The Abdus Salam
International Centre
for Theoretical Physics

Introduction to Git

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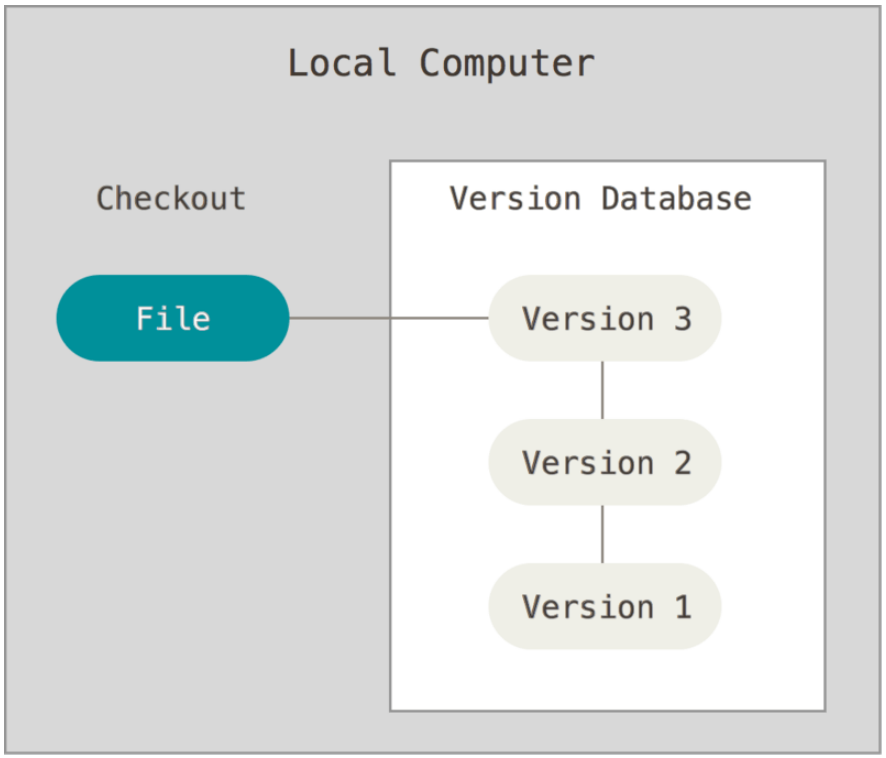
Human Version Control

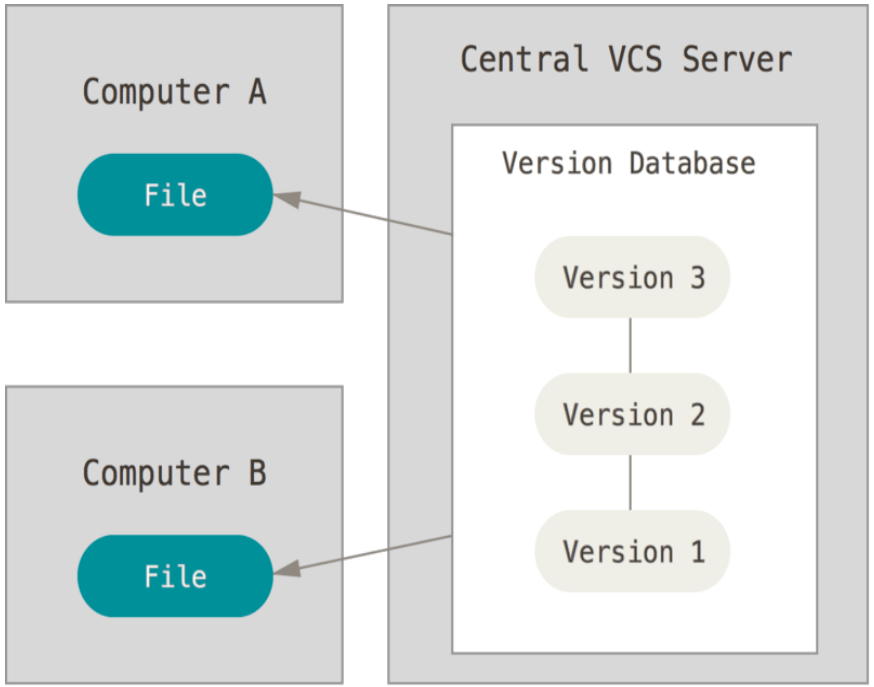
- Only one person makes changes one after the other is complete
- No need for source code management software:
  - Make a copy of the code
  - Add new features, test if working
  - Modified copy becomes new master version
- What happen if we need to go back?!

Local Version Control Systems



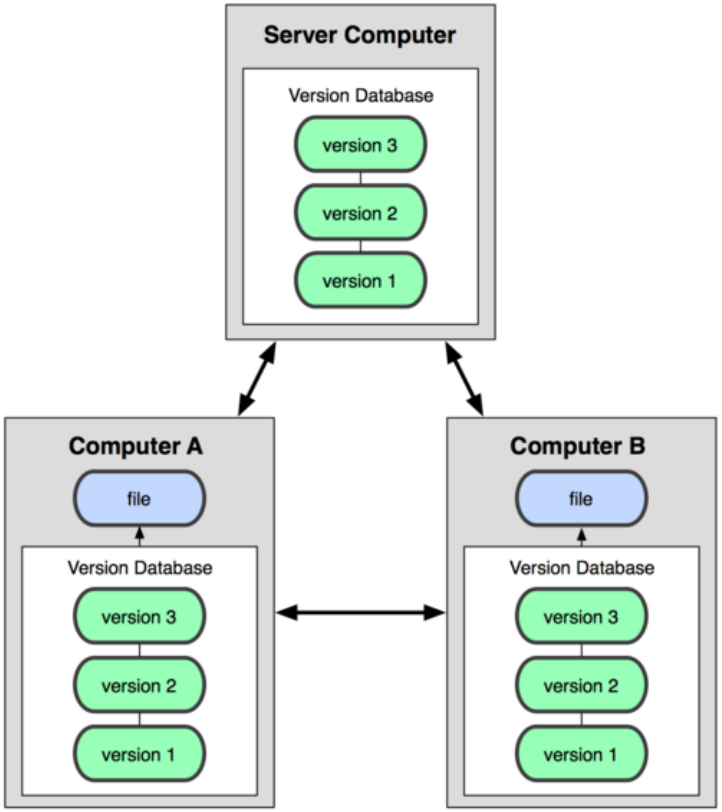
- Early days fashion style
- Mainly for a single developer
- Older status can be easily recovered
- RCS, early 80s

Centralized Version Control Systems



- From the 90s
- Serialized when committing changes back into the repository
- Only committed changes generate a history
- CVS, SVN

Distributed Version Control Systems



- Modern Version Control
- Every developers own a full copy of the main trunk locally
- Used as tool for SW development management in most modern software packages

Terminology: Working Copy

- It is where you are currently working
- Every new modification makes your working copy a new “version” of the code
- Nothing is saved up to the next operation of “saving”
- the git status command logs the status of your working copy
- the git diff command show the differences since your last operation of “saving”

Terminology: Staging Area

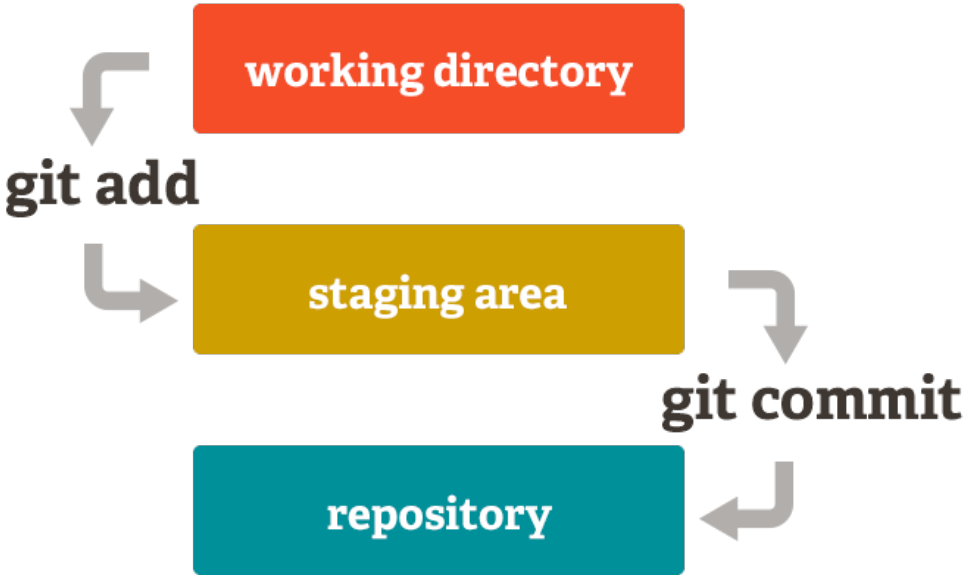
- Only the new modifications which are "staged" can be included into an operation of saving
- The command git add includes the new modifications to exiting files/new files into the staging area, to be included into the next operation of "saving"

