



Department of Computer Science and Engineering (Data Science)

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Subject: Big Data Engineering (DJ19DSL604)

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**Experiment 2 (Infrastructure
Implementation)**

Aim: Hands on experience of Dockers and Kubernetes.

Theory:

Docker Overview

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.

The Docker Platform

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. 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.

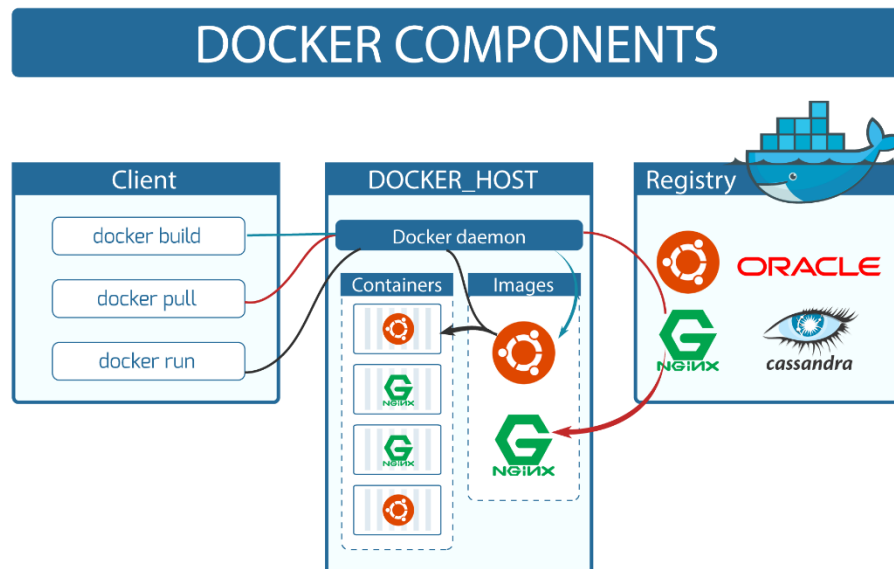
Docker provides tooling and a platform to manage the lifecycle of your containers:

- Develop your application and its supporting components using containers.



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- The container becomes the unit for distributing and testing your application.
- When you're ready, deploy your application into your production environment, as a container or an orchestrated service. This works the same whether your production environment is a local data center, a cloud provider, or a hybrid of the two.



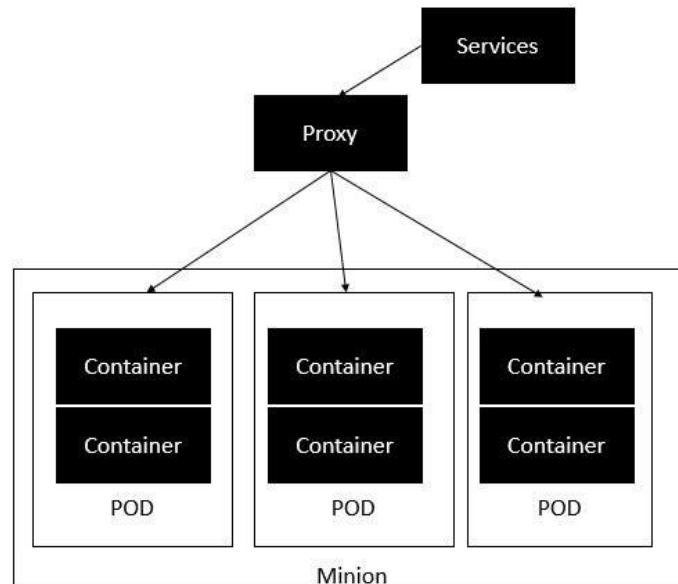
Kubernetes

Kubernetes is an orchestration framework for Docker containers which helps expose containers as services to the outside world. For example, you can have two services – One service would contain nginx and mongoDB, and another service would contain nginx and redis. Each service can have an IP or service point which can be connected by other applications. Kubernetes is then used to manage these services.

The following diagram shows in a simplistic format how Kubernetes works from an architecture point of view.



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The minion is the node on which all the services run. You can have many minions running at one point in time. Each minion will host one or more POD. Each POD is like hosting a service. Each POD then contains the Docker containers. Each POD can host a different set of Docker containers. The proxy is then used to control the exposing of these services to the outside world.

Kubernetes has several components in its architecture. The role of each component is explained below & minus;

etcd – This component is a highly available key-value store that is used for storing shared configuration and service discovery. Here the various applications will be able to connect to the services via the discovery service.

