

PRÁCTICA 2 - DOCKER

Aarón Cela Riveiro

Ejercicio 1

Inicio del contenedor redis-client e información de los contenedores

```
vagrant@acr2324-docker:~$ docker run --name redis-client --entrypoint redis-cli acr2324-redis -h 172.17.0.2 ping
PONG
vagrant@acr2324-docker:~$ docker ps -a
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
0dba9567fd63	acr2324-redis	"redis-cli -h 172.17..."	2 seconds ago	Exited (0) 1 second ago		redis-client
cf4fd28c1897	acr2324-redis	"redis-server --prot..."	11 minutes ago	Up 11 minutes	6379/tcp	redis-server

Listado de contenedores y ejecución en primer plano del redis-server con imagen optimizada

```
vagrant@acr2324-docker:~$ docker image ls
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
acr2324-redis-opt	latest	e2b5ecbf9936	10 seconds ago	30.9MB
acr2324-redis	latest	9d4195d740bb	46 minutes ago	137MB

```
vagrant@acr2324-docker:~$ docker run --rm --name redis-server acr2324-redis-opt
1:C 03 Mar 2024 10:04:12.125 # WARNING Memory overcommit must be enabled! Without it, a background save or replication may fail under low memory condition. Being disabled, it can also cause failures without low memory condition, see https://github.com/jemalloc/jemalloc/issues/1328. To fix this issue add 'vm.overcommit_memory = 1' to /etc/sysctl.conf and then reboot or run the command 'sysctl vm.overcommit_memory=1' for this to take effect.
1:C 03 Mar 2024 10:04:12.125 * o000o000o000o Redis is starting o000o000o000o
1:C 03 Mar 2024 10:04:12.125 * Redis version=7.2.4, bits=64, commit=00000000, modified=0, pid=1, just started
1:C 03 Mar 2024 10:04:12.125 * Configuration loaded
1:M 03 Mar 2024 10:04:12.126 * monotonic clock: POSIX clock_gettime
1:M 03 Mar 2024 10:04:12.127 * Running mode=standalone, port=6379.
1:M 03 Mar 2024 10:04:12.127 * Server initialized
1:M 03 Mar 2024 10:04:12.127 * Ready to accept connections tcp
```

Ejercicio 2

Creación de volumen y creación de nuevo contenedor asociado al volumen comprobando que los datos persisten en la base de datos

```
vagrant@acr2324-docker:~$ docker volume create redis-vol
redis-vol
vagrant@acr2324-docker:~$ docker volume ls
```

