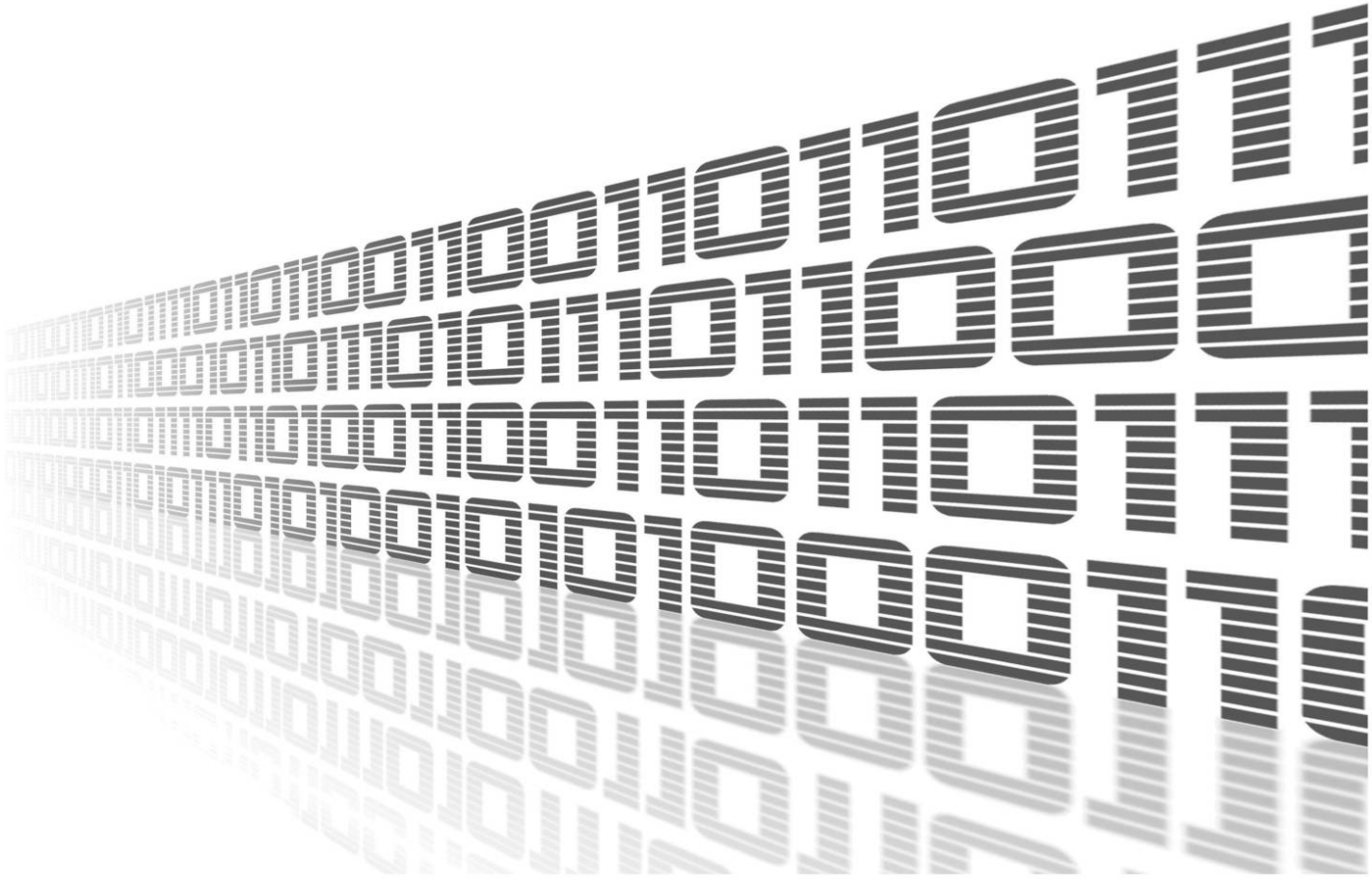
ADVANTECH

RouterApp

# Docker



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# Used symbols

*Danger* – Information regarding user safety or potential damage to the router.

*Attention* – Problems that can arise in specific situations.

*Information* – Useful tips or information of special interest.

*Example* – Example of function, command or script.

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# 1. Changelog

This Router App has been tested on a router with firmware version 6.3.10. After updating the router's firmware to a higher version, make sure that a newer version of the Router App has not also been released, as it is necessary to update it as well for compatibility reasons.

## 1.1 Docker Changelog

**v20.10.7 (2021-09-23)**

- First release

**v20.11.0 (2022-11-03)**

- Reworked license information

**v20.11.1 (2023-03-08)**

- Fixed dependency on FW files

**v20.10.25 (2023-09-06)**

- Fixed CVE-2023-28842 by updating of moby/cli to version 20.10.25
- Fixed CVE-2023-28642 and CVE-2023-27561 by updating of runc to version 1.1.9
- Softened all fatal errors in startup init script to non-fatal

# 2. What is Docker?

Docker is an open platform for developing, shipping, and running applications. Docker enables you to separate your applications from your infrastructure so you can deliver software quickly. With Docker, you can manage your infrastructure in the same ways you manage your applications. By taking advantage of Docker's methodologies for shipping, testing, and deploying code quickly, you can significantly reduce the delay between writing code and running it in production.


Figure 1: Docker logo

Docker provides the ability to package and run an application in a loosely isolated environment called a container. The isolation and security allow you to run many containers simultaneously on a given host. Containers are lightweight and contain everything needed to run the application, so you do not need to rely on what is currently installed on the host. You can easily share containers while you work, and be sure that everyone you share with gets the same container that works in the same way.

## 2.1 Docker objects

When you use Docker, you are creating and using images, containers, networks, volumes, plugins, and other objects. This section is a brief overview of some of those objects.

**Image**

is a read-only template with instructions for creating a Docker container. Often, an image is based on another image, with some additional customization. For example, you may build an image which is based on the ubuntu image, but installs the Apache web server and your application, as well as the configuration details needed to make your application run.

You might create your own images or you might only use those created by others and published in a registry. To build your own image, you create a *Dockerfile* with a simple syntax for defining the steps needed to create the image and run it. Each instruction in a Dockerfile creates a layer in the image. When you change the Dockerfile and rebuild the image, only those layers which have changed are rebuilt. This is part of what makes images so lightweight, small, and fast, when compared to other virtualization technologies.

**Container**

is a runnable instance of an image. You can create, start, stop, move, or delete a container using the Docker API or CLI. You can connect a container to one or more networks, attach storage to it, or even

create a new image based on its current state.

By default, a container is relatively well isolated from other containers and its host machine. You can control how isolated a container's network, storage, or other underlying subsystems are from other containers or from the host machine.

A container is defined by its image as well as any configuration options you provide to it when you create or start it. When a container is removed, any changes to its state that are not stored in persistent storage disappear.

## 2.2 Example *docker run* command

The following command runs an ubuntu container, attaches interactively to your local command-line session, and runs /bin/bash.

```
$ docker run -i -t ubuntu /bin/bash
```

When you run this command, the following happens (assuming you are using the default registry configuration):

1. If you do not have the ubuntu image locally, Docker pulls it from your configured registry, as though you had run docker pull ubuntu manually.
2. Docker creates a new container, as though you had run a docker container create command manually.
3. Docker allocates a read-write filesystem to the container, as its final layer. This allows a running container to create or modify files and directories in its local filesystem.
4. Docker creates a network interface to connect the container to the default network, since you did not specify any networking options. This includes assigning an IP address to the container. By default, containers can connect to external networks using the host machine's network connection.
5. Docker starts the container and executes /bin/bash. Because the container is running interactively and attached to your terminal (due to the -i and -t flags), you can provide input using your keyboard while the output is logged to your terminal.
6. When you type exit to terminate the /bin/bash command, the container stops but is not removed. You can start it again or remove it.

# 3. Docker Router App Description

Supported routers: **SmartStart SL305**, **ICR-3200 family**, and **ICR-4400 family**.

Please note that router's firmware of version 6.3.2 and above is required for the *Docker* router app to work properly.

When uploaded to the router, the router app is accessible in the *Customization* section in the *Router Apps* item of the router's web interface. Click on the title of the router app to see the router app menu as shown below:


Figure 2: Docker Router App Menu

The *Status* section provides the *Overview*, *Statistics*, *Log*, *Events* pages. In the *Configuration* section we will find the *Global* page. *Administration* section contains pages which works with *Images*, *Containers*, *Volumes* and pages for *Login* and *Logout*. More about every page mentioned above will be described further in this application note. The *Information* section provides the *Licenses* page with the list of licenses used in this Router App. The *Return* item in the *Customization* section is to return to the higher menu of the router.

Menu item *Compose Container* is not available on ICR-3xxx routers.

## 3.1 Status

### 3.1.1 Overview

Overview section consists of four parts, first *Service* contains information about Router App status

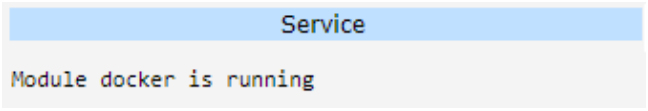


Figure 3: Overview service info

Second part provides information about disk usage

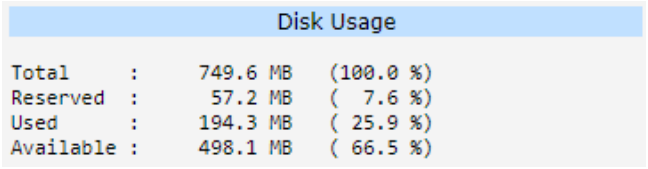


Figure 4: Status overview disk usage

Third provides information about Docker Router App Version

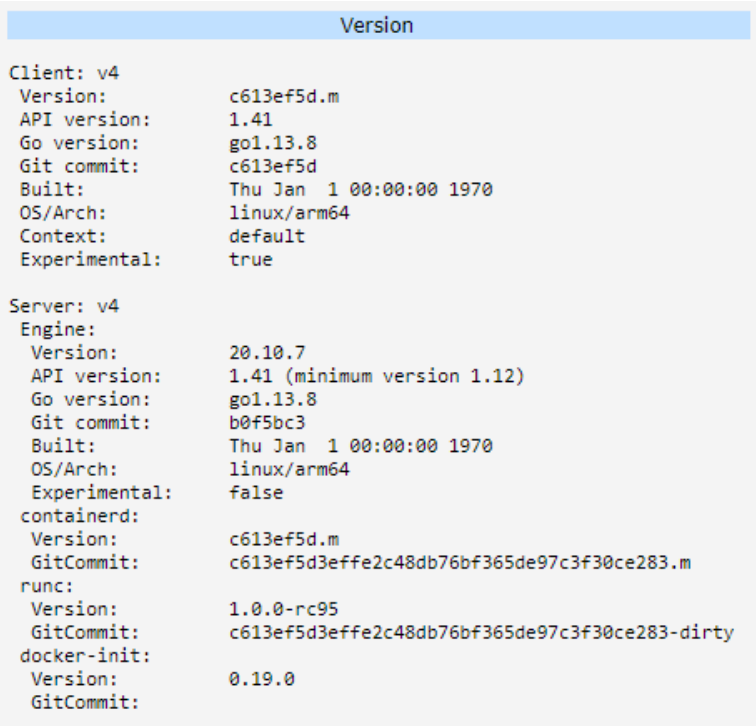


Figure 5: Status overview version

And last one contains all other useful information

Information

```
Client:
 Context:    default
 Debug Mode: false

Server:
 Containers: 0
  Running: 0
  Paused: 0
  Stopped: 0
 Images: 0
 Server Version: 20.10.7
 Storage Driver: overlay2
  Backing Filesystem: extfs
  Supports d_type: true
  Native Overlay Diff: true
  userxattr: false
 Logging Driver: json-file
 Cgroup Driver: cgroupfs
 Cgroup Version: 1
 Plugins:
  Volume: local
  Network: bridge host ipvlan macvlan null overlay
  Log: awslogs fluentd gcplogs gelf journald json-file local logentries splunk syslog
 Swarm: inactive
 Runtimes: io.containerd.runc.v2 io.containerd.runtime.v1.linux runc
 Default Runtime: runc
 Init Binary: docker-init
 containerd version: c613ef5d3effe2c48db76bf365de97c3f30ce283.m
 runc version: c613ef5d3effe2c48db76bf365de97c3f30ce283-dirty
 init version:
 Kernel Version: 4.14.138
 Operating System: ICR-445x 6.3.2 (2021-09-19) BETA #1380
 OSType: linux
 Architecture: aarch64
 CPUs: 4
 Total Memory: 993.8MiB
 Name: Router
 ID: KLRE:YJHQ:PFES:IQ5D:RYBB:P3KD:R554:AHLB:JI7R:NFZS:N7YQ:DX2Y
 Docker Root Dir: /opt/docker_root
 Debug Mode: false
 Registry: https://index.docker.io/v1/
 Labels:
 Experimental: false
 Insecure Registries:
  127.0.0.0/8
 Live Restore Enabled: false

WARNING: No swap limit support
```

Figure 6: Status overview information

In the *Information* section is one item worth mentioning and it is *Architecture*. This information could be useful when you are not sure if your routers architecture support certain image.

```
Kernel Version: 4.14.138
Operating System: ICR-323x 6.3.6 (2022-06-08) BETA #1666
OSType: linux
Architecture: armv7l
CPUs: 1
Total Memory: 497.5MiB
Name: Router
```

Figure 7: Architecture

You can just go on Docker Hub[1], search for Image you desire and in the *Tags* tab are supported architectures listed.