Flannel – This is a backend network which is required for the containers.

kube-apiserver – This is an API which can be used to orchestrate the Docker containers.

kube-controller-manager – This is used to control the Kubernetes services. kube-scheduler

– This is used to schedule the containers on hosts.



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Kubelet – This is used to control the launching of containers via manifest files. kube-proxy

– This is used to provide network proxy services to the outside world.

Lab Assignment:

1. Installation of Docker and Kubernetes on Ubuntu 20.4.5.

```
Activities Feb 5 12:04 Terminal
Debug Mode: false
HTTP Proxy: http.docker.internal:3128
HTTPS Proxy: http.docker.internal:3128
No Proxy: hubproxy.docker.internal
Experimental: false
Insecure Registries:
  hubproxy.docker.internal:5555
  127.0.0.0/8
Live Restore Enabled: false

WARNING: daemon is not using the default seccomp profile
cs-ds@mun0923cpu09888:~/Desktop$ sudo docker run -i -t ubuntu /bin/bash
[sudo] password for cs-ds:
docker: cannot connect to the Docker daemon at unix:///var/run/docker.sock. Is the docker daemon running?
See 'docker run --help'.
cs-ds@mun0923cpu09888:~/Desktop$ git clone https://github.com/docker/welcome-to-docker
Cloning into 'welcome-to-docker'...
remote: Enumerating objects: 125, done.
remote: Counting objects: 100% (64/64), done.
remote: Compressing objects: 100% (37/37), done.
remote: Total 125 (delta 39), reused 48 (delta 24), pack-reused 61
Receiving objects: 100% (125/125), 319.34 KiB | 19.56 MiB/s, done.
Resolving deltas: 100% (56/56), done.
cs-ds@mun0923cpu09888:~/Desktop$ cd welcome-to-docker
cs-ds@mun0923cpu09888:~/Desktop/welcome-to-docker$ cd desktop
bash: cd: desktop: No such file or directory
cs-ds@mun0923cpu09888:~/Desktop/welcome-to-docker$ cd Desktop
bash: cd: Desktop: No such file or directory
cs-ds@mun0923cpu09888:~/Desktop/welcome-to-docker$ ^C
cs-ds@mun0923cpu09888:~/Desktop/welcome-to-docker$ cd ~/Desktop
cs-ds@mun0923cpu09888:~/Desktop$ git clone https://github.com/docker/welcome-to-docker
fatal: destination path 'welcome-to-docker' already exists and is not an empty directory.
cs-ds@mun0923cpu09888:~/Desktop$ cd welcome-to-docker
cs-ds@mun0923cpu09888:~/Desktop/welcome-to-docker$ docker build -t welcome-to-docker .
[+] Building 10.3s (2/2) FINISHED
=> [internal] load build definition from Dockerfile
=> transferring Dockerfile: 647B 0.0s
=> [internal] load metadata for docker.io/library/node:18-alpine 10.2s
> [internal] load metadata for docker.io/library/node:18-alpine:
-----
Dockerfile:2
-----
1 | # Start your image with a node base image
2 | >>> FROM node:18-alpine
3 |
4 | # The /app directory should act as the main application directory
-----
ERROR: failed to solve: node:18-alpine: failed to do request: Head "https://registry-1.docker.io/v2/library/node/nanifests/18-alpine": net/http: TLS handshake timeout
View build details: docker-desktop://dashboard/build/desktop-linux/desktop-linux/rqn7ka26pe5d9qsp3indhbr8
cs-ds@mun0923cpu09888:~/Desktop/welcome-to-docker$
```



