It Contains Every Thing That Application Want To Run:

IMAGE
- A cut-down OS
- Third-party libraries
- Application files
- Environment variables

****

It has Its Own File-System Of The Image.

Each Container Has Its Own Write Layer.

CONTAINER
- Provides an isolated environment
- Can be stopped & restarted
- Is just a process!

****
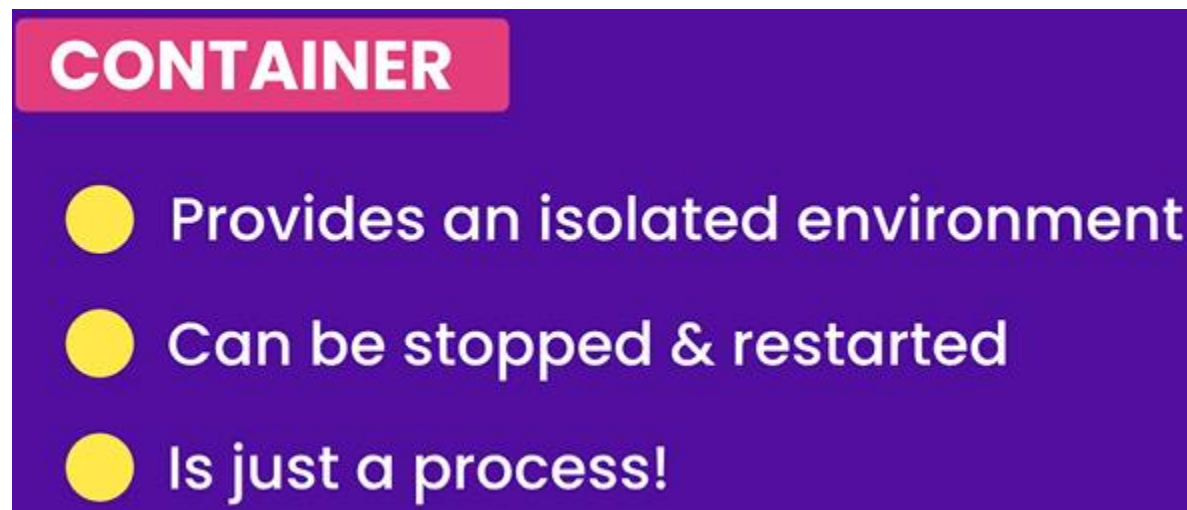
A Dockerfile contains instructions for building an image

****

****

The Docker File Name Is: **Dockerfile**

****

The Command: *docker build -t react-app .*

To Run The Build Operation Of Docker Images, We Use The Previous Command.

- Note: The . Is For Specify Where Find The Docker File.

****

To Run Shell Session For Our Image (Here, The Image Name Is: **react-app**)

****

If We Copy Files And Directories Using **COPY-Command**, If The Destination Not Found Docker Will Create It.

****

If We Set *WORKDIR-Command* First Before COPY OR ADD Then We Can Use Relative Paths Using: *COPY && ADD*.

And, If The Directory Of *WORKDIR Not Found*, Then Docker Will Create It.

****

If We Have Spaces In The Name Of Files And Directories That We Want To Copy, Then We Can Use Array.

COPY ["File Name Here.extension", "..."]

****

ADD-Command Has Two Benefit Addition To *COPY-Command*; We Can Use URLs With *ADD-Command*, And If We Have *Zip-File* With Add, It Will Copy It Then *Un-Zip*.

