Lab 7: Learning basic feature of Docker in Azure Cloud

Objectives

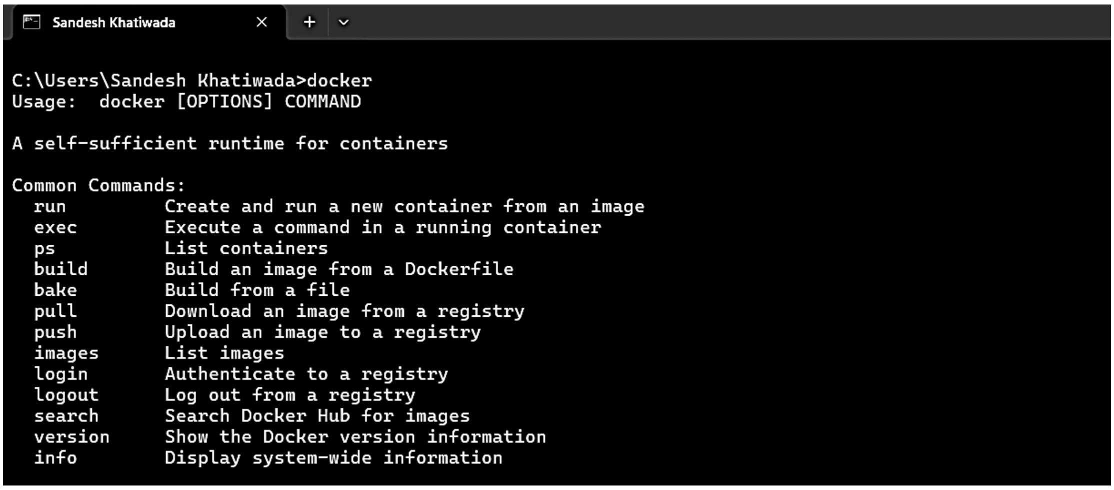
1. To understand basic Docker concepts and container lifecycle
2. To pull Docker images from Docker Hub
3. To run and manage Docker containers using CLI and GUI
4. To inspect, monitor, and troubleshoot running containers

Tools Required

1. Docker Desktop (Windows)
2. Docker CLI
3. Web Browser

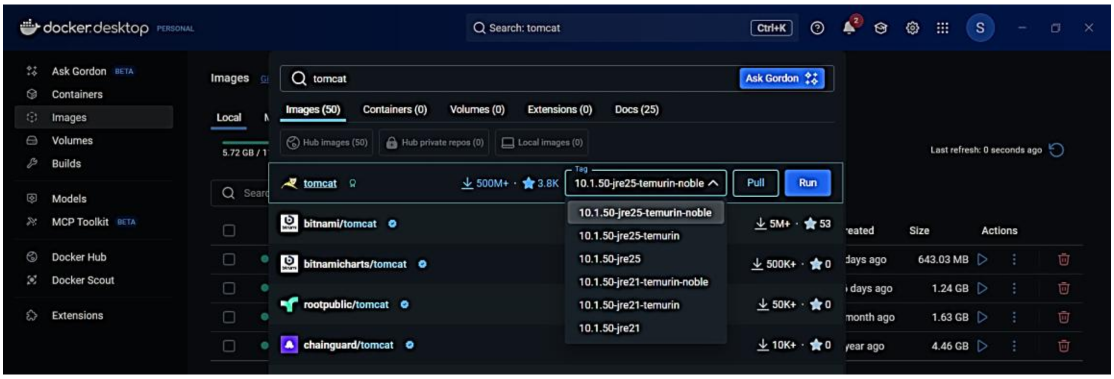
Procedure / Methodology

1. Verify Docker Installation
   a. docker



```
C:\Users\Sandesh Khatiwada>docker
Usage:  docker [OPTIONS] COMMAND

A self-sufficient runtime for containers

Common Commands:
  run         Create and run a new container from an image
  exec        Execute a command in a running container
  ps          List containers
  build       Build an image from a Dockerfile
  bake        Build from a file
  pull        Download an image from a registry
  push        Upload an image to a registry
  images      List images
  login       Authenticate to a registry
  logout      Log out from a registry
  search      Search Docker Hub for images
  version     Show the Docker version information
  info        Display system-wide information
```

