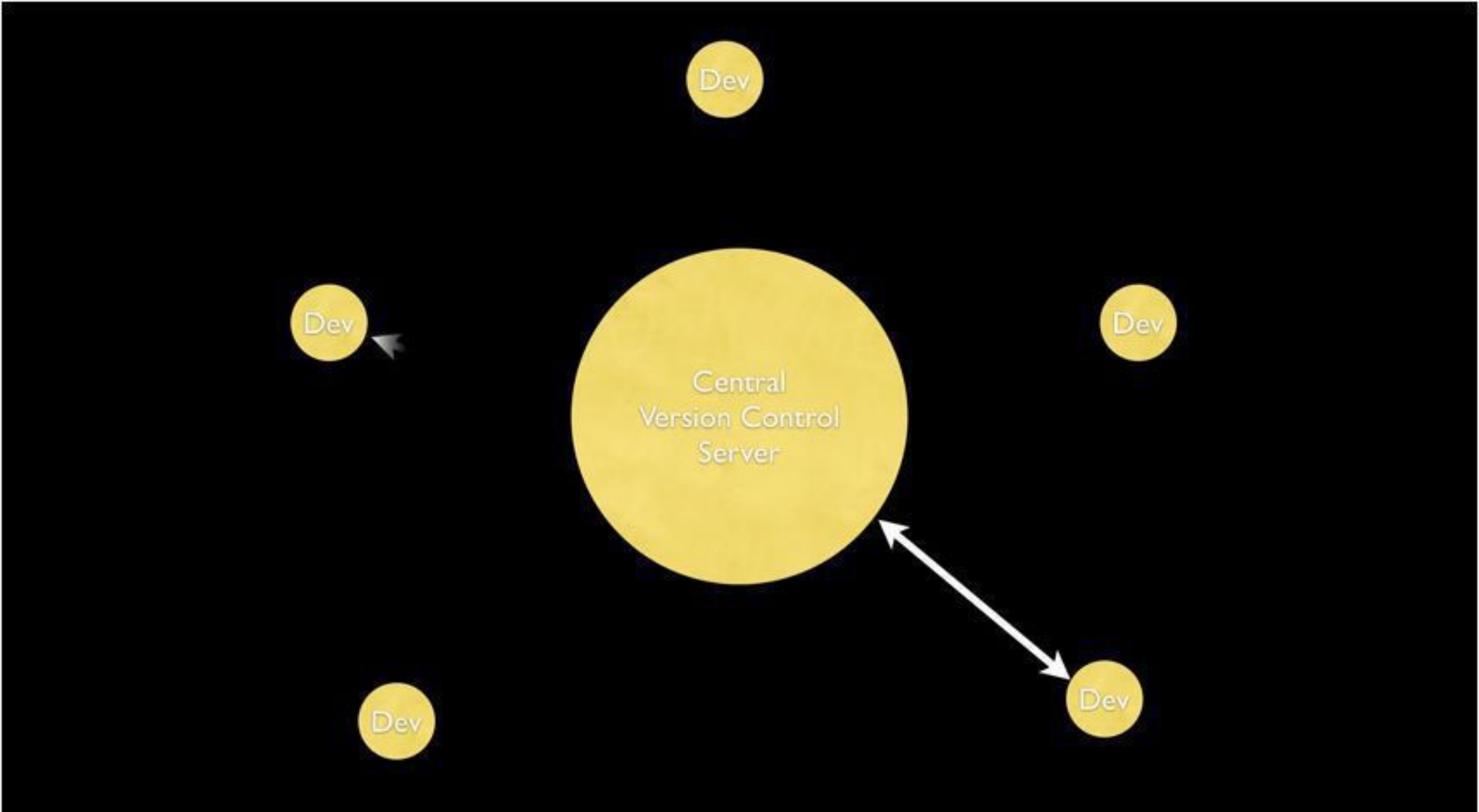
Types of Version Control

Types of Version Control

- Centralized
- Distributed

Centralized


Central
Version Control
Server
Dev
Dev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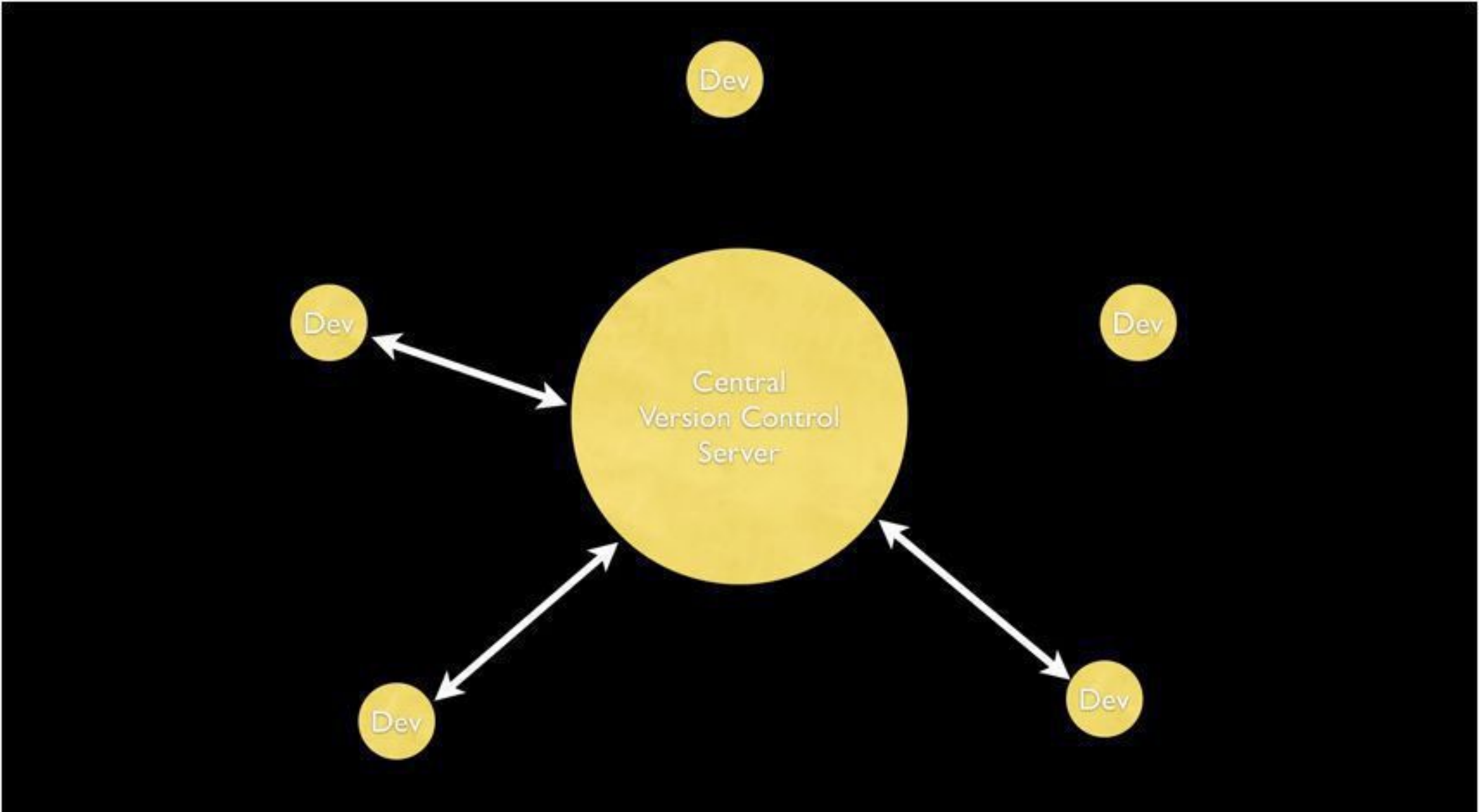
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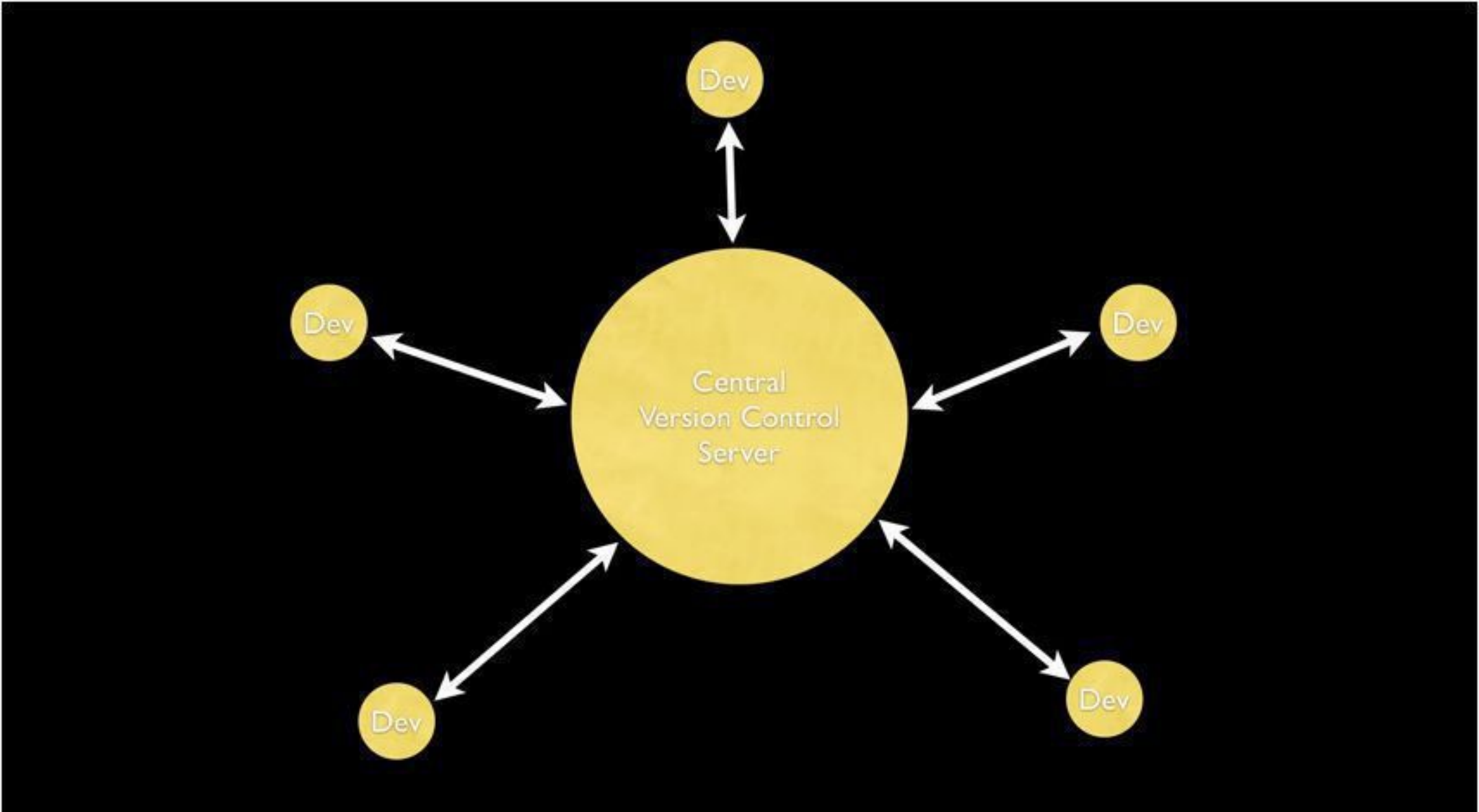
Dev
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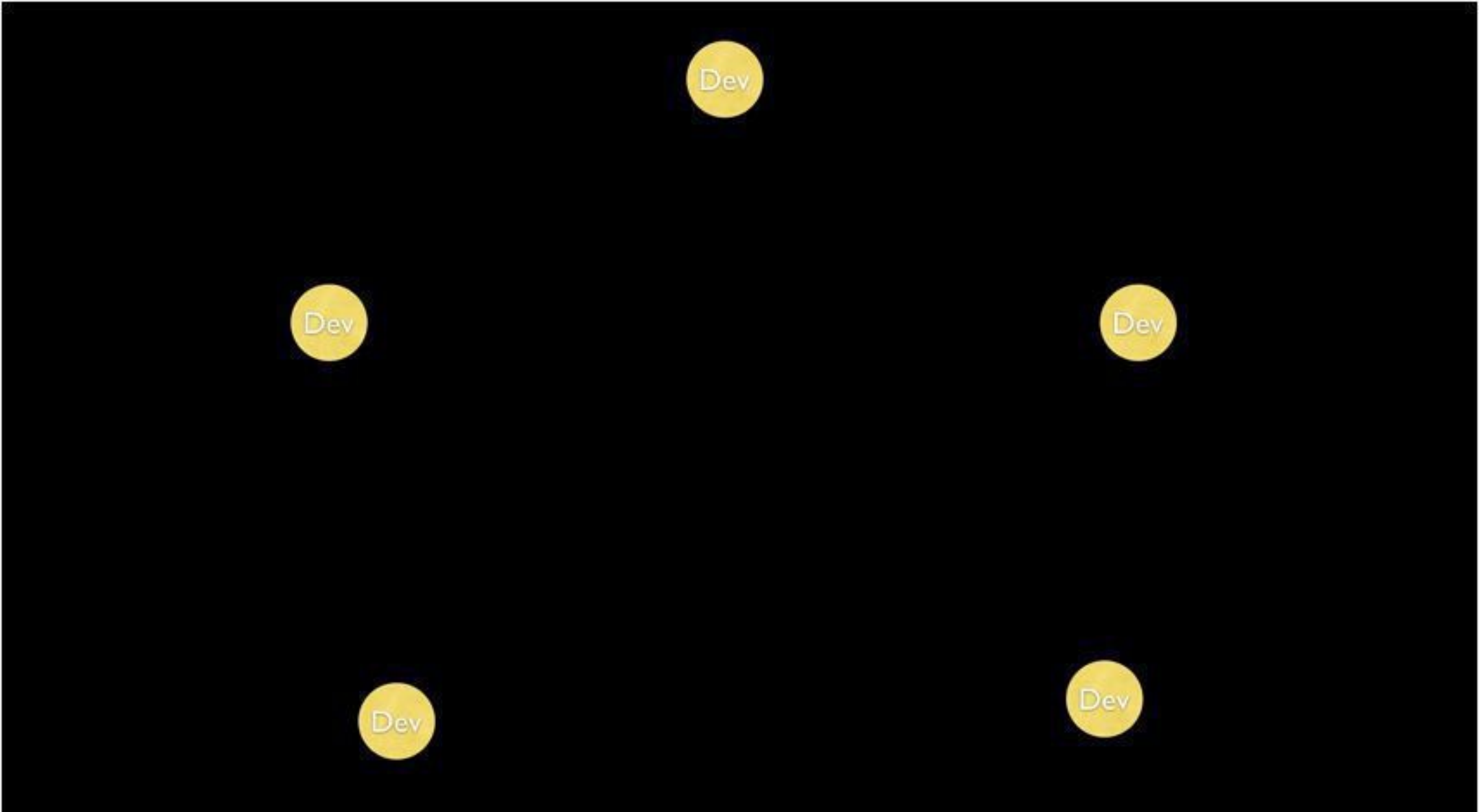
Dev
Central
Version Control
Server
Dev
Dev