DRIVER	VOLUME NAME
local	redis-vol

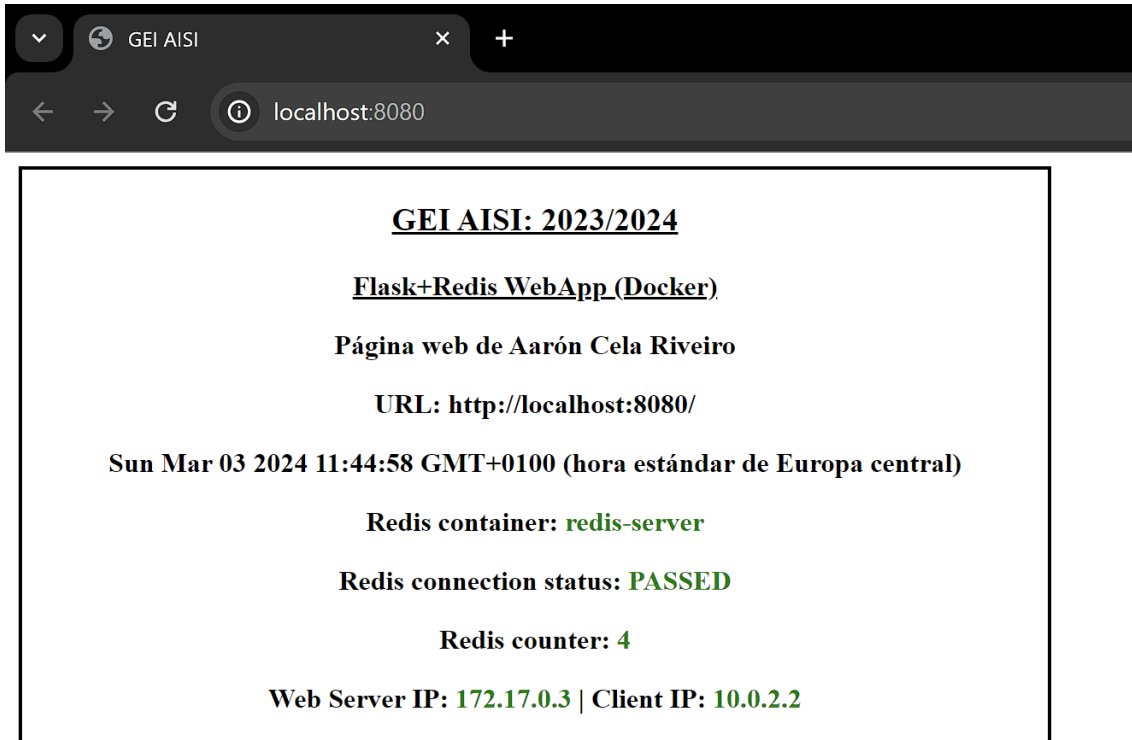
```
vagrant@acr2324-docker:~$ docker inspect redis-vol
```

```
[
  {
    "CreatedAt": "2024-03-03T10:13:12Z",
    "Driver": "local",
    "Labels": null,
    "Mountpoint": "/var/lib/docker/volumes/redis-vol/_data",
    "Name": "redis-vol",
    "Options": null,
    "Scope": "local"
  }
]
```

```
vagrant@acr2324-docker:~$
vagrant@acr2324-docker:~$ docker run -d --rm --name redis-server -v redis-vol:/data acr2324-redis-opt
6e27dc55411e3b7c7e2634beadb202ad8722ed88d66f07fe667af8d88553aa58
vagrant@acr2324-docker:~$ docker run --rm --name redis-client --entrypoint redis-cli acr2324-redis -h 172.17.0.2 incr hits
1
vagrant@acr2324-docker:~$ docker run --rm --name redis-client --entrypoint redis-cli acr2324-redis -h 172.17.0.2 incr hits
2
vagrant@acr2324-docker:~$ docker rm -f redis-server
redis-server
vagrant@acr2324-docker:~$ docker run -d --rm --name redis-server -v redis-vol:/data acr2324-redis-opt
af44f4fb582e3e70a609f6a12b55479cbd45d2879e0fcef44a3a0d09bccf7a58
vagrant@acr2324-docker:~$ docker run --rm --name redis-client --entrypoint redis-cli acr2324-redis -h 172.17.0.2 get hits
2
vagrant@acr2324-docker:~$ docker run --rm --name redis-client --entrypoint redis-cli acr2324-redis -h 172.17.0.2 incr hits
3
vagrant@acr2324-docker:~$ sudo ls -lh /var/lib/docker/volumes/redis-vol/_data
total 4.0K
-rw-r--r-- 1 systemd-network systemd-journal 101 Mar  3 10:16 dump.rdb
```

Ejercicio 3

Comprobación de acceso a la aplicación web desde el host



The screenshot shows a web browser window with the address bar displaying 'localhost:8080'. The page content is centered and contains the following text:

GEI AISI: 2023/2024

Flask+Redis WebApp (Docker)

Página web de Aarón Cela Riveiro

URL: http://localhost:8080/

Sun Mar 03 2024 11:44:58 GMT+0100 (hora estándar de Europa central)

Redis container: redis-server

Redis connection status: PASSED

Redis counter: 4

Web Server IP: 172.17.0.3 | Client IP: 10.0.2.2

Comprobación de logs con el contenedor webapp en segundo plano

```
vagrant@acr2324-docker:~$ docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS              PORTS                               NAMES
6ed27973d658   acr2324-web    "flask run"             About a minute ago    Up About a minute (healthy)    0.0.0.0:80->5000/tcp, :::80->5000/tcp    webapp
42905dfc711d   acr2324-redis-opt "redis-server --prot..." 9 minutes ago      Up 9 minutes        6379/tcp                            redis-server

vagrant@acr2324-docker:~$ docker logs webapp
* Serving Flask app 'counter.py'
* Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on all addresses (0.0.0.0)
* Running on http://127.0.0.1:5000
* Running on http://172.17.0.3:5000
Press CTRL+C to quit
* Restarting with stat
* Debugger is active!
* Debugger PIN: 485-236-525
127.0.0.1 - - [03/Mar/2024 10:50:24] "GET / HTTP/1.1" 200 -
10.0.2.2 - - [03/Mar/2024 10:50:43] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [03/Mar/2024 10:50:54] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [03/Mar/2024 10:51:24] "GET / HTTP/1.1" 200 -
vagrant@acr2324-docker:~$
```

