

## Docker three-tier architecture

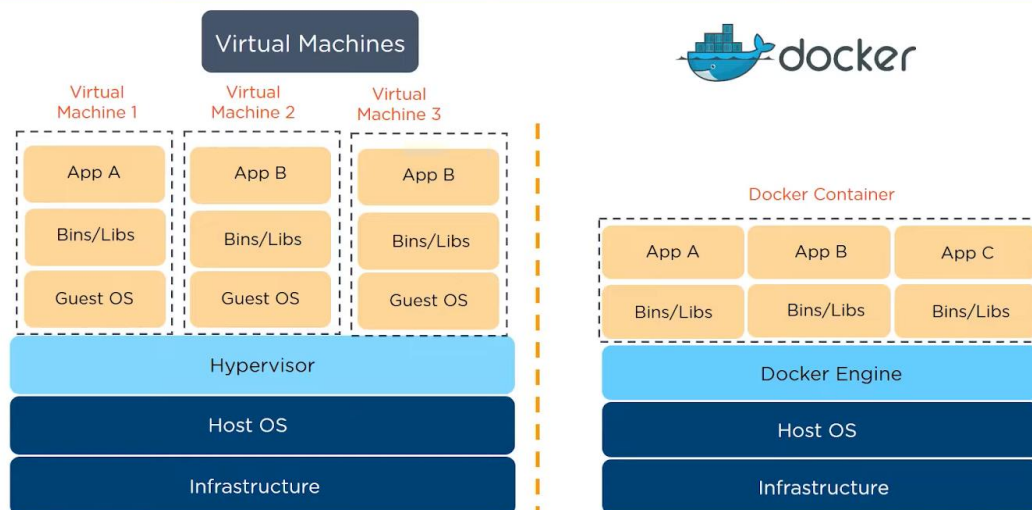
Before docker was introduced developers and testers experienced the difficulty due to the in computer environment. i.e. the code doesn't work on other system.  
The solution was Virtual Machine.

Docker was introduced as an alternate as a light weight solution.

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.

Docker provides the ability to package and run an application in a loosely isolated environment called a Container. The isolation and security allows 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.

## Why Docker?



## Why Docker?

Criteria	Virtual Machine	Docker
OS support	Occupies a lot of memory space	Docker Containers occupy less space
Boot-up time	Long boot-up time	Short boot-up time
Performance	Running multiple virtual machines leads to unstable performance	Containers have a better performance as they are hosted in a single Docker engine
Scaling	Difficult to scale up	Easy to scale up
Efficiency	Low efficiency	High efficiency
Portability	Compatibility issues while porting across different platforms	Easily portable across different platforms
Space allocation	Data volumes cannot be shared	Data volumes can be shared and reused among multiple containers

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The engine consists of three major components:

**Docker Daemon:** The daemon (dockerd) is a process that keeps running in the background and waits for commands from the client. The daemon is capable of managing various Docker objects.

**Docker Client:** The client (docker) is a command-line interface program mostly responsible for transporting commands issued by users.

**REST API:** The REST API acts as a bridge between the daemon and the client. Any command issued using the client passes through the API to finally reach the daemon.

**First get into the folder where source code is present**

<https://github.com/archanareddyse/docker.git>

```
Loading personal and system profiles took 1069ms.  
PS C:\Users\Archana_Sama> cd C:\Users\Archana_Sama\Desktop\getting-started-master\app  
PS C:\Users\Archana_Sama\Desktop\getting-started-master\app> docker network create todo-app
```

create the network first and attach the MySQL container at startup.

```
PS C:\Users\Archana_Sama\Desktop\getting-started-master\app> docker network create todo-app  
f820c82260224c4c841bddfb0910ba0feb67be45509544517bc362cc6c0660ae
```

Start a MySQL container and attach it to the network. We're also going to define a few environment variables that the database will use to initialize the database

```
PS C:\Users\Archana_Sama\Desktop\getting-started-master\app> docker run -d `
>> --network todo-app --network-alias mysql `
>> -v todo-mysql-data:/var/lib/mysql `
>> -e MYSQL_ROOT_PASSWORD=secret `
>> -e MYSQL_DATABASE=todos `
>> mysql:5.7
Unable to find image 'mysql:5.7' locally
5.7: Pulling from library/mysql
66fb34780033: Pull complete
ef4ccd63cdb4: Pull complete
4668041516: Pull complete
```

To get list of images

```
PS C:\Users\Archana_Sama\Desktop\getting-started-master\app> docker images
REPOSITORY          TAG
IMAGE ID            CREATED             SIZE
mysql                5.7
3147495b3a5c        5 days ago         431MB
hubproxy.docker.internal:5000/docker/desktop-kubernetes  kubernetes-v1.24.1-cni-v0.8.5-critools-v1.24.2-cri-dockerd-v0.2.1-1-debian
516347ab354         2 months ago       263MB
```

To confirm we have the database up and running, connect to the database and verify it connects.  
Copy the id from >docker container ps -a

- After executing the command will get into database with password secret
- Show databases where we can see tables

```
PS C:\Users\Archana_Sama\Desktop\getting-started-master\app> docker exec -it c52f4049e3ce mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 3
Server version: 5.7.39 MySQL Community Server (GPL)

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> show databases
-> ;
+-----+
| Database |
+-----+
| information_schema |
| mysql |
| performance_schema |
| sys |
| todos |
+-----+
5 rows in set (0.01 sec)
```

Start a new container using the nicolaka/netshoot image. Make sure to connect it to the same network.

