

Deploy Docker Containers on the Cloud

image.png

Objective:

In this Article we want you to be able to deploy secure apps with containers in the cloud space. This deployment is useful for deploying apps or services without the need of a separate Firewall on prem or the cloud to secure and encrypt the communication. Another benefits of this design is, that the user's never interact with the actual server.

Pre-Requisites:

- Domain or be able to create sub-domains (cloud-npm.your_domain.tld, cloud-portainer.your_domain.tld, any_app_conatainer.your_domain.tld)
- Ability to open ports 80,81,443 on the firewall or VPS
- Ubuntu Linux VM (with the necessary resources to run your containers)

This guide will **not** show you how to create a VM, open the necessary ports on your VPS (80, 81, 443), or create the necessary DNS records on your Public DNS Server or Domain Registrar.

Understanding the Design:



The above shows how we intend the communication to work. In this design, you will always use Nginx Proxy manager (NPM), and to manage docker from a web-ui we are going to use Portainer. We will expose to the public port **80 TCP** and port **443 TCP**. We will also open temporarily port **81 TCP** for NPM's initial setup / management.

Install Docker using the convenience script

Docker provides a convenience script at https://get.docker.com/open_in_new to install Docker into development environments non-interactively. The convenience script isn't recommended for production environments, but it's useful for creating a provisioning script tailored to your needs.

Also refer to the [install using the repository](#) steps to learn about installation steps to install using the package repository. The source code for the script is open source, and you can find it in the [docker-install repository on GitHub](#)[open_in_new](#).

Always examine scripts downloaded from the internet before running them locally. Before installing, make yourself familiar with potential risks and limitations of the convenience script:

- The script requires `root` or `sudo` privileges to run.
- The script attempts to detect your Linux distribution and version and configure your package management system for you.
- The script doesn't allow you to customize most installation parameters.
- The script installs dependencies and recommendations without asking for confirmation. This may install a large number of packages, depending on the current configuration of your host machine.
- By default, the script installs the latest stable release of Docker, containerd, and runc. When using this script to provision a machine, this may result in unexpected major version upgrades of Docker. Always test upgrades in a test environment before deploying to your production systems.
- The script isn't designed to upgrade an existing Docker installation. When using the script to update an existing installation, dependencies may not be updated to the expected version, resulting in outdated versions.

Tip: preview script steps before running

You can run the script with the `--dry-run` option to learn what steps the script will run when invoked:

```
curl -fsSL https://get.docker.com -o get-docker.sh
sudo sh ./get-docker.sh --dry-run
```

py

This example downloads the script from https://get.docker.com/open_in_new and runs it to install the latest stable release of Docker on Linux:

```
curl -fsSL https://get.docker.com -o get-docker.sh
sudo sh get-docker.sh
Executing docker install script, commit: 7cae5f8b0decc17d6571f9f52eb840fbc13b2737
<...>
```

Linux post-installation steps for Docker Engine

These optional post-installation procedures describe how to configure your Linux host machine to work better with Docker.

Manage Docker as a non-root user

The Docker daemon binds to a Unix socket, not a TCP port. By default it's the `root` user that owns the Unix socket, and other users can only access it using `sudo`. The Docker daemon always runs as the `root` user.

If you don't want to preface the `docker` command with `sudo`, create a Unix group called `docker` and add users to it. When the Docker daemon starts, it creates a Unix socket accessible by members of the `docker` group. On some Linux distributions, the system automatically creates this group when installing Docker Engine using a package manager. In that case, there is no need for you to manually create the group.

Warning

The `docker` group grants root-level privileges to the user. For details on how this impacts security in your system, see [Docker Daemon Attack Surface](#).

Note To run Docker without root privileges, see [Run the Docker daemon as a non-root user \(Rootless mode\)](#).

To create the `docker` group and add your user:

1. Create the `docker` group.

```
sudo groupadd docker
```

2. Add your user to the `docker` group.

```
sudo usermod -aG docker $USER
```

3. Log out and log back in so that your group membership is re-evaluated.

If you're running Linux in a virtual machine, it may be necessary to restart the virtual machine for changes to take effect.

You can also run the following command to activate the changes to groups:

```
newgrp docker
```

4. Verify that you can run `docker` commands without `sudo`.

```
docker run hello-world
```

This command downloads a test image and runs it in a container. When the container runs, it prints a message and exits.

