
>>> network .toCode()
Collaborative Workflows
With Git and GitHub
Workshop

Introductions

To Network to Code and the Training Library

>>> Who is Network to Code?

Network Automation Solutions Provider

Founded in 2014, we help companies transform the way their networks are deployed, managed, and consumed using network automation and DevOps technologies.

A Diverse Team, with Deep Expertise

Engineers and developers in network automation, software and security, with leadership from vendors, integrators, and top tier consulting firms - all drive value to our clients.

Vendor Neutral Community

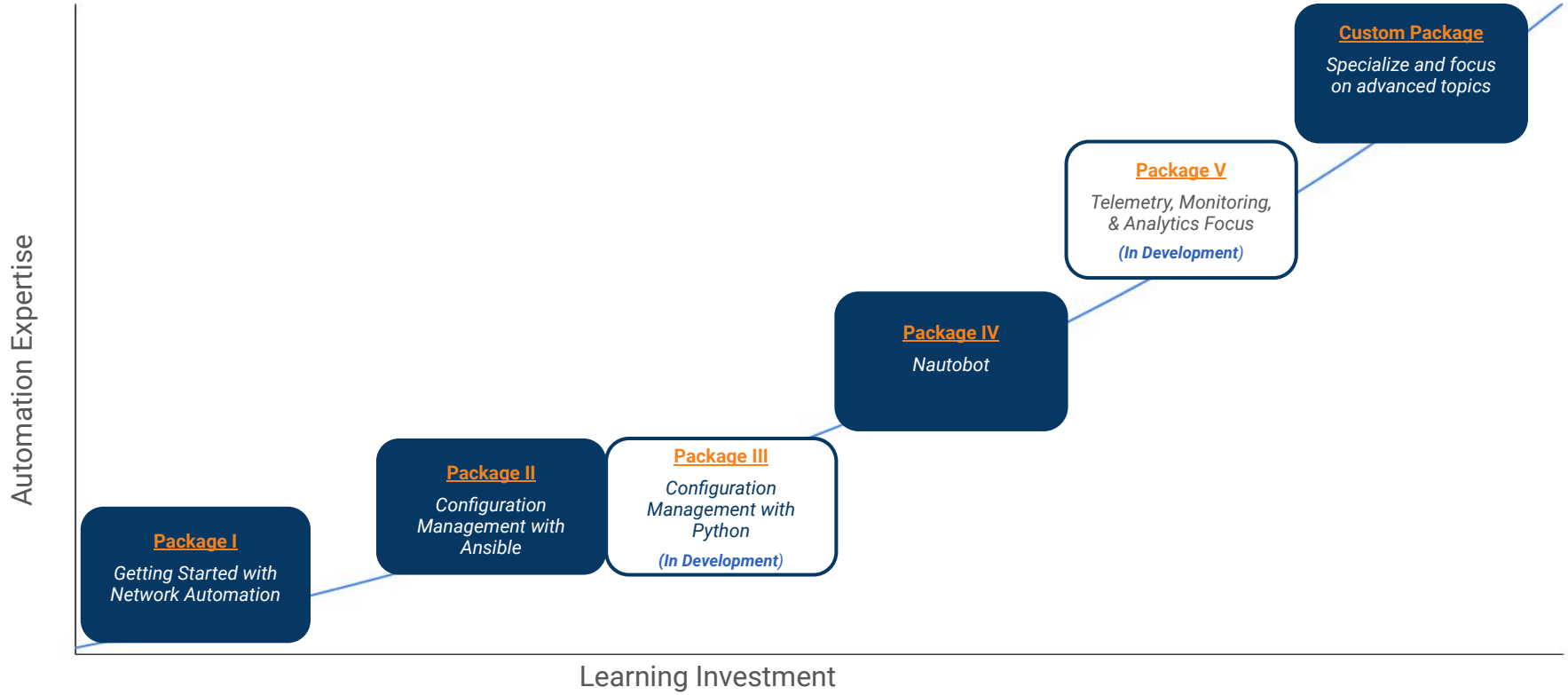
Partner with all OEMs, develop solutions with commercial and open source components. Host 19,000+ members and 300+ channels at slack.networktocode.com

Industry Recognized Thought Leaders

Working with clients across all industries and geographies, we promote a vendor and tool neutral approach, making automation a reality for any network.

>>> The Network Automation Journey: Enablement Packages

Pre-Built Packages from Start to Finish



>>> Instructor Introduction

Cristian Sîrbu

- Trainer and consultant with 17+ years of networking industry experience in a wide range of roles.
- Diverse technical background - coding, system administration, mobile telecoms, enterprise, operations, design.
- Developed and updated many of the courses and workshops in the current NTC training portfolio.
- CCIE #43453
- Cisco Certified DevNet Professional & DevNet 500
- Based in Dublin, Ireland.

>>> Housekeeping

Length & Time

Breaks

Course Evaluation: a feedback form link will be sent on the last day. Please take a few minutes to to fill this out - we value your feedback!

Agenda

- Introduction to Git & Version Control Systems
- Working with a Local Git Repo
  - Demo + Hands-on Labs
- Collaborating with GitHub
  - Demo + Hands-on Labs
- Time Travel with Git
  - Demo
- Collaborating on GitHub Repos with CI
  - Demo + Challenge Lab


Introduction to Git & Version Control Systems

Why Version Control?

- Collaboration
- Storing Versions
- Restoring Previous Versions
- Understanding What Happened

Tools: **Git** (most common), Subversion (SVN), Mercurial (HG), CVS, Fossil, Perforce

>>> Git Overview

- Command-line utility created by Linus Torvalds in 2005
- Original purpose was to support multiple collaborators working on Linux Kernel development
- Git is a **distributed** version control system
  - peer-to-peer interaction vs. client-to-server
  - version control = historical change tracking
- Intent
  - Provide version control (core functionality)
  - Foster better code collaboration
  - Reduce mistakes (bugs!)

>>> Git Use Cases - Network Automation

Network Engineers can use Git for version control and collaboration on:

- Network Device Configs
- Playbooks
- Scripts
- Variables Files
- Any file that would benefit from being version controlled!

>>> Git Use Cases

Developers use Git to:

- Work on different versions of code
- See the difference between two or more versions of code
- Review the history of code
- Store code in a shared repository
- Experiment with a new feature without interfering with working code

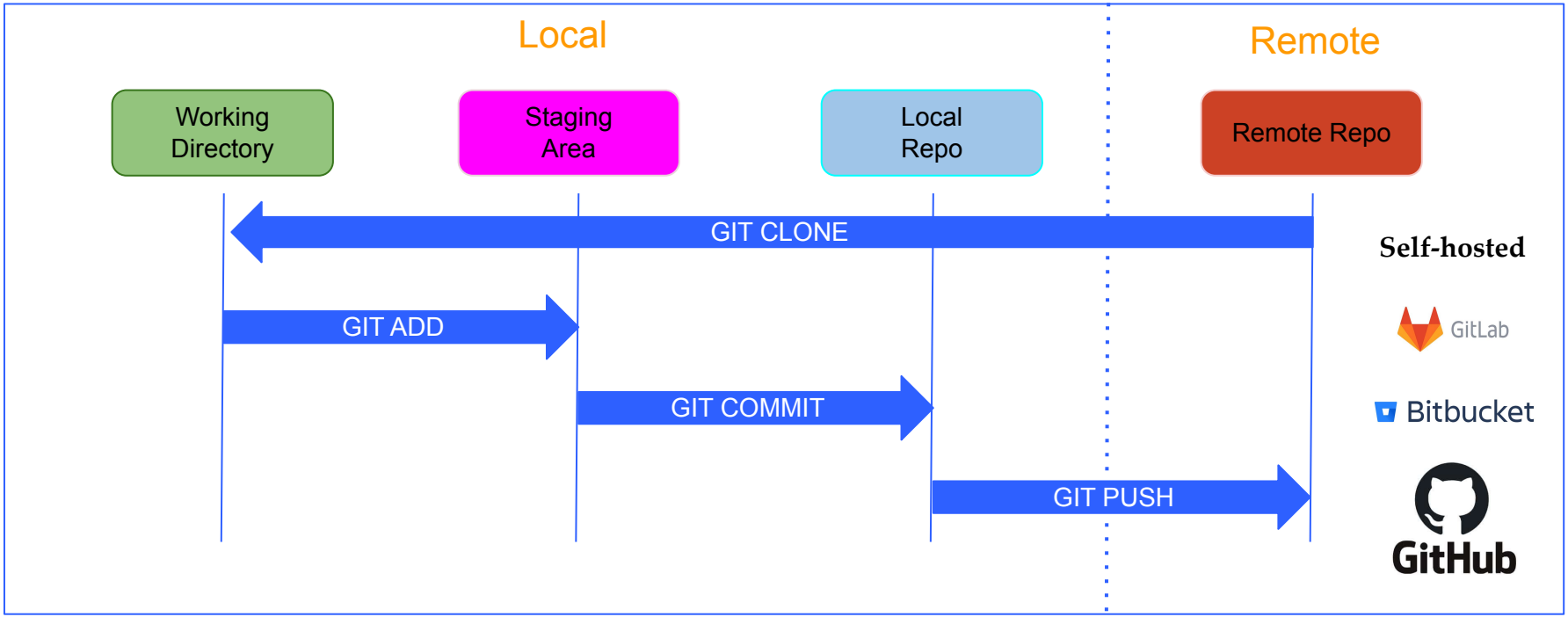
>>> Collaborative Platforms

Cloud-based or private on-premises storage for your code.

Common features:

- Web UI
- Viewing code differences between versions
- Merging together code from different feature branches
- Code review capabilities
- Notifications, Discussion Boards
- Support multiple version control systems
- Issue and Project tracking

Git Architecture



Agenda

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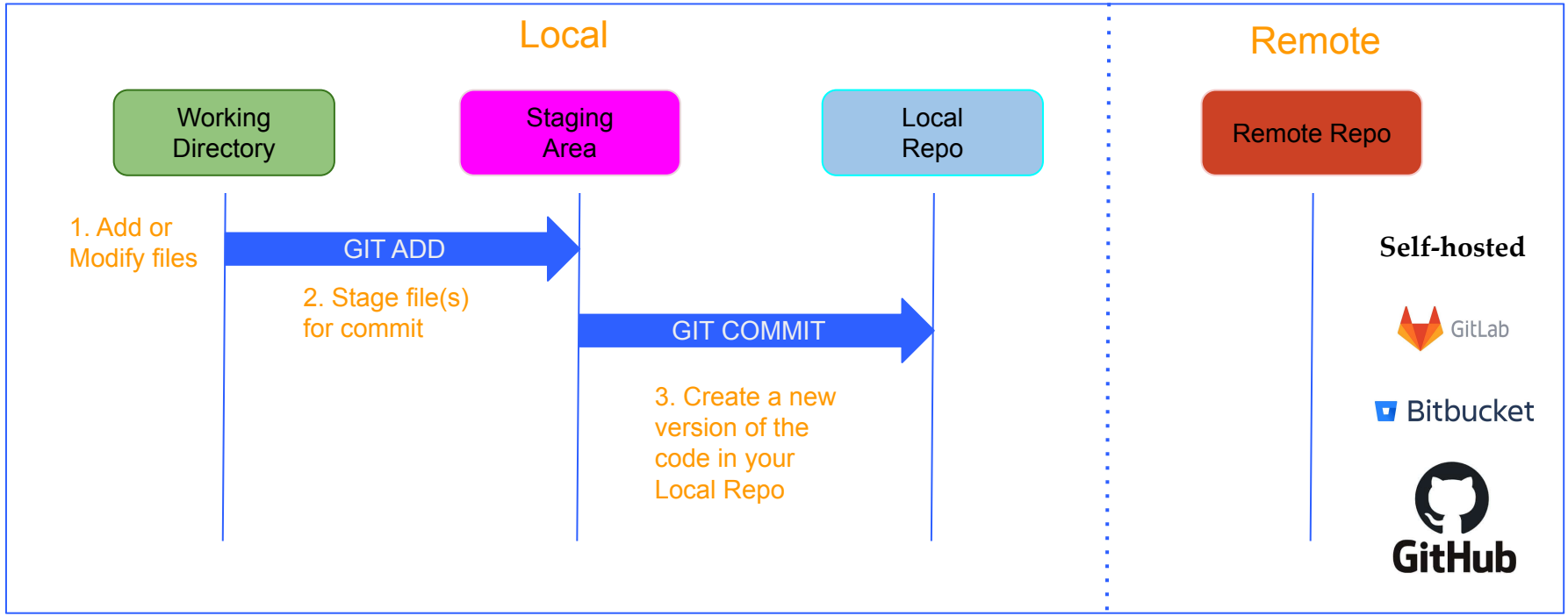
Git Workflow Overview



>>> Use Cases

- Add VLAN to a config file that is versioned in a Git repository
- Update YAML files
- Update Ansible playbooks
- Update scripts
- And more!