****

```
PS C:\Tests\Docker\Ultimate-Docker-Course-By-Mosh\Section-04> docker image ls
REPOSITORY                              TAG                                                             IMAGE ID       CREATED
        SIZE
docker/desktop-kubernetes               kubernetes-v1.30.5-cni-v1.4.0-critools-v1.29.0-cri-dockerd-v0.3.11-1-debian   a60dd8dae2ad   2 month
s ago    435MB
registry.k8s.io/kube-apiserver          v1.30.5                                                         e9adc5c075a8   3 month
s ago    117MB
registry.k8s.io/kube-controller-manager v1.30.5                                                         38406042cf08   3 month
s ago    111MB
registry.k8s.io/kube-scheduler          v1.30.5                                                         25903461e65c   3 months ago   62MB
registry.k8s.io/kube-proxy              v1.30.5                                                         71161e05b9bb   3 months ago   84.7MB
registry.k8s.io/coredns/coredns         v1.11.3                                                         c69fa2e9cbf5   5 months ago   61.8MB
registry.k8s.io/etcd                    3.5.15-0                                                        2e96e5913fc0   5 months ago   148MB
registry.k8s.io/etcd                    3.5.12-0                                                        3861cfcd7c04   11 months ago  149MB
docker/desktop-vpnkit-controller        dc331cb22850be0cdd97c84a9cfecaf44a1afb6e                        556098075b3d   20 months ago  36.2MB
hello-world                             latest                                                          d2c94e258dcb   20 months ago  13.3kB
registry.k8s.io/pause                   3.9                                                             e6f181688397   2 years ago    744kB
docker/desktop-storage-provisioner      v2.0                                                            99f89471f470   3 years ago    41.9MB
react-app                               latest                                                          110fec006660   3 years ago    117MB
PS C:\Tests\Docker\Ultimate-Docker-Course-By-Mosh\Section-04> 
```

****

To Ignore The Files From Copy Inside The Docker File, We Create New File Named: **.dockerignore** And Set A List Of Directories And Files That We Need To Ignore Them From Copying-Process.

****

To Set The Environment Variables, Using Docker File:

```
ENV API_URL=https://jafar.loka.com/
ENV API_URL https://jafar.loka.com/ # This is The Old Way
```
****

To Tell The Container That We Want To Listen To Specific Port, We Use *EXPOSE-Command*: *EXPOSE 3000*

****

To Set The Current User For The Container: USER → Is The Command && app → Is The User For The System

```
USER app
```
****

To Avoid The Permissions Error, We Set The Instructions In This Way:

```
FROM node:14.16.0-alpine3.13
RUN addgroup app && adduser -S -G app app
USER app
WORKDIR /app
COPY . .
RUN npm i
ENV API_URL=https://jafar.loka.com/
EXPOSE 3000
```
****

If We Have Multiple *CMD-Instructions* Then The Last One Only Will Be Executed:

```
CMD npm start
```
****

The *RUN-Command* Is For Build Process Only.

The *CMD-Command* Is For Run The Image Commands.

****

The CMD-Command Has Two Form:

- *Shell Form*: *CMD npm start*
  - o *Note:* This Will Executed In Shell Sub-Process.
- *Exec Form*: *CMD ["npm", "start"]*
  - o *Note:* This Is The Recommended Option.

****

The *ENTRYPOINT-Command*, Also Has Two Form: *Shell Form*, And *Exec Form*.

****

The *CMD-Command* Can Be Overwrite When Run The Container.

The *ENTRYPOINT-Command* Can Be Overwrite With *--entrypoint* Option When Run The Container.

****

```
PS C:\Tests\Docker\Ultimate-Docker-Course-By-Mosh\Section-04> docker history react-app
IMAGE          CREATED         CREATED BY                                      SIZE      COMMENT
5d2f6fbb5505   9 minutes ago   EXPOSE map[3000/tcp:{}]                          0B        buildkit.dockerfile.v0
<missing>      9 minutes ago   ENV API_URL=https://jafar.loka.com/             0B        buildkit.dockerfile.v0
<missing>      9 minutes ago   RUN /bin/sh -c npm i # buildkit                 362MB     buildkit.dockerfile.v0
<missing>      14 minutes ago  COPY . . # buildkit                              963kB     buildkit.dockerfile.v0
<missing>      14 minutes ago  WORKDIR /app                                     0B        buildkit.dockerfile.v0
<missing>      14 minutes ago  USER app                                         0B        buildkit.dockerfile.v0
<missing>      14 minutes ago  RUN /bin/sh -c addgroup app && adduser -S -G…   4.84kB    buildkit.dockerfile.v0
<missing>      3 years ago     /bin/sh -c #(nop)  CMD ["node"]                  0B
<missing>      3 years ago     /bin/sh -c #(nop)  ENTRYPOINT ["docker-entry…    0B
<missing>      3 years ago     /bin/sh -c #(nop) COPY file:238737301d473041…   116B
<missing>      3 years ago     /bin/sh -c apk add --no-cache --virtual .bui…   7.84MB
<missing>      3 years ago     /bin/sh -c #(nop)  ENV YARN_VERSION=1.22.5       0B
<missing>      3 years ago     /bin/sh -c addgroup -g 1000 node    && addu…    103MB
<missing>      3 years ago     /bin/sh -c #(nop)  ENV NODE_VERSION=14.16.0      0B
<missing>      3 years ago     /bin/sh -c #(nop)  CMD ["/bin/sh"]               0B
<missing>      3 years ago     /bin/sh -c #(nop) ADD file:7119167b56ff1228b…   5.61MB
```

