CCPP Training
College Park, MD, March 12-13, 2019

Using GitHub with CCPP

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Global Model Test Bed

Using GitHub with CCPP

- Overview (brief!) of git and GitHub
- Overview of GitHub workflow
- Code repositories and how to get the code

git: distributed version control systems

- This presentation (slides, and recorded video) has a nice history and background of VCS systems!

https://www2.cisl.ucar.edu/user-support/training/library/using-git-centralized-and-distributed-version-control-workflows

- All developers have a local copy of the entire project
- Everyone can work at their own pace and merge with the authoritative repository when convenient
- There are many web-based git repository hosts available:
  - GitHub.com
  - Vlab.ncep.noaa.gov
  - Bitbucket.org

GitHub features

- Organizations and individuals can manage and host repositories
- Public and private repositories
- Many add-on software engineering tools available
- NCAR provides a GitHub organizational space
  - Public and private repositories
  - NOAA-EMC, NOAA-GFDL, others also
- Individuals can create repositories
  - Free accounts can only create public repos
- Individual accounts can fork private repositories (to which they have access) and those retain the private status
- These features support a "forking" workflow

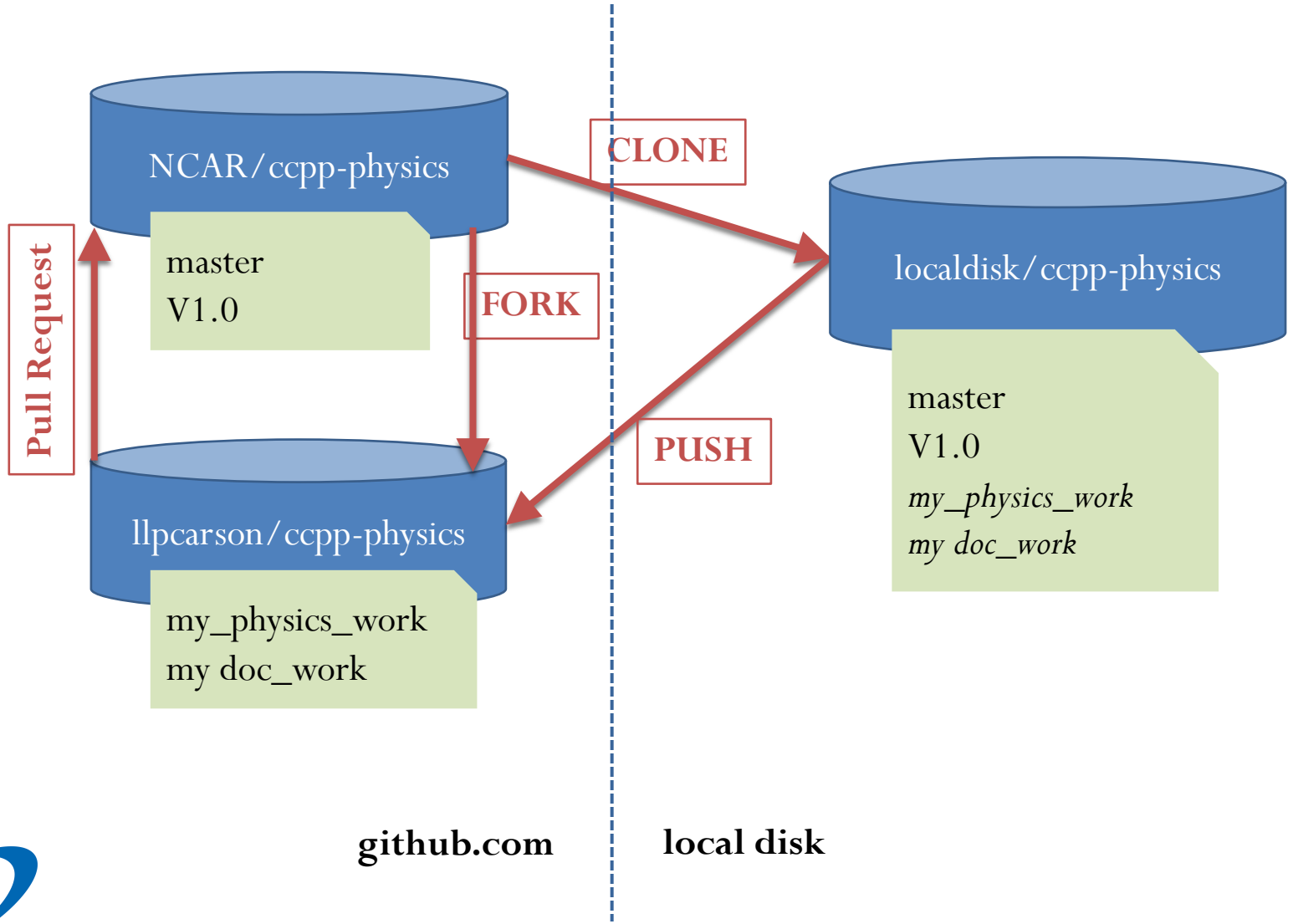
GitHub forking workflow

- CCPP is currently using a git forking workflow for the various code repositories
  - The GitHub forking workflow relies on forks (personal copies) of the shared repositories on GitHub.
  - These forks need to be created only once, and only for repositories that users will contribute changes to.
  - The use of forks and PRs (pull requests) are slightly different than the Vlab workflow – but many of the concepts are similar.
- Additional resources:
  - https://www.atlassian.com/git/tutorials/comparing-workflows/forking-workflow
  - https://guides.github.com/activities/forking/

