Course End Project: Creating a Docker Image and Deploying It on a Swarm Cluster

https://github.com/paglipay/paglipay-dca-end-course-1

Project Objective:

As a DevOps engineer in an IT firm, the objective is to create a Redis-based Docker image and deploy it on a Swarm cluster.

Background:

The organization requires Redis for data storage and caching within a Swarm cluster. The development team requests the creation of a Redis-based Docker image using a Dockerfile and its deployment on the Swarm cluster. Additionally, it's necessary to publish this image on the organization's Docker Hub account for accessibility by other team members.

Requirements:

- Utilize Docker CLI to create the Docker image and deploy it on the Swarm cluster.
- Publish the Docker image on Docker Hub.
- Document the step-by-step process for completion.

Steps Involved:

1. **Set Up Docker Environment:**
    - Install Docker on your local machine if not already installed.
    - Make sure Docker Swarm is initialized on the cluster where you intend to deploy the application.
2. **Create Dockerfile:**
    - Create a `Dockerfile` specifying the instructions to build the Redis-based image.
    - This file typically includes commands to pull the Redis base image, expose necessary ports, set configurations, etc.

- Example:
- `# Dockerfile`
- `FROM alpine:latest`
- `RUN apk add --no-cache redis`
- `EXPOSE 6379`
- `CMD ["redis-server"]`

3. **Build Docker Image:**
    - Navigate to the directory containing the `Dockerfile`.
    - Use the `docker build` command to build the Docker image.

```
docker build --pull --rm -f "Dockerfile" -t paglipay/redis:latest "."
```

4. **Test Docker Image Locally:**
    - Run a container using the newly created image to ensure it works as expected.

```
docker run --rm -it -p 6379:6379/tcp paglipay/redis:latest
```

5. **Push Image to Docker Hub:**
    - Log in to your Docker Hub account using the `docker login` command.

```
docker login
```

Tag the built image with your Docker Hub username and repository name.

```
docker tag paglipay/redis paglipay/redis
```

Push the tagged image to Docker Hub.

```
docker push paglipay/redis
```

6. **Deploy Image on Swarm Cluster Using Docker Compose:**
    - Create a `docker-compose.yml` file with the following content:

```
version: '3.9'

services:
  redis:
    image: paglipay/redis:latest
    deploy:
      replicas: 3 # adjust the number of replicas as needed
    ports:
      - "6379:6379"
```

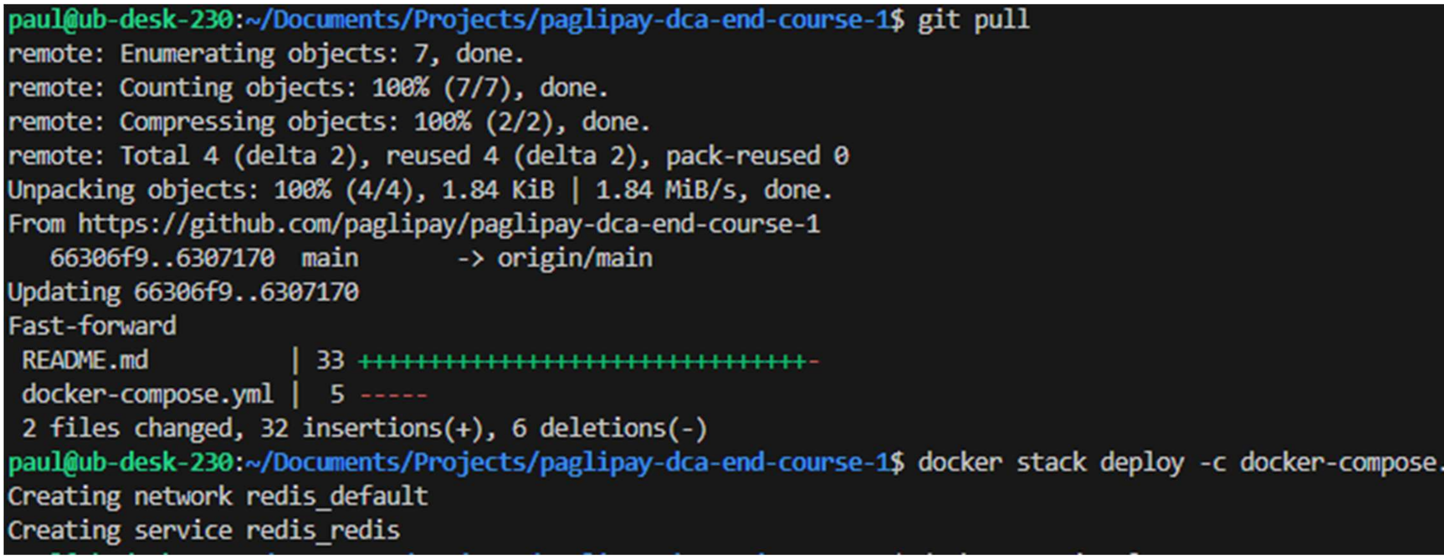
7. **Verify Deployment:**
   - Confirm that the Redis service is running on the Swarm cluster.

```
docker service ls
```