>>> Quiz Question

What is in the `.git` file?

What is in the `.git` file?

Trick question as .git is a directory, not a file. It contains the repository content in multiple subdirectories and individual files.

>>> Initialize (Create) a Project

Create a local directory and initialize the repo:

```
$ mkdir git-demo
$ cd git-demo
$ git init
Initialized empty Git repository in /Users/ntc/git-demo/.git/
```

>>> Initialize (Create) a Project

```
git init vlan-configs # Sample git repo name
```

Git init - Creates an empty Git repository or re-initializes an existing one

```
# Creates (if necessary) a repository-named directory
that contains a new .git subdirectory
ls -al vlan-configs # shows ., .., & .git directories
# Changing to vlan-configs may show the git prompt
cd vlan-configs
vlan-configs (master #)
# This branch can be renamed to main
git branch -m main
vlan-configs (main #)
```

>>> Create / Modify Files

Create and modify files in the Working Directory.

```
$ cat vlan_config.txt

vlan 10
  name Management

vlan 20
  name Voice

vlan 30
  name Web
```


```
$ cat vlan_config.txt

vlan 10
  name Management

vlan 20
  name Voice

vlan 30
  name Web

vlan 40
  name App
```

>>> Quiz Question

What is likely the most commonly used git command?

What is likely the most commonly used git command?

`git status` is a read-only command so it is safe to use any time to help you learn your current situation.

>>> Git Status - use frequently!

Shows files that have been staged for commit as well as untracked files.

Untracked means the files have never been added to staging or committed.

```
$ git status
On branch main

No commits yet

Untracked files:
  (use "git add <file>..." to include in what will be committed)
    vlan_config.txt

nothing added to commit but untracked files present (use "git
add" to track)
```

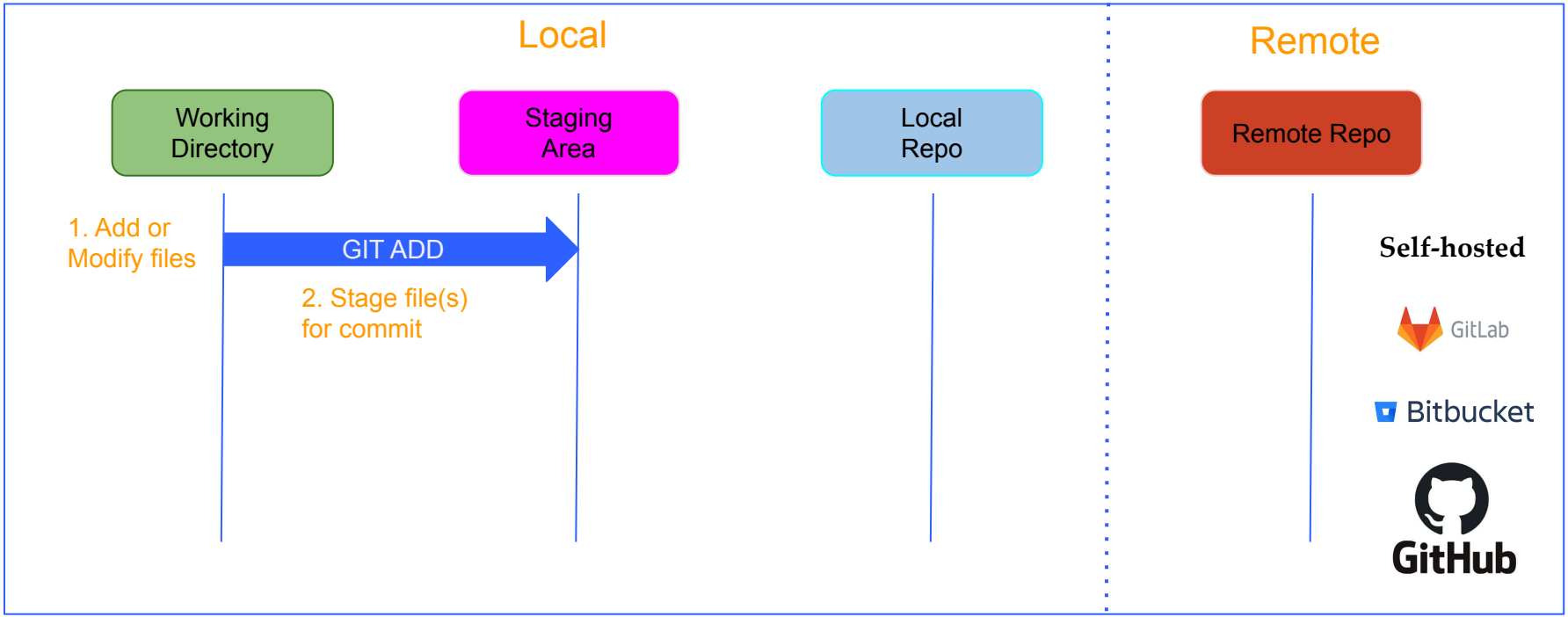
>>> Legacy branch naming convention

Originally the term used for the main branch was ‘master’.

The GitHub default changed to ‘main’ in October 2020.

Should you encounter the former term, when in that branch, you can rename it to the newer one with the command ‘git branch -m main’.

Git Workflow Overview



>>> Git Add

Create/Modify files and then execute “git add [filename]”:

```
$ git add vlan_config.txt
```

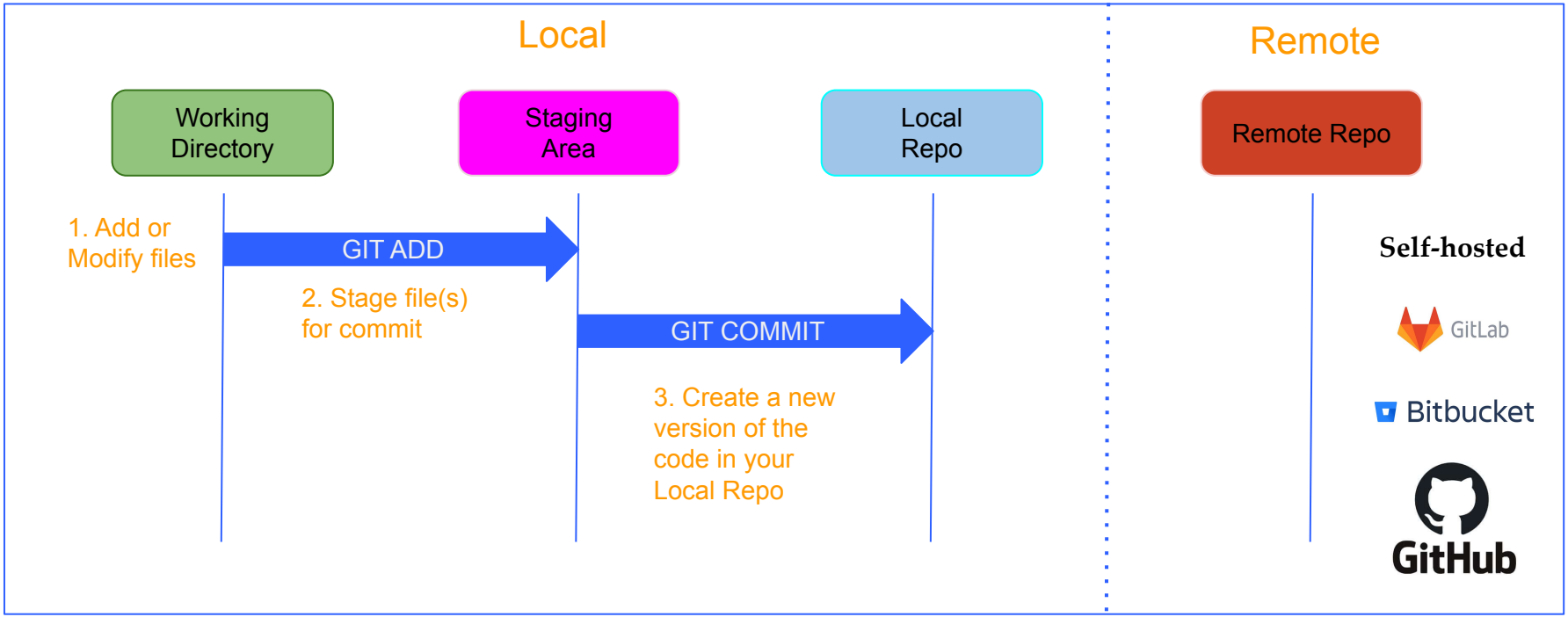
You can also use "`git add .`" to add all files to the staging area

>>> Git Status

Changes to be committed indicates file has been added to Staging

```
$ git status
On branch main
No commits yet
Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
 new file:   vlan_config.txt
```

Git Workflow Overview



>>> Git Config

When creating a commit and prior to initiating a push, user information must be specified.

```
$ git config --global user.name "John Smith"
$ git config --global user.email john_smith@networktocode.com
$ git config --list --global  # to see current global settings
$ git config --list  # to see current local settings
```

This is a one-time configuration that must be done prior to making any commits.

If you forget to configure, git reminds you and provides the commands too!

>>> Git Commit

Creates a snapshot in time in the Local Repo

```
$ git commit -m "first commit"
[main (root-commit) 379327e] first commit
 1 file changed, 1 insertion(+)
 create mode 100644 vlan_config.txt
```

>>> Git Log

Shows you the Commit History and associated Commit IDs


```
$ git log
commit 379327e7c9a377156b0a481b6eb92c1918fefaca (HEAD -> main)
Author: Matt Mullen <matt.mullen@networktocode.com>
Date:   Wed Jul 8 14:23:20 2020 -0400

    first commit
```

>>> Show commit logs with `git log --oneline`

```
c78a6ad34 (HEAD -> develop, origin/develop, origin/HEAD) Update release date, version.
8f669461c Add release-note for #2095
3a8e0a0c7 Documenting Redis TLS and adjusting healthcheck. (#2097)
6a51b2041 Add release-notes for #2073, #2080, #2143
c4d01dbff Add local option to runjob (#2073)
2f0cf37f5 Update job view to show the class path and add data as option to runjob (#2080)
453ec9e46 Add custom interval to scheduled job view (#2143)
709613359 add release note for #2114
```

>>> What do the various forms of `HEAD` point to?

```
c78a6ad34 (HEAD -> develop, origin/develop, origin/HEAD) Update release date, version.
8f669461c Add release-note for #2095
3a8e0a0c7 Documenting Redis TLS and adjusting healthcheck. (#2097)
6a51b2041 Add release-notes for #2073, #2080, #2143
c4d01dbff Add local option to runjob (#2073)
2f0cf37f5 Update job view to show the class path and add data as option to runjob (#2080)
453ec9e46 Add custom interval to scheduled job view (#2143)
709613359 add release note for #2114
```

```
HEAD   points to c78a6ad34
HEAD~0 points to c78a6ad34
HEAD~1 points to 8f669461c
HEAD~2 points to 3a8e0a0c7
HEAD~3 points to 6a51b2041
etc.
```

>>> Viewing Local Diffs

View the difference between your local working directory and latest commit:

```
$ git diff
diff --git a/vlan_config.txt b/vlan_config.txt
index ed40a9b..e69d684 100644
--- a/vlan_config.txt
+++ b/vlan_config.txt
@@ -7,4 +7,6 @@ vlan 20
 vlan 30
   name Web
+vlan 40
+  name App
```

>>> Why use **`git mv`** and **`git rm`** versus manual `mv` and `rm`?

- `git mv` and `git rm`:
  - Directly change both the working directory and index

- `mv` and `rm`:
  - Changes only the working directory
  - Must manually then do `git add <filename>` to move to index

- Bottom line:
  - Matter of convenience
  - Less likely to forget to afterwards manually `git add <filename>`

Demo - Working with a Local Repo

Lab 1

Agenda

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Remote Repository (“repo”)

- Cloud-based or private on-premises storage for your code
- Common features:
  - Web UI
  - Viewing code differences between versions
  - Merging together code from different feature branches
  - Code review capabilities
  - Notifications

Self-hosted

>>> Authentication with GitHub Today - Method 1 of 2

https://github.blog/2020-12-15-token-authentication-requirements-for-git-operations/

From August 13, 2021, GitHub is no longer accepting account passwords when authenticating Git operations. You need to add a PAT (Personal Access Token) instead, and you can follow the below method to add a PAT on your system.

Create Personal Access Token on GitHub

From your GitHub account, go to Settings, then Developer Settings, then Personal Access Token. Click on Generate New Token. Complete the form and click Generate token. Make sure to copy the generated PAT to somewhere safe. It will be of a format similar to ghp_sFhFsSHhTzMDreGRLjmks4Tzuzgthdvfsrta

Based on your machine type, follow the instructions in the extra slides at the end of this presentation.