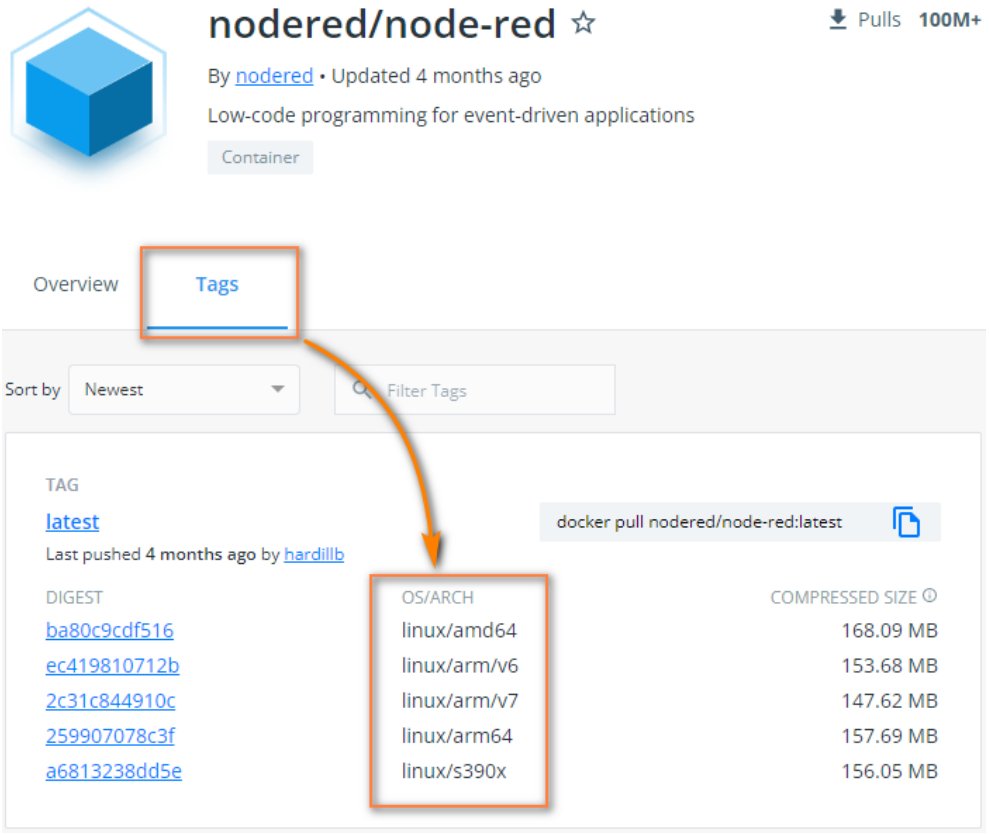


Figure 8: Architectures supported by the image

[1] https:\hub.docker.com

### 3.1.2 Statistics

In this section we could see statistics of running containers

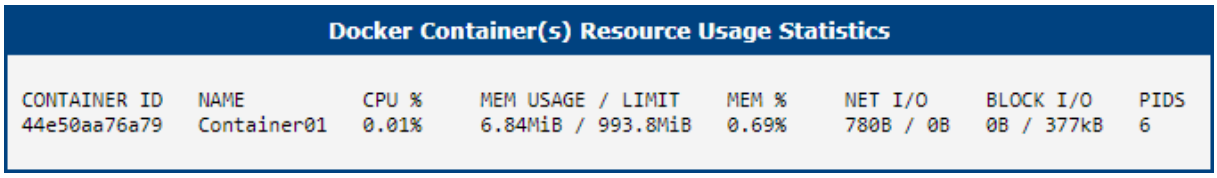


Figure 9: Statistics

| Column | Description |
|---|---|
| CONTAINER ID | Id of the container |
| NAME | Name of the container |
| CPU % | Actual CPU usage |
| MEM USAGE / LIMIT | Actual memory used / Limit of the memory used |
| MEM % | Actual memory used from limit in percent |
| NET I/O | Actual network operations |
| BLOCK I/O | Actual drive operations |
| PIDS | Process IDs |

Table 1: Statistics columns

### 3.1.3 Log

This section contains detail log messages of Docker Router App divided into 2 parts *Containerd Log Messages* and *Dockerd Log Messages*

### 3.1.4 Events

In this section we could find list of Docker event raised by our usage.

**Docker Events**

```
2021-09-20T14:05:45.234765600+02:00 image pull ubuntu:latest (name=ubuntu)
2021-09-20T14:11:33.858323800+02:00 image pull portainer/portainer-ce:latest (name=portainer/portainer-ce)
2021-09-20T14:13:06.157239520+02:00 volume create ba7e30f07d0700dd6e043a74175d8060fe2436db63bf31143a8fc682a2a94ede
2021-09-20T14:13:06.201069120+02:00 container create 8a609ec68dcdedd5985a15f0e5af73049b6c100263a336c846cc8f0f62e56
2021-09-20T14:13:06.268918160+02:00 network connect ef2ff5c2f32da0758c41ff192945b06d443e535607f788524495adcaaf088b
2021-09-20T14:13:06.272819320+02:00 volume mount ba7e30f07d0700dd6e043a74175d8060fe2436db63bf31143a8fc682a2a94ede
2021-09-20T14:13:06.988324960+02:00 container start 8a609ec68dcdedd5985a15f0e5af73049b6c100263a336c846cc8f0f62e561
2021-09-20T14:18:07.713145440+02:00 container die 8a609ec68dcdedd5985a15f0e5af73049b6c100263a336c846cc8f0f62e56121
2021-09-20T14:18:07.851152160+02:00 network disconnect ef2ff5c2f32da0758c41ff192945b06d443e535607f788524495adcaaf0
2021-09-20T14:18:07.880521200+02:00 volume unmount ba7e30f07d0700dd6e043a74175d8060fe2436db63bf31143a8fc682a2a94ed
2021-09-20T14:38:47.225967080+02:00 volume create c511d7c5973af85d242caa68a8e6021716fbc2b6f59583af5864c5fff313ea0e
2021-09-20T14:38:47.268844440+02:00 container create cfc86335c6a500bf1b3d0ea802def02176ed7e655d2ec42a7081abe5828e4
2021-09-20T14:38:47.329333000+02:00 network connect ef2ff5c2f32da0758c41ff192945b06d443e535607f788524495adcaaf088b
2021-09-20T14:38:47.333260760+02:00 volume mount c511d7c5973af85d242caa68a8e6021716fbc2b6f59583af5864c5fff313ea0e
2021-09-20T14:38:48.063397240+02:00 container start cfc86335c6a500bf1b3d0ea802def02176ed7e655d2ec42a7081abe5828e4b
```

Figure 10: Docker events

## 3.2 Configuration

### 3.2.1 Global

Docker Router App configuration is placed in *Global* section.

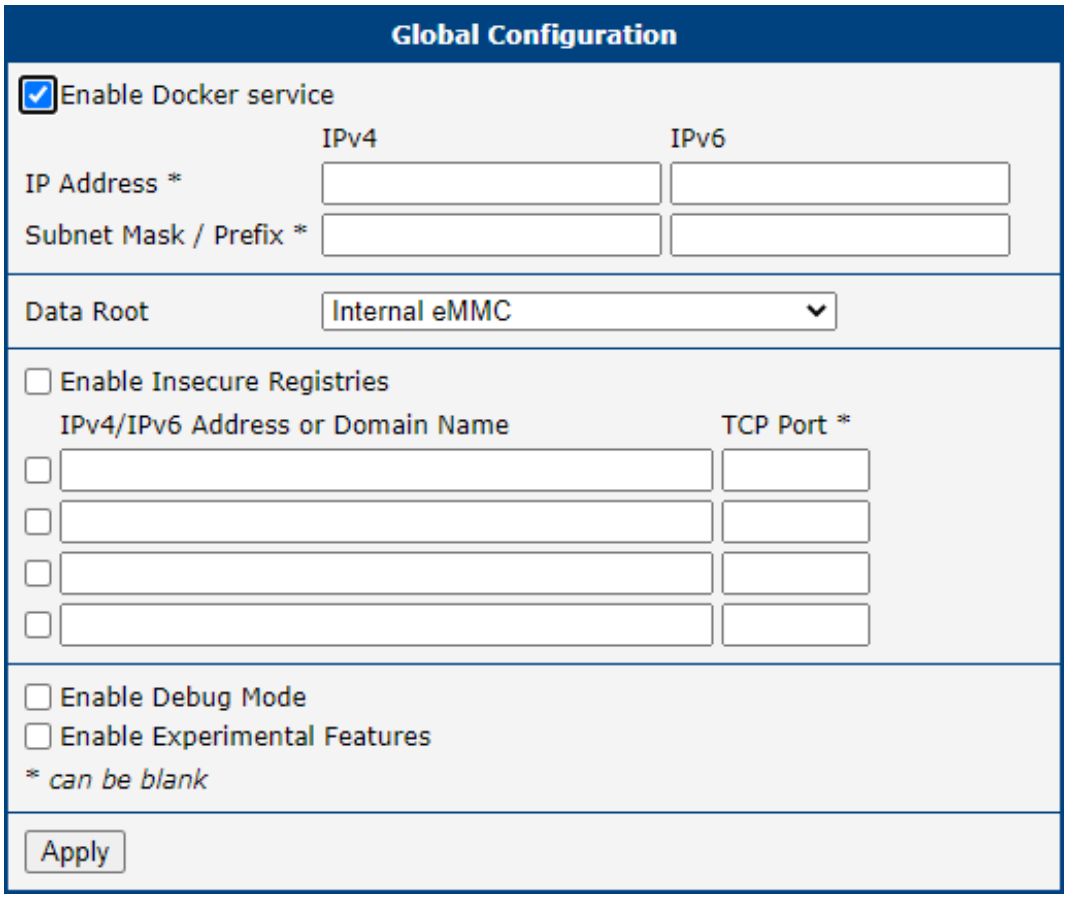


Figure 11: Global configuration

| Item | Description |
|---|---|
| Enable Docker Service | Enables Docker functionality. This option alone suffice for using Docker Router App |
| IP Address | Docker itself makes up his own IPv4 address, if it does suit your need for any reason, you can fill IP address you want. For IPv6 its little different - Docker won't make a IPv6 address and if you want one, you have to add one here in IPv6 field. |
| Subnet Mask / Prefix | Similar to IP Address above - in case you want some specific Subnet Mask / Prefix, you should specify it here. |

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| Item | Description |
|---|---|
| Data Root | Dynamically generated list of options where is possible to create data root for Docker Router App. This list could differ on different routers. All possible options are:<br>• Internal eMMC<br>• SD Card<br>• USB Flashdrive<br>• SATA harddrive (*only on v4 routers*)<br>**There has to be supported filesystem on selected Data Root (ext2, ext3, ext4)!** |
| Enable Insecure Registries | Enable if you have your own custom reigistry without https access. You can add up to 4 registries. |
| Enables Debug Mode | When enabled, extra data will be written out to logs. |
| Enables Experimental Features | Possibility to enable experimenta features. |

Table 2: Configuration items description

## 3.3 Administration

This section allows you administer your Images, Containers, Volumes and lets you Login and Logout to and from your preferred registry.

**All actions and operation from *Administration* section are available only when *Docker* is enabled and running.**

### 3.3.1 Images

Here you will find the list with your available Images.