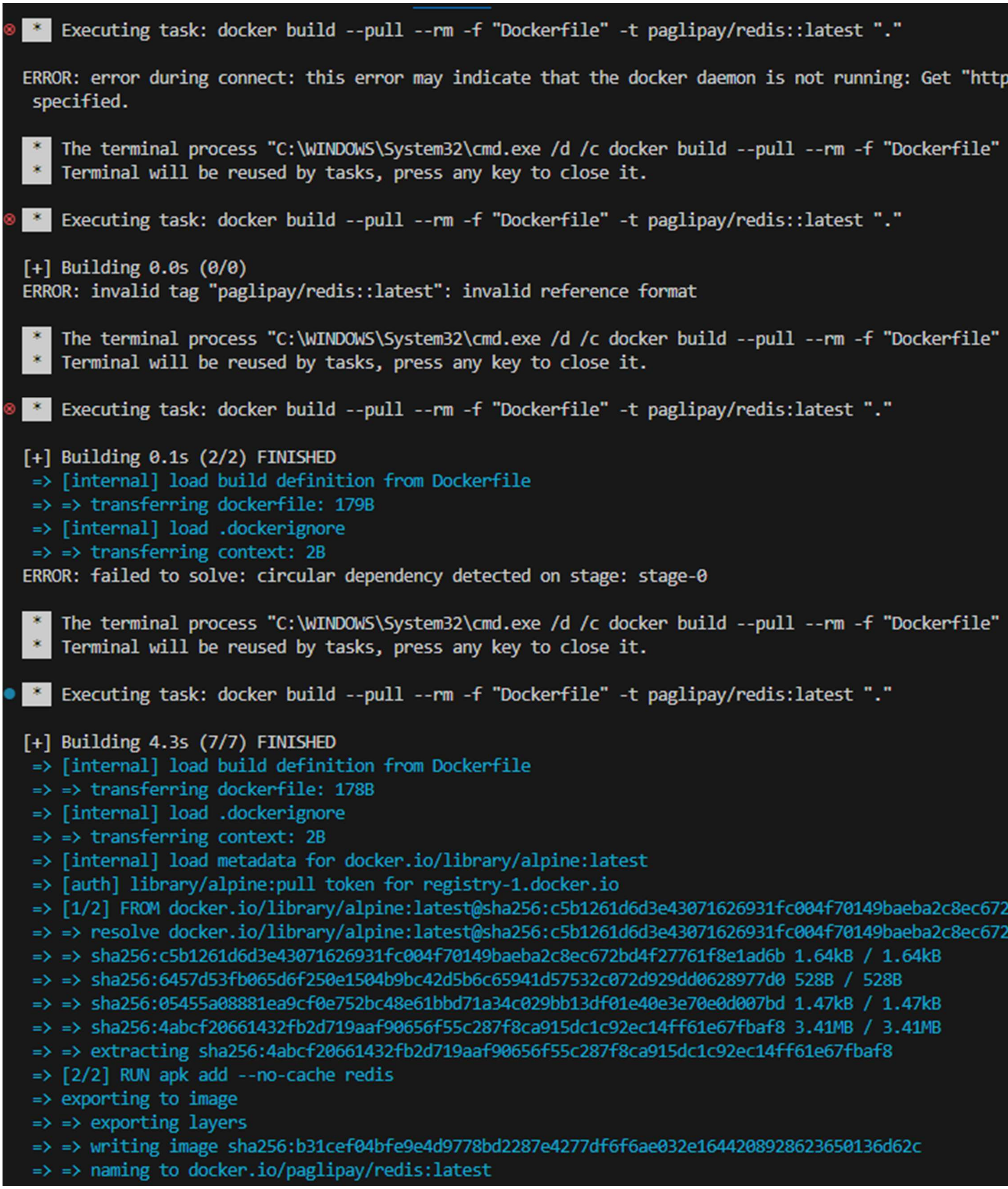
Output:

```
docker stack deploy -c docker-compose.yml redis
 Creating network redis_default
 Creating service redis_redis
 paul@ub-desk-230:~/Documents/Projects/paglipay-dca-end-course-1$
docker service ls
 ID             NAME                              MODE         REPLICAS
IMAGE                                              PORTS
 c5vvk57aysjs   redis_redis                       replicated   3/3
paglipay/redis:latest
```

