Lab: Using Distroless for Building Lightweight Docker Images & Scanning via Clair

Lab Scenario

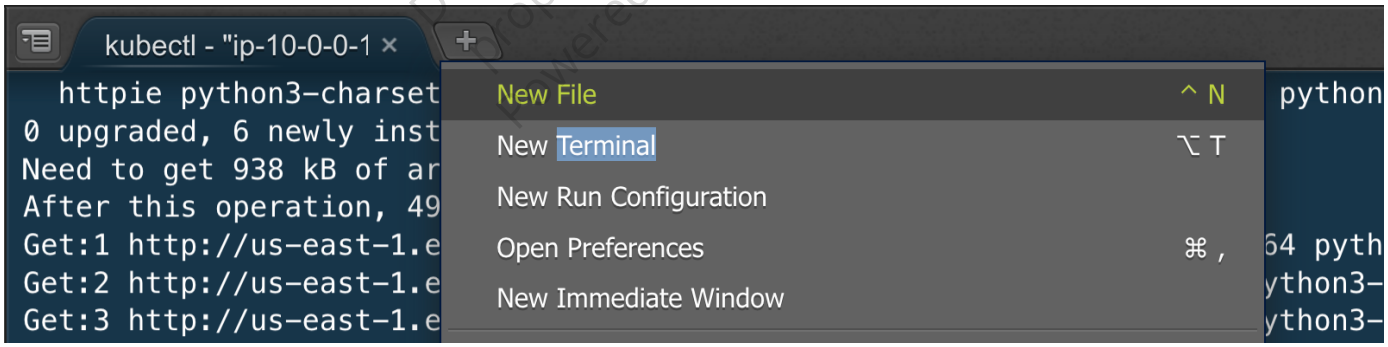
The primary goal of this lab is to leverage Distroless images to create a lightweight Docker image for a Python application and scan it for vulnerabilities using Clair-Scanner.

Lab:

- Tool: Clair-Scan
- Distroless Container: Distroless

Open New Terminal

- Click on `+` icon, then select `new terminal` to open new terminal.



Hands On Lab

- Organize the lab files in a structured directory.

```
mkdir -p course/7_protection_strategies/7_distroless/
cd course/7_protection_strategies/7_distroless/
```

```
root@ip-10-0-0-202:/home/ubuntu/ workspace# mkdir -p course/7_protection_strategies/7_distroless/
root@ip-10-0-0-202:/home/ubuntu/ workspace# cd course/7_protection_strategies/7_distroless/
```

- First, set up the Clair database and the Clair vulnerability scanner.

```
docker run -d --name clair-db arminc/clair-db:latest
docker run -p 6060:6060 --link clair-db:postgres -d --name clair arminc/clair-local-scan:v2.0.8_fe9b059d930314b54c78f75afe265955faf4fdc1
```

```
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless# docker run -d --name clair-db arminc/clair-db:latest
Unable to find image 'arminc/clair-db:latest' locally
latest: Pulling from arminc/clair-db
c9b1b535fdd9: Downloading [>                                          ]  32.19kB/2.803MB
c9b1b535fdd9: Pull complete
d1030c456d04: Pull complete
d1d0211bbd9a: Pull complete
07d0560c0a3f: Pull complete
ce7fd4584a5f: Pull complete
63eb0325fe1c: Pull complete
b67486507716: Pull complete
f58de2b85820: Pull complete
ca982626dd56: Pull complete
29786d8f0245: Pull complete
Digest: sha256:1f85f90034b2ce09dfbf077d51b6550ce23dcb2b822e2b6bc78851ce840ef898
Status: Downloaded newer image for arminc/clair-db:latest
d1a25d057ea7dcb5d6cc696ef75cfe8b5061322f75bbba9a19ef783ccd7b128e
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless# docker run -p 6060:6060 --link clair-db:postgres -d --name clair arminc/clair-local-scan:v2.0.8_fe9b059d930314b
54c78f75afe265955faf4fdc1
Unable to find image 'arminc/clair-local-scan:v2.0.8_fe9b059d930314b54c78f75afe265955faf4fdc1' locally
v2.0.8_fe9b059d930314b54c78f75afe265955faf4fdc1: Pulling from arminc/clair-local-scan
6c40cc604d8e: Pull complete
51d6d4c96fd3: Pull complete
945d978b4f19: Pull complete
74ebde557090: Pull complete
e6618267e614: Pull complete
45f1431207d0: Pull complete
5cc89d656c53: Pull complete
e2bd76ee288e: Pull complete
18ee2e42969f: Pull complete
Digest: sha256:2704c6b13cc2d568baa07ac31e718367309c078df4b31bc7eda79474f480ffb4
Status: Downloaded newer image for arminc/clair-local-scan:v2.0.8_fe9b059d930314b54c78f75afe265955faf4fdc1
```