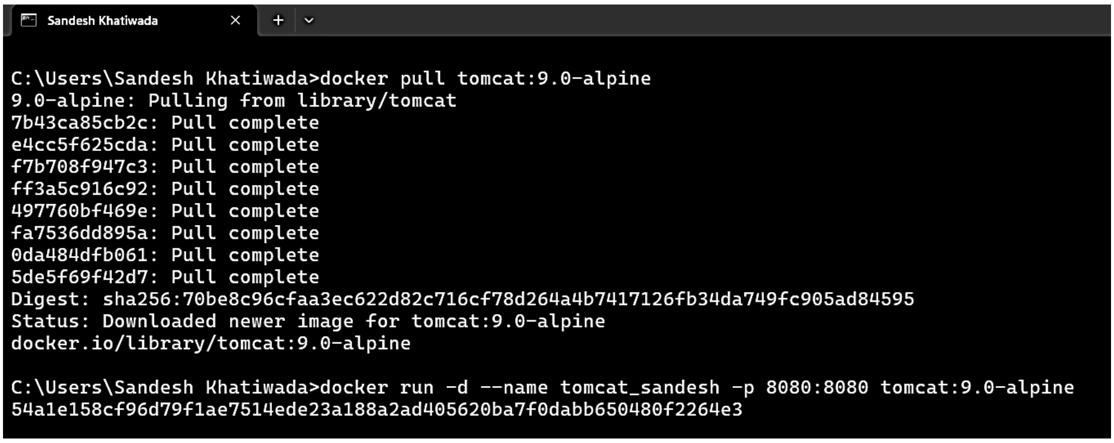
2. Pull Docker Image (GUI)
   a. Open Docker Desktop
      i. Search for tomcat:9.0-alpine
      ii. Pull the image



3. Pull and Run Docker Image (CLI)

   a. docker pull tomcat:9.0-alpine

   b. docker run -d --name tomcat_sandesh -p 8080:8080 tomcat:9.0-alpine



```
C:\Users\Sandesh Khatiwada>docker pull tomcat:9.0-alpine
9.0-alpine: Pulling from library/tomcat
7b43ca85cb2c: Pull complete
e4cc5f625cda: Pull complete
f7b708f947c3: Pull complete
ff3a5c916c92: Pull complete
497760bf469e: Pull complete
fa7536dd895a: Pull complete
0da484dfb061: Pull complete
5de5f69f42d7: Pull complete
Digest: sha256:70be8c96cfaa3ec622d82c716cf78d264a4b7417126fb34da749fc905ad84595
Status: Downloaded newer image for tomcat:9.0-alpine
docker.io/library/tomcat:9.0-alpine

C:\Users\Sandesh Khatiwada>docker run -d --name tomcat_sandesh -p 8080:8080 tomcat:9.0-alpine
54a1e158cf96d79f1ae7514ede23a188a2ad405620ba7f0dabb650480f2264e3
```

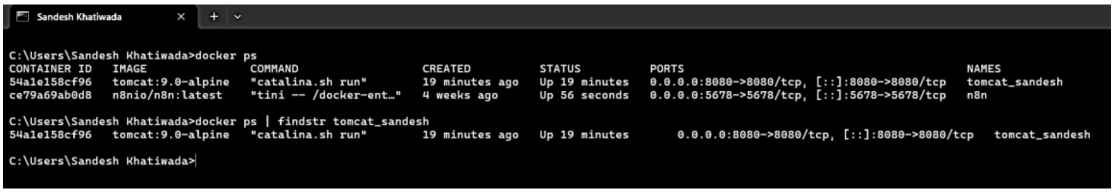
4. Runs Tomcat container in detached mode

   a. Maps container port 8080 to host port 8080

5. Check Running Containers

   a. docker ps

   b. docker ps | findstr tomcat_sandesh

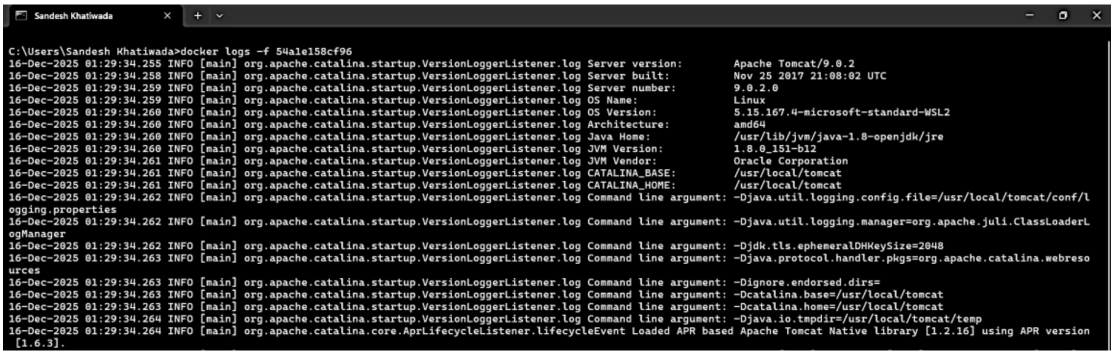


```
C:\Users\Sandesh Khatiwada>docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED          STATUS          PORTS                                         NAMES
54a1e158cf96   tomcat:9.0-alpine    "catalina.sh run"        19 minutes ago   Up 19 minutes   0.0.0.0:8080->8080/tcp, [::]:8080->8080/tcp   tomcat_sandesh
ce79a69ab0d8   n8nio/n8n:latest     "tini -- /docker-ent…"   4 weeks ago      Up 56 seconds   0.0.0.0:5678->5678/tcp, [::]:5678->5678/tcp   n8n

C:\Users\Sandesh Khatiwada>docker ps | findstr tomcat_sandesh
54a1e158cf96   tomcat:9.0-alpine    "catalina.sh run"        19 minutes ago   Up 19 minutes      0.0.0.0:8080->8080/tcp, [::]:8080->8080/tcp   tomcat_sandesh

C:\Users\Sandesh Khatiwada>
```

