01- Harbor Installation Prerequisites

Hardware

The following table lists the minimum and recommended hardware configurations for deploying Harbor.

Resource	Minimum	Recommended
CPU	2 CPU	4 CPU
Mem	4 GB	8 GB
Disk	40 GB	160 GB

Software

The following table lists the software versions that must be installed on the target host.

Software	Version	Description
Docker Engine	Version 20.10.10-ce+ or higher	For installation instructions, see https://docs.docker.com/engine/installation/
Docker Compose	docker-compose (v1.18.0+) or docker compose v2 (docker-compose-plugin)	For installation instructions, see https://docs.docker.com/compose/install/
OpenSSL	Latest is preferred	Used to generate certificate and keys for Harbor

Network ports

Harbor requires that the following ports be open on the target host.

Port	Protocol	Description
443	HTTPS	Harbor portal and core API accept HTTPS requests on this port. You can change this port in the configuration file.
4443	HTTPS	Connections to the Docker Content Trust service for Harbor. You can change this port in the configuration file.
80	HTTP	Harbor portal and core API accept HTTP requests on this port. You can change this port in the configuration file.

For Opening Network ports , we use `ufw` :

```
sudo ufw allow 22/tcp   # Open SSH port
sudo ufw allow 80/tcp   # Open HTTP port
sudo ufw allow 443/tcp  # Open HTTPS port
sudo ufw allow 4443/tcp # Open Harbor's default port
sudo ufw allow 8080/tcp # Open port 8080
```

Then we enable the `ufw` :

```
sudo ufw enable     # Enable ufw
sudo ufw status     # Staus of ufw
```

we should an output like following output :

```
Status: active

To Action From
```

```
---

22/tcp ALLOW Anywhere
80/tcp ALLOW Anywhere
443/tcp ALLOW Anywhere
4443/tcp ALLOW Anywhere
8080/tcp ALLOW Anywhere
```

02- Configure DNS Records

Part 1 : DNS Records

We should config and set DNS Records for our domain.
My main domain is : `developerhub.blog`
I need a subdomain for Harbor : `harbor.developerhub.blog`

Also I have IPV4 and IPV6 on my VPS . So we have

> ⚠ **Warning**
>
> Change IPV4 and IPV6 in following tutorial to your VPS IP .

1. **A Records (IPv4)**:
   - `@` (or `developerhub.blog`): This record maps the root domain to your server's IPv4 address. TTL: 3600 (1 hour)
   - `www.developerhub.blog`: This record maps the `www` subdomain to your server's IPv4 address. TTL: 3600 (1 hour)

    - `harbor.developerhub.blog`: This record maps the `harbor` subdomain to your server's IPv4 address. TTL: 3600 (1 hour)
2. **AAAA Records (IPv6)**:
    - `@` (or `developerhub.blog`): This record maps the root domain to your server's IPv6 address. TTL: 3600 (1 hour)
    - `www.developerhub.blog`: This record maps the `www` subdomain to your server's IPv6 address. TTL: 3600 (1 hour)
    - `harbor.developerhub.blog`: This record maps the `harbor` subdomain to your server's IPv6 address. TTL: 3600 (1 hour)
3. **CNAME Record**:
    - `harbor.developerhub.blog`: This record is an alias or a canonical name record that points the `harbor` subdomain to another domain name. TTL: 3600 (1 hour)
4. **MX Record**:
    - `@` (or `developerhub.blog`): This record specifies the mail server(s) responsible for handling email for your domain. TTL: 86400 (24 hours)
5. **TXT Records**:
    - `@` (or `developerhub.blog`): TXT records are used for various purposes, such as verifying domain ownership, configuring email security (SPF, DKIM), or providing additional information about your domain. TTL: 3600 (1 hour)

Here's an example of how your DNS records might look like with TTL values:

```
; A Records (IPv4)
@                   IN A      192.0.2.1      3600
www                 IN A      192.0.2.1      3600
harbor              IN A      192.0.2.1      3600
```

```
; AAAA Records (IPv6)
@                    IN AAAA   2001:db8::1    3600
www                  IN AAAA   2001:db8::1    3600
harbor               IN AAAA   2001:db8::1    3600

; CNAME Record (Only if harbor is hosted on a different server)
harbor               IN CNAME  example.com    3600

; MX Record
@                    IN MX 10  mail.example.com 86400

; TXT Records (Examples)
@                    IN TXT    "v=spf1 include:example.com ~all" 3600
@                    IN TXT    "google-site-verification=..." 3600
```

The TTL (Time to Live) value specifies the amount of time (in seconds) that a DNS record can be cached by other DNS servers and clients before it needs to be refreshed. A lower TTL value means that changes to your DNS records will propagate faster, but it also increases the load on your DNS server. A higher TTL value reduces the load on your DNS server but may cause delays in propagating changes.

The recommended TTL values can vary based on your specific use case and requirements. For example, MX records generally have a higher TTL value (e.g., 24 hours) since they don't change frequently, while A and AAAA records may have a lower TTL value (e.g., 1 hour) to facilitate faster updates in case of IP address changes.