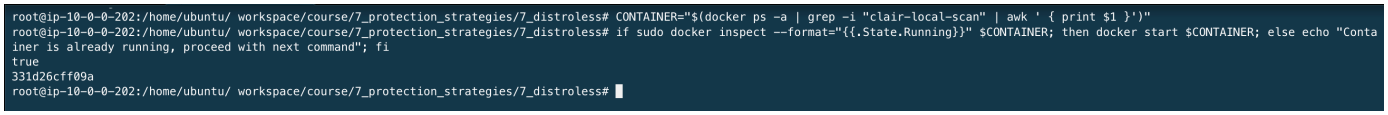

- Get the scanner binary, which will be instrumental in evaluating Docker container vulnerabilities.

```
wget https://github.com/arminc/clair-scanner/releases/download/v12/clair-scanner_linux_386 -O /usr/local/bin/clair-scanner
chmod +x /usr/local/bin/clair-scanner
```

```
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless# wget https://github.com/arminc/clair-scanner/releases/download/v12/clair-scanner_linux_386 -O /usr/local/bin/cl
air-scanner
--2023-09-11 15:08:14--  https://github.com/arminc/clair-scanner/releases/download/v12/clair-scanner_linux_386
Resolving github.com (github.com)... 140.82.113.3
Connecting to github.com (github.com)|140.82.113.3|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://objects.githubusercontent.com/github-production-release-asset-2e65be/86972405/23fe3680-a019-11e9-9f76-78d2ed40c599?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVE
H53A%2F20230911%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230911T150814Z&X-Amz-Expires=300&X-Amz-Signature=4717d6cefd3b819b2190f61649bc8e70fc78b9fd2966cfad3273fc7d9e696cc4&X-Amz-SignedHeaders=host
&actor_id=0&key_id=0&repo_id=86972405&response-content-disposition=attachment%3B%20filename%3Dclair-scanner_linux_386&response-content-type=application%2Foctet-stream [following]
--2023-09-11 15:08:14--  https://objects.githubusercontent.com/github-production-release-asset-2e65be/86972405/23fe3680-a019-11e9-9f76-78d2ed40c599?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=A
KIAIWNJYAX4CSVEH53A%2F20230911%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230911T150814Z&X-Amz-Expires=300&X-Amz-Signature=4717d6cefd3b819b2190f61649bc8e70fc78b9fd2966cfad3273fc7d9e696cc4&X-Amz-Sig
nedHeaders=host&actor_id=0&key_id=0&repo_id=86972405&response-content-disposition=attachment%3B%20filename%3Dclair-scanner_linux_386&response-content-type=application%2Foctet-stream
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.111.133, 185.199.108.133, 185.199.109.133, ...
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.111.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 8422631 (8.0M) [application/octet-stream]
Saving to: '/usr/local/bin/clair-scanner'

/usr/local/bin/clair-scanner                  100%[=============================================================================================================>]   8.03M  --.-KB/s    in 0.06s

2023-09-11 15:08:15 (137 MB/s) - '/usr/local/bin/clair-scanner' saved [8422631/8422631]

root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless# chmod +x /usr/local/bin/clair-scanner
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless#
```

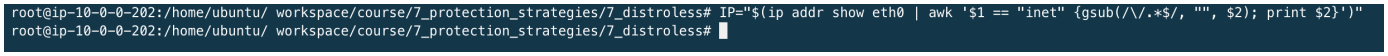
- Check if clair-local-scan conatiner is running, else we will have error. This command will fetch the conatiner id and start the container if exited.

```
CONTAINER="$(docker ps -a | grep -i "clair-local-scan" | awk ' { print $1 }')"
if sudo docker inspect --format="{{.State.Running}}" $CONTAINER; then docker
start $CONTAINER; else echo "Container is already running, proceed with next
command"; fi
```



