

# Docker installation and basic container operations, Build an image from Dockerfile

For Window and MacOS

We can simply install Docker in window and MacOS by downloading Docker Desktop related to operating systems and install it.

After installing, we can verify it by using following commands

```
docker --version
```

## For Linux

We simply run following commands in terminal to download and install in our Linux Operating system.

```
$ sudo apt update
```

```
$ sudo apt install docker.io -y
```

```
$ sudo docker --version
```

```
$ sudo systemctl status docker
```

```
$ sudo systemctl start docker
```

```
$ sudo systemctl enable docker
```

```
kali@kali: ~  
File Actions Edit View Help  
[kali@kali]~  
$ sudo apt update  
[sudo] password for kali:  
Get:1 http://mirrors.ustc.edu.cn/kali kali-rolling InRelease [41.5 kB]  
Get:2 http://mirrors.ustc.edu.cn/kali kali-rolling/main amd64 Packages [21.0 MB]  
26% [2 Packages 10.6 MB/21.0 MB 51%]  
[kali@kali]~  
$ sudo apt update  
Get:1 http://kali.download/kali kali-rolling InRelease [41.5 kB]  
Get:2 http://kali.download/kali kali-rolling/main amd64 Packages [21.0 MB]  
Get:3 http://kali.download/kali kali-rolling/main amd64 Contents (deb) [51.4 MB]  
Get:4 http://kali.download/kali kali-rolling/contrib amd64 Packages [120 kB]  
Get:5 http://kali.download/kali kali-rolling/contrib amd64 Contents (deb) [327 kB]  
Get:6 http://kali.download/kali kali-rolling/non-free amd64 Packages [197 kB]  
Get:7 http://kali.download/kali kali-rolling/non-free amd64 Contents (deb) [911 kB]  
Get:8 http://kali.download/kali kali-rolling/non-free-firmware amd64 Packages [10.6 kB]  
Get:9 http://kali.download/kali kali-rolling/non-free-firmware amd64 Contents (deb) [26.4 kB]  
Fetched 63.4 MB in 35s (1,827 kB/s)  
282 packages can be upgraded. Run 'apt list --upgradable' to see them.  
[kali@kali]~  
$ sudo apt install docker.io -y  
Installing:  
docker.io  
  
Installing dependencies:  
containerd docker-buildx libcompel1 libintl-xs-perl libproc-processtable-perl needrestart runc  
criu docker-cli libintl-perl libmodule-find-perl libsort-naturally-perl python3-pycruu tini  
  
Suggested packages:  
containernetworking-plugins docker-doc aufs-tools btrfs-progs cgroupfs-mount debootstrap rinse rootlesskit xfsprogs zfs-fuse | zfsutils-linux  
  
Summary:  
Upgrading: 0, Installing: 15, Removing: 0, Not Upgrading: 282  
Download size: 81.4 MB  
Space needed: 335 MB / 63.7 GB available  
  
Get:1 http://http.kali.org/kali kali-rolling/main amd64 runc amd64 1.1.15+ds1-2+b3 [3,229 kB]  
Get:2 http://mirror.kku.ac.th/kali kali-rolling/main amd64 libcompel1 amd64 4.1-1 [64.0 kB]  
Get:3 http://http.kali.org/kali kali-rolling/main amd64 containerd amd64 1.7.24-ds1-6+b2 [32.8 MB]  
Get:4 http://mirror.kku.ac.th/kali kali-rolling/main amd64 criu amd64 4.1-1 [560 kB]  
Get:5 http://http.kali.org/kali kali-rolling/main amd64 tini amd64 0.19.0-3+b1 [280 kB]  
Get:6 http://http.kali.org/kali kali-rolling/main amd64 docker.io amd64 26.1.5+dfsg1-9+b6 [23.0 MB]  
Get:7 http://http.kali.org/kali kali-rolling/main amd64 docker-buildx amd64 0.13.1+ds1-3 [13.2 MB]  
Get:8 http://http.kali.org/kali kali-rolling/main amd64 docker-cli amd64 26.1.5+dfsg1-9+b6 [7,338 kB]  
Get:9 http://kali.download/kali kali-rolling/main amd64 libintl-perl all 1.35-1 [690 kB]  
Get:10 http://kali.download/kali kali-rolling/main amd64 libintl-xs-perl amd64 1.35-1 [15.3 kB]  
Get:11 http://kali.download/kali kali-rolling/main amd64 libmodule-find-perl all 0.17-1 [10.7 kB]  
Get:12 http://http.kali.org/kali kali-rolling/main amd64 libproc-processtable-perl amd64 0.636-1+b3 [42.3 kB]  
Get:13 http://kali.download/kali kali-rolling/main amd64 libsort-naturally-perl all 1.03-4 [13.1 kB]
```

```
(kali㉿kali)-[~]
└─$ sudo systemctl status docker
● docker.service - Docker Application Container Engine
   Loaded: loaded (/usr/lib/systemd/system/docker.service; enabled; preset: enabled)
   Active: active (running) since Sun 2025-06-29 04:10:47 EDT; 1min 59s ago
   Invocation: c1cb45fbb2e84942bb2c1cd6c695c1f7
   TriggeredBy: ● docker.socket
     Docs: https://docs.docker.com
    Main PID: 6245 (dockerd)
      Tasks: 9
     Memory: 29.6M (peak: 31.3M)
        CPU: 673ms
    CGroup: /system.slice/docker.service
            └─6245 /usr/sbin/dockerd -H fd:// --containerd=/run/containerd/containerd.sock

Jun 29 04:10:46 kali systemd[1]: Starting docker.service - Docker Application Container Engine ...
Jun 29 04:10:46 kali (dockerd)[6245]: docker.service: Referenced but unset environment variable evaluates to an empty string: DOCKER_OPTS
Jun 29 04:10:46 kali dockerd[6245]: time="2025-06-29T04:10:46.934506215-04:00" level=info msg="Starting up"
Jun 29 04:10:47 kali dockerd[6245]: time="2025-06-29T04:10:47.112467820-04:00" level=info msg="Loading containers: start."
Jun 29 04:10:47 kali dockerd[6245]: time="2025-06-29T04:10:47.818232428-04:00" level=info msg="Loading containers: done."
Jun 29 04:10:47 kali dockerd[6245]: time="2025-06-29T04:10:47.858306931-04:00" level=info msg="Docker daemon" commit=411e817 containerd-snapshotter=false s
Jun 29 04:10:47 kali dockerd[6245]: time="2025-06-29T04:10:47.858719381-04:00" level=info msg="Daemon has completed initialization"
Jun 29 04:10:47 kali dockerd[6245]: time="2025-06-29T04:10:47.931680813-04:00" level=info msg="API listen on /run/docker.sock"
Jun 29 04:10:47 kali systemd[1]: Started docker.service - Docker Application Container Engine.

(kali㉿kali)-[~]
└─$ sudo docker --version
Docker version 26.1.5+dfsg1, build a72d7cd

(kali㉿kali)-[~]
└─$
```