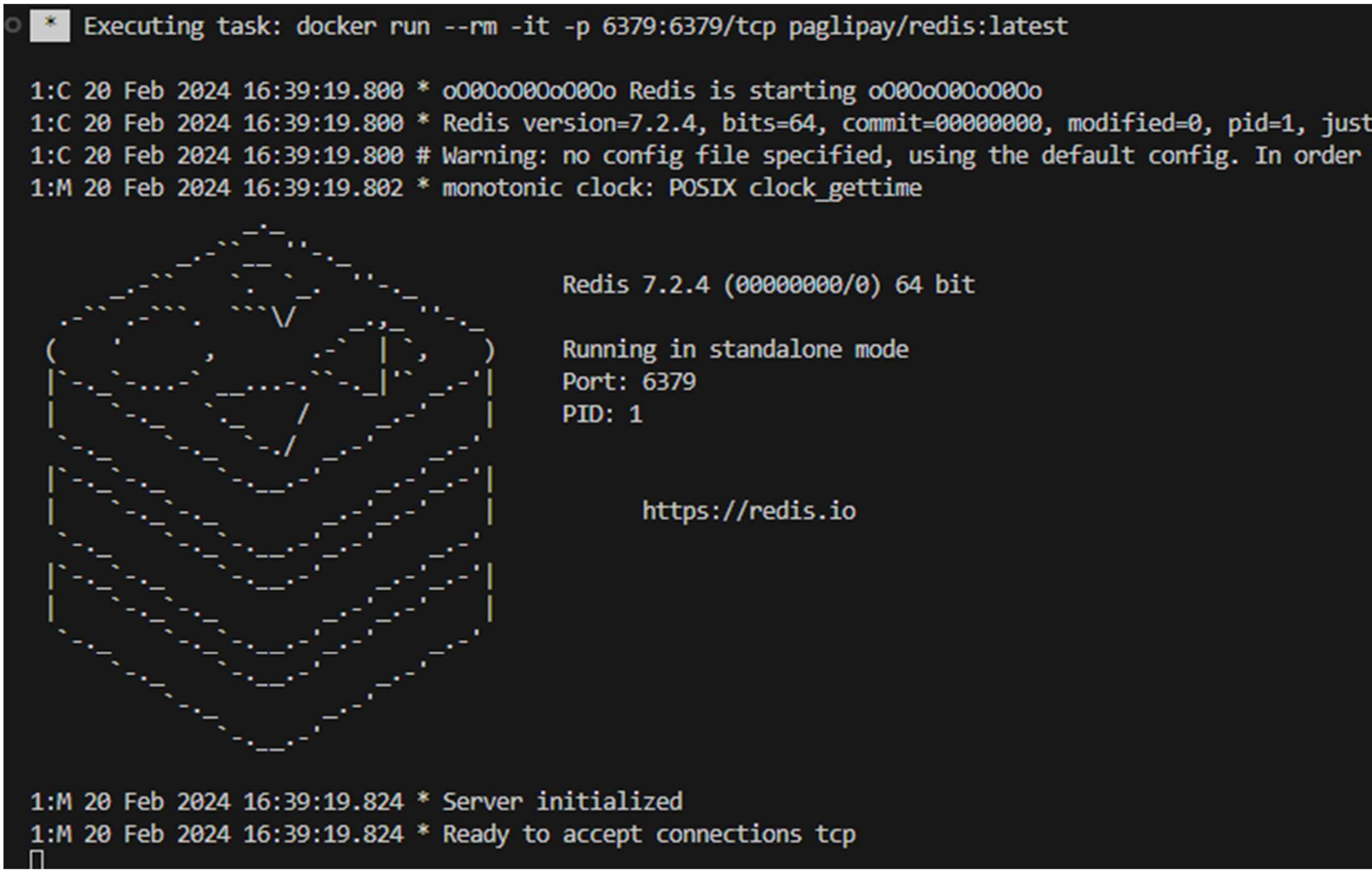
Gallery



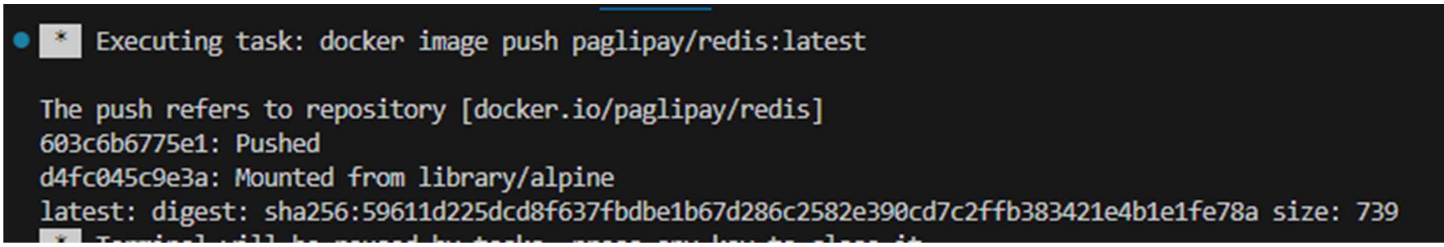
```
paul@ub-desk-230:~/Documents/Projects/paglipay-dca-end-course-1$ git pull
remote: Enumerating objects: 7, done.
remote: Counting objects: 100% (7/7), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 4 (delta 2), reused 4 (delta 2), pack-reused 0
Unpacking objects: 100% (4/4), 1.84 KiB | 1.84 MiB/s, done.
From https://github.com/paglipay/paglipay-dca-end-course-1
   66306f9..6307170  main       -> origin/main
Updating 66306f9..6307170
Fast-forward
 README.md          | 33 +++++++++++++++++++++++++++++++++-
 docker-compose.yml |  5 -----
 2 files changed, 32 insertions(+), 6 deletions(-)
paul@ub-desk-230:~/Documents/Projects/paglipay-dca-end-course-1$ docker stack deploy -c docker-compose.
Creating network redis_default
Creating service redis_redis
```