Ejercicio 4

Despliegue de la aplicación con Docker compose

```
vagrant@acr2324-docker:~$ docker compose -f /vagrant/ej4/compose.yml up
[+] Running 3/0
 ✓ Network ej4_default      Created                                0.1s
 ✓ Container ej4-redis-1    Created                                0.0s
 ✓ Container ej4-webapp-1   Created                                0.0s
Attaching to redis-1, webapp-1
redis-1 | 1:C 03 Mar 2024 11:15:19.672 # WARNING Memory overcommit must be enabled! Without it, a background save or replication may fail under low memory condition. Being di
sabled, it can also cause failures without low memory condition, see https://github.com/jemalloc/jemalloc/issues/1328. To fix this issue add 'vm.overcommit_memory = 1' to /etc/
sysctl.conf and then reboot or run the command 'sysctl vm.overcommit_memory=1' for this to take effect.
redis-1 | 1:C 03 Mar 2024 11:15:19.672 * o000o00o000o Redis is starting o000o00o000o
redis-1 | 1:C 03 Mar 2024 11:15:19.672 * Redis version=7.2.4, bits=64, commit=00000000, modified=0, pid=1, just started
redis-1 | 1:C 03 Mar 2024 11:15:19.672 * Configuration loaded
redis-1 | 1:M 03 Mar 2024 11:15:19.672 * monotonic clock: POSIX clock_gettime
redis-1 | 1:M 03 Mar 2024 11:15:19.673 * Running mode=standalone, port=6379.
redis-1 | 1:M 03 Mar 2024 11:15:19.673 * Server initialized
redis-1 | 1:M 03 Mar 2024 11:15:19.673 * Loading RDB produced by version 7.2.4
redis-1 | 1:M 03 Mar 2024 11:15:19.673 * RDB age 80 seconds
redis-1 | 1:M 03 Mar 2024 11:15:19.673 * RDB memory usage when created 0.83 Mb
redis-1 | 1:M 03 Mar 2024 11:15:19.673 * Done loading RDB, keys loaded: 1, keys expired: 0.
redis-1 | 1:M 03 Mar 2024 11:15:19.673 * DB loaded from disk: 0.000 seconds
redis-1 | 1:M 03 Mar 2024 11:15:19.673 * Ready to accept connections tcp
webapp-1 | * Serving Flask app 'counter.py'
webapp-1 | * Debug mode: on
webapp-1 | WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
webapp-1 | * Running on all addresses (0.0.0.0)
webapp-1 | * Running on http://127.0.0.1:5000
webapp-1 | * Running on http://172.19.0.3:5000
webapp-1 | Press CTRL+C to quit
webapp-1 | * Restarting with stat
webapp-1 | * Debugger is active!
webapp-1 | * Debugger PIN: 119-717-004
webapp-1 | 10.0.2.2 - - [03/Mar/2024 11:15:27] "GET / HTTP/1.1" 200 -
redis-1 | 1:M 03 Mar 2024 11:15:27.532 * 1 changes in 5 seconds. Saving...
redis-1 | 1:M 03 Mar 2024 11:15:27.532 * Background saving started by pid 10
redis-1 | 10:C 03 Mar 2024 11:15:27.534 * DB saved on disk
redis-1 | 10:C 03 Mar 2024 11:15:27.534 * Fork CoW for RDB: current 0 MB, peak 0 MB, average 0 MB
redis-1 | 1:M 03 Mar 2024 11:15:27.633 * Background saving terminated with success
webapp-1 | 127.0.0.1 - - [03/Mar/2024 11:15:34] "GET / HTTP/1.1" 200 -
redis-1 | 1:M 03 Mar 2024 11:15:34.955 * 1 changes in 5 seconds. Saving...
redis-1 | 1:M 03 Mar 2024 11:15:34.955 * Background saving started by pid 11
redis-1 | 11:C 03 Mar 2024 11:15:34.957 * DB saved on disk
redis-1 | 11:C 03 Mar 2024 11:15:34.957 * Fork CoW for RDB: current 0 MB, peak 0 MB, average 0 MB
redis-1 | 1:M 03 Mar 2024 11:15:35.056 * Background saving terminated with success
webapp-1 | 127.0.0.1 - - [03/Mar/2024 11:15:49] "GET / HTTP/1.1" 200 -
redis-1 | 1:M 03 Mar 2024 11:15:50.013 * 1 changes in 5 seconds. Saving...
redis-1 | 1:M 03 Mar 2024 11:15:50.013 * Background saving started by pid 12
redis-1 | 12:C 03 Mar 2024 11:15:50.015 * DB saved on disk
redis-1 | 12:C 03 Mar 2024 11:15:50.015 * Fork CoW for RDB: current 0 MB, peak 0 MB, average 0 MB
redis-1 | 1:M 03 Mar 2024 11:15:50.114 * Background saving terminated with success
```