By running above commands, we have successfully installed docker in active running state.

There are some **basic container operations** as follows:

Pull an Image

\$ sudo docker pull alpine

Run a container

\$ sudo docker run -it alpine /bin/sh

List running containers

\$ sudo docker ps

List all containers

\$ sudo docker ps -a

Stop a containers

\$ sudo docker stop <container\_id>

Remove containers

```
$ sudo docker rm <container_id>
```

## Dockerfile

We will create a simple Dockerfile and run it as following

```
kali@kali: ~/Desktop
File Actions Edit View Help

(kali@kali)-[~]
$ cd Desktop
(kali@kali)-[~/Desktop]
$ touch Dockerfile
(kali@kali)-[~/Desktop]
$ nano Dockerfile
(kali@kali)-[~/Desktop]
$ sudo docker build -t alpine-demo .
[+] Building 1.0s (5/5) FINISHED
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 173B
=> [internal] load metadata for docker.io/library/alpine:latest
=> [internal] load .dockerignore
=> => transferring context: 2B
=> CACHED [1/1] FROM docker.io/library/alpine:latest@sha256:8a1f59ffb675680d47db6337b49d22281a139e9d709335b492be023728e11715
=> exporting to image
=> => writing image sha256:84b06a103388eaed8ed77b860bbdeb882b4f163236ac64ec1e2cc7a69ef769d1
=> => naming to docker.io/library/alpine-demo
(kali@kali)-[~/Desktop]
$ sudo docker run -it alpine-demo
This is my first Dockerfile as example
(kali@kali)-[~/Desktop]
$ sudo docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS   NAMES
(kali@kali)-[~/Desktop]
$ sudo docker ps -a
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS   NAMES
a142cc3cb20a   alpine-demo   "echo 'This is my fi..."   15 seconds ago   Exited (0) 14 seconds ago   heuristic_goldwasser
```

We

We have a Dockerfile as follow:

FROM alpine:latest

CMD ["echo", "This is my first Dockerfile as example"]

After saving Dockerfile, we have build docker image and then directly run it for only once time to perform it's functionality and at same time, it will Exited

In such a way, we have created a Dockerfile and run a container