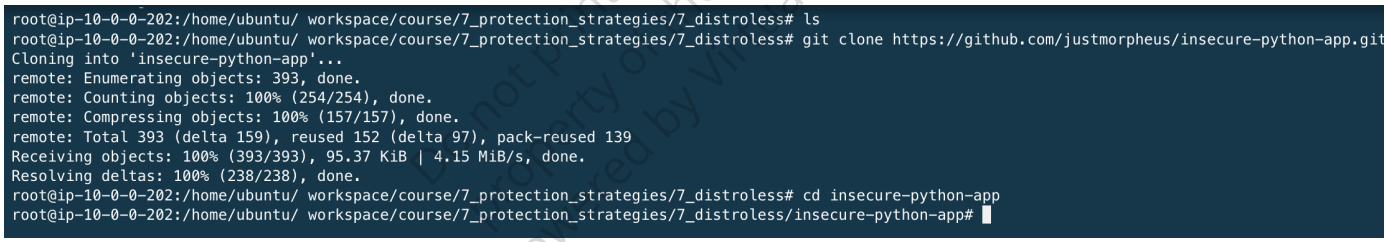
- Extract the IP address of the eth0 interface. This IP is needed by the Clair-Scanner.

```
IP="$(ip addr show eth0 | awk '$1 == "inet" {gsub(/\/.*$/, "", $2); print
$2}')"
```



- Clone the python vulnerable app for demo.

```
ls
git clone https://github.com/justmorpheus/insecure-python-app.git
cd insecure-python-app
```



- Create Dockerfile for creating the image of the python vulnerable application.

```
cat <<EOF > Dockerfile
FROM python:3.8-slim-buster
LABEL maintainer="Justmorpheus <namaste@securitydojo.co.in"
LABEL version="1.0"
LABEL description="This is insecure password manager for k8s labs @
securitydojo"
WORKDIR /python-docker

COPY requirements.txt requirements.txt
RUN pip3 install -r requirements.txt
copy . .

CMD [ "python3", "-m" , "flask", "run", "--host=0.0.0.0", "--port=8000"]
EOF
```

```
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app# cat <<EOF > Dockerfile
> FROM python:3.8-slim-buster
> LABEL maintainer="Justmorpheus <namaste@securitydojo.co.in"
> LABEL version="1.0"
> LABEL description="This is insecure password manager for k8s labs @ securitydojo"
> WORKDIR /python-docker
>
> COPY requirements.txt requirements.txt
> RUN pip3 install -r requirements.txt
> copy . .
>
> CMD [ "python3", "-m" , "flask", "run", "--host=0.0.0.0", "--port=8000"]
> EOF
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app#
```

- Build the image from Dockerfile via `docker build`

```
docker build --tag vulapp-docker .
```

```
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app# docker build --tag vulapp-docker .
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
            Install the buildx component to build images with BuildKit:
            https://docs.docker.com/go/buildx/

Sending build context to Docker daemon    190kB
Step 1/9 : FROM python:3.8-slim-buster
 ---> addd6962740a
Step 2/9 : LABEL maintainer="Justmorpheus <namaste@securitydojo.co.in"
 ---> Using cache
 ---> 305be92e90e4
Step 3/9 : LABEL version="1.0"
 ---> Using cache
 ---> bcc1a661c8b3
Step 4/9 : LABEL description="This is insecure password manager for k8s labs @ securitydojo"
 ---> Using cache
 ---> 419b29bd11a2
Step 5/9 : WORKDIR /python-docker
 ---> Using cache
 ---> 469caee7afe7
Step 6/9 : COPY requirements.txt requirements.txt
 ---> 98d74147c25a
Step 7/9 : RUN pip3 install -r requirements.txt
 ---> Running in 9ed02a4e2b8e
Collecting insecure-package==0.1
  Downloading insecure_package-0.1.0-py2.py3-none-any.whl (3.5 kB)
Collecting asn1crypto==1.5.1
  Downloading asn1crypto-1.5.1-py2.py3-none-any.whl (105 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 105.0/105.0 kB 11.5 MB/s eta 0:00:00
Collecting certifi==2022.6.15
  Downloading certifi-2022.6.15-py3-none-any.whl (160 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 160.2/160.2 kB 18.7 MB/s eta 0:00:00
```