6. View Docker Logs

   a. Via CLI:

      i. docker logs tomcat_sandesh



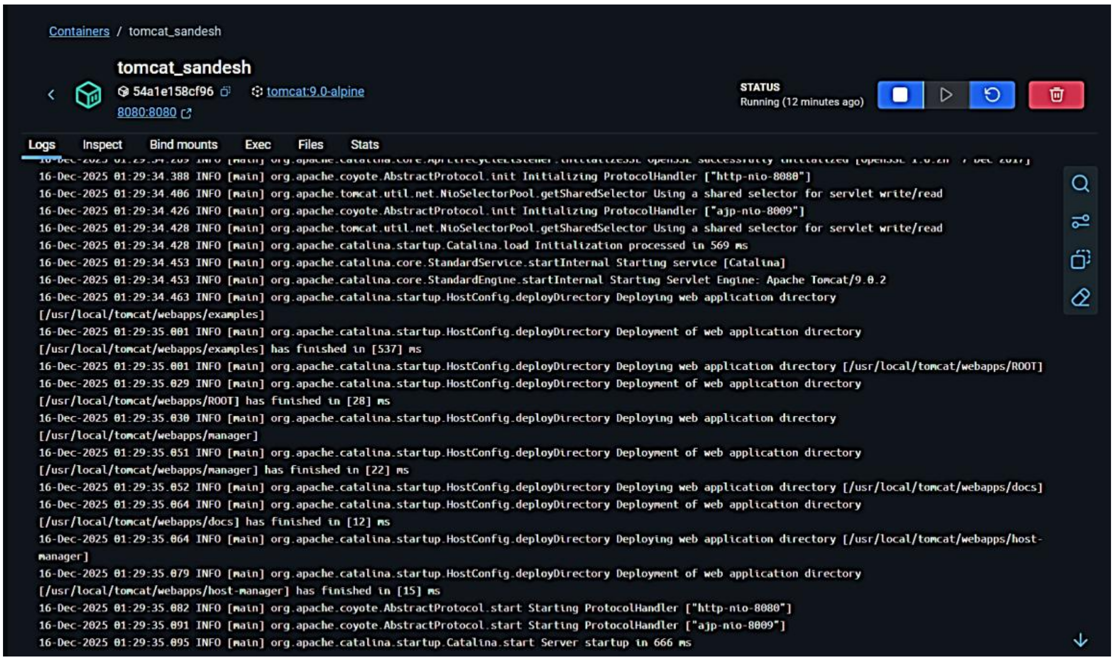
```
C:\Users\Sandesh Khatiwada>docker logs -f 54a1e158cf96
16-Dec-2025 01:29:34.255 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Server version:        Apache Tomcat/9.0.2
16-Dec-2025 01:29:34.258 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Server built:          Nov 25 2017 21:08:02 UTC
16-Dec-2025 01:29:34.259 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Server number:         9.0.2.0
16-Dec-2025 01:29:34.259 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log OS Name:               Linux
16-Dec-2025 01:29:34.260 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log OS Version:            5.15.167.4-microsoft-standard-WSL2
16-Dec-2025 01:29:34.260 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Architecture:          amd64
16-Dec-2025 01:29:34.260 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Java Home:             /usr/lib/jvm/java-1.8-openjdk/jre
16-Dec-2025 01:29:34.260 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log JVM Version:           1.8.0_151-b12
16-Dec-2025 01:29:34.261 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log JVM Vendor:            Oracle Corporation
16-Dec-2025 01:29:34.261 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log CATALINA_BASE:         /usr/local/tomcat
16-Dec-2025 01:29:34.261 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log CATALINA_HOME:         /usr/local/tomcat
16-Dec-2025 01:29:34.262 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Command line argument: -Djava.util.logging.config.file=/usr/local/tomcat/conf/l
ogging.properties
16-Dec-2025 01:29:34.262 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Command line argument: -Djava.util.logging.manager=org.apache.juli.ClassLoaderL
ogManager
16-Dec-2025 01:29:34.262 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Command line argument: -Djdk.tls.ephemeralDHKeySize=2048
16-Dec-2025 01:29:34.263 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Command line argument: -Djava.protocol.handler.pkgs=org.apache.catalina.webreso
urces
16-Dec-2025 01:29:34.263 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Command line argument: -Dignore.endorsed.dirs=
16-Dec-2025 01:29:34.263 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Command line argument: -Dcatalina.base=/usr/local/tomcat
16-Dec-2025 01:29:34.263 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Command line argument: -Dcatalina.home=/usr/local/tomcat
16-Dec-2025 01:29:34.264 INFO [main] org.apache.catalina.startup.VersionLoggerListener.log Command line argument: -Djava.io.tmpdir=/usr/local/tomcat/temp
16-Dec-2025 01:29:34.264 INFO [main] org.apache.catalina.core.AprLifecycleListener.lifecycleEvent Loaded APR based Apache Tomcat Native library [1.2.16] using APR version
 [1.6.3].
```