Terminology: commit

- It is the operation of “saving”
- The command git commit executes the operation
- It is a good attitude to include a meaningful comment to each commit, in case you need to go back to previous status (which status?!)
- git commit -m “Insert here the message”

Terminology: repository (local, remote)

- It is used to identify the final destination of the new development



Terminology: branch /1

- In the jargon of development normally considered a deviation of the development from the main trunk
- A branches are a fundamental component of Git
- During an on-going development you are always working on a branch
- At the beginning two branches are available
  - master (the local repository)
  - origin/master (local copy of the remote repository when last imported/cloned)

Terminology: branch /2

- The command git branch -a logs the available local branches
- In Git every new development "session" should be made on a new branch
- Git allows to handle number of branches in parallel and easily switch among them
- the command git checkout *branchname* is used to move from the current branch to branch *branchname*

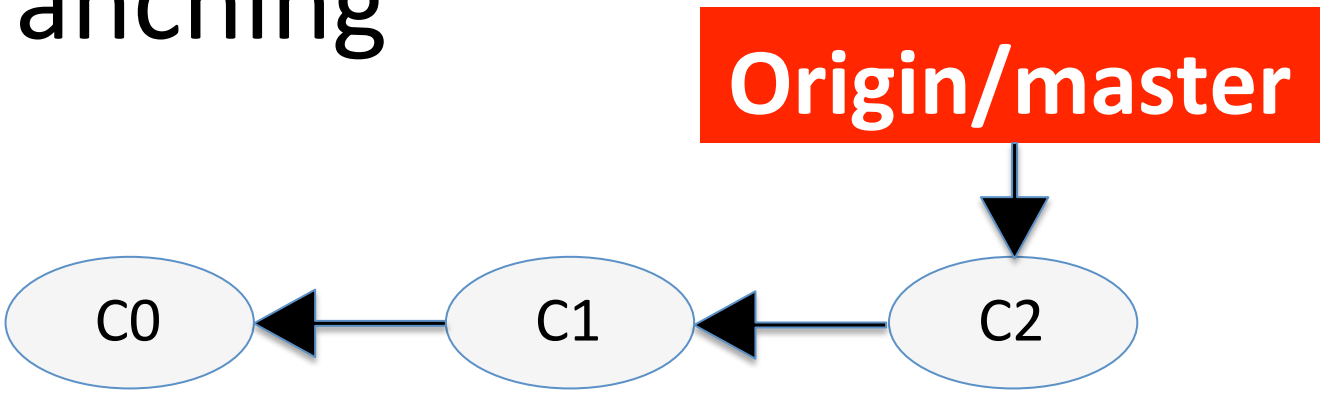
Terminology: branch /3

- the command git checkout -b *branchname* is used to move on a new branch named *branchname* (copy of the source branch)
- Once the session is terminated the new branch is merged into the master/ref. branch
- The command git merge *branchname* merge *branchname* into the current branch (here conflicts are automatically or manually resolved)

Terminology: pull/push

- Are the operation between the local and the remote repositories
- The command git push is used to send the new development included into the local repository to the remote repository
- The command git pull is used to retrieve the new development included in the remote repository, into the local repository (here conflicts are automatically or manually resolved)

Basic Branching



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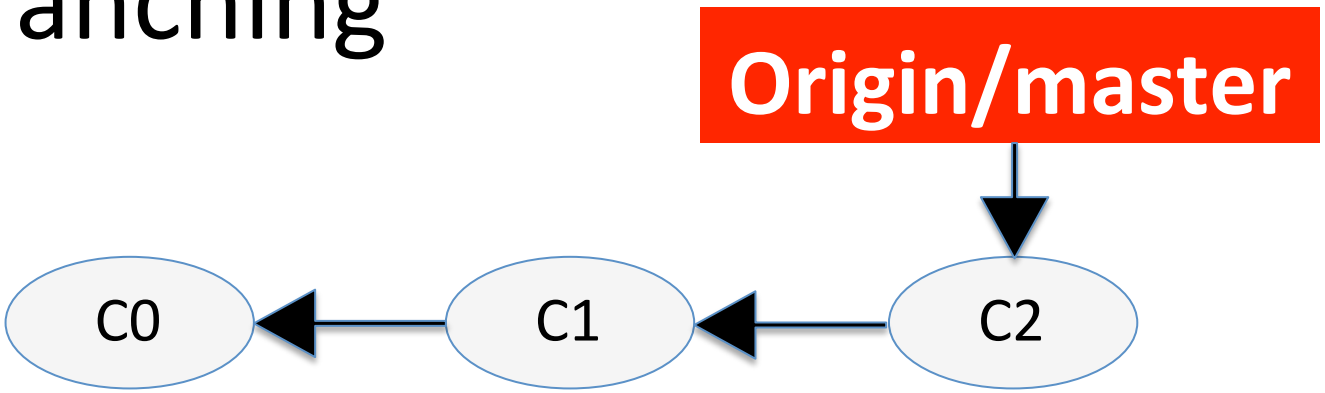
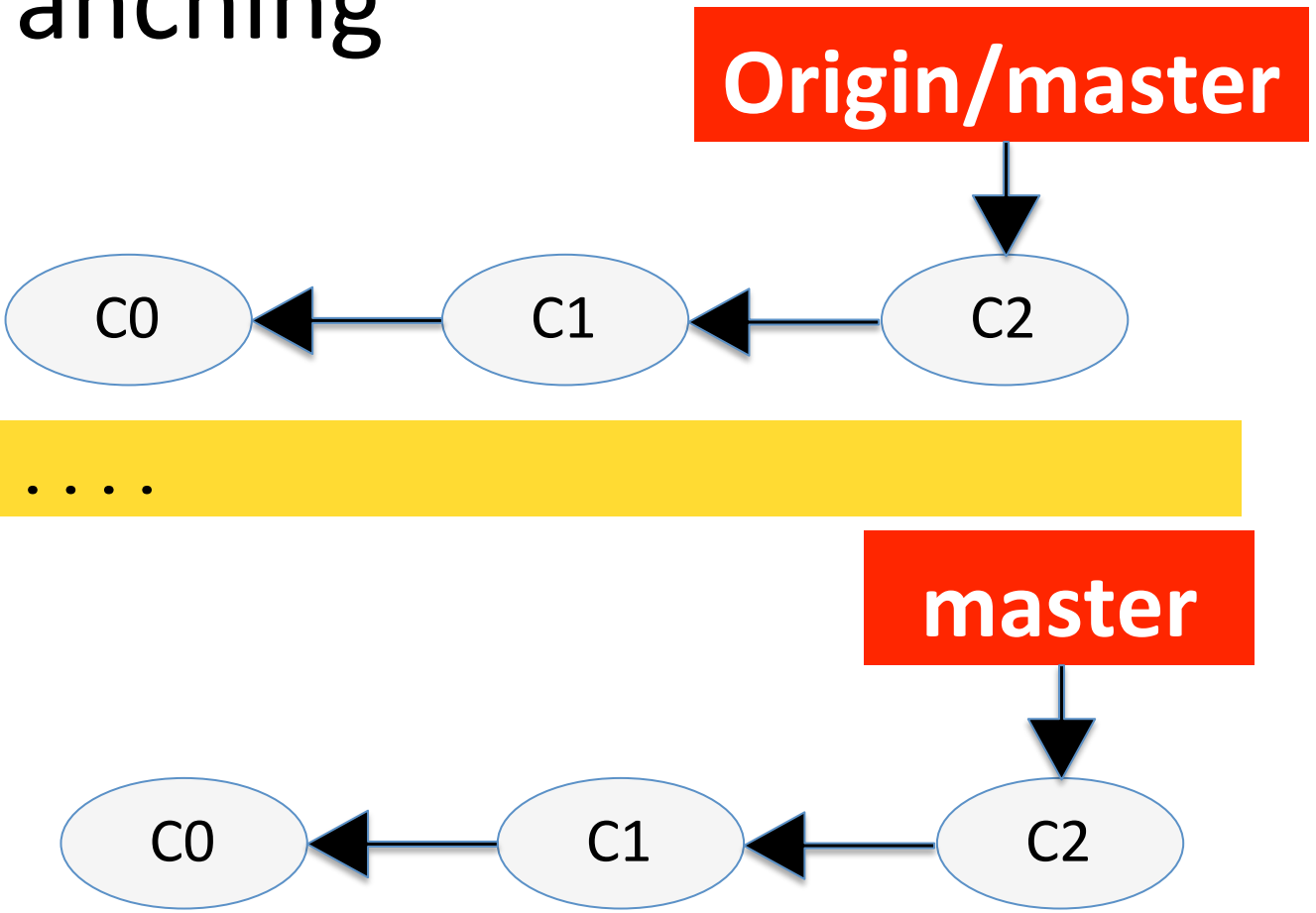



```
$git clone ....
```