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```
Activities Feb 5 12:03
Terminal
cs-ds@mun0923cpu0988:~/Desktop$ docker info
$ command not found
cs-ds@mun0923cpu0988:~/Desktop$ docker info
Client: Docker Engine - Community
Version: 25.0.2
Context: desktop-linux
Debug Mode: false
Plugins:
  buildx: Docker Buildx (Docker Inc.)
    Version: v0.12.1-desktop.4
    Path: /usr/lib/docker/cli-plugins/docker-buildx
  compose: Docker Compose (Docker Inc.)
    Version: v2.24.3-desktop.1
    Path: /usr/lib/docker/cli-plugins/docker-compose
  debug: Get a shell into any image or container. (Docker Inc.)
    Version: 0.0.22
    Path: /usr/lib/docker/cli-plugins/docker-debug
  dev: Docker Dev Environments (Docker Inc.)
    Version: v0.1.0
    Path: /usr/lib/docker/cli-plugins/docker-dev
  extension: Manages Docker extensions (Docker Inc.)
    Version: v0.2.21
    Path: /usr/lib/docker/cli-plugins/docker-extension
  feedback: Provide feedback, right in your terminal! (Docker Inc.)
    Version: v1.0.4
    Path: /usr/lib/docker/cli-plugins/docker-feedback
  init: Creates Docker-related starter files for your project (Docker Inc.)
    Version: v1.0.0
    Path: /usr/lib/docker/cli-plugins/docker-init
  sbom: View the packaged-based Software Bill Of Materials (SBOM) for an image (Anchore Inc.)
    Version: 0.6.0
    Path: /usr/lib/docker/cli-plugins/docker-sbom
  scout: Docker Scout (Docker Inc.)
    Version: v1.3.0
    Path: /usr/lib/docker/cli-plugins/docker-scout
Server:
  Containers: 0
  Running: 0
  Paused: 0
  Stopped: 0
  Images: 1
  Server Version: 25.0.2
  Storage Driver: overlay2
    backing filesystem: extfs
    supports d.type: true
    Using metacopy: false
    Native Overlay Diff: true
  userxattr: false
  Logging Driver: json-file
  Cgroup Driver: cgroupfs
  Cgroup Version: 2
```

```
Activities Feb 5 12:03
Terminal
o: command not found
bash: export: 'HADOOP_OPTS=java.library.path=/Home/hadoop/hadoop-3.3.6/lib/nativ': not a valid identifier
cs-ds@mun0923cpu0988:~$ sudo apt-get update
[sudo] password for cs-ds:
Hit:1 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://packages.microsoft.com/repos/code stable InRelease
Get:3 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:4 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Hit:5 https://ppa.launchpadcontent.net/wireshark-dev/stable/ubuntu jammy InRelease
Hit:6 https://dl.google.com/linux/chrome/deb stable InRelease
Hit:7 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease
Get:8 http://in.archive.ubuntu.com/ubuntu jammy-updates/main i386 Packages [560 kB]
Get:9 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [1,109 kB]
Get:10 http://in.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [1,326 kB]
Get:11 http://in.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [268 kB]
Get:12 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe i386 Packages [686 kB]
Get:13 http://security.ubuntu.com/ubuntu jammy-security/main i386 Packages [394 kB]
Get:14 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1,043 kB]
Get:15 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [207 kB]
Get:16 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [838 kB]
Get:17 http://security.ubuntu.com/ubuntu jammy-security/universe i386 Packages [589 kB]
Fetched 7,249 kB in 9s (768 kB/s)
Reading package lists... Done
cs-ds@mun0923cpu0988:~$ sudo apt-get install ca-certificates curl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20230311ubuntu0.22.04.1).
ca-certificates set to manually installed.
The following packages were automatically installed and are no longer required:
  libflashrom1 libfdt1:2 liblvm1 libwireshark15 libwireshark15 libwireshark15 libwireshark15 libwireshark15
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  curl
0 upgraded, 1 newly installed, 0 to remove and 7 not upgraded.
Need to get 194 kB of archives.
After this operation, 454 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu jammy-updates/main amd64 curl amd64 7.81.0-1ubuntu1.15 [194 kB]
Fetched 194 kB in 1s (150 kB/s)
Selecting previously unselected package curl.
(Reading database ... 22123 files and directories currently installed.)
Preparing to unpack .../curl-7.81.0-1ubuntu1.15.amd64.deb ...
Unpacking curl (7.81.0-1ubuntu1.15) ...
Setting up curl (7.81.0-1ubuntu1.15) ...
Processing triggers for man-db (2.10.2-1) ...
cs-ds@mun0923cpu0988:~$ sudo install -m 0755 -d /etc/apt/keyrings
cs-ds@mun0923cpu0988:~$ "[[200-sudo curl -fsSL https://download.docker.com/linux/ubuntu/gpg -o /etc/apt/keyrings/docker.asc-
sudo: command not found
cs-ds@mun0923cpu0988:~$ sudo curl -fsSL https://download.docker.com/linux/ubuntu/gpg -o /etc/apt/keyrings/docker.asc
cs-ds@mun0923cpu0988:~$ sudo chmod a+r /etc/apt/keyrings/docker.asc
cs-ds@mun0923cpu0988:~$ echo \
```



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2. Group Activity (3 students): Create two Docker containers. One with an OS image and another with Node.js and React.

The screenshot shows the Docker Desktop application window. The top bar is blue with the 'docker desktop' logo on the left and a search bar on the right containing 'welcome to docker'. Below the top bar is a sidebar with various icons. The main area is titled 'Images' and has two tabs: 'Local' and 'Hub'. The 'Local' tab is active, showing a progress bar for '18.55 MB / 0 Bytes in use' and '1 images'. Below this is a search bar and a table of images.

Name	Tag	Status	Created	Size	Actions
docker/welcome-to-docker c1f619b6477e	latest	In use	3 months ago	18.55 MB	[Play] [More] [Delete]

At the bottom of the main area, there is a 'Walkthroughs' section with two cards: 'Run Docker Hub images' (5 mins) and 'Publish your image' (5 mins). The bottom status bar shows system information: RAM 1.01 GB, CPU 0.00%, Disk 62.76 GB avail. of 67.32 GB, and a 'Not signed in' status. The version 'v4.27.1' and a notification bell icon are also present.



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The screenshot shows the Visual Studio Code interface with a Dockerfile open in the editor. The Dockerfile contains instructions to build a Node.js application container. The terminal at the bottom shows the output of the Docker build process, including the installation of npm packages and the execution of the serve command. A notification from Microsoft prompts the user to install the Docker extension.