If you initially ran Docker CLI commands using `sudo` before adding your user to the `docker` group, you may see the following error:

```
WARNING: Error loading config file: /home/user/.docker/config.json -  
stat /home/user/.docker/config.json: permission denied
```

This error indicates that the permission settings for the `~/.docker/` directory are incorrect, due to having used the `sudo` command earlier.

To fix this problem, either remove the `~/.docker/` directory (it's recreated automatically, but any custom settings are lost), or change its ownership and permissions using the following commands:

```
sudo chown "$USER":"$USER" /home/"$USER"/.docker -R  
sudo chmod g+rx "$HOME/.docker" -R
```

Configure Docker to start on boot with systemd

Many modern Linux distributions use [systemd](#) to manage which services start when the system boots. On Debian and Ubuntu, the Docker service starts on boot by default. To automatically start Docker and containerd on boot for other Linux distributions using systemd, run the following commands:

```
sudo systemctl enable docker.service
sudo systemctl enable containerd.service
```

To stop this behavior, use `disable` instead.

```
sudo systemctl disable docker.service
sudo systemctl disable containerd.service
```

If you need to add an HTTP proxy, set a different directory or partition for the Docker runtime files, or make other customizations, see [customize your systemd Docker daemon options](#).

Install Docker-Compose standalone

Important

From July 2023 Compose V1 stopped receiving updates. It's also no longer available in new releases of Docker Desktop.

Compose V2 is included with all currently supported versions of Docker Desktop. For more information, see [Migrate to Compose V2](#).
Docker's documentation refers to and describes Compose V2 functionality.

On this page you can find instructions on how to install Compose standalone on Linux or Windows Server, from the command line.

On Linux

Compose standalone

Note that Compose standalone uses the `-compose` syntax instead of the current standard syntax `compose`.

For example type `docker-compose up` when using Compose standalone, instead of `docker compose up`.

1. To download and install Compose standalone, run:

```
curl -SL https://github.com/docker/compose/releases/download/v2.23.0/docker-compose-linux-x86_64 -o /usr/local/bin/docker-compose
```

2. Apply executable permissions to the standalone binary in the target path for the installation.
3. Test and execute compose commands using `docker-compose`.

“**Tip**

If the command `docker-compose` fails after installation, check your path. You can also create a symbolic link to `/usr/bin` or any other directory in your path. For example:

```
sudo ln -s /usr/local/bin/docker-compose /usr/bin/docker-compose
```

Creating a new Docker Network

I'm going to demonstrate how to create a bridge network and then show you how to deploy a container on that network. We'll create a network called `net-to-proxy`. The creation of this network can be achieved with a single command:

```
docker network create --driver bridge net-to-proxy
```

The output of that command will be a long string of characters that represents the ID of that newly-created network

Organization:

Because we will be deploying Three **Stacks** with `docker-compose`, we will need to keep our files organized. We are going to use the `"mkdir"` command to create our directories for the containers in the `"home"` folder of the current user.

```
mkdir ./npm && mkdir ./portainer && mkdir ./bookstack
```

The plan is to have a `"docker-compose.yml"` file for each stack in their own folders.

Prepare Deployment of Portainer

Portainer has a few dependencies that must be supplied when you start your container:

- It requires a volume to store persistent data.
- Your host's Docker socket should be mounted into the container so that Portainer can access and interact with the [Docker daemon](#).
- You need to bind a port to the container so you can access the web UI.

Change to the Portainer directory we created `~/portainer`. Create a file called "docker-compose.yml". This lets you write the container's configuration into a file so you can bring up the app with a single command.

Portainer-Docker-Compose.yml

```
version: "3"
services:
  portainer:
    image: portainer/portainer-ce:latest
    ports:
      - 9443:9443
    volumes:
      - data:/data
      - /var/run/docker.sock:/var/run/docker.sock
    restart: unless-stopped
    networks:
      - portainer_net
      - net-to-proxy
volumes:
  data: ./portainer_data

networks:
  portainer_net:
    driver: bridge # This means that, this network is using the host bridge
  net-to-proxy:
    external: true # This means that, this network was created previously and is external
```

Here, the `image` field is set to `portainer/portainer-ce:latest` to use the latest Portainer CE release from Docker Hub. Change this to `portainer/portainer-ee:latest` if you've purchased an Enterprise Edition license.

The `ports` field sets up a port binding from your host to the container. You'll be able to access the Portainer UI by visiting `https://localhost:9443`. Portainer provides a self-signed HTTPS certificate,

which you can override by [mounting your own](#) into the container.