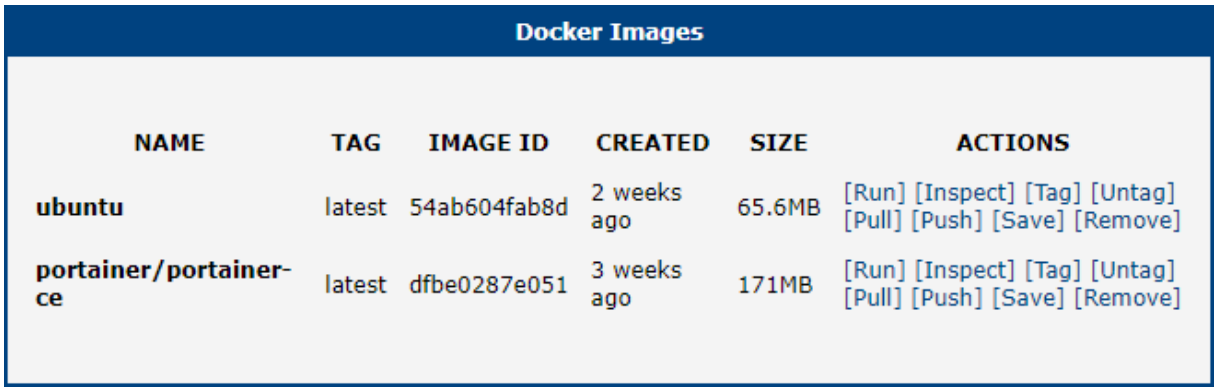


Figure 12: Images

| Column | Description |
|---|---|
| Name | Name of the container |
| Tag | Tag of the container |
| Image ID | ID of the image |
| Created | Date of creation of image |
| Size | Size of the image |
| Actions | Possible action with image |

Table 3: Docker Images columns

### Images actions

Each Image has 8 actions available.

| Item | Description |
|---|---|
| Run | Runs the image and creates the container |
| Inspect | Display detailed information of image |
| Tag | Creates a tag |
| Untag | Removes a tag, removing last tag will at the same time remove whole image |
| Pull | Pull an image from a registry |
| Push | Push an image to a registry |
| Save | Saves image to a tar archive (streamed to STDOUT by default) |
| Remove | Remove image. Image can't be removed when it has multiple tags or container from this image already exists. |

Table 4: Image actions

### Run Image

The run action is used to mention that we want to create an instance of an image, which is then called a container. After clicking on action *Run* the options of this action will show. There are 2 levels of options available *Basic* and *Advanced*. Basic options are displayed everytime, but Advanced are shown only after clicking on the button *Show Advanced*. Run Image is the key part of Docker Router App. We have Image and we need to run the Image and create the container. In simplest case we click on Run and *something* happens - either it will run, or it won't and we get some kind of error which helps with running the image. Worst case scenario is that it won't run. Some images needs parameters to be filled. The way, how to run an image typically can not be guessed. Author of the image have to give you some rules how to run the image corectly.

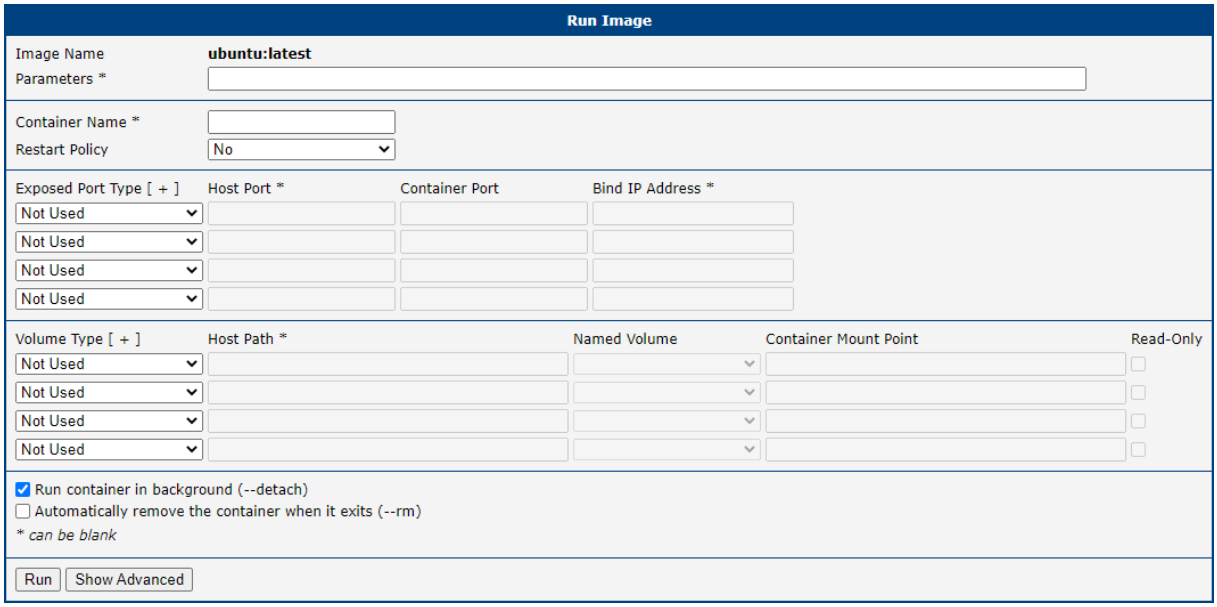


Figure 13: Image Run

| Item | Description |
|---|---|
| Parameters | Parameters for the container or the service that run inside. |
| Container Name | Name of the container, if left blank, random name will be given. |
| Restart Policy | Specify a restart policy for how a container should or should not be restarted on exit. Options are:<br>• **no** - Do not automatically restart the container when it exits. This is the default.<br>• **on-failure** - Restart only if the container exits with a non-zero exit status. Optionally, limit the number of restart retries the Docker daemon attempts.<br>• **unless-stopped** - Always restart the container regardless of the exit status. When you specify always, the Docker daemon will try to restart the container indefinitely. The container will also always start on daemon startup, regardless of the current state of the container.<br>• **always** - Always restart the container regardless of the exit status, including on daemon startup, except if the container was put into a stopped state before the Docker daemon was stopped. |

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| Item | Description |
|---|---|
| Exposed Port Type | Map or bind ports where the container should run od listen. Container port is most important, its sufficient to specify only where the container should run, if its the same on routers it does not need to be specified, if you want some other, just fill it in. If you want to specify to not listening everywhere, but only on some interface, fill the address of the interface where it should listen. |
| Volume Type | Data storage for the container. For example database need to store data somewhere or you need to take some files from the router to the container, this is the section where to map it. There are two options<br>• Host path - path is specified<br>• Named Volume - volume is selected from the available volumes |
| Run Container in background | If enabled, the service runs on background. By default is this option enabled, in most cases we want to services to be ready to fulfil its purpose. |
| Automatically remove the container when it exists | When container ends, it stays in the list and theoretically can be started again, but there are cases, where you do some one-time operation and there no need to container stays in list to be removed manually so you can check this option even before it starts and save some time. |

Table 5: Run Image Basic Options

Options from the Advanced part are mostly optional, therefore are hidden at first to make the Run action clearer.

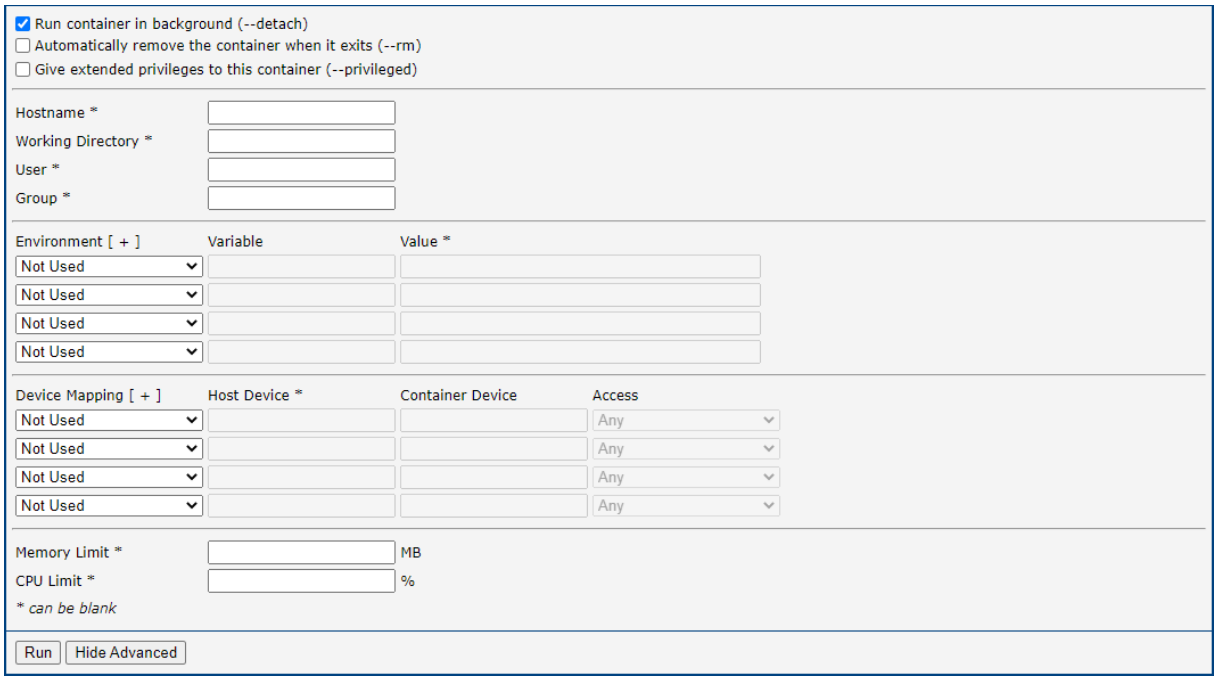


Figure 14: Image Run Advanced

| Item | Description |
|---|---|
| Give extended privileges to this container | The –privileged flag gives all capabilities to the container, and it also lifts all the limitations enforced by the device cgroup controller. In other words, the container can then do almost everything that the host can do. This flag exists to allow special use-cases, like running Docker within Docker. |
| Hostname | Enter the hostname of the container. |
| Working Directory | It is possible to select working directory, where container is running e.g. if you want the container to start in /tmp/ directory to handle some temporary files, it could be done with this option. |
| User | Specify the user under which the container will run. |
| Group | Specify the group under which the container will run. |
| Environment | Set simple (non-array) environment variables in the container you're running, or overwrite variables that are defined in the Dockerfile of the image you're running. |

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| Item | Description |
|---|---|
| Device Mapping | It is often necessary to directly expose devices to a container. This option option enables that. For example, a specific block storage device or loop device or audio device can be added to an otherwise unprivileged container (without the –privileged flag) and have the application directly access it. |
| Memory Limit | Memory limit given to the container. Can be seen in Container list. Default value is maximum memory usage and that could be undesirable, therefore you can specify the amount needed. |
| CPU Limit | Specify how much CPU power you want to give to the container. Its in percent and 1 core means 100%, so in case 4-core v4 router is 400% absolute maximum and 200% means that container could use 2 cores. |

Table 6: Run Image Advanced Options

As a result of running an image we get a Container ID. More about Containers will be described below in *Containers* section.

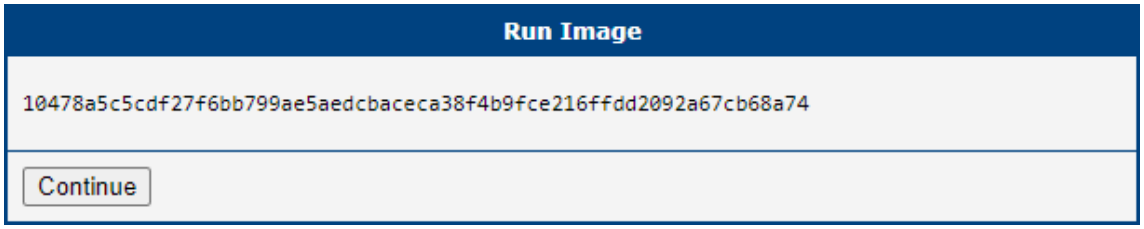


Figure 15: Image run result

### Transforming Docker Run Command into Run Image action

Let's say we want to run Image of for example *netdata*. So we search for it and pull the first one with most ratings. As we stated earlier, we have to find some rules how to run this Image. So we search the Docker Hub [2], find this Image and go to the netdata official site and here we have the example we were looking for:

```
docker run -d --name=netdata \
-p 19999:19999 \
-v netdataconfig:/etc/netdata \
-v netdatalib:/var/lib/netdata \
-v netdatacache:/var/cache/netdata \
-v /etc/passwd:/host/etc/passwd:ro \
-v /etc/group:/host/etc/group:ro \
-v /proc:/host/proc:ro \
-v /sys:/host/sys:ro \
-v /etc/os-release:/host/etc/os-release:ro \
--restart unless-stopped \
--cap-add SYS_PTRACE \
--security-opt apparmor=unconfined \
netdata/netdata
```

First line alone will run, but it won't do what we need it to do and that is the reason why there are those extra parameters, which tells what to do/from where take data/how it should behave/what it should do if it crashes/other necessities and thats what we need se set in our Router App in Run Image action.

Second line *-p 19999:19999* is port, the first 19999 defines on which port on our router it will be visible and the second defines on which port the service is running in container. In this case ports are the same, but you can remap those ports as you wish. As mentioned in table above, when the ports are identical it is sufficient to fill only *Container Port*. Ports are TCP as default, when not stated otherwise. So for our example - this is how the ports section should look like.