```
1 Start your image with a node base image
2 FROM node:18-alpine
3
4 # The /app directory should act as the main application directory
5 WORKDIR /app
6
7 # Copy the app package and package-lock.json file
8 COPY package*.json ./
9
10 # Copy local directories to the current local directory of our docker image (/app)
11 COPY ./src ./src
12 COPY ./public ./public
13
14 # Install node packages, install serve, build the app, and remove dependencies at the end
15 RUN npm install \
16     && npm install -g serve \
17     && npm run build \
18     && rm -fr node_modules
19
20 EXPOSE 3000
21
22 # Start the app using serve command
23 CMD [ "serve", "-s", "build" ]
```

OUTPUT
Loading configuration....
Done loading configuration

Do you want to install the recommended 'Docker' extension from Microsoft for the Docker language?

Install Show Recommendations

The screenshot shows the Docker Desktop interface with the 'Images' tab selected. It displays a list of local Docker images, including 'docker-nodejs-sample-server' and 'docker/welcome-to-docker'. The table includes columns for Name, Tag, Status, Created, Size, and Actions.

Name	Tag	Status	Created	Size	Actions
docker-nodejs-sample-server	latest	In use	2 days ago	191.2 MB	
docker/welcome-to-docker	latest	In use	3 months ago	18.55 MB	



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```
cs-ds@mun0923cpu0989:~/Desktop/docker-nodejs-sample$ docker init
```

Welcome to the Docker Init CLI!

This utility will walk you through creating the following files with sensible defaults for your project:

- .dockerignore
- Dockerfile
- compose.yaml
- README.Docker.md

Let's get started!

```
? What application platform does your project use? Node
? What version of Node do you want to use? 18.0.0
? Which package manager do you want to use? npm
? What command do you want to use to start the app? node src/index.js
? What port does your server listen on? 3000
```

```
CREATED: .dockerignore
CREATED: Dockerfile
CREATED: compose.yaml
CREATED: README.Docker.md
```

✓ Your Docker files are ready!

Take a moment to review them and tailor them to your application.

When you're ready, start your application by running: `docker compose up --build`