The `volumes` field sets up a `data` volume that's mounted to `/data` inside the container. Portainer will write your settings to this location, allowing them to persist after the container restarts. The host's Docker socket, `/var/run/docker.sock`, is [bind mounted](#) straight into the container so Portainer can manage the Docker installation it's running within.

The `Networks` field, maps out the networks the container will have. There are other ways to add a network to a stack, in this case we used this way to ensure connectivity after reboots.

Finally, the `restart` field is set to `unless-stopped`, so Docker automatically starts Portainer after the host reboots unless you manually stop the container first.

Now you can use this Compose file to bring up Portainer:

Please **DO NOT RUN THE COMMAND BELOW**- yet

```
docker compose up -d
```

NGINX Proxy Manager Deployment

Compatibility

The docker images support the following architectures:

- amd64
- arm64
- armv7

The docker images are a manifest of all the architecture docker builds supported, so this means you don't have to worry about doing anything special and you can follow the common instructions above.

Check out the [dockerhub tags](#) for a list of supported architectures and if you want one that doesn't exist, [create a feature request](#).

Also, if you don't know how to already, follow [this guide to install docker and docker-compose](#) on Raspbian.

Please note that the `jc21/mariadb-aria:latest` image might have some problems on some ARM devices, if you want a separate database container, use the `yobasystems/alpine-mariadb:latest` image.

Navigate to `~/npm` and create a `docker-compose.yml` file:

NGINX-Docker-Compose.yml

```
version: '3.8'
services:
  app:
    image: 'jc21/nginx-proxy-manager:latest'
    restart: unless-stopped
    ports:
      # These ports are in format <host-port>:<container-port>
      - '80:80' # Public HTTP Port
      - '443:443' # Public HTTPS Port
      - '81:81' # Admin Web Port
      # Add any other Stream port you want to expose
      # - '21:21' # FTP
    environment:
      # Mysql/Maria connection parameters:
      DB_MYSQL_HOST: "db"
      DB_MYSQL_PORT: 3306
      DB_MYSQL_USER: "npm"
      DB_MYSQL_PASSWORD: "npm" #change this line
      DB_MYSQL_NAME: "npm"
      # Uncomment this if IPv6 is not enabled on your host
      # DISABLE_IPV6: 'true'
    volumes:
      - ./data:/data
      - ./letsencrypt:/etc/letsencrypt
    depends_on:
      - db
    networks:
      - net-to-proxy
      - npm_default
  db:
```

```
image: 'jc21/mariadb-aria:latest'
restart: unless-stopped
environment:
  MYSQL_ROOT_PASSWORD: 'npm' #change this line
  MYSQL_DATABASE: 'npm'
  MYSQL_USER: 'npm'
  MYSQL_PASSWORD: 'npm' # change this line
volumes:
  - ./mysql:/var/lib/mysql
networks:
  - npm_default
networks:
  net-to-proxy:
    external: true
  npm_default:
    driver: bridge
```

Please note the lines that need to be edited

Then:

```
docker-compose up -d
```

Initial Run

After the app is running for the first time, the following will happen:

1. GPG keys will be generated and saved in the data folder
2. The database will initialize with table structures
3. A default admin user will be created

This process can take a couple of minutes depending on your machine.

Next Navigate on a web-browser to `https://your_domain.tld:81`

This is where exposing the port **81 TCP** is necessary and Temporary.

[image.png](#)

Default Administrator User

Email: admin@example.com
Password: changeme

Immediately after logging in with this default user you will be asked to modify your details and change your password.

Proxy NGINX Management Dashboard

Deploy Portainer

Now, that NGINX Proxy Manager is running, we can navigate to the portainer folder `~/portainer` and start portainer with:

```
docker-compose up -d
```

next, run:

```
docker ps -a
```

This command is useful to see all running docker containers, the container's ID and container's open ports to the Docker host.

find portainer's IP address by running:

```
docker inspect --format '{{.NetworkSettings.IPAddress}}' <CONTAINER ID>
```

or

```
docker inspect <CONTAINER ID>
```

Here is an Example output:

Code example

```
ubuntu@instance-20231025-1926:~$ docker ps -a
CONTAINER ID   IMAGE                                COMMAND                                CREATED
STATUS
PORTS
NAMES
91ba49cd0990   lscr.io/linuxserver/bookstack      "/init"                                27 hours ago   Up 27
hours      443/tcp, 0.0.0.0:6875->80/tcp, :::6875-
>80/tcp                                bookstack
60a49a71795a   lscr.io/linuxserver/mariadb        "/init"                                27 hours ago   Up 27
hours
3306/tcp                                bookstack_db
f756a302bcbd   jc21/nginx-proxy-manager:latest    "/init"                                27 hours ago   Up 27
hours      0.0.0.0:80-81->80-81/tcp, :::80-81->80-81/tcp, 0.0.0.0:443->443/tcp, :::443-
>443/tcp                                npm-app-1
1ed7856bd307   jc21/mariadb-aria:latest           "/scripts/run.sh"                     27 hours ago   Up 27
hours
3306/tcp                                npm-db-1
ddccc9f35392   portainer/portainer-ce:latest      "/portainer"                           2 days ago     Up 29
hours      0.0.0.0:8000->8000/tcp, :::8000->8000/tcp, 0.0.0.0:9443->9443/tcp, :::9443-
>9443/tcp, 9000/tcp                    portainer
ubuntu@instance-20231025-1926:~$ docker inspect ddccc9f35392
[
  {
    "Id": "ddccc9f35392eed4e829f7cf0b3d17e79a9af5a4eb57232306ab10355cfd55c7",
    "Created": "2023-10-26T03:21:27.100878836Z",
    "Path": "/portainer",
    "Args": [],
    "State": {
      "Status": "running",
      "Running": true,
      "Paused": false,
      "Restarting": false,
      "OOMKilled": false,
      "Dead": false,
      "Pid": 7701,
```

```
    "ExitCode": 0,
    "Error": "",
    "StartedAt": "2023-10-27T15:40:38.580190785Z",
    "FinishedAt": "2023-10-27T15:40:37.763361341Z"
  },
  "Image":
    "sha256:ecc519e8696aa56565c7b34ea94ae31d25325ebdb4d91077c30d6b9f757ae7cd",
    "ResolvConfPath":
      "/var/lib/docker/containers/ddccc9f35392eed4e829f7cf0b3d17e79a9af5a4eb57232306ab10355cfd55c7/resolv.conf",
    "HostnamePath":
      "/var/lib/docker/containers/ddccc9f35392eed4e829f7cf0b3d17e79a9af5a4eb57232306ab10355cfd55c7/hostname",
    "HostsPath":
      "/var/lib/docker/containers/ddccc9f35392eed4e829f7cf0b3d17e79a9af5a4eb57232306ab10355cfd55c7/hosts",
    "LogPath":
      "/var/lib/docker/containers/ddccc9f35392eed4e829f7cf0b3d17e79a9af5a4eb57232306ab10355cfd55c7/ddccc9f35392eed4e829f7cf0b3d17e79a9af5a4eb57232306ab10355cfd55c7-json.log",
    "Name": "/portainer",
    "RestartCount": 0,
    "Driver": "overlay2",
    "Platform": "linux",
    "MountLabel": "",
    "ProcessLabel": "",
    "AppArmorProfile": "docker-default",
    "ExecIDs": null,
    "HostConfig": {
      "Binds": [
        "/var/run/docker.sock:/var/run/docker.sock",
        "portainer_data:/data"
      ],
      "ContainerIDFile": "",
      "LogConfig": {
        "Type": "json-file",
        "Config": {}
      },
      "NetworkMode": "default",
      "PortBindings": {
```

```
    "8000/tcp": [
      {
        "HostIp": "",
        "HostPort": "8000"
      }
    ],
    "9443/tcp": [
      {
        "HostIp": "",
        "HostPort": "9443"