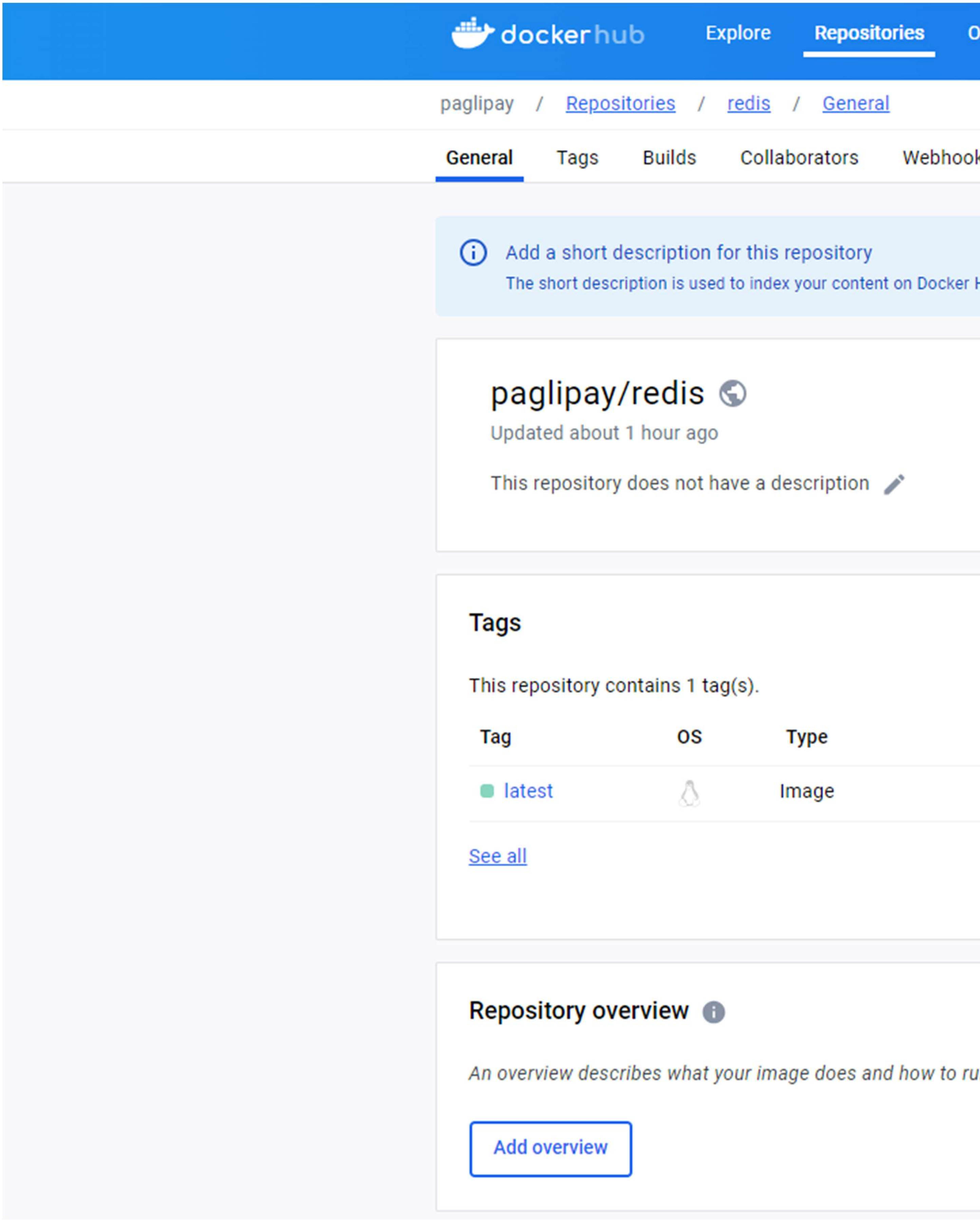
```
 *  Executing task: docker build --pull --rm -f "Dockerfile" -t paglipay/redis::latest "."

ERROR: error during connect: this error may indicate that the docker daemon is not running: Get "http
 specified.

 *  The terminal process "C:\WINDOWS\System32\cmd.exe /d /c docker build --pull --rm -f "Dockerfile"
 *  Terminal will be reused by tasks, press any key to close it.

 *  Executing task: docker build --pull --rm -f "Dockerfile" -t paglipay/redis::latest "."

[+] Building 0.0s (0/0)
ERROR: invalid tag "paglipay/redis::latest": invalid reference format

 *  The terminal process "C:\WINDOWS\System32\cmd.exe /d /c docker build --pull --rm -f "Dockerfile"
 *  Terminal will be reused by tasks, press any key to close it.

 *  Executing task: docker build --pull --rm -f "Dockerfile" -t paglipay/redis:latest "."

[+] Building 0.1s (2/2) FINISHED
 => [internal] load build definition from Dockerfile
 => => transferring dockerfile: 179B
 => [internal] load .dockerignore
 => => transferring context: 2B
ERROR: failed to solve: circular dependency detected on stage: stage-0

 *  The terminal process "C:\WINDOWS\System32\cmd.exe /d /c docker build --pull --rm -f "Dockerfile"
 *  Terminal will be reused by tasks, press any key to close it.

 *  Executing task: docker build --pull --rm -f "Dockerfile" -t paglipay/redis:latest "."

[+] Building 4.3s (7/7) FINISHED
 => [internal] load build definition from Dockerfile
 => => transferring dockerfile: 178B
 => [internal] load .dockerignore
 => => transferring context: 2B
 => [internal] load metadata for docker.io/library/alpine:latest
 => [auth] library/alpine:pull token for registry-1.docker.io
 => [1/2] FROM docker.io/library/alpine:latest@sha256:c5b1261d6d3e43071626931fc004f70149baeba2c8ec672
 => => resolve docker.io/library/alpine:latest@sha256:c5b1261d6d3e43071626931fc004f70149baeba2c8ec672
 => => sha256:c5b1261d6d3e43071626931fc004f70149baeba2c8ec672bd4f27761f8e1ad6b 1.64kB / 1.64kB
 => => sha256:6457d53fb065d6f250e1504b9bc42d5b6c65941d57532c072d929dd0628977d0 528B / 528B