Your application will be available at <http://localhost:3000>

Consult README.Docker.md for more information about using the generated files.

```
cs-ds@mun0923cpu0989:~/Desktop/docker-nodejs-sample$ docker compose up --build
```

```
[+] Building 113.4s (6/10)
```

```
=> [server internal] load build definition from Dockerfile
=> => transferring dockerfile: 1.21kB
=> [server] resolve image config for docker.io/docker/dockerfile:1
=> [server] docker.io/docker:1qsha256:ac85f380a63b13dfcefa89046420e1781752bab202122f8f50032edf31be0021
=> => resolve docker.io/docker:1qsha256:ac85f380a63b13dfcefa89046420e1781752bab202122f8f50032edf31be0021
=> => sha256:ac85f380a63b13dfcefa89046420e1781752bab202122f8f50032edf31be0021 8.40kB / 8.40kB
=> => sha256:657fcc512c7369f4cb3d94ea329150f8daf626bc838b1a1e81f1834c73ecc77e 482B / 482B
=> => sha256:a17ee7ff8f5e97b574f5b48f51647d2cf28d545f2aa0c1aaa0ea431b44bb89 1.27kB / 1.27kB
=> => sha256:9d9c93f4b00be908ab094e4d4f732570bced3baa9db7515d70ff93402179ad232 11.80MB / 11.80MB
=> => extracting sha256:9d9c93f4b00be908ab094e4d4f732570bced3baa9db7515d70ff93402179ad232
=> [server internal] load metadata for docker.io/library/node:18.0.0-alpine
=> => [server internal] load .dockerignore
=> => transferring context: 659B
=> [server stage-0 1/4] FROM docker.io/library/node:18.0.0-alpine@sha256:469ee26d9e00547ea91202a34ff2542f984c2c60a2edbb4007558ccb76b56df2
=> => resolve docker.io/library/node:18.0.0-alpine@sha256:469ee26d9e00547ea91202a34ff2542f984c2c60a2edbb4007558ccb76b56df2
=> => sha256:469ee26d9e00547ea91202a34ff2542f984c2c60a2edbb4007558ccb76b56df2 1.43kB / 1.43kB
=> => sha256:77f86133ced4263d78a2ca2ab27945f8ac9aa06ef092f52c84bb9b2a13055fc 1.16kB / 1.16kB
=> => sha256:de1a9de7d95550de3a7caaa4f6a5085b72b17ec272dc56c13b3a2becba4cab3 6.58kB / 6.58kB
=> => sha256:df9b9388f04ad6279a7410b85cedfdbc22080a003da7ab5613af71079148139 1.05MB / 2.81MB
```




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localhost:3000

New Item

Add Item

Kresha

Hello



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3. Develop a website in one Docker Container, share it with your team mates and allow parallel corrections from all team members.

```
cs-ds@num0923cpu0989:~/Desktop$ git clone https://github.com/docker/welcome-to-docker
Cloning into 'welcome-to-docker'...
remote: Enumerating objects: 125, done.
remote: Counting objects: 100% (64/64), done.
remote: Compressing objects: 100% (37/37), done.
remote: Total 125 (delta 39), reused 40 (delta 24), pack-reused 61
Receiving objects: 100% (125/125), 319.34 KiB | 1.60 MiB/s, done.
Resolving deltas: 100% (56/56), done.
cs-ds@num0923cpu0989:~/Desktop$ cd welcome-to-docker
cs-ds@num0923cpu0989:~/Desktop/welcome-to-docker$ docker build -t welcome-to-docker .
[+] Building 24.7s (2/2) FINISHED                                docker:desktop-linux
=> [internal] load build definition from Dockerfile              0.0s
=> == transferring dockerfile: 647B                             0.0s
=> ERROR [internal] load metadata for docker.io/library/node:18-alpine 24.6s
-----
> [internal] load metadata for docker.io/library/node:18-alpine:
-----
Dockerfile:2
-----
1 | # Start your image with a node base image
2 | >>> FROM node:18-alpine
3 |
4 | # The /app directory should act as the main application directory
-----
ERROR: failed to solve: node:18-alpine: failed to do request: Head "https://registry-1.docker.io/v2/library/node/manifests/18-alpine": net/http: TLS handshake timeout
View build details: docker-desktop://dashboard/build/desktop-linux/desktop-linux/y9qalbrxclhy5vbehpmx7ip8u
cs-ds@num0923cpu0989:~/Desktop/welcome-to-docker$
```

```
cs-ds@num0923cpu0989:~/Desktop/docker-nodejs-sample$ docker init

Welcome to the Docker Init CLI!

This utility will walk you through creating the following files with sensible defaults for your project:
- .dockerignore
- Dockerfile
- compose.yaml
- README.Docker.md

Let's get started!

? What application platform does your project use? Node
? What version of Node do you want to use? 18.0.0
? Which package manager do you want to use? npm
? What command do you want to use to start the app? node src/index.js
? What port does your server listen on? 3000

CREATED: .dockerignore
CREATED: Dockerfile
CREATED: compose.yaml
CREATED: README.Docker.md

✓ Your Docker files are ready!

Take a moment to review them and tailor them to your application.

When you're ready, start your application by running: docker compose up --build

Your application will be available at http://localhost:3000

Consult README.Docker.md for more information about using the generated files.
cs-ds@num0923cpu0989:~/Desktop/docker-nodejs-sample$ docker compose up --build
[+] Building 113.4s (6/10)
=> [server internal] load build definition from Dockerfile
=> == transferring dockerfile: 1.21kB
=> [server] resolve image config for docker.io/docker/dockerfile:1
=> [server] docker-image://docker.io/docker/dockerfile:1qsha256:ac85f380a63b13dfcefa89046420e1781752bab202122f8f50032edf31be0021
=> == resolve docker.io/docker/dockerfile:1qsha256:ac85f380a63b13dfcefa89046420e1781752bab202122f8f50032edf31be0021
=> == sha256:ac85f380a63b13dfcefa89046420e1781752bab202122f8f50032edf31be0021 8.40kB / 8.40kB
=> == sha256:657fcc512c7369f4cb3d94ea329150f8daf626bc838b1a1e81f1834c73ecc77e 482B / 482B
=> == sha256:a17ee7ff8f5e97b974f5b48f51647d2cf28d543f2aa6c1aaa0ea431b44bb89 1.27kB / 1.27kB
=> == sha256:9d9c93f4b00be908ab694a4df732570bcd3b8a96b7515d70ff93402179ad232 11.80MB / 11.80MB
=> == extracting sha256:9d9c93f4b00be908ab694a4df732570bcd3b8a96b7515d70ff93402179ad232
=> [server internal] load metadata for docker.io/library/node:18.0.0-alpine
=> [server internal] load .dockerignore
=> == transferring context: 659B
=> [server stage-0 1/4] FROM docker.io/library/node:18.0.0-alpine@sha256:469ee26d9e00547ea91202a34ff2542f984c2c60a2edbb4007558ccb76b56df2
=> == resolve docker.io/library/node:18.0.0-alpine@sha256:469ee26d9e00547ea91202a34ff2542f984c2c60a2edbb4007558ccb76b56df2
=> == sha256:469ee26d9e00547ea91202a34ff2542f984c2c60a2edbb4007558ccb76b56df2 1.43kB / 1.43kB
=> == sha256:77f86133ced42635d78a2ca2ab27945f8ac9aa06ef092f52c84bb9b2a13055fc 1.16kB / 1.16kB
=> == sha256:de1a9de7d955550ed3a7caaa4f6a5885b72b17ec272dc56c13b3a2becba4cab3 6.58kB / 6.58kB
=> == sha256:d9b9388f04ad6279a7410b85cedfcb2208ca003da7ab5613af71679148139 1.05MB / 2.81MB
```