GitHub forking workflow

Basic steps

1. Clone the authoritative repository locally
2. Create a local branch, add development, complete testing
    1. First time only: create your personal fork
3. Push local branch to your personal fork
4. Open a PR (pull request) to request a code review and merge with the authoritative repository


NCAR/ccpp-physics
master
V1.0
CLONE
FORK
Pull Request
PUSH
localdisk/ccpp-physics
master
V1.0
my_physics_work
my doc_work
llpcarson/ccpp-physics
my_physics_work
my doc_work
github.com
local disk

1. Clone the authoritative repository locally

- Clone a working copy of the authoritative repository on disk: NEMSfv3gfs
  - This command creates a local cloned repository, checks out the branch named gmtb/ccpp, and recursively checks out the related submodules

% **git clone –recursive -b gmtb/ccpp https://github.com/NCAR/NEMSfv3gfs**

- RENAME the git remote from "origin" to "upstream"

% git remote rename origin upstream

1.A git submodules

- Submodules are a mechanism in git repositories to provide a link or connection to another repository
- Submodules are configured using the ”git submodule” command, i.e.
  - git submodule init
  - git submodule update
  - git submodule add
- The linked repositories are listed in .gitmodules

```
[submodule "FV3"]
        path = FV3
        url = https://github.com/NCAR/FV3
[submodule "NEMS"]
        path = NEMS
        url = https://github.com/NCAR/NEMS
```

- Submodule repositories can also have submodules (recursive!)
- git subtrees are different ☺

1.B github authentication

- For private repositories, github.com will ask for authentication (username and password) to access the repository
- You may optionally configure SSH keys
  - From the upper-right user icon, select "settings"*
  - Select "SSH and PGP keys"
  - Follow the instructions here:

https://help.github.com/en/articles/connecting-to-github-with-ssh

*There are many other useful settings here, including notifications, look around!