      }
    ]
  },
  "RestartPolicy": {
    "Name": "always",
    "MaximumRetryCount": 0
  },
  "AutoRemove": false,
  "VolumeDriver": "",
  "VolumesFrom": null,
  "ConsoleSize": [
    83,
    205
  ],
  "CapAdd": null,
  "CapDrop": null,
  "CgroupnsMode": "private",
  "Dns": [],
  "DnsOptions": [],
  "DnsSearch": [],
  "ExtraHosts": null,
  "GroupAdd": null,
  "IpcMode": "private",
  "Cgroup": "",
  "Links": null,
  "OomScoreAdj": 0,
  "PidMode": "",
  "Privileged": false,
  "PublishAllPorts": false,
```

```
"ReadOnlyRootfs": false,
"SecurityOpt": null,
"UTSMode": "",
"UsersnsMode": "",
"ShmSize": 67108864,
"Runtime": "runc",
"Isolation": "",
"CpuShares": 0,
"Memory": 0,
"NanoCpus": 0,
"CgroupParent": "",
"BlkioWeight": 0,
"BlkioWeightDevice": [],
"BlkioDeviceReadBps": [],
"BlkioDeviceWriteBps": [],
"BlkioDeviceReadIOps": [],
"BlkioDeviceWriteIOps": [],
"CpuPeriod": 0,
"CpuQuota": 0,
"CpuRealtimePeriod": 0,
"CpuRealtimeRuntime": 0,
"CpusetCpus": "",
"CpusetMems": "",
"Devices": [],
"DeviceCgroupRules": null,
"DeviceRequests": null,
"MemoryReservation": 0,
"MemorySwap": 0,
"MemorySwappiness": null,
"OomKillDisable": null,
"PidsLimit": null,
"Ulimits": null,
"CpuCount": 0,
"CpuPercent": 0,
"IOMaximumIOps": 0,
"IOMaximumBandwidth": 0,
"MaskedPaths": [
    "/proc/asound",
    "/proc/acpi",
```

```

        "/proc/kcore",
        "/proc/keys",
        "/proc/latency_stats",
        "/proc/timer_list",
        "/proc/timer_stats",
        "/proc/sched_debug",
        "/proc/scsi",
        "/sys/firmware"
    ],
    "ReadOnlyPaths": [
        "/proc/bus",
        "/proc/fs",
        "/proc/irq",
        "/proc/sys",
        "/proc/sysrq-trigger"
    ]
},
"GraphDriver": {
    "Data": {
        "LowerDir":
"/var/lib/docker/overlay2/6c52adb809a69f5cd0943b6e0783b0765f0a2e16cb8e44f5929a04fa38610d03
-
init/diff:/var/lib/docker/overlay2/c91f7fecf896c5c66a30b63d79aaf79127d7d1676ce0c56e9b88b63
f4e14bbb3/diff:/var/lib/docker/overlay2/6ca723844f37bba15380d5f7ee1f92b6370960933e95e8f12c
18cb0695263b3e/diff:/var/lib/docker/overlay2/dbfe93b7499b1686e55cd83ee1c6a3d994452e3e8e082
fa6c812c68f048ace8e/diff:/var/lib/docker/overlay2/c63d3db485f14dc788088a1f548f973ec867f68f
39c36ff587b069f89c346429/diff:/var/lib/docker/overlay2/fd595bcd1e7587be951eb9f4125b451669a
139441fc927f87ededd3f2fda02a7/diff:/var/lib/docker/overlay2/de72a959af4301fbfd1bb57a3b5046
54551de204ccd208c0849b8e6f632ec6db/diff:/var/lib/docker/overlay2/656ed3a41d736d4e22245ff7c
5a7e702d8c56a8c248c61abd8d7cb9a0801042c/diff:/var/lib/docker/overlay2/a44742a1ea16001b049e
a1d135856a4a5c757a165c4decac6cb8078aac42e2ac/diff:/var/lib/docker/overlay2/a0e0f2c89d00e6f
c95f73869f237933eef4b9f126119cec0c7b8f14b1a5fd57d/diff:/var/lib/docker/overlay2/08b663333a
2880aff2a507afd630f680362f60eb7d581045845dac6354440943/diff:/var/lib/docker/overlay2/10703
6274e659999f78fef4379be3bcc4e50107c5fbd030e27757a1b4d78a836/diff",
        "MergedDir":
"/var/lib/docker/overlay2/6c52adb809a69f5cd0943b6e0783b0765f0a2e16cb8e44f5929a04fa38610d03
/merged",
        "UpperDir":
"/var/lib/docker/overlay2/6c52adb809a69f5cd0943b6e0783b0765f0a2e16cb8e44f5929a04fa38610d03