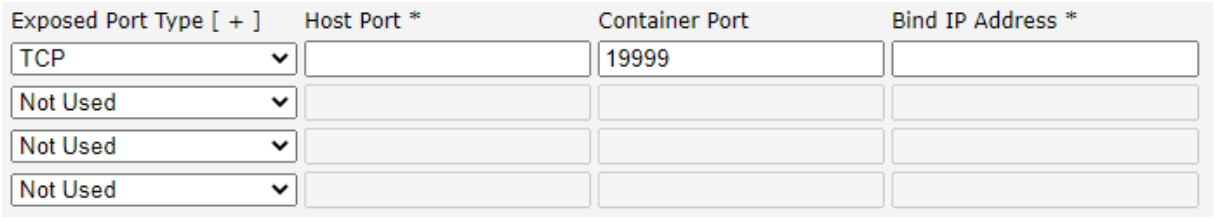


Figure 16: Image run ports

[2] https:\hub.docker.com

Lines 3-10 are about volumes. When the argument of the parameter *-v* begin with slash then its *Host Path* Volume Type, otherwise it is *Named Volume*. When selecting one of those options in Volume Type section of Run Image section, some fields grays up to indicate how the field should be filled in. On how to create *Named Volume* consult the section 3.3.3. When all Volumes needed for netdata image are done, the *Docker Volumes* section should look like this:

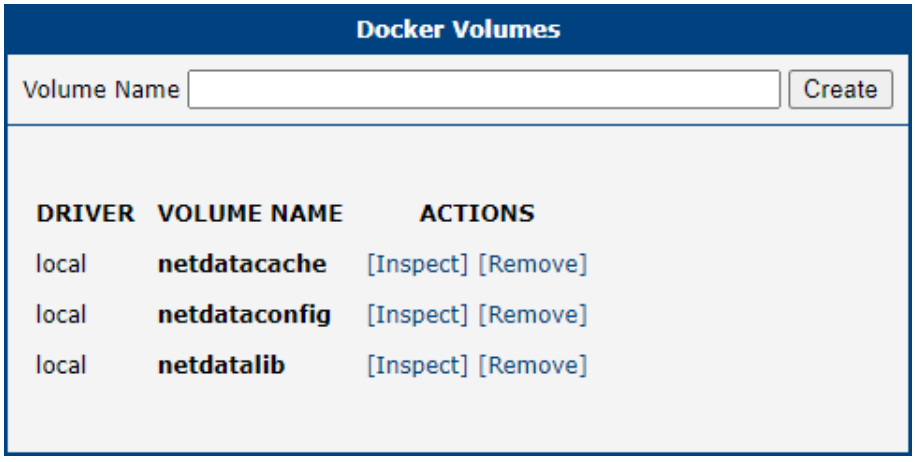


Figure 17: Image run volumes

Lines 3-5 are Named Volumes, so we select this option and choose right one from the now active drop-down menu. The *Container Mount Point* is the second part of the argument, right after colon.

Lines 6-10 are *Host Path* volumes. So we select this option and similarly to *Named Volumes* we split the arguments into *Host Path* and *Container Mount Point* inputs. We can see, that on the end of each line is another colon with *ro* - this is *Read-Only* so we check the checkbox for those lines. The result should look like this:

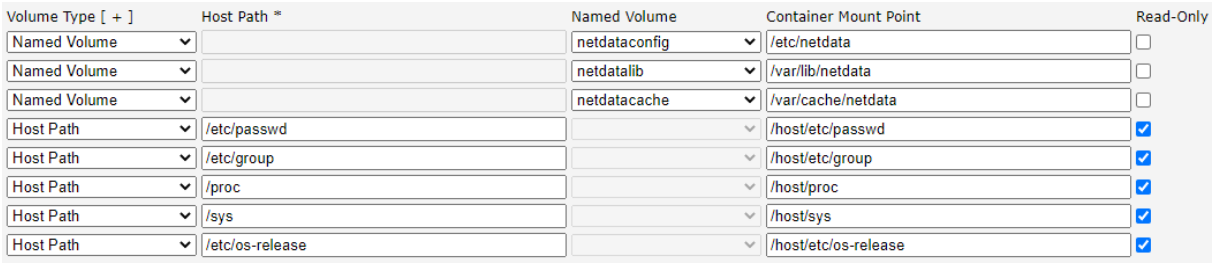


Figure 18: Image run netdata volumes

Last thing worth mentioning is the line 11. According to this line we can set the restart policy like that:


Figure 19: Image run volumes

Lines 12 and 13 we can skip. We don't have items for them in our *Run Image* dialog window as they are not essential and the Image will run just fine without them.

And thats it. We can now hit the *Run* button and Run our netdata image and create container.

### Search Image

**Working connection to the internet and to the router is needed for use of the *Search Image* function**

There are three ways how to get Images to our router. First is via *Search Image*. In this case you are able to search images directly in oficial repository, just type in the image name and browse the results. In this case we are searching for images *ubuntu*, you can see results of our search below:

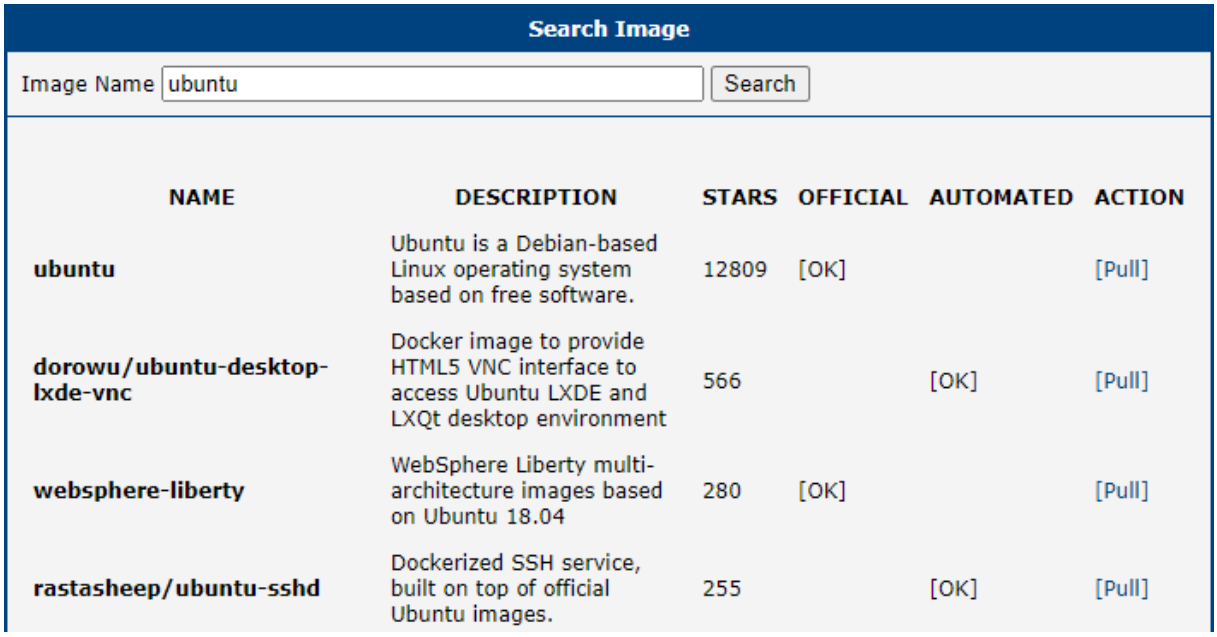


Figure 20: Image search

Official repository and the base source of images is Docker Hub - `https://hub.docker.com/`

| Column | Description |
|---|---|
| Name | Name of the image |
| Description | Description of the image |
| Stars | Rating of the image |
| Official | Official image. These images have clear documentation, promote best practices, and are designed for the most common use cases. |
| Automated | Docker Hub can automatically build images from source code in an external repository and automatically push the built image to your Docker repositories. |
| Action | Actions available to the image |

Table 7: Search image columns

When we choose the image we want to use, we just click on the *Pull* action on the right side of the result view and the image gets pulled to our router

Depending on the Image size, pull could take up to few minutes to download.

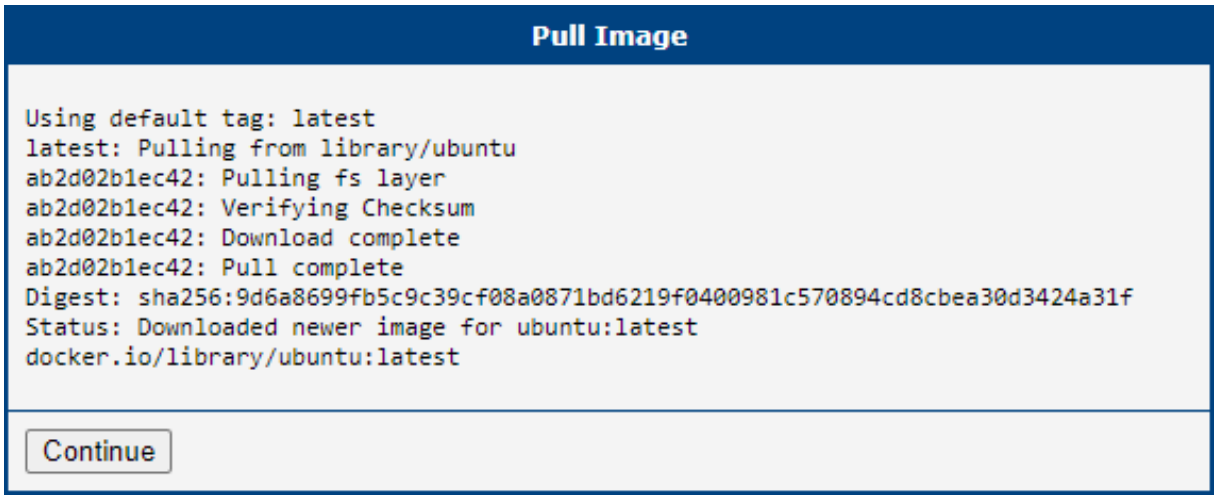


Figure 21: Pull image

### Load Image

Another way how to obtain images is to Load them directly from our file system. You just need the tar archive of the image and you are ready to go. This way it is possible to load image saved by the action *Save* mentioned in section 3.3.1.

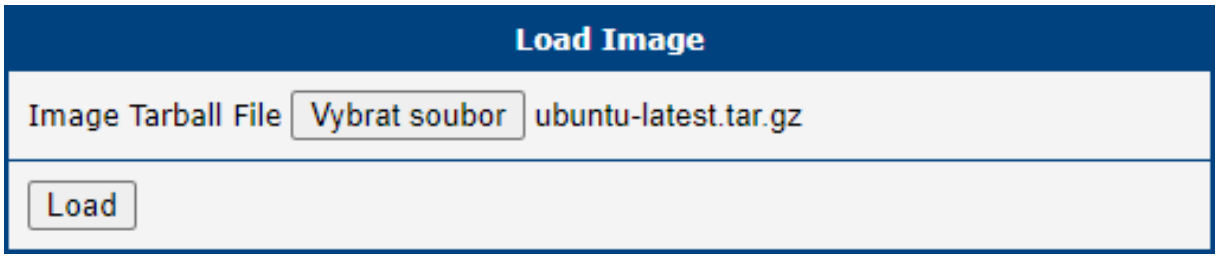


Figure 22: Load image

### Build Image

Third way ho to get Docker Image into our router is via *Build Image* option. There are 2 option from which you can choose while building image - first one is *Edit*, where you can write the Docker Image definition i.e. *dockerfile* by yourself. Many projects e.g. on GitHub offers already prepared dockerfiles.

Lets build a simple Image that only greets the users in the log.

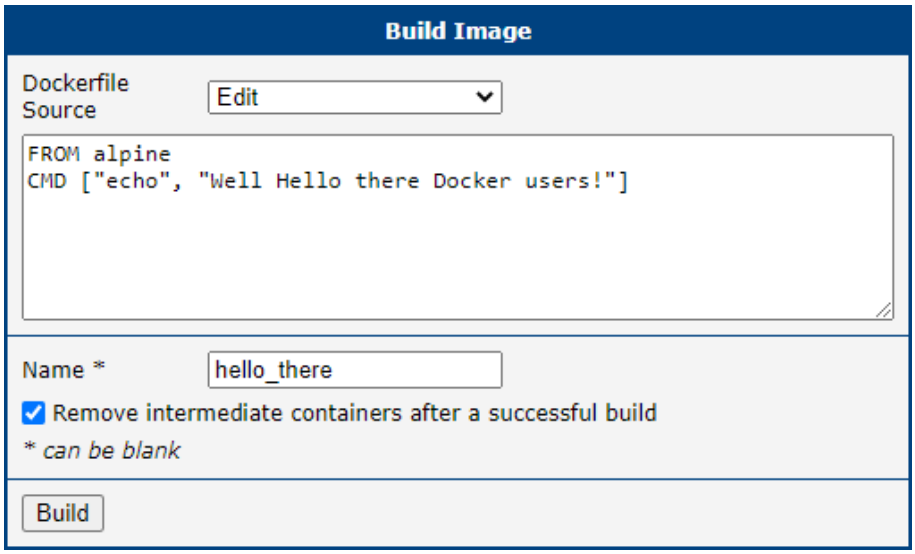


Figure 23: Images Build Edit

| Item | Description |
|---|---|
| Name | Name of the image which will be displayed in the image list |
| Remove intermediate containers after succesfull build | Support container can be created during the build, in most cases those are not useful and theres no need to keep those so this option allows to remove then automatically. |

Table 8: Search image columns

After building the image, running the image and inspecting log of freshly created container we get this heartwarming greeting

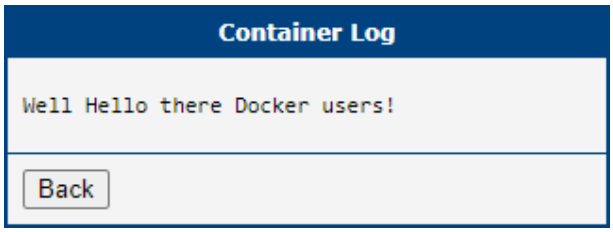


Figure 24: Container Log

For tips and hints how to write dockerfiles see https://docs.docker.com/develop/develop-images/dockerfile_best-practices/

And second is *URL*, where you can insert URL of the *dockerfile*.

