MkDocs CI/CD

Note

Although this article assumes the same setup as mi k3s cluster, it can be very easily changed to suit your needs.

What ?

In this article I note down how I set up automated build and upload of this site to the web using GitLab.

This side is generated from ***Markdown*** type files using MkDocs https://www.mkdocs.org/, which is super useful for generating a technical documentation style site that is fast and clear to read.

Old process

I store the source of this page in my private GitLab that is running on a server inside my network. I could deploy it to my K3s server, however GitLab is quite a hefty boy, and to avoid issues I run it on an Unraid server with a reverse proxy, so I can access it from the Internet through HTTPS.

So, my old process was to have GitHub Desktop to sync folders from GitLab to my local PC. I edited the files locally, then built the site using `mkdocs build` and manually logged in to FTP of my website and uploaded the files. Then I would sync all changes to GitLab.

This works fine if you do small changes once a month 🙂. However, I find typos and add new pages quite often and it is taking forever, it's 2021! I should get out of a cave and set up CI/CD.

This is the new way !

Note

I know you can set up this in GitHub and publish directly there, but this is using what I have at home...

CI/CD I'm going to setup will do the following:

- I edit the page locally
- Push to GitLab
- GitLab provision docker image on my rpi4 (Image we build containing what we need)
- Build using MkDocs in that docker image
- Upload the result to my hosting
- Nuke the docker container

I know there are ways to do this without a docker like linking your Kubernetes cluster to GitLab, but I decided that Kubernetes is complicated enough and this is a simple task. Another option is to run `gitlab runner` directly on your machine, but this requires to run it as root as far as I remember so no... Nice middle part is using GitLab runner in docker and have it separated from OS a little using docker images, while avoiding complexity of Kubernetes.

Why ?

There are a ton of different ways this can be achieved, but I had ulterior motives in writing this. I also think this might be a nice intro to CI/CD tools in GitLab, which I like a lot (but they are not perfect). It is like having Jenkins bundled with your Git. Sharp, right?

How ?

This is not a guide from ground zero, there are some ***pre-requisites***:

- ***GitLab*** - I'm using my own locally hosted, perhaps free account on GitLab would work the same..
- ***Docker Register*** - Again, I'm using my own deployed on K3s, but any other docker registry could work.
- ***Raspberry Pi 4 with Docker*** - Again, I'm using my control01 from my Kubernetes cluster, but any Linux with docker should do the trick.

Custom Docker image

We can start with a custom Docker image. GitLab runner, a software that will execute your commands from GitLab's `.gitlab-ci.yml` file, will use this image by copying git where your site `.md` files are and execute whatever you like. So, we know that MkDocs is running the `mkdocs build` command to build the site, and in my case it also needs additional plugins and themes pre-installed in builde

Therefore, on my `control01` rpi4 server I have created new folder `mkdocs-builder` and in it I have made a new file, `Dockerfile`, containing:

```
FROM alpine:latest

RUN \
  apk add --update \
  ca-certificates \
  bash \
  git \
  openssh \
  python3 \
  python3-dev \
  py3-pip \
  lftp \
  build-base && \
  pip install --upgrade pip && \
  pip install mkdocs && \
  pip install mkdocs-minify-plugin && \
  pip install mkdocs-drawio-exporter && \
  pip install mkdocs-material && \
  pip install mkdocs-ko-fi-button-plugin && \
  pip install mkdocs-windmill && \
  pip install mkdocs-git-revision-date-localized-plugin && \
  pip install mkdocs-windmill-dark && \
  rm -rf /tmp/* /var/tmp/* /var/cache/apk/* /var/cache/distfiles/*

CMD ["sh", "-c", "tail -f /dev/null"]
```

As you can deduct from the lines, it will use `alpine:latest` image (because alpine is built for almost all architectures), then it installs git and other software. Next, pip installs MkDocs with all the plugins I need. Lastly, cleanup. The last line will make sure that Docker container will not exit the moment it starts; docker needs some process to be running.

This give us all that we need to build our page and push it via ftp using `lftp`.

Build it and push it to the registry of your choice. The one mentioned in this command is my local one.

```
root@control01:/home/ubuntu/mkdocs-builder# docker build . -t registry.cube.local:5000/mkdocs-builder
root@control01:/home/ubuntu/mkdocs-builder# docker push registry.cube.local:5000/mkdocs-builder
```

Nicely done! Our mkdocs-builder image is snugly stored in Docker Registry. Let's move on!