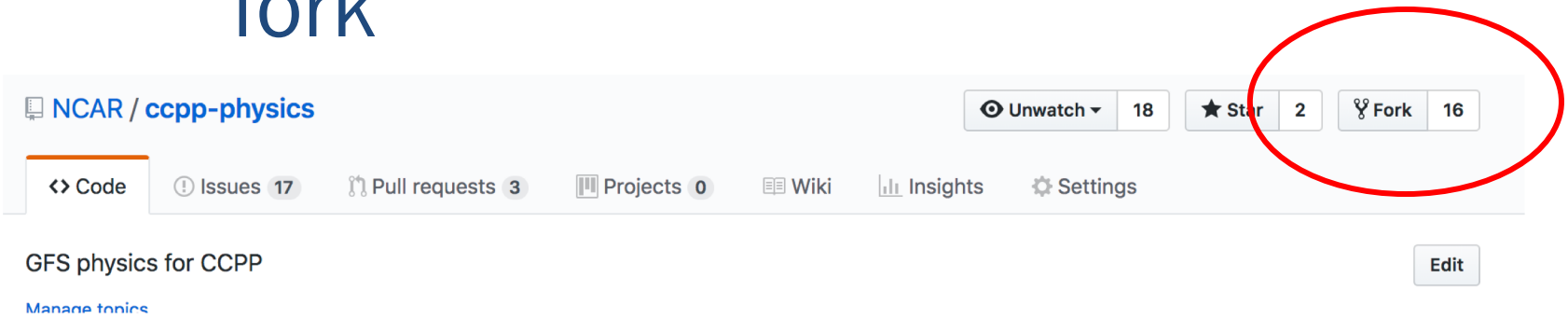
2. Create a local branch, add development, complete testing

% **git checkout -b my_physics_work**

- The "-b" makes a new branch for you. It will be a copy of the branch you are currently viewing (gmtb/ccpp)

- Use the usual git commands to add and commit

3. Push local branch to your personal fork



- Create a personal fork if you have not already done so!
- In your local repository on your local disk, add a remote called "origin" pointing to your local fork, and update (to check that the remote is configured correctly)

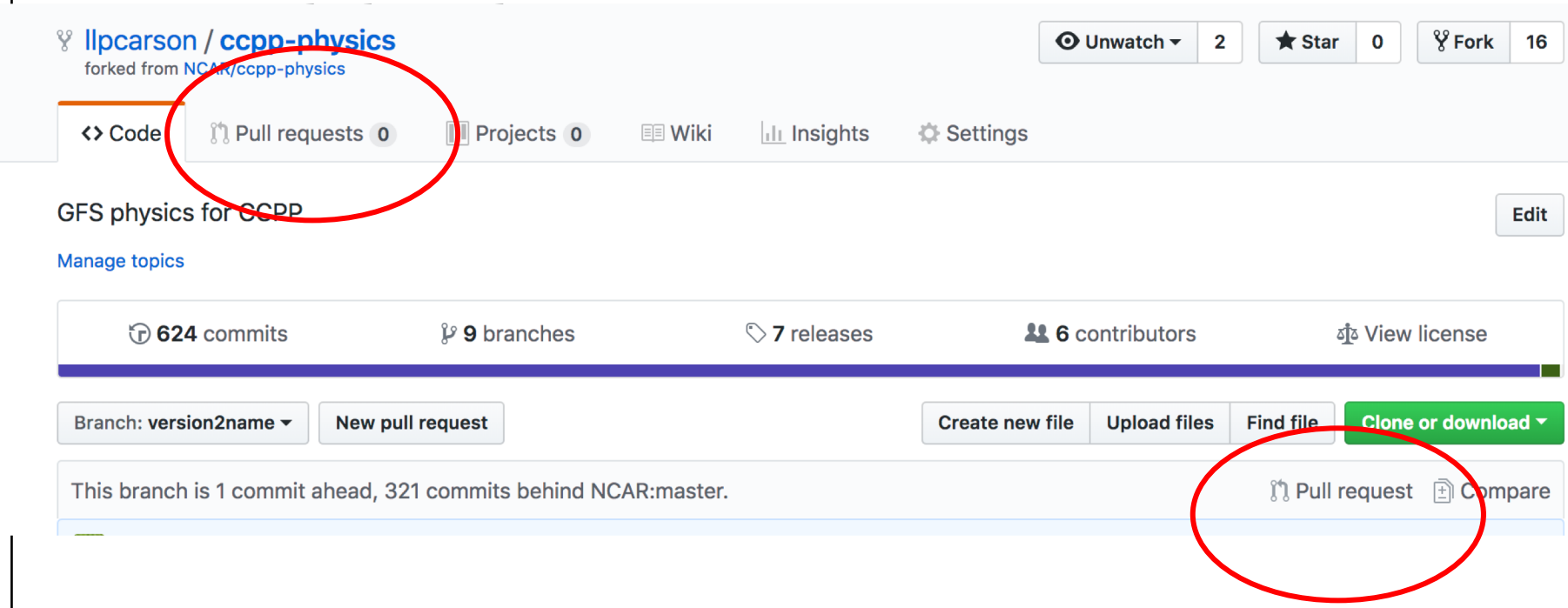
- **% git remote add origin https://github.com/YOUR_GITHUB_USER/ccpp-physics**
- **% git remote update**