Distributed


Dev
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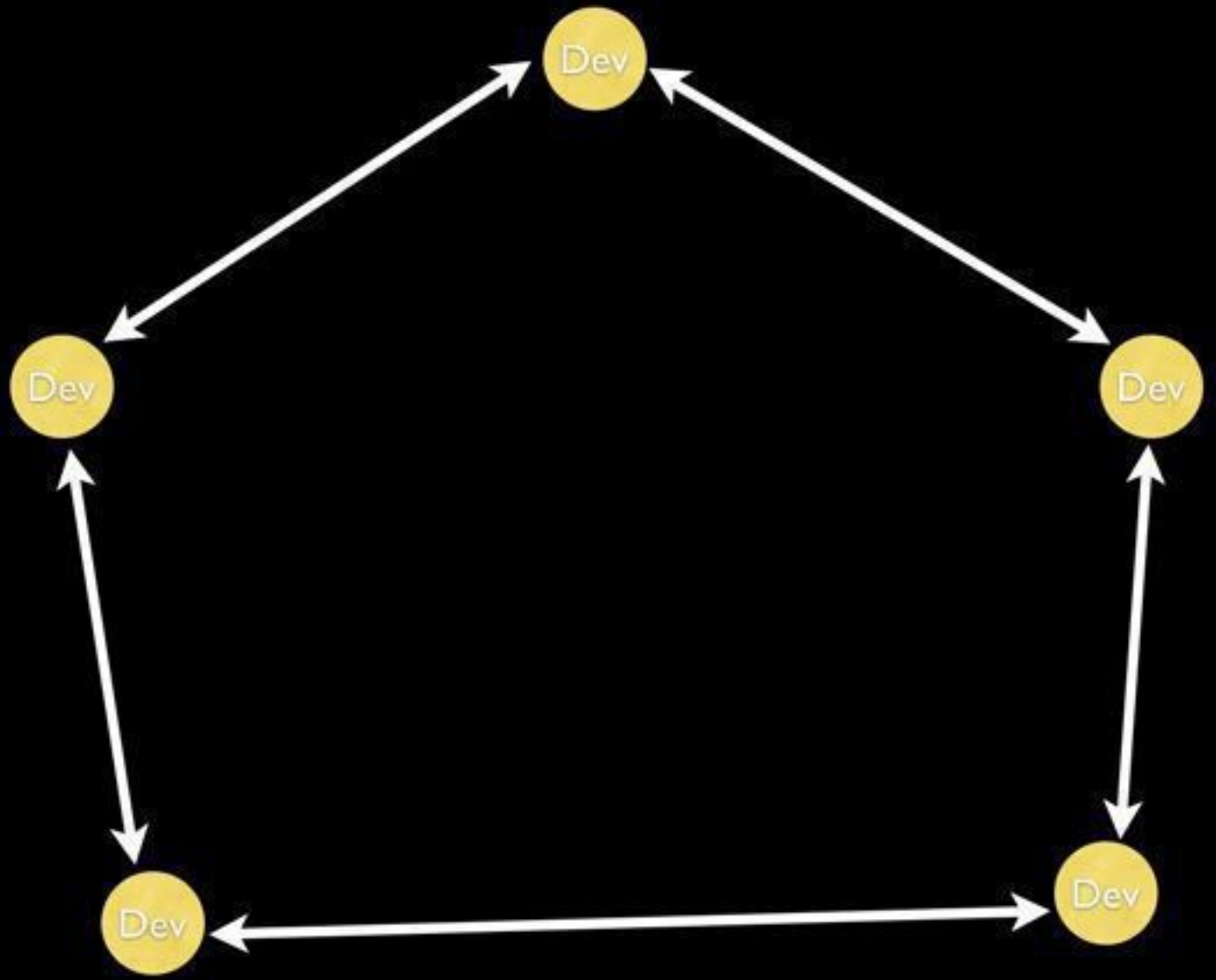
Dev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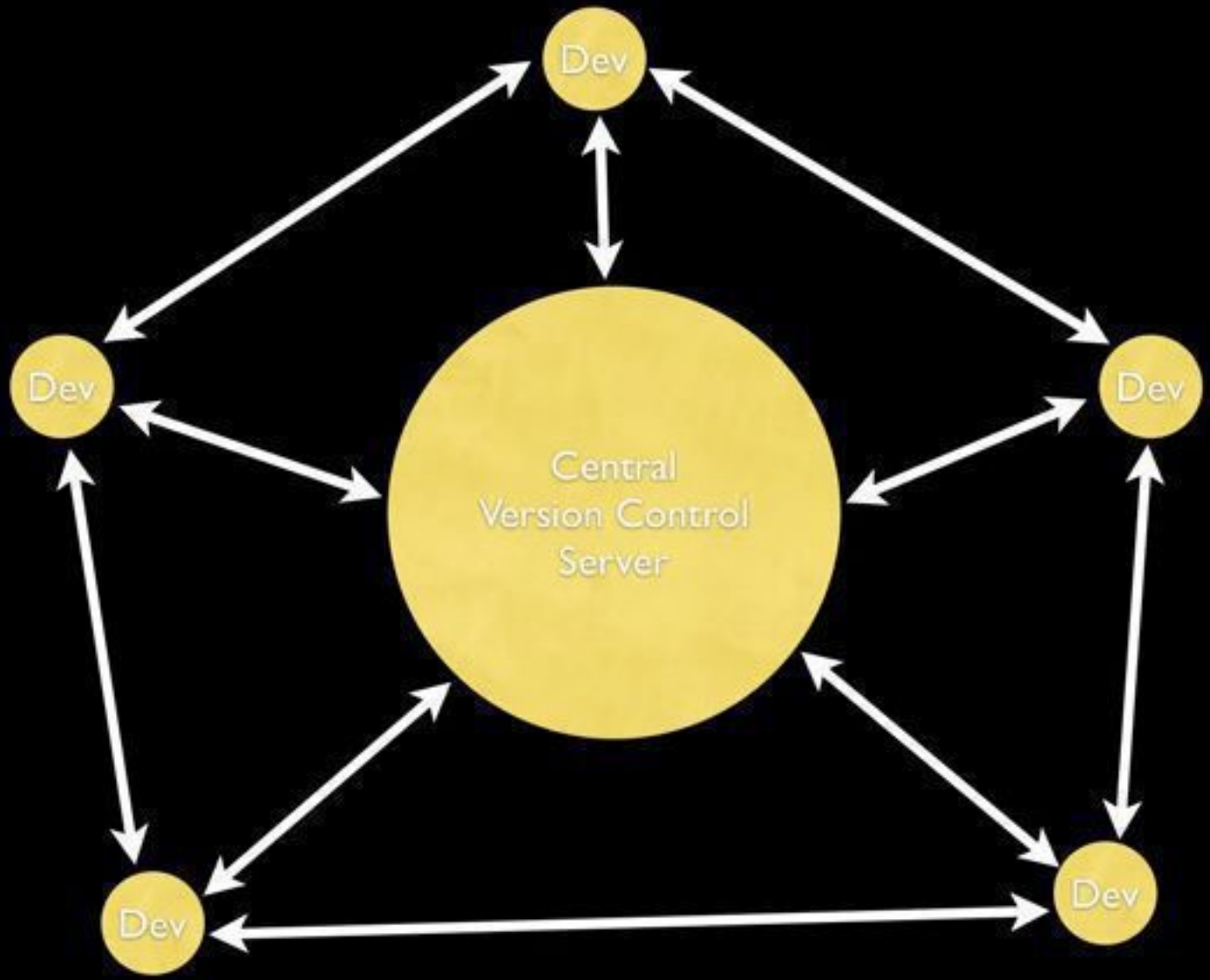

Dev
Dev
Dev
Central
Version Control
Server
Dev
Dev

Available Version Control Systems

Centralized VCS

- CVS

Centralized VCS

- CVS
- Subversion (SVN)

Centralized VCS

- CVS
- Subversion (SVN)
- Team Foundation Server (TFS)

Distributed VCS

- Git

Distributed VCS

- Git
- Mecurial (hg)