>>> Authentication with GitHub Today - Method 2 of 2

Ssh-keygen is a tool for creating new SSH authentication key pairs. These are used for automating logins, single sign-on, and for authenticating hosts.

```
$ ssh-keygen -t rsa -b 4096  # Generate keys by type & bit length, accepting defaults for passphrase and the output_keyfile file name where keys are saved
```

Copy the ssh key to your clipboard. In the upper righthand corner of any GitHub web page, click your profile photo, then Settings, then SSH and GPG keys, then New or Add SSH key, then add a descriptive Title, paste your ssh key into the Key field, and then Add SSH key.

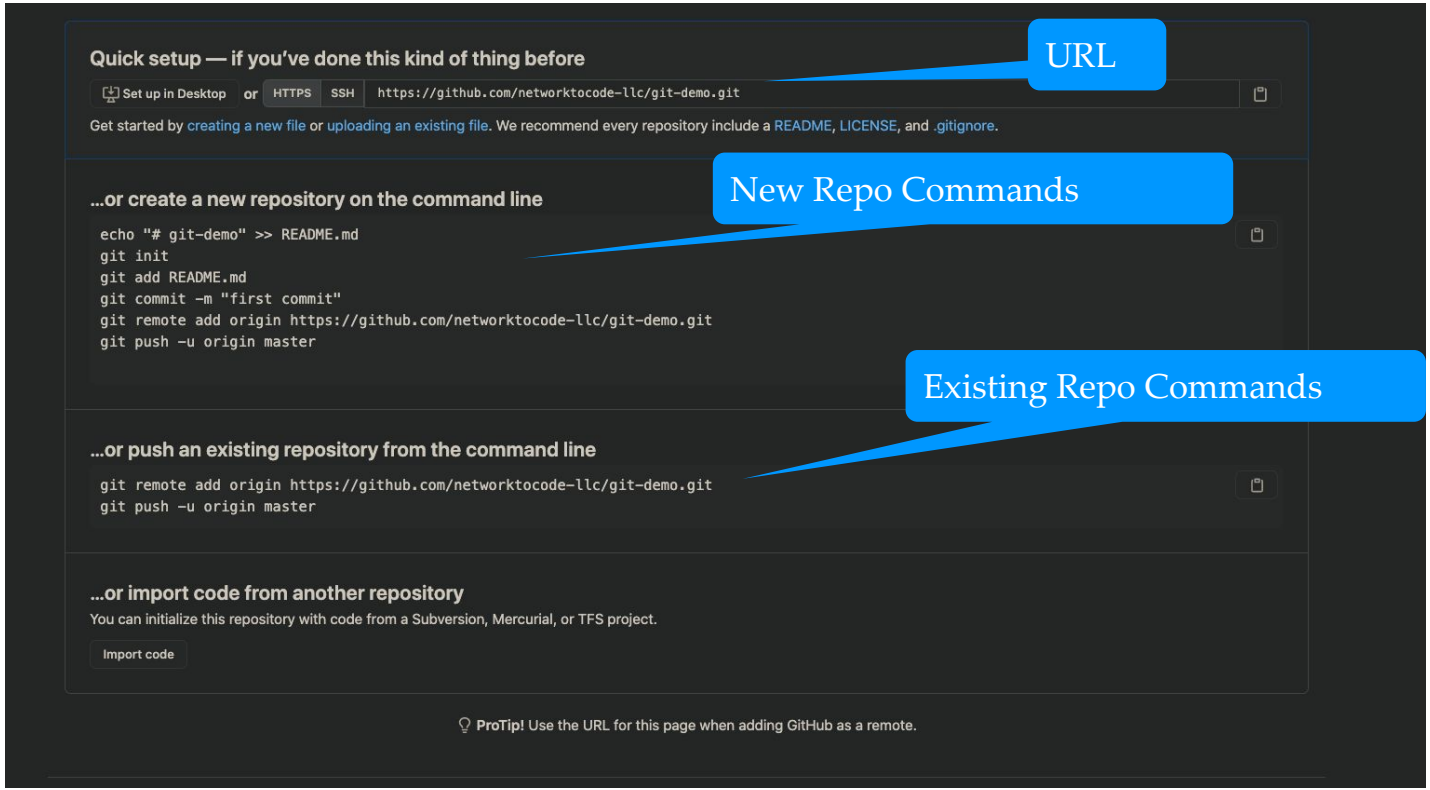
https://docs.github.com/en/authentication/connecting-to-github-with-ssh/adding-a-new-ssh-key-to-your-github-account has more details from GitHub.

Note: for the NTC labs, so you don't accidentally leave behind actual SSH keys, we recommend using Personal Access Tokens (PATs) instead.

Pushing to Remote - Prerequisites

1. Create the remote repo
2. Obtain the URL for the remote repo
3. Configure your git profile on your local machine using “git config”
4. Configure the URL to the remote repo using “git remote”

Creating a Repo - GitHub Example



Git Remote

Remote always called "origin" by convention

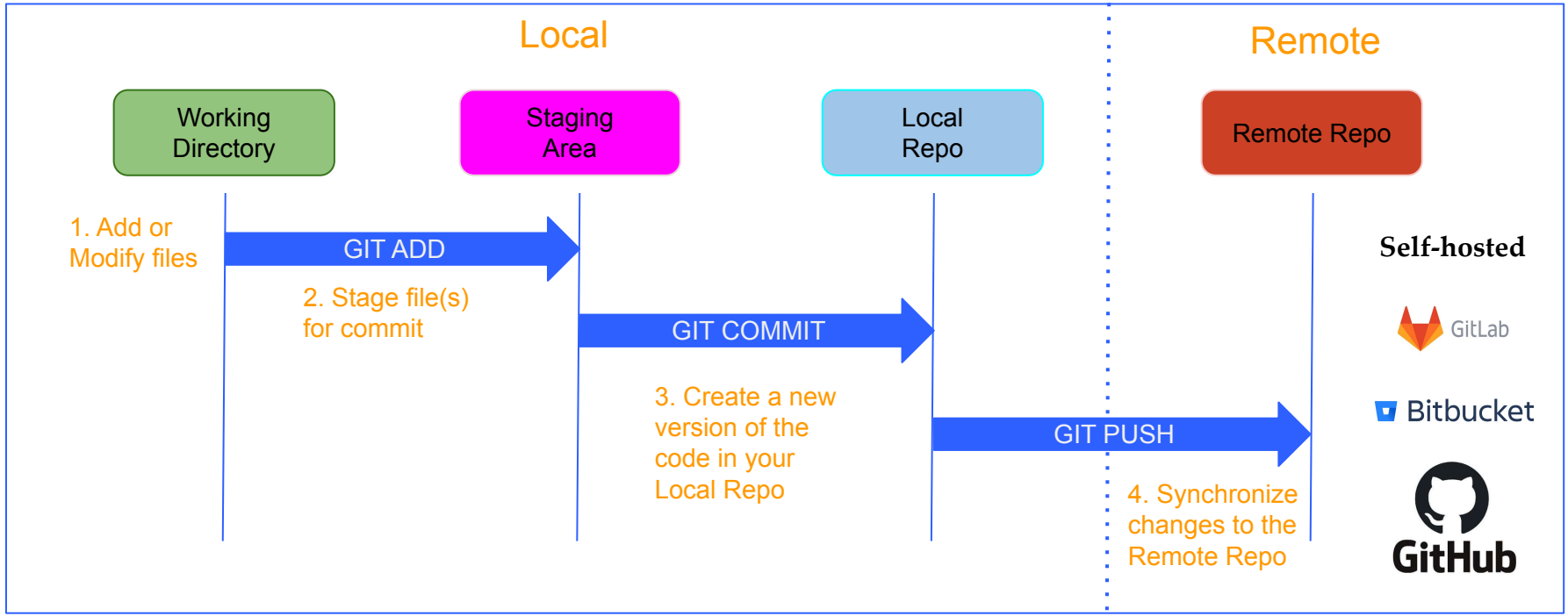
Sets the URL to the remote repo

```
$ git remote add origin https://github.com/ntc-training/git-demo.git
```

View the URL to the remote repo

```
$ git remote -v
origin    https://github.com/ntc-training/git-demo.git (fetch)
origin    https://github.com/ntc-training/git-demo.git (push)
```

Git Push


Local
Remote
Working Directory
Staging Area
Local Repo
Remote Repo
1. Add or Modify files
GIT ADD
2. Stage file(s) for commit
GIT COMMIT
3. Create a new version of the code in your Local Repo
GIT PUSH
4. Synchronize changes to the Remote Repo
Self-hosted
GitLab
Bitbucket
GitHub

Copy the files from the Local Repo to the Remote

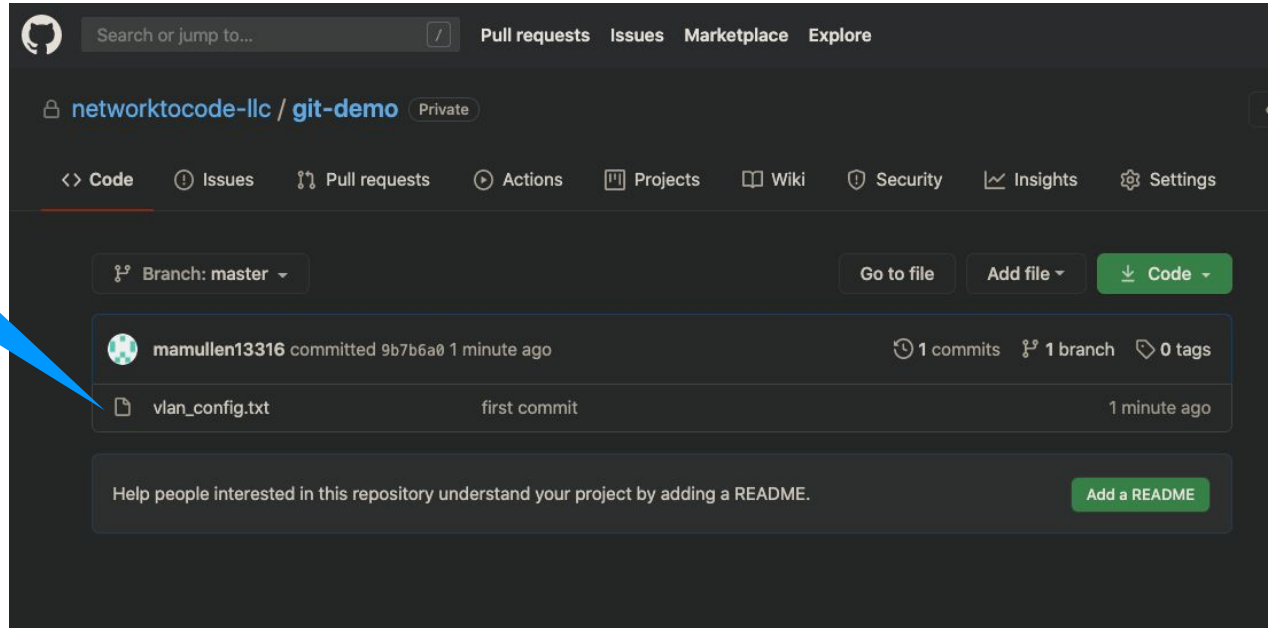
```
$ git push -u origin main
Enumerating objects: 3, done.
Counting objects: 100% (3/3), done.
Writing objects: 100% (3/3), 228 bytes | 228.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/ntc-training/git-demo.git
 * [new branch]      main -> main
Branch 'main' set up to track remote branch 'main' from 'origin'.
```

main = branch name.

-u is short for --set-upstream and is only needed on the first push.