b. Via GUI:

i. Open Docker Desktop

ii. Select container

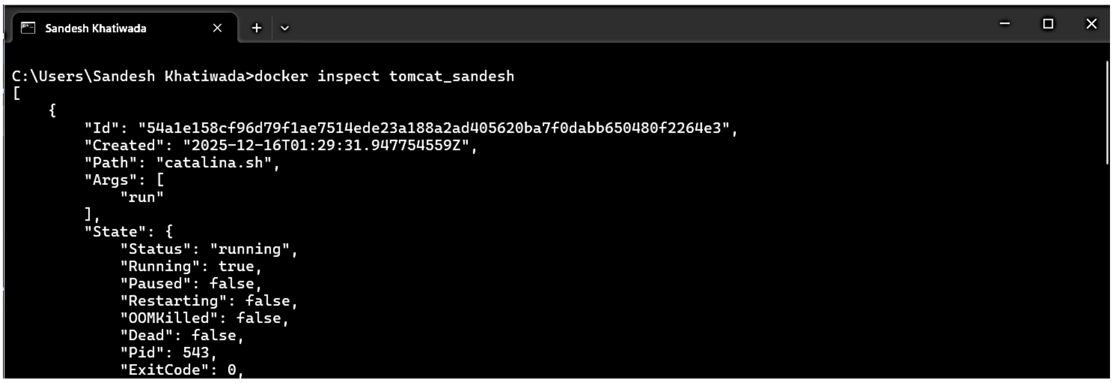
iii. View logs section



```
16-Dec-2025 01:29:34.269 INFO [main] org.apache.catalina.core.AprLifecycleListener.initializeSSL OpenSSL successfully initialized [OpenSSL 1.0.2n  7 Dec 2017]
16-Dec-2025 01:29:34.388 INFO [main] org.apache.coyote.AbstractProtocol.init Initializing ProtocolHandler ["http-nio-8080"]
16-Dec-2025 01:29:34.406 INFO [main] org.apache.tomcat.util.net.NioSelectorPool.getSharedSelector Using a shared selector for servlet write/read
16-Dec-2025 01:29:34.426 INFO [main] org.apache.coyote.AbstractProtocol.init Initializing ProtocolHandler ["ajp-nio-8009"]
16-Dec-2025 01:29:34.428 INFO [main] org.apache.tomcat.util.net.NioSelectorPool.getSharedSelector Using a shared selector for servlet write/read
16-Dec-2025 01:29:34.428 INFO [main] org.apache.catalina.startup.Catalina.load Initialization processed in 569 ms
16-Dec-2025 01:29:34.453 INFO [main] org.apache.catalina.core.StandardService.startInternal Starting service [Catalina]
16-Dec-2025 01:29:34.453 INFO [main] org.apache.catalina.core.StandardEngine.startInternal Starting Servlet Engine: Apache Tomcat/9.0.2
16-Dec-2025 01:29:34.463 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deploying web application directory
[/usr/local/tomcat/webapps/examples]
16-Dec-2025 01:29:35.001 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web application directory
[/usr/local/tomcat/webapps/examples] has finished in [537] ms
16-Dec-2025 01:29:35.001 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deploying web application directory [/usr/local/tomcat/webapps/ROOT]
16-Dec-2025 01:29:35.029 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web application directory
[/usr/local/tomcat/webapps/ROOT] has finished in [28] ms
16-Dec-2025 01:29:35.030 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deploying web application directory
[/usr/local/tomcat/webapps/manager]
16-Dec-2025 01:29:35.051 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web application directory
[/usr/local/tomcat/webapps/manager] has finished in [22] ms
16-Dec-2025 01:29:35.052 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deploying web application directory [/usr/local/tomcat/webapps/docs]
16-Dec-2025 01:29:35.064 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web application directory
[/usr/local/tomcat/webapps/docs] has finished in [12] ms
16-Dec-2025 01:29:35.064 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deploying web application directory [/usr/local/tomcat/webapps/host-
manager]
16-Dec-2025 01:29:35.079 INFO [main] org.apache.catalina.startup.HostConfig.deployDirectory Deployment of web application directory
[/usr/local/tomcat/webapps/host-manager] has finished in [15] ms
16-Dec-2025 01:29:35.082 INFO [main] org.apache.coyote.AbstractProtocol.start Starting ProtocolHandler ["http-nio-8080"]
16-Dec-2025 01:29:35.091 INFO [main] org.apache.coyote.AbstractProtocol.start Starting ProtocolHandler ["ajp-nio-8009"]
16-Dec-2025 01:29:35.095 INFO [main] org.apache.catalina.startup.Catalina.start Server startup in 666 ms
```

