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1. Introduction

Being a part of cutting-edge technology team who is responsible for designing, deploying, and securing a modern e-commerce application and application is designed and deployed that will revolutionize online shopping by incorporating the latest advancements in not only technology but in security and DevOps practices as well.

In this project Saleor application suite is skillfully constructed, configured, and deployed on a linux server. Saleor is an open-source ecommerce platform that uses a Python API backend, React Javascript in the frontend and PostgreSQL database in the backend. The creation of cluster in the google and its deployment is done in the first phase and in the second phase the microservices architecture deployment is done. The tasks done are sub divided in the two phases Task 1 and Task 2 respectively.

2. Task 1: Set Up Initial Infrastructure

Git Link: <https://github.com/diwashc/ISEC6000-Secure-DevOps>

In this phase a Kubernetes cluster is created on GKE. For this at first logging in google cloud console is required. Then navigating inside Kubernetes Engine section using the GUI after clicking “Create Cluster” a new cluster is created as shown in figure 1. Then as shown in figure 2 we can see the cluster name, location, number of nodes, total CPU and total memory of the cluster that is created.

Cluster basics

The new cluster will be created with the name, version, and in the location you specify here. After the cluster is created, name and location can't be changed.

To experiment with an affordable cluster, try [My first cluster](#) in the [Cluster set-up guides](#)

Name
assignment-1

Cluster names must start with a lowercase letter followed by up to 39 lowercase letters, numbers, or hyphens. They can't end with a hyphen. You cannot change the cluster's name once it's created.

Location type
Resource prices may vary between certain regions. [Learn more](#)

☒ Zonal
☐ Regional

Zone
us-central1-c

☐ Specify default node locations

Increase availability by selecting more than one zone
Current default: us-central1-c

Control plane version
Choose whether you'd like to upgrade the cluster's control plane version manually or let GKE do it automatically. [Learn more](#)

CREATE CANCEL Equivalent **REST** or **COMMAND LINE**

Estimated monthly cost PREVIEW

\$176.38
That's about \$0.24 per hour

Pricing is based on the resources you use, management fees, discounts and credits. [Learn more](#)

US-CENTRAL1

Item	Estimated monthly cost
Cluster management fee \$0.10/hour x 730 hours	\$73.00
default-pool (e2-medium) 2 vCPU + 4 GB memory (\$24.46 x 3 nodes)	\$73.38
100 GB balanced persistent disk (\$10.00 x 3 nodes)	\$30.00

Cluster discounts

Monthly free tier credit	Not included
--------------------------	--------------

Estimated monthly cost **\$176.38**

Exact cost is contingent upon actual resource use and other factors that can't be accurately estimated before a cluster is created. [Learn more](#)

[HIDE COST BREAKDOWN](#)

Figure 1: Setting up cluster name, location and node pool

Kubernetes clusters

[+ CREATE](#)
[+ DEPLOY](#)
[REFRESH](#)

[OPERATIONS](#)
[HELP ASSISTANT](#)
[LEARN](#)

OVERVIEW

OBSERVABILITY

COST OPTIMIZATION

Filter

Enter property name or value

<input type="checkbox"/> Status	Name	Location	Number of nodes	Total vCPUs	Total memory	Notifications	Labels
<input checked="" type="checkbox"/>	assignment-1	us-central1-c	3	6	12 GB		

Figure 2: Cluster created

To configure the local environment to use kubectl to interact with the cluster we use the command “gcloud container clusters get-credentials CLUSTERNAME --zone us-central1-c --project PROJECT NAME”. As shown in figure 3 kubeconfig entry was generated for assignment-1.

```
diwashc@cloudshell:~ (isec6000-397804)$ gcloud container clusters get-credentials assignment-1 --zone us-central1-c --project isec6000-397804
Fetching cluster endpoint and auth data.
kubeconfig entry generated for assignment-1.
diwashc@cloudshell:~ (isec6000-397804)$
```

Figure 3: Authenticated kubectl with cluster

Version control is used to track the files and helps to go back in previous working version if ever needed in the future. (Betterexplained, 2023) ISEC6000-Secure-Devops repository is created to keep track of the tasks done in the project. The readme.md file in the repository consists of the steps and requirements required for the project.