Distributed VCS

- Git
- Mecurial (hg)
- Bazaar

Online VCS Hosting

Online VCS Hosting

- Github

Online VCS Hosting

- Github
- Bitbucket

Online VCS Hosting

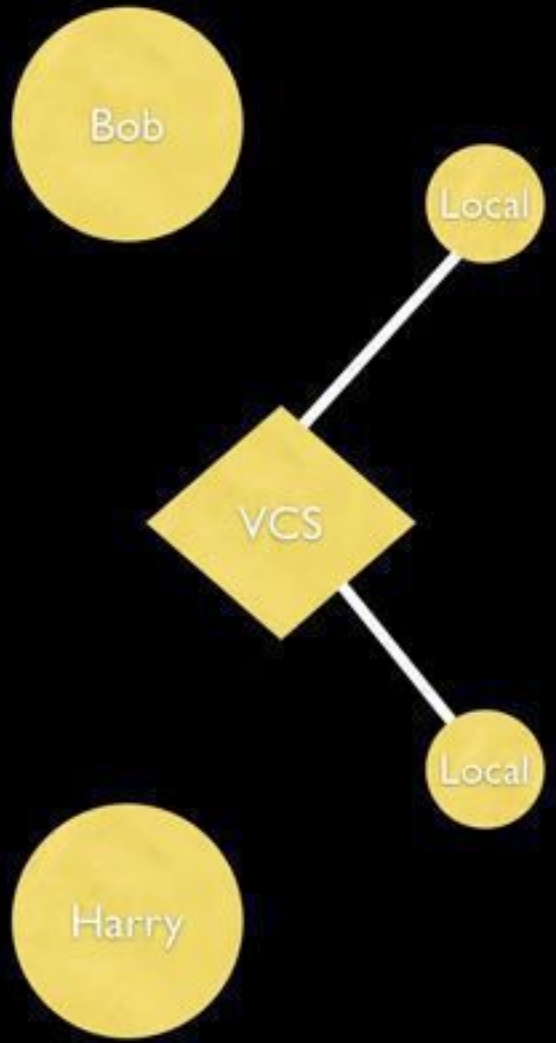
- Github
- Bitbucket
- Codeplex

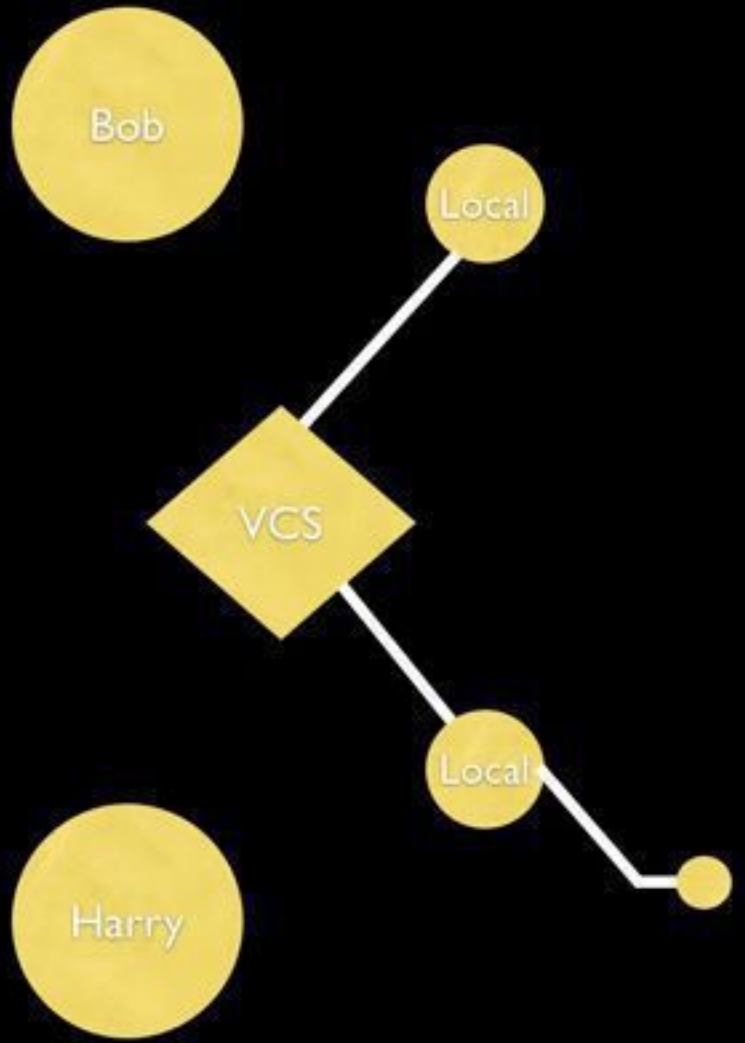
How They Work

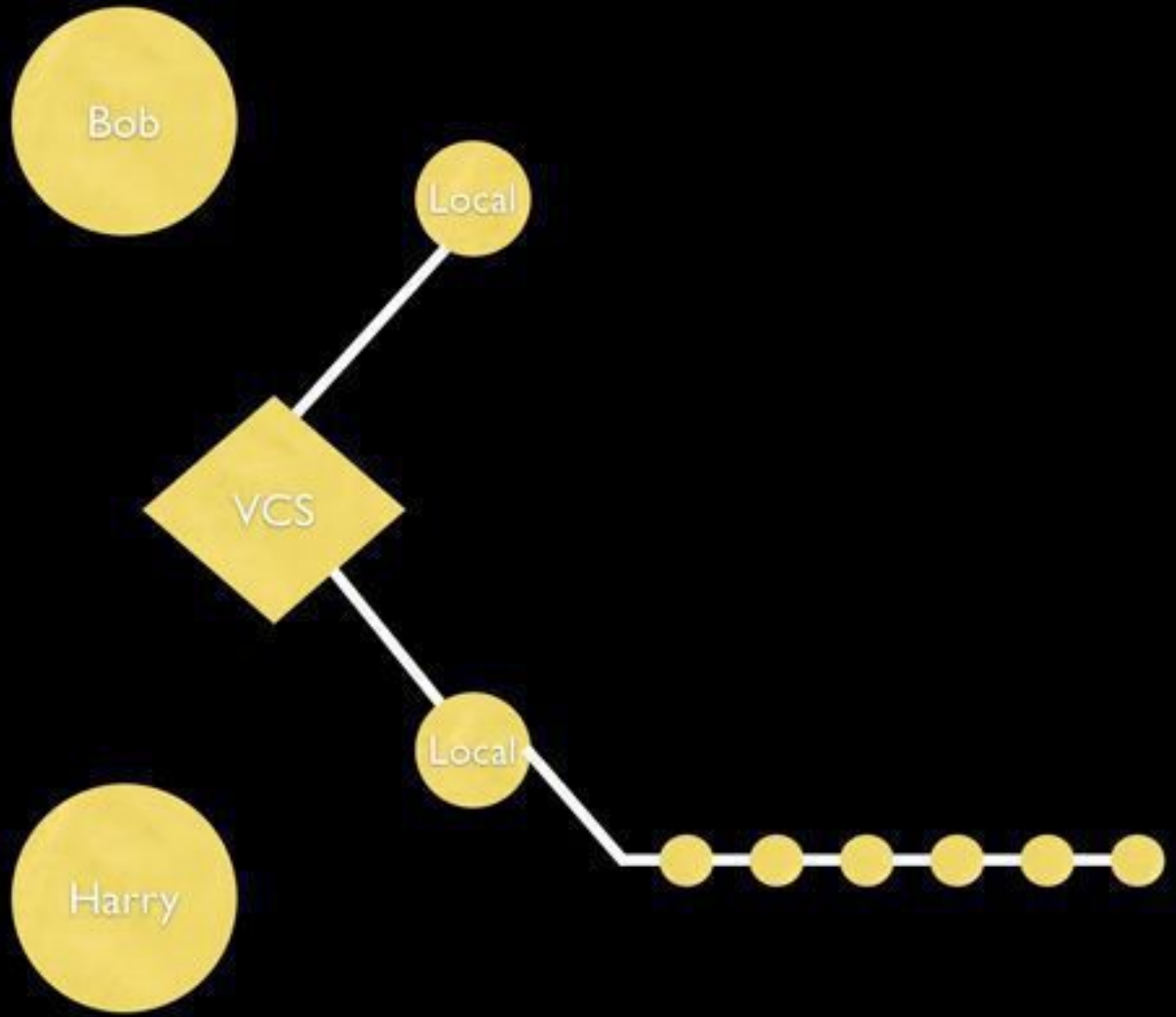

Bob

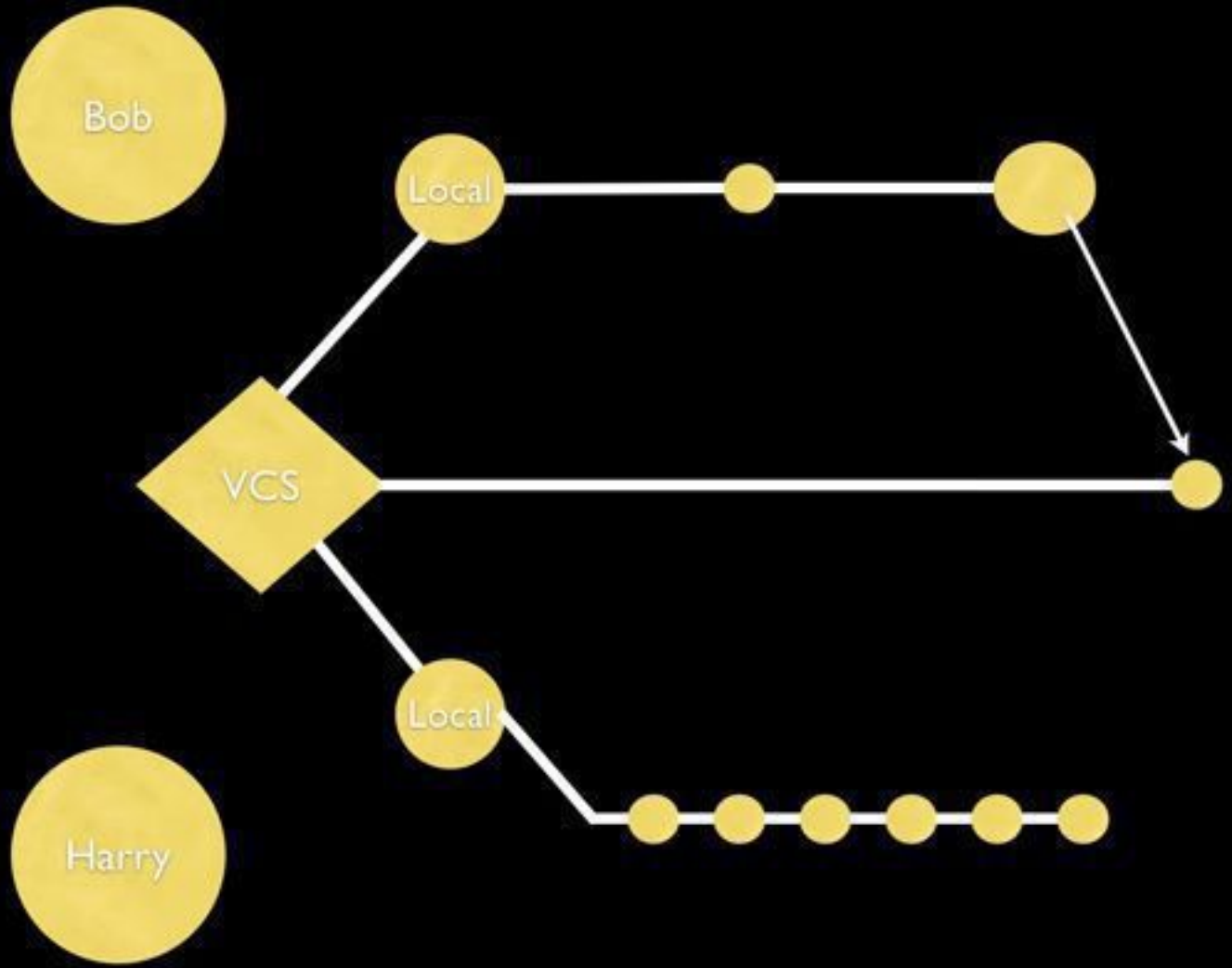

Bob

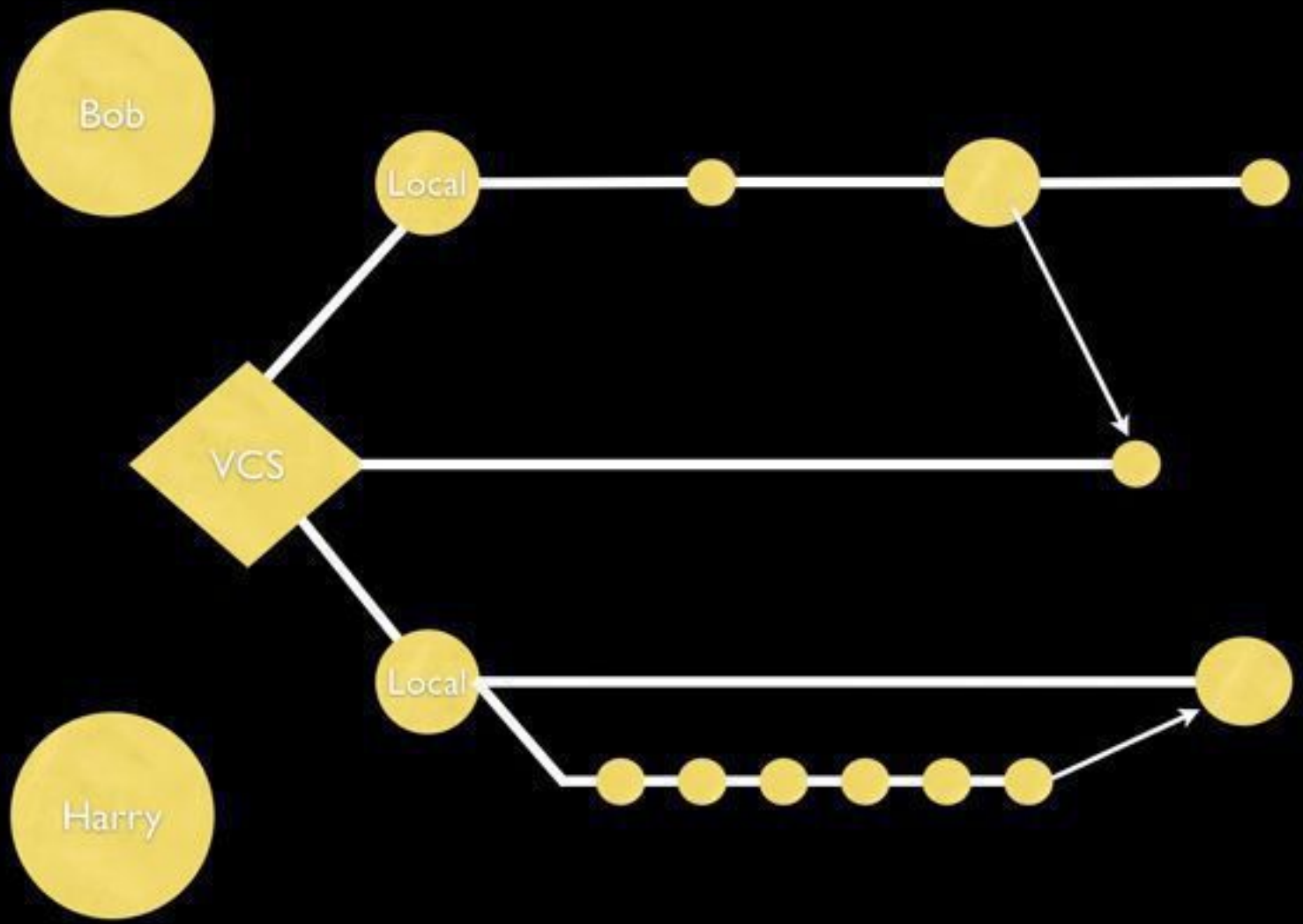

Harry

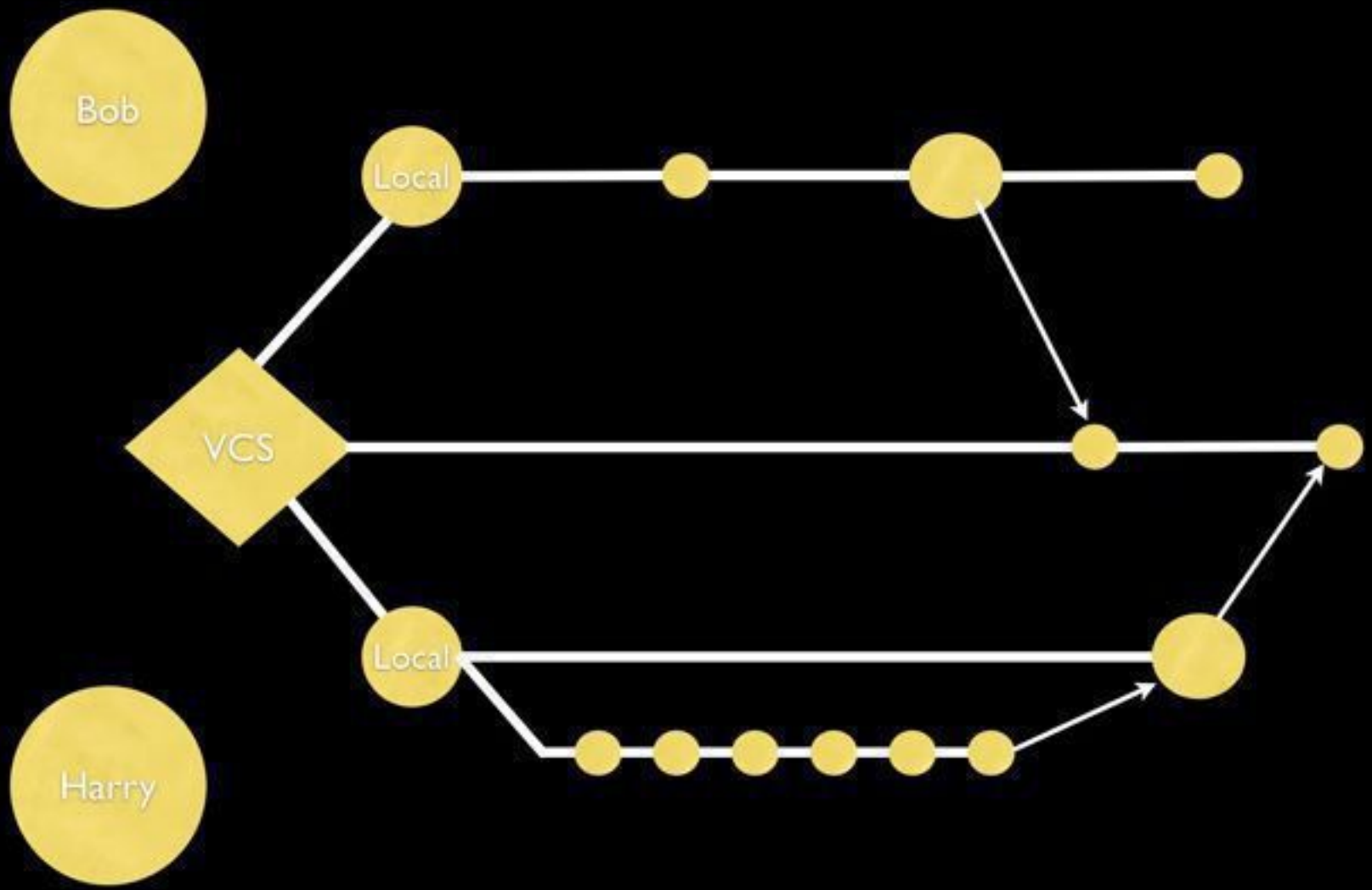

Bob
Local
VCS
Local
Harry

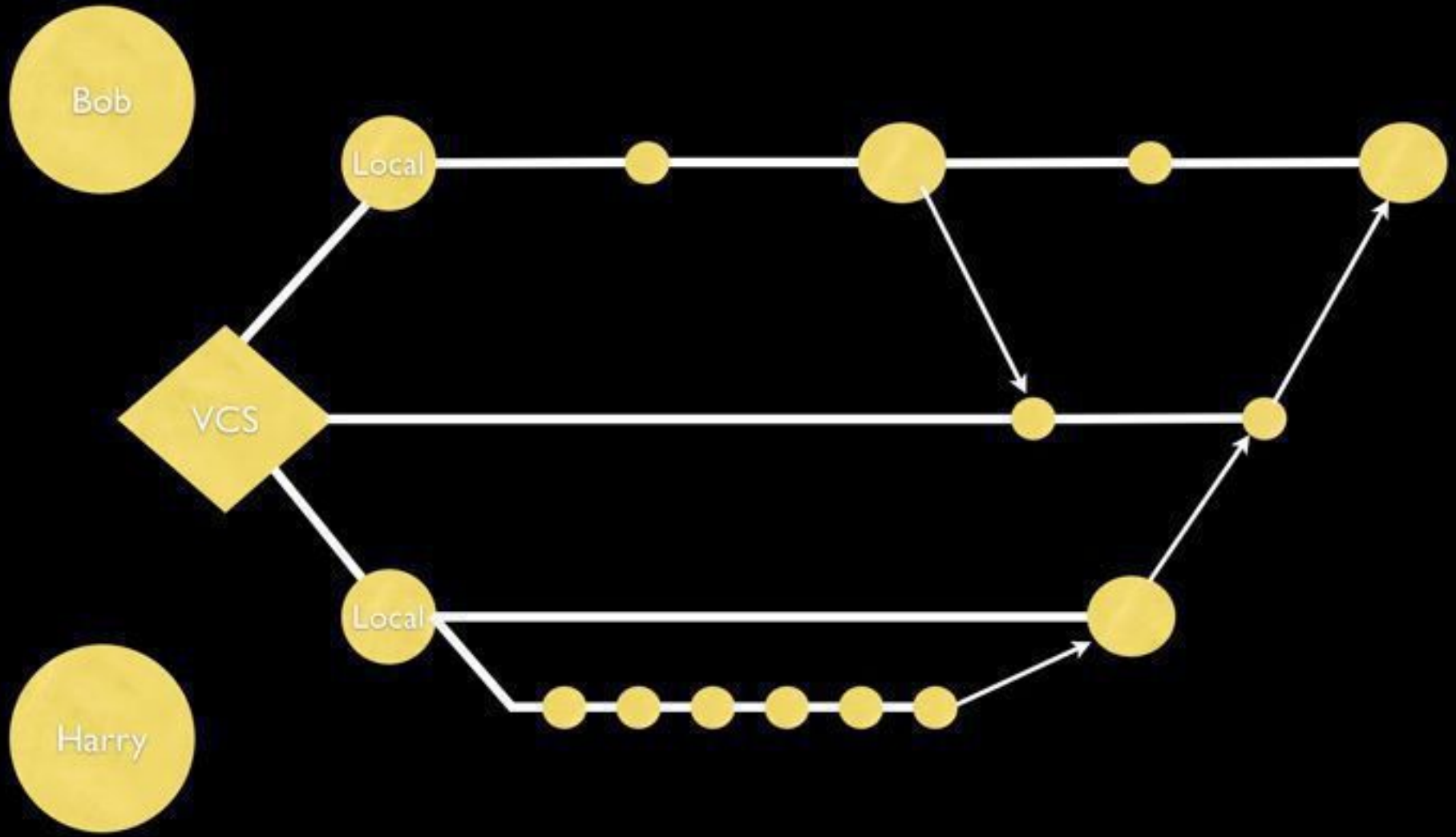

Bob
Local
VCS
Local
Harry


Bob
Local
VCS
Local
Harry


Bob
Local
VCS
Local
Harry


Bob
Local
VCS
Local
Harry


Bob
Local
VCS
Local
Harry


Bob
Local
VCS
Local
Harry

Next Episode?

CHAPTER 2

Version Control with Git

Intro to Git & Git Basics

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Computer Engineering Department
Presented By S. M. Masoud Sadrnezhaad
Source: Michael Koby

Why Git?

What is Git?

