

# Docker Advanced Assessment

Problem: In CI/CD concept we need to build docker image. As we are working on microservices we need to aware of three different type of building docker image

## 1. Build a Docker image using docker file

Creating Dockerfile along with source code of a Spring Boot application.

```
FROM openjdk:19-jdk-alpine3.16

ARG JAR_FILE=target/webapp-0.0.1-SNAPSHOT.jar
ADD ${JAR_FILE} app.jar
EXPOSE 8080
ENTRYPOINT ["java", "-jar", "/app.jar"]
```

## Building Docker image – webappimage

```
arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ ls
Dockerfile  HELP.md  mvnw*  mvnw.cmd  pom.xml  src/  target/

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ docker build -t webappimage .
[+] Building 73.1s (8/8) FINISHED
=> [internal] load build definition from Dockerfile                                0.1s
=> => transferring dockerfile: 195B                                              0.0s
=> [internal] load .dockerignore                                                  0.1s
=> => transferring context: 2B                                                    0.0s
=> [internal] load metadata for docker.io/library/openjdk:19-jdk-alpine3.16      9.8s
=> [auth] library/openjdk:pull token for registry-1.docker.io                   0.0s
=> [internal] load build context                                                 0.3s
=> => transferring context: 20.82MB                                              0.2s
=> [1/2] FROM docker.io/library/openjdk:19-jdk-alpine3.16@sha256:1686909f4ca66f3e13463e2b00a1c53808aa155f81ae9a8aad8f4b 56.5s
=> => resolve docker.io/library/openjdk:19-jdk-alpine3.16@sha256:1686909f4ca66f3e13463e2b00a1c53808aa155f81ae9a8aad8f4b 0.0s
=> => sha256:b915427458bc94c8d27b2d5b98d76b7eb0074c61b0daf90b4bb19dd0451d901c 939.12kB / 939.12kB 2.8s
=> => sha256:6b2ef90fa5eab15cc31f40f31d39e4715086230cc2c28c03fff04b93aa1d7406 190.59MB / 190.59MB 51.9s
=> => sha256:1686909f4ca66f3e13463e2b00a1c53808aa155f81ae9a8aad8f4b89420d91ef 319B / 319B 0.0s
=> => sha256:a8ac92087e997ddbb21211a57eb0fcb02d10e81edbf88c451cc021d7f407aae 951B / 951B 0.0s
=> => sha256:5391561d376b245c65bc2a15eaffdba0eb0cef3f53bf54c092faae848d84171f 3.48kB / 3.48kB 0.0s
=> => extracting sha256:b915427458bc94c8d27b2d5b98d76b7eb0074c61b0daf90b4bb19dd0451d901c 0.1s
=> => extracting sha256:6b2ef90fa5eab15cc31f40f31d39e4715086230cc2c28c03fff04b93aa1d7406 4.2s
=> [2/2] ADD target/webapp-0.0.1-SNAPSHOT.jar app.jar                          6.5s
=> => exporting to image                                                         0.2s
=> => exporting layers                                                         0.1s
=> => writing image sha256:34bb6c9fedbd00fcfab7e59c9267f7a37e234183bfb548ea703c1a0d2b4c67 0.0s
=> => naming to docker.io/library/webappimage                                  0.0s

Use 'docker scan' to run Snyk tests against images to find vulnerabilities and learn how to fix them
```

```
arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ docker images
REPOSITORY          TAG          IMAGE ID          CREATED          SIZE
webappimage         latest       34bb6c9fedbd     45 seconds ago  353MB
gcr.io/k8s-minikube/kicbase v0.0.36     866c1fe4e3f2     2 months ago   1.11GB

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ docker run -d -p 8080:8080 webappimage
6e9d09169a1c139ca19bfee1f4ebc0e1f39f583b6082e07099930fda3cbbf08

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED          STATUS          PORTS                    NAMES
6e9d09169a1c   webappimage    "java -jar /app.jar"    15 seconds ago  Up 13 seconds  0.0.0.0:8080->8080/tcp   sad_bardeen

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ curl localhost:8080
Hello World!!!

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
```