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EXT

+

Kresha

[docker/welcome-to-docker:latest](#)

250c064bae5d

[8089.80](#)

STATUS

Running (0 seconds ago)

LogsInspectBind mountsExecFilesStats

2024-02-05 11:59:21 /docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuration

2024-02-05 11:59:21 /docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/

2024-02-05 11:59:21 /docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh

2024-02-05 11:59:21 10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf

2024-02-05 11:59:21 10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf

2024-02-05 11:59:21 /docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh

2024-02-05 11:59:21 /docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh

2024-02-05 11:59:21 /docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh

2024-02-05 11:59:21 /docker-entrypoint.sh: Configuration complete; ready for start up

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: using the "epoll" event method

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: nginx/1.25.3

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: built by gcc 12.2.1 20220924 (Alpine 12.2.1_git20220924-r10)

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: OS: Linux 6.6.12-linuxkit

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker processes

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 30

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 31

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 32

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 33

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 34

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 35

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 36

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 37

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 38

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 39

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 40

2024-02-05 11:59:21 2024/02/05 06:29:21 [notice] 1#1: start worker process 41

2024-02-05 11:59:40 172.17.0.1 - - [05/Feb/2024:06:29:40 +0000] "GET / HTTP/1.1" 200 651 "-" "Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101 Firefox/122.0" "-"

2024-02-05 11:59:40 172.17.0.1 - - [05/Feb/2024:06:29:40 +0000] "GET /static/js/main.c9e951e4.js HTTP/1.1" 200 382506 "http://localhost:8089/" "Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101 Firefox/122.0" "-"

2024-02-05 11:59:40 172.17.0.1 - - [05/Feb/2024:06:29:40 +0000] "GET /static/css/main.27312bf9.css HTTP/1.1" 200 791 "http://localhost:8089/" "Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101 Firefox/122.0" "-"

2024-02-05 11:59:40 172.17.0.1 - - [05/Feb/2024:06:29:40 +0000] "GET /favicon.ico HTTP/1.1" 200 15986 "http://localhost:8089/" "Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:122.0) Gecko/20100101 Firefox/122.0" "-"