Basic Branching



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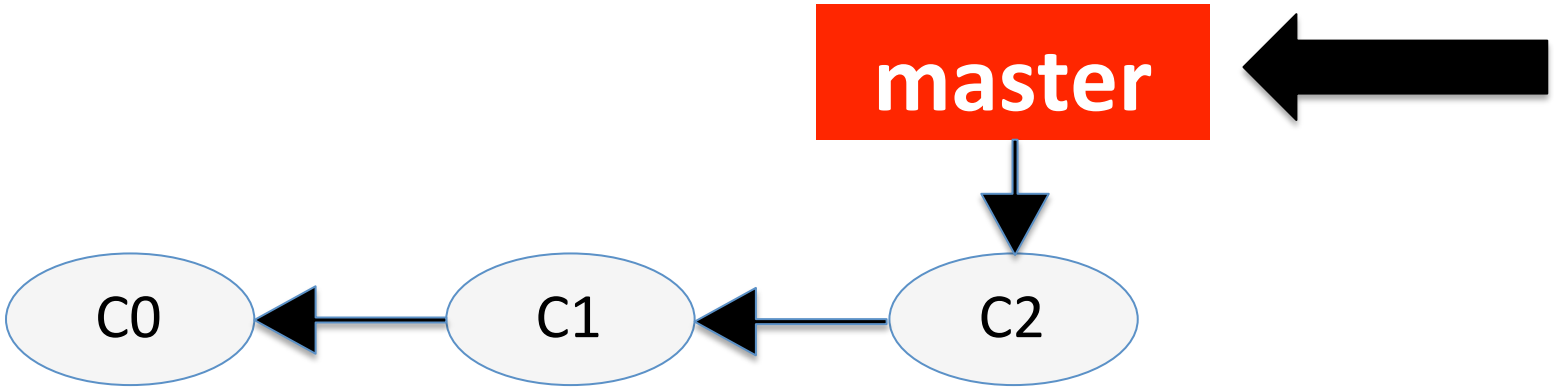

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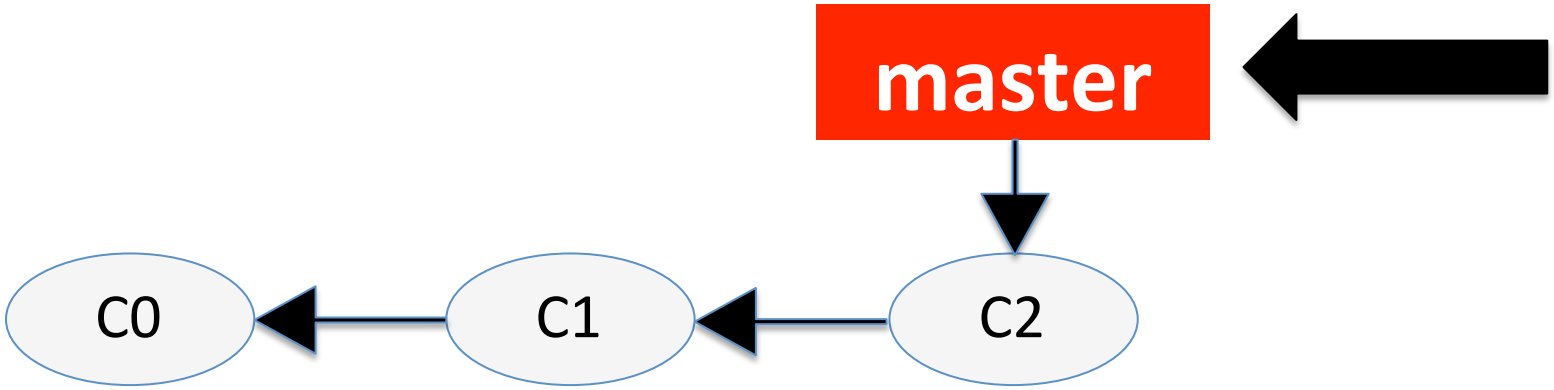
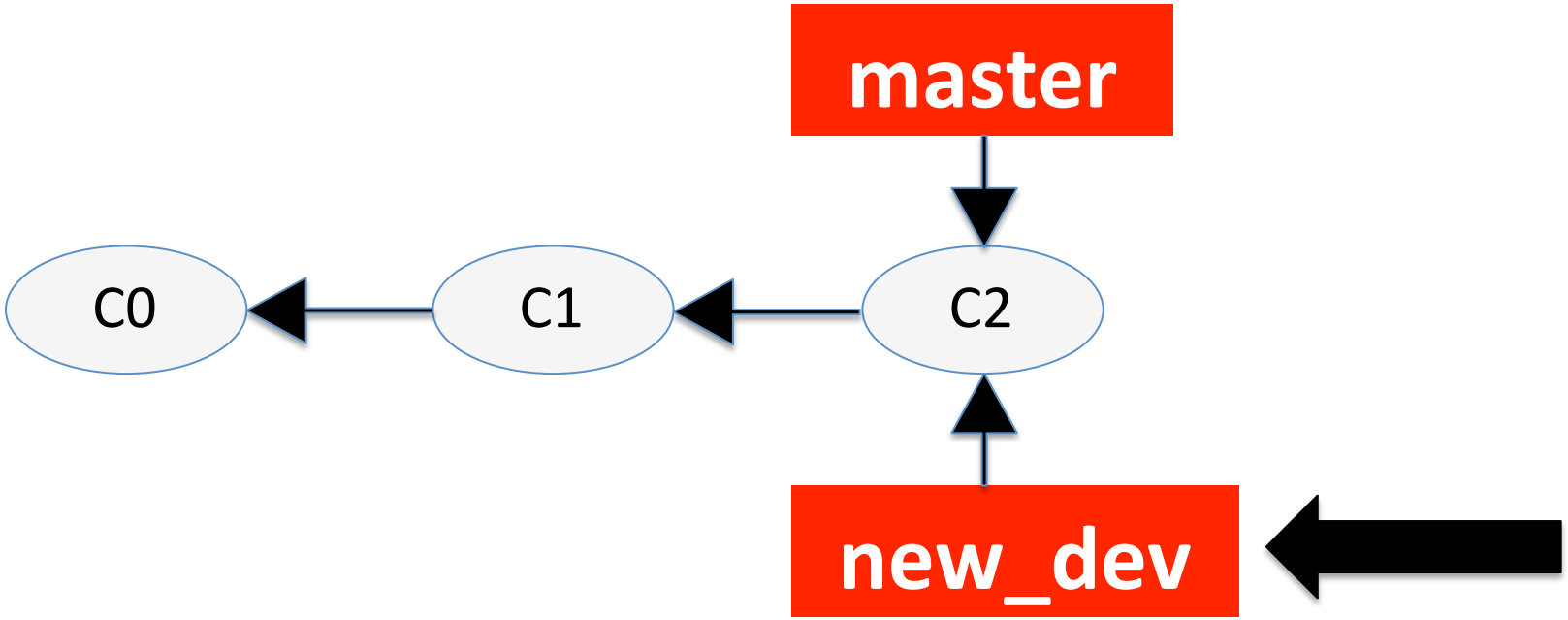



```
$git checkout -b new_dev
switched to a new branch "new_dev"
```