## Add buildpack plugin for Spring boot in pom.xml

Run the build plugin:

```
2023-01-06 11:35:12.785 INFO 5364 --- [main] com.org.webapp.WebappApplicationTests : Starting WebappApplicationTests using Java 17.0.3.1 on WKWZTpqZJFfnHMX with PID 5364 (started by arnsengu in C:\Drive\Development\psi\DevOps\DOCKER-Advanced\webapp)
2023-01-06 11:35:12.789 INFO 5364 --- [main] com.org.webapp.WebappApplicationTests : No active profile set, falling back to 1 default profile: "default"
2023-01-06 11:35:15.136 INFO 5364 --- [main] o.s.b.a.e.web.EndpointLinksResolver : Exposing 1 endpoint(s) beneath base path '/actuator'
2023-01-06 11:35:15.228 INFO 5364 --- [main] com.org.webapp.WebappApplicationTests : Started WebappApplicationTests in 2.711 seconds (JVM running for 3.929)
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 3.861 s - in com.org.webapp.WebappApplicationTests
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO]
[INFO] --- maven-jar-plugin:3.2.2:jar (default-jar) @ webapp ---
[INFO] Building jar: C:\Drive\Development\psi\DevOps\DOCKER-Advanced\webapp\target\webapp-0.0.1-SNAPSHOT.jar
[INFO]
```

```

[INFO] [creator] Adding layer 'launch.sbom'
[INFO] [creator] Adding 5/5 app layer(s)
[INFO] [creator] Adding layer 'launcher'
[INFO] [creator] Adding layer 'config'
[INFO] [creator] Adding layer 'process-types'
[INFO] [creator] Adding label 'io.buildpacks.lifecycle.metadata'
[INFO] [creator] Adding label 'io.buildpacks.build.metadata'
[INFO] [creator] Adding label 'io.buildpacks.project.metadata'
[INFO] [creator] Adding label 'org.opencontainers.image.title'
[INFO] [creator] Adding label 'org.opencontainers.image.version'
[INFO] [creator] Adding label 'org.springframework.boot.version'
[INFO] [creator] Setting default process type 'web'
[INFO] [creator] Saving docker.io/arnabcs10/webapp:latest...
[INFO] [creator] *** Images (55dd9f16c06e):
[INFO] [creator] docker.io/arnabcs10/webapp:latest
[INFO] [creator] Adding cache layer 'paketo-buildpacks/syft:syft'
[INFO] [creator] Adding cache layer 'cache.sbom'
[INFO] Successfully built image 'docker.io/arnabcs10/webapp:latest'
[INFO]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 01:15 min
[INFO] Finished at: 2023-01-06T11:36:24+05:30
[INFO] -----

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)

```

New image created :

```

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ docker images

```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
paketo/buildpacks/run	base-cnb	9aa882ca71d8	10 hours ago	87MB
webappimage	lite	e5e6253805a5	12 hours ago	492MB
webappimage	latest	34bb6c9fedbd	13 hours ago	353MB
paketo/buildpacks/run	<none>	e06d1d37657c	3 weeks ago	87MB
gcr.io/k8s-minikube/kicbase	v0.0.36	866c1fe4e3f2	2 months ago	1.11GB
webappimage	buildpack	91448f41c3ab	43 years ago	263MB
paketo/buildpacks/builder	<none>	32a2df4d7bbe	43 years ago	1.2GB
paketo/buildpacks/builder	base	c123a4e8e130	43 years ago	1.2GB
arnabcs10/webapp	latest	55dd9f16c06e	43 years ago	263MB
pack.local/builder/znfygvlqw1	latest	e4797c0c6755	43 years ago	1.2GB

```

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$

```

Running the container:

```

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ docker run -d -p 8080:8080 arnabcs10/webapp
c5009eb1dc6bbcd6a6797672d1d725cb0cb1d6fa751fc5a123fcb40cf18a6040c

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ docker ps

```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
c5009eb1dc6b	arnabcs10/webapp	"/cnb/process/web"	7 seconds ago	Up 5 seconds	0.0.0.0:8080->8080/tcp	modest_kel

```

arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ curl localhost:8080
Hello World!!!
arnsengu@WKWZTpqZJFfnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$

```

The screenshot shows a web browser window with the address bar set to 'localhost:8080'. The page content displays 'Hello World!!!'. The browser's taskbar at the bottom shows several open applications, including a mail client, a code editor, and a terminal.