GitHub

`vlan_config.txt` has been pushed and now in the repo



More Changes - Rinse and Repeat

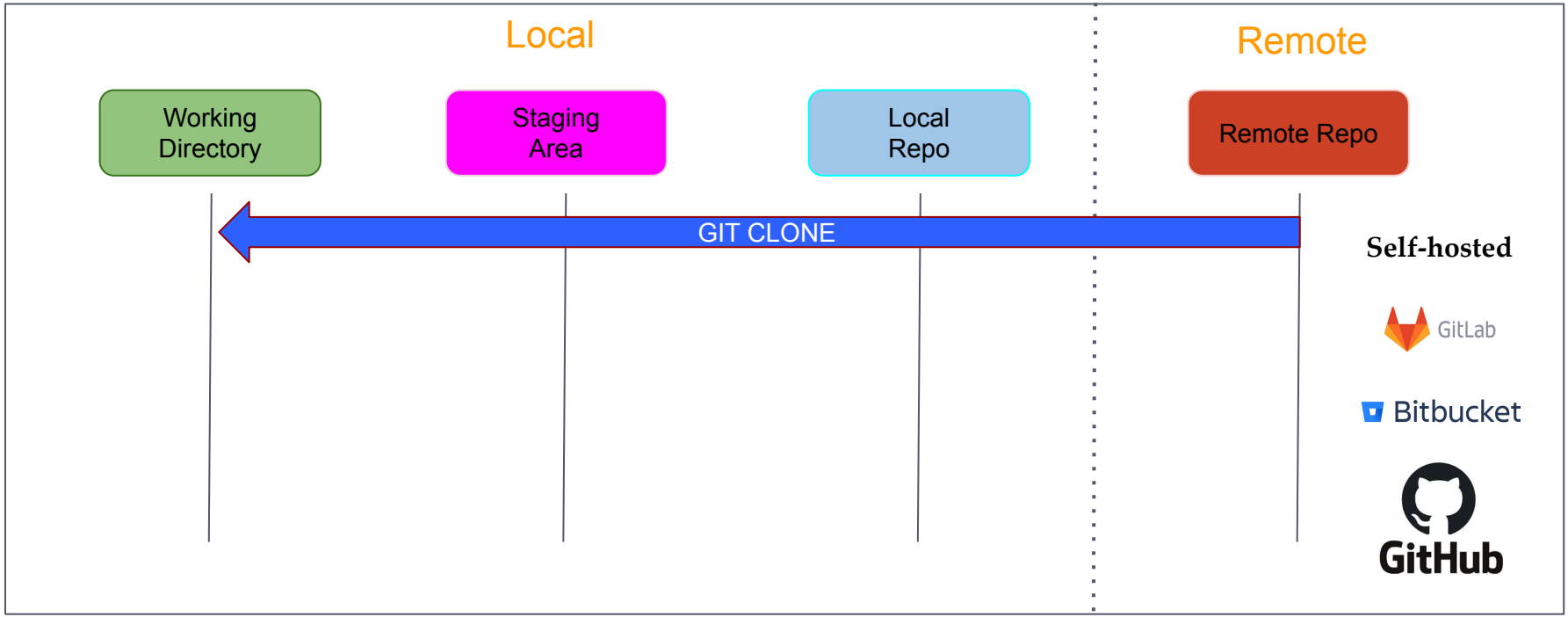
1. Make changes/additions/etc in the Working Directory
2. git add .
3. git commit -m "commit message"
4. git push

"." means all files and directories under the current directory

Cloning

- One-time operation to pull down a copy of a remote repo into your local working directory
- The project retains the same remote URL as the original project
- Accomplished using the git clone [url] command

Git Clone


Local
Remote
Working Directory
Staging Area
Local Repo
Remote Repo
GIT CLONE
Self-hosted
GitLab
Bitbucket
GitHub

Git Clone Example

```
$ git clone https://github.com/ntc-training/git-demo.git git-demo-clone
Cloning into 'git-demo'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 3 (delta 0), pack-reused 0
Receiving objects: 100% (3/3), done.
$ ls
git-demo
$ cd git-demo
$ ls
test.txt
```

Optionally specify the directory we are cloning into. If left out, it will be the same as the repo name.

Git Clone

- One-time operation
- Copy from remote
- **Same remote url as original**
- Syntax:

```
git clone [url]
git clone [url] [dir]
```

Git Branch

A parallel copy of the project in which you can add new features and functionality non-disruptively.

To create a branch:

```
$ git branch mybranch
```

And then work on it:

```
$ git checkout mybranch
```

To create a new branch and work on it:

```
$ git checkout -b mybranch
```

OR (new syntax)

```
$ git switch -c mybranch
```

Changing Branches

To change branches:

```
$ git checkout mybranch
```

OR

```
$ git switch mybranch
```

New in git version 2.23.0

You are now working in the new branch with an exact copy of the files as they existed in the original branch (main)

Viewing Branches

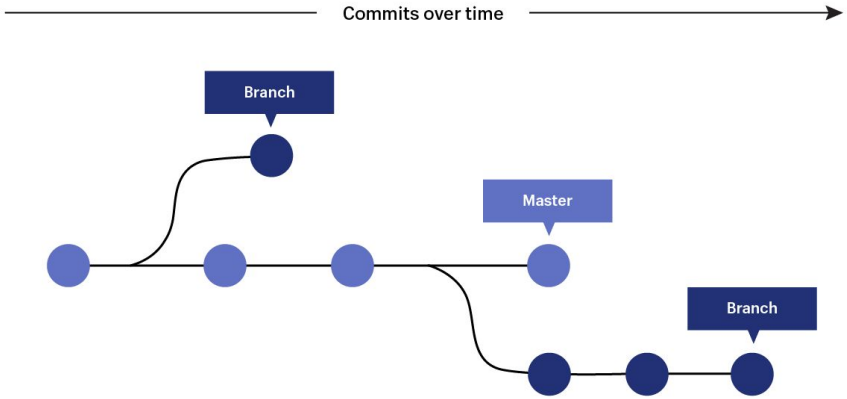
To view branches:

```
$ git branch
  main
* mybranch
```

The current branch will have an asterisk (*) next to it

Git Branches

- **Repository (repo)** - A project or collection of work being managed by git
- **Branch** - A particular series of changes to content within the repo
  - Branches can diverge and merge, like paths through a forest
  - The default branch is typically named main by convention
  - Branches may be temporary or permanent



Git Branches

- Commits allow us to move forward and backward in time
- Branches **exist in parallel** to one another
  - Each branch has its own series of commits
- Branches are "**checked out**" to the current workspace
- Disruptive development can be confined to a particular branch without sacrificing the stability of another
  - Example: **main** versus **develop** branches
  - Example: **bugfix** and **feature-add** branches
- Keep branches focused on one thing and as short-lived as possible

Demo - Git Branching and GitHub


Lab 2

>>> Forking on GitHub to collaborate with others

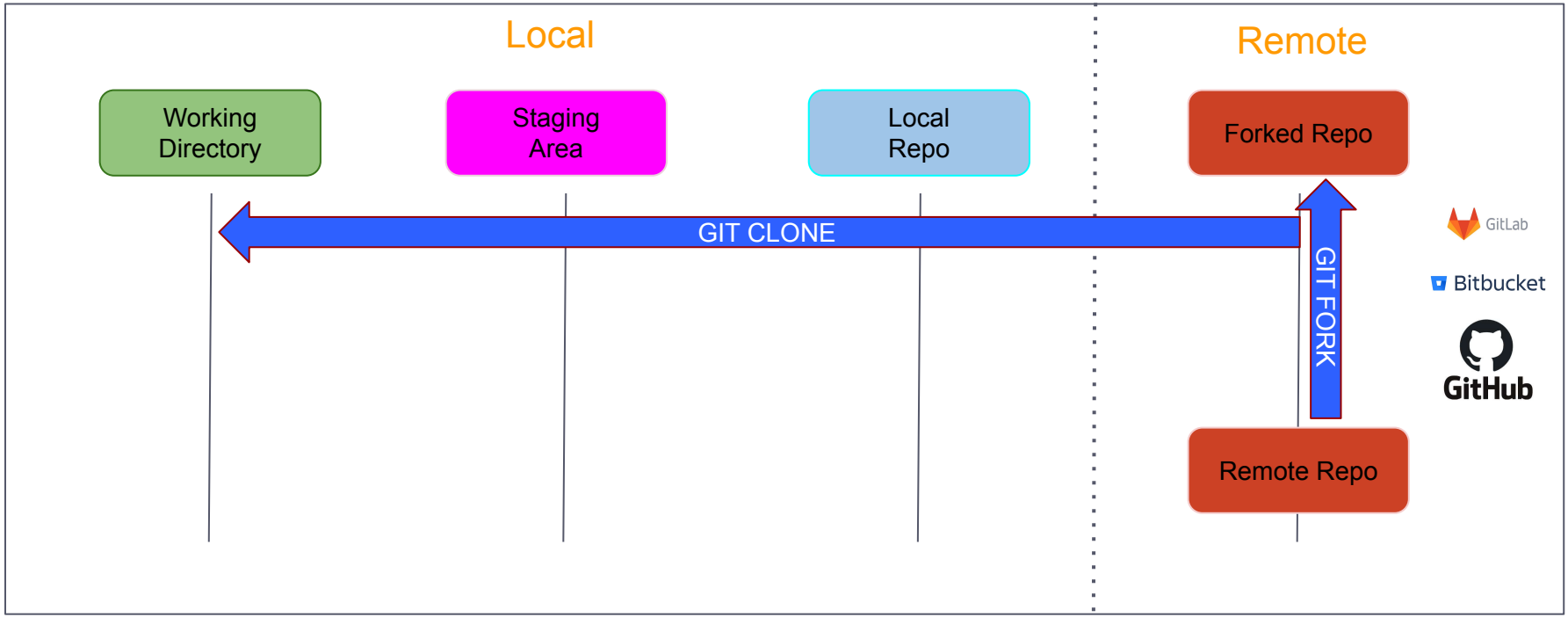
- Creates a copy of the remote repo on the remote repository server
- The copy is given a brand new name and URL (which aligns to your GitHub / BitBucket account)
- It is accomplished using the GUI of the remote repo, rather than a git command
- Clone the forked copy to work on it locally

GitHub Fork

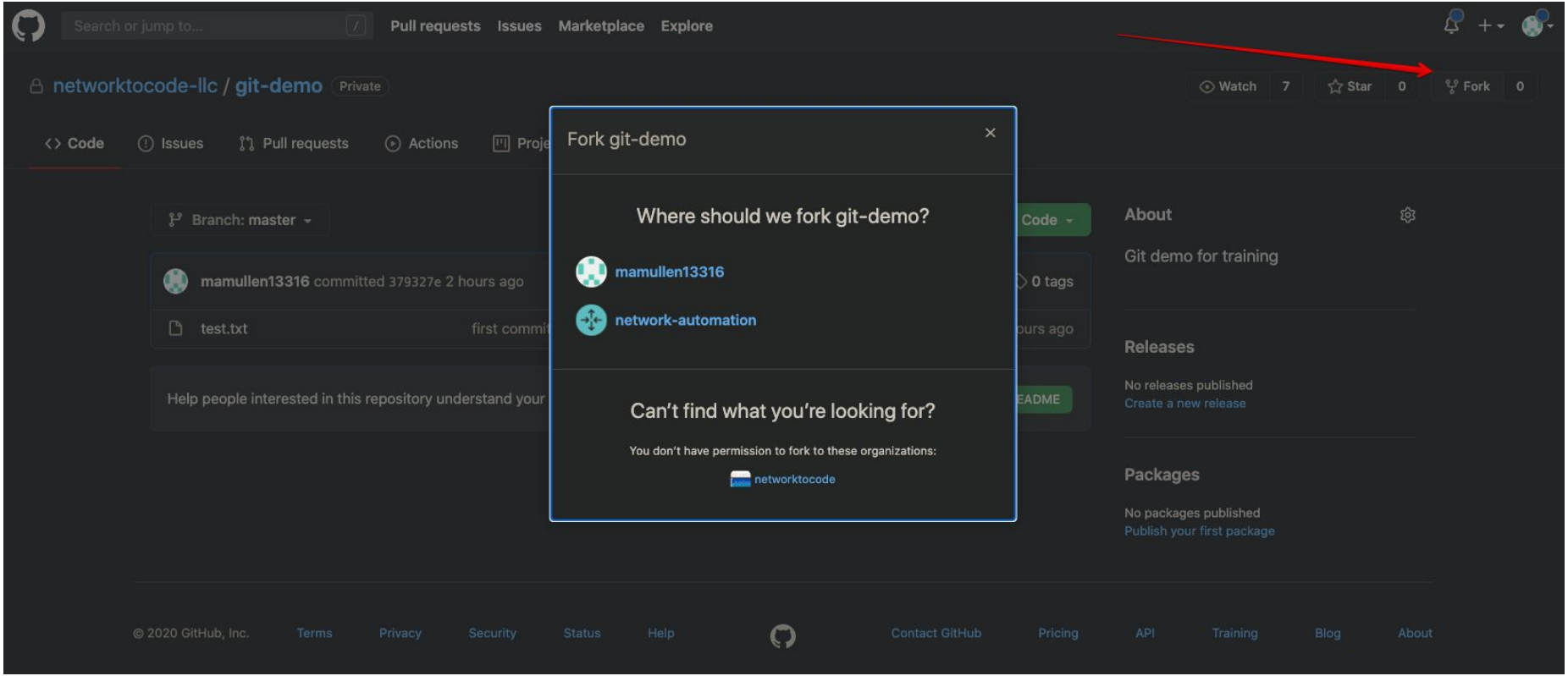
- One-time operation
- Copy from remote
- **Different remote url than original**
- Once you fork, you can clone from the new url
- Syntax:

```
git remote add origin
https://github.com/example/example.git
```

Git Fork, then Git Clone



Git Fork Example



When should you **fork** a repository versus **clone** it with `git`?

Fork or Clone?