Basic Branching

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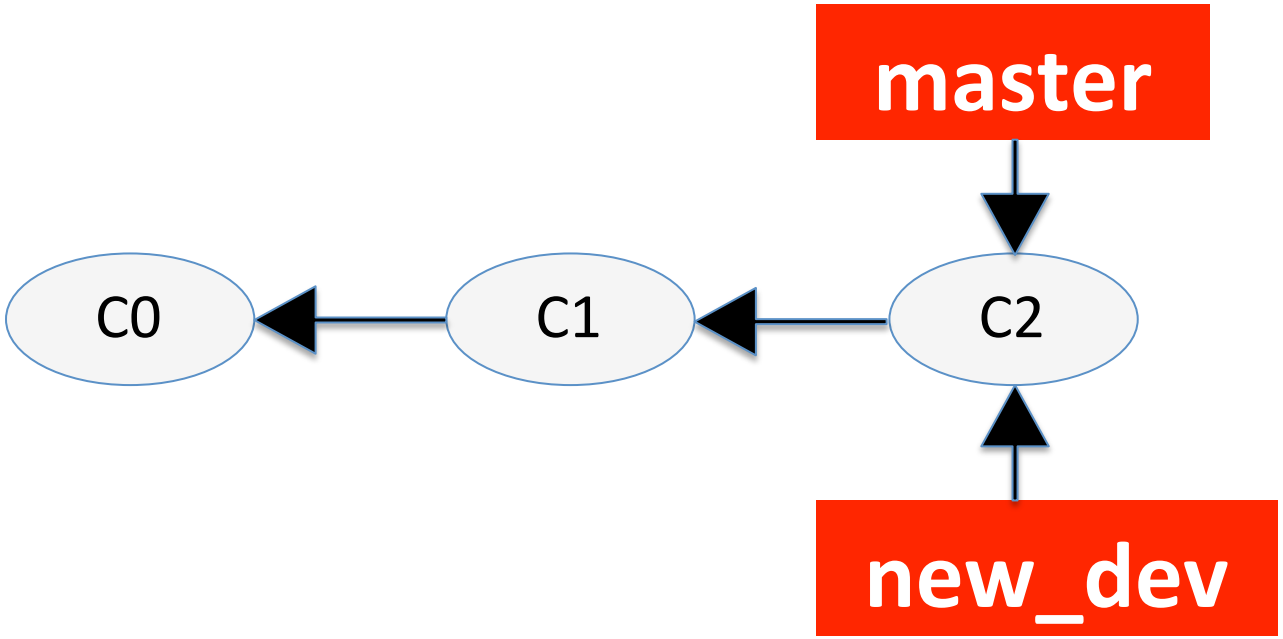
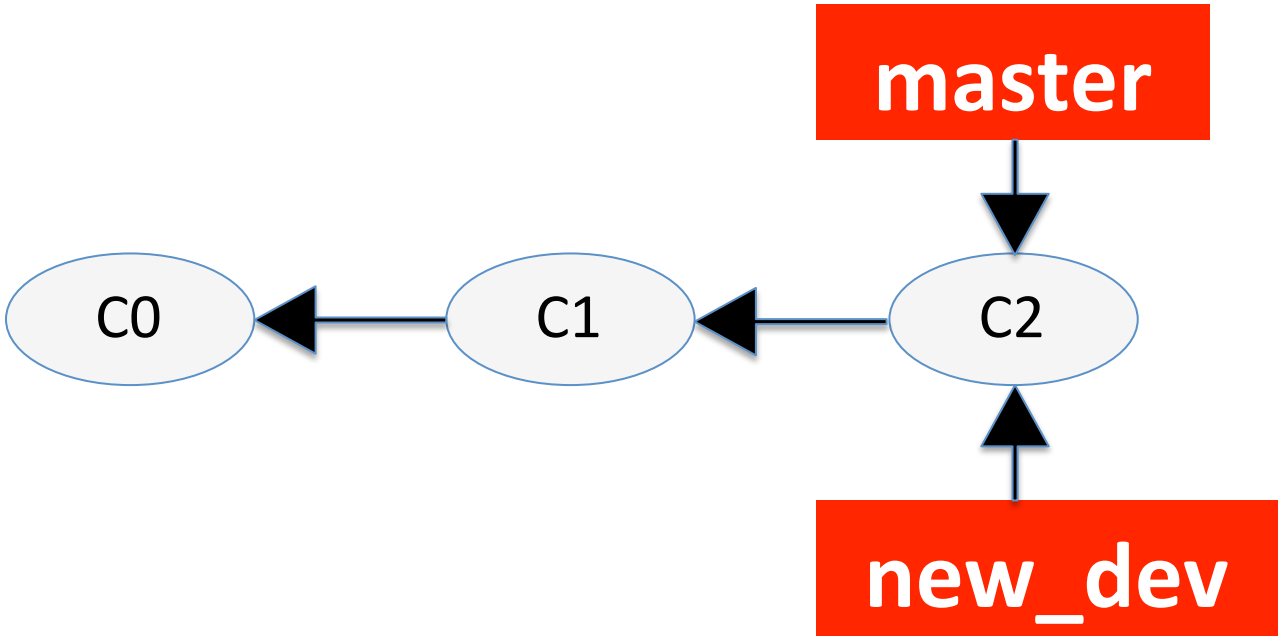
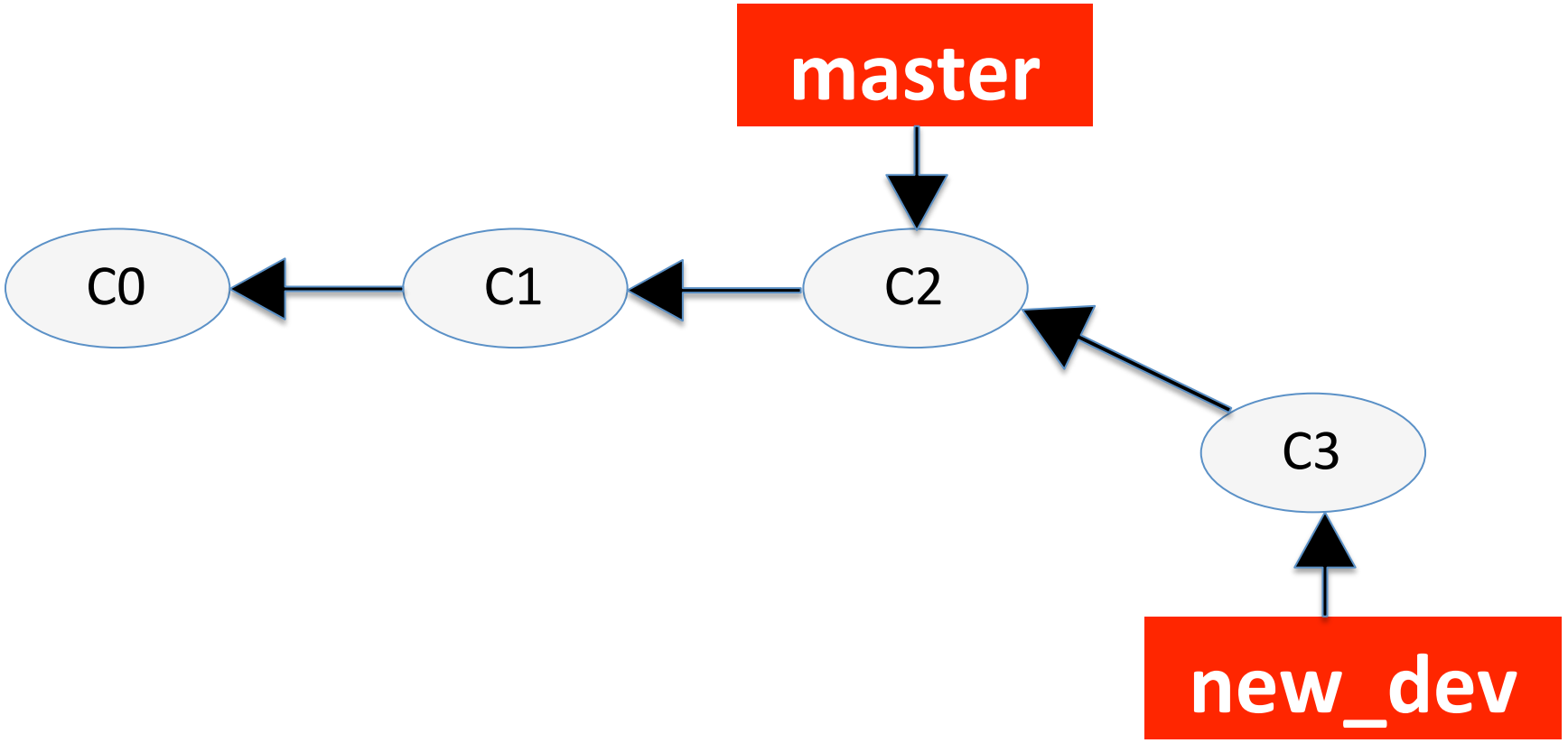