 => => sha256:05455a08881ea9cf0e752bc48e61bbd71a34c029bb13df01e40e3e70e0d007bd 1.47kB / 1.47kB
 => => sha256:4abcf20661432fb2d719aaf90656f55c287f8ca915dc1c92ec14ff61e67fbaf8 3.41MB / 3.41MB
 => => extracting sha256:4abcf20661432fb2d719aaf90656f55c287f8ca915dc1c92ec14ff61e67fbaf8
 => [2/2] RUN apk add --no-cache redis
 => exporting to image
 => => exporting layers
 => => writing image sha256:b31cef04bfe9e4d9778bd2287e4277df6f6ae032e16442089286236501 36d62c
 => => naming to docker.io/paglipay/redis:latest
```



```
* Executing task: docker run --rm -it -p 6379:6379/tcp paglipay/redis:latest

1:C 20 Feb 2024 16:39:19.800 * oO0OoO0OoO0Oo Redis is starting oO0OoO0OoO0Oo
1:C 20 Feb 2024 16:39:19.800 * Redis version=7.2.4, bits=64, commit=00000000, modified=0, pid=1, just
1:C 20 Feb 2024 16:39:19.800 # Warning: no config file specified, using the default config. In order
1:M 20 Feb 2024 16:39:19.802 * monotonic clock: POSIX clock_gettime
                _._
           _.-``__ ''-._
      _.-``    `.  `_.  ''-._           Redis 7.2.4 (00000000/0) 64 bit
  .-`` .-```.  ```\/    _.,_ ''-._
 (    '      ,       .-`  | `,    )     Running in standalone mode
 |`-._`-...-` __...-.``-._|'` _.-'|     Port: 6379
 |    `-._   `._    /     _.-'    |     PID: 1
  `-._    `-._  `-./  _.-'    _.-'
 |`-._`-._    `-.__.-'    _.-'_.-'|
 |    `-._`-._        _.-'_.-'    |           https://redis.io
  `-._    `-._`-.__.-'_.-'    _.-'
 |`-._`-._    `-.__.-'    _.-'_.-'|
 |    `-._`-._        _.-'_.-'    |
  `-._    `-._`-.__.-'_.-'    _.-'
      `-._    `-.__.-'    _.-'
          `-._        _.-'
              `-.__.-'

1:M 20 Feb 2024 16:39:19.824 * Server initialized
1:M 20 Feb 2024 16:39:19.824 * Ready to accept connections tcp
```



```
* Executing task: docker image push paglipay/redis:latest

The push refers to repository [docker.io/paglipay/redis]
603c6b6775e1: Pushed
d4fc045c9e3a: Mounted from library/alpine
latest: digest: sha256:59611d225dcd8f637fbdbe1b67d286c2582e390cd7c2ffb383421e4b1e1fe78a size: 739
* Terminal will be reused by tasks, press any key to close it.
```