Comprobar que podemos modificar el código fuente de la app “al vuelo”

```
vagrant@acr2324-docker:~$ docker compose -f /vagrant/ej4/compose.yml ps
NAME                IMAGE                COMMAND                SERVICE    CREATED        STATUS        PORTS
ej4-redis-1         acr2324-redis-opt   "redis-server --prot..." redis      About a minute ago Up About a minute        6379/tcp
ej4-webapp-1        acr2324-web         "flask run"            webapp     About a minute ago Up About a minute (healthy) 0.0.0.0:80->5000/tcp, :::80->5000/tcp
vagrant@acr2324-docker:~$ docker ps
CONTAINER ID        IMAGE                COMMAND                CREATED        STATUS        PORTS                NAMES
00aabee92119       acr2324-web         "flask run"            About a minute ago Up About a minute (healthy) 0.0.0.0:80->5000/tcp, :::80->5000/tcp ej4-webapp-1
8056b6076dbe       acr2324-redis-opt   "redis-server --prot..." About a minute ago Up About a minute        6379/tcp          ej4-redis-1
vagrant@acr2324-docker:~$
vagrant@acr2324-docker:~$ curl -s http://localhost | grep "Redis counter"
<p>Redis counter: <span style="color: green;">58</span></p>
vagrant@acr2324-docker:~$
vagrant@acr2324-docker:~$ sed -i 's/Redis counter/New Redis counter/g' /vagrant/ej3/src/templates/index.html
vagrant@acr2324-docker:~$ curl -s http://localhost | grep "Redis counter"
<p>New Redis counter: <span style="color: green;">60</span></p>
vagrant@acr2324-docker:~$
```

Ejercicio 5

Despliegue y comprobación del funcionamiento de las instancias

```
vagrant@acr2324-docker:~$ docker stack ls
NAME      SERVICES
mystack   2
vagrant@acr2324-docker:~$ docker stack services mystack
ID        NAME      MODE      REPLICAS  IMAGE                                  PORTS
nq9clcxsmnh1  mystack_redis  replicated  1/1        localhost:5000/acr2324-redis-opt:latest
qy8zcmq96sy2  mystack_webapp  replicated  0/3        localhost:5000/acr2324-web:latest    *:80->5000/tcp
vagrant@acr2324-docker:~$ docker stack ps mystack
ID        NAME      IMAGE                                  NODE      DESIRED STATE  CURRENT STATE      ERROR      PORTS
0fflfjjwrnmq  mystack_redis.1  localhost:5000/acr2324-redis-opt:latest  acr2324-docker  Running         Running 19 seconds ago
7n5ywe75wd9a  mystack_webapp.1  localhost:5000/acr2324-web:latest        acr2324-docker  Running         Running 4 seconds ago
swza6l6ejlv4  mystack_webapp.2  localhost:5000/acr2324-web:latest        acr2324-docker  Running         Running 4 seconds ago
4arm8jbvv9fm  mystack_webapp.3  localhost:5000/acr2324-web:latest        acr2324-docker-worker  Running         Running 2 seconds ago
vagrant@acr2324-docker:~$ docker ps
CONTAINER ID   IMAGE                                COMMAND                  CREATED        STATUS              PORTS          NAMES
a0c4c88b2942  localhost:5000/acr2324-web:latest   "flask run"             25 seconds ago  Up 23 seconds (healthy)  5000/tcp      mystack_webapp.1.7n5ywe75wd9am0jxsh7z00wmd
a7c89ca45cb0  localhost:5000/acr2324-web:latest   "flask run"             25 seconds ago  Up 23 seconds (healthy)  5000/tcp      mystack_webapp.2.swza6l6ejlv4md7qkdod3tr
0219e03ff6d1  localhost:5000/acr2324-redis-opt:latest "redis-server --prot..." 25 seconds ago  Up 23 seconds              6379/tcp      mystack_redis.1.0fflfjjwrnmqgitnqjzmylxg
vagrant@acr2324-docker:~$
```