⚠️ We need to configure SSL Certificate for this domain and subdomain . Also We should set DNS Records for SSL.

Part 2 : Let’s Encrypt SSL Certificate

1. Installing `certbot`

Debian

```
# Debian-based OS
sudo apt-get install certbot python3-certbot-nginx
```

Red-Hat

```
#RedHat-based OS
sudo yum install certbot python3-certbot-nginx
```

2. Obtain SSL Certificate using `Certbot`

```
sudo certbot certonly --manual --preferred-challenges=dns -d developerhub.blog -d harbor.develop
```

3. Create a TXT Record for Domain Ownership Verification

For `developerhub.blog`

```
_acme-challenge    TXT    "<acme-challenge-value>"
```

For `harbor.developerhub.blog`

```
_acme-challenge.harbor    TXT    "<acme-challenge-value>"
```

> ⚠ **Warning**
>
> The acme-challenge-value for domain and subdomain is different !

You can check DNS Records and acme-challenge-value in the following website :

Dig (DNS lookup)

Part 3 - Convert SSL Certificates

If you want to upload you SSL certificate into your domain Provider , it is better to do following steps :

1. Go to SSL directory

```
# /etc/letsencrypt/live/YOURDOMAIN
cd /etc/letsencrypt/live/developerhub.blog
```

2. Convert `privkey.pem` to `privkey.key`

```
openssl pkey -in privkey.pem -out privkey.key
```

3. Convert `cert.pem` to `cert.crt`

```
openssl x509 -in cert.pem -out cert.crt
```

4. Copy `cert.crt` to docker directory

```
mkdir /etc/docker/certs.d/
cd /etc/docker/certs.d/
# mkdir YOURDOMAIN/
mkdir developerhub.blog
```

Then copy `cert.crt` to docker directory :

```
# cp /etc/letsencrypt/live/YOURDOMAIN/cert.crt /etc/docker/certs.d/YOURDOMAIN
cp /etc/letsencrypt/live/developerhub.blog/cert.crt \
/etc/docker/certs.d/developerhub.blog/

chmod 644 /etc/docker/certs.d/developerhub.blog/cert.crt
```

1. Restart docker

```
sudo systemctl restart docker
sudo systemctl status docker
```

03- Harbor Installation Process

The process of installing Harbor involves several steps, which are all essential to ensure a smooth and successful installation.

Step 1 - Download the Harbor Installer

The first step is to download the Harbor installer from the official GitHub repository. It's important to select the appropriate installer that corresponds to your operating system. This is to ensure compatibility and prevent potential installation issues.

Harbor Release URL : https://github.com/goharbor/harbor/releases

In this tutorial , I've used `offline` installer

```
cat << EOF
wget \
  https://github.com/goharbor/harbor/releases/download/v2.9.4/\
  harbor-offline-installer-v2.9.4.tgz
EOF
```

Step 2 - Unzip the Installer

Once the download process is complete, the next step is to unzip the installer. This can be done using any standard unzipping tool. When unzipped, the installer files should be readily accessible.

```
# tar xzvf harbor-offline-installer-version.tgz
tar xzvf harbor-offline-installer--v2.9.4.tgz
```

Step 3 - Configure the `harbor.yml` File

Next, it's time to configure the `harbor.yml` file. This configuration file is crucial as it contains various settings and parameters that Harbor will use during and after the installation. It's important to carefully review and update this file according to your specific requirements.

```
cd ./harbor
cp harbor.yml.tmpl harbor.yml
```

Then we should edit the `harbor.yml` :
We just edit hostname , http port , https certificate and private_key .
The remain config is default .

```
# Configuration file of Harbor

# The IP address or hostname to access admin UI and registry service.
# DO NOT use localhost or 127.0.0.1, because Harbor needs to be accessed by external clients.
hostname: harbor.developerhub.blog

# http related config
http:
  # port for http, default is 80. If https enabled, this port will redirect to https port
  port: 8080

# https related config
https:
  # https port for harbor, default is 443
  port: 443
  # The path of cert and key files for nginx
  certificate: /etc/letsencrypt/live/developerhub.blog/fullchain.pem
  private_key: /etc/letsencrypt/live/developerhub.blog/privkey.pem
```

Step 4 - Run install.sh Script

Finally, once the `harbor.yml` file has been configured to your liking, the last step is to run the `install.sh` script. This script will initiate the installation process of Harbor. You'll need to wait for some time as the script installs all necessary components and sets up Harbor on your system.

```
./install.sh
```

⚠️ After Installation , you can check `docker-compose ps` in the harbor directory to ensure harbor images are running and up !