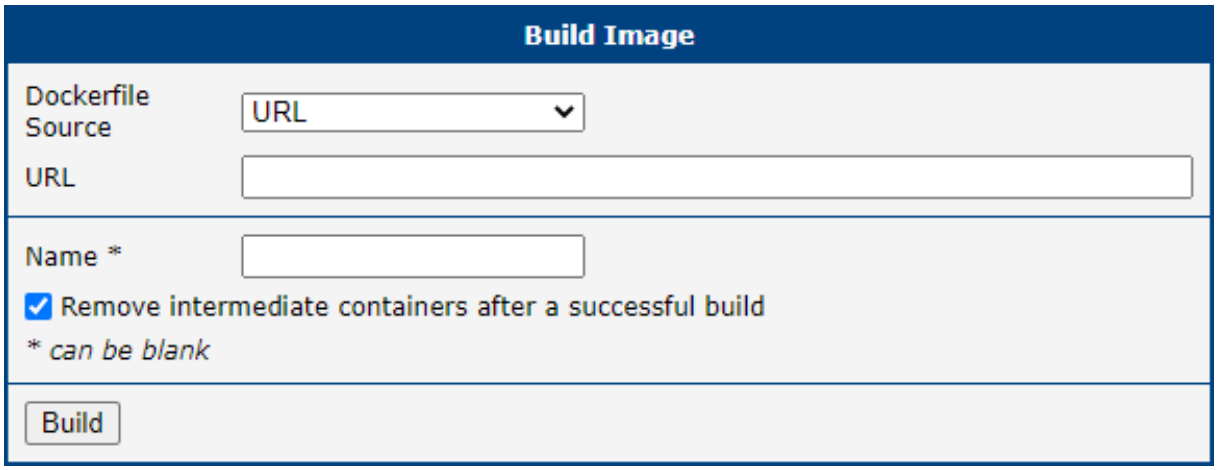


Figure 25: Images Build Url

### 3.3.2 Containers

This section contains list of available Containers

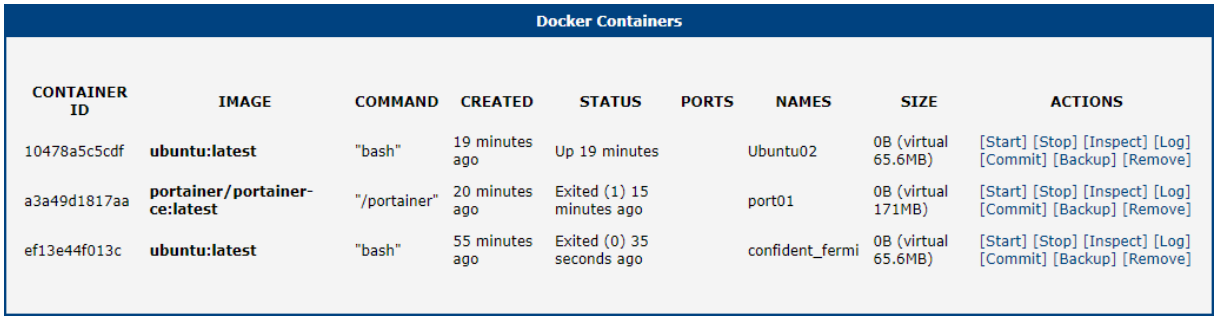


Figure 26: Available containers

| Column | Description |
|---|---|
| Container ID | ID of the container |
| Image | Source image |
| Command | Command created after container is built. We can after use this command to get to the functionality of container. |
| Created | Container creation date. |
| Status | Actual status of the container |
| Ports | Ports declared in the Run Image action |
| Names | Name of the container |
| Size | Actual size of the container |
| Actions | Actions available with the container |

Table 9: Search image columns

### Containers Actions

Each Container has 7 actions available.

| Item | Description |
|---|---|
| Start | Start stopped container |
| Stop | Stop running container |
| Inspect | Display detailed information on container |
| Log | Fetch the logs of a container |
| Commit | Create a new image from a container's changes |
| Backup | Saves a container and all its data as a tar file |
| Remove | Remove container |

Table 10: Container actions

### Restore Container

Restores a backed up container. After using Backup action on container, you'll get a tar file containing a backup of this container. In this section you can restore the container and use it afterwards.

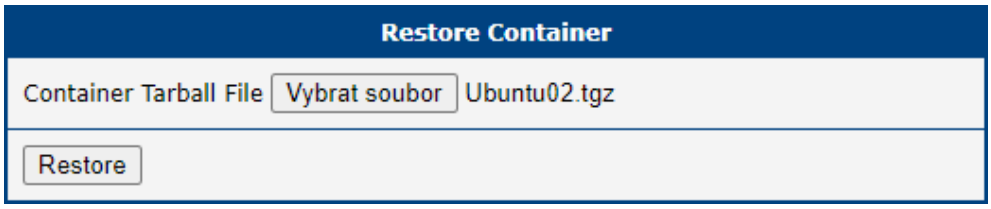


Figure 27: Restore container

### Compose Container

This option is similar as the *Build Image* - you can write a definition of container and use it. Similarily as in case of Image there are 2 option from which you can choose while compose container - first one is *Edit*, where you can write the Docker Image definition by yourself.

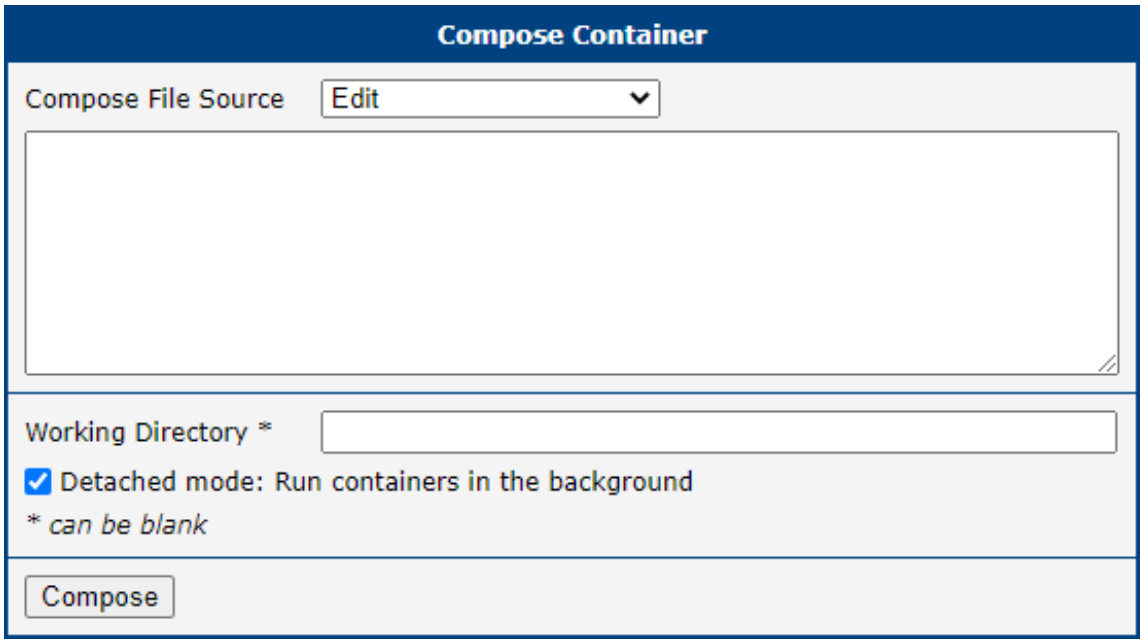


Figure 28: Compose container

| Item | Description |
|---|---|
| Working directory | Directory, where the container will run. Typically needed when getting data from the router, the container expect certain directory to work in. |
| Detached mode: Run containers in the background | Background/foreground container run switch. |

Table 11: Compose container items

For tips and hints how to write composefiles see https://docs.docker.com/compose/gettingstarted/

And second is *URL*, where you can insert URL of Docker Container definition.

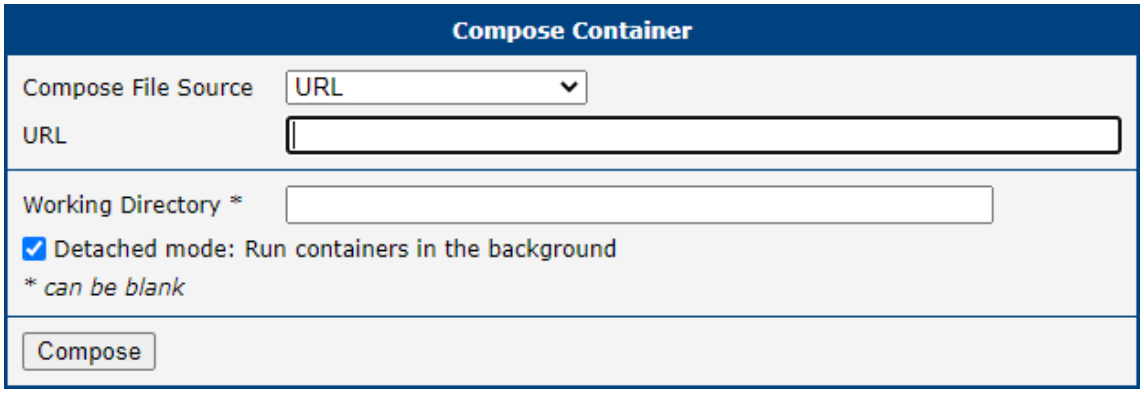


Figure 29: Compose container url

### 3.3.3 Volumes

Volumes are the preferred mechanism for persisting data generated by and used by Docker containers. While bind mounts are dependent on the directory structure and OS of the host machine, volumes are completely managed by Docker. In addition, volumes are often a better choice than persisting data in a container's writable layer, because a volume does not increase the size of the containers using it, and the volume's contents exist outside the lifecycle of a given container.

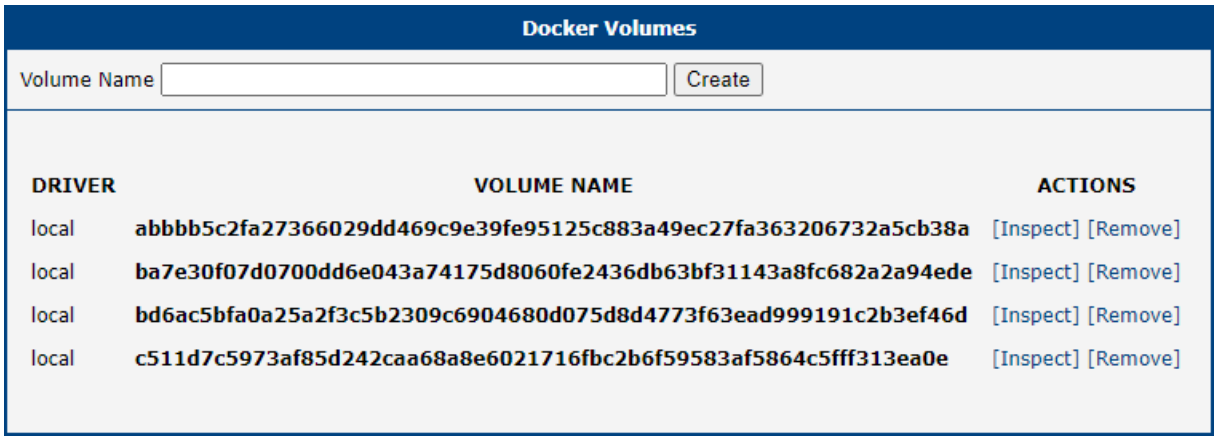


Figure 30: Volumes

To create a volume, simply enter volume name and hit the create button. After that, this volume will be available to be selected in *Run Image* Volume Type dropdown.

### Volume actions

Each Volume has 2 actions available.

| Item | Description |
|---|---|
| Inspect | Display detailed information on volume |
| Remove | Remove volume |

Table 12: Volume actions

### 3.3.4 Login

There is possibility to Login to *Official Docker Hub* or your *Own Hosted* hub. In case of Official Docker Hub just fill in Username and Password and login. In case of Own Hosted hub you need to fill in the *Own Hosted Registry URL*. Login is persistent even after router restart. Only way how to remove *Login* is *Logout*.