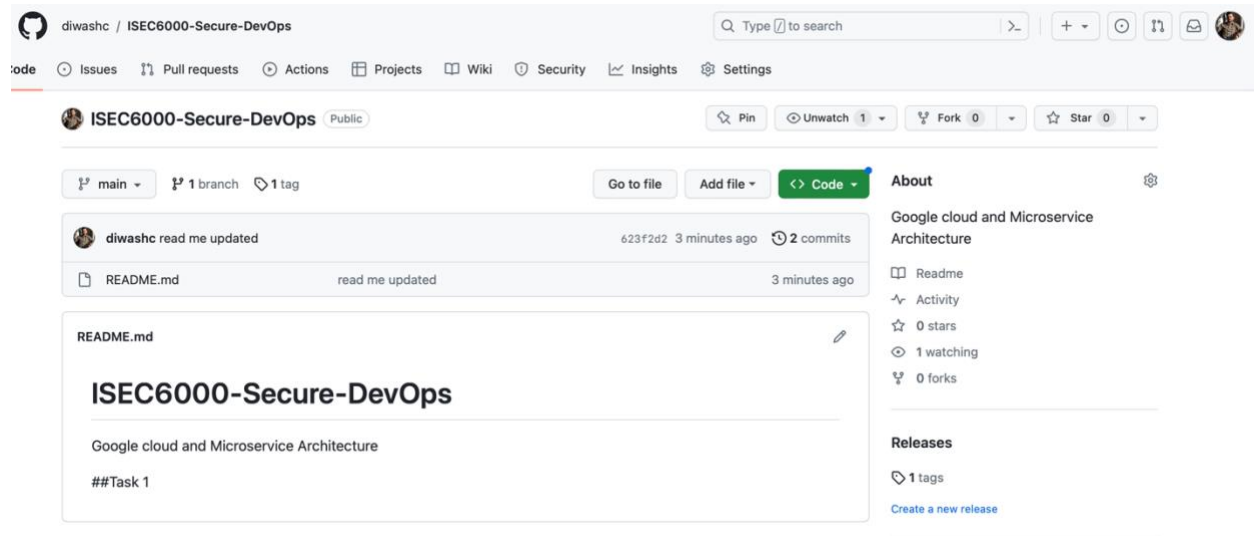


Figure 4: Initial Git Repository

3. Task 2: Microservices Architecture and Deployment

Git Link Saleor Platform: <https://github.com/diwashc/saleor-platform>

Git Link React StoreFront: <https://github.com/diwashc/react-storefront>

For task 2 Saleor and version control is used. Saleor is a GraphQL API that provides the backend for the frontend applications. (Saleor, 2023) The repositories for Saleor application to be used is publicly available in github and initially to use it Saleor platform is forked into our github account so that further changes can be maintained using the version control. React-storefront is also forked to change the port address for saleor react storefront.

```

diwashchand@Diwashes Assignment % git clone git@github.com:diwashc/saleor-platform.git
Cloning into 'saleor-platform'...
remote: Enumerating objects: 501, done.
remote: Counting objects: 100% (181/181), done.
remote: Compressing objects: 100% (114/114), done.
remote: Total 501 (delta 100), reused 134 (delta 61), pack-reused 320
Receiving objects: 100% (501/501), 142.15 KiB | 353.00 KiB/s, done.
Resolving deltas: 100% (260/260), done.
diwashchand@Diwashes Assignment % ls
ISEC6000-Secure-DevOps      SecureDevOps-Assignment1.pdf
P1_21255001.docx           saleor-platform
README.md
diwashchand@Diwashes Assignment % cd saleor-platform
diwashchand@Diwashes saleor-platform % docker compose build
[+] Building 0.0s (0/0)                                docker:desktop-linux
diwashchand@Diwashes saleor-platform % docker compose run --rm api python3 manage.py migrate
[+] Creating 5/2
  ✓ Network saleor-platform_default                  Created          0.0s
  ✓ Network saleor-platform_saleor-backend-tier      Created          0.0s
  ✓ Container saleor-platform-redis-1                Created          0.0s
  ✓ Container saleor-platform-jaeger-1               Created          0.0s
  ✓ Container saleor-platform-db-1                   Created          0.0s
[+] Running 3/3
  ✓ Container saleor-platform-jaeger-1               Started          0.4s
  ✓ Container saleor-platform-db-1                   Started          0.3s
  ✓ Container saleor-platform-redis-1                Started          0.3s
2023-09-07 04:06:36,338 WARNING saleor.core.jwt_manager RSA_PRIVATE_KEY is missing. Using temporary key for local development with DEBUG
Operations to perform:
  Apply all migrations: account, app, attribute, auth, channel, checkout, contenttypes, core, csv, discount, django_celery_beat, django_l
menu, order, page, payment, permission, plugins, product, schedulers, shipping, site, sites, tax, thumbnail, warehouse, webhook
Running migrations:
  No migrations to apply.
diwashchand@Diwashes saleor-platform % docker compose run --rm api python3 manage.py populatedb --createsuperuser
[+] Creating 3/0
  ✓ Container saleor-platform-redis-1                Running          0.0s
  ✓ Container saleor-platform-jaeger-1               Running          0.0s
  ✓ Container saleor-platform-db-1                   Running          0.0s

```

Figure 5: Cloning the git repo and using docker compose

```

diwashchand@Diwashes saleor-platform % docker compose up
[+] Running 7/7
  ✓ Container saleor-platform-dashboard-1            Created          0.1s
  ✓ Container saleor-platform-mailpit-1              Created          0.0s
  ✓ Container saleor-platform-redis-1                Running          0.0s
  ✓ Container saleor-platform-jaeger-1               Running          0.0s
  ✓ Container saleor-platform-db-1                   Running          0.0s
  ✓ Container saleor-platform-api-1                  Created          0.0s
  ✓ Container saleor-platform-worker-1               Created          0.0s

```

Figure 6: Using docker compose up to run the application

As shown in figure 5 “docker compose build” is used to build the application after cloning the saleor platform repository. “docker compose run --rm api python3 manage.py migrate” is used to apply Django migrations. “docker compose run --rm api python3 manage.py populatedb --createsuperuser” is used to populate the database with example data and create the admin user. The dashboard can be accessed by using admin@example.com as username and admin as password. Finally “docker compose up” runs the application.