... a distributed version control system
created by Linus Tovalds, creator of Linux,
to replace BitKeeper as the VCS used
for maintaining the Linux kernel

Design Goals for Git

Design Goals for Git

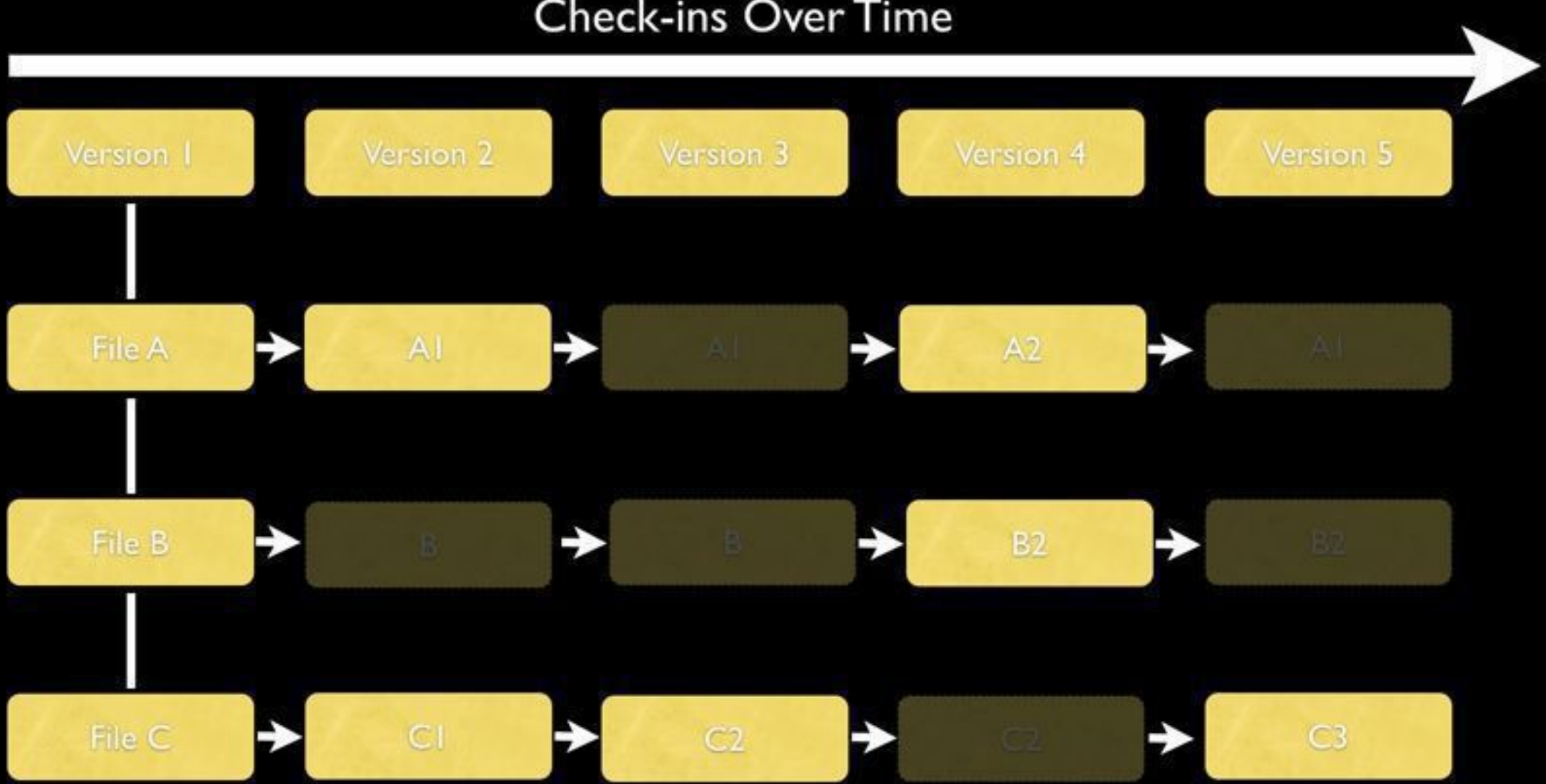
- Speed
- Simplicity

Design Goals for Git

- Speed
- Simplicity
- Strong support for non-linear development
- Ability to handle large projects

What Makes Git Different?

Snapshots, Not Differences


Check-ins Over Time
Version 1
Version 2
Version 3
Version 4
Version 5
File A
A1
A1
A2
A1
File B
B
B
B2
B2
File C
C1
C2
C2
C3

It's All (Mostly) Local

Three Main Stages

Three Main Stages

- Commited

Three Main Stages

- Commited
- Staged

Three Main Stages

- Commited
- Staged
- Modified

Installing Git

http://git-scm.com/book/en/Getting-Started-Installing-Git

Lets Get Started,
Open Your Terminal

CHAPTER 3

Version Control with Git

Branches

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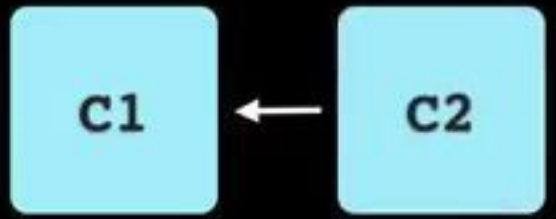
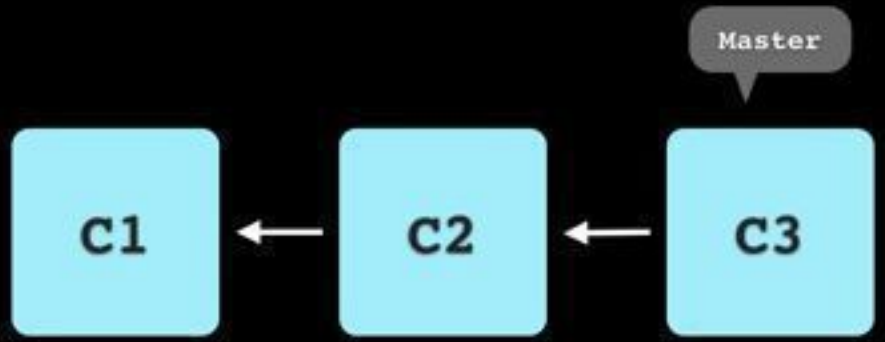
Presented By S. M. Masoud Sadrnezhaad
Source: Michael Koby

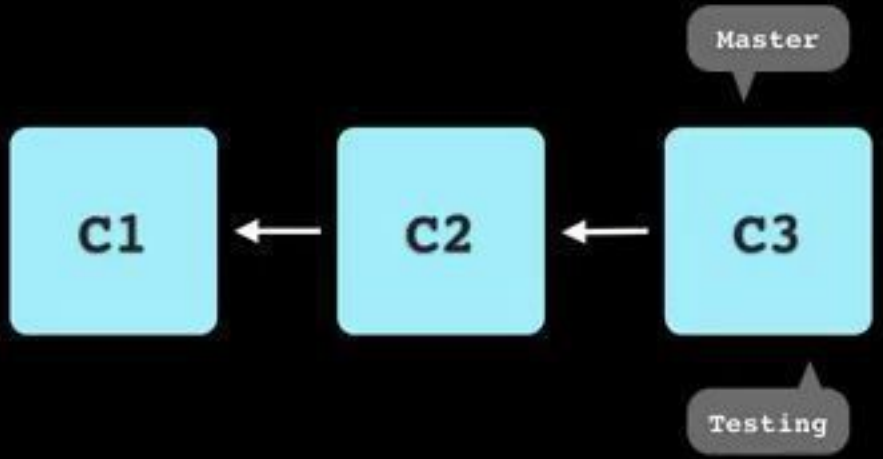
Git commits are pointers to the previous commit