Clone Use-Cases

- You just want to copy, use, or explore the project

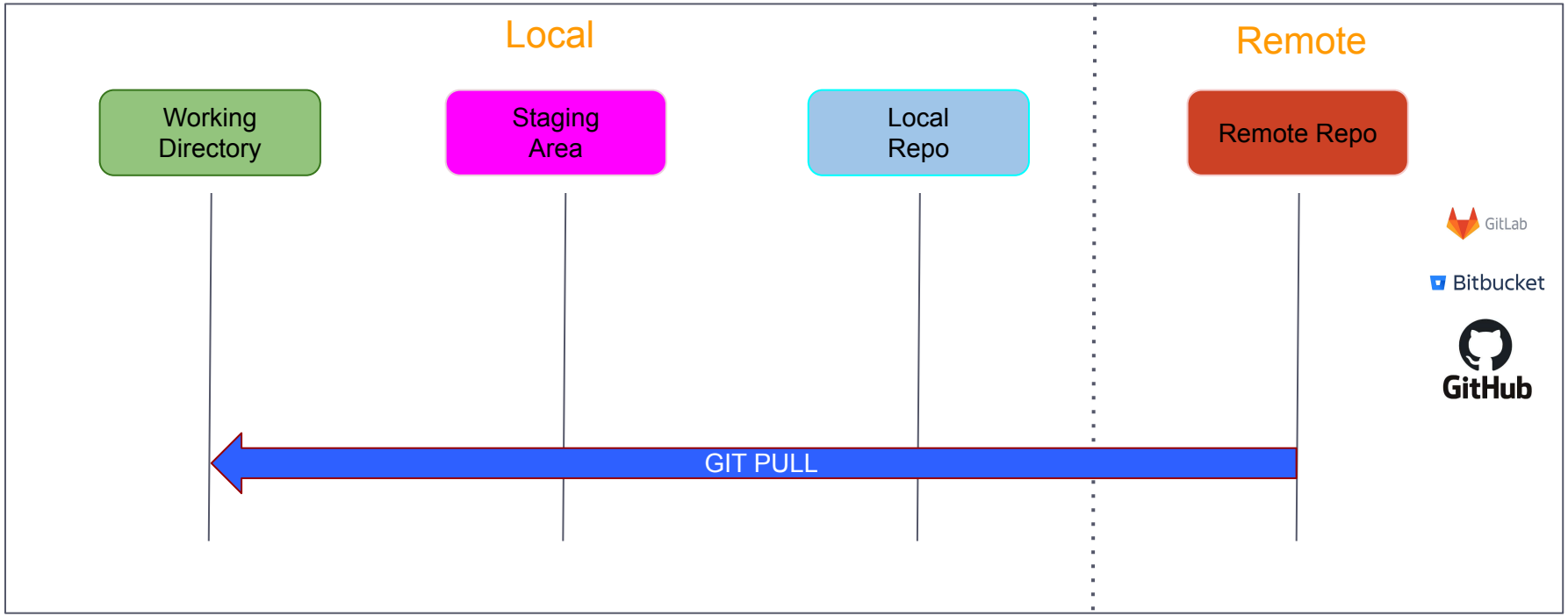
- You have write access to the repo and therefore, can push back up directly

Fork Use-Cases

- You want to contribute to a project you don't have write access to

- Standard approach is to fork'n'pull vs. clone/push

Git Pull


Local
Remote
Working Directory
Staging Area
Local Repo
Remote Repo
GitLab
Bitbucket
GitHub
GIT PULL

Git Pull

First someone else makes a change and pushes to the remote.

```
$ echo "created another file" > test2.txt
$ ls
test.txt test2.txt
$ git add .
$ git commit -m “file added by some user”
```

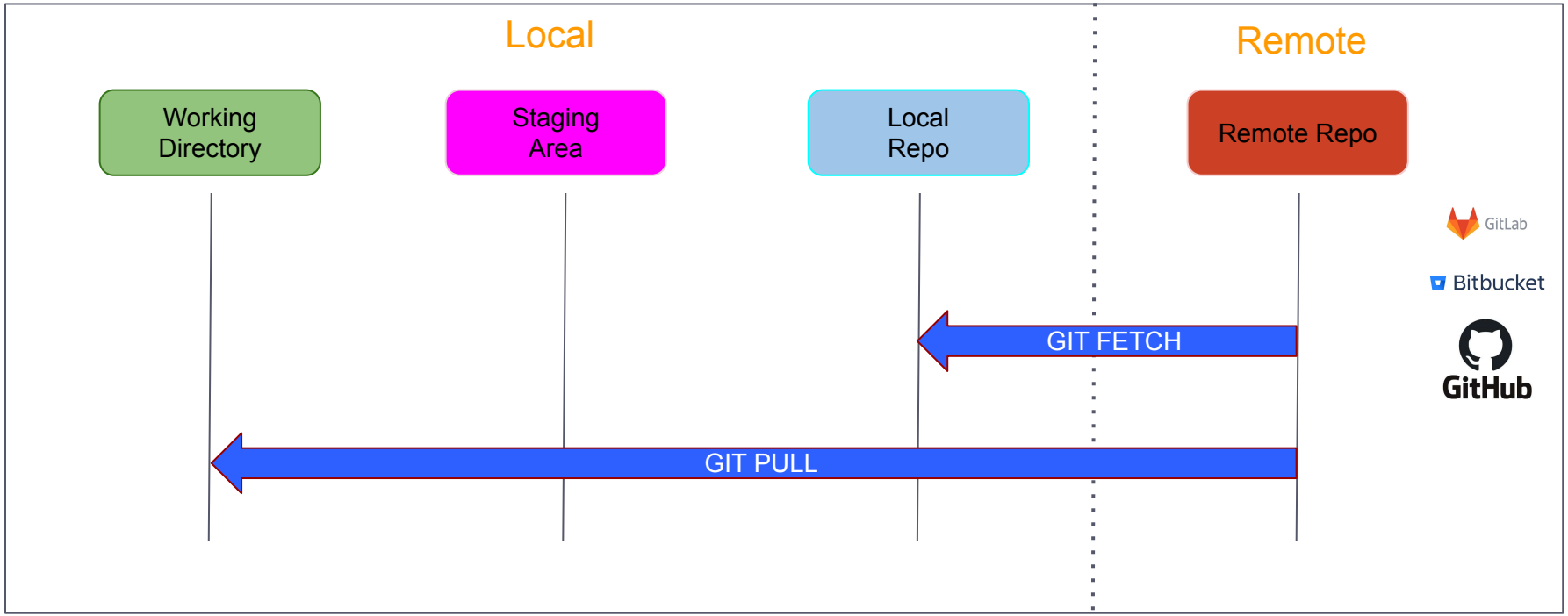
For this task we are simulating another user making a change by making a change in the cloned copy of the repo.

Git Pull

Pull the contents of the remote repo into your working directory:

```
$ git pull
remote: Enumerating objects: 7, done.
remote: Counting objects: 100% (7/7), done.
remote: Compressing objects: 100% (4/4), done.
remote: Total 5 (delta 0), reused 5 (delta 0), pack-reused 0
Unpacking objects: 100% (5/5), 574 bytes | 191.00 KiB/s, done.
From https://github.com/ntc-training/git-demo
   2201f74..84d5247  main     -> origin/main
Updating 2201f74..84d5247
Fast-forward
 test2.txt | 1 +
 1 file changed, 1 insertion(+)
 create mode 100644 test2.txt
```

Git Fetch


Local
Remote
Working Directory
Staging Area
Local Repo
Remote Repo
GitLab
Bitbucket
GitHub
GIT FETCH
GIT PULL

Git Fetch

User makes a change in the remote repo

```
$ echo "changed by another user" >> test.txt
$ git add .
$ git commit -m "text.txt changed by another user"
```

In this task we are again simulating a user making a change by making the change in the cloned repo and pushing it to the remote.

Git Fetch

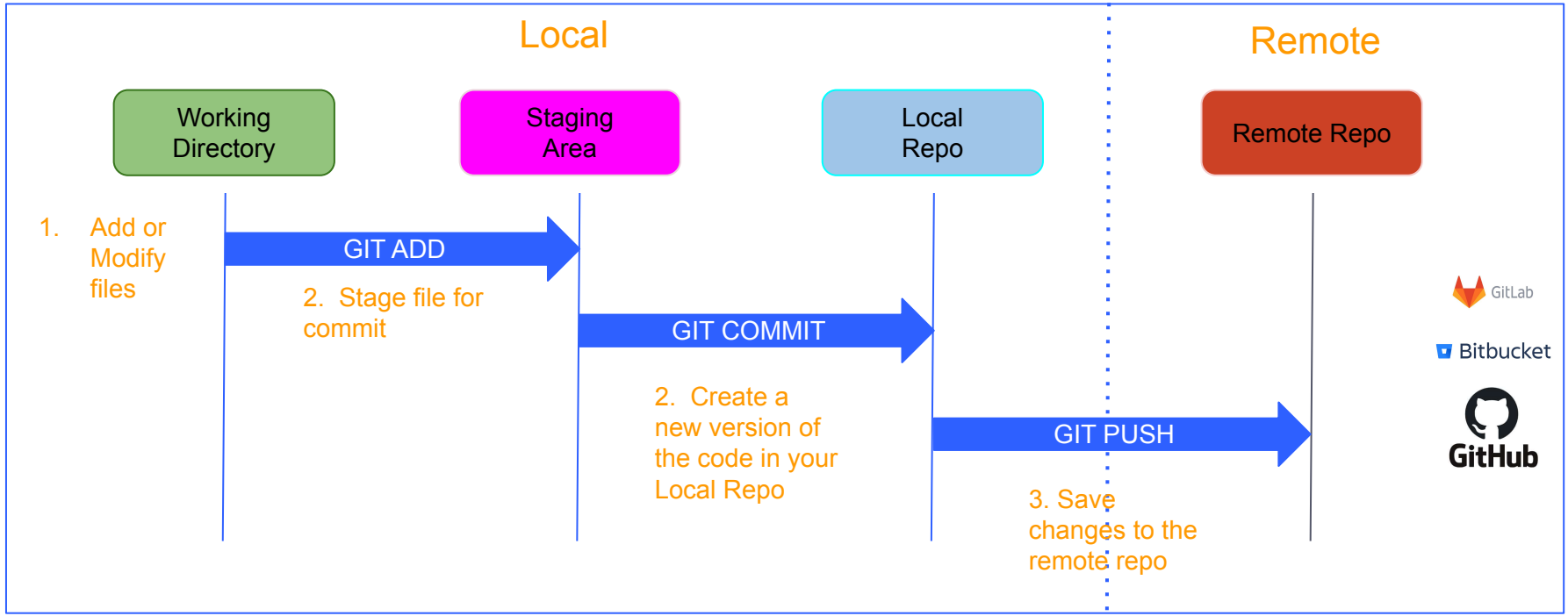
Pull down changes from the remote to your Local Repo:

```
$ git fetch
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Total 3 (delta 0), reused 3 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 260 bytes | 130.00 KiB/s, done.
From https://github.com/ntc-training/git-demo
   369dcea..45239bb  main     -> origin/main
```

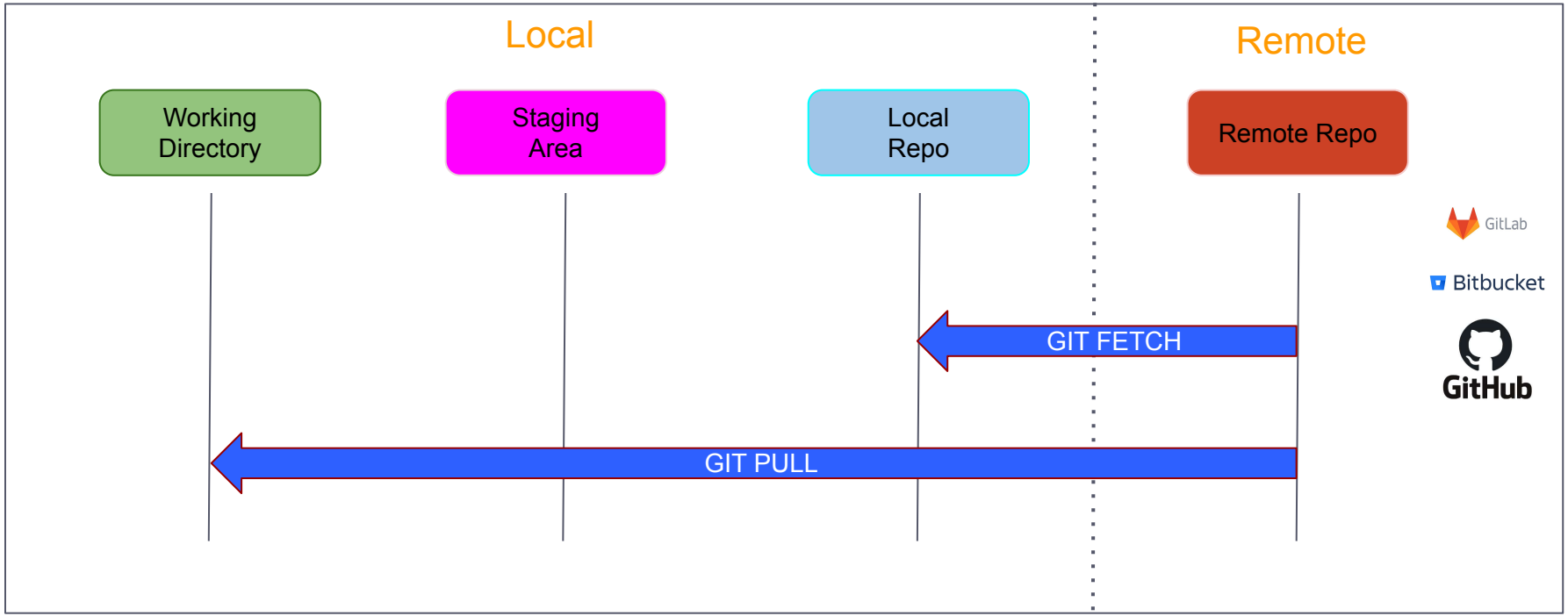
Notice that the changes in the remote are not yet in the file in your working directory, that's because they are in the Local Repo!