Basic Branching



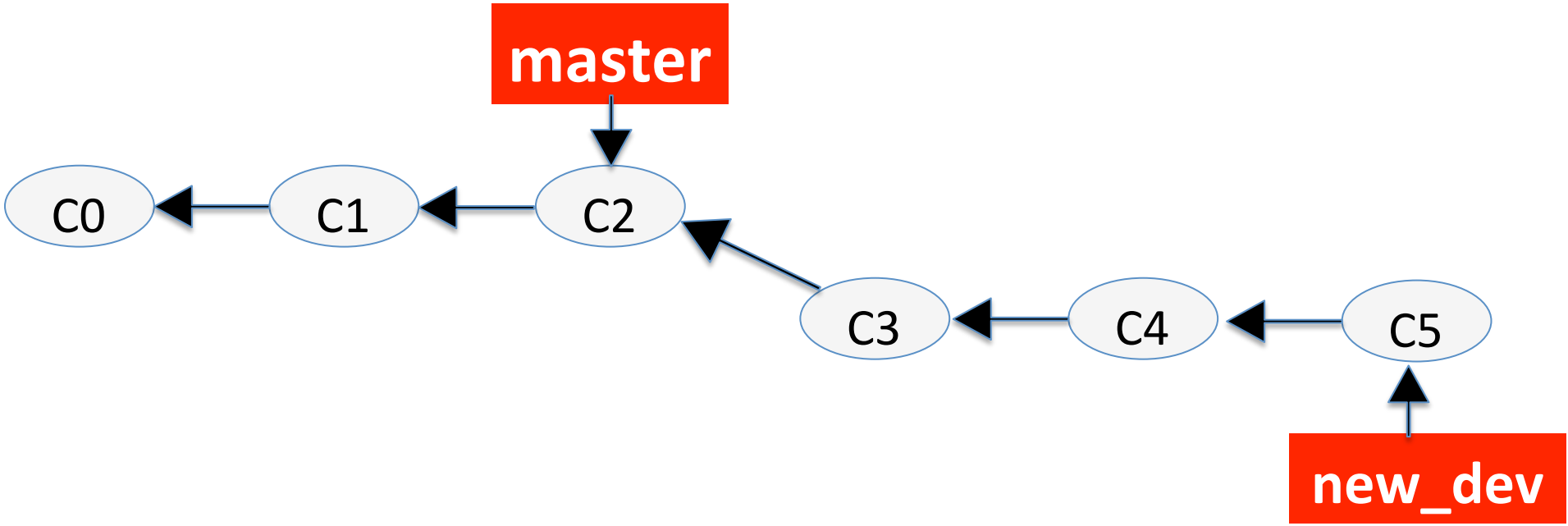

```
$git commit -m "new development"
```

Basic Branching

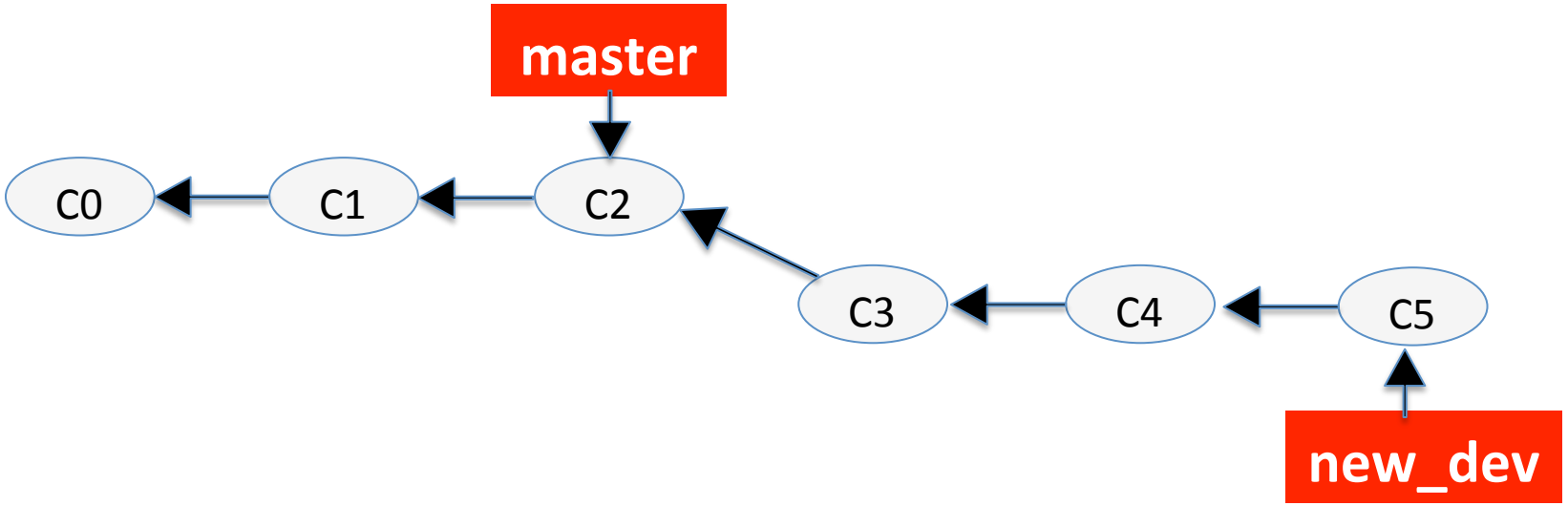


Basic Branching

After two more commits ...