- Run the command to perform the scan & generate the report.

```
clair-scanner --ip $IP -r clair_report.json vulapp-docker
```

```
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app# clair-scanner --ip $IP -r clair_report.json vulapp-docker
2023/09/11 15:13:01 [INFO] ▶ Start clair-scanner
2023/09/11 15:13:04 [INFO] ▶ Server listening on port 9279
2023/09/11 15:13:04 [INFO] ▶ Analyzing 7a4ee64ce06ab8f25f1ac3e9823c61f489bebb20dde49a8b68feaee25455787e
2023/09/11 15:13:05 [INFO] ▶ Analyzing 674a98e45d4f81a8558d37e26f8e39102f0b1ca616f8787d18d08fe62d7b9a86
2023/09/11 15:13:05 [INFO] ▶ Analyzing 1ef5d7819f06b3099b239d3ab68f77fd98a8afa582d652a89c8fb5cd15d45a44
2023/09/11 15:13:05 [INFO] ▶ Analyzing 22bf70308497ace5c627c750842f3b1292fecc29e1fb4f9fd035a80d5944a0c6
2023/09/11 15:13:05 [INFO] ▶ Analyzing d1a53efc06824da95cb0589122fcff30a1f513d7e51798cab833264aecccacb8
2023/09/11 15:13:05 [INFO] ▶ Analyzing fb7d8f1e942449d11a51946aecd7b4770e39e1e2e65ecec3ebcd980d2d8edce3
2023/09/11 15:13:05 [INFO] ▶ Analyzing 9cd024b49fdf5025028442e26326f6e85b0d1708930b2d47456cece8654cbe75
2023/09/11 15:13:05 [INFO] ▶ Analyzing ff222edc89f06c5b474e8bbeb3c7ddfeb47f2252c18b7fc5b1814821414a2c6a
2023/09/11 15:13:05 [INFO] ▶ Analyzing b45dc04416ef2a496d67f16065ce929d0615ac22062909f0751b5955eeba8520
2023/09/11 15:13:05 [WARN] ▶ Image [vulapp-docker] contains 87 total vulnerabilities
2023/09/11 15:13:05 [ERRO] ▶ Image [vulapp-docker] contains 87 unapproved vulnerabilities
+------------+-----------------------------+--------------+---------------------+-----------------------------------------------------------------+
| STATUS     | CVE SEVERITY                | PACKAGE NAME | PACKAGE VERSION     | CVE DESCRIPTION                                                 |
+------------+-----------------------------+--------------+---------------------+-----------------------------------------------------------------+
| Unapproved | Medium CVE-2021-33560       | libgcrypt20  | 1.8.4-5+deb10u1     | Libgcrypt before 1.8.8 and 1.9.x before 1.9.3 mishandles        |
|            |                             |              |                     | ElGamal encryption because it lacks exponent blinding           |
|            |                             |              |                     | to address a side-channel attack against mpi_powm,              |
|            |                             |              |                     | and the window size is not chosen appropriately.                |
|            |                             |              |                     | This, for example, affects use of ElGamal in OpenPGP.           |
|            |                             |              |                     | https://security-tracker.debian.org/tracker/CVE-2021-33560      |
+------------+-----------------------------+--------------+---------------------+-----------------------------------------------------------------+
| Unapproved | Medium CVE-2019-12290       | libidn2      | 2.0.5-1+deb10u1     | GNU libidn2 before 2.2.0 fails to perform the roundtrip         |
|            |                             |              |                     | checks specified in RFC3490 Section 4.2 when converting         |
|            |                             |              |                     | A-labels to U-labels. This makes it possible in some            |
|            |                             |              |                     | circumstances for one domain to impersonate another.            |
|            |                             |              |                     | By creating a malicious domain that matches a target            |
|            |                             |              |                     | domain except for the inclusion of certain punycoded            |
|            |                             |              |                     | Unicode characters (that would be discarded when                |
|            |                             |              |                     | converted first to a Unicode label and then back to an          |
|            |                             |              |                     | ASCII label), arbitrary domains can be impersonated.            |
|            |                             |              |                     | https://security-tracker.debian.org/tracker/CVE-2019-12290      |
+------------+-----------------------------+--------------+---------------------+-----------------------------------------------------------------+
| Unapproved | Medium CVE-2019-3843        | systemd      | 241-7~deb10u9       | It was discovered that a systemd service that uses              |
|            |                             |              |                     | DynamicUser property can create a SUID/SGID binary              |
|            |                             |              |                     | that would be allowed to run as the transient service           |
|            |                             |              |                     | UID/GID even after the service is terminated. A local           |
|            |                             |              |                     | attacker may use this flaw to access resources that             |
|            |                             |              |                     | will be owned by a potentially different service                |
|            |                             |              |                     | in the future, when the UID/GID will be recycled.               |
|            |                             |              |                     | https://security-tracker.debian.org/tracker/CVE-2019-3843       |
+------------+-----------------------------+--------------+---------------------+-----------------------------------------------------------------+
| Unapproved | Medium CVE-2020-1751        | glibc        | 2.28-10+deb10u2     | An out-of-bounds write vulnerability was found in               |
|            |                             |              |                     | glibc before 2.31 when handling signal trampolines              |
|            |                             |              |                     | on PowerPC. Specifically, the backtrace function                |
|            |                             |              |                     | did not properly check the array bounds when storing            |
|            |                             |              |                     | the frame address, resulting in a denial of service             |
|            |                             |              |                     | or potential code execution. The highest threat                 |
|            |                             |              |                     | from this vulnerability is to system availability.              |
|            |                             |              |                     | https://security-tracker.debian.org/tracker/CVE-2020-1751       |
+------------+-----------------------------+--------------+---------------------+-----------------------------------------------------------------+
| Unapproved | Medium CVE-2022-1304        | e2fsprogs    | 1.44.5-1+deb10u3    | An out-of-bounds read/write vulnerability was                   |
```