Desde la máquina worker

```
vagrant@acr2324-docker-worker:~$ docker ps
CONTAINER ID   IMAGE                                COMMAND                  CREATED        STATUS              PORTS          NAMES
92a0c3507713  localhost:5000/acr2324-web:latest   "flask run"             About a minute ago  Up About a minute (healthy)  5000/tcp      mystack_webapp.3.4arm8jbvv9fm1f6uoylr14aae
a9ab1ce7530d  registry:2.8.3                      "/entrypoint.sh /etc..." 6 minutes ago    Up 6 minutes              5000/tcp      registry.1.rfgn71srt06hrhruyu0m3g6za
vagrant@acr2324-docker-worker:~$
```

Escalar el servicio webapp

```
vagrant@acr2324-docker:~$ docker stack services mystack
ID        NAME      MODE      REPLICAS  IMAGE                                  PORTS
nq9clcxsmnh1  mystack_redis  replicated  1/1        localhost:5000/acr2324-redis-opt:latest
qy8zcmq96sy2  mystack_webapp  replicated  3/3        localhost:5000/acr2324-web:latest    *:80->5000/tcp
vagrant@acr2324-docker:~$ docker service scale mystack_webapp=4
mystack_webapp scaled to 4
overall progress: 4 out of 4 tasks
1/4: running [=====]
2/4: running [=====]
3/4: running [=====]
4/4: running [=====]
verify: Service converged
vagrant@acr2324-docker:~$ docker stack services mystack
ID        NAME      MODE      REPLICAS  IMAGE                                  PORTS
nq9clcxsmnh1  mystack_redis  replicated  1/1        localhost:5000/acr2324-redis-opt:latest
qy8zcmq96sy2  mystack_webapp  replicated  4/4        localhost:5000/acr2324-web:latest    *:80->5000/tcp
vagrant@acr2324-docker:~$ docker stack ps mystack
ID        NAME      IMAGE                                  NODE      DESIRED STATE  CURRENT STATE      ERROR
0fflfjjwrnmq  mystack_redis.1  localhost:5000/acr2324-redis-opt:latest  acr2324-docker  Running         Running 10 minutes ago
7n5ywe75wd9a  mystack_webapp.1  localhost:5000/acr2324-web:latest        acr2324-docker  Running         Running 9 minutes ago
inonroesha34  mystack_webapp.2  localhost:5000/acr2324-web:latest        acr2324-docker  Running         Running about a minute ago
swza6l6ejlv4  \_ mystack_webapp.2  localhost:5000/acr2324-web:latest        acr2324-docker  Shutdown        Failed about a minute ago  "task: non-zero exit (137)"
4arm8jbvv9fm  mystack_webapp.3  localhost:5000/acr2324-web:latest        acr2324-docker-worker  Running         Running 9 minutes ago
qaepq9quv4og  mystack_webapp.4  localhost:5000/acr2324-web:latest        acr2324-docker-worker  Running         Running 45 seconds ago
vagrant@acr2324-docker:~$ docker service scale mystack_webapp=2
mystack_webapp scaled to 2
overall progress: 2 out of 2 tasks
1/2: running [=====]
2/2: running [=====]
verify: Service converged
vagrant@acr2324-docker:~$ docker stack services mystack
ID        NAME      MODE      REPLICAS  IMAGE                                  PORTS
nq9clcxsmnh1  mystack_redis  replicated  1/1        localhost:5000/acr2324-redis-opt:latest
qy8zcmq96sy2  mystack_webapp  replicated  2/2        localhost:5000/acr2324-web:latest    *:80->5000/tcp
vagrant@acr2324-docker:~$
```