What is the opposite of `git push`?

Opposite of Git Push is NOT Git Pull



Opposite of Git Push is Git Fetch



Comparing the Working Directory with Remote

```
$ git diff origin/main
diff --git a/test.txt b/test.txt
index 9439068..6d0f058 100644
--- a/test.txt
+++ b/test.txt
@@ -1,2 +1,2 @@
 first edit
-changed by another user
+second commit
```

Reference to the Local Repo which now has a copy of the Remote

Minus sign means this line doesn't exist in our local copy of the file

Always do a "git fetch" first, otherwise you might be looking at old data in your Local Repo

Merge Conflict

What if we try to pull now?

```
$ git pull origin main
Updating 69742b6..ba91a8f
error: Your local changes to the following files
would be overwritten by merge:
 test.txt
Please commit your changes or stash them before
you merge.
Aborting
```

Merge Conflict

Let’s take the advice and commit our changes...

```
$ git add .
$ git commit -m "third commit"
[main 1abe23f] third commit
 1 file changed, 1 insertion(+)
$ git pull
Auto-merging test.txt
CONFLICT (content): Merge conflict in test.txt
Automatic merge failed; fix conflicts and then commit
the result.
```

Correcting the Conflict

The file in conflict will have markers where the conflict arose...

```
created file
<<<<<<< HEAD
second commit
=======
changed by another user
>>>>>>> ba91a8fed3ca5f89b93a3996d2327f2eda2091fc
```

Remove the lines with <<<<<<, >>>>>>, and ========, keep the contents that are correct, and then save the changes

Commit and Push the Changes

```
$ git add .
$ git commit -m "resolving merge conflict"
[main 72a5e56] resolving merge conflict
$ git push
Enumerating objects: 10, done.
Counting objects: 100% (10/10), done.
Delta compression using up to 12 threads
Compressing objects: 100% (5/5), done.
Writing objects: 100% (6/6), 617 bytes | 617.00 KiB/s, done.
Total 6 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/ntc-training/git-demo.git
   ba91a8f..72a5e56  main -> main
```

Make Changes in the New Branch

Create a new file and commit it:

```
$ echo "new file in branch" > test3.txt
$ git add test3.txt
$ git commit -m "test3 added in feature branch"
[mybranch e852896] test3 added in feature branch
 1 file changed, 1 insertion(+)
 create mode 100644 test3.txt
```

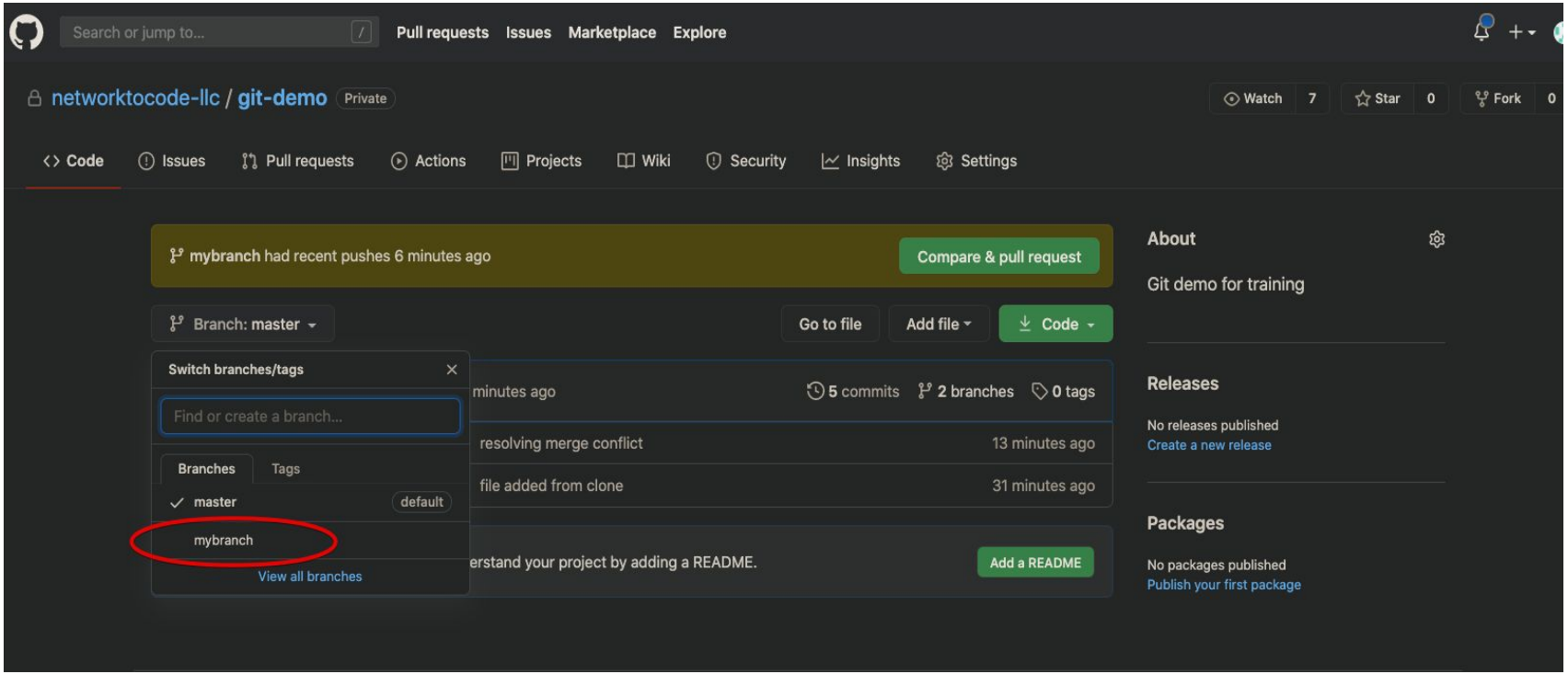
Push the Changes

```
$ git push -u origin mybranch
Enumerating objects: 4, done.
Counting objects: 100% (4/4), done.
Delta compression using up to 12 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 323 bytes | 323.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
remote:
remote: Create a pull request for 'mybranch' on GitHub by visiting:
remote:      https://github.com/ntc-training/git-demo/pull/new/mybranch
remote:
To https://github.com/ntc-training/git-demo.git
 * [new branch]      mybranch -> mybranch
Branch 'mybranch' set up to track remote branch 'mybranch' from 'origin'.
```

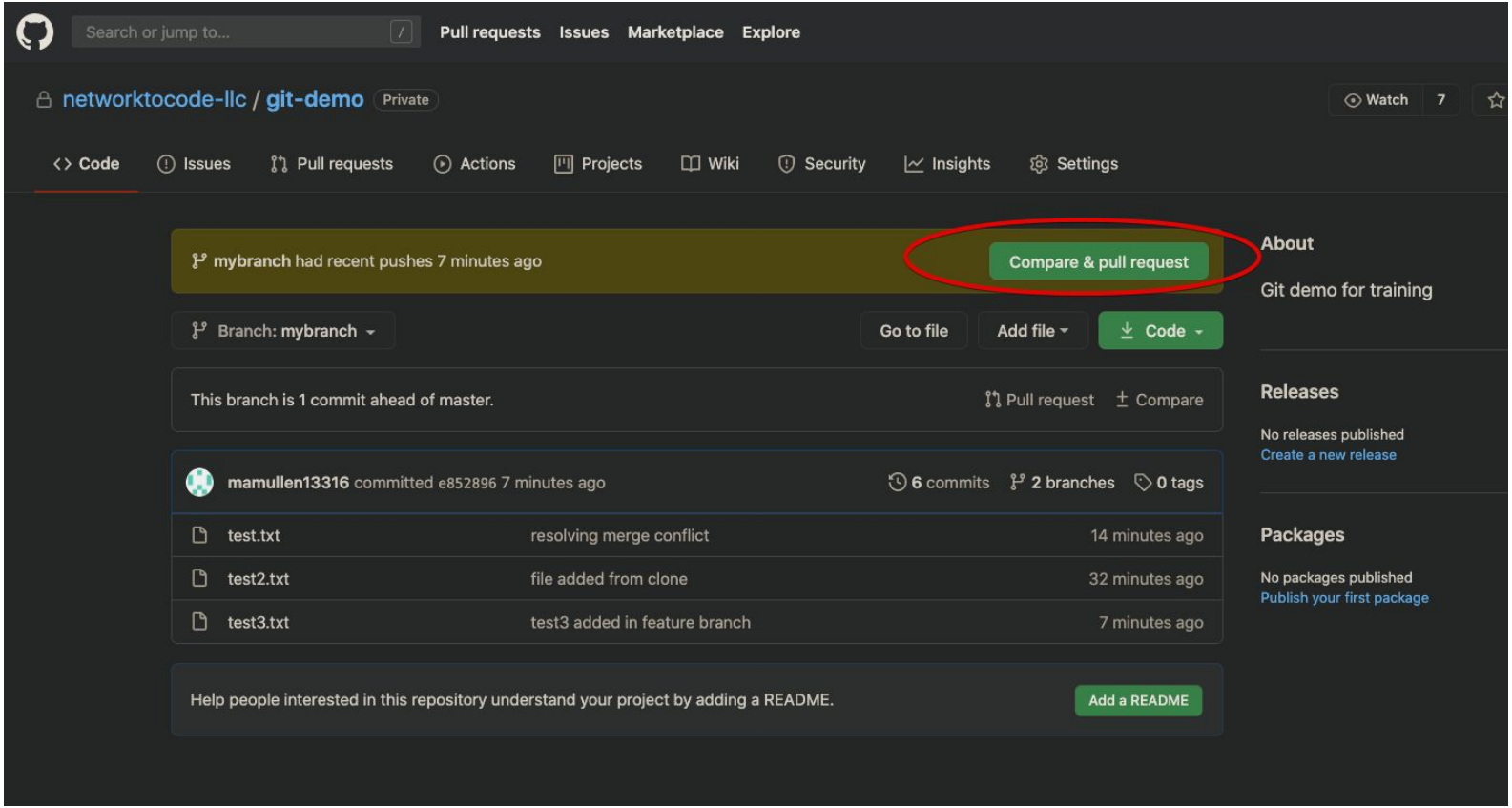
Set-upstream is required for the initial push