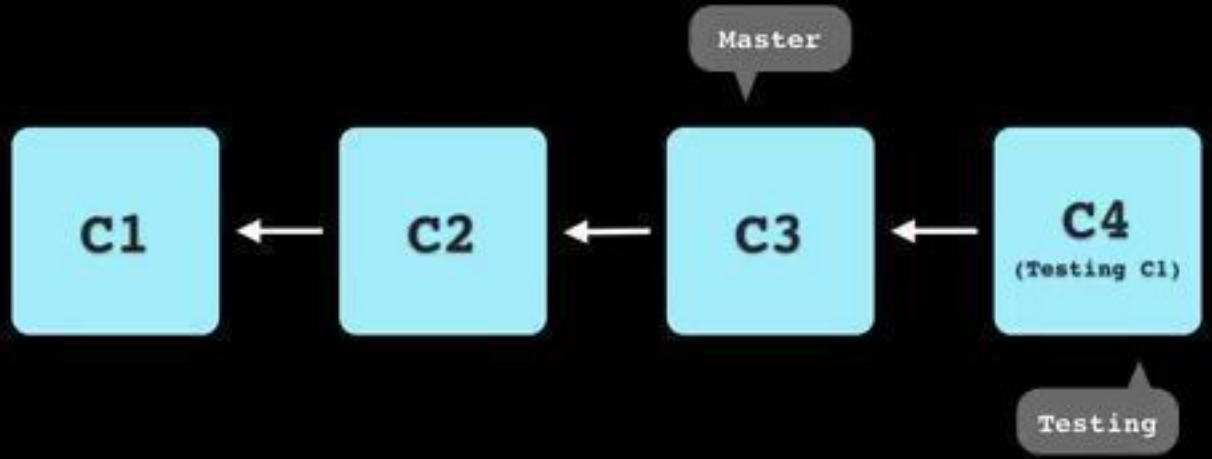

C1

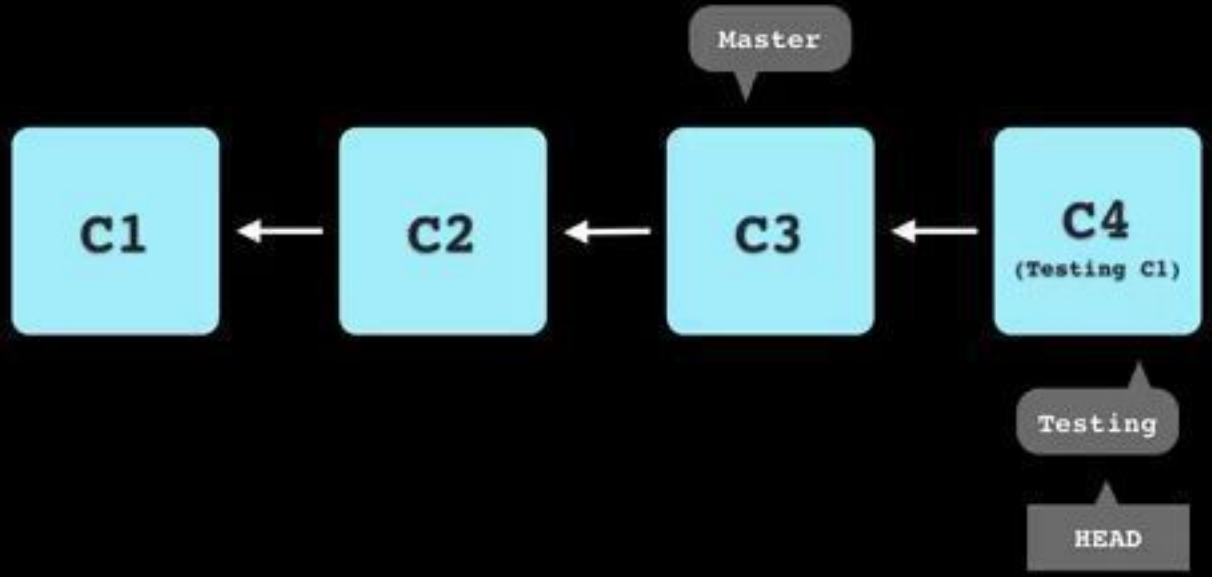

C1
C2

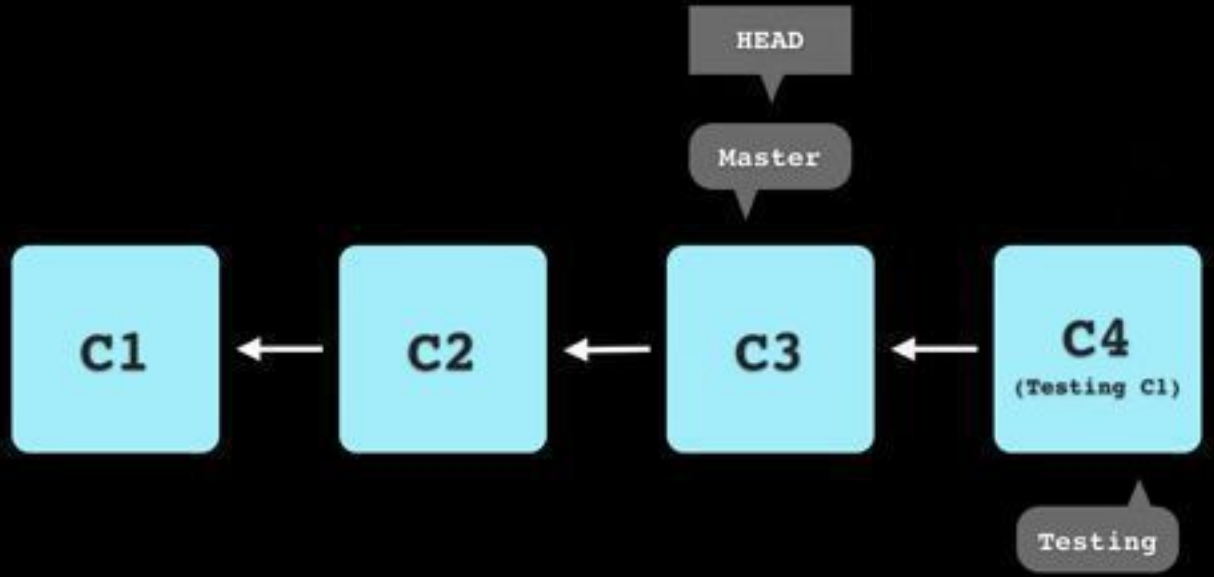

C1
C2
C3


Master
C1
C2
C3


Master
C1
C2
C3
Testing

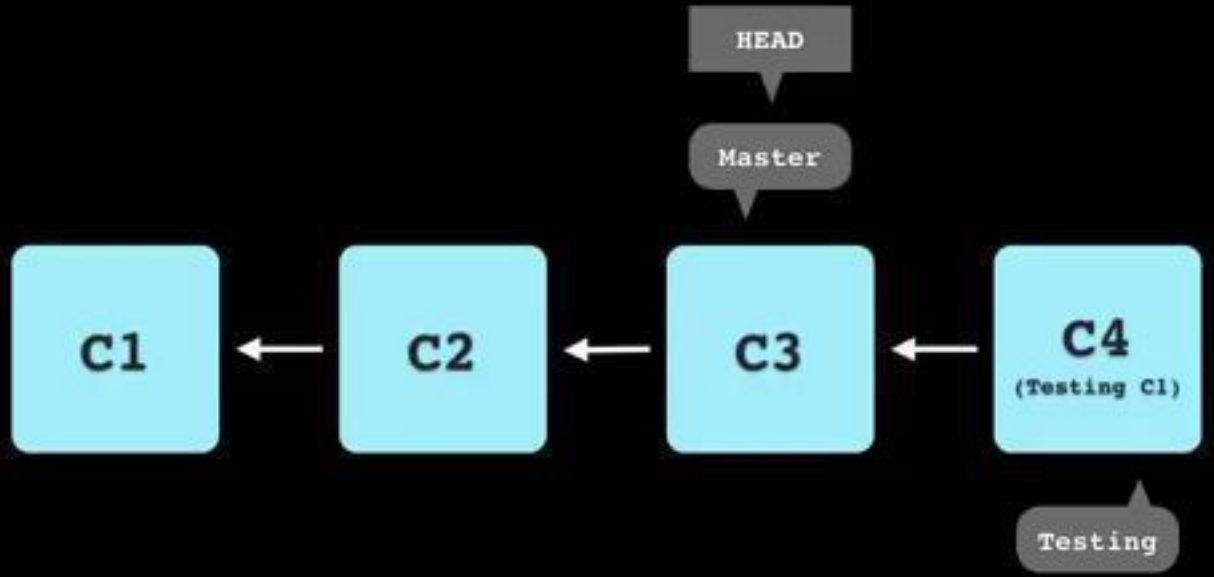

Master
C1
C2
C3
C4
(Testing C1)
Testing

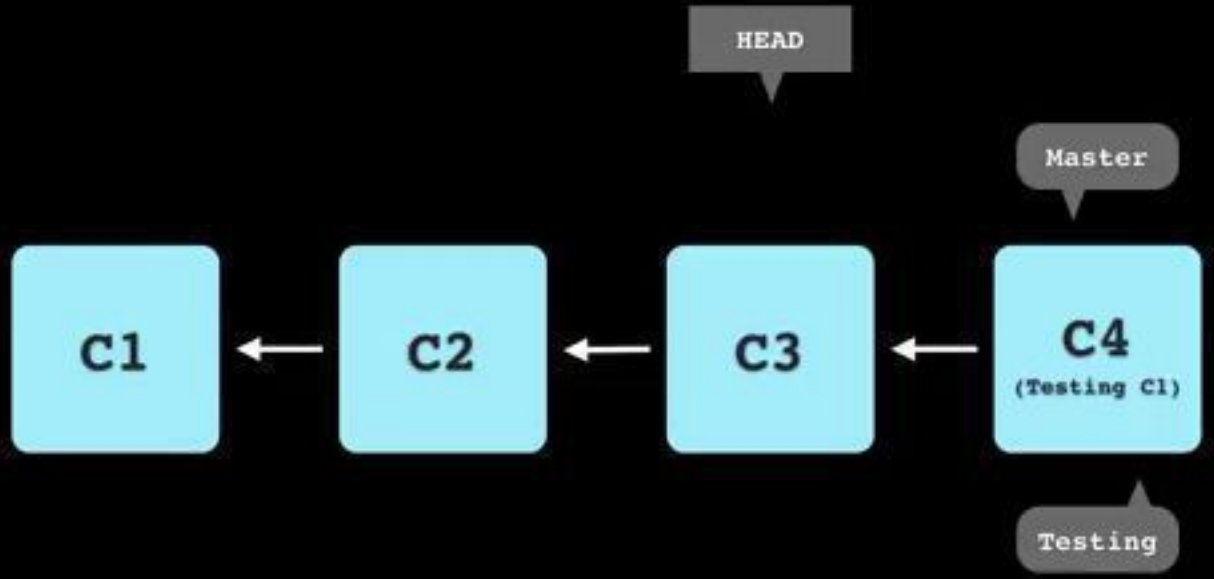

Master
C1
C2
C3
C4
(Testing C1)
Testing
HEAD

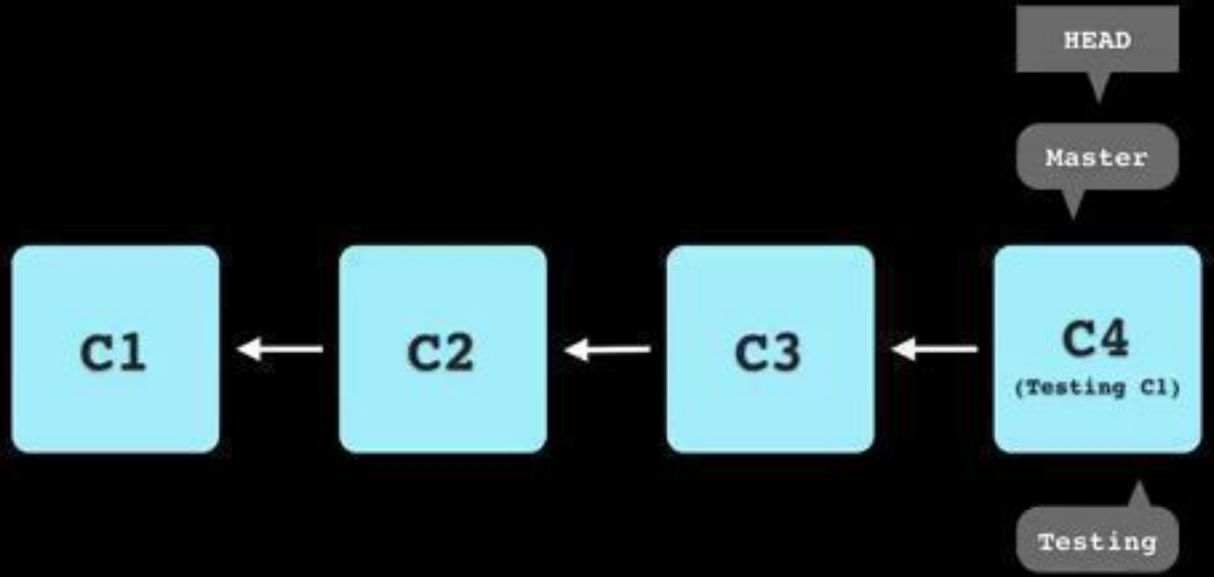

HEAD
Master
C1
C2
C3
C4
(Testing C1)
Testing

Going Hands On

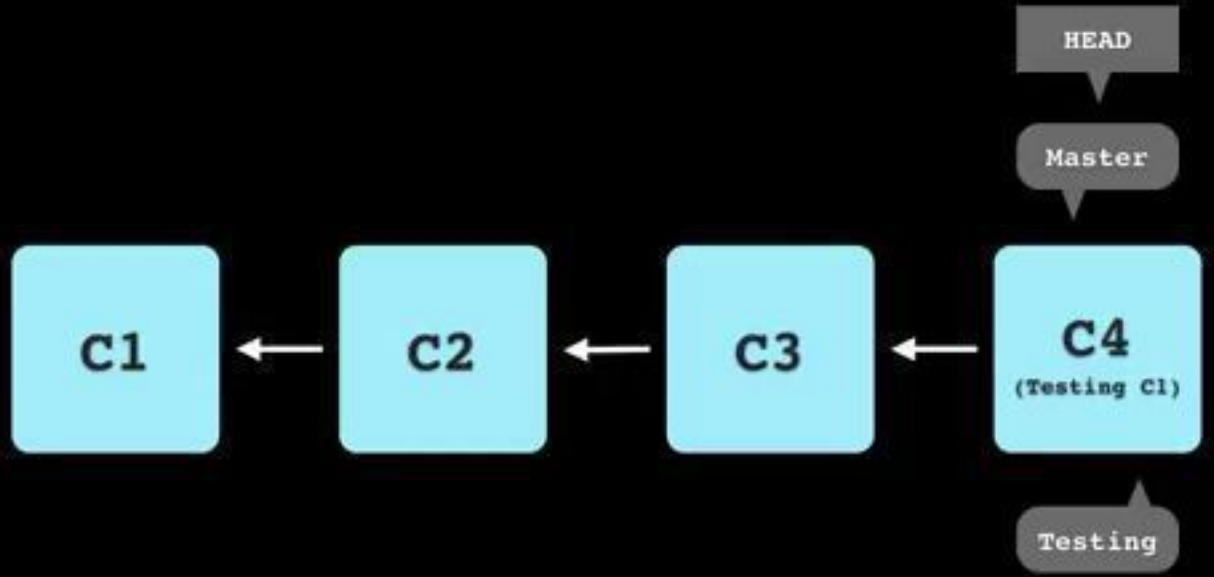
Merging


HEAD
Master
C1
C2
C3
C4
(Testing C1)
Testing


HEAD
Master
C1
C2
C3
C4
(Testing C1)
Testing


HEAD
Master
C1
C2
C3
C4
(Testing C1)
Testing

Fast Forward Merge



CHAPTER 4

Version Control With Git

Branches - Part Deux

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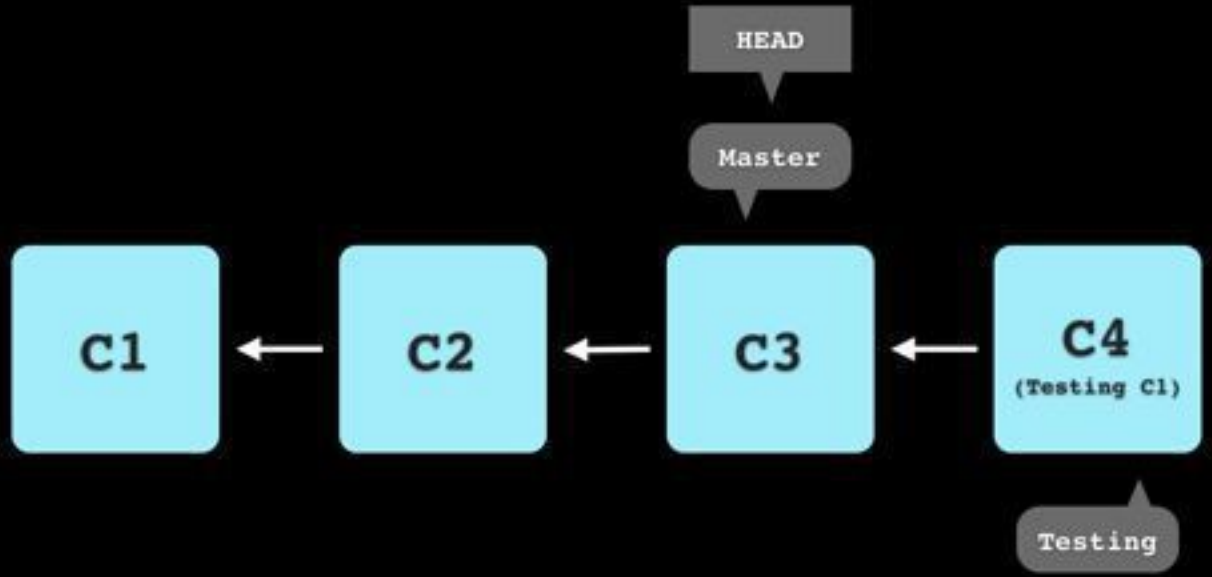
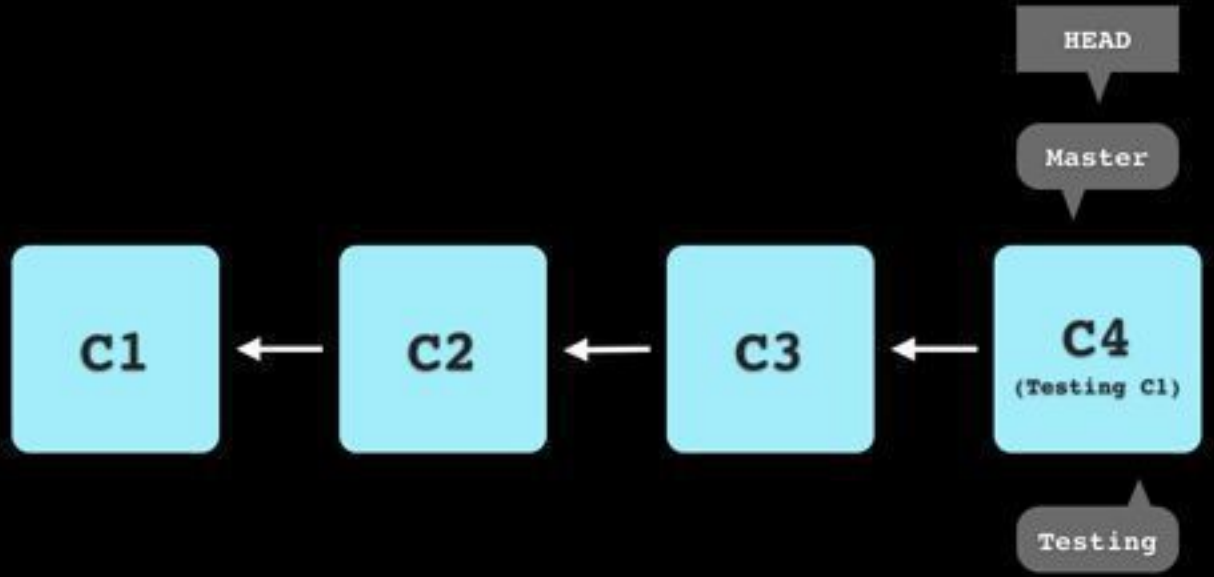
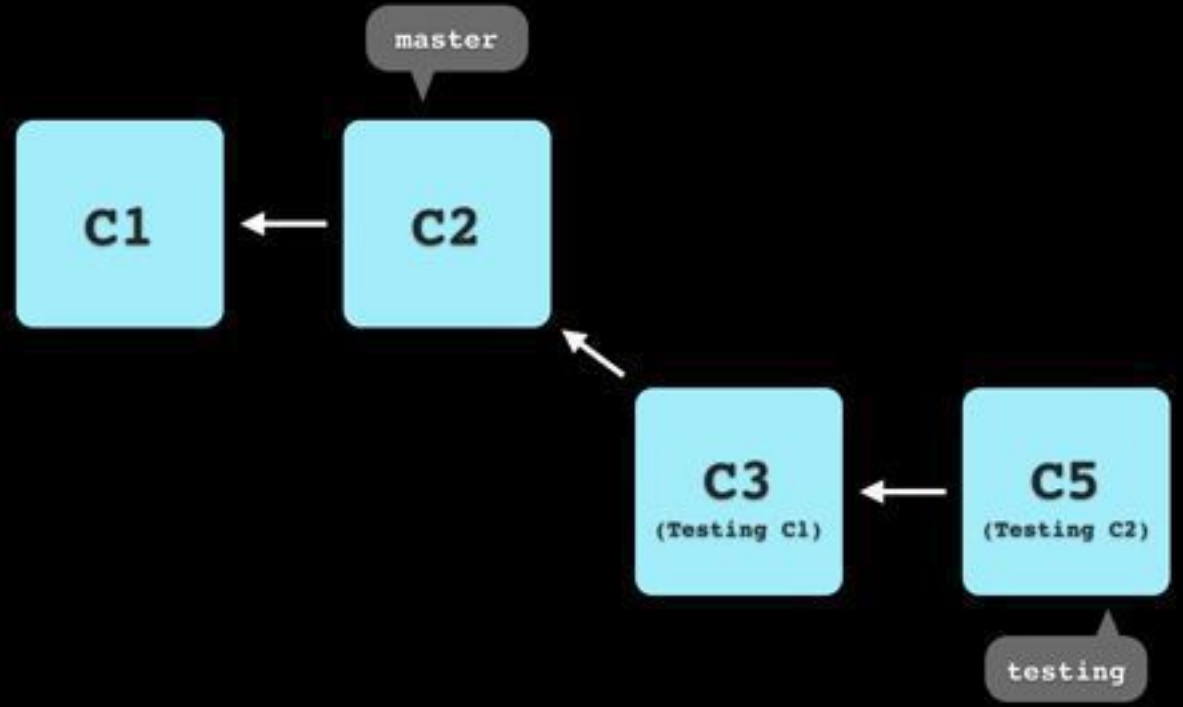
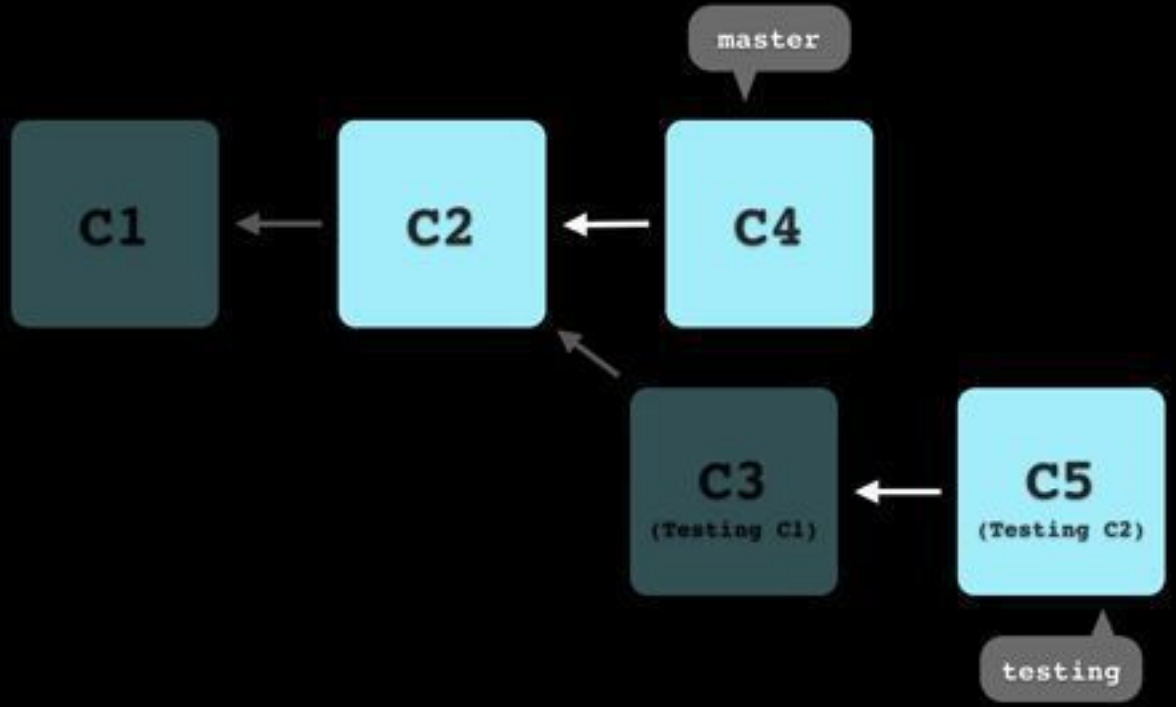
Computer Engineering Department
Presented By S. M. Masoud Sadrnezhaad
Source: Michael Koby