Ejercicio 6

Comprobación servicios Docker en un clúster Swarm

```
vagrant@acr2324-docker:~$ docker service ls
ID                NAME      MODE      REPLICAS  IMAGE                                  PORTS
y8ve5d8me0tr     redis     replicated 1/1        localhost:5000/acr2324-redis-opt:latest
rq5ldgxbkww      registry replicated 1/1        registry:2.8.3
nmyfl3k54s8n     webapp    replicated 5/5        localhost:5000/acr2324-web:latest    *:5000->5000/tcp
*:80->5000/tcp

vagrant@acr2324-docker:~$ docker service ps redis webapp
ID                NAME      IMAGE                                  NODE                DESIRED STATE  CURRENT STATE  ERROR  PORTS
qln1d4ybtp5      redis.1   localhost:5000/acr2324-redis-opt:latest  acr2324-docker     Running         Running 43 seconds ago
r6oeb2d1p638     webapp.1  localhost:5000/acr2324-web:latest        acr2324-docker     Running         Running 23 seconds ago
2eotjzngtd6y     webapp.2  localhost:5000/acr2324-web:latest        acr2324-docker-worker Running         Running 23 seconds ago
l746ty0mv3z5     webapp.3  localhost:5000/acr2324-web:latest        acr2324-docker-worker Running         Running 23 seconds ago
lpvkp4kejwie     webapp.4  localhost:5000/acr2324-web:latest        acr2324-docker     Running         Running 23 seconds ago
m15zcieqqsp2     webapp.5  localhost:5000/acr2324-web:latest        acr2324-docker-worker Running         Running 23 seconds ago

vagrant@acr2324-docker:~$ docker ps
CONTAINER ID   IMAGE                                COMMAND                  CREATED          STATUS          PORTS          NAMES
1d2a2b070d01  localhost:5000/acr2324-web:latest   "flask run"             53 seconds ago  Up 51 seconds  5000/tcp       webapp.4.lpvkp4kejwiejibwxspt8
bwe
4dd81824a7e1  localhost:5000/acr2324-web:latest   "flask run"             53 seconds ago  Up 51 seconds  5000/tcp       webapp.1.r6oeb2d1p638dza7j7j671
wfy
cea5bd55a92b  localhost:5000/acr2324-redis-opt:latest "redis-server --prot..." About a minute ago  Up About a minute  6379/tcp       redis.1.qln1d4ybtp5xc747puniln
qq

vagrant@acr2324-docker:~$
```

Inspección del servicio redis

```
vagrant@acr2324-docker:~$ docker service inspect --pretty redis

ID:            ijcje92jhjr8tba2li0d75oef
Name:          redis
Service Mode:  Replicated
  Replicas:    1
Placement:
UpdateConfig:
  Parallelism: 1
  On failure:  pause
  Monitoring Period: 5s
  Max failure ratio: 0
  Update order: stop-first
RollbackConfig:
  Parallelism: 1
  On failure:  pause
  Monitoring Period: 5s
  Max failure ratio: 0
  Rollback order: stop-first
ContainerSpec:
  Image:        localhost:5000/acr2324-redis-opt:latest@sha256:20ab8f5e2ee6c990815cab2bd8bb53c1d5819b16203b8c52d36a34faa218acbf
  Init:         false
Mounts:
  Target:       /data
  Source:       redis-vol
  ReadOnly:     false
  Type:         volume
Resources:
Networks: mynetwork
Endpoint Mode: vip

vagrant@acr2324-docker:~$
```