New branch created on the remote

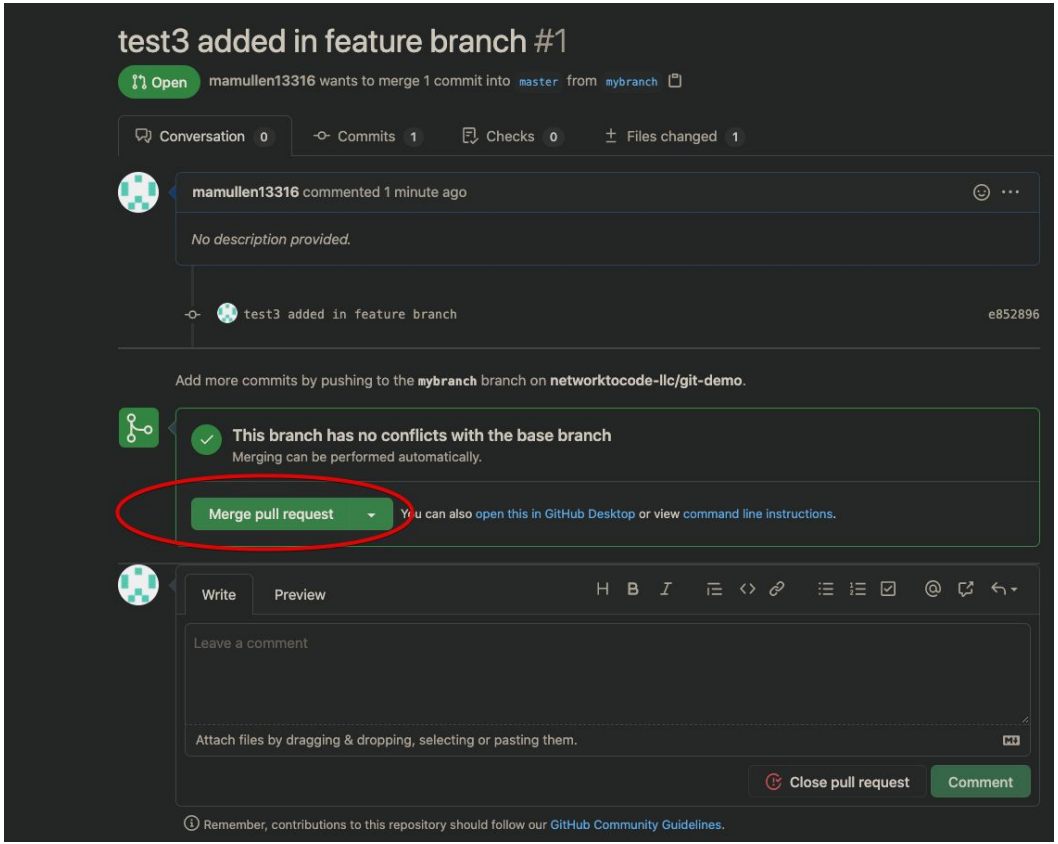
New Branch on GitHub



Creating a Pull Request



Merge Pull Request



Switch to Main

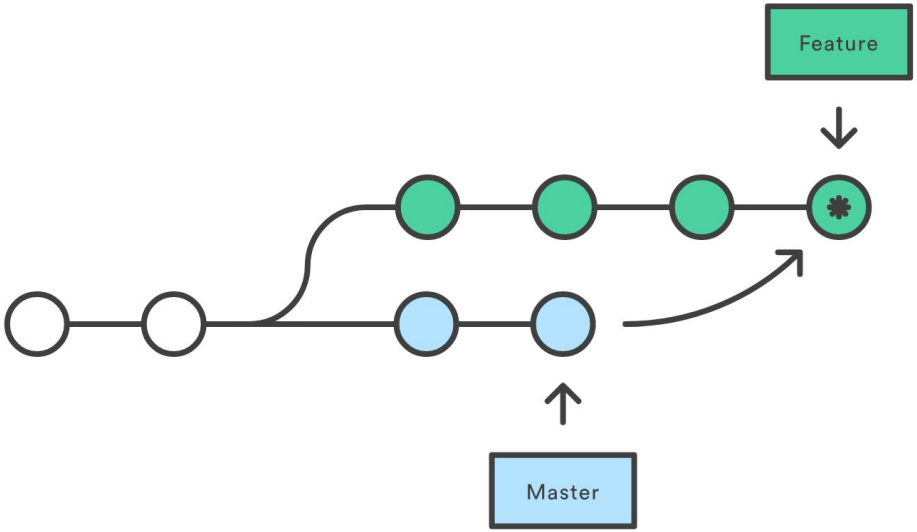
```
$ git switch main
Switched to branch 'main'
Your branch is up to date with 'origin/main'.
```

Pull Remote Changes

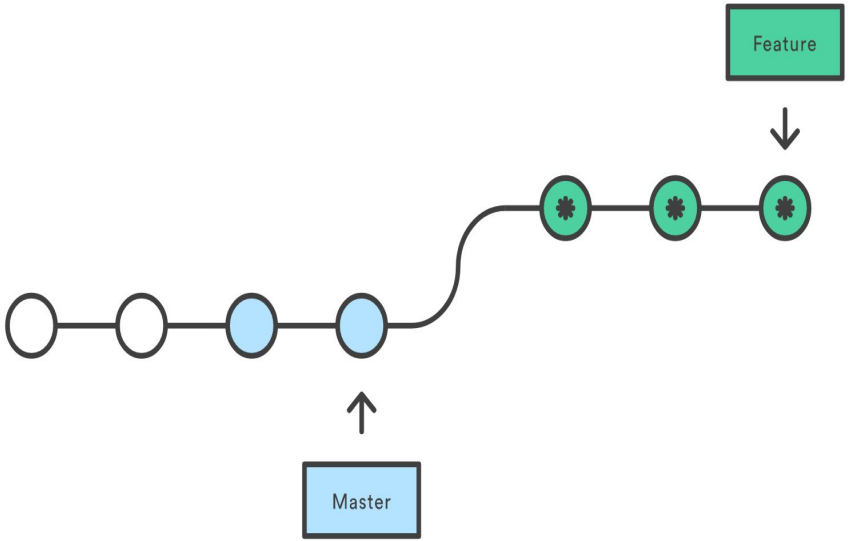
```
$ git pull origin main
remote: Enumerating objects: 1, done.
remote: Counting objects: 100% (1/1), done.
remote: Total 1 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (1/1), 641 bytes | 641.00 KiB/s, done.
From https://github.com/ntc-training/git-demo
   72a5e56..1f16701  main     -> origin/main
Updating 72a5e56..1f16701
Fast-forward
 test3.txt | 1 +
 1 file changed, 1 insertion(+)
 create mode 100644 test3.txt
```

We have now integrated the changes from the branch into main

Git Merge vs Rebase



* Merge commit



* Brand new commit

Git Merge vs Rebase

- Rebase benefits
  - Streamlines a potentially complex history
  - Avoids merge commit “noise” in busy repos with busy branches
  - Cleans intermediate commits by making them a single commit
- Never rebase a public or protected branch (such as those *multiple* people might work on)! You may rewrite project history and destroy teammates changes!!!

Demo
Collaborating with the GitHub Fork Model

Lab 3

Agenda

- Introduction to Git & Version Control Systems
- Working with a Local Git Repo
  - Demo + Hands-on Labs
- Collaborating with GitHub
  - Demo + Hands-on Labs
- **Time Travel with Git**
  - Demo
- Collaborating on GitHub Repos with CI
  - Demo + Challenge Lab

Time Travel with `git COMMAND FLAG HEAD~n` (back n commits)

COMMAND	checkout	reset	reset	reset	revert
FLAG		--soft	--mixed (default)	--hard	
Use with repo type	Local	Local	Local	Local	Remote
Commit history	No changes	Alters existing	Alters existing	Alters existing	Adds new commit
Uncommit changes?	No	Yes	Yes	Yes	No
Unstage changes?	No	No	Yes	Yes	No
Delete changes?	No	No	No	Yes	No

>>> Saving work-in-progress with `git stash`

- `git stash` # save staged changes in the stash stack
- `git stash --include-untracked` # save unstaged changes
- `git stash list` # list the stashes
- `git stash show` # show the latest change
- `git stash pop` # put in current working branch & remove from stack
- `git stash clear` # Clear all stashes from the stack
- `git stash branch <branch_name>` # Create new branch from latest stash

Demo - Git Time Travel

Agenda

- Introduction to Git & Version Control Systems
- Working with a Local Git Repo
  - Demo + Hands-on Labs
- Collaborating with GitHub
  - Demo + Hands-on Labs
- Time Travel with Git
  - Demo
- **Collaborating on GitHub Repos with CI**
  - Demo + Challenge Lab

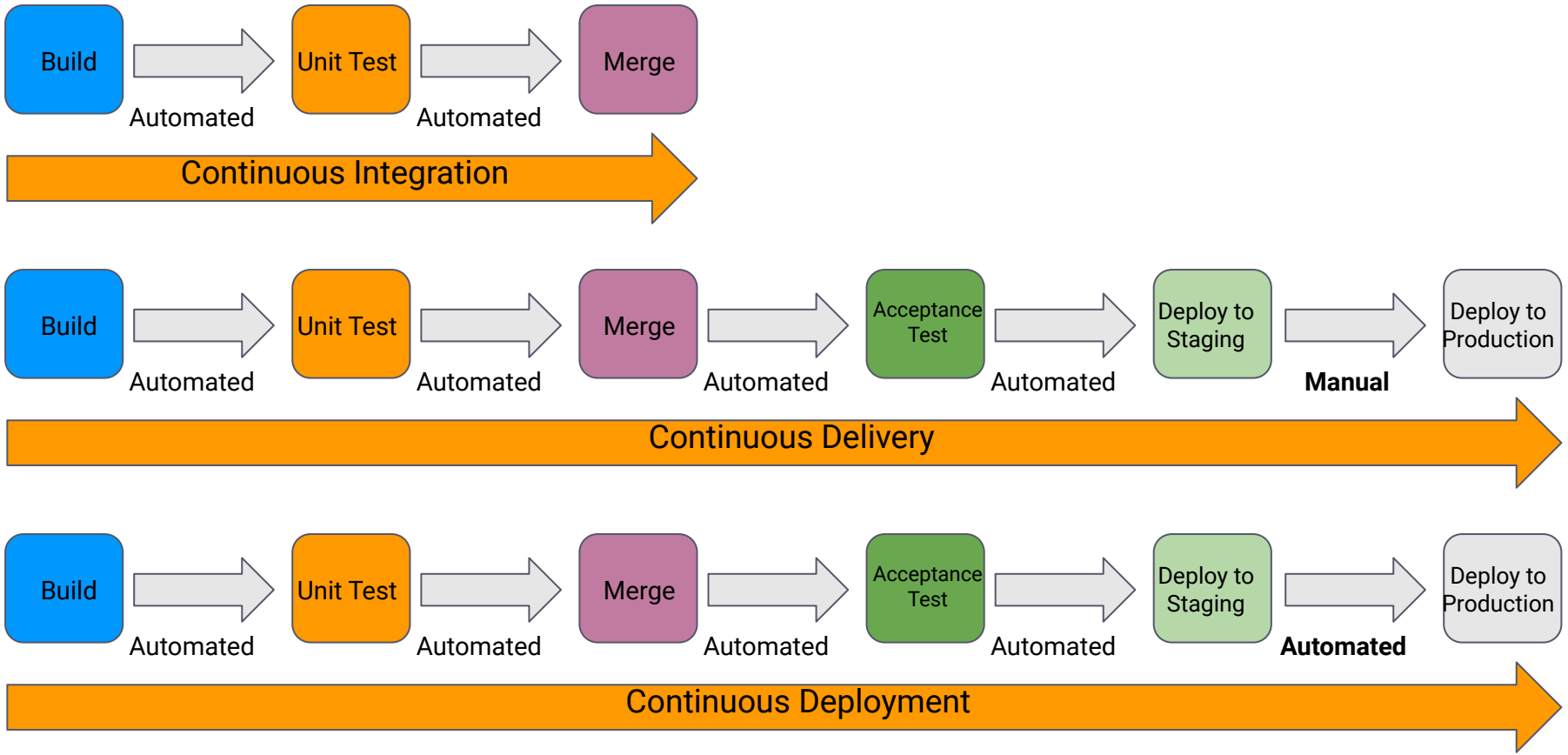
Introduction to CI/CD

- **CI** is the practice of merging code changes frequently and leveraging automated testing - this builds trust in the system and healthier code.
  - "Code" can be anything - Ansible playbooks, data models, device configs etc.
- CI is often paired with **CD** - i.e. Continuous Delivery / Deployment.
  - A pipeline can test but also deploy your "code" to a staging environment, to production, package on PyPi, Ansible collection on Galaxy etc.
- These may be Software-as-a-Service (**SaaS**) providing a cloud-based **continuous integration (CI)** server or **On-Premise**.
  - They may integrate with code hosted on Bitbucket, GitHub, GitLab, etc.
  - Work steps performed (the pipeline) are commonly defined in a YAML file
- Example platforms: Circle-CI, GitHub Actions, Gitlab-CI, Jenkins, Travis, etc.

>>> How to Choose Your CI/CD Tool?

- Already used within your organization
- Can access the code where it is already stored
- Has the necessary features
- Open source vs Commercial & Degree of Support Available
- Wide acceptance in your industry
- Wide acceptance in general

What is CI CD?