GitLab Runners

This is a small client/software that talks to GitLab server, either your own or the public one, and executes your commands. There is more to it than that, like reporting back with the results so you can see it nicely in GitLab web UI, or handling build files through stages... but that's not important now.

Also, there are more options for running this GitLb Runners, read more here: https://docs.gitlab.com/runner/. We are using the Docker choice.

First, create docker volume to store config in. You will most likely never have to edit this manually.

```
root@control01:/home/ubuntu/mkdocs-builder# docker volume create gitlab-runner-config
```

Deploy a small container with GitLab runner (this one will be always on).

```
docker run -d --name gitlab-runner --restart always \
    -v /var/run/docker.sock:/var/run/docker.sock \
    -v gitlab-runner-config:/etc/gitlab-runner \
    gitlab/gitlab-runner:latest
```

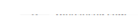
Now we trigger the registration process to your GitLab.

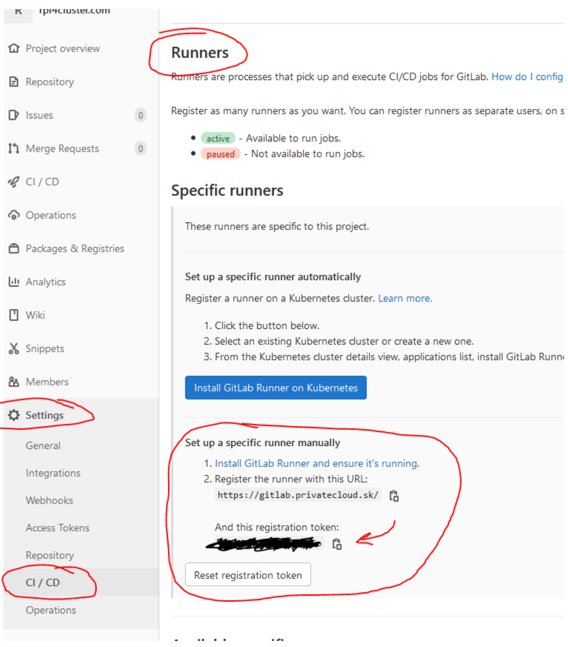
```
docker run --rm -it -v gitlab-runner-config:/etc/gitlab-runner gitlab/gitlab-runner:latest register
```

You are asked a few questions, but none except URL and token are important: you can change that later.

```
Enter the GitLab instance URL (for example, https://gitlab.com/):
https://gitlab.privatecloud.sk
Enter the registration token:
sometoken
Enter a description for the runner:
[159002b83191]: rpi4cluster
Enter tags for the runner (comma-separated):
rpi, kubernetes, rpi
Registering runner... succeeded
Enter an executor:
docker
Enter the default Docker image (for example, ruby:2.6):
ubuntu:20.04
```

But hold on you sexy beast, ***where do I get that magical token***? Go into your ***GitLab instance -> Your project -> Settings -> CI/CD and expand Runners***.





Runners

Runners are processes that pick up and execute CI/CD jobs for GitLab. How do I config

Register as many runners as you want. You can register runners as separate users, on s

- active - Available to run jobs.
- paused - Not available to run jobs.

Specific runners

These runners are specific to this project.

Set up a specific runner automatically

Register a runner on a Kubernetes cluster. Learn more.

1. Click the button below.
2. Select an existing Kubernetes cluster or create a new one.
3. From the Kubernetes cluster details view, applications list, install GitLab Runn

Install GitLab Runner on Kubernetes

Set up a specific runner manually

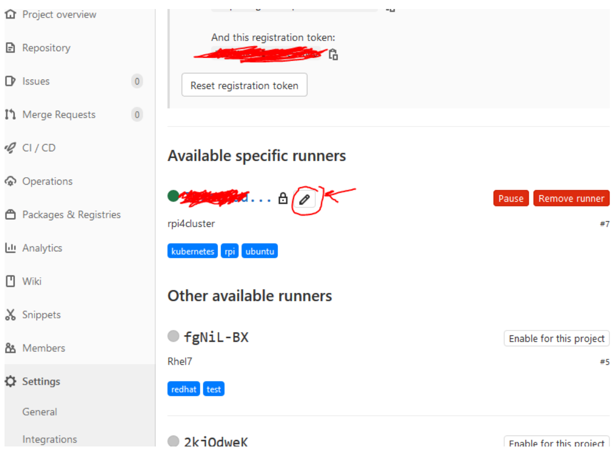
1. Install GitLab Runner and ensure it's running.
2. Register the runner with this URL:
   `https://gitlab.privatecloud.sk/`

   And this registration token:
   [redacted]

Reset registration token

If all went right, you should have Runner in green right under the place where you got the token.