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The short description is used to index your content on Docker H

paglipay/redis

Updated about 1 hour ago

This repository does not have a description

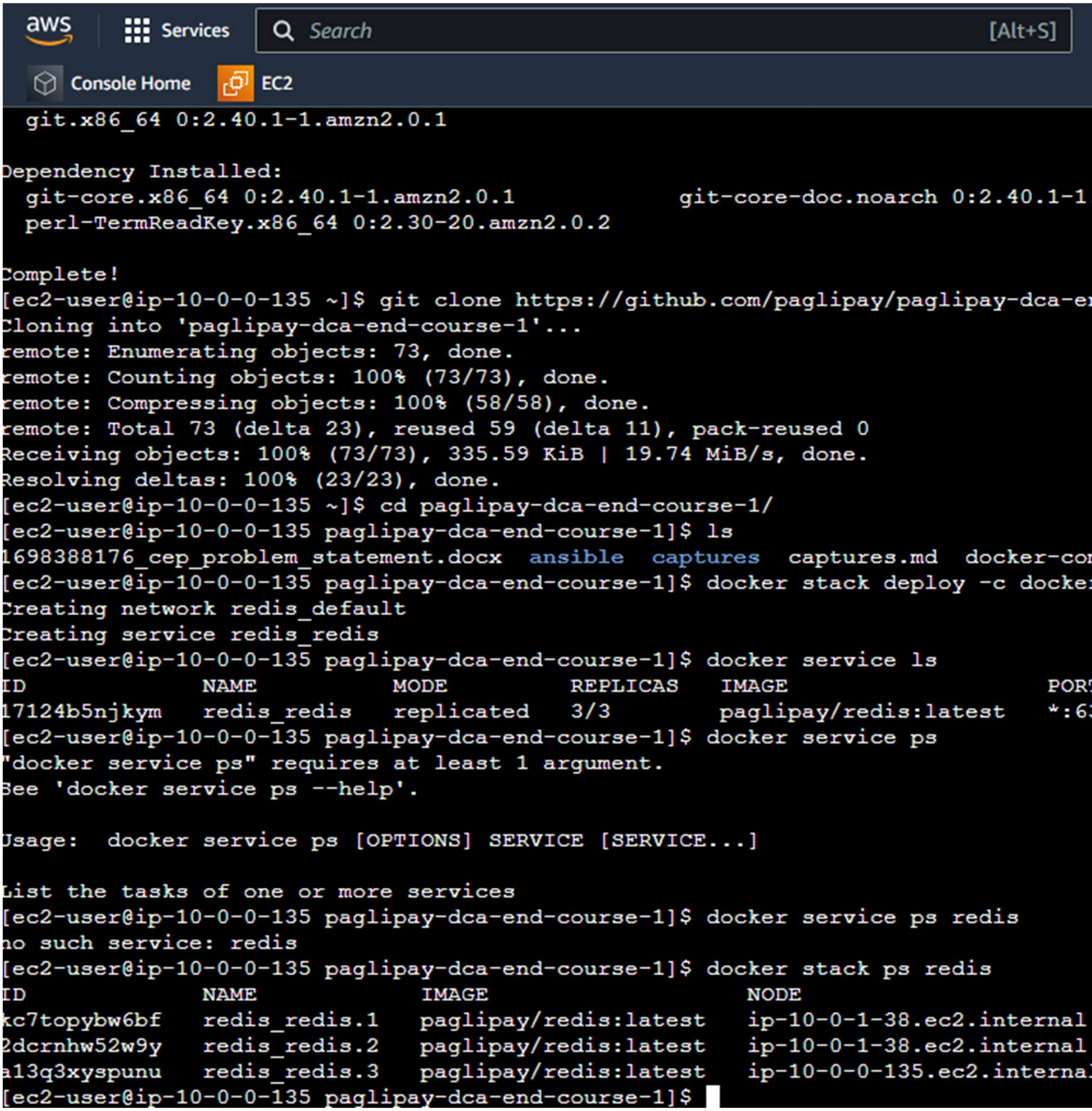
Tags

This repository contains 1 tag(s).

Tag	OS	Type
🟩 latest	🐧	Image

Repository overview

An overview describes what your image does and how to ru



```
  git.x86_64 0:2.40.1-1.amzn2.0.1

Dependency Installed:
  git-core.x86_64 0:2.40.1-1.amzn2.0.1          git-core-doc.noarch 0:2.40.1-1.
  perl-TermReadKey.x86_64 0:2.30-20.amzn2.0.2

Complete!
[ec2-user@ip-10-0-0-135 ~]$ git clone https://github.com/paglipay/paglipay-dca-en
Cloning into 'paglipay-dca-end-course-1'...
remote: Enumerating objects: 73, done.
remote: Counting objects: 100% (73/73), done.
remote: Compressing objects: 100% (58/58), done.
remote: Total 73 (delta 23), reused 59 (delta 11), pack-reused 0
Receiving objects: 100% (73/73), 335.59 KiB | 19.74 MiB/s, done.
Resolving deltas: 100% (23/23), done.
[ec2-user@ip-10-0-0-135 ~]$ cd paglipay-dca-end-course-1/
[ec2-user@ip-10-0-0-135 paglipay-dca-end-course-1]$ ls
1698388176_cep_problem_statement.docx  ansible  captures  captures.md  docker-com