```



```
/diff",
    "WorkDir":
"/var/lib/docker/overlay2/6c52adb809a69f5cd0943b6e0783b0765f0a2e16cb8e44f5929a04fa38610d03
/work"
    },
    "Name": "overlay2"
},
"Mounts": [
    {
        "Type": "volume",
        "Name": "portainer_data",
        "Source": "/var/lib/docker/volumes/portainer_data/_data",
        "Destination": "/data",
        "Driver": "local",
        "Mode": "z",
        "RW": true,
        "Propagation": ""
    },
    {
        "Type": "bind",
        "Source": "/var/run/docker.sock",
        "Destination": "/var/run/docker.sock",
        "Mode": "",
        "RW": true,
        "Propagation": "rprivate"
    }
],
"Config": {
    "Hostname": "ddccc9f35392",
    "Domainname": "",
    "User": "",
    "AttachStdin": false,
    "AttachStdout": false,
    "AttachStderr": false,
    "ExposedPorts": {
        "8000/tcp": {},
        "9000/tcp": {},
        "9443/tcp": {}
    },
    },
```

```

    "Tty": false,
    "OpenStdin": false,
    "StdinOnce": false,
    "Env": [
        "PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin"
    ],
    "Cmd": null,
    "Image": "portainer/portainer-ce:latest",
    "Volumes": {
        "/data": {}
    },
    "WorkingDir": "/",
    "Entrypoint": [
        "/portainer"
    ],
    "OnBuild": null,
    "Labels": {
        "com.docker.desktop.extension.api.version": ">= 0.2.2",
        "com.docker.desktop.extension.icon": "https://portainer-io-
assets.sfo2.cdn.digitaloceanspaces.com/logos/portainer.png",
        "com.docker.extension.additional-urls":
    "[{ \"title\": \"Website\", \"url\": \"https://www.portainer.io?utm_campaign=DockerCon&utm_sou
rce=DockerDesktop\" }, { \"title\": \"Documentation\", \"url\": \"https://docs.portainer.io\" }, {
\"title\": \"Support\", \"url\": \"https://join.slack.com/t/portainer/shared_invite/zt-
txh3ljab-52QHTyjCqbe5RibC2lcjKA\" } ]",
        "com.docker.extension.detailed-description": "<p data-renderer-start-
pos=\\\"226\\\">Portainer's Docker Desktop extension gives you access to all of
Portainer's rich management functionality within your docker desktop
experience.</p><h2 data-renderer-start-pos=\\\"374\\\">With Portainer you can:</h2><ul><li>See
all your running containers</li><li>Easily view all of your container logs</li><li>Console
into containers</li><li>Easily deploy your code into containers using a simple
form</li><li>Turn your YAML into custom templates for easy reuse</li></ul><h2 data-
renderer-start-pos=\\\"660\\\">About Portainer&nbsp;</h2><p data-renderer-start-
pos=\\\"680\\\">Portainer is the world's most popular universal container management
platform with more than 650,000 active monthly users. Portainer can be used to manage
Docker Standalone, Kubernetes, Docker Swarm and Nomad environments through a single common
interface. It includes a simple GitOps automation engine and a Kube API.&nbsp;</p><p data-
renderer-start-pos=\\\"1006\\\">Portainer Business Edition is our fully supported commercial
grade product for business-wide use. It includes all the functionality that businesses