- Then, push your local branch to your fork:

  % git push origin my_physics_work[:my_physics_work]

4. Open a PR (pull request)

- Open a PR (pull request) to request a code review and merge

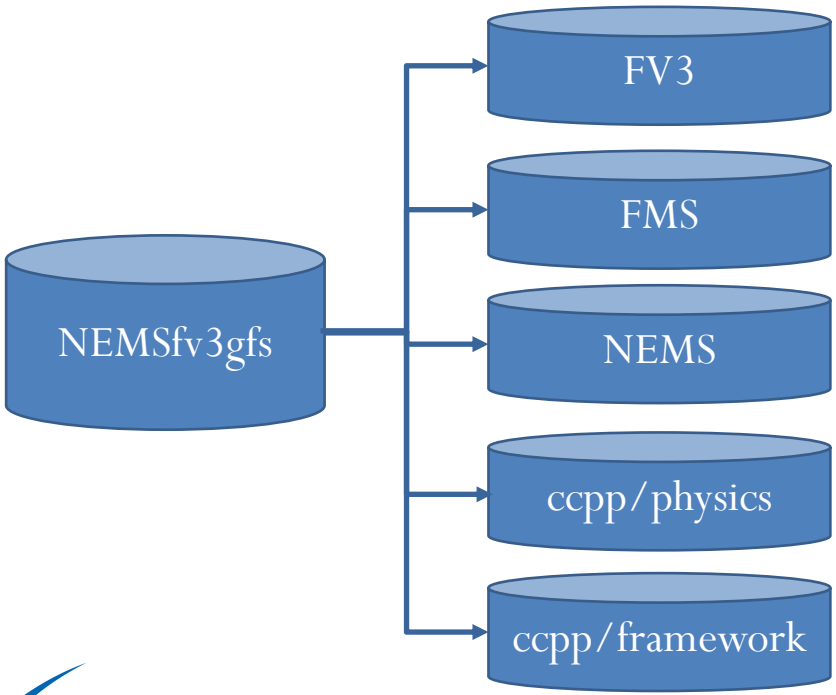


A Pull Request is a GitHub-provided mechanism to request a code review, and merge changes into another branch or repository

NEMSfv3gfs and CCPP

Code repositories

- The repository structure for CCPP development in NEMSfv3gfs mirrors the Vlab repository structure, with the addition of the CCPP repositories



Repository (GMTB development version)	Branch name
https://github.com/NCAR/NEMSfv3gfs	**gmtb/ccpp**
https://github.com/NCAR/FV3	gmtb/ccpp
https://github.com/NCAR/ccpp-physics	master
https://github.com/NCAR/ccpp-framework	master
https://github.com/NCAR/NEMS	gmtb/ccpp
https://github.com/NCAR/FMS	GFS-FMS

How to get the code

- The authoritative repositories are located on github.com in the NCAR organizational space
  - Some repositories are private (NEMSfv3gfs, FV3, NEMS)
  - Some repositories are public (ccpp-physics, ccpp-framework, FMS)
  - Send a request to gmtb-help@ucar.edu to request access to the private repositories
- Clone a local copy of the repository to begin working, including submodules

```
git clone --recursive -b emc_training_march_2019  https://github.com/NCAR/NEMSfv3gfs
```

- Any Questions?
- Up next, how to compile, and what build options are available