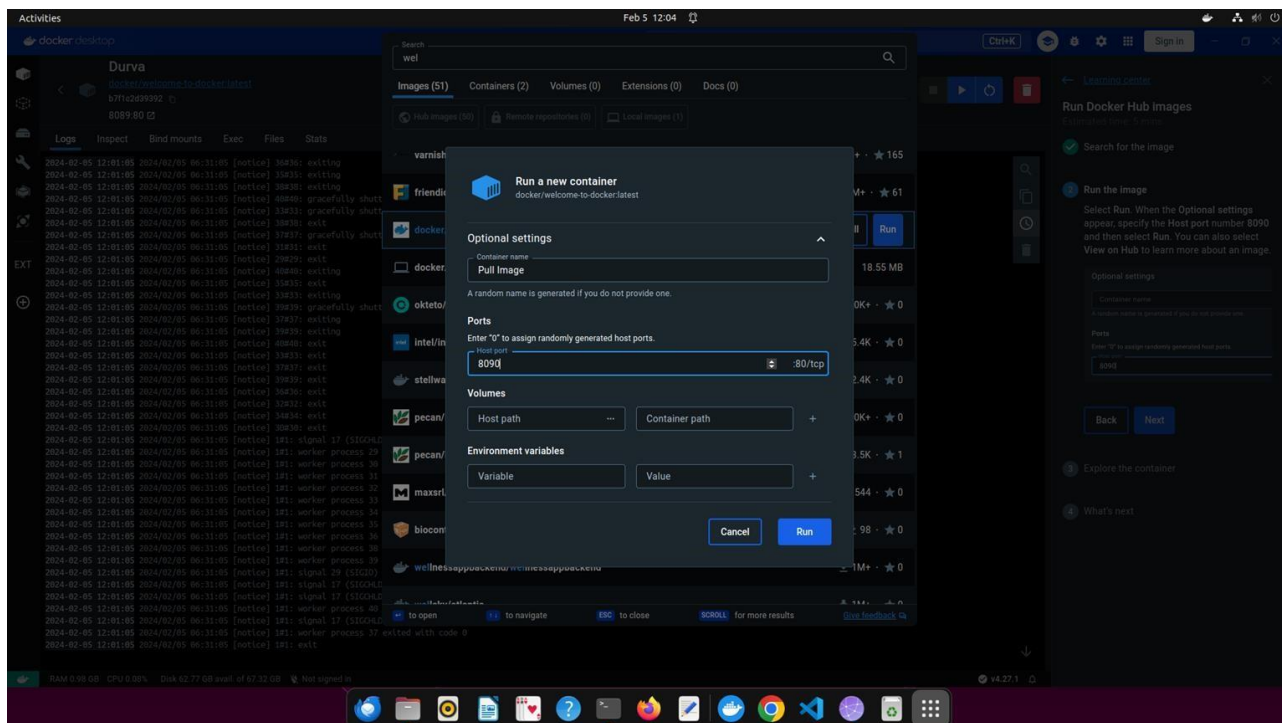
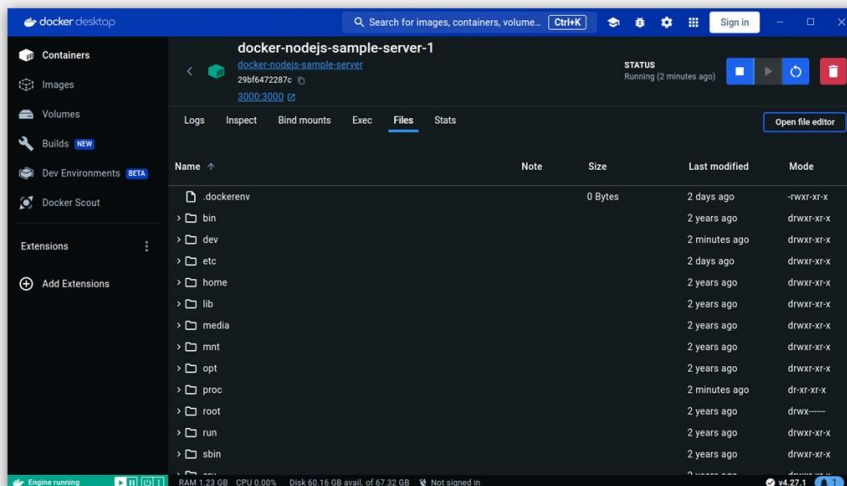
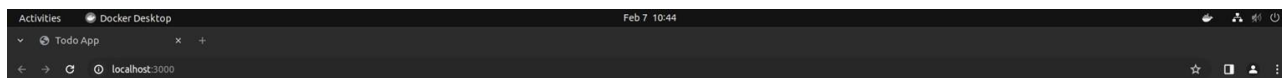
localhost:8089

Congratulations!!!