Now to configure the react storefront to operate on port 3009 port address was changed in docker-compose.yml and pushed to the repository.

Commits on Sep 7, 2023

changed port of react storefront

 diwashc committed 2 days ago

Showing 1 changed file with 2 additions and 2 deletions.

docker-compose.yml			
↑	@@ -21,10 +21,10 @@	services:	
21	21	dockerfile: Dockerfile.base	
22	22	args:	
23	23	- SALEOR_API_URL=http://localhost:8000/graphql/ # handled by nginx	
24	-	- STOREFRONT_URL=http://localhost:3000	
24	+	- STOREFRONT_URL=http://localhost:3009	
25	25	- CHECKOUT_APP_URL=http://localhost:3001	
26	26	- CHECKOUT_STOREFRONT_URL=http://localhost:3001/checkout-spa/	
27	27	- CLOUD_DEPLOYMENT_URL=	
28	28	ports:	
29	-	- 3000:3000	
29	+	- 3009:3000	
30	30	command: sh -c '(nginx &) && pnpm turbo run start --filter=storefront...'	

Figure 7: Changing port address from 3000 to 3009 and pushed to github repository

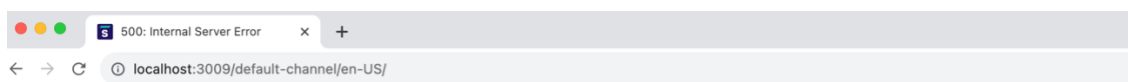


Figure 8: React storefront having error by default

By default, the port address of 3000 i.e storefront_url had 500 error so there was the same error even when changing the port address.

Now, for the dashboard port number 9000 was changed to 9009.

7	7	-	8000:8000
8	8		restart: unless-stopped
@@ -22,13 +22,13 @@ services:			
22	22	-	backend.env
23	23		environment:
24	24	-	JAEGER_AGENT_HOST=jaeger
25	-	-	DASHBOARD_URL=http://localhost:9000/
25	+	-	DASHBOARD_URL=http://localhost:9003/
26	26	-	ALLOWED_HOSTS=localhost,api
27	27		
28	28		dashboard:
29	-	image:	ghcr.io/saleor/saleor-dashboard:3.15.2
29	+	image:	ghcr.io/saleor/saleor-dashboard:3.14.4
30	30		ports:
31	-	-	9000:80
31	+	-	9003:80
32	32		restart: unless-stopped
33	33		

Figure 9: Port address of dashboard changed from 9000 to 9003 and pushed to github repository

500: Internal Server Error x Sign in to the Saleor Dashboard x +

localhost:9003

saleor

Sign In

Email address

Password

[Forgot password?](#)

Sign in

Figure 10: Saleor Dashboard page

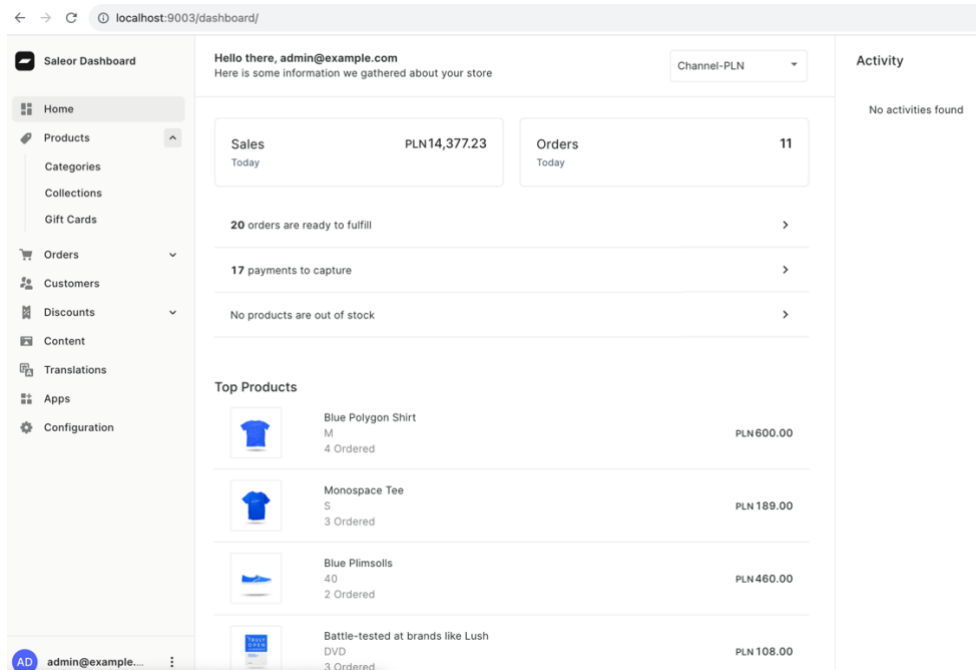


Figure 11: Dashboard page after logging in

Using admin@example.com as username and admin as password the dashboard page as shown in figure 11 is displayed.