\$ dig mysql

```
PS C:\Users\Archana_Sama\Desktop\getting-started-master\app> docker run -it --network todo-app nicolaka/netshoot
Unable to find image 'nicolaka/netshoot:latest' locally
latest: Pulling from nicolaka/netshoot
2408cc74d12b: Pull complete
3cf03e9fd7e4: Pull complete
```

```

4f374adfcdbf |< dig mysql

<<>> DiG 9.18.3 <<>> mysql
; global options: +cmd
; Got answer:
;->>HEADER<- opcode: QUERY, status: NOERROR, id: 45572
; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

; QUESTION SECTION:
mysql.                IN      A

; ANSWER SECTION:
mysql.                600     IN      A      172.18.0.2

; Query time: 50 msec
; SERVER: 127.0.0.11#53(127.0.0.11) (UDP)
; WHEN: Mon Aug 01 06:46:16 UTC 2022
; MSG SIZE rcvd: 44

```

**Note:** for MySQL versions 8.0 and higher, make sure to include the following commands in `mysql`.

```

PS C:\Users\Archana_Sama\Desktop\getting-started-master\app> docker exec -it c52f4049e3ce mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 4
Server version: 5.7.39 MySQL Community Server (GPL)

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Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> ALTER USER 'root' IDENTIFIED WITH mysql_native_password BY 'secret';
Query OK, 0 rows affected (0.00 sec)

mysql> flush privileges;
Query OK, 0 rows affected (0.00 sec)

mysql> exit

```

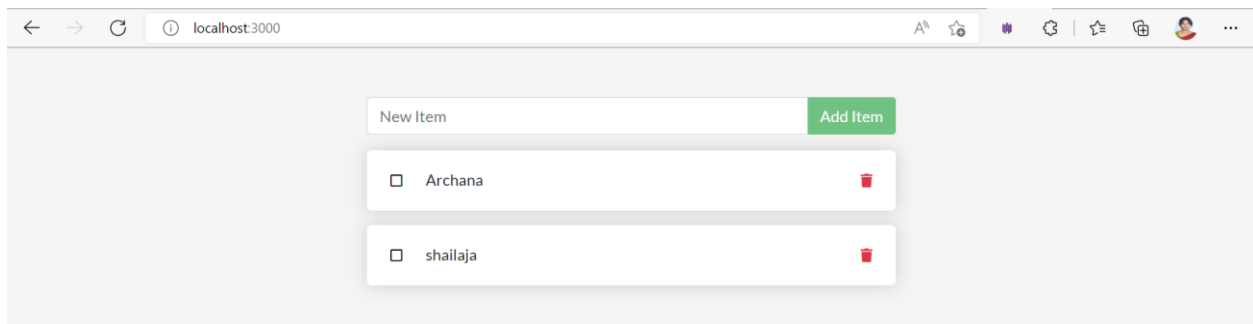
We'll specify each of the environment variables above, as well as connect the container to our app network.

```

PS C:\Users\Archana_Sama\Desktop\getting-started-master\app> docker run -dp 3000:3000 `
>> -w /app -v "${pwd}:/app" `
>> --network todo-app `
>> -e MYSQL_HOST=mysql `
>> -e MYSQL_USER=root `
>> -e MYSQL_PASSWORD=secret `
>> -e MYSQL_DB=todos `
>> node:12-alpine `
>> sh -c "yarn install && yarn run dev"
Unable to find image 'node:12-alpine' locally
12-alpine: Pulling from library/node
df9b9388f04a: Pull complete
3bf6d7380205: Pull complete
7939e601ee5e: Pull complete
31f0fb9de071: Pull complete
Digest: sha256:d4b15b3d48f42059a15bd659be60afe21762aae9d6cbea6f124440895c27db68
Status: Downloaded newer image for node:12-alpine
8129ae55beb4352159275c8a88cf56215205dea69019a6e3f1e92115f6a2c4c5

```

1. Open the app in your browser and add a few items to your todo list.



Open the app in your browser and add a few items to your todo list.