****

The Problem Of Our Dockerfile Is With Instruction: *COPY . .*

****

The Solution For Cache The npm install Command To Copy The Required Files With Name Only:

```
FROM node:14.16.0-alpine3.13
RUN addgroup app && adduser -S -G app app
USER app
WORKDIR /app
COPY package*.json .
RUN npm i
COPY . .
ENV API_URL=https://jafar.loka.com/
EXPOSE 3000
# Exec Form
CMD ["npm", "start"]
```
****

In This Way We Must Organize Our Dockerfile:

Set The Instructions That Doesn't Change First, Then The Instructions That Are Changed OR Use Special Syntax.

****
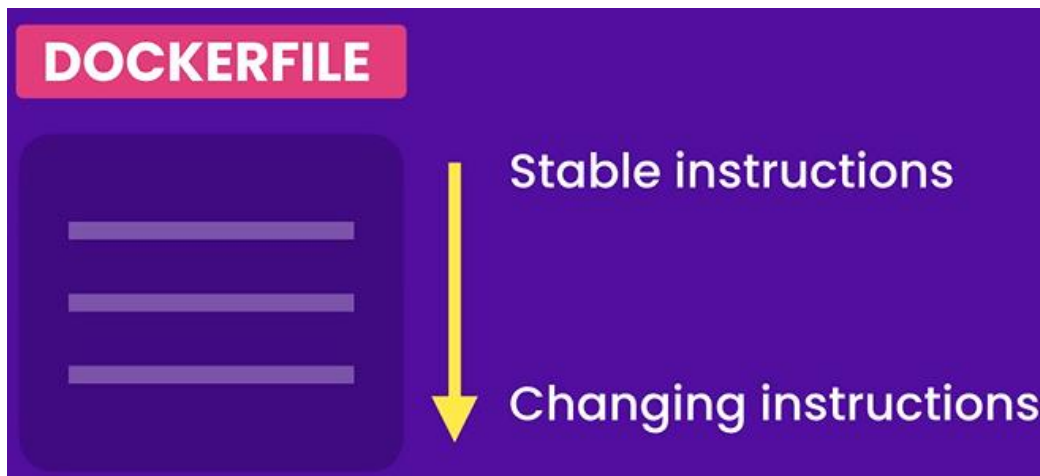
The Instruction: COPY . . Doesn't Tell The Docker Which Files Have Been Changed.

****

```dockerfile
FROM node:14.16.0-alpine3.13
RUN addgroup app && adduser -S -G app app
USER app
WORKDIR /app
COPY package*.json .
RUN npm i
COPY . .
ENV API_URL=https://jafar.loka.com/
EXPOSE 3000
# Exec Form
CMD ["npm", "start"]
```
****

When Working With Docker; May The Relation Between Images And Containers Lost; And We Call That dangling images.

To Delete The Dangling Images:

- *Run Command*: *docker image prune*

```
C:\Users\Tatweer>docker image prune
WARNING! This will remove all dangling images.
Are you sure you want to continue? [y/N] y
Deleted Images:
deleted: sha256:067a05818072d00b87a21b210b8f8570f7d0c1e13952371a898cc07cf4aa7e78
deleted: sha256:5d2f6fbb55056b825b8640cfddc8a51bc728fa800b795a11e95f8ad141190911
deleted: sha256:073b6cb18a860bd1cd1c9c8e14019a9e4783b3f40b4b13fad9c6c43e600a34e2
```

****

We Notice From The Previous Command; That Not All Images Deleted; Because We Have Containers That Connected To These Images.