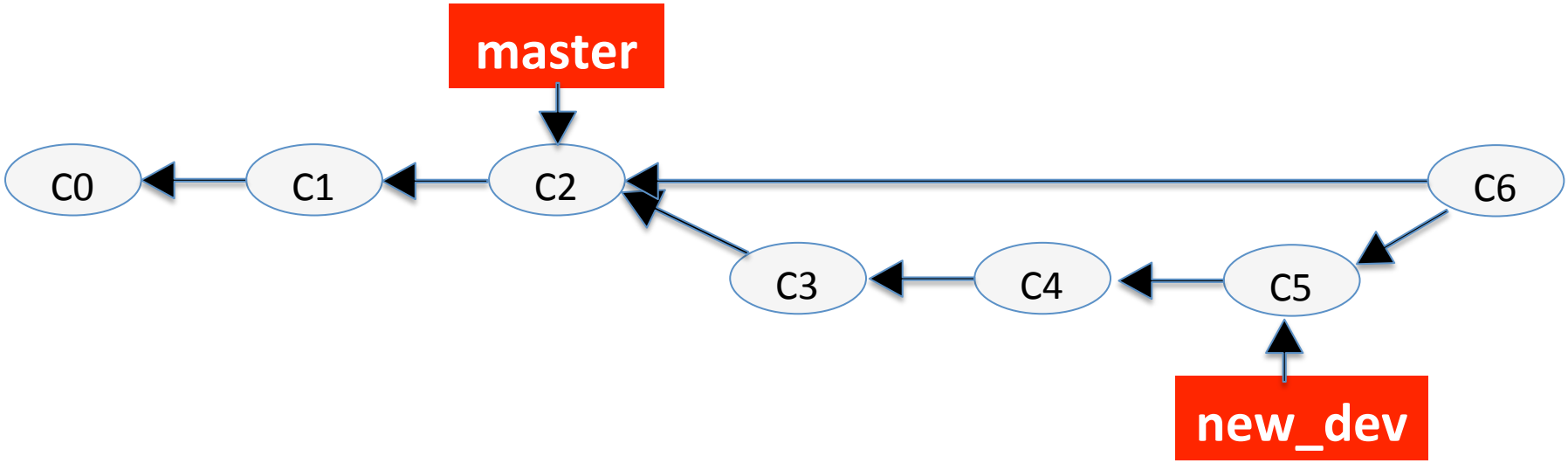


Basic Merging



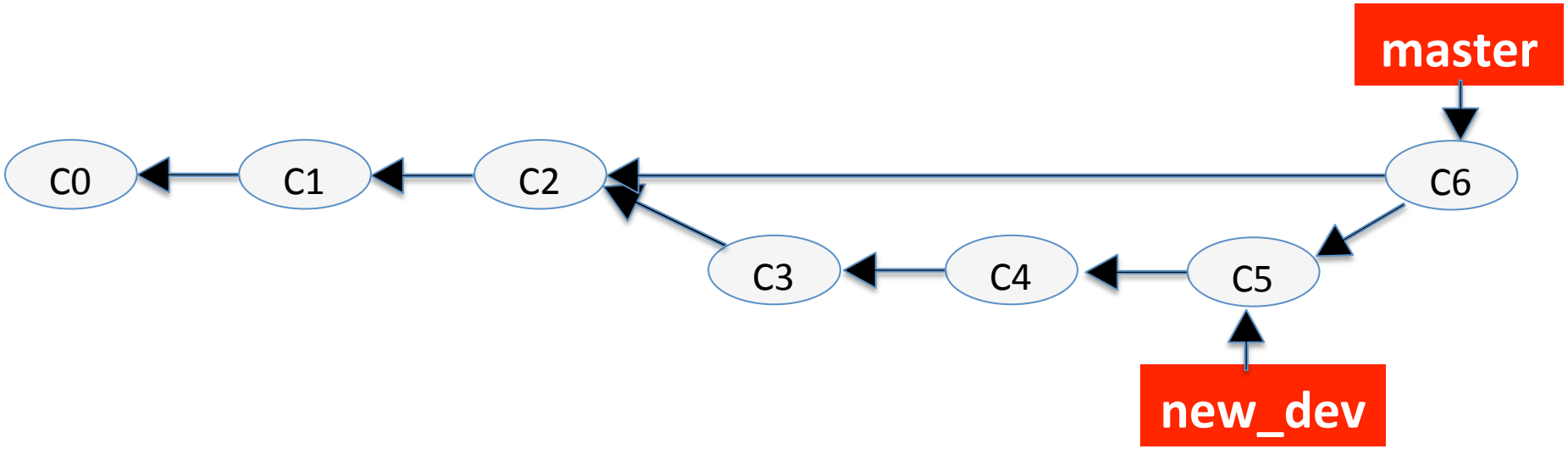

```
$git checkout master
```

Basic Merging




```
$git merge new_dev
```

Basic Merging



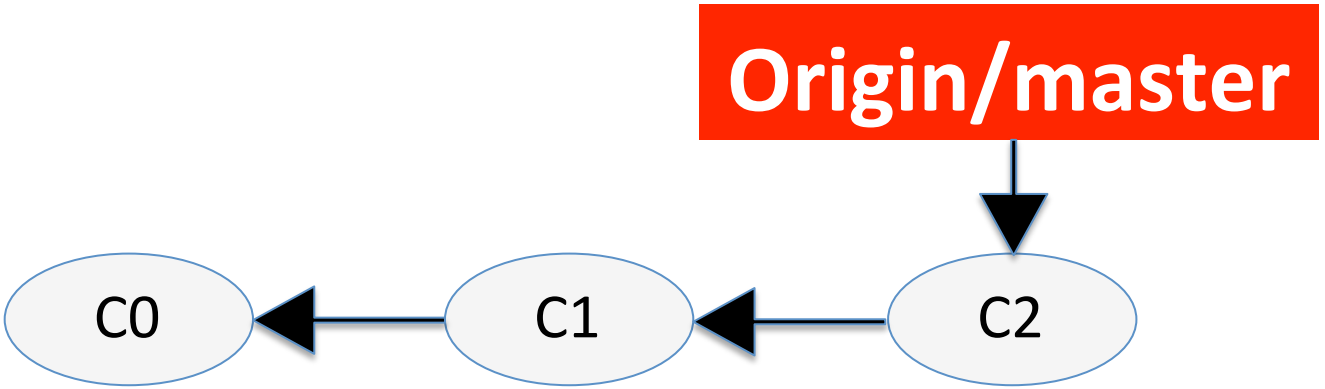

```
$git merge new_dev
$git branch -d new_dev
```

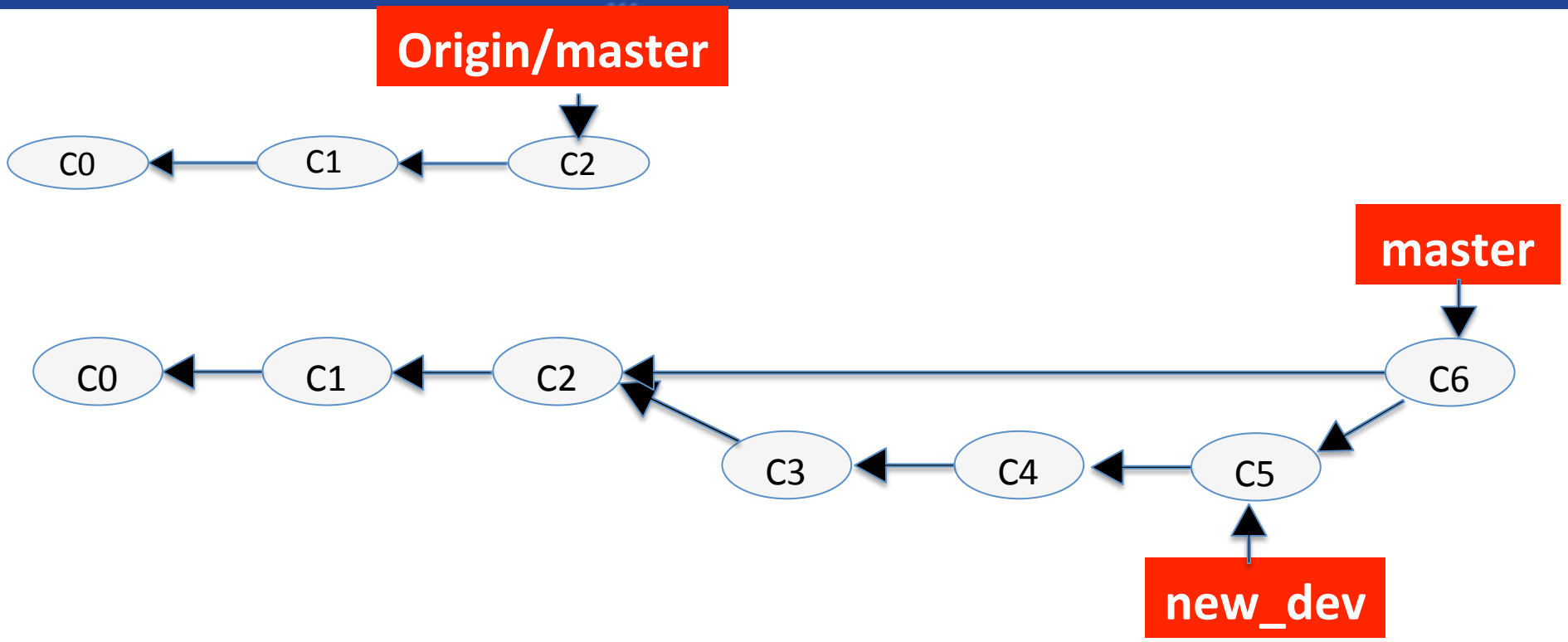
Push the new development

- The new development should be now pushed to the remote repository (if write permission)
- git push origin master execute the operation
- The remote repository is meant to be the server where the origin/master branch is stored (Github, Gitlab, etc...)