7. Inspect Container Details

a. docker inspect tomcat_sandesh

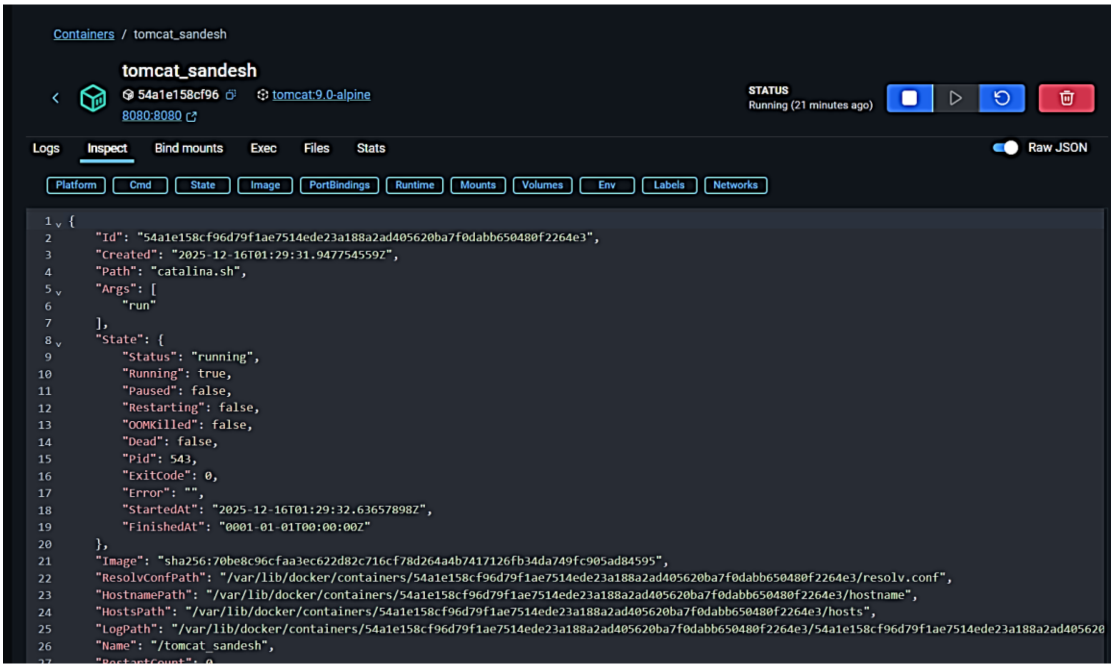


```
C:\Users\Sandesh Khatiwada>docker inspect tomcat_sandesh
[
    {
        "Id": "54a1e158cf96d79f1ae7514ede23a188a2ad405620ba7f0dabb650480f2264e3",
        "Created": "2025-12-16T01:29:31.947754559Z",
        "Path": "catalina.sh",
        "Args": [
            "run"
        ],
        "State": {
            "Status": "running",
            "Running": true,
            "Paused": false,
            "Restarting": false,
            "OOMKilled": false,
            "Dead": false,
            "Pid": 543,
            "ExitCode": 0,
```

b. Via GUI:

i. Select container

ii. Open Inspect / Details panel

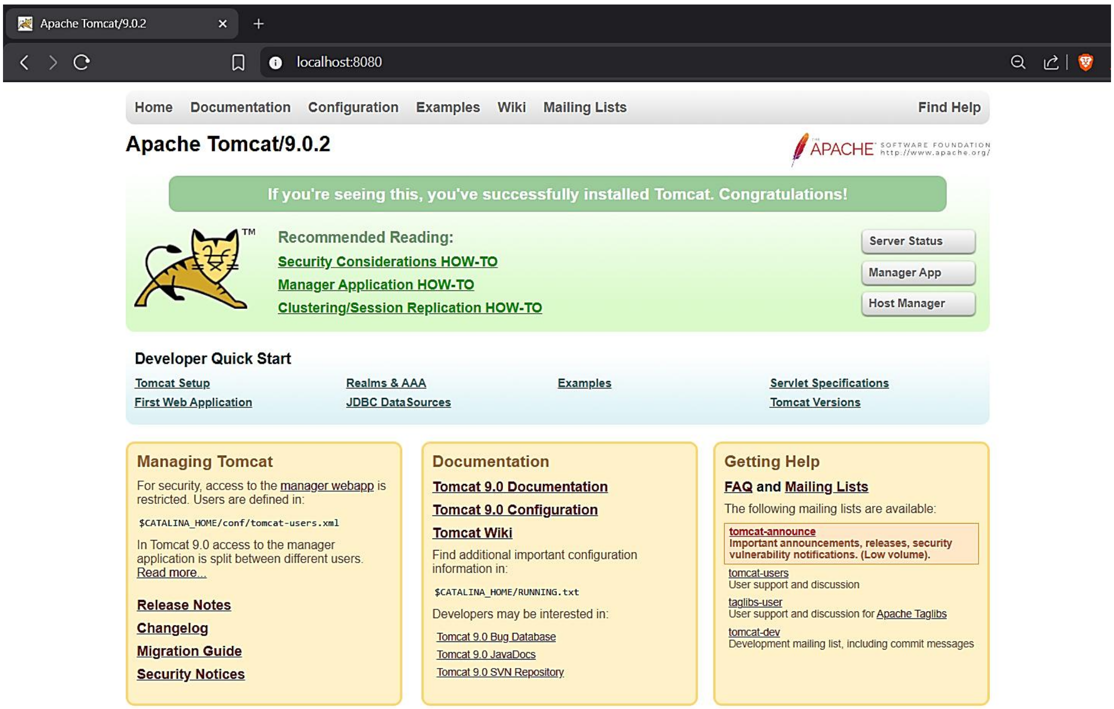


```
{
    "Id": "54a1e158cf96d79f1ae7514ede23a188a2ad405620ba7f0dabb650480f2264e3",
    "Created": "2025-12-16T01:29:31.947754559Z",
    "Path": "catalina.sh",
    "Args": [
        "run"
    ],
    "State": {
        "Status": "running",
        "Running": true,
        "Paused": false,
        "Restarting": false,
        "OOMKilled": false,
        "Dead": false,
        "Pid": 543,
        "ExitCode": 0,
        "Error": "",
        "StartedAt": "2025-12-16T01:29:32.63657898Z",
        "FinishedAt": "0001-01-01T00:00:00Z"
    },
    "Image": "sha256:70be8c96cfaa3ec622d82c716cf78d264a4b7417126fb34da749fc905ad84595",
    "ResolvConfPath": "/var/lib/docker/containers/54a1e158cf96d79f1ae7514ede23a188a2ad405620ba7f0dabb650480f2264e3/resolv.conf",
    "HostnamePath": "/var/lib/docker/containers/54a1e158cf96d79f1ae7514ede23a188a2ad405620ba7f0dabb650480f2264e3/hostname",
    "HostsPath": "/var/lib/docker/containers/54a1e158cf96d79f1ae7514ede23a188a2ad405620ba7f0dabb650480f2264e3/hosts",
    "LogPath": "/var/lib/docker/containers/54a1e158cf96d79f1ae7514ede23a188a2ad405620ba7f0dabb650480f2264e3/54a1e158cf96d79f1ae7514ede23a188a2ad405620
    "Name": "/tomcat_sandesh",
    "RestartCount": 0
```

8. Access Application

a. Open browser

b. Visit: http://localhost:8080



Apache Tomcat/9.0.2

If you're seeing this, you've successfully installed Tomcat. Congratulations!

Recommended Reading:
Security Considerations HOW-TO
Manager Application HOW-TO
Clustering/Session Replication HOW-TO

Developer Quick Start

Tomcat Setup
First Web Application
Realms & AAA
JDBC DataSources
Examples
Servlet Specifications
Tomcat Versions

Managing Tomcat

For security, access to the manager webapp is restricted. Users are defined in:

```
$CATALINA_HOME/conf/tomcat-users.xml
```

In Tomcat 9.0 access to the manager application is split between different users. Read more...

Release Notes
Changelog
Migration Guide
Security Notices

Documentation

Tomcat 9.0 Documentation
Tomcat 9.0 Configuration
Tomcat Wiki

Find additional important configuration information in:

```
$CATALINA_HOME/RUNNING.txt
```

Developers may be interested in:

Tomcat 9.0 Bug Database
Tomcat 9.0 JavaDocs
Tomcat 9.0 SVN Repository

Getting Help

FAQ and Mailing Lists

The following mailing lists are available:

tomcat-announce
Important announcements, releases, security vulnerability notifications. (Low volume).