HEAD
Master
C1
C2
C3
C4
(Testing C1)
Testing

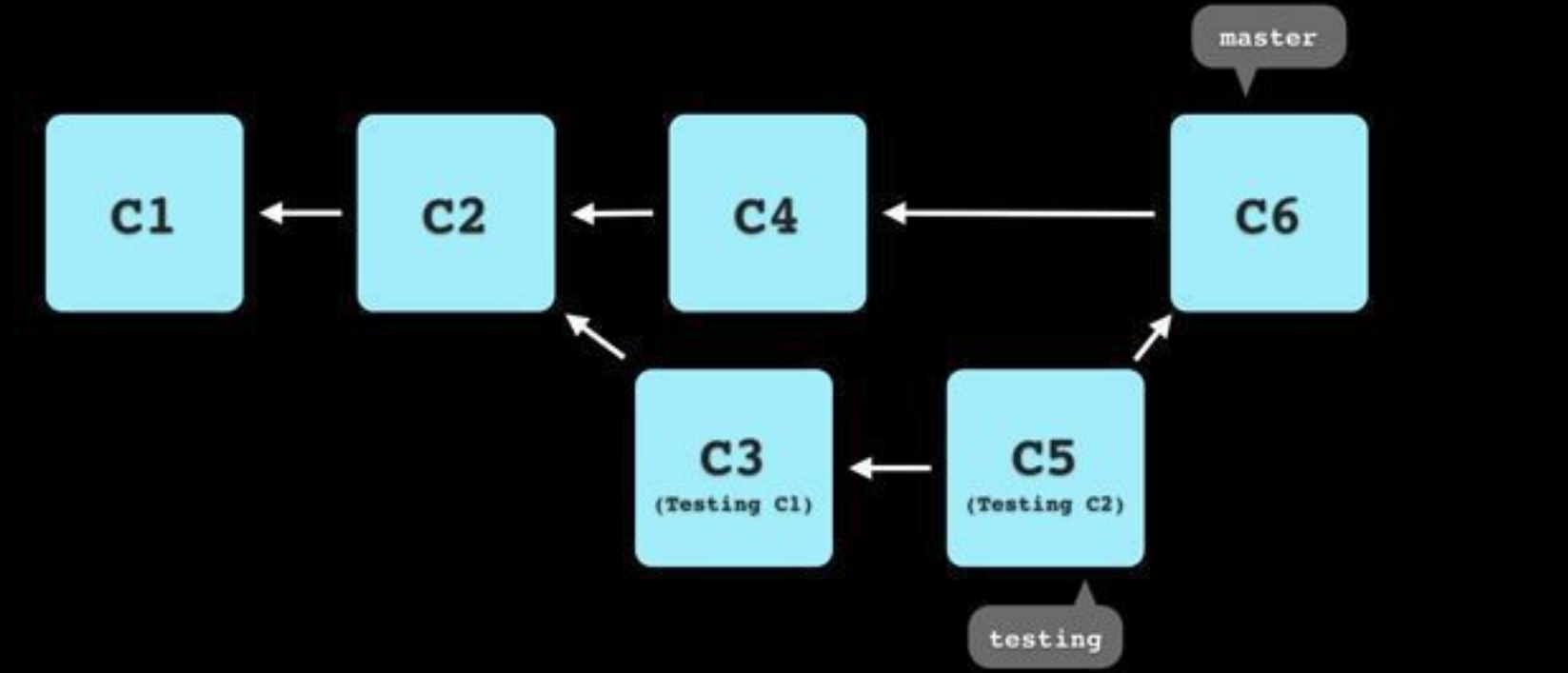
Fast Forward Merge

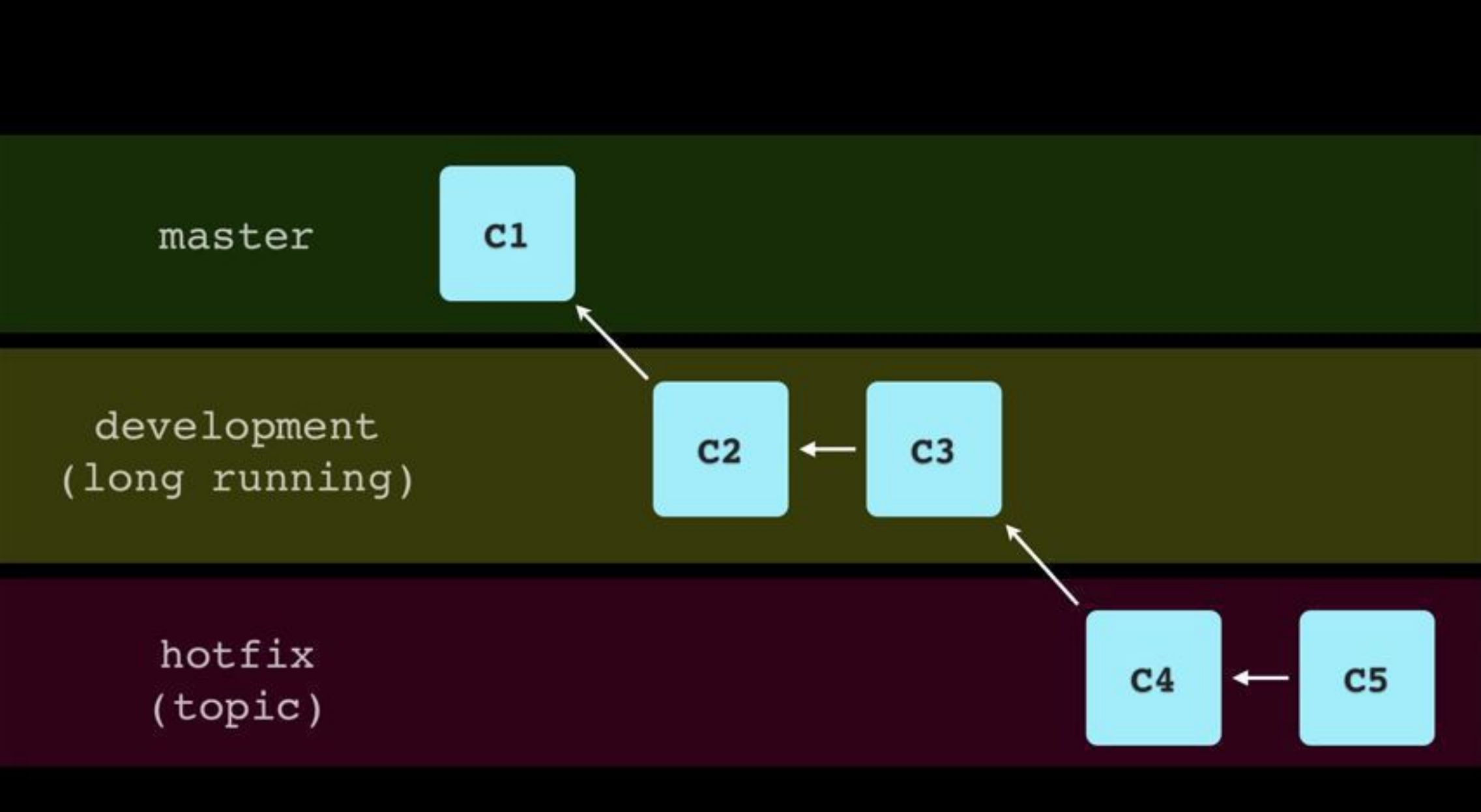


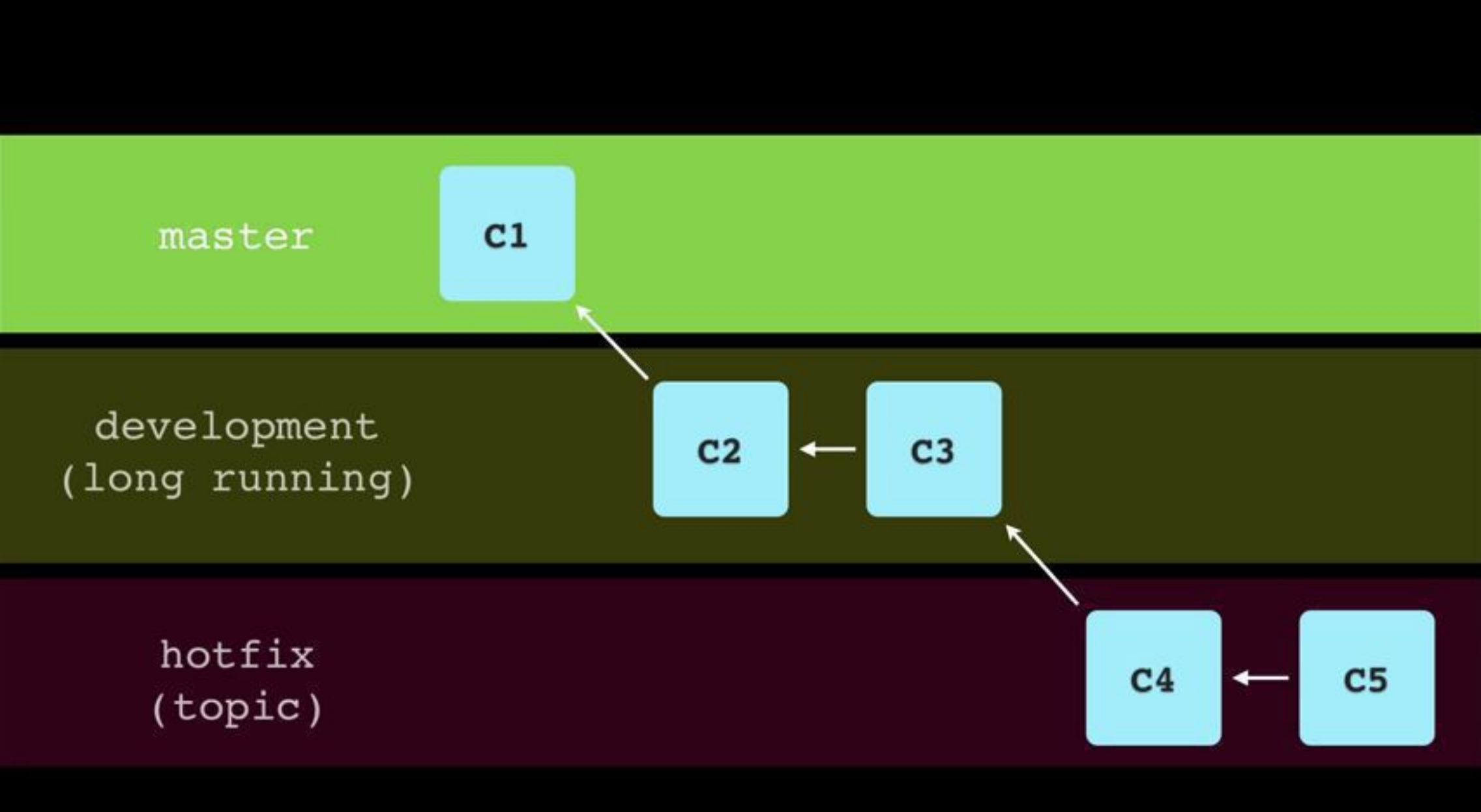

master
C1
C2
C3
(Testing C1)
C5
(Testing C2)
testing

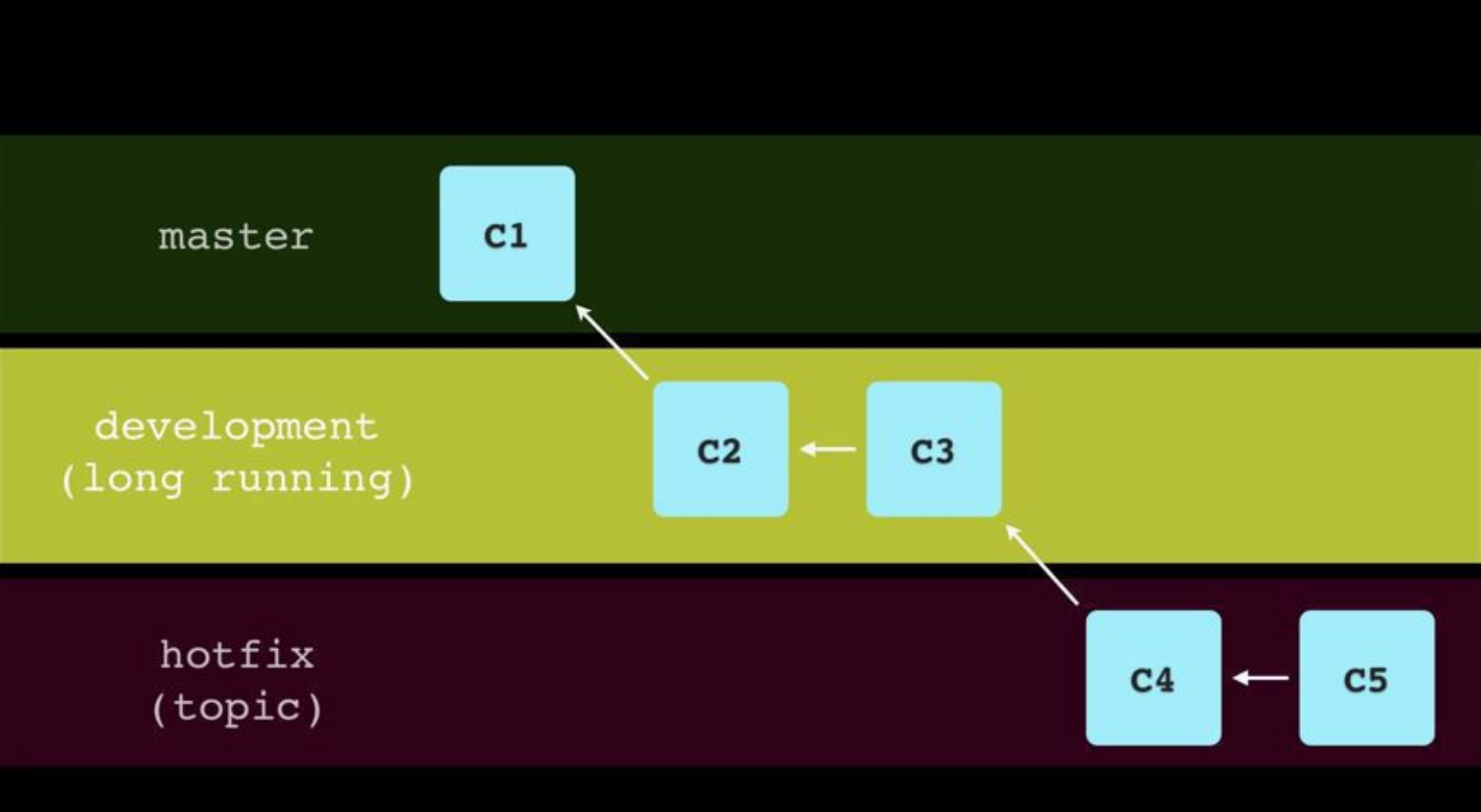

master
C1
C2
C4
C3
(Testing C1)
C5
(Testing C2)
testing

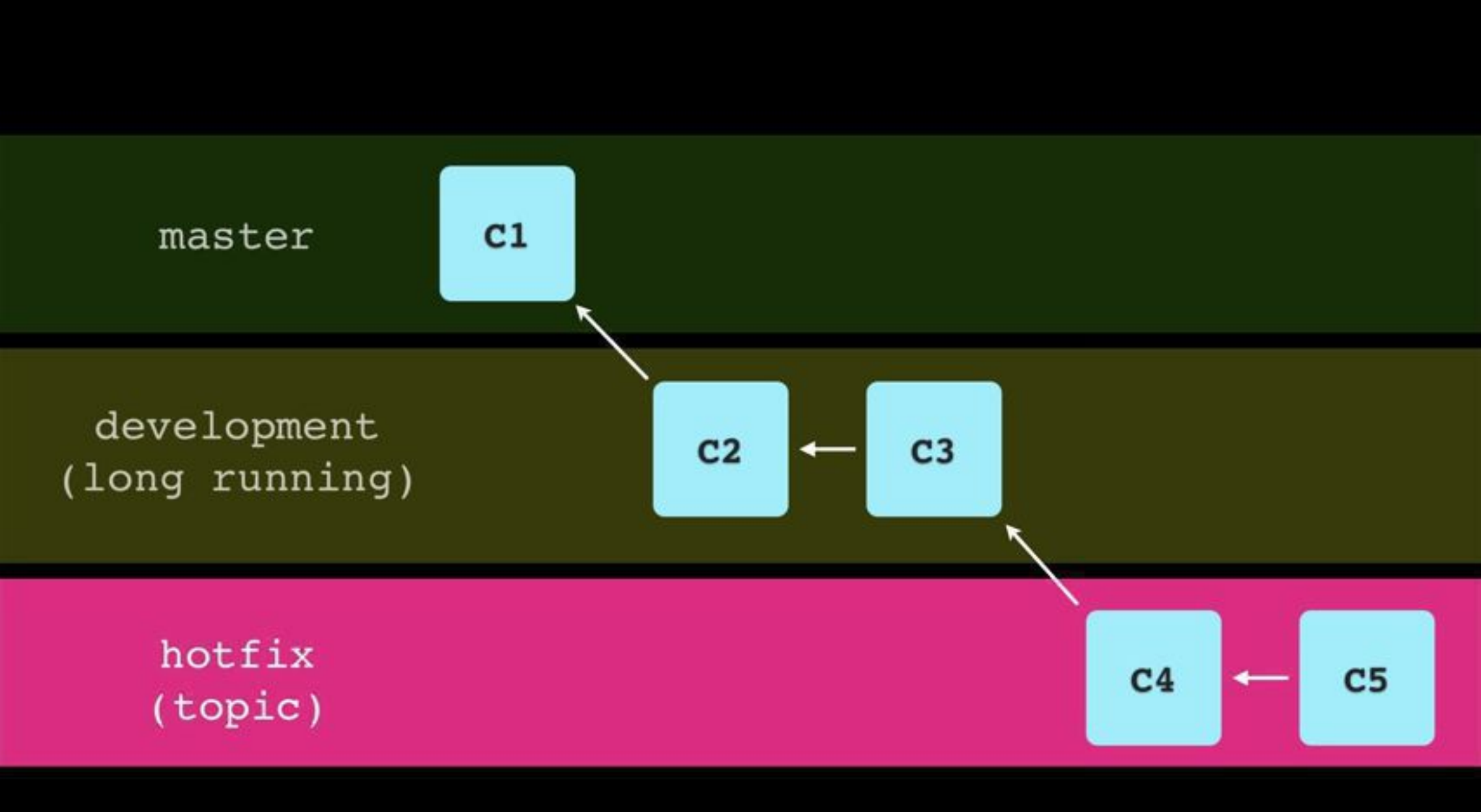
Three Way Merge
(aka Recursive Merge)




master
development
(long running)
hotfix
(topic)
C1
C2
C3
C4
C5


master
C1
development
(long running)
C2
C3
hotfix
(topic)
C4
C5


master
C1
development
(long running)
C2
C3
hotfix
(topic)
C4
C5


master
development
(long running)
hotfix
(topic)
C1
C2
C3
C4
C5

Long Running Branches Stick Around

Topic Branches Center Around Features, Bug Fixes, Etc

Merged Back Into a Long Running Branch

Topic Branches Are Usually Deleted When You're Done With Them

Deleting a Branch

```
git branch -D BRANCHNAME
```

```
git branch -D testing
```