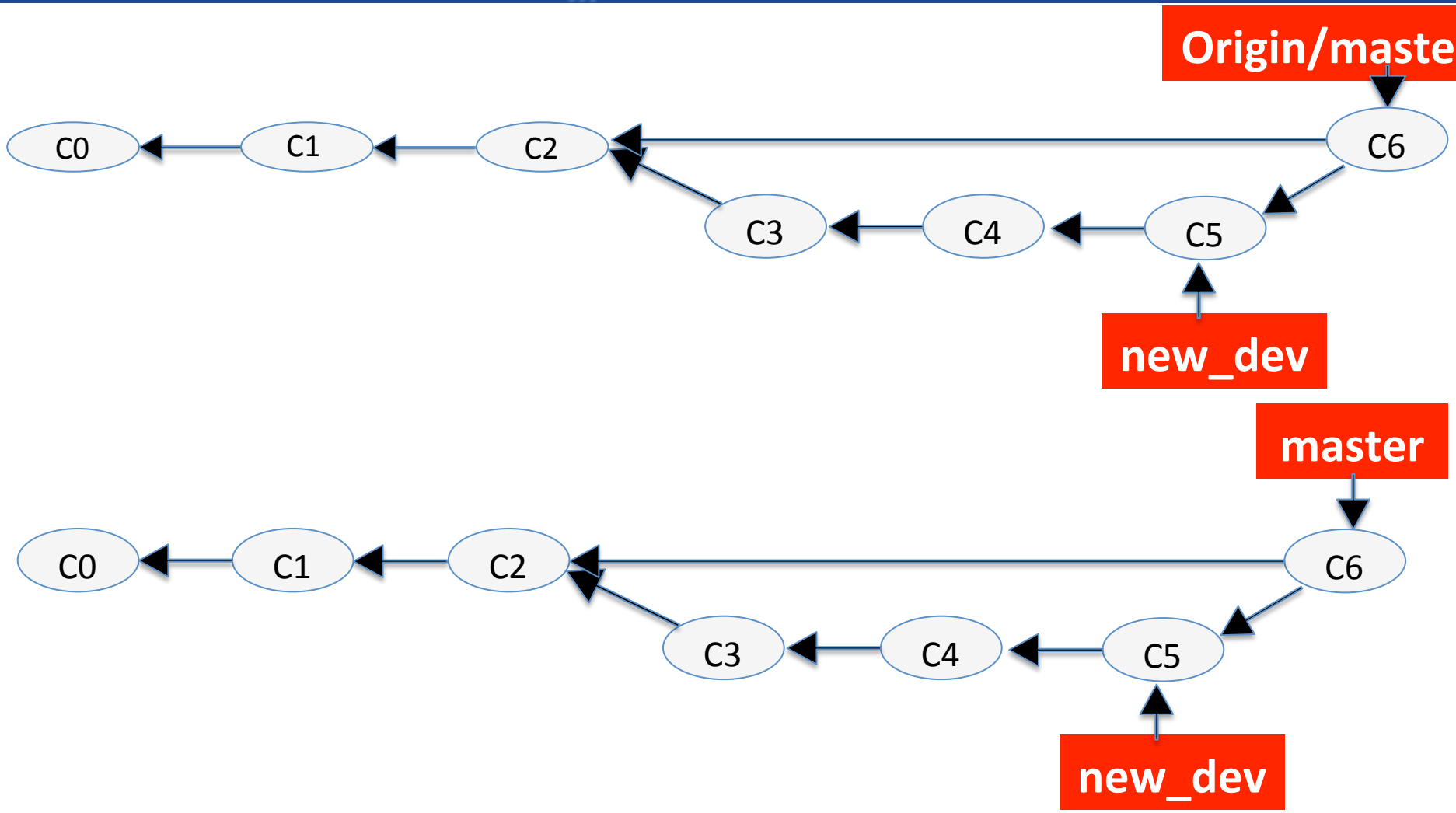
Two cases here...