You ran your first container.



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4. Connect both the Dockers through Kubernetes and show how new request is handled.

```
cs-ds@kmaster:~$ minikube service hello-minikube
```

NAMESPACE	NAME	TARGET PORT	URL
default	hello-minikube	8080	http://192.168.49.2:31226

```
Starting tunnel for service hello-minikube.
NAMESPACE   NAME           TARGET PORT  URL
default     hello-minikube 8080         http://127.0.0.1:43971
Opening service default/hello-minikube in default browser...
Because you are using a Docker driver on linux, the terminal needs to be open to run it.
[30447:30447:0212/114820.388527:ERROR:process_singleton_posix.cc(353)] The profile appears to be in use by another Google Chrome process (5126) on another computer (num0923cpu0988). Chrome has locked the profile so that it doesn't get corrupted. If you are sure no other processes are using this profile, you can unlock the profile and relaunch Chrome.
[30447:30447:0212/114820.390041:ERROR:message_box_dialog.cc(140)] Unable to show a dialog outside the UI thread message loop: Google Chrome - The profile appears to be in use by another Google Chrome process (5126) on another computer (num0923cpu0988). Chrome has locked the profile so that it doesn't get corrupted. If you are sure no other processes are using this profile, you can unlock the profile and relaunch Chrome.
```

Activities Terminal Feb 12 11:3

Terminal

```
o: command not found
bash: export: `HADOOP_OPTS-Djava.library.path=/Home/hadoop/hadoop-3.3.6/lib/nativ': not a valid identifier
cs-ds@kmaster:~$ minikube start
😊 minikube v1.32.0 on Ubuntu 22.04
🌟 Using the docker driver based on existing profile
❌ Requested memory allocation (1826MB) is less than the recommended minimum 1900MB. Deployments may fail.
👍 Starting control plane node minikube in cluster minikube
🔄 Pulling base image ...
🔄 Restarting existing docker container for "minikube" ...
🔄 Preparing Kubernetes v1.28.3 on Docker 24.0.7 ...
🔄 Configuring bridge CNI (Container Networking Interface) ...
🔄 Verifying Kubernetes components...
   ■ Using image gcr.io/k8s-minikube/storage-provisioner:v5
🌟 Enabled addons: storage-provisioner, default-storageclass
👏 Done! kubectrl is now configured to use "minikube" cluster and "default" namespace by default
```




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The screenshot shows the Docker Desktop application window. The left sidebar contains navigation options: Containers, Images, Volumes, Builds, Dev Environments, Docker Scout, Extensions, and Add Extensions. The main panel displays the 'Containers' view with a search bar and a toggle for 'Only show running containers'. Below this is a table of containers, all of which are in an 'Exited' state. A tooltip for 'Engine total disk usage' is visible over the 'docker-nodejs-sample' container. The bottom status bar shows system metrics: RAM 0.88 GB, CPU 0.08%, Disk 60.16 GB avail. of 67.32 GB, and version v4.27.1.

Name	Image	Status	CPU (%)	Port(s)	Actions
intelligent_robinson b485c91b36a5	kicbase/stl	Exited (255)	N/A	N/A	[Stop] [Refresh] [Logs]
unruffled_feynman db2e1cf319ad	kicbase/stl	Exited (1)	N/A	N/A	[Stop] [Refresh] [Logs]
minikube 59745912fcaa	docker.io/k	Exited (255)	N/A	N/A	[Stop] [Refresh] [Logs]
burna b7f1cd39392	docker/wel	Exited	N/A	8089:80	[Stop] [Refresh] [Logs]
welcome-to-docker d250d9a57c0	docker/wel	Exited	N/A	8088:80	[Stop] [Refresh] [Logs]
docker-nodejs-sample		Exited	N/A	N/A	[Stop] [Refresh] [Logs]

Engine total disk usage. This includes containers plus overheads.

Showing 6 items

Engine running | RAM 0.88 GB | CPU 0.08% | Disk 60.16 GB avail. of 67.32 GB | Not signed in | v4.27.1