```

need to manage containers at scale. Visit [Portainer.io](http://portainer.io/ "http://Portainer.io") to learn more about Portainer Business and [get 3 free nodes.](http://portainer.io/take-3?utm_campaign=DockerCon&utm_source=Docker%20Desktop "http://portainer.io/take-3?utm_campaign=DockerCon&utm_source=Docker%20Desktop")

```
        "com.docker.extension.publisher-url": "https://www.portainer.io",
        "com.docker.extension.screenshots": "[{"alt": "screenshot one",
"url": "https://portainer-io-assets.sfo2.digitaloceanspaces.com/screenshots/docker-extension-1.png"}, {"alt": "screenshot two", "url": "https://portainer-io-assets.sfo2.digitaloceanspaces.com/screenshots/docker-extension-2.png"}, {"alt": "screenshot three", "url": "https://portainer-io-assets.sfo2.digitaloceanspaces.com/screenshots/docker-extension-3.png"}, {"alt": "screenshot four", "url": "https://portainer-io-assets.sfo2.digitaloceanspaces.com/screenshots/docker-extension-4.png"}, {"alt": "screenshot five", "url": "https://portainer-io-assets.sfo2.digitaloceanspaces.com/screenshots/docker-extension-5.png"}, {"alt": "screenshot six", "url": "https://portainer-io-assets.sfo2.digitaloceanspaces.com/screenshots/docker-extension-6.png"}, {"alt": "screenshot seven", "url": "https://portainer-io-assets.sfo2.digitaloceanspaces.com/screenshots/docker-extension-7.png"}, {"alt": "screenshot eight", "url": "https://portainer-io-assets.sfo2.digitaloceanspaces.com/screenshots/docker-extension-8.png"}, {"alt": "screenshot nine", "url": "https://portainer-io-assets.sfo2.digitaloceanspaces.com/screenshots/docker-extension-9.png"}]",
        "io.portainer.server": "true",
        "org.opencontainers.image.description": "Docker container management made simple, with the world's most popular GUI-based container management platform.",
        "org.opencontainers.image.title": "Portainer",
        "org.opencontainers.image.vendor": "Portainer.io"
    },
    {
        "NetworkSettings": {
            "Bridge": "",
            "SandboxID":
"043d93a4ae7e151ea78b088376579e29e7b0efe33dd961cffba0307c642a04ca",
            "HairpinMode": false,
```

```
"LinkLocalIPv6Address": "",
"LinkLocalIPv6PrefixLen": 0,
"Ports": {
  "8000/tcp": [
    {
      "HostIp": "0.0.0.0",
      "HostPort": "8000"
    },
    {
      "HostIp": "::",
      "HostPort": "8000"
    }
  ],
  "9000/tcp": null,
  "9443/tcp": [
    {
      "HostIp": "0.0.0.0",
      "HostPort": "9443"
    },
    {
      "HostIp": "::",
      "HostPort": "9443"
    }
  ]
},
"SandboxKey": "/var/run/docker/netns/043d93a4ae7e",
"SecondaryIPAddresses": null,
"SecondaryIPv6Addresses": null,
"EndpointID":
"6357a139fd6b5f3429a595294a79ee409b1d45c360e0c3a71753c6e2986b2370",
"Gateway": "172.17.0.1",
"GlobalIPv6Address": "",
"GlobalIPv6PrefixLen": 0,
"IPAddress": "172.17.0.2",
"IPPrefixLen": 16,
"IPv6Gateway": "",
"MacAddress": "02:42:ac:11:00:02",
"Networks": {
  "bridge": {
```

```
        "IPAMConfig": null,
        "Links": null,
        "Aliases": null,
        "NetworkID":
"bbea4213fff37a9904b60d7e2699721e1311e11f770e2095288875175cfdb533",
        "EndpointID":
"6357a139fd6b5f3429a595294a79ee409b1d45c360e0c3a71753c6e2986b2370",
        "Gateway": "172.17.0.1",
        "IPAddress": "172.17.0.2",
        "IPPrefixLen": 16,
        "IPv6Gateway": "",
        "GlobalIPv6Address": "",
        "GlobalIPv6PrefixLen": 0,
        "MacAddress": "02:42:ac:11:00:02",
        "DriverOpts": null
    },
    "towne-net": {
        "IPAMConfig": null,
        "Links": null,
        "Aliases": [
            "ddccc9f35392"
        ],
        "NetworkID":
"24fba8d25afa8fbe7efec42df03de1844cc72197ed22bfa137c6120cffc2c3db",
        "EndpointID":
"e7501abfa77e30abc66313c1e2c25eef4cf2f5c6d73baf5ed5107d03d312a6c8",
        "Gateway": "172.18.0.1",
        "IPAddress": "172.18.0.4",
        "IPPrefixLen": 16,
        "IPv6Gateway": "",
        "GlobalIPv6Address": "",
        "GlobalIPv6PrefixLen": 0,
        "MacAddress": "02:42:ac:12:00:04",
        "DriverOpts": null
    }
}
}
}
}
```

```
ubuntu@instance-20231025-1926:~$
```

The above is an example. This command gives a lot of information. Look Carefully for the "IPV4Address"; line.

[image.png](#)

Proxy NPM's Management Interface

With your service running, return to the Nginx Proxy Manager interface. There, add a proxy host for the service, creating a reverse proxy that forwards traffic from the domain to the service.

[npm-1.png](#)

[image.png](#)

- Navigate to the **Proxy Hosts** page. Get there either using the **Proxy Hosts** button from the **Dashboard** or via the **Hosts > Proxy Hosts** option from the top menu bar.
- Click the **Add Proxy Host** button. Complete the form that displays as follows:
 - Enter the domain name to be used for your service in the **Domain Names** field.
 - Set the **Scheme** to *https*. This refers to the scheme used by Nginx to access the service, not the scheme used for the proxy itself. A later step adds SSL encryption to the proxy.
 - Enter the service address in the **Forward Hostname/IP** field. For this case **127.0.0.1**.
Enter the local-docker address from which the proxy manager could access the service.
 - Enter the service port in the **Forward Port** field. Following the configuration for NGiNx used in this tutorial, that port is 81.
 - Toggle on the **Block Common Exploits, Cache Assets, Websockets Support** options as this is generally a nice feature to have.
 - Leave the remaining fields at their defaults.