[ec2-user@ip-10-0-0-135 paglipay-dca-end-course-1]$ docker stack deploy -c docker
Creating network redis_default
Creating service redis_redis
[ec2-user@ip-10-0-0-135 paglipay-dca-end-course-1]$ docker service ls
ID             NAME          MODE         REPLICAS   IMAGE                     PORT
17124b5njkym   redis_redis   replicated   3/3        paglipay/redis:latest     *:63
[ec2-user@ip-10-0-0-135 paglipay-dca-end-course-1]$ docker service ps
"docker service ps" requires at least 1 argument.
See 'docker service ps --help'.

Usage:  docker service ps [OPTIONS] SERVICE [SERVICE...]

List the tasks of one or more services
[ec2-user@ip-10-0-0-135 paglipay-dca-end-course-1]$ docker service ps redis
no such service: redis
[ec2-user@ip-10-0-0-135 paglipay-dca-end-course-1]$ docker stack ps redis
ID             NAME            IMAGE                     NODE
kc7topybw6bf   redis_redis.1   paglipay/redis:latest     ip-10-0-1-38.ec2.internal
2dcrnhw52w9y   redis_redis.2   paglipay/redis:latest     ip-10-0-1-38.ec2.internal
a13q3xyspunu   redis_redis.3   paglipay/redis:latest     ip-10-0-0-135.ec2.interna
[ec2-user@ip-10-0-0-135 paglipay-dca-end-course-1]$
```