- Creating a Distroless Multi-stage Dockerfile.

A multi-stage Docker build is a technique where you use multiple FROM statements in a Dockerfile to split the build process into multiple stages. Each stage starts from a base image and produces an intermediary image. Only the final stage produces the image that will be used to deploy your application.

```
cat <<EOF > Dockerfile_distroless
# Use python:3.8-slim-buster to build the application, but we'll copy from it
later
FROM python:3.8-slim-buster as build

WORKDIR /python-docker

COPY requirements.txt requirements.txt
RUN pip3 install --no-cache-dir -r requirements.txt

COPY . .

# Final Distroless image
FROM gcr.io/distroless/python3

LABEL maintainer="Justmorpheus <namaste@securitydojo.co.in>"
LABEL version="1.0"
LABEL description="This is insecure password manager for k8s labs @
securitydojo"

# Copy the Python app from the build image
COPY --from=build /python-docker /app
WORKDIR /app

# Note: Distroless doesn't have a shell. Therefore, commands must be run
directly.
CMD [ "python3", "-m", "flask", "run", "--host=0.0.0.0", "--port=8000"]
EOF
```



```
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app# cat <<EOF > Dockerfile_distroless
> # Use python:3.8-slim-buster to build the application, but we'll copy from it later
> FROM python:3.8-slim-buster as build
>
> WORKDIR /python-docker
>
> COPY requirements.txt requirements.txt
> RUN pip3 install --no-cache-dir -r requirements.txt
>
> COPY . .
>
> # Final Distroless image
> FROM gcr.io/distroless/python3
>
> LABEL maintainer="Justmorpheus <namaste@securitydojo.co.in>"
> LABEL version="1.0"
> LABEL description="This is insecure password manager for k8s labs @ securitydojo"
>
> # Copy the Python app from the build image
> COPY --from=build /python-docker /app
> WORKDIR /app
>
> # Note: Distroless doesn't have a shell. Therefore, commands must be run directly.
> CMD [ "python3", "-m", "flask", "run", "--host=0.0.0.0", "--port=8000"]
> EOF
```