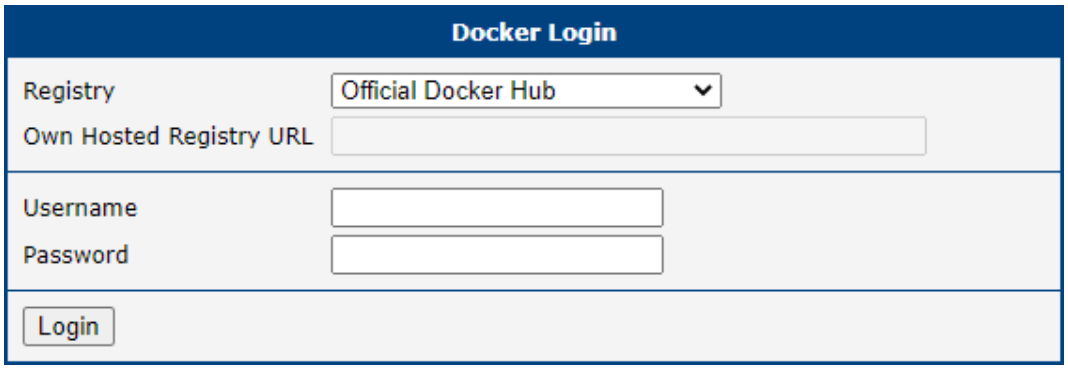


Figure 31: Login

### 3.3.5 Logout

In this section you can Logout from previously logged in Registries.

## 3.4 Information

### 3.4.1 Licenses

Licenses used in Docker Router App are listed below.

**Docker Licenses**

| Project | License | More Information |
|---|---|---|
| cli | Apache | License |
| compose | Apache | License |
| containerd | Apache | License |
| libaio | LGPLv2.1 | License |
| lvm2 | GPLv2 | License |
| moby | Apache | License |
| runc | Apache | License |
| tini | MIT | License |

Figure 32: Licenses

# 4. Examples

In this chapter we focus on few examples on how we use Docker Router App. Those examples are step by step description on how to get the image, how to run it and what the result should be. Lets start with absolute basics - Hello World!

## 4.1 Example 1: Hello World

First step should always be finding the right Image - so lets head to the *Search Image* section and search for *Hello World*.

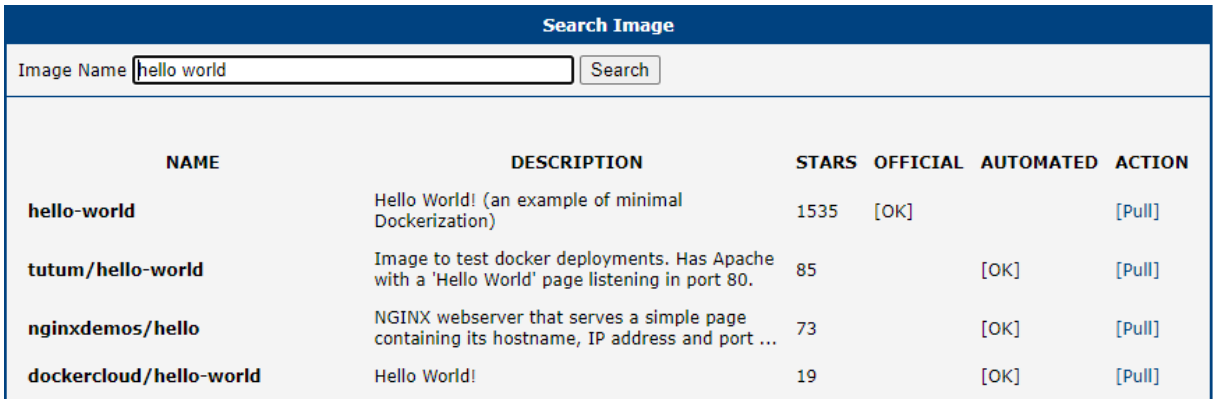


Figure 33: Hello World Image Search

First one looks perfect, it has amount of start exceeding any other else, its from Official source, its what we want. So lets Pull it!

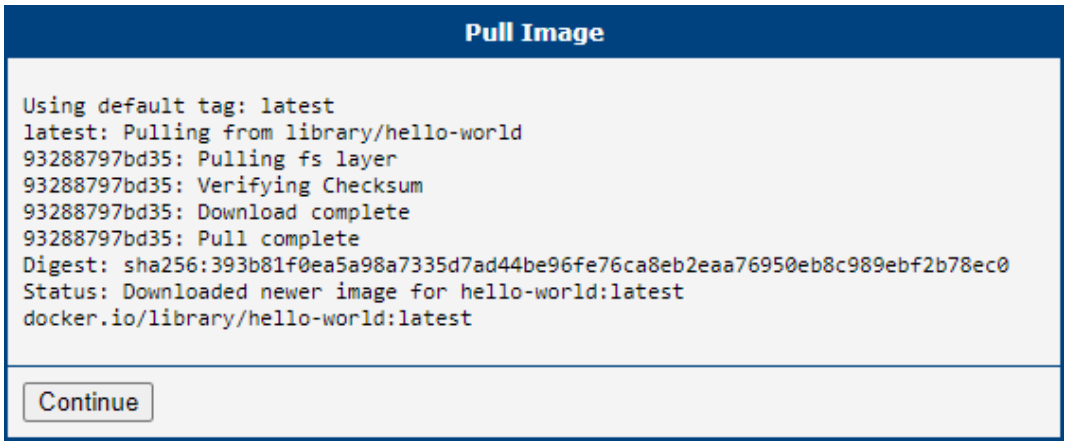


Figure 34: Hello World Image Pull

Image is pulled and ready to run.

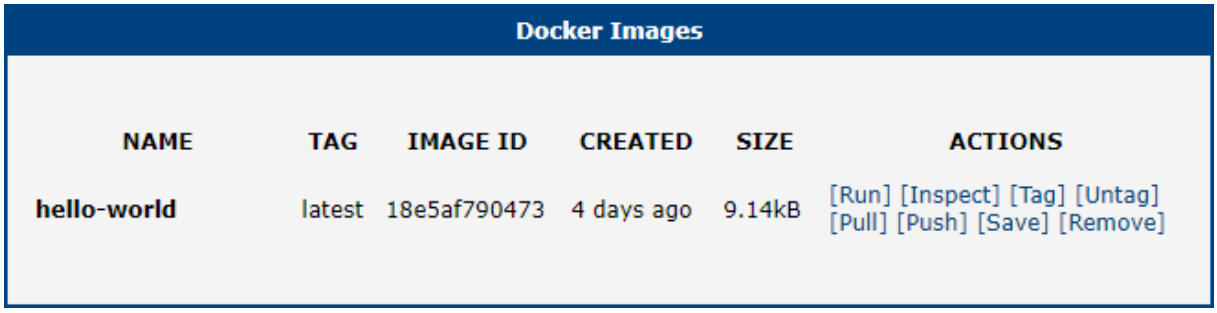


Figure 35: Hello World Image

This Image is so simple, that we don't need to fill anything into Run Image options.

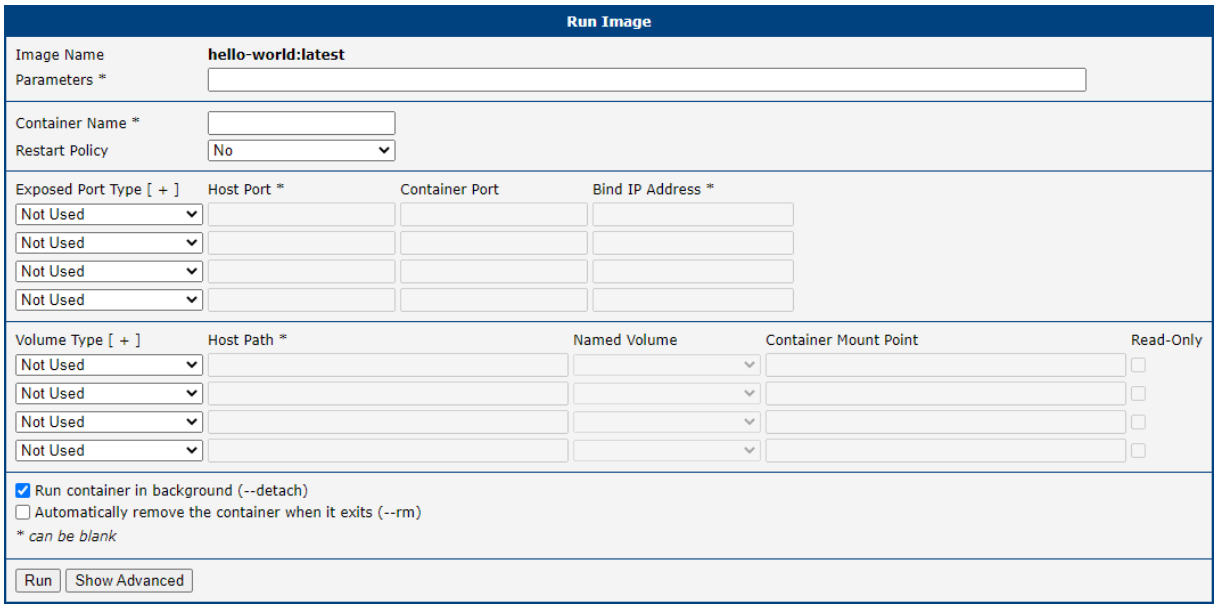


Figure 36: Hello World Container Log

After running, we can see screen with full Container ID.

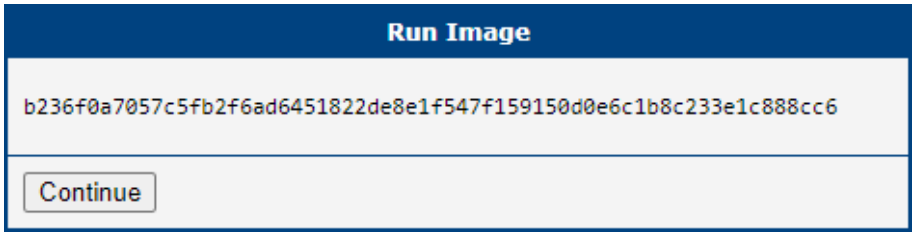


Figure 37: Hello World Image Run Done

Now lets head to the Container list and the container is really here.

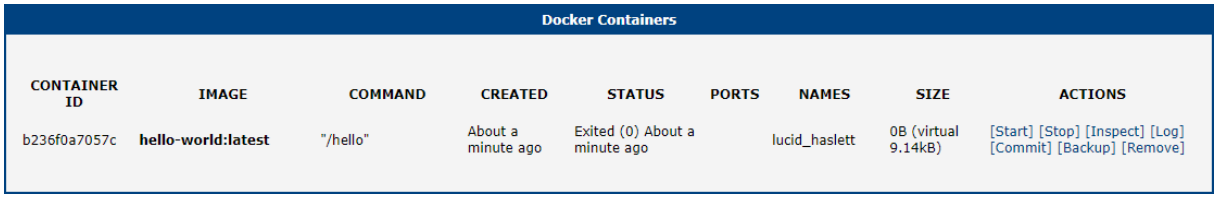


Figure 38: Hello World Container

Now we could read the Container log to see that the Hello World ran successfully.

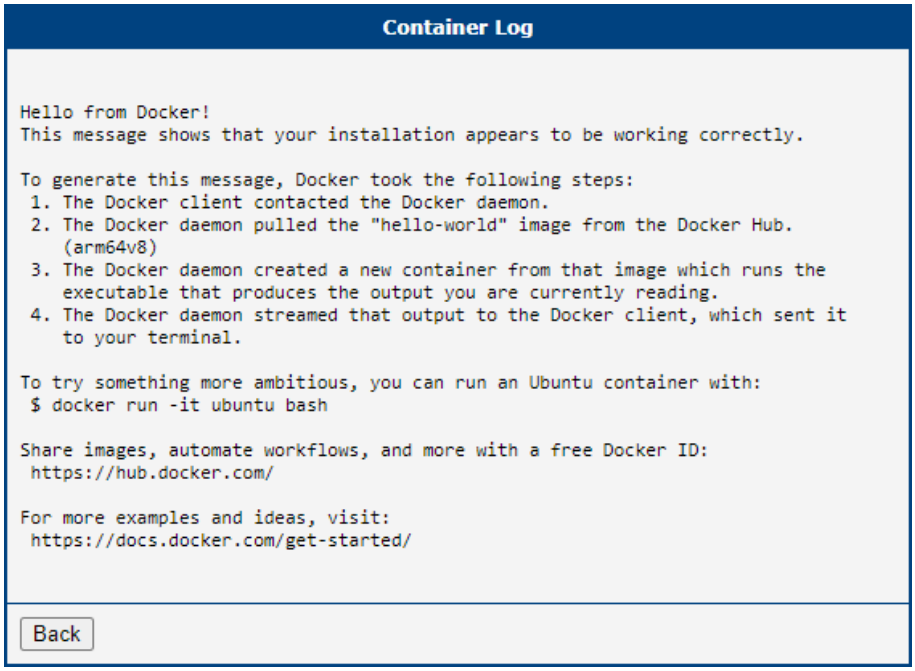


Figure 39: Hello World Image Run

And thats it!

## 4.2 Example 2: Portainer

Now lets take a look on something more challenging - the Portainer. We start the same way like in first example and that is searching for the right image.