[image.png](#)

- Before saving the configuration, navigate to the **SSL** tab and complete the form as follows:
 - Select *Request a new SSL Certificate* from the **SSL Certificate** drop down.
 - Toggle on the **Force SSL** option to ensure HTTPS is used, encrypting traffic to and from the service.
 - Enter an email address for the Let's Encrypt certificate process. Let's Encrypt uses this to alert you when the certificate needs to be renewed.
 - Select the **I Agree** toggle after reading the terms of service for Let's Encrypt.
 - Leave the remaining fields at their defaults.

Adding an SSL certificate to a proxy host in the Nginx Proxy Manager

- Select **Save** to complete the proxy host setup.

Your reverse proxy for the NPM, s Management UI service is now in place. Navigate to your chosen domain to see it in action.

Do the same process to Portainer's Management interface by entering portainer's IP address and port **9443**. Don't forget to set the scheme to **HTTPS**.

This process is rinse-and-repeat for most of the App/containers you will deploy. Below we will make available the docker-compose.yml files for all the stacks.

Use Bookstack's docker-compose.yml supplied below, to deploy bookstack or any other container or stack.

Docker-compose.yml Files

NGINX Proxy Manager

```
version: '3.8'
services:
  app:
    image: 'jc21/nginx-proxy-manager:latest'
    restart: unless-stopped
    ports:
      # These ports are in format <host-port>:<container-port>
      - '80:80' # Public HTTP Port
      - '443:443' # Public HTTPS Port
      - '81:81' # Admin Web Port
      # Add any other Stream port you want to expose
      # - '21:21' # FTP
```

```
environment:
  # MySQL/Maria connection parameters:
  DB_MYSQL_HOST: "db"
  DB_MYSQL_PORT: 3306
  DB_MYSQL_USER: "npm"
  DB_MYSQL_PASSWORD: "npm" #change this line
  DB_MYSQL_NAME: "npm"
  # Uncomment this if IPv6 is not enabled on your host
  # DISABLE_IPV6: 'true'
```

```
volumes:
  - ./data:/data
  - ./letsencrypt:/etc/letsencrypt
```

```
depends_on:
```

```
- db
```

```
networks:
```

```
- net-to-proxy
- npm_default
```

```
db:
```

```
image: 'jc21/mariadb-aria:latest'
```

```
restart: unless-stopped
```

```
environment:
```

```
  MYSQL_ROOT_PASSWORD: 'npm' #change this line
  MYSQL_DATABASE: 'npm'
  MYSQL_USER: 'npm'
  MYSQL_PASSWORD: 'npm' # change this line
```

```
volumes:
```

```
- ./mysql:/var/lib/mysql
```

```
networks:
```

```
- npm_default
```

```
networks:
```

```
net-to-proxy:
```

```
external: true
```

```
npm_default:
```

```
driver: bridge
```



```
version: "3"
services:
  portainer:
    image: portainer/portainer-ce:latest
    ports:
      - 9443:9443
    volumes:
      - data:/data
      - /var/run/docker.sock:/var/run/docker.sock
    restart: unless-stopped
    networks:
      - portainer_net
      - net-to-proxy
volumes:
  data: ./poertainer_data

networks:
  portainer_net:
    driver: bridge # This means that, this network is using the host bridge
  net-to-proxy:
    external: true # This means that, this network was created previously and is external
```

Bookstack

```
version: "2"
services:
  bookstack:
    image: lscr.io/linuxserver/bookstack
    container_name: bookstack
    environment:
      - PUID=1001
      - PGID=1001
      - APP_URL=https://your_domain.tld
      - DB_HOST=bookstack_db
      - DB_PORT=3306
      - DB_USER=bookstack
      - DB_PASS=Change_this_line
```

```
- DB_DATABASE=bookstackapp
volumes:
  - ./bookstack_app_data:/config
ports:
  - 6875:80
restart: unless-stopped
depends_on:
  - bookstack_db
networks:
  - bookstack_default
  - net-to-proxy
```

bookstack_db:

```
image: lscr.io/linuxserver/mariadb
container_name: bookstack_db
environment:
  - PUID=1001
  - PGID=1001
  - MYSQL_ROOT_PASSWORD=Change_this_line
  - TZ=America/New_York
  - MYSQL_DATABASE=bookstackapp
  - MYSQL_USER=bookstack
  - MYSQL_PASSWORD=Must_match_password
volumes:
  - ./bookstack_db_data:/config
restart: unless-stopped
networks:
  - bookstack_default
```

networks:

bookstack_default:

```
driver: bridge
```

net-to-proxy:

```
external: true
```