- Build the newly created distroless dockerfile to create distroless image.

```
docker build -f Dockerfile_distroless --tag distroless_vulapp .
```

```
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app# docker build -f Dockerfile_distroless --tag distroless_vulapp .
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
            Install the buildx component to build images with BuildKit:
            https://docs.docker.com/go/buildx/

Sending build context to Docker daemon  251.9kB
Step 1/12 : FROM python:3.8-slim-buster as build
 ---> addd6962740a
Step 2/12 : WORKDIR /python-docker
 ---> Running in 40197d223e34
Removing intermediate container 40197d223e34
 ---> 35ed9ee70a8d
Step 3/12 : COPY requirements.txt requirements.txt
 ---> d24662c18e60
Step 4/12 : RUN pip3 install --no-cache-dir -r requirements.txt
 ---> Running in 2e04f0025783
Collecting insecure-package==0.1
  Downloading insecure_package-0.1.0-py2.py3-none-any.whl (3.5 kB)
Collecting asn1crypto==1.5.1
  Downloading asn1crypto-1.5.1-py2.py3-none-any.whl (105 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 105.0/105.0 kB 27.1 MB/s eta 0:00:00
Collecting certifi==2022.6.15
  Downloading certifi-2022.6.15-py3-none-any.whl (160 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 160.2/160.2 kB 110.3 MB/s eta 0:00:00
Collecting cffi==1.15.1
  Downloading cffi-1.15.1-cp38-cp38-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (442 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 442.7/442.7 kB 109.7 MB/s eta 0:00:00
Collecting chardet==3.0.4
  Downloading chardet-3.0.4-py2.py3-none-any.whl (133 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 133.4/133.4 kB 88.3 MB/s eta 0:00:00
Collecting charset-normalizer==2.1.0
  Downloading charset_normalizer-2.1.0-py3-none-any.whl (39 kB)
Collecting click==8.1.3
  Downloading click-8.1.3-py3-none-any.whl (96 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 96.6/96.6 kB 88.0 MB/s eta 0:00:00
Collecting colorclass==2.2.2
  Downloading colorclass-2.2.2-py2.py3-none-any.whl (18 kB)
Collecting docopt==0.6.2
  Downloading docopt-0.6.2.tar.gz (25 kB)
  Preparing metadata (setup.py): started
  Preparing metadata (setup.py): finished with status 'done'
Collecting Flask==2.1.2
  Downloading Flask-2.1.2-py3-none-any.whl (95 kB)
```

- Scan the newly created distroless image. Check the results.