Hello World!!!

3. Optimize the image at runtime by splitting part of JAR into different layers using layer tools.

Build a layered docker image

```
FROM adoptopenjdk:latest as builder
WORKDIR application
ARG JAR_FILE=target/*.jar
COPY ${JAR_FILE} application.jar
RUN java -Djarmode=layertools -jar application.jar extract

FROM adoptopenjdk:latest
WORKDIR application
COPY --from=builder application/dependencies/ ./
COPY --from=builder application/snapshot-dependencies/ ./
COPY --from=builder application/application/ ./
ENTRYPOINT
["java", "org.springframework.boot.loader.JarLuncher"]
```

```
arnsengu@WKWZTpqZJFFnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ docker build -t webappimage:lite -f docker.layer .
[+] Building 87.5s (13/13) FINISHED
=> [internal] load build definition from docker.layer                                0.0s
=> => transferring dockerfile: 492B                                                0.0s
=> [internal] load .dockerignore                                                    0.0s
=> => transferring context: 2B                                                      0.0s
=> [internal] load metadata for docker.io/library/adoptopenjdk:latest             9.4s
=> [auth] library/adoptopenjdk:pull token for registry-1.docker.io                0.0s
=> [stage-1 1/5] FROM docker.io/library/adoptopenjdk:latest@sha256:3f2982d13b40d8c6d56a3a736c4f6c51a3c99688c2b43a27ed 71.6s
=> => resolve docker.io/library/adoptopenjdk:latest@sha256:3f2982d13b40d8c6d56a3a736c4f6c51a3c99688c2b43a27ed5d1b5f3fb 0.0s
=> => sha256:3f2982d13b40d8c6d56a3a736c4f6c51a3c99688c2b43a27ed5d1b5f3fb 1.70kB / 1.70kB 0.0s
=> => sha256:f872bb02bbb761d09d3b96fbd2140ea24173651da14de39db23185e522531f8d 954B / 954B 0.0s
=> => sha256:47078e718afa7b132c9ef90600ccc5f41fe0f2c297aa01717cc6bb057adb42c1 4.72kB / 4.72kB 0.0s
=> => sha256:f3ef4ff62e0da0ef761ec1c8a578f3035bef51043e53ae1b13a20b3e03726d17 28.57MB / 28.57MB 17.6s
=> => sha256:706b9b9c1c443d1cd3d83fa6ecf9e3a4ae13b711dcc6b3aa34e9603c1cb8a930 16.03MB / 16.03MB 10.0s
=> => sha256:66893017ee66c84eb5e4d032e9035f9daba47395e649ed423f2d1ee47bed3d26 206.47MB / 206.47MB 66.7s
=> => extracting sha256:f3ef4ff62e0da0ef761ec1c8a578f3035bef51043e53ae1b13a20b3e03726d17 1.2s
=> => extracting sha256:706b9b9c1c443d1cd3d83fa6ecf9e3a4ae13b711dcc6b3aa34e9603c1cb8a930 0.7s
=> => extracting sha256:66893017ee66c84eb5e4d032e9035f9daba47395e649ed423f2d1ee47bed3d26 4.5s
=> [internal] load build context                                                    0.3s
```

```
arnsengu@WKWZTpqZJFFnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$ docker images
REPOSITORY          TAG         IMAGE ID      CREATED        SIZE
webappimage         lite        e5e6253805a5 15 minutes ago 492MB
webappimage         latest      34bb6c9fedbd 2 hours ago   353MB
paketobuildpacks/run base-cnb     e06d1d37657c 3 weeks ago   87MB
gcr.io/k8s-minikube/kicbase v0.0.36     866c1fe4e3f2 2 months ago 1.11GB
paketobuildpacks/builder base         32a2df4d7bbe 43 years ago 1.2GB

arnsengu@WKWZTpqZJFFnHMX MINGW64 /c/Drive/Development/psi/DevOps/Docker-Advanced/webapp (master)
$
```