Remote Branches

```
git push REMOTE BRANCHNAME
```

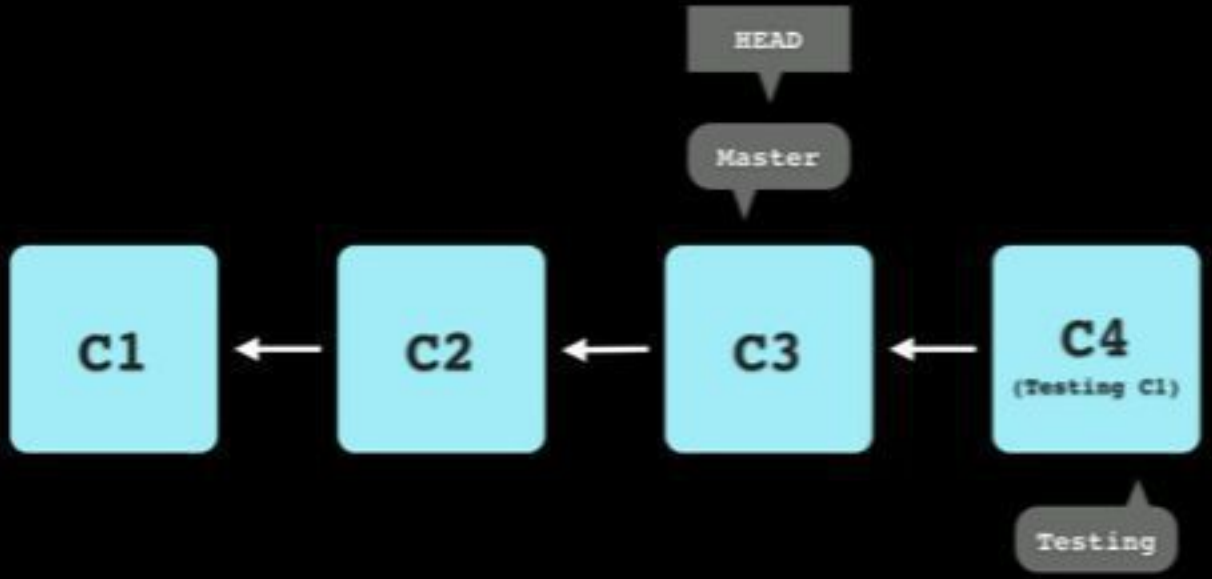
Deleting Remote Branches

```
git push REMOTE :BRANCHNAME
```

```
git push origin :testing
```

That’s all folks!

CHAPTER 5



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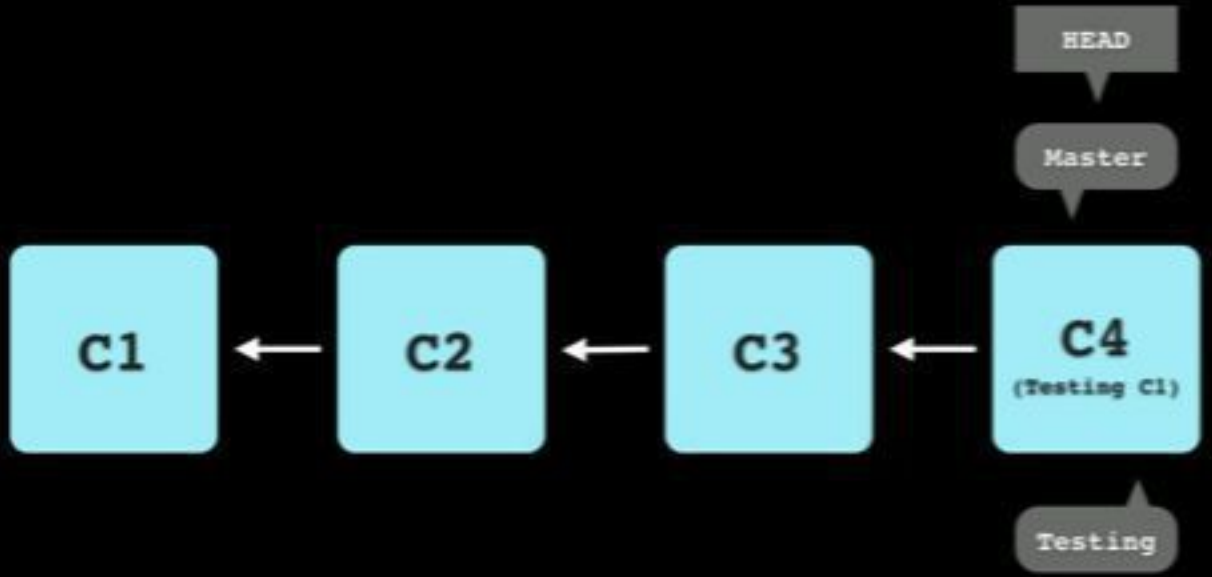
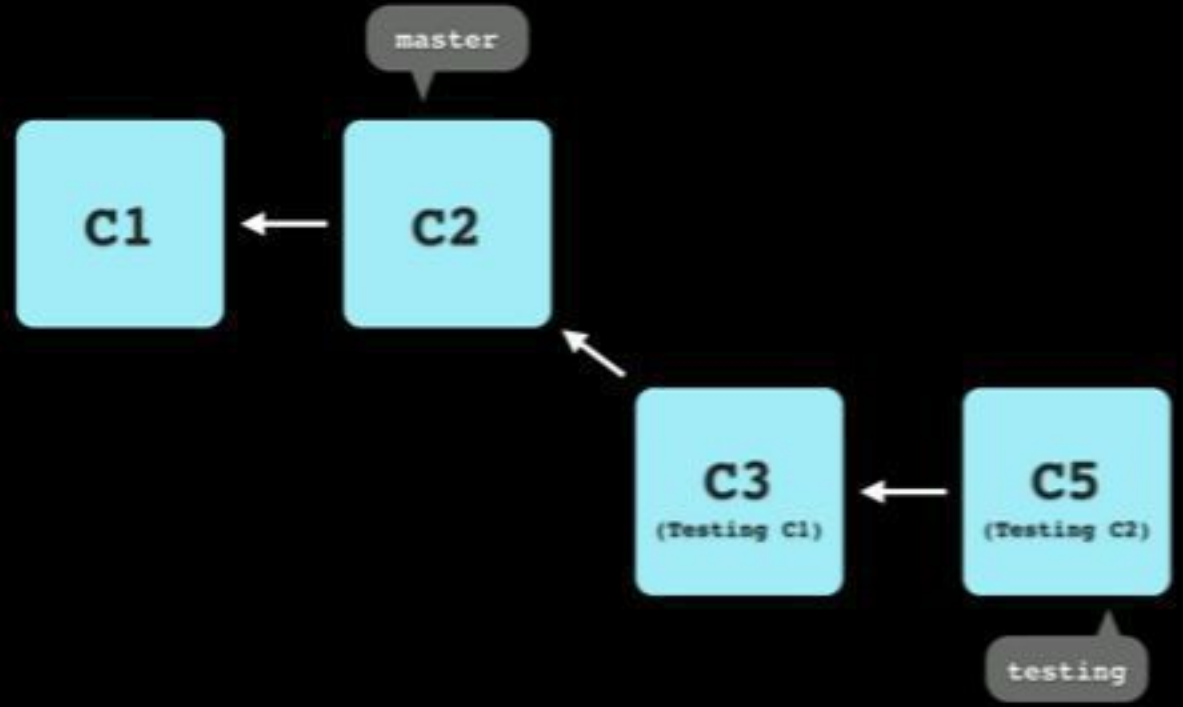
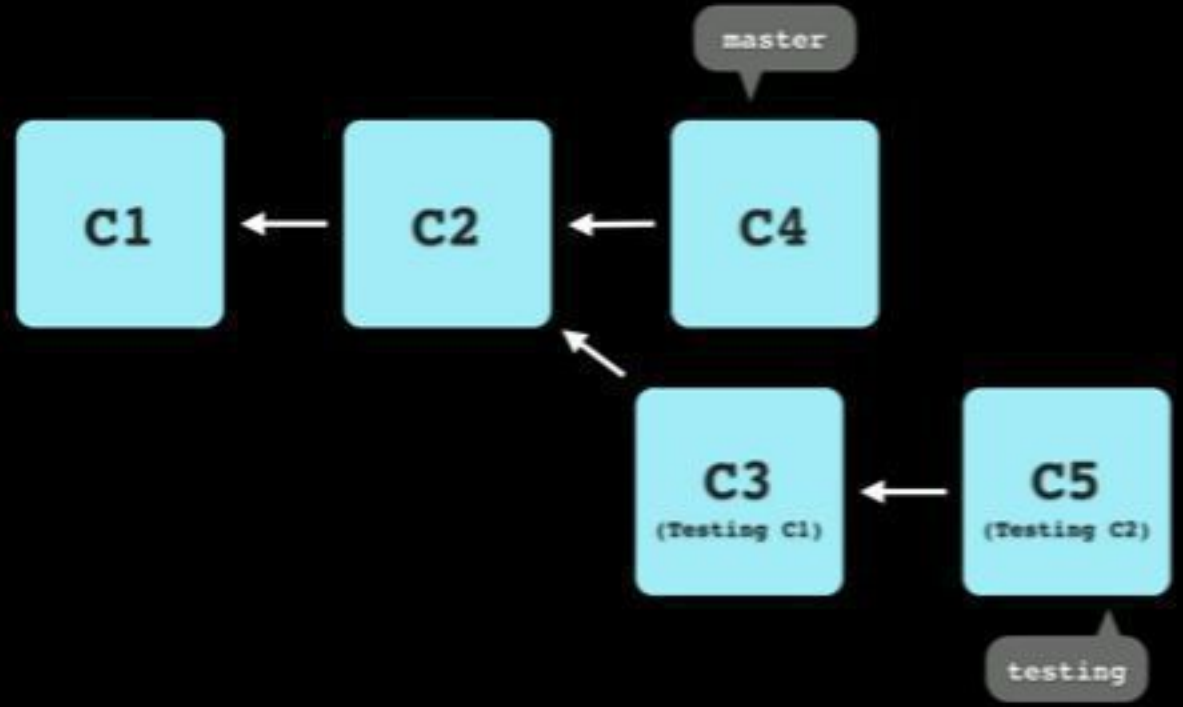
Source: Michael Koby