You can edit a few things by clicking on the pen icon, if you like.



And this registration token:
[redacted]

Reset registration token

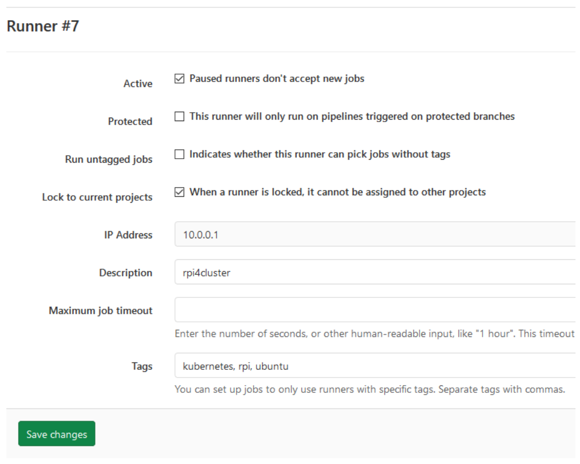
Available specific runners

[redacted]... Pause Remove runner
rpi4cluster #7
kubernetes rpi ubuntu

Other available runners

fgNiL-BX Enable for this project
Rhel7 #5
redhat test

2kjOdweK Enable for this project



Runner #7

Active	☑ Paused runners don't accept new jobs
Protected	☐ This runner will only run on pipelines triggered on protected branches
Run untagged jobs	☐ Indicates whether this runner can pick jobs without tags
Lock to current projects	☑ When a runner is locked, it cannot be assigned to other projects
IP Address	10.0.0.1
Description	rpi4cluster
Maximum job timeout	Enter the number of seconds, or other human-readable input, like "1 hour". This timeout
Tags	kubernetes, rpi, ubuntu You can set up jobs to only use runners with specific tags. Separate tags with commas.

Save changes

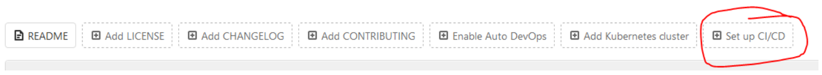
Important

Keep in mind the tags. We will use them later on.

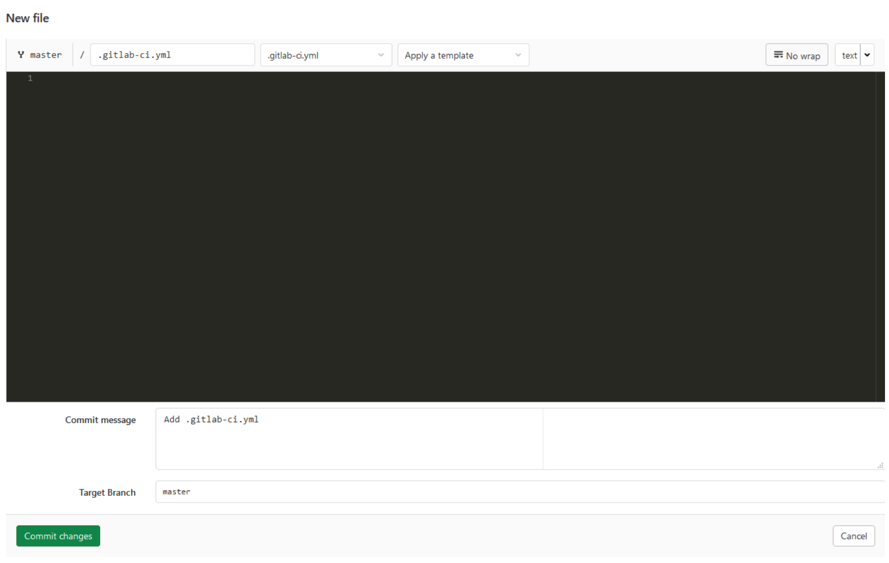
.gitlab-ci.yml

Now that we have set up Docker image we use for building and Docker hosted GitLab Runner, we can create `.gitlab-ci.yml`, which tells GitLab what to do. Apart from a few details, think of this as a set of commands you would type if you deployed your stuff manually, built the program and copied it somewhere, run unit tests, etc...

Go to your project main page, and if you never set up CI/CD, you should have button like this `Set up CI/CD`:



Clicking on it, you will automagically get `.gitlab-ci.yml` in your repository and editor to edit.