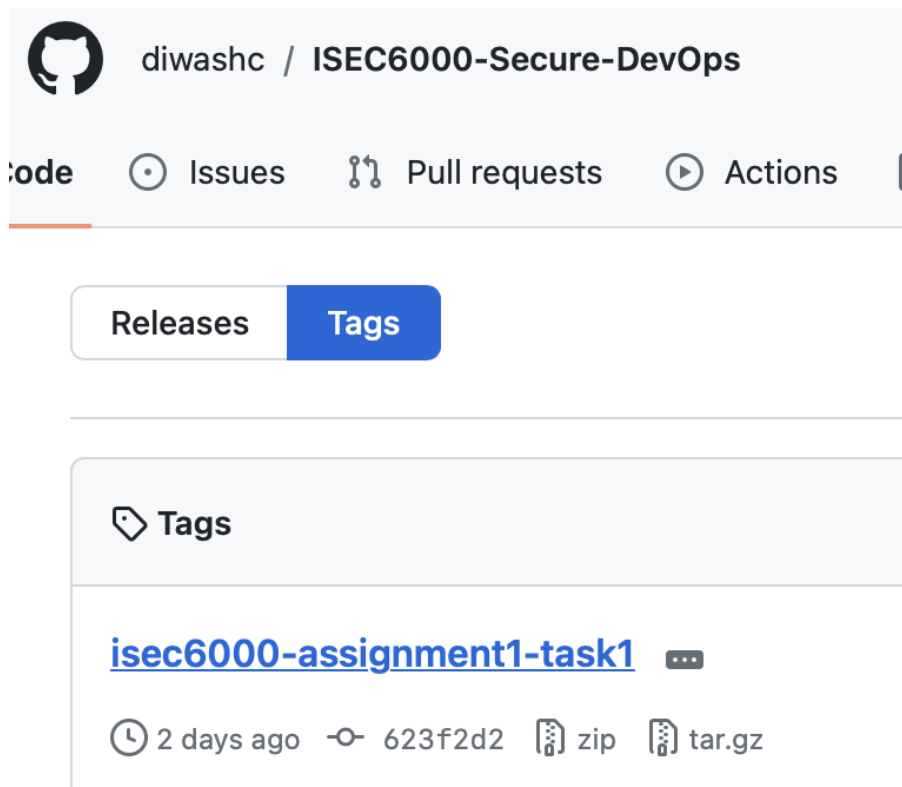


Figure 12: Tag for Task 1

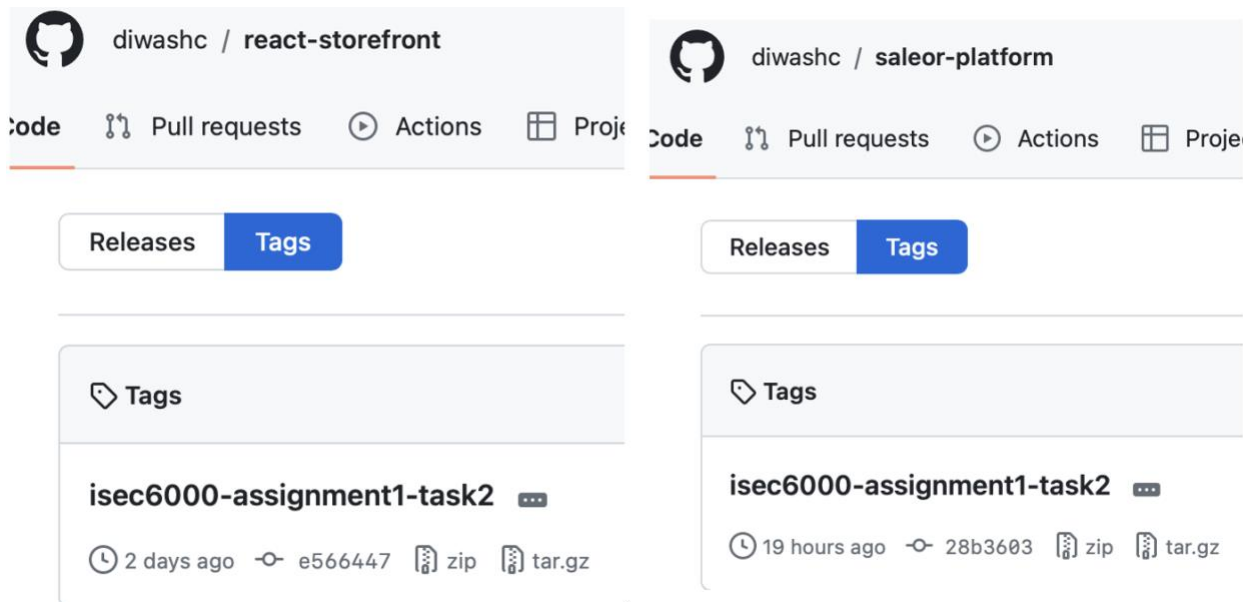


Figure 13: Tag for Task 2

The tags for respective repositories are committed and pushed and tags are created as shown in figure 12 and 13.