To Delete These Containers:

- *Run Command*: *docker container prune*

```
C:\Users\Tatweer>docker container prune
WARNING! This will remove all stopped containers.
Are you sure you want to continue? [y/N] y
Deleted Containers:
9e84315a998b017573436608a7ef56fa20495d5edae1e758a341ab31c3eaff4b
df9af99631a252b4b3ac40bc4e4abf7ac87e1b8fc1d8ba1389f906a2f48db3f9
ae7f5b8dced2036dbe8f8f73dde244bff6d263360a2830b78a76652bdfddb833
e5479b4a950ded980286db43615a6a1403d256abbe0a95b83fc83e82c6aeee2b
ce67ebf495de73723935ebdff6e8a5027c8ddaccabcfcbd1391acb946b345361
6e9830f279623e5e444b10a0ccd697d58cb3463e1bfc93fcb32ca5cb069b4fe3
c7854ac590c4743b4095847055d789330d0bf66d77d5028aee896c73d5c257b7
06e6c3744fc00fcb14f17003ed07699dc4423e8791ceb0132997036a711be650
dad1d8302ce5b74540f0225d08e473bf551bfe8ed2f318210d5f505d42a23f6a
d0e1bd47e47d031b68d37008ae37ef8a68f2eaefae169beae05cf0e2f585abf4
aaed716627c04358ef1159113388474dcc00b168d2d34ae52112b390a7059c85
6d533d0494c7669e6a5ef3e2fbabe83753abedb77bd795dd4fa99f5cd1d42a09
fdccc8f8605abd03cc134691a8b7c7d4144b24ee94c7a969628df60afa5ecdf2
69fab8dd7f54b30cced2994df89bc5363608a02dc360d2611212861714a75dfa
02cb41a3b38108dbec105988e410334f4223be9772b82b3a19e0ea818ad18df2
c03481347465e59b77e8e856729cf3ebe0549b536ad3621ce0d2c4993cef4030
0d0d5f70d580acfa92457169de0204cf75a14e6d9ad4937103092f959ec561ba
c43629c9f4f5f6aaea56c1e737d892b66710356cc9b7cd649c034ca90c24b22a
55ae1d757e784bb4ca3d4097d8a99e9fe39bc6598671ce9c668f1beec934d5f0
71d99e233c11e45bb252383cedf1e440bdd1eb1900f7f7a871f8e86e62b7a2fa
8f4253895ac2d50ee10d77e0b4f56b8a0f61c341b75508cb85facad489fb1567
24c644d7891d8078d29f0d32dc6f2b253f1f40700b38feae88aaae5e2f05aac8
2395bbb93cd5bfbdfc94c0f1fabbc49d2fc55ad9d980464af71a0039a5fbd929
9c192a56afa8875eebd256e50ed30a0f2bbb1602c8b4cc79f917ce508d160df1
38a96e19ee54b84dbf5bb95531d5e81efea5fce917743cdbe94a4673721941cd

Total reclaimed space: 298B

C:\Users\Tatweer>docker image prune
WARNING! This will remove all dangling images.
Are you sure you want to continue? [y/N] y
Deleted Images:
deleted: sha256:9170135fd2d2069e37567acaad11bde8f57fe64f3e8b3bf57c2263dc79408a7b
deleted: sha256:110fec0066604935b4ffb6f1aeb9353eb88258e86cd83b98fb85cf389e5d1156
deleted: sha256:d17a8bfb500a6555d1192b0ad7b541055d78b56066e6eb0e9ba574dc333ed876
deleted: sha256:b80edbd7e30fe715849736f3fb1cbe50a866daa6a9fa963fd2b3cf130f99f2ea
deleted: sha256:25d1888700eed7f849ee9e4098b6a286004feb8894d612df793f9ae633896f2b

Total reclaimed space: 0B
```

****

We Can Also Delete Image By *Image ID*.