And in the mysql shell, run the following:

```
PS C:\Users\Archana_Sama\Desktop\getting-started-master\app> docker exec -it c52f4049e3ce mysql -p todos
Enter password:
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 7
Server version: 5.7.39 MySQL Community Server (GPL)

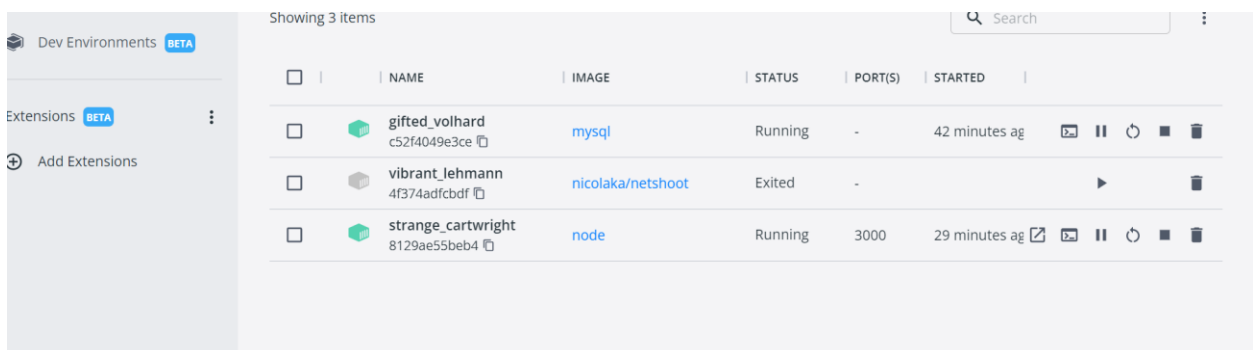
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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> select * from todo_items;
+-----+-----+-----+
| id                | name    | completed |
+-----+-----+-----+
| 5a8b37c0-6a02-4b0d-b8d3-eafd4f2e8c41 | Archana | 0         |
| b1f31a25-f2a2-4a2b-b530-ea609c459da8 | shailaja | 0         |
+-----+-----+-----+
```

If you take a quick look at the Docker Dashboard, you'll see that we have two app containers running.

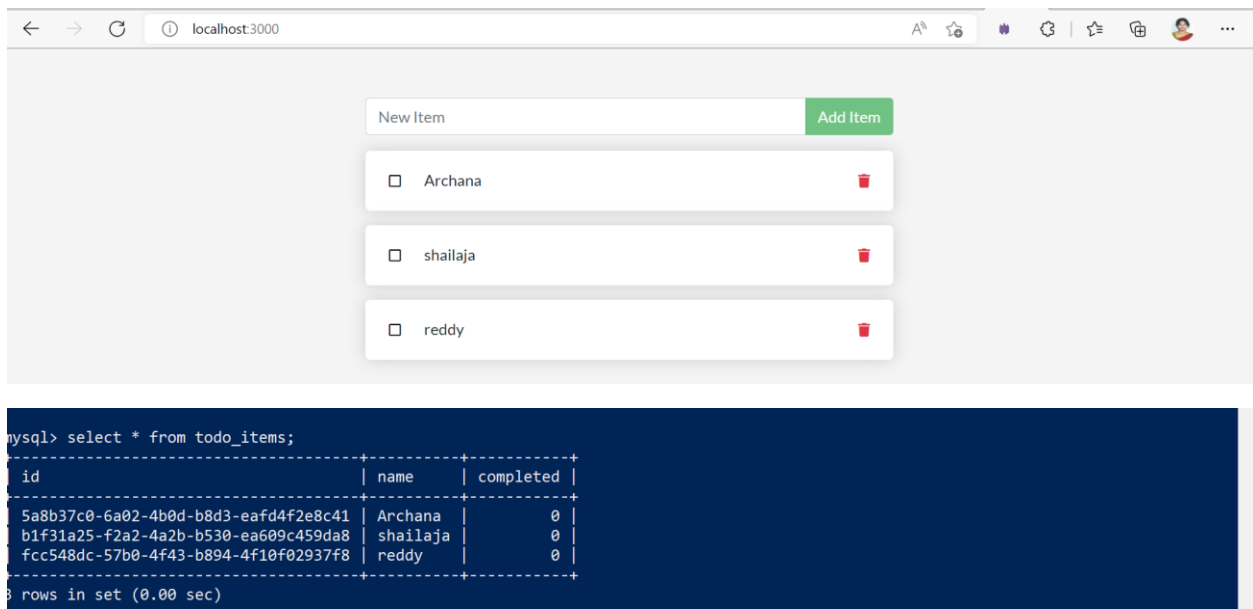


Again run the command and make changes to it and see the result

```
PS C:\Users\Archana_Sama\Desktop\getting-started-master\app> docker exec -it c52f4049e3ce mysql -p todos
Enter password:
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Welcome to the MySQL monitor.  Commands end with ; or \g.
```

After making changes we see result



The screenshot shows a web browser at localhost:3000 displaying a todo application. At the top, there is a text input labeled "New Item" and a green "Add Item" button. Below this, a list of three todo items is shown, each with a checkbox and a red trash icon for deletion:

- ☐ Archana
- ☐ shailaja
- ☐ reddy

Below the UI, a terminal window displays the SQL query result:

```
mysql> select * from todo_items;
```

id	name	completed
5a8b37c0-6a02-4b0d-b8d3-eafd4f2e8c41	Archana	0
b1f31a25-f2a2-4a2b-b530-ea609c459da8	shailaja	0
fcc548dc-57b0-4f43-b894-4f10f02937f8	reddy	0

3 rows in set (0.00 sec)