There are no vulnerabilities in the distroless image.

```
clair-scanner --ip $IP -r clair_report_distroless.json distroless_vulapp:latest
```

```
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app# clair-scanner --ip 10.0.0.202 -r clair_report_distroless.json distroless_vulapp:latest
2023/09/11 15:14:14 [INFO] ▶ Start clair-scanner
2023/09/11 15:14:15 [INFO] ▶ Server listening on port 9279
2023/09/11 15:14:15 [INFO] ▶ Analyzing 201e0cfeee08c1fe734fc1db2e7f2fba8405d74140d93e0f09a79f9804424381
2023/09/11 15:14:15 [INFO] ▶ Analyzing 02d252efb62119dcb7a4b7b1391b0d2cbeb047dd7a99cdd34dc867c6a9ca844d
2023/09/11 15:14:15 [INFO] ▶ Analyzing e0551287a72a56dd36973a781190216ac36904662470634341cef97395ae0904
2023/09/11 15:14:15 [INFO] ▶ Analyzing 2aaac3b40027725180b473f7c2ebcd0ccc8e081f0b1ab0c1f654b4b47c3542a9
2023/09/11 15:14:15 [INFO] ▶ Analyzing fb2d0a940ab28fdafd88a979e33d3c1e3b7ab678b7477400d8c2e0297729a59e
2023/09/11 15:14:15 [INFO] ▶ Analyzing f44a03806fadb987737e84bb9e350f078ee1751d405e90fc2ff01ac7f2fe12f6
2023/09/11 15:14:15 [INFO] ▶ Analyzing f2c76c8c68f08736fc778bda104c7d799e3378372633d2bfeb719b28de693333
2023/09/11 15:14:15 [INFO] ▶ Analyzing 3e9ebe525969e65b27d686aaff350d0c679675d62f9032a0801e2843ef35466d
2023/09/11 15:14:15 [INFO] ▶ Analyzing 9119a349d2be671c66e8f06da8bd5f6c97f2f117168ebeaef318108b00866f84
2023/09/11 15:14:15 [INFO] ▶ Analyzing 749e21ae4bbe185b4eff4f64ccdf1e3b8230a06d8d4fe2bc05f941dc719f0f04
2023/09/11 15:14:15 [INFO] ▶ Analyzing 59296b1265c2f8e5c9f671dba1bf2905da90734db630bc8b47f09c2ff2088efe
2023/09/11 15:14:15 [INFO] ▶ Analyzing 9d0d7646b9ac14338eba4cb6a6355c99c46c9adb2ca466632f06d9e6a975dab3
2023/09/11 15:14:15 [INFO] ▶ Analyzing 8dc7fff91f09f9f843f91240554ba07d52b36b3189bfb2868ee91cc6746587b2
2023/09/11 15:14:15 [INFO] ▶ Analyzing 679431691604d1039a9e987cc0b6230554a861eb1ab6b1f55a2c744d3ee13f4e
2023/09/11 15:14:15 [INFO] ▶ Analyzing 8252b4fee6d9753ca78c5713e7b68951b28bb03772c229b231082fa7592fb18f
2023/09/11 15:14:15 [INFO] ▶ Analyzing 970b8b8ceaaaa215f0eade95bbe49f7bfe33018f36ba01db74c60139123da6ae
2023/09/11 15:14:15 [INFO] ▶ Analyzing 6d3fbe57b499fc2c9d64aed635fe890566bac5aab47655d8d39c473d4a6f4bd5
2023/09/11 15:14:15 [INFO] ▶ Analyzing 792a1004d820d4697be0f7a6d5b6a1741cd0673243f6be803504ebf4e530f676
2023/09/11 15:14:15 [INFO] ▶ Analyzing 20504eb87670c02ed4e60a3fd6461a1885c8cb97aea4eea59de14c173a2c7dc0
2023/09/11 15:14:15 [INFO] ▶ Analyzing 3228b95f27aed3435729ec8dbcb7ec677162b1ea7975a325ba98c62a4171d335
2023/09/11 15:14:15 [INFO] ▶ Analyzing cca1726b3e9cb6dd09d5165e9951394674b5cdddf1423c952e5792c7fe589d68
2023/09/11 15:14:15 [INFO] ▶ Analyzing 03ca7ad9bd89d875c4c7fd269103d74d898e0913d1470958420149e8a3f36e79
2023/09/11 15:14:15 [INFO] ▶ Analyzing e7fb4fabd8588928f54c650c02669d18585c0d81216f3e822537d336e5a71493
2023/09/11 15:14:15 [INFO] ▶ Analyzing 89aafec8bad1d7fc1f757b78946f1d27d9ba5fc1874f7be9ef976e8ad789349e
2023/09/11 15:14:15 [INFO] ▶ Analyzing eae71748668555cd038a1c9accec7f0c8953ebbd45e892a0f8ef4e4d5c9ac738
2023/09/11 15:14:15 [INFO] ▶ Analyzing a9e32d9208f988841ffd801f38f86f26c4cc06b6b4657c00ad2f82bfe1b57525
2023/09/11 15:14:15 [INFO] ▶ Analyzing 3930ad4646c429d51b799cb08393974edf8f589d6d0bf2d54414880f55178d2c
2023/09/11 15:14:15 [INFO] ▶ Analyzing 14ab3a2931e45b1769296b4144bcbcd75ccd32bcaac780350c53ab3ed79cbddf
2023/09/11 15:14:15 [INFO] ▶ Analyzing 13ff89a4ec8c9da3ef560e2a836b3fa9481e68c535d3b86ebd51dad8393b3f49
2023/09/11 15:14:15 [INFO] ▶ Analyzing 2adc7489bc799b870adb3ff83acfc840732734e5cb750fc6285925d0886353e2
2023/09/11 15:14:15 [INFO] ▶ Analyzing 0fbc25627de570ee4cc0d2bbc9241f43549d663525ed0b15faae00c60d0a4069
2023/09/11 15:14:15 [INFO] ▶ Analyzing fba24a5eed5538c64ef7acfeff2bdc40bb906b2df9dbd28edbba5130af8f35e0
2023/09/11 15:14:15 [INFO] ▶ Analyzing a158bdb103e92b9b32ea91567ca84f329a6ebe9c07d870a0370384af04ac2af9
2023/09/11 15:14:15 [INFO] ▶ Analyzing 808cf9640f1a713b78c6aff372727312dc2480b964a8498c32a358776210e0a
2023/09/11 15:14:15 [INFO] ▶ Analyzing 6f234902a16f410768fce6e93318ea826dba4868181a543ce4982aac272fde76
2023/09/11 15:14:15 [INFO] ▶ Analyzing 7848883d5c8c4a994669ca8939909521a17d25677977004584e9cf070f0b764f
2023/09/11 15:14:15 [INFO] ▶ Analyzing 3c9b3336767dcdee0977a23b8c1fc8c87302e0fc70873aa88c267537fe794c8a
2023/09/11 15:14:15 [INFO] ▶ Analyzing 5898047bda5b20d88e702d60dc382e6ee1e511f236bf89152fde690fd93e7fbd
2023/09/11 15:14:15 [INFO] ▶ Analyzing b6a68968b5af6d524a7d9704dcdac79715c405dff3f61ed9eb6ea843611d3b84
2023/09/11 15:14:15 [INFO] ▶ Analyzing 7f2c373d37a9755f3bea81ce893f842ad25cd45e762242569add2082832cf316
2023/09/11 15:14:15 [INFO] ▶ Analyzing f86a4d13c33a48392caa5a6556c1dce4d1e926f3f01ed177c4a9425a252ce8e5
2023/09/11 15:14:15 [INFO] ▶ Analyzing 28f65234f9af5e820439b87de86d5e56c7434e83125af948ddd404cc56aefdd7
2023/09/11 15:14:15 [INFO] ▶ Analyzing 11b0dad998d0ce3a8184fbd4833f3aa3ee91b2c14d6f49e24e2b5f116b8fb3b3
2023/09/11 15:14:15 [INFO] ▶ Analyzing e17f0cb9bebfd1496ab521c496c847f35990081a877929dfd5494839c6a53807
2023/09/11 15:14:15 [INFO] ▶ Analyzing 126ede793e8d194415558908c94ff1ee1668ef0da91357759c0b137e407f8eb9
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app#
```