New file

master / .gitlab-ci.yml

Commit message: Add .gitlab-ci.yml

Target Branch: master

This is what is in mine, and I will explain it:

```
image: registry.cube.local:5000/mkdocs-builder

stages:
  - deploy

Build and Upload:
    stage: deploy
    tags:
        - rpi
    script:
        - mkdocs build
        - cp -rT web-server-files site
        - lftp -e "set ssl:verify-certificate no; open ftp.rpi4cluster.com; user $FTP_USERNAME $FTP_PASSWORD; set ftp:list-options -a; mirror --reverse --verbose --
delete site/ rpi4cluster.com/web/; bye"
```

Lets go line by line:

`image: registry.cube.local:5000/mkdocs-builder` - We are telling the GitLab Runner to use our image, it will look for it, deploy it and copy our git in it by itself.

`stages:` and `- deploy` - You can define multiple stages like build, test, deployment. The naming does not matter. It's important to keep in mind that GitLab Runner will create a new Docker Container for each stage, and if you do not use Artifacts (a method of storing data between stages) your deploy stage will not have the data you made in the build stage. Read more about artifacts here: GitLab Artifacts. I will make a separate page about this to make it clear: it's not difficult once explained.

`Build and Upload:` - name of ***Job*** this name you will see in GitLab UI, it will be clear when I show you a picture later down.

`stage: deploy` - Here you need to specify which stage it actually is, and it has to match the `stages:` list. Stages are executed one by one as specified in `stages:`, particular stages do not have to be in that order in the yaml file.

`tags:` and `- rpi` - Remember when I mentioned tags when deploying GitLab Runner ? Well, here you need to specify the same tags that the Runner has, otherwise it will not be picked up. This makes it so you can use different runners, for example you wanted to test your code on RedHat and Suse, each are separate machines with their own runners, just tagged appropriately. An example of this will come later; it's not needed here.

`script:` - Here we literally write out shell commands for the runner to execute one by one. Your runner will be in your git main root folder by default, so no need to specify full paths to files.

I'm executing `mkdocs build` to build the web, this will create everything in the folder `site`. Then I copy the files from `web-server-files` into the `site` folder. This mainly contains `robots.txt` and `.htaccess`, which are not generated by MkDocs.

In the end, everything is synced to my web hosting FTP server with lftp.

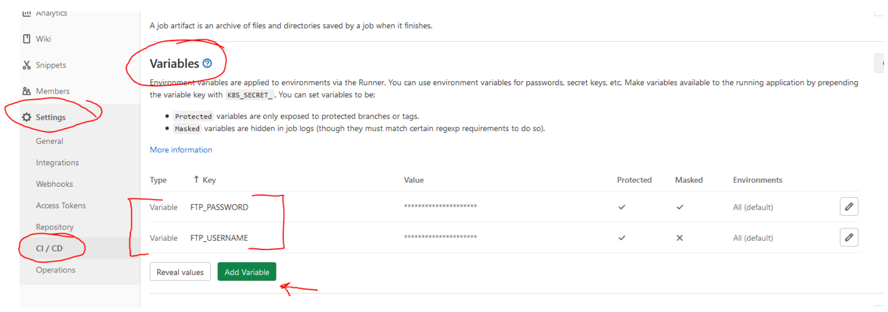
```
- set ssl:verify-certificate no # Ignore if ssl cert does not match
- open ftp.rpi4cluster.com # Open link to my FTP server
- user $FTP_USERNAME $FTP_PASSWORD # Use username and password from variables
- set ftp:list-options -a # List and see all files including .hidden ones
- mirror --reverse --verbose --delete #Reverse so the local folder is source,
#and delete to keep in sync, so when I delete in local it will be removed from ftp server as well
- site/ rpi4cluster.com/web/  #site is folder where the generated web is
#and the other path is path on ftp server.
- bye # Close the connection
```

Environmental variables or how to hide passwords

Where did you get `$FTP_USERNAME` and `$FTP_PASSWORD` from? Right, these are environmental variables passed to, well... the environment, by the GitLab Runner. A great place to hide sensitive information like passwords and usernames. If you host your gitlab and the repository is public, and keep this in your code anybody could see this sensitive data. There are literally scanners that looks for this mistakes to exploit in public Git, so be careful.

We can set these in: `Your project -> Settings -> CI / CD -> expand Variables`

Mine looks like this:



A job artifact is an archive of files and directories saved by a job when it finishes.