4. Task 3: Implementing Security Measures

4.1. Ensuring Secure Configuration of containers

To protect containerized environments, container security is used. It involves the maintenance and implementation of security controls that protects underlying infrastructures and containers. (Tigera, 2023) To ensure secure configuration of containers the following steps are used in this project.

- Continuously scanning image for any vulnerabilities
- Removing unnecessary service or package from container images
- Avoid running containers as root
- Use only trusted images
- Set resource constraints such as CPU and memory limits to prevent containers from excessive use of resources.

4.2. Implementation of container image vulnerability

Among open-source security scanner, trivy is the most popular as it is more reliable, fast, and easy to use. (Trivy, 2023) For using trivy there are different ways to install it but here it is installed within a docker container using “docker run aquasec/trivy” command”.

Now to run trivy and check it for saleor dashboard the following command was used.

```
docker run --rm -v /var/run/docker.sock:/var/run/docker.sock aquasec/trivy image
ghcr.io/saleor/saleor-dashboard:3.15.2
```

```
diwashchand@192-168-1-118 saleor-platform % docker run --rm -v /var/run/docker.sock:/var/run/docker.sock aquasec/trivy image ghcr.io/saleor/saleor-dashboard:3.15.2
2023-09-08T14:18:23.187Z      INFO    Need to update DB
2023-09-08T14:18:23.187Z      INFO    DB Repository: ghcr.io/aquasecurity/trivy-db
2023-09-08T14:18:23.187Z      INFO    Downloading DB...
1.12 MiB / 39.51 MiB [----->] 2.84% ? p/s 72.31 MiB / 39.51 MiB [----->] 5.85% ? p/s 73.56
MiB / 39.51 MiB [----->] 15.03% 6.20 MiB p/s ETA 5:27.19 MiB / 39.51 MiB [----->] 18.19% 6.20 MiB p/s ETA 5:08.44 MiB / 3
9.51 MiB [----->] 21.35% 6.18 MiB p/s ETA 5:09.58 MiB / 39.51 MiB [----->] 24.04% 6.18 MiB p/s ETA 4:58.69 MiB / 39.5
1 MiB [----->] 27.05% 6.18 MiB p/s ETA 4:51.95 MiB / 39.51 MiB [----->] 30.25% 6.16 MiB p/s ETA 4:43.09 MiB / 39.51 Mi
B [----->] 33.14% 6.16 MiB p/s ETA 4:34.31 MiB / 39.51 MiB [----->] 36.22% 6.16 MiB p/s ETA 4:25.53 MiB / 39.51 MiB [
----->] 39.33% 6.15 MiB p/s ETA 4:16.78 MiB / 39.51 MiB [----->] 42.47% 6.15 MiB p/s ETA 4:08.00 MiB / 39.51 MiB [
----->] 45.56% 6.15 MiB p/s ETA 4:00.25 MiB / 39.51 MiB [----->] 48.72% 6.15 MiB p/s ETA 3:52.41 MiB / 39.51 MiB [
----->] 51.65% 6.15 MiB p/s ETA 3:42.62 MiB / 39.51 MiB [----->] 54.73% 6.15 MiB p/s ETA 3:32.89 MiB / 39.51 MiB [
----->] 57.93% 6.15 MiB p/s ETA 3:24.09 MiB / 39.51 MiB [----->] 60.98% 6.15 MiB p/s ETA 3:16.34 MiB / 39.51 MiB [
----->] 64.14% 6.15 MiB p/s ETA 3:06.51 MiB / 39.51 MiB [----->] 67.11% 6.14 MiB p/s ETA 2:57.75 MiB / 39.51 MiB [
----->] 70.23% 6.14 MiB p/s ETA 2:52.80 MiB / 39.51 MiB [----->] 72.80% 6.14 MiB p/s ETA 2:48.06 MiB / 39.51 MiB [
----->] 76.09% 6.13 MiB p/s ETA 2:31.25 MiB / 39.51 MiB [----->] 79.09% 6.13 MiB p/s ETA 2:22.41 MiB / 39.51 MiB [
----->] 82.02% 6.13 MiB p/s ETA 2:13.66 MiB / 39.51 MiB [----->] 85.18% 6.12 MiB p/s ETA 2:04.91 MiB / 39.51 MiB [
----->] 88.35% 6.12 MiB p/s ETA 1:56.12 MiB / 39.51 MiB [----->] 91.43% 6.12 MiB p/s ETA 1:47.41 MiB / 39.51 MiB [
----->] 94.67% 6.13 MiB p/s ETA 1:38.59 MiB / 39.51 MiB [----->] 97.68% 6.13 MiB p/s ETA 1:30.51 MiB / 39.51 MiB [
----->] 100.00% 6.13 MiB p/s ETA 0:39.51 MiB / 39.51 MiB [----->] 100.00% 5.96 MiB p/s ETA 0:39.51 MiB / 39.51 MiB [
----->] 100.00% 5.96 MiB p/s ETA 0:39.51 MiB / 39.51 MiB [----->] 100.00% 5.96 MiB p/s ETA 0:39.51 MiB / 39.51 MiB [----->] 1
00.00% 5.33 MiB p/s 7.6s2023-09-08T14:18:32.903Z      INFO    Vulnerability scanning is enabled
2023-09-08T14:18:32.903Z      INFO    Secret scanning is enabled
2023-09-08T14:18:32.903Z      INFO    If your scanning is slow, please try '--scanners vuln' to disable secret scanning
2023-09-08T14:18:32.903Z      INFO    Please see also https://aquasecurity.github.io/trivy/v0.45/docs/scanner/secret/#recommendation for faster secret detection
2023-09-08T14:18:41.391Z      INFO    Detected OS: alpine
2023-09-08T14:18:41.391Z      INFO    Detecting Alpine vulnerabilities...
2023-09-08T14:18:41.395Z      INFO    Number of language-specific files: 0
ghcr.io/saleor/saleor-dashboard:3.15.2 (alpine 3.17.5)
=====
Total: 0 (UNKNOWN: 0, LOW: 0, MEDIUM: 0, HIGH: 0, CRITICAL: 0)
diwashchand@192-168-1-118 saleor-platform %
```