- Contrast the sizes of the Docker images created to understand the benefits of Distroless.

```
docker images | grep vulapp
```

```
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app# docker images | grep vulapp
distroless_vulapp           latest                                          90a63a30d9e5   52 seconds ago       54.7MB
vulapp-docker               latest                                          314fe7796ed1   About a minute ago   154MB
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app#
```

Cleanup

- Remove both the docker images.

```
docker rmi  distroless_vulapp vulapp-docker
```

```
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app# docker rmi  distroless_vulapp vulapp-docker
Untagged: distroless_vulapp:latest
Deleted: sha256:90a63a30d9e59250500b0f6033343d440fb9eb9bf91e7baa9765c07686a18d17
Deleted: sha256:1fc0d55b943af93616a5743ad8e3ee0d0c31f57f12e2009f2d054d1076a31421
Deleted: sha256:8d868652a1b5f5cc3bea455cf2c4962a69826b3d1da462c4c6b298e2daa2c25b
Deleted: sha256:47371da2df218a8ea512de8cd222af8189b22a68511588edb9c18d1d5e1308ba
Deleted: sha256:661592b47790a6398c7308fce93356c7a700638a9aba8322c0836038e33a3ebb
Deleted: sha256:00b2e21b105e28b5fe3eaeb2cd522a713ef086b194b9b90353eea763c4e9f4d8
Deleted: sha256:7071c1d931af44284093630a45da15240726201f5cd88fae224146b41db90f55
Untagged: vulapp-docker:latest
Deleted: sha256:314fe7796ed13eada03f49255ed05d3ff735bdc990ee315a88af95e62d1933a7
Deleted: sha256:2854319453ec613f1a6c327b4bd4051213d600fcde4bdcc2b5edf35575220254
Deleted: sha256:515b77992b0c90e9a8e43628d2108ee7eb23f6a8ec23772231e400baa29d0453
Deleted: sha256:6795f13ef4a67bd1fd3d6d2d6937a52cff7f3a88947a26b7b32c210f8e0a220b
Deleted: sha256:a038735da0666d2f61b99cb838948df26af4497f6383c88d4af8d98c22c88e28
Deleted: sha256:98d74147c25a5cddd7c0128b9518abb14e0c10dd0ae6ab46c79210641e1677c2
Deleted: sha256:b6bd9ab2a9a1f7e975a4128c4394ee2c627ba0a2a4f49c9396b530a01044ac70
Deleted: sha256:469caee7afe720534b4153cd4c7c587389d3add579fc402bf4b0c8e74fd5f3db
Deleted: sha256:40e909bc200d05e72729c5496022b16af5723f3c7a92a0892dfe840191662a4c
Deleted: sha256:419b29bd11a20749b063e2d65b0981b15e0c9caf7ac2a86e1e06d77d7df65f09
Deleted: sha256:bcc1a661c8b39b2d31b2c2f380047d0914c4fa1e39ef58e9d44c90cb4e852b25
Deleted: sha256:305be92e90e4b50db3bb62b59d3442a09c52f5b1e63b3f34543179a9d77c3395
root@ip-10-0-0-202:/home/ubuntu/ workspace/course/7_protection_strategies/7_distroless/insecure-python-app#
```