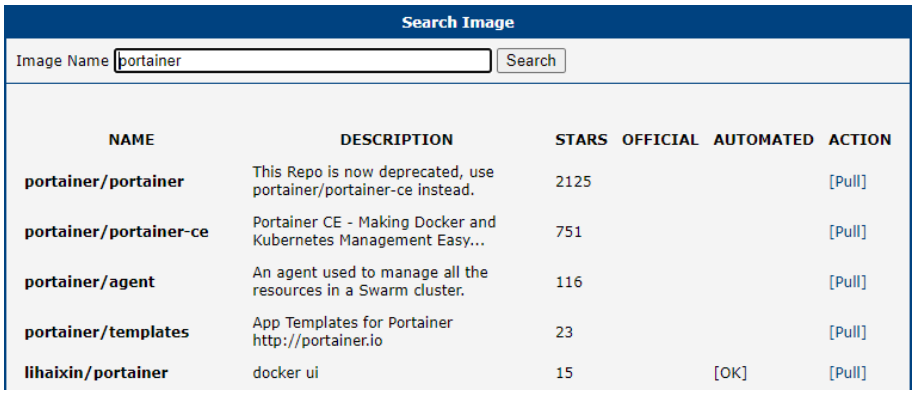


Figure 40: Portainer Image Search

Ok, results are in and we can see that the first and most starred image has in description *This Repo is now deprecated, use portainer/portainer-ce instead.*, ok, let's go with the second one and pull it.

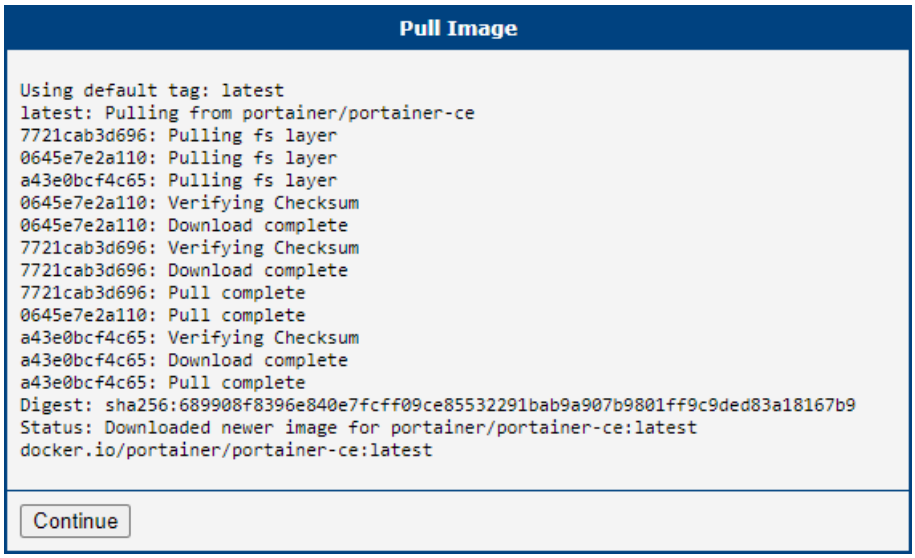


Figure 41: Portainer Image Pull

Image is pulled and ready.

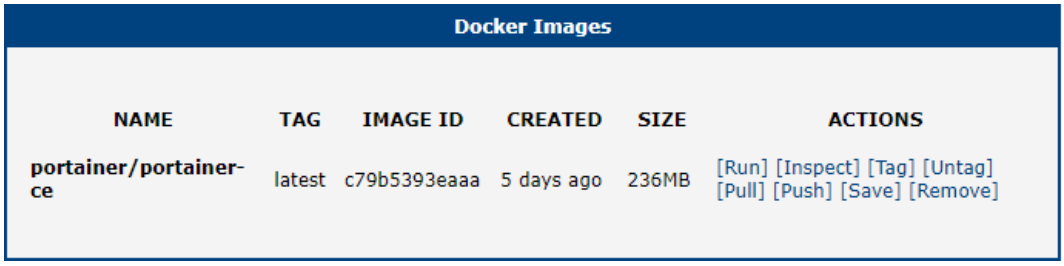


Figure 42: Portainer Image

But how to run it? This is not as simple as Hello World, we actually need to know how to run it from Portainer developers, we can't just guess it. So lets head to Docker Hub [1] and search for this image here.

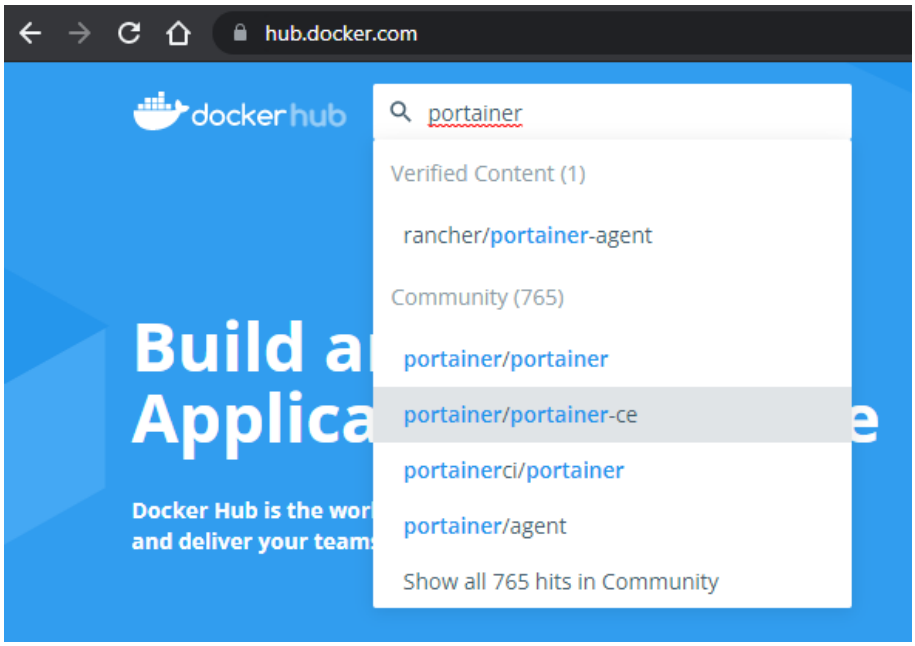


Figure 43: Portainer Search on Docker Hub

[1] https://hub.docker.com

The image is found, but we need example how to run this image and we definitely will find that on the official pages. We can find the link to those on Docker Hub.

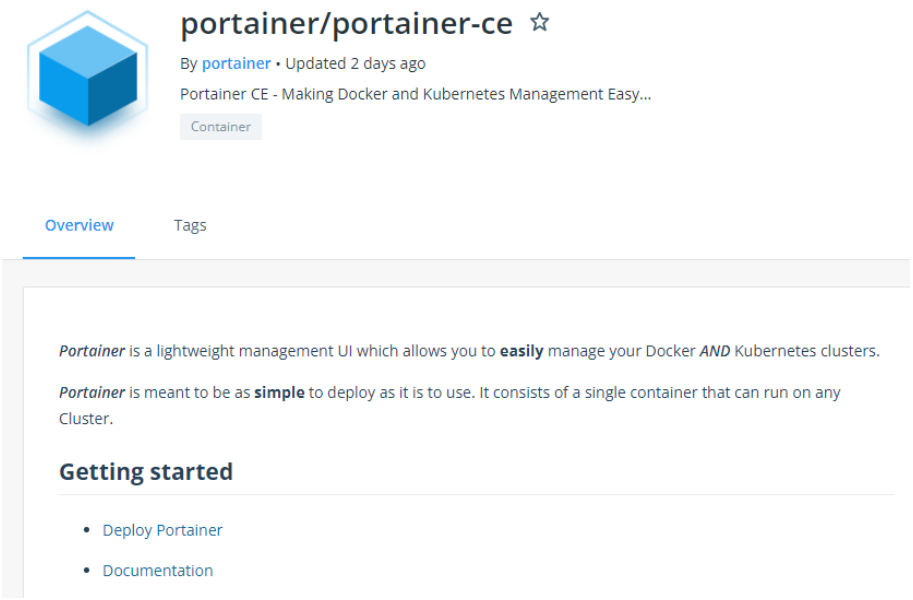


Figure 44: Portainer Search detail on Docker Hub

Lets click on the *Deploy Portainer* item. And now we are redirected to the official pages for portainer `https://docs.portainer.io/v/ce-2.9/start/intro`

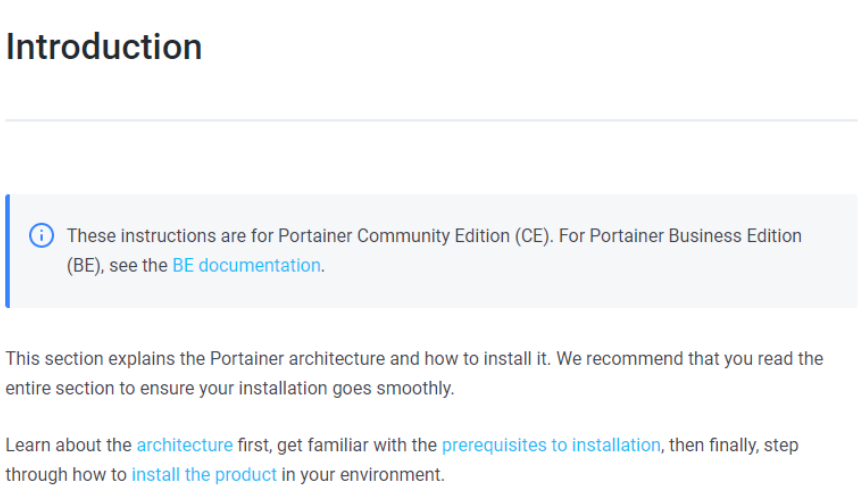


Figure 45: Portainer Official Pages

Now we navigate through their site - click on the *Install the product*, then *Set up a new Portainer Server installation* then select *Docker Standalone* and finally click on *Install Portainer with Docker on WSL / Docker Desktop* a we are where we need to be - behold, the Docker run example we were looking for:

## Deployment

First, create the volume that Portainer Server will use to store its database:

```
docker volume create portainer_data
```

Then, download and install the Portainer Server container:

```
docker run -d -p 8000:8000 -p 9443:9443 --name portainer \
    --restart=always \
    -v /var/run/docker.sock:/var/run/docker.sock \
    -v portainer_data:/data \
    portainer/portainer-ce:latest
```

Figure 46: Portainer Deployment

Lets use the knowledge we gained in section 3.3.1 *Transforming Docker Run Command into Run Image action* and create needed volume

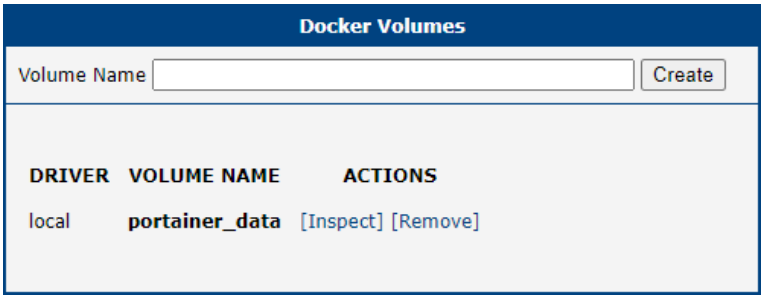


Figure 47: Portainer Volume

and then fill out the Run Image action for Portainer image like this:

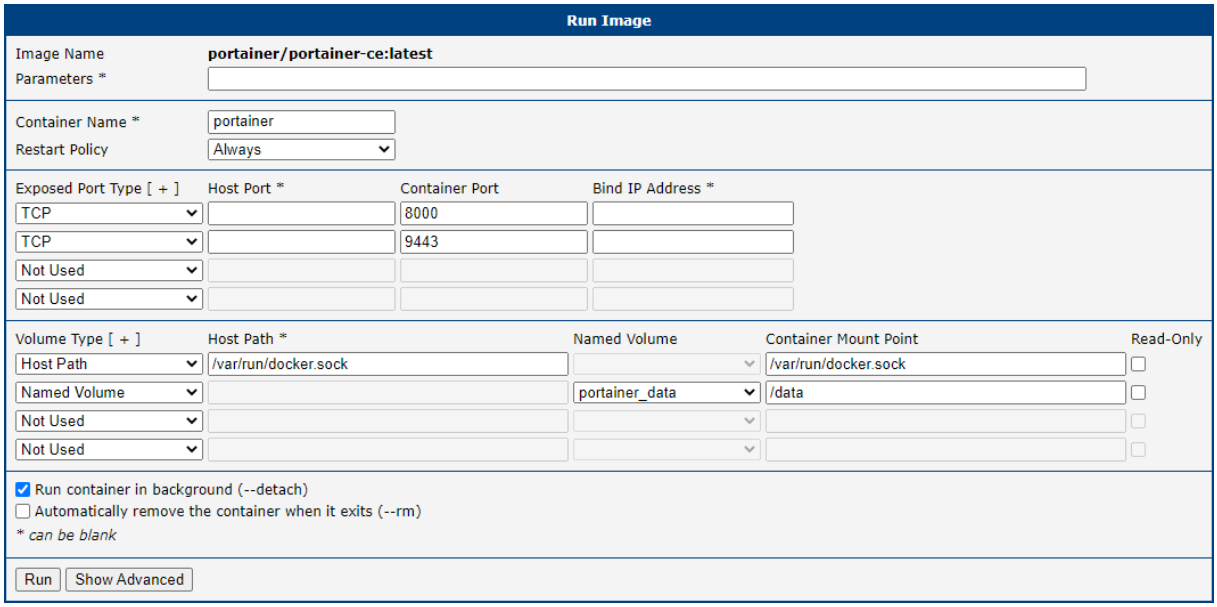


Figure 48: Portainer Image Run

And now we can run the Image.