Figure 14: Image Scan for Saleor Dashboard

Figure 14 displays that there are no vulnerabilities for saleor dashboard in the trivy scan result. Now for image vulnerability scanning for react storefront the following command was used.

```
docker run --rm -v /var/run/docker.sock:/var/run/docker.sock aquasec/trivy image react-
storefront-storefront:latest
```

```

diwashchand@192-168-1-118 saleor-platform % docker run --rm -v /var/run/docker.sock:/var/run/docker.sock aquasec/trivy image react-storefront-storefront:latest
2023-09-08T14:21:31.067Z INFO Need to update DB
2023-09-08T14:21:31.067Z INFO DB Repository: ghcr.io/aquasecurity/trivy-db
2023-09-08T14:21:31.067Z INFO Downloading DB...
1.00 MiB / 39.51 MiB [-----] 2.54% ? p/s 72.32 MiB / 39.51 MiB [-----] 5.88% ? p/s 73.65
MiB / 39.51 MiB [-----] 8.98% ? p/s 74.78 MiB / 39.51 MiB [-----] 12.09% 6.28 MiB p/s ETA 5s6.03 MiB
/ 39.51 MiB [-----] 15.27% 6.28 MiB p/s ETA 5s7.24 MiB / 39.51 MiB [-----] 18.33% 6.28 MiB p/s ETA 5s8.52 MiB / 3
9.51 MiB [-----] 21.50% 6.27 MiB p/s ETA 4s9.72 MiB / 39.51 MiB [-----] 24.61% 6.27 MiB p/s ETA 4s10.97 MiB / 39.5
1 MiB [-----] 27.70% 6.27 MiB p/s ETA 4s12.21 MiB / 39.51 MiB [-----] 30.90% 6.27 MiB p/s ETA 4s13.45 MiB / 39.51 M
iB [-----] 34.04% 6.27 MiB p/s ETA 4s14.69 MiB / 39.51 MiB [-----] 37.19% 6.27 MiB p/s ETA 3s15.72 MiB / 39.51 MiB [-
-----] 39.79% 6.24 MiB p/s ETA 3s17.08 MiB / 39.51 MiB [-----] 43.23% 6.24 MiB p/s ETA 3s18.28 MiB / 39.51 MiB [-----]
-----] 46.07% 6.24 MiB p/s ETA 3s19.47 MiB / 39.51 MiB [-----] 49.29% 6.24 MiB p/s ETA 3s20.63 MiB / 39.51 MiB [-----]
-----] 52.23% 6.24 MiB p/s ETA 3s21.73 MiB / 39.51 MiB [-----] 55.02% 6.24 MiB p/s ETA 2s23.01 MiB / 39.51 MiB [-----]
-----] 58.24% 6.22 MiB p/s ETA 2s24.19 MiB / 39.51 MiB [-----] 61.23% 6.22 MiB p/s ETA 2s25.34 MiB / 39.51 MiB [-----]
-----] 64.13% 6.22 MiB p/s ETA 2s26.64 MiB / 39.51 MiB [-----] 67.43% 6.21 MiB p/s ETA 2s27.79 MiB / 39.51 MiB [-----]
-----] 70.33% 6.21 MiB p/s ETA 1s29.01 MiB / 39.51 MiB [-----] 73.43% 6.21 MiB p/s ETA 1s30.27 MiB / 39.51 MiB [-----]
-----] 76.62% 6.20 MiB p/s ETA 1s31.45 MiB / 39.51 MiB [-----] 79.60% 6.20 MiB p/s ETA 1s32.51 MiB / 39.51 MiB [-----]
-----] 82.29% 6.20 MiB p/s ETA 1s33.78 MiB / 39.51 MiB [-----] 85.49% 6.17 MiB p/s ETA 0s34.99 MiB / 39.51 MiB [-----]
-----] 88.55% 6.17 MiB p/s ETA 0s36.23 MiB / 39.51 MiB [-----] 91.70% 6.17 MiB p/s ETA 0s37.47 MiB / 39.51 MiB [-----]
-----] 94.84% 6.17 MiB p/s ETA 0s38.71 MiB / 39.51 MiB [-----] 97.98% 6.17 MiB p/s ETA 0s39.51 MiB / 39.51 MiB [-----]
-----] 100.00% 6.17 MiB p/s ETA 0s39.51 MiB / 39.51 MiB [-----] 100.00% 5.99 MiB p/s ETA 0s39.51 MiB / 39.51 MiB [-----]
-->] 100.00% 5.99 MiB p/s ETA 0s39.51 MiB / 39.51 MiB [-----] 100.00% 5.99 MiB p/s ETA 0s39.51 MiB / 39.51 MiB [-----]
100.00% 6.61 MiB p/s ETA 0s39.51 MiB / 39.51 MiB [-----] 100.00% 6.61 MiB p/s ETA 0s39.51 MiB / 39.51 MiB [-----] 1
00.00% 5.31 MiB p/s 7.6s2023-09-08T14:21:40.527Z INFO Vulnerability scanning is enabled
2023-09-08T14:21:40.527Z INFO Secret scanning is enabled
2023-09-08T14:21:40.527Z INFO If your scanning is slow, please try '--scanners vuln' to disable secret scanning
2023-09-08T14:21:40.527Z INFO Please see also https://aquasecurity.github.io/trivy/v0.45/docs/scanner/secret/#recommendation for faster secret detection
2023-09-08T14:21:40.527Z INFO Detected OS: debian
2023-09-08T14:21:40.527Z INFO Detecting Debian vulnerabilities...
2023-09-08T14:21:40.527Z INFO Number of language-specific files: 5
2023-09-08T14:21:40.527Z INFO Detecting golang vulnerabilities...
2023-09-08T14:21:40.527Z INFO Detecting node-pkg vulnerabilities...
2023-09-08T14:21:40.527Z INFO Table result includes only package filenames. Use '--format json' option to get the full path to the package file.

react-storefront-storefront:latest (debian 10.13)
=====
Total: 238 (UNKNOWN: 0, LOW: 149, MEDIUM: 53, HIGH: 27, CRITICAL: 1)