Variables

Environment variables are applied to environments via the Runner. You can use environment variables for passwords, secret keys, etc. Make variables available to the running application by prepending the variable key with `K8S_SECRET_`. You can set variables to be:

- `Protected` variables are only exposed to protected branches or tags.
- `Masked` variables are hidden in job logs (though they must match certain regexp requirements to do so).

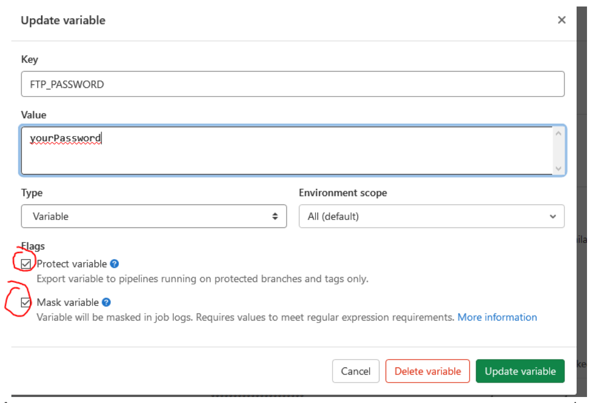
More information

Type	↑ Key	Value	Protected	Masked	Environments
Variable	FTP_PASSWORD	********************	✓	✓	All (default)
Variable	FTP_USERNAME	********************	✓	✗	All (default)

Simply click `Add Variable`

For ***User*** just check ***Protect variable***

For ***Password*** make sure the value/password is base64 compatible, and than you can check both ***Protect and Mask*** . This will never display your password in the CI/CD pipeline.


Update variable

Key: FTP_PASSWORD

Value: yourPassword

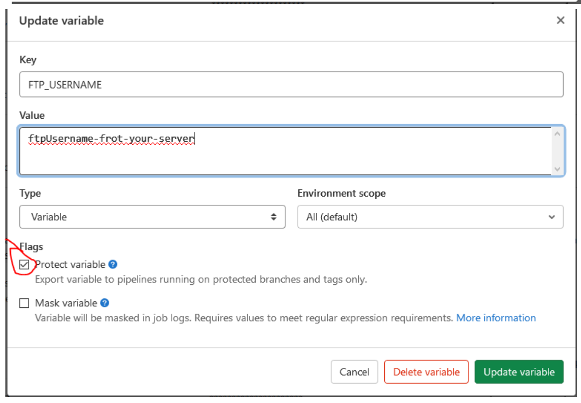
Type: Variable

Environment scope: All (default)

Flags

☑ Protect variable
Export variable to pipelines running on protected branches and tags only.

☑ Mask variable
Variable will be masked in job logs. Requires values to meet regular expression requirements. More information


Update variable

Key: FTP_USERNAME

Value: ftpUsername-frot-your-server

Type: Variable

Environment scope: All (default)

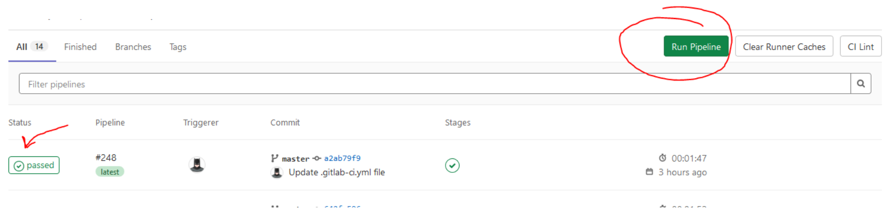
Flags

☑ Protect variable
Export variable to pipelines running on protected branches and tags only.

☐ Mask variable
Variable will be masked in job logs. Requires values to meet regular expression requirements. More information

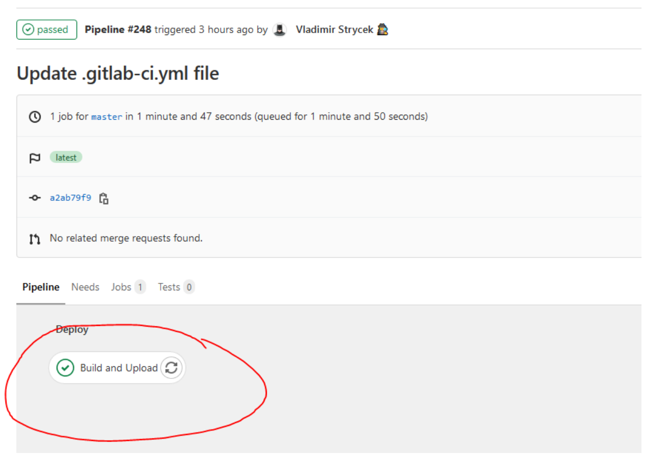
Look at me go Mom!