tomcat-users
User support and discussion

taglibs-user
User support and discussion for Apache Taglibs

tomcat-dev
Development mailing list, including commit messages

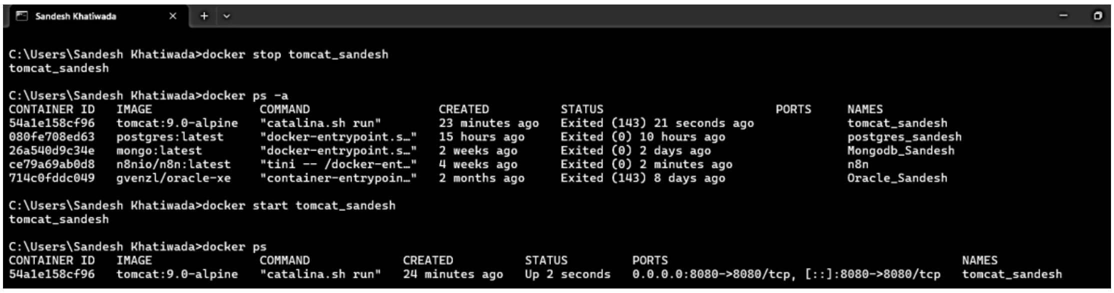
9. Stop and Start Container

    a. docker stop tomcat_sandesh

    b. docker ps -a

    c. docker start tomcat_sandesh

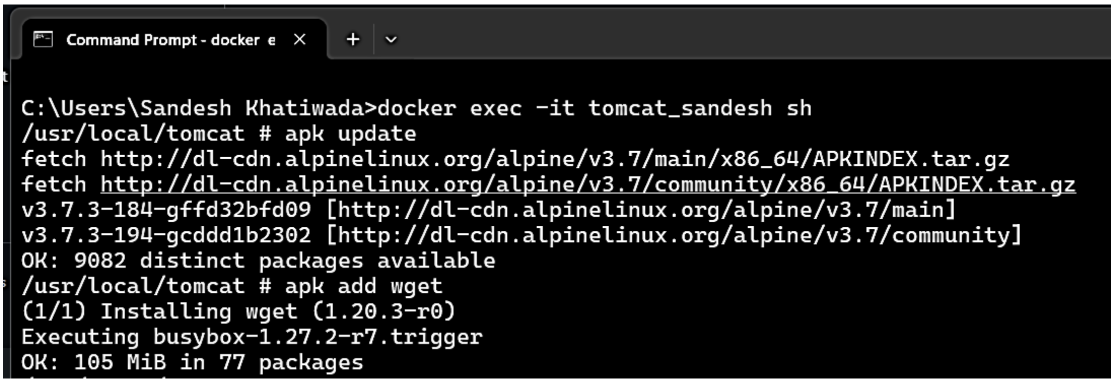
    d. docker ps



```
C:\Users\Sandesh Khatiwada>docker stop tomcat_sandesh
tomcat_sandesh

C:\Users\Sandesh Khatiwada>docker ps -a
CONTAINER ID   IMAGE                COMMAND                  CREATED          STATUS                        PORTS     NAMES
54a1e158cf96   tomcat:9.0-alpine    "catalina.sh run"        23 minutes ago   Exited (143) 21 seconds ago             tomcat_sandesh
080fe708ed63   postgres:latest      "docker-entrypoint.s…"   15 hours ago     Exited (0) 10 hours ago                 postgres_sandesh
26a540d9c34e   mongo:latest         "docker-entrypoint.s…"   2 weeks ago      Exited (0) 2 days ago                   Mongodb_Sandesh
ce79a69ab0d8   n8nio/n8n:latest     "tini -- /docker-ent…"   4 weeks ago      Exited (0) 2 minutes ago                n8n
714c0fddc049   gvenzl/oracle-xe     "container-entrypoin…"   2 months ago     Exited (143) 8 days ago                 Oracle_Sandesh

C:\Users\Sandesh Khatiwada>docker start tomcat_sandesh
tomcat_sandesh

C:\Users\Sandesh Khatiwada>docker ps
CONTAINER ID   IMAGE                COMMAND             CREATED          STATUS         PORTS                                       NAMES
54a1e158cf96   tomcat:9.0-alpine    "catalina.sh run"   24 minutes ago   Up 2 seconds   0.0.0.0:8080->8080/tcp, [::]:8080->8080/tcp   tomcat_sandesh
```