```

Figure 15: Image Scan for React Storefront

Figure 15 displays the vulnerabilities that were found while scanning react storefront container. And figure 16 and 17 further displays the detailed result which displays the library, vulnerability, severity, status, installed version, fixed version and title.

Library	Vulnerability	Severity	Status	Installed Version	Fixed Version	Title
apt	CVE-2011-3374	LOW	affected	1.8.2.3		It was found that apt-key in apt, all versions, do not correctly... https://avd.aquasec.com/nvd/cve-2011-3374
bash	CVE-2019-18276			5.0-4		bash: when effective UID is not equal to its real UID the... https://avd.aquasec.com/nvd/cve-2019-18276
bsdutils	CVE-2021-37600			1:2.33.1-0.1		util-linux: integer overflow can lead to buffer overflow in get_sem_elements() in sys-utils/lpccutils.c... https://avd.aquasec.com/nvd/cve-2021-37600
	CVE-2022-0563					partial disclosure of arbitrary files in chfn and chsh when compiled with... https://avd.aquasec.com/nvd/cve-2022-0563
coreutils	CVE-2016-2781		will_not_fix	8.30-3		coreutils: Non-privileged session can escape to the parent session in chroot https://avd.aquasec.com/nvd/cve-2016-2781
	CVE-2017-18018		affected			coreutils: race condition vulnerability in chown and chgrp https://avd.aquasec.com/nvd/cve-2017-18018
e2fsprogs	CVE-2022-1394	HIGH		1.44.5-1+deb10u3		out-of-bounds read/write via crafted filesystem https://avd.aquasec.com/nvd/cve-2022-1394
fdisk	CVE-2021-37600	LOW		2.33.1-0.1		util-linux: integer overflow can lead to buffer overflow in get_sem_elements() in sys-utils/lpccutils.c... https://avd.aquasec.com/nvd/cve-2021-37600
	CVE-2022-0563					partial disclosure of arbitrary files in chfn and chsh when compiled with... https://avd.aquasec.com/nvd/cve-2022-0563
gcc-8-base	CVE-2018-12886	HIGH	will_not_fix	8.3.0-6		gcc: spilling of stack protection address in cfgexpand.c and function.c leads to... https://avd.aquasec.com/nvd/cve-2018-12886
	CVE-2019-15847					gcc: POWER9 "DARN" RNG intrinsic produces repeated output https://avd.aquasec.com/nvd/cve-2019-15847
gpgv	CVE-2019-14855	LOW		2.2.12-1+deb10u2		gnupg2: OpenPGP Key Certification Forgeries with SHA-1 https://avd.aquasec.com/nvd/cve-2019-14855
	CVE-2022-3219		affected			denial of service issue (resource consumption) using compressed packets https://avd.aquasec.com/nvd/cve-2022-3219
libapt-pkg5.0	CVE-2011-3374			1.8.2.3		It was found that apt-key in apt, all versions, do not correctly... https://avd.aquasec.com/nvd/cve-2011-3374