As soon as there are detected changes in git, CI/CD will kick in and try to run the task we set up. You can watch this in ***Your Project -> CI / CD***. This is where you can trigger it by clicking on `Run Pipeline`.



Status	Pipeline	Triggerer	Commit	Stages	
passed	#248 latest		master a2ab79f9 Update .gitlab-ci.yml file	✓	00:01:47 3 hours ago

And when you trigger it, you will see the jobs below, and when you click on the Status you can observe the whole process.


passed **Pipeline #248** triggered 3 hours ago by **Vladimir Strycek**

Update .gitlab-ci.yml file

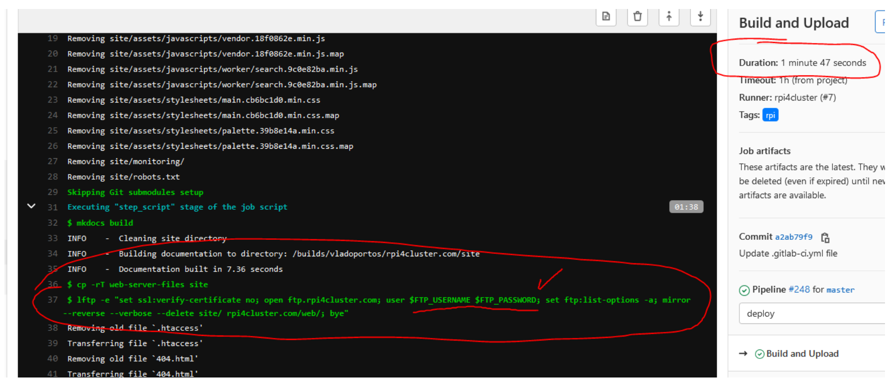
1 job for `master` in 1 minute and 47 seconds (queued for 1 minute and 50 seconds)

latest

a2ab79f9

No related merge requests found.

Above, as you can see, is the stage we named `Build and Upload` in `.gitlab-ci.yml`. Clicking on that will give you console output, and you can watch this happening semi-live when it is building.


```
Removing site/assets/javascripts/vendor.18f0862e.min.js
Removing site/assets/javascripts/vendor.18f0862e.min.js.map
Removing site/assets/javascripts/worker/search.9c0e82ba.min.js
Removing site/assets/javascripts/worker/search.9c0e82ba.min.js.map
Removing site/assets/stylesheets/main.cb6bc1d0.min.css
Removing site/assets/stylesheets/main.cb6bc1d0.min.css.map
Removing site/assets/stylesheets/palette.39b8e14a.min.css
Removing site/assets/stylesheets/palette.39b8e14a.min.css.map
Removing site/monitoring/
Removing site/robots.txt
Skipping Git submodules setup
Executing "step_script" stage of the job script                01:38
$ mkdocs build
INFO    -  Cleaning site directory
INFO    -  Building documentation to directory: /builds/vladoportos/rpi4cluster.com/site
INFO    -  Documentation built in 7.36 seconds
$ cp -rT web-server-files site
$ lftp -e "set ssl:verify-certificate no; open ftp.rpi4cluster.com; user $FTP_USERNAME $FTP_PASSWORD; set ftp:list-options -a; mirror
--reverse --verbose --delete site/ rpi4cluster.com/web/; bye"
Removing old file `.htaccess'
Transferring file `.htaccess'
Removing old file `404.html'
Transferring file `404.html'
```

Build and Upload

Duration: 1 minute 47 seconds
Timeout: 1h (from project)
Runner: rpi4cluster (#7)
Tags: rpi

Job artifacts
These artifacts are the latest. They w
be deleted (even if expired) until nev
artifacts are available.

Commit a2ab79f9
Update .gitlab-ci.yml file

Pipeline #248 for master

deploy

→ Build and Upload

As you can see, the username and password are hidden.

No auto build !

Maybe you don't want the CI/CD pipeline to execute every time something changes and want to do it manually, the solution is to add following to your job `.gitlab-ci.yml`.

```
.
.
.
Build and Upload:
    stage: deploy
    rules:
        - when: manual
    tags:
        - rpi
.
.
.
```

Read more about rules here: GitLab Rules

Meta

Just to be super "meta", this is the first page I have added that uses this automatic process 🙂.

This took a while to regurgitate so what do you think, do I deserve a drink?

Liked it ? Buy me a drink :)

Last update: May 26, 2022

Comments