We Can Delete Multiple Images, By Separate Them *By Space*.

```
C:\Users\Tatweer>docker image rm hello-world
Untagged: hello-world:latest
Untagged: hello-world@sha256:5b3cc85e16e3058003c13b7821318369dad01dac3dbb877aac3c28182255c724
Deleted: sha256:d2c94e258dcb3c5ac2798d32e1249e42ef01cba4841c2234249495f87264ac5a
Deleted: sha256:ac28800ec8bb38d5c35b49d45a6ac4777544941199075dff8c4eb63e093aa81e

C:\Users\Tatweer>docker images
REPOSITORY                              TAG                                                                          IMAGE ID       CREATED        SIZE
react-app                               latest                                                                       1fb32099b101   5 days ago     480MB
docker/desktop-kubernetes               kubernetes-v1.30.5-cni-v1.4.0-critools-v1.29.0-cri-dockerd-v0.3.11-1-debian  a60dd8dae2ad   2 months ago   435MB
registry.k8s.io/kube-apiserver          v1.30.5                                                                      e9adc5c075a8   4 months ago   117MB
registry.k8s.io/kube-scheduler          v1.30.5                                                                      25903461e65c   4 months ago   62MB
registry.k8s.io/kube-controller-manager v1.30.5                                                                      38406042cf08   4 months ago   111MB
registry.k8s.io/kube-proxy              v1.30.5                                                                      71161e05b9bb   4 months ago   84.7MB
registry.k8s.io/coredns/coredns         v1.11.3                                                                      c69fa2e9cbf5   5 months ago   61.8MB
registry.k8s.io/etcd                    3.5.15-0                                                                     2e96e5913fc0   5 months ago   148MB
registry.k8s.io/etcd                    3.5.12-0                                                                     3861cfcd7c04   11 months ago  149MB
docker/desktop-vpnkit-controller        dc331cb22850be0cdd97c84a9cfecaf44a1afb6e                                     556098075b3d   20 months ago  36.2MB
registry.k8s.io/pause                   3.9                                                                          e6f181688397   2 years ago    744kB
docker/desktop-storage-provisioner      v2.0                                                                         99f89471f470   3 years ago    41.9MB
```

****

In This Way We Can Tag The Images:

We Set After The *-t image-name-here:tag-name-here*

```
PS C:\Tests\Docker\Ultimate-Docker-Course-By-Mosh\Tutorial-01\Section-04> docker build -t react-app:1 .
[+] Building 7.4s (11/11) FINISHED                                                                      docker:desktop-linux
 => [internal] load build definition from Dockerfile                                                                    0.1s
 => => transferring dockerfile: 262B                                                                                    0.0s
 => [internal] load metadata for docker.io/library/node:14.16.0-alpine3.13                                              6.9s
 => [internal] load .dockerignore                                                                                       0.1s
 => => transferring context: 60B                                                                                        0.0s
 => [internal] load build context                                                                                       0.1s
 => => transferring context: 711B                                                                                       0.0s
 => [1/6] FROM docker.io/library/node:14.16.0-alpine3.13@sha256:2c51dc462a02f15621e7486774d36d048a27225d581374b002b8477a79a59b4b  0.0s
 => CACHED [2/6] RUN addgroup app && adduser -S -G app app                                                              0.0s
 => CACHED [3/6] WORKDIR /app                                                                                            0.0s
 => CACHED [4/6] COPY package*.json .                                                                                    0.0s
 => CACHED [5/6] RUN npm i                                                                                               0.0s
 => CACHED [6/6] COPY . .                                                                                                0.0s
 => exporting to image                                                                                                  0.0s
 => => exporting layers                                                                                                  0.0s
 => => writing image sha256:1fb32099b101c5978b5000714548d446dd75d1866f6f02ec52182a7380c52dab                            0.0s
 => => naming to docker.io/library/react-app:1                                                                          0.0s

What's next:
    View a summary of image vulnerabilities and recommendations → docker scout quickview
```

****

```
C:\Users\Tatweer>docker images
REPOSITORY                              TAG                                                                          IMAGE ID       CREATED        SIZE
react-app                               1                                                                            1fb32099b101   5 days ago     480MB
react-app                               latest                                                                       1fb32099b101   5 days ago     480MB
docker/desktop-kubernetes               kubernetes-v1.30.5-cni-v1.4.0-critools-v1.29.0-cri-dockerd-v0.3.11-1-debian  a60dd8dae2ad   2 months ago   435MB
registry.k8s.io/kube-apiserver          v1.30.5                                                                      e9adc5c075a8   4 months ago   117MB
registry.k8s.io/kube-scheduler          v1.30.5                                                                      25903461e65c   4 months ago   62MB
registry.k8s.io/kube-controller-manager v1.30.5                                                                      38406042cf08   4 months ago   111MB
registry.k8s.io/kube-proxy              v1.30.5                                                                      71161e05b9bb   4 months ago   84.7MB
registry.k8s.io/coredns/coredns         v1.11.3                                                                      c69fa2e9cbf5   5 months ago   61.8MB
registry.k8s.io/etcd                    3.5.15-0                                                                     2e96e5913fc0   5 months ago   148MB
registry.k8s.io/etcd                    3.5.12-0                                                                     3861cfcd7c04   11 months ago  149MB
docker/desktop-vpnkit-controller        dc331cb22850be0cdd97c84a9cfecaf44a1afb6e                                     556098075b3d   20 months ago  36.2MB
registry.k8s.io/pause                   3.9                                                                          e6f181688397   2 years ago    744kB
docker/desktop-storage-provisioner      v2.0                                                                         99f89471f470   3 years ago    41.9MB
```

****

The Docker Image Can Have Multiple Tags, But Only One Image Id.