Figure 16: Vulnerability in react storefront

libcom-err2	CVE-2022-1384	HIGH		1.44.5-1+deb10u3		out-of-bounds read/write via crafted filesystem https://avd.aquasec.com/nvd/cve-2022-1384
libdb5.3	CVE-2019-8457	CRITICAL	will_not_fix	5.3.28+dfsg1-0.5		heap out-of-bound read in function rtreenode() https://avd.aquasec.com/nvd/cve-2019-8457
libexpat1	CVE-2013-0340	LOW	affected	2.2.6-2+deb10u6		expat: internal entity expansion https://avd.aquasec.com/nvd/cve-2013-0340
libext2fs2	CVE-2022-1384	HIGH		1.44.5-1+deb10u3		out-of-bounds read/write via crafted filesystem https://avd.aquasec.com/nvd/cve-2022-1384
libfdisk1	CVE-2021-37600	LOW		2.33.1-0.1		util-linux: integer overflow can lead to buffer overflow in get_sem_elements() in sys-utils/ipcutils.c... https://avd.aquasec.com/nvd/cve-2021-37600
	CVE-2022-0563					partial disclosure of arbitrary files in chfn and chsh when compiled with... https://avd.aquasec.com/nvd/cve-2022-0563
libfreetype6	CVE-2022-31782			2.9.1-3+deb10u3		ftbench.c in FreeType Demo Programs through 2.12.1 has a heap-based bu https://avd.aquasec.com/nvd/cve-2022-31782
libgcc1	CVE-2018-12886	HIGH	will_not_fix	1:8.3.0-6		gcc: spilling of stack protection address in cfgexpand.c and function.c leads to... https://avd.aquasec.com/nvd/cve-2018-12886
	CVE-2019-15847					gcc: POWER9 "DARN" RNG intrinsic produces repeated output https://avd.aquasec.com/nvd/cve-2019-15847
libgcrpt20	CVE-2021-33560		affected	1.8.4-5+deb10u1		libgcrpt: mishandles ElGamal encryption because it lacks exponent blinding to address a... https://avd.aquasec.com/nvd/cve-2021-33560
	CVE-2019-13627	MEDIUM				ECDSA timing attack allowing private key leak https://avd.aquasec.com/nvd/cve-2019-13627
	CVE-2018-6829	LOW				libgcrpt: ElGamal implementation doesn't have semantic security due to incorrectly encoded plaintexts... https://avd.aquasec.com/nvd/cve-2018-6829

Figure 17: Vulnerability in react storefront 2

5. Task 4: Architecture Visualization

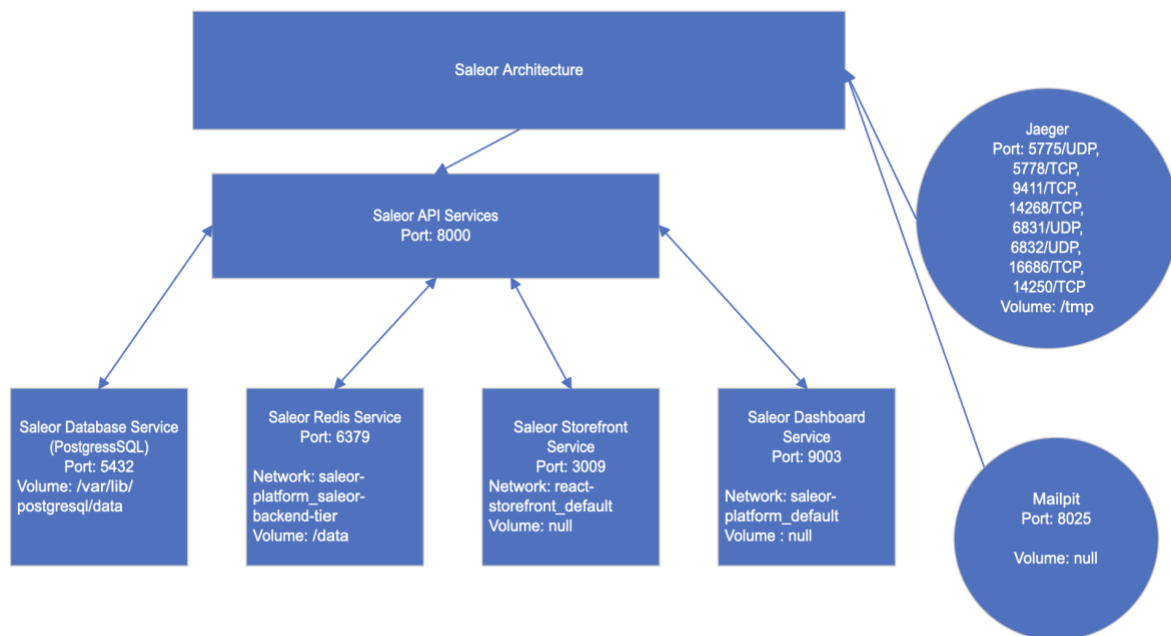


Figure 18: Architecture Diagram for Saleor service

All Saleor services interact with API services to interact with each other. All the services operate in their respective ports so that there is no clash between their operations.

6. Conclusion

The cluster was successfully created and deployed in google cloud with location and node pool configuration. With the help of git repositories saleor components were configured and build. Changes to the ports were made to change the URL in which it was running previously. Implementation of security measures were done to secure the containers from vulnerabilities. The architecture diagram that encapsulates the main functionalities of each Saleor service was created.

Reference

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