Inspección del servicio web

```

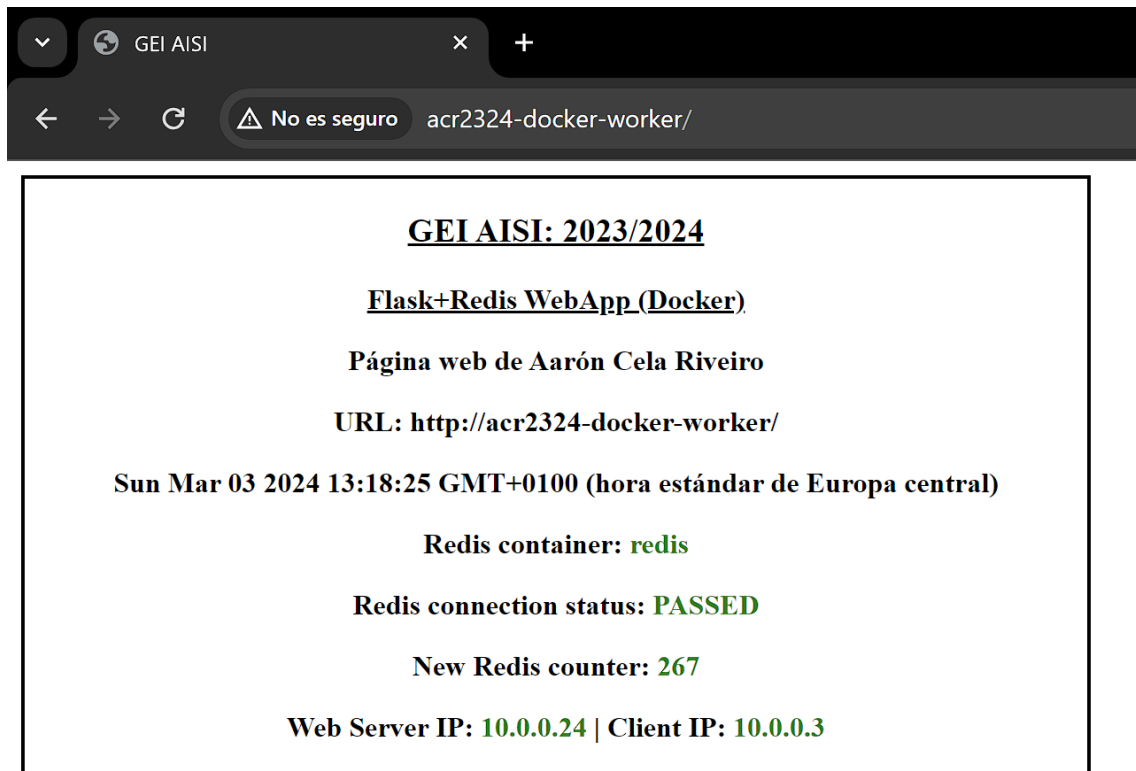
vagrant@acr2324-docker:~$ docker service inspect --pretty webapp
ID:                nnbp53moighwc79zqzk6vuj6w
Name:              webapp
Service Mode:      Replicated
Replicas:          5
Placement:
UpdateConfig:
  Parallelism:      1
  On failure:        pause
  Monitoring Period: 5s
  Max failure ratio: 0
  Update order:      stop-first
RollbackConfig:
  Parallelism:      1
  On failure:        pause
  Monitoring Period: 5s
  Max failure ratio: 0
  Rollback order:    stop-first
ContainerSpec:
  Image:             localhost:5000/acr2324-web:latest@sha256:0fe75757af5087f90a5b915f60d91ed0ebfaf6545fde8b266debff1ec6971a32
  Init:              false
Mounts:
  Target:            /src
  Source:            /vagrant/ej3/src
  ReadOnly:          false
  Type:              bind
Resources:
  Networks: mynetwork
Endpoint Mode: vip
Ports:
  PublishedPort = 80
  Protocol = tcp
  TargetPort = 5000
  PublishMode = ingress
vagrant@acr2324-docker:~$ curl -s http://localhost | grep "Redis counter"
<p>New Redis counter: <span style="color: green;">265</span></p>
vagrant@acr2324-docker:~$

```

Comprobación funcionamiento desde host a la url: <http://acr2324-docker/>



Comprobación funcionamiento desde host a la url: <http://acr2324-docker-worker/>



GEI AISI: 2023/2024

Flask+Redis WebApp (Docker)

Página web de Aarón Cela Riveiro

URL: <http://acr2324-docker-worker/>

Sun Mar 03 2024 13:18:25 GMT+0100 (hora estándar de Europa central)

Redis container: redis

Redis connection status: PASSED

New Redis counter: 267

Web Server IP: 10.0.0.24 | Client IP: 10.0.0.3