10. Execute Commands Inside Container

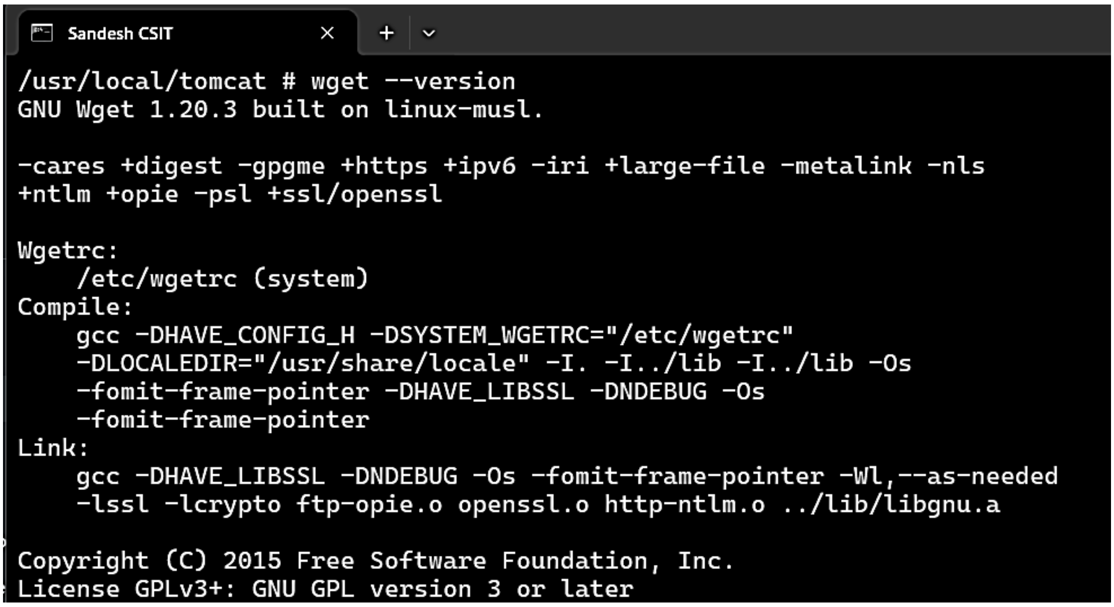
    a. docker exec -it tomcat_sandesh sh



```
C:\Users\Sandesh Khatiwada>docker exec -it tomcat_sandesh sh
/usr/local/tomcat # apk update
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/main/x86_64/APKINDEX.tar.gz
fetch http://dl-cdn.alpinelinux.org/alpine/v3.7/community/x86_64/APKINDEX.tar.gz
v3.7.3-184-gffd32bfd09 [http://dl-cdn.alpinelinux.org/alpine/v3.7/main]
v3.7.3-194-gcddd1b2302 [http://dl-cdn.alpinelinux.org/alpine/v3.7/community]
OK: 9082 distinct packages available
/usr/local/tomcat # apk add wget
(1/1) Installing wget (1.20.3-r0)
Executing busybox-1.27.2-r7.trigger
OK: 105 MiB in 77 packages
```

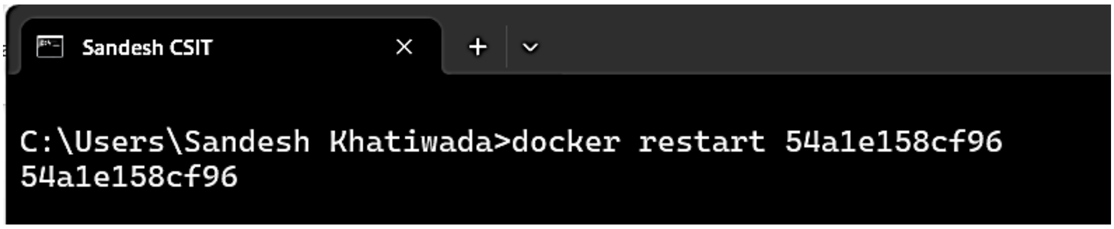
    b. apk add wget

    c. wget --version



```
/usr/local/tomcat # wget --version
GNU Wget 1.20.3 built on linux-musl.

-cares +digest -gpgme +https +ipv6 -iri +large-file -metalink -nls
+ntlm +opie -psl +ssl/openssl

Wgetrc:
    /etc/wgetrc (system)
Compile:
    gcc -DHAVE_CONFIG_H -DSYSTEM_WGETRC="/etc/wgetrc"
    -DLOCALEDIR="/usr/share/locale" -I. -I../lib -I../lib -Os
    -fomit-frame-pointer -DHAVE_LIBSSL -DNDEBUG -Os
    -fomit-frame-pointer
Link:
    gcc -DHAVE_LIBSSL -DNDEBUG -Os -fomit-frame-pointer -Wl,--as-needed
    -lssl -lcrypto ftp-opie.o openssl.o http-ntlm.o ../lib/libgnu.a

Copyright (C) 2015 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later
```

11. Restart Container
    a. docker restart <container_id>



```
C:\Users\Sandesh Khatiwada>docker restart 54a1e158cf96
54a1e158cf96
```

Conclusion

This lab successfully demonstrated the use of Docker for containerized application deployment and management. A Tomcat Docker image was pulled from Docker Hub and executed as a container using both Docker CLI and Docker Desktop GUI. The container lifecycle operations including start, stop, restart, inspect, and log analysis were performed effectively. Accessing the application through localhost:8080 verified successful container deployment. Additionally, executing commands inside the running container confirmed container isolation and runtime interaction. Overall, the lab provided practical understanding of Docker fundamentals and real-world container management.