Build
Automated
Unit Test
Automated
Merge
Continuous Integration
Build
Automated
Unit Test
Automated
Merge
Automated
Acceptance Test
Automated
Deploy to Staging
Manual
Deploy to Production
Continuous Delivery
Build
Automated
Unit Test
Automated
Merge
Automated
Acceptance Test
Automated
Deploy to Staging
Automated
Deploy to Production
Continuous Deployment

>>> Test-Driven Development - TDD

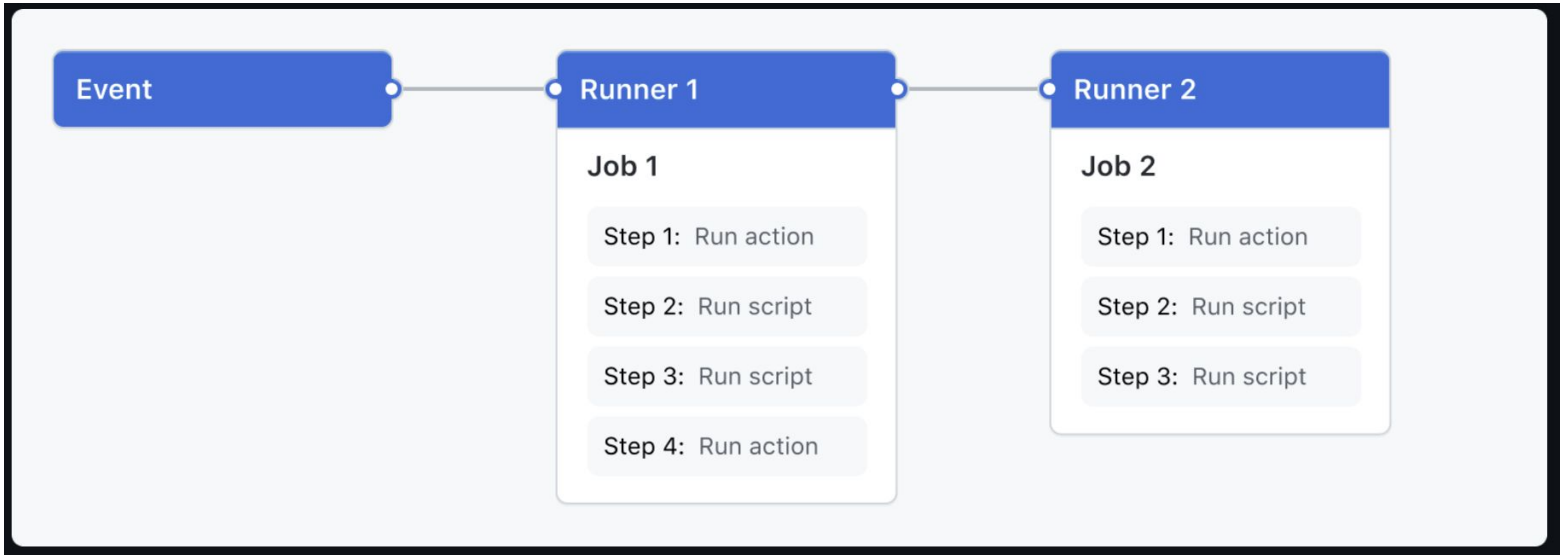
“Test-driven development (TDD) is a software development process relying on software requirements being converted to test cases before software is fully developed, and tracking all software development by repeatedly testing the software against all test cases. This is as opposed to software being developed first and test cases created later.”

- https://en.wikipedia.org/wiki/Test-driven_development

Because of the presence of Unit Tests, Acceptance Tests, and other types of testing, TDD may (but doesn’t always) integrate in with CI/CD.

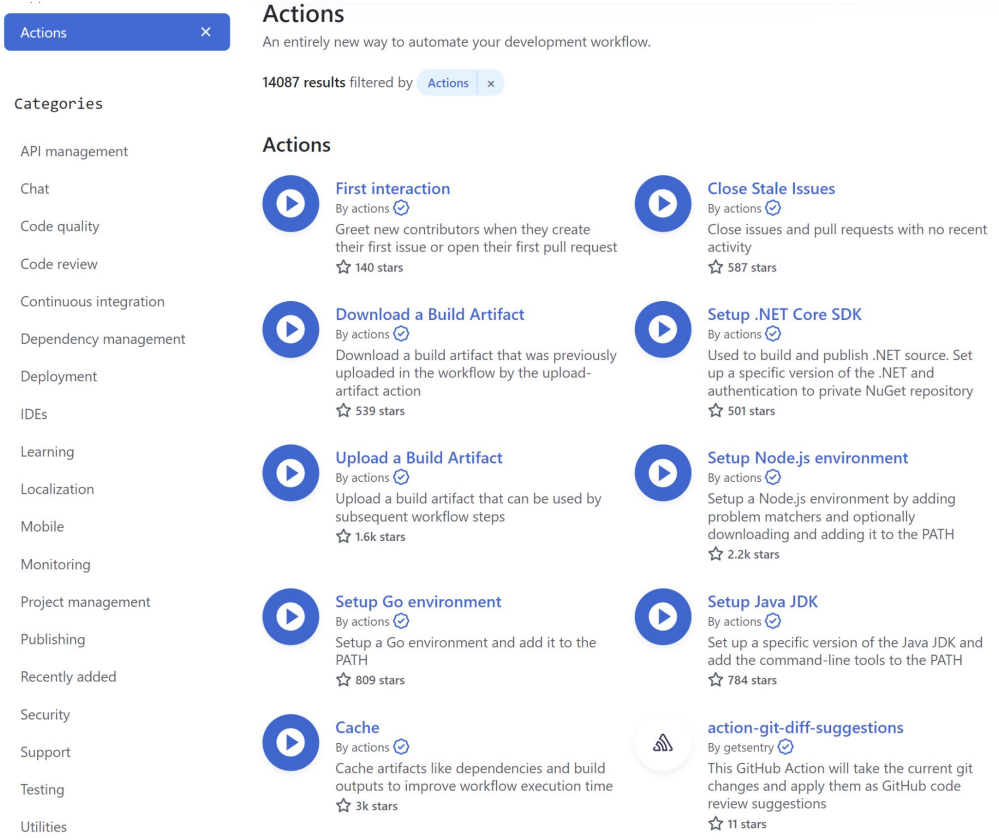
>>> Components of GitHub Actions (one example of CI/CD)

You can configure a GitHub Actions workflow to be triggered when an event occurs in your repository, such as a pull request being opened or an issue being created. Your workflow contains one or more jobs which can run in sequential order or in parallel. Each job will run inside its own virtual machine runner, or inside a container, and has one or more steps that either run a script that you define or run an action, which is a reusable extension that can simplify your workflow.



>>> GitHub Actions Marketplace

https://github.com/marketplace?type=actions



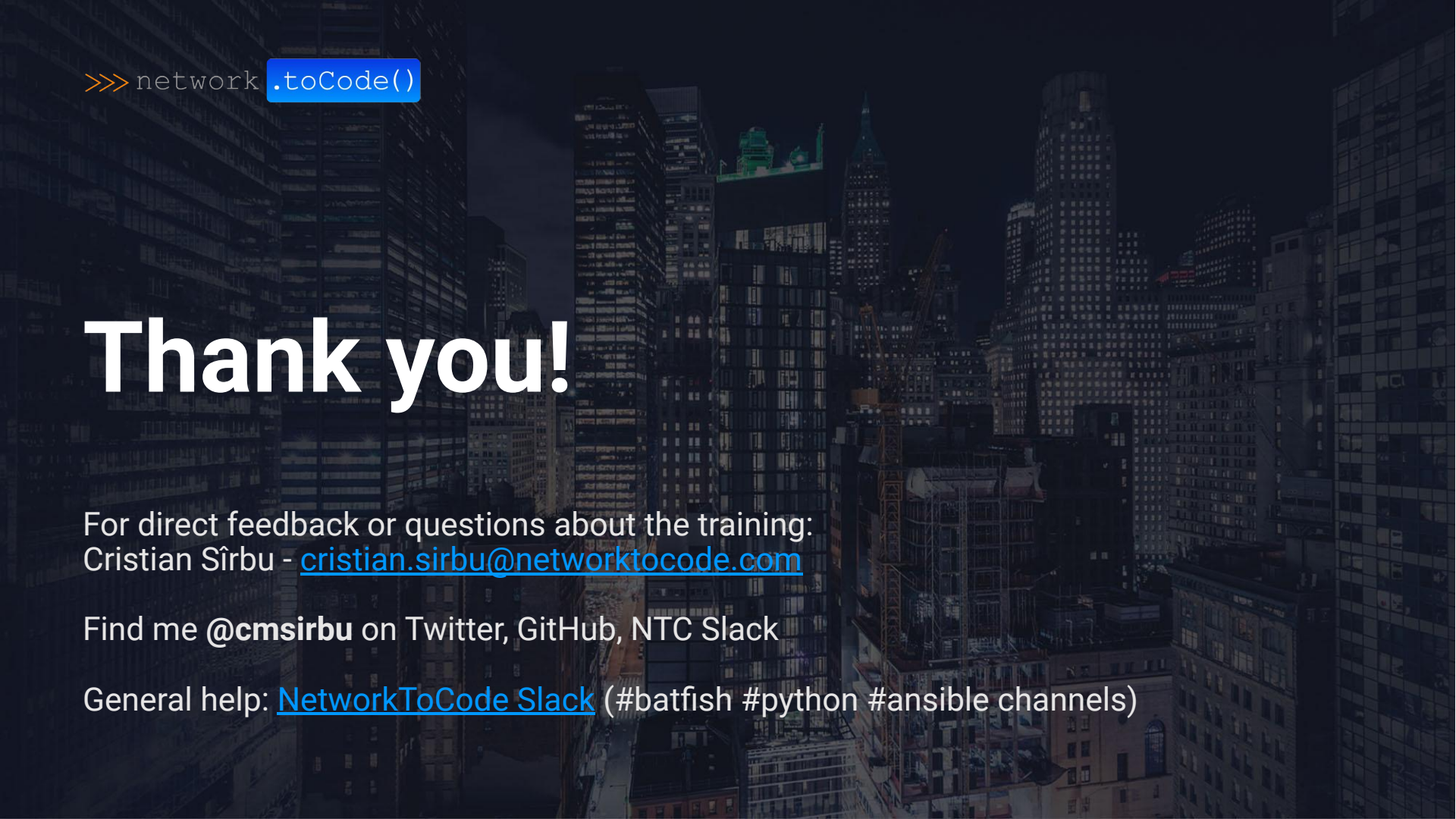

Demo - CI/CD with GitHub Actions

>>> Recap

- Git is great for collaboration and version control
- It has a learning curve
- CLI can make you more efficient
- VSCode extensions can improve productivity, e.g. GitLens

The Challenge

- **Lab 04 is a Challenge Lab!**
- You have to fix all the errors in the https://github.com/ntc-training/codelint repository
  - There are Python syntax and formatting errors
  - There are YAML syntax errors
  - There are Ansible specific errors
- Submit a Pull Request with your fixes and see that the CI Build is Green (Passed) in your PR.



Thank you!

For direct feedback or questions about the training:
Cristian Sîrbu - cristian.sirbu@networktocode.com

Find me **@cmsirbu** on Twitter, GitHub, NTC Slack

General help: NetworkToCode Slack (#batfish #python #ansible channels)

Extra Slides

>>> Useful Git and GitHub Resources

- Git Pro eBook: https://git-scm.com/book/en/v2
- GitHub Account Setup and Configuration: https://git-scm.com/book/en/v2/GitHub-Account-Setup-and-Configuration
- GitHub's Git Cheat Sheet: https://education.github.com/git-cheat-sheet-education.pdf
- Git External Links: https://git-scm.com/doc/ext
- Dang it Git: https://dangitgit.com/en
- A visual guide to Git internals: https://www.freecodecamp.org/news/git-internals-objects-branches-create-repo/
- Git Commit Comment Humor - https://xkcd.com/1296/

>>> Internal Git Terms:

- Blob: contents of a file (without the file metadata)
- Tree: directory listing of blobs and other trees
- Commit: snapshot of the working tree (with metadata)
- Branch: named reference to a commit
- HEAD: generally a pointer to the current branch
- Working directory: filesystem directory with .git repo
- Repository: collection of commits (with other info)
- Staging area (or Index): playground for the next commit

>>> Authentication with GitHub Today for Linux

For Linux, you need to configure the local GIT client with a username and email address,

$ git config --global user.name "your_github_username"

$ git config --global user.email "your_github_email"

$ git config -l

Once GIT is configured, we can begin using it to access GitHub. Example:

$ git clone https://github.com/YOUR-USERNAME/YOUR-REPOSITORY

> Cloning into `YOUR-REPOSITORY`...

Username: <type your username>

Password: <type your password or personal access token (GitHub)

Now cache the given record in your computer to remembers the token:

— Continued on next page —

>>> Authentication with GitHub Today for Linux (continued)

$ git config --global credential.helper cache

If needed, anytime you can delete the cache record by:

$ git config --global --unset credential.helper

$ git config --system --unset credential.helper

Now try to pull with -v to verify

$ git pull -v

Linux/Debian (Clone as follows):

git clone https://<tokenhere>@github.com/<user>/<repo>.git

>>> Authentication with GitHub Today for OSX

Click on the Spotlight icon (magnifying glass) on the right side of the menu bar. Type Keychain access and then press the Enter key to launch the app. In Keychain Access, search for github.com, find the internet password entry for github.com, and Edit or Delete the entry accordingly.

>>> Authentication with GitHub Today for Windows

Go to Credential Manager from Control Panel => Windows Credentials

Click on git:https://github.com

Click on Edit and replace the Password with your GitHub Personal Access Token

Click on Save

If you don't find git:https://github.com, click on Add a generic credential and enter:

- Internet address - git:https://github.com
- Your username and
- Your GitHub Personal Access Token as the password
- Click Ok