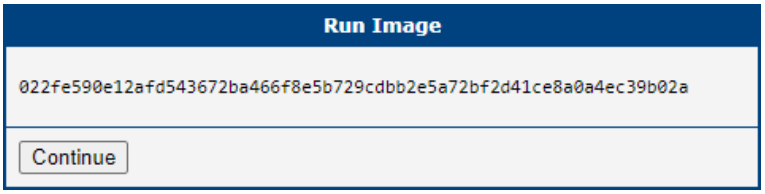


Figure 49: Portainer Image Run Done

After Image run is done, we could finally see Portainer Container in container list

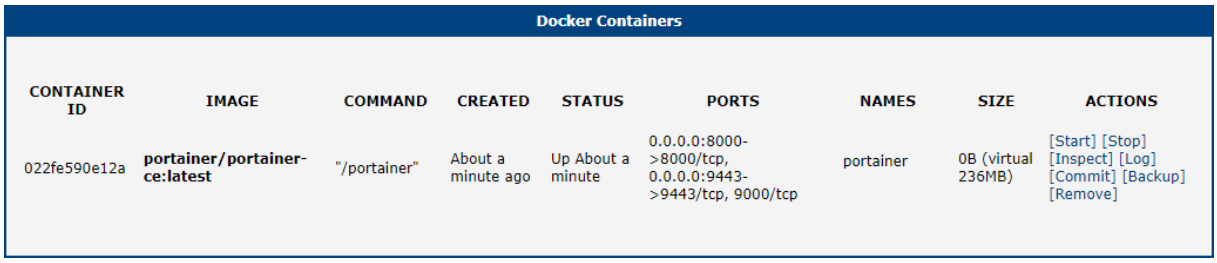


Figure 50: Portainer Container

Whats next? Lets take a look what oficial guide says

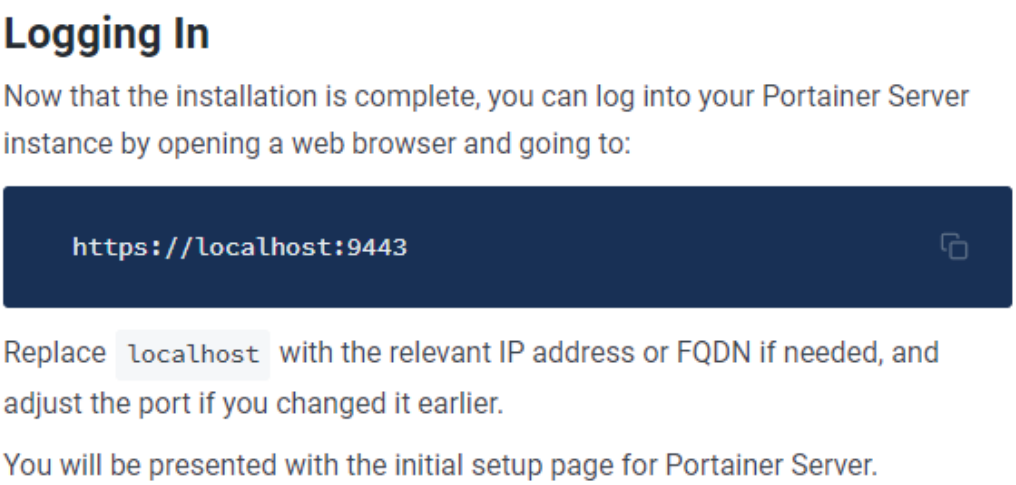


Figure 51: Portainer How to log in

So lets do it and again, they know what they say, so we can see login screen to portaner

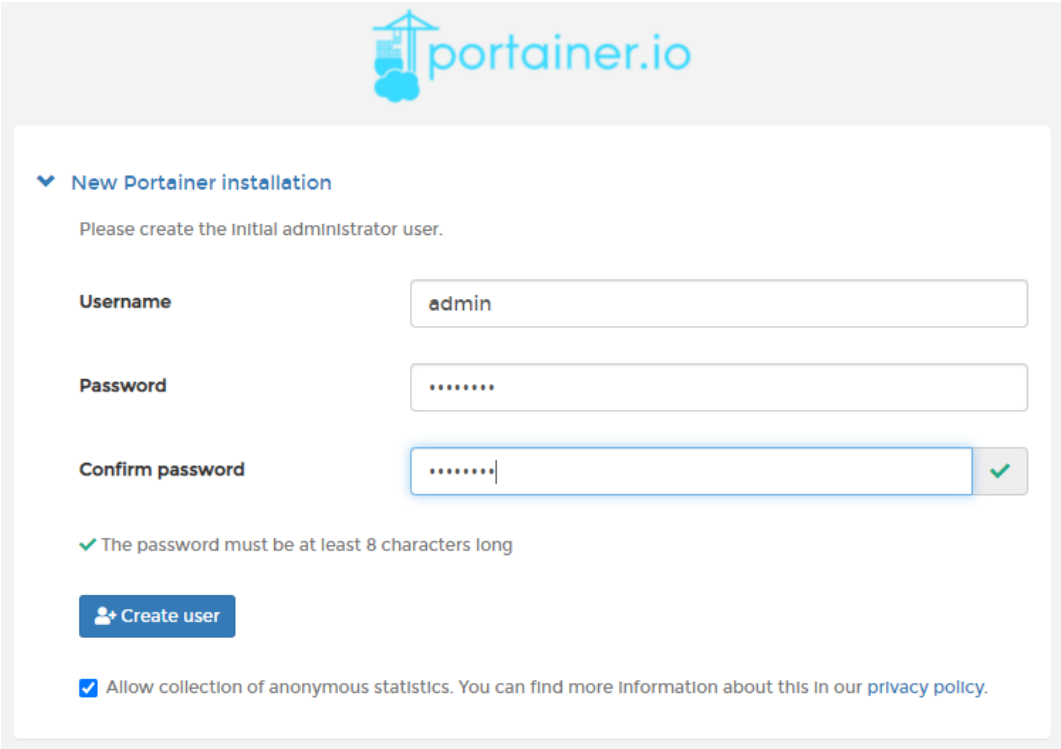


Figure 52: Portainer Logging In

and after creating an admin user account we can finally see working Portainer

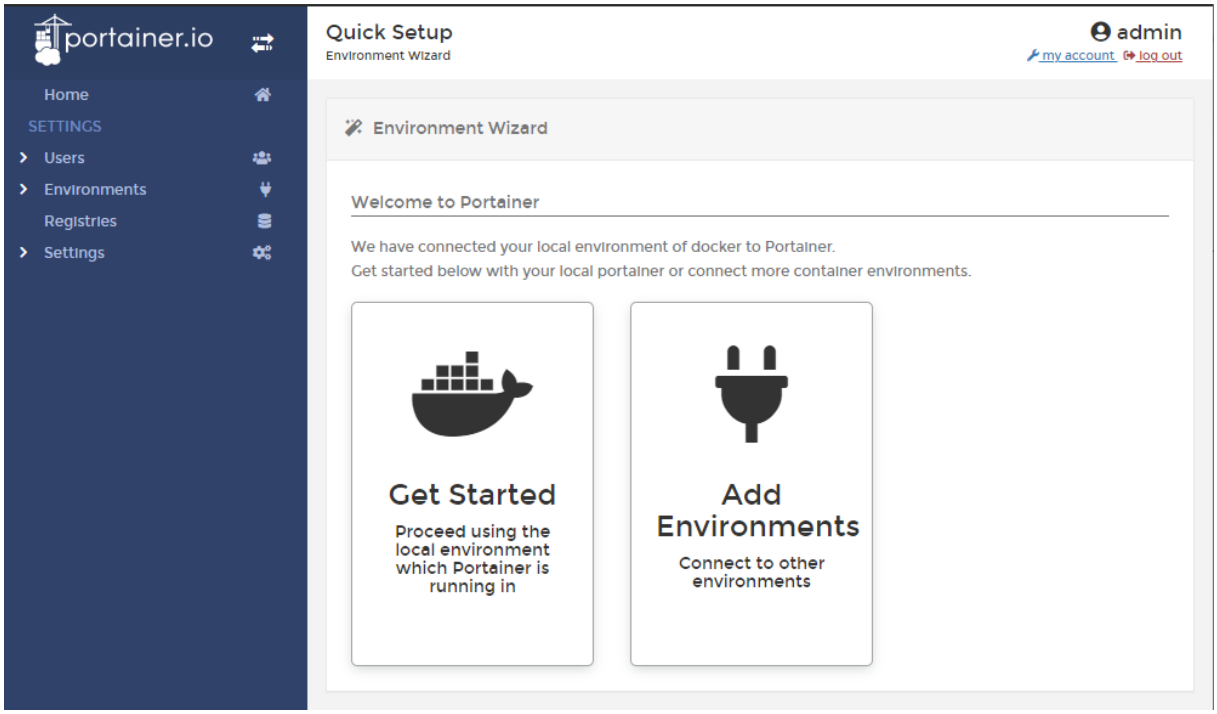


Figure 53: Portainer

# 5. Troubleshooting

Now there are 2 kinds of error we could get when working with Docker Router App. You can find those errors in routers *System Log*.

## 5.1 Unsupported firmware

This error typically arises on for example v3 routers, which doesn't have eMMC memory. Simply said, the router isn't capable to run Docker Router App.

eMMC memory is vital for running Docker Router App. SD Card alone is not sufficient.

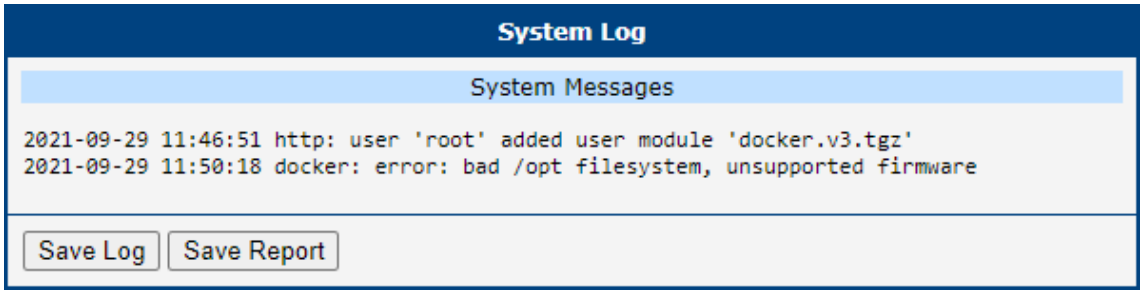


Figure 54: Unsupported firmware

## 5.2 Update firmware

This error gives us a hope compared to the previous one - it means, that the router has older firmware, than it is required to run. Firmware update to at least version 6.3.2 should do the trick and Docker Router App should work just fine after.

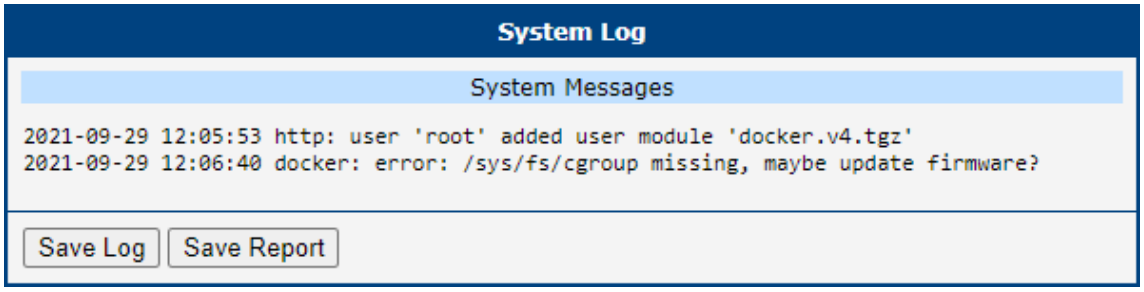


Figure 55: Update firmware

# 6. Related Documents


**[1]** Docker Docs: **https://docs.docker.com/**
**[2]** Docker Hub: **https://hub.docker.com/**


You can obtain product-related documents on *Engineering Portal* at *icr.advantech.com* address.

To get your router's *Quick Start Guide*, *User Manual*, *Configuration Manual*, or *Firmware* go to the *Router Models* page, find the required model, and switch to the *Manuals* or *Firmware* tab, respectively.

The *Router Apps* installation packages and manuals are available on the *Router Apps* page.

For the *Development Documents*, go to the *DevZone* page.