1. The remote repository is still in his initial status (lucky)



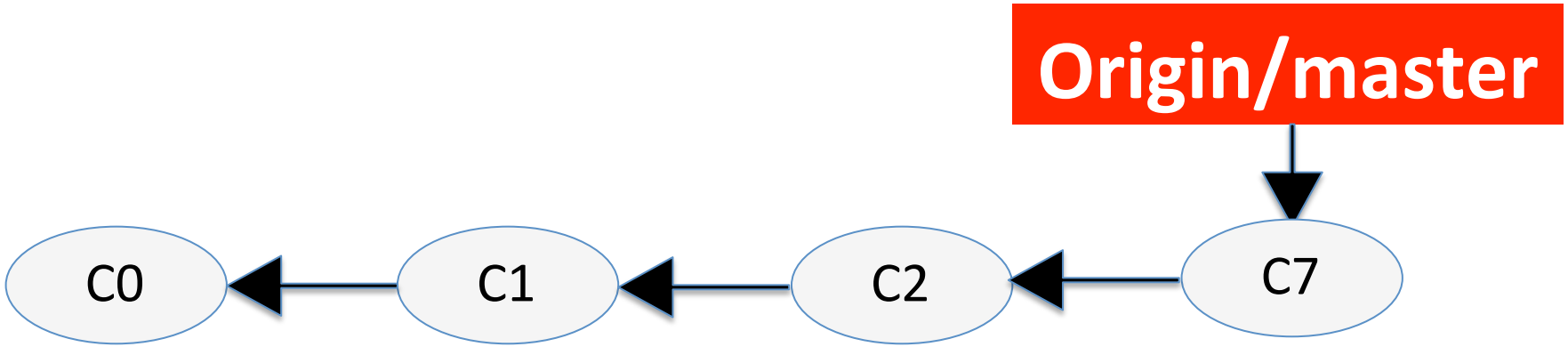


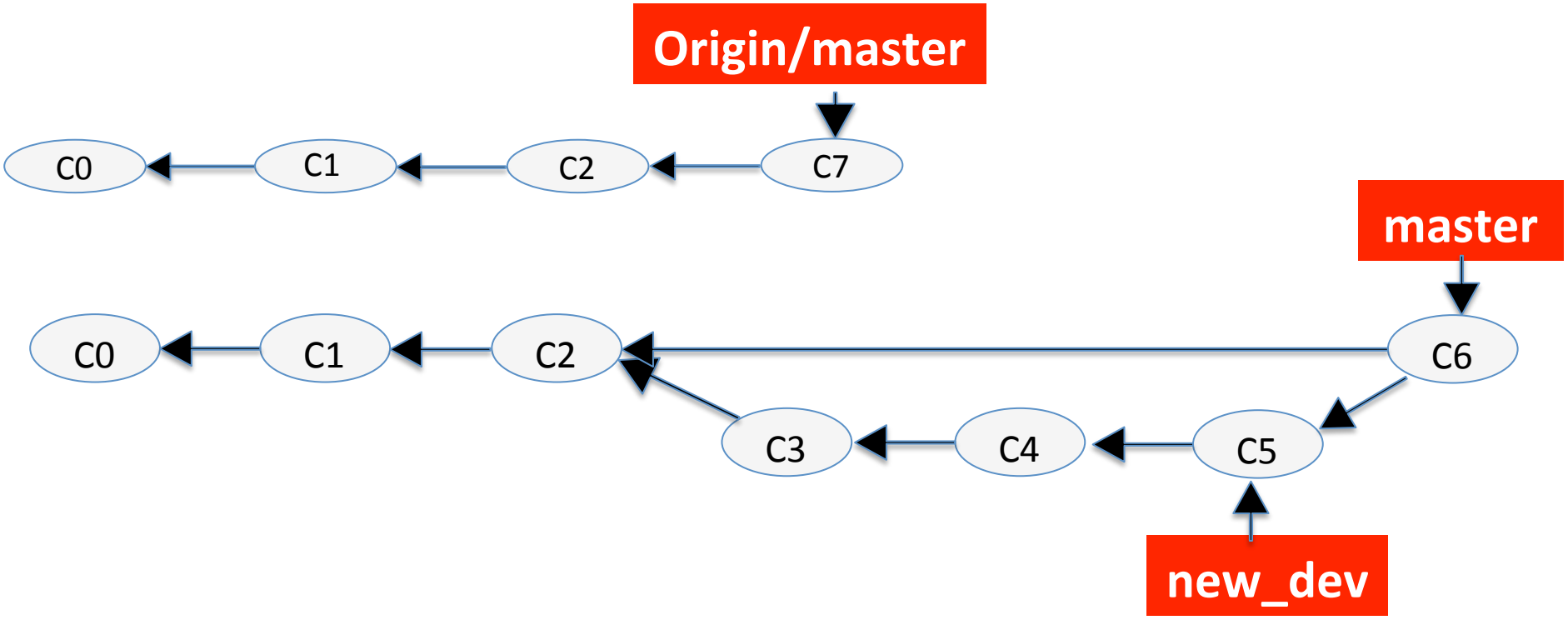

```
$git push origin master
```


Origin/master
C0
C1
C2
C3
C4
C5
C6
new_dev
master
C0
C1
C2
C3
C4
C5
C6
new_dev

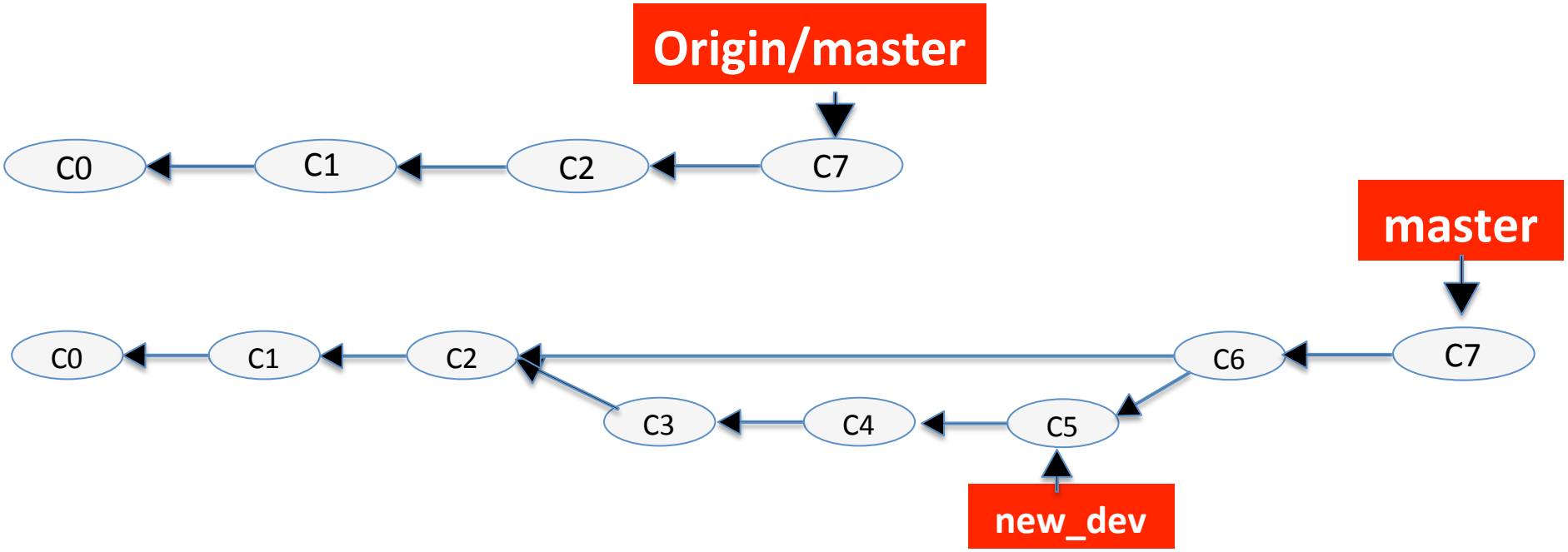
Two cases here...

2. The remote repository is changed (likely when collaborating with others). This is what you will be frequently experimenting on next week






```
$git pull
```

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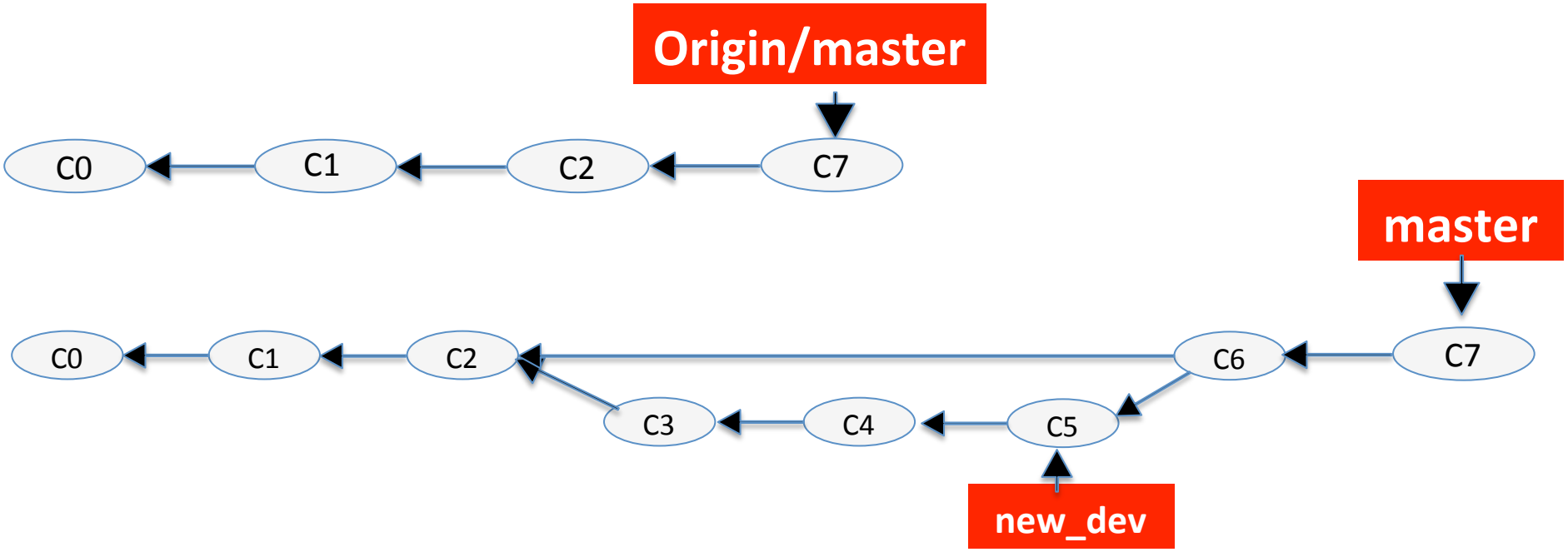


```
$git push
```

Pull the new development

- The new remote development should be pulled to your local repository before you can safely push on the remote repository
- git pull execute the operation
- If conflicts are solved you local repository is now aligned with the remote repository you share with other users. Is now safe to push on it!