To Remove The Tag From Image:

- <u>Run Command</u>: *docker image remove image-name-here:tag-name-here*

```
C:\Users\Tatweer>docker image remove react-app:1
Untagged: react-app:1

C:\Users\Tatweer>docker images
REPOSITORY                              TAG                                                              IMAGE ID       CREATED        SIZE
react-app                               latest                                                           1fb32099b101   5 days ago     480MB
docker/desktop-kubernetes               kubernetes-v1.30.5-cni-v1.4.0-critools-v1.29.0-cri-dockerd-v0.3.11-1-debian   a60dd8dae2ad   2 months ago   435MB
registry.k8s.io/kube-apiserver          v1.30.5                                                          e9adc5c075a8   4 months ago   117MB
registry.k8s.io/kube-controller-manager v1.30.5                                                         38406042cf08   4 months ago   111MB
registry.k8s.io/kube-scheduler          v1.30.5                                                          25903461e65c   4 months ago   62MB
registry.k8s.io/kube-proxy              v1.30.5                                                          71161e05b9bb   4 months ago   84.7MB
registry.k8s.io/coredns/coredns         v1.11.3                                                          c69fa2e9cbf5   5 months ago   61.8MB
registry.k8s.io/etcd                    3.5.15-0                                                         2e96e5913fc0   5 months ago   148MB
registry.k8s.io/etcd                    3.5.12-0                                                         3861cfcd7c04   11 months ago  149MB
docker/desktop-vpnkit-controller        dc331cb22850be0cdd97c84a9cfecaf44a1afb6e                         556098075b3d   20 months ago  36.2MB
registry.k8s.io/pause                   3.9                                                              e6f181688397   2 years ago    744kB
docker/desktop-storage-provisioner      v2.0                                                             99f89471f470   3 years ago    41.9MB
```

****

To Tag The Image After We Build It:

- *Run Command*: *docker image tag image-name:tag-name image-name:new-tag-name*
- *OR Run Command*: *docker image tag image-id image-name-here:new-tag-name*

```
C:\Users\Tatweer>docker image tag react-app:latest react-app:1

C:\Users\Tatweer>docker images
REPOSITORY                              TAG                                                              IMAGE ID       CREATED        SIZE
react-app                               1                                                                1fb32099b101   5 days ago     480MB
react-app                               latest                                                           1fb32099b101   5 days ago     480MB
docker/desktop-kubernetes               kubernetes-v1.30.5-cni-v1.4.0-critools-v1.29.0-cri-dockerd-v0.3.11-1-debian   a60dd8dae2ad   2 months ago   435MB
registry.k8s.io/kube-apiserver          v1.30.5                                                          e9adc5c075a8   4 months ago   117MB
registry.k8s.io/kube-scheduler          v1.30.5                                                          25903461e65c   4 months ago   62MB
registry.k8s.io/kube-controller-manager v1.30.5                                                         38406042cf08   4 months ago   111MB
registry.k8s.io/kube-proxy              v1.30.5                                                          71161e05b9bb   4 months ago   84.7MB
registry.k8s.io/coredns/coredns         v1.11.3                                                          c69fa2e9cbf5   5 months ago   61.8MB
registry.k8s.io/etcd                    3.5.15-0                                                         2e96e5913fc0   5 months ago   148MB
registry.k8s.io/etcd                    3.5.12-0                                                         3861cfcd7c04   11 months ago  149MB
docker/desktop-vpnkit-controller        dc331cb22850be0cdd97c84a9cfecaf44a1afb6e                         556098075b3d   20 months ago  36.2MB
registry.k8s.io/pause                   3.9                                                              e6f181688397   2 years ago    744kB
docker/desktop-storage-provisioner      v2.0                                                             99f89471f470   3 years ago    41.9MB
```

****