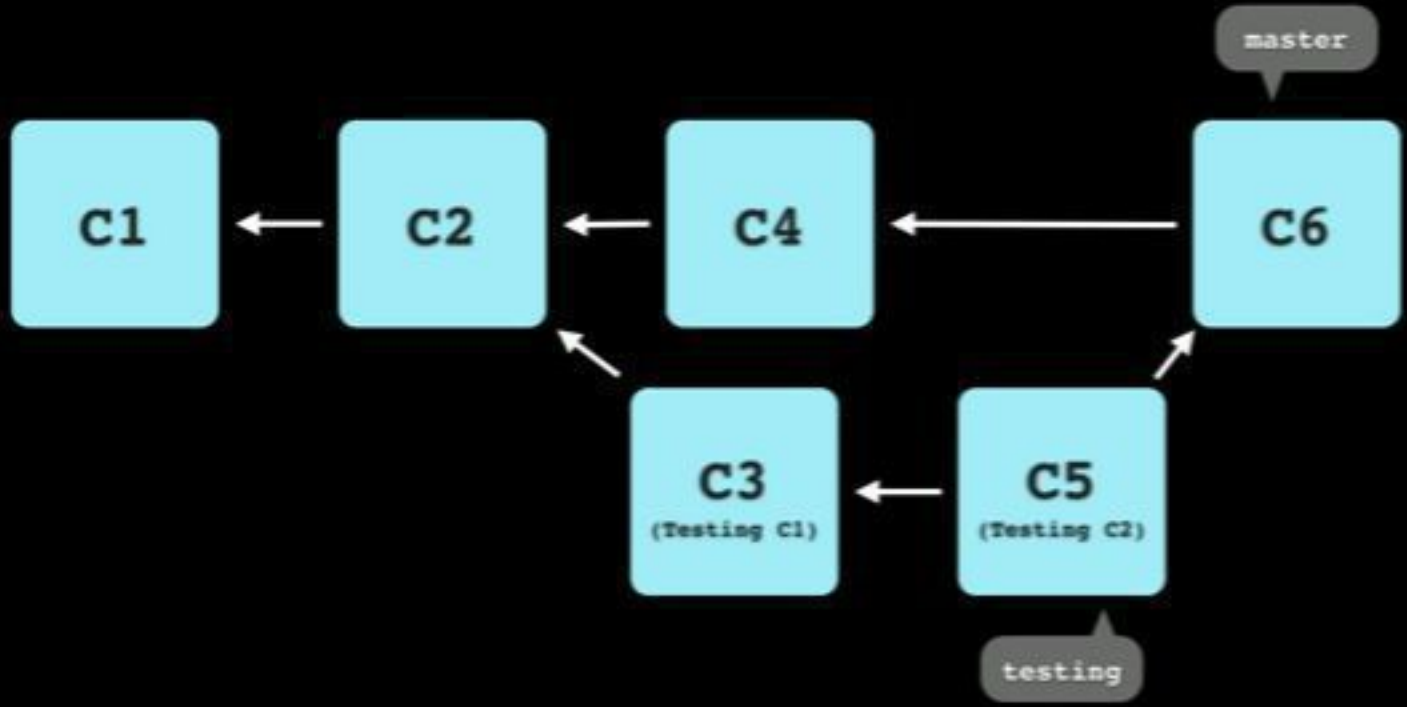
Fast Forward Merge

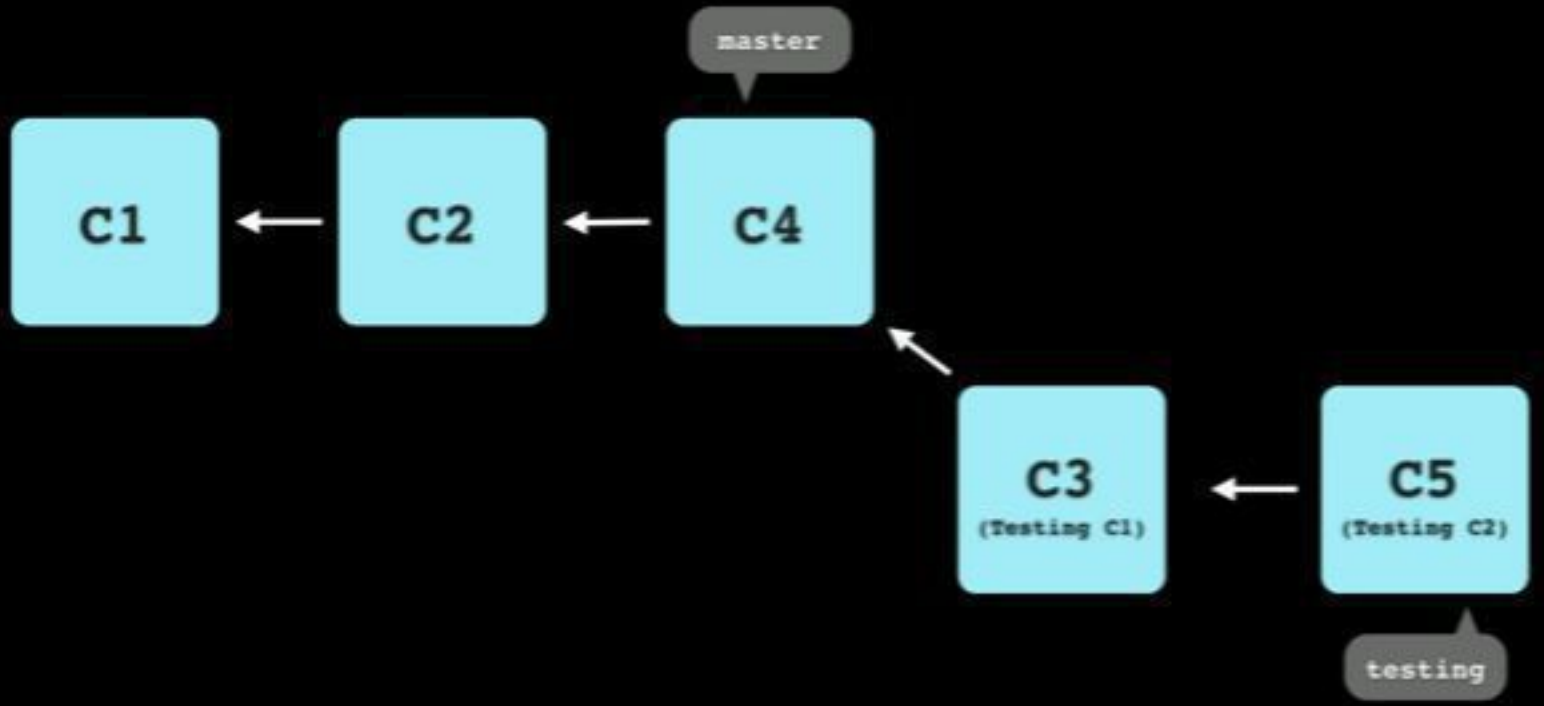



master
C1
C2
C3
(Testing C1)
C5
(Testing C2)
testing

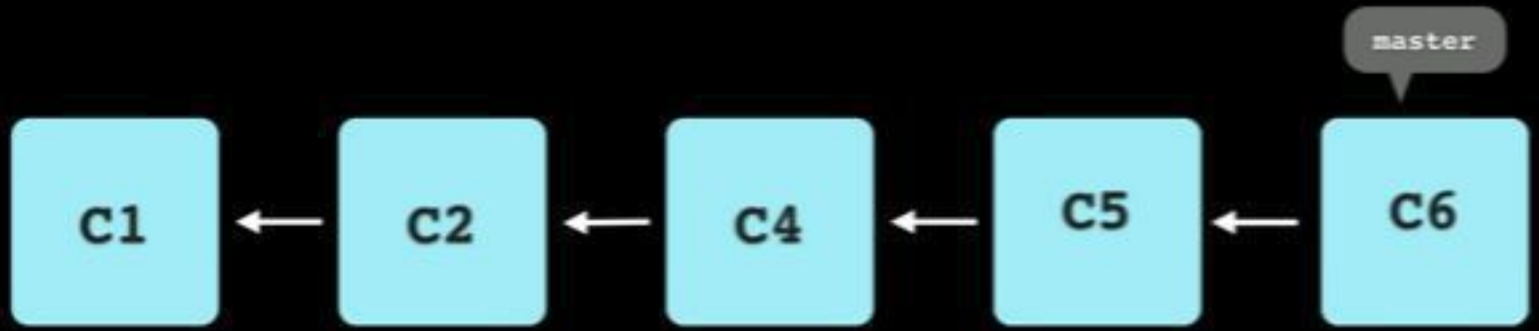

master
C1
C2
C4
C3
(Testing C1)
C5
(Testing C2)
testing

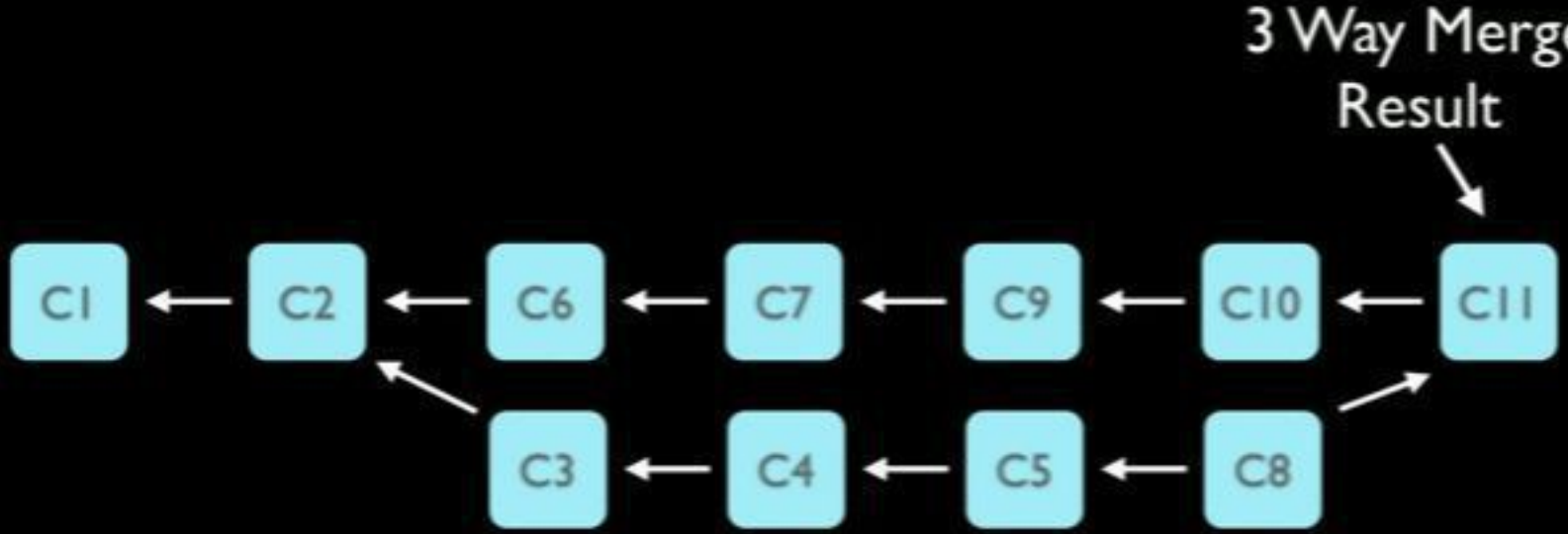
Three Way Merge
(aka Recursive Merge)



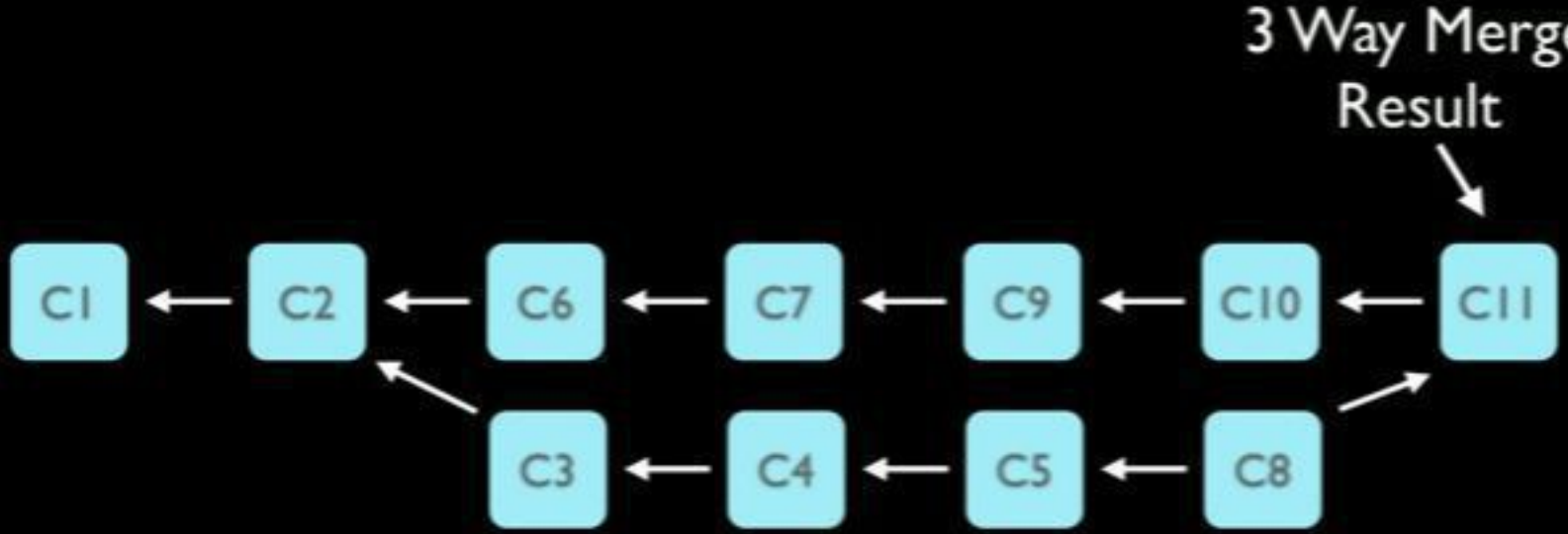

master
C1
C2
C4
C3
(Testing C1)
C5
(Testing C2)
testing

Rebase

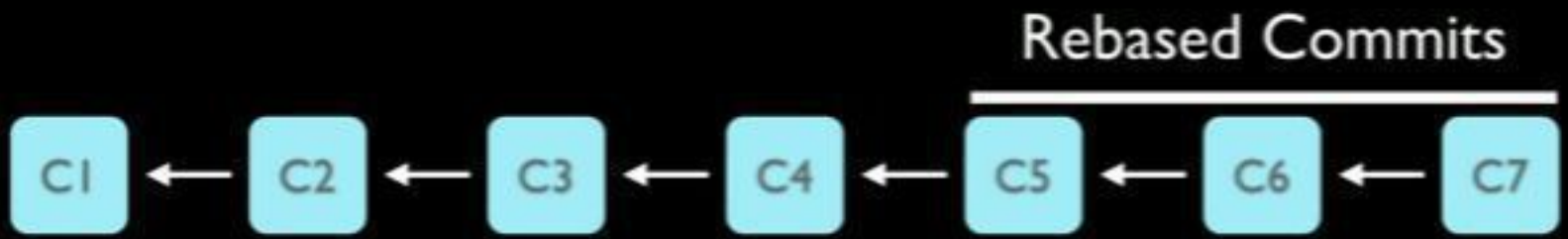



3 Way Merge
Result
C1
C2
C6
C7
C9
C10
C11
C3
C4
C5
C8

Merged Without Rebase


3 Way Merge
Result
C1
C2
C6
C7
C9
C10
C11
C3
C4
C5
C8

Merged With Rebase


Rebased Commits
C1
C2
C3
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Never rebase a public branch!

CHAPTER 6

Let's see in action

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Initiate Git and It's Files
Working With Changes

```
# make a new directory and go to project path
> mkdir git_repo
> cd git_repo

# initialize git
> git init
Initialized empty Git repository in /path/to/git/repository/.git/
> ls -a
.  ..  .git

# let's have a deeper look at .git directory
> ls -a .git/
.  ..  branches  config  description  HEAD  hooks  info  objects  refs
```

```
# define your name and email address (this config is per machine)
> git config --global user.name "Masoud Sadrnezhaad"
> git config --global user.email smmsadrnezh@gmail.com

# checkout your git config
> git config --list
user.name=Masoud Sadrnezhaad
user.email=smmsadrnezh@gmail.com
credential.helper=cache
core.repositoryformatversion=0
core.filemode=true
core.bare=false
core.logallrefupdates=true
```

```
# create and open README.md file with your default system editor.
> vi README.md

# let's write a readme file (with or witout markdown syntax)

# go to insert mode by click "I" one time
# and go back to command mode by Esc. save the file by "wq"

# make sure everything ok.
> ls -a
.  ..  .git  README.md

# check modification and it's level (slide 62) you see modifications a
> git status
nothing added to commit but untracked files present (use "git add" to
```

```
# level up this file to staged level
> git add README.md

# look at git status. you see changes in staged level.
> git status

# add staged changes to new commit.
# write a meaningful message for your commit.
> git commit -m "added readme file"
[master (root-commit) 021bd57] commit message
 0 files changed
 create mode 100644 README

# look at git status. there is nothing to commit because changes
# are commited.
> git status
```

```
# let's take a look at created commits.
> git log
commit 021bd57955b472d8e6979ba71e4907e9f1e3ab8b
Author: Masoud Sadrnezhaad <smmsadrnezh@gmail.com>
Date:   Fri May 1 02:12:46 2015 +0430

    commti message

# final notes:

# it's easier to add and commit at once.
> git commit -am "commit message"

# this command add All files in your project directory
> git add -A
```

Undoing Things

```
# adding new modification to previous commits.

> git commit --amend

# you see commit message as it's name in first line.
# uncomment changes you want to ammend to that commit
# then save the file and close the editor.



# you see this modification in your last commit
> git log
```

```
# do some modification and stage them.

# now imagine that you want to unstage one of added files.
# to undo "git add"

> git reset HEAD README.md


# undo to last working version of that specific file.
> git checkout -- README.md

# undo to last working commit.
# actually this one reset everything not only one file.

> git reset --hard

HEAD is now at 11d075a commit message
```

Branching

```
# see list of all availeble branches.
> git branch
* master

# asterix indicates that HEAD is pointing to master branch.

# let's create a new branch and name it dev
> git branch dev

# HEAD is pointing to last commit of master branch likewise before.
> git branch
  dev
* master

# change HEAD pointer to dev branch.
> git checkout dev
Switched to branch 'dev'
```

```
# do some modification and commit them.

> git commit -am "message"
[master 79635ac] message
 1 file changed, 1 insertion(+)

# switch back to master branch.
> git checkout dev
Switched to branch 'dev'

# open recent changed files. changes does not apply becuz
# you are working on master branch and commited to dev branch.

# it's possible to create and switch to new branch at once.
> git checkout -b dev master
# master indicates that new branch is started from master.
# -b used to create it.
```

```
# to merge branch dev switch to branch you are going to merge with

> git checkout master

# now merge dev. this remove dev branch automatically
# but it keeps revision history (changelog)

> git merge dev
```

Remotes

```
# use .gitignore to indicate which files are not going to pushed
# into remote repository. you can put it everywhere in your project
# we use ! to exclude some files and dirs and * for all of them.

# use this command when you want to have a local copy
# from remote repository. --bare is used
> git clone --bare ~/git-repo/

# to clone from github
> git clone git@github.com:smmsadrnezh/repo-name.git

# to see centeral repository url you fetch from or push into
> git remote -v
origin https://github.com/smmsadrnezh/repo-name.git (fetch)
origin https://github.com/smmsadrnezh/repo-name.git (push)
```

```
# to push commits
> git push -u origin master

# typing "-u origin master" is only needed at first time.

# to get commits pushed by other collaborators.
# pull is equivalent to run fetch and merge one by one.
> git pull

# fetch get's commits but do'nt merge it.
# use diff command to see differences.
> git fetch origin
> git diff origin/master

# important note: pull everytime you want to push
# merge conflicts when using three way merge
```

Rebase

```
# rebasing branches is not a good idea

> git branch
> gitx
> git rebase master
```

Thank you :)