04- Harbor UI login

We can login to Harbor UI using the hostname url in `harbor.yml`

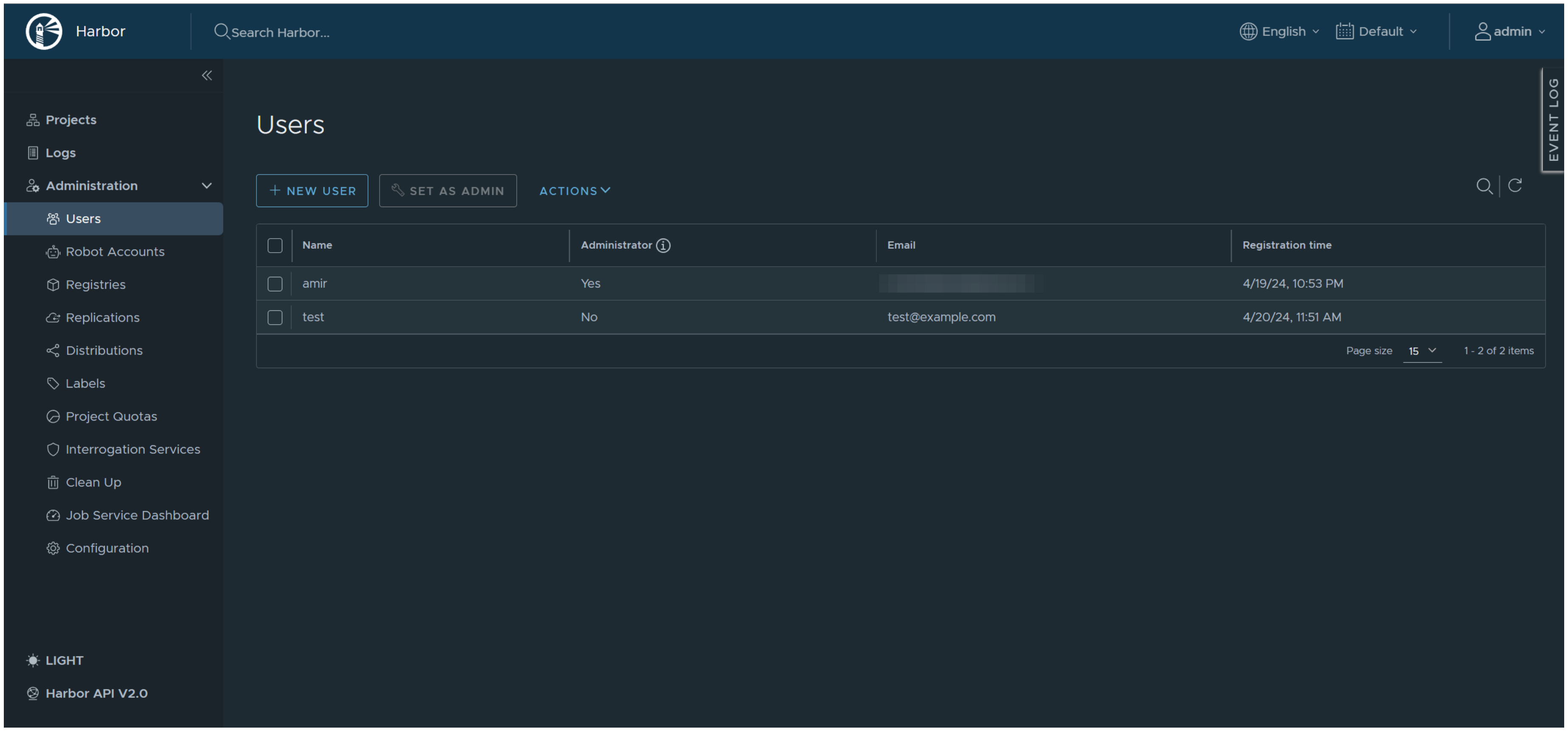
`harbor.developerhub.blog`

Credentials for login (Default) :

```
Username : admin
Password : Harbor12345
```

05- Managing Users

From Users Tab , we can add new users to Harbor



Users

Name	Administrator	Email	Registration time
amir	Yes	[redacted]	4/19/24, 10:53 PM
test	No	test@example.com	4/20/24, 11:51 AM

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06- Working with Projects

For creating docker private registry , we need to create new projects to able to push new docker images to Harbor . So we create a new project name : `reg`

In the client (Where we want to push images from) , first we should login to our docker private registry using following command

```
# docker login YOURDOMAIN
docker login harbor.developerhub.blog
```

Then docker asks username and password

```
Username : admin
Password : Harbor12345
```

If the credentials is true , you should see this message :

```
Authenticating with existing credentials...
WARNING! Your password will be stored unencrypted in /home/amir/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
```

Then you are able to push new images to your docker registry !

For pushing images , you should do following steps :

1. list docker images to see the IMAGE ID

```
docker image ls
```

2. Select the image you want to push and copy the IMAGE ID. Then change the image tag like the following structure

```
# docker tag IMAGEID HARBORURL/PROJECT/IMAGE:TAG
```

```
docker tag bb6d28039b8c harbor.developerhub.blog/reg/node:12-alpine
```

3. Then push this docker image

```
docker push harbor.developerhub.blog/reg/node:12-alpine
```