- Deploy microservices

1. In k8s folder, run "kubectl apply -f . "

2. get the pod name of hadoop deployment, use "kubectl get pods"

3. enter shell of the hadoop pod, use "kubectl exec -it --namespace=default sa-hadoop-base-xxxxxxxxx-xxxxx -- bin/sh"

4. in the shell of the hadoop pod, run "./run.sh" and then exit the hadoop pod

```
[→  k8s git:(master) ✗ kubectl exec -it --namespace=default sa-hadoop-base-66cd7f8f8b-s6g4s -- /bin/sh
[/docker-multinode-hadoop # ./run.sh
305257d2dfe20a2f723110b131ff645852c77e95641175fc4a56df71a09d5518
Unable to find image 'zyh6158/base-hadoop:latest' locally
latest: Pulling from zyh6158/base-hadoop
58690f9b18fc: Pull complete
b51569e7c507: Pull complete
da8ef40b9eca: Pull complete
fb15d46c38dc: Pull complete
8dab8dc9dfc5: Pull complete
e65d377c1c52: Pull complete
341b3a4624cc: Pull complete
856acd18d5f7: Pull complete
fd2d8d629338: Pull complete
d349eac0a7c2: Pull complete
ce7b8ccb554b: Pull complete
1376775ed8ed: Pull complete
8a2932373e5d: Pull complete
28d7ba7aad74: Pull complete
232c609c6c43: Pull complete
f6362491b703: Pull complete
e6b948dac247: Pull complete
2785d8ed2940: Pull complete
c437c8f967bb: Pull complete
868182b245e8: Pull complete
e8dbc88624a8: Pull complete
Digest: sha256:0eb912cd7c89b9db165fd70a7f4e5a774c31faa3580cf52c44f9391f22151d0e
Status: Downloaded newer image for zyh6158/base-hadoop:latest
457de527d16800edf7e939b6bba24e92ab9fa0cf89e12cd7cb54ef2acc1fe445
92d43979158790b780b1fc31e35057ca43276f2c1438a8b2398de7b1ca619565
7fb9b72f9d9822dbc8656d15d174008a9777636624349644c842bd65549980c7
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.

21/11/20 02:47:42 INFO namenode.NameNode: STARTUP_MSG:
/************************************************************
STARTUP_MSG: Starting NameNode
STARTUP_MSG:   host = master/172.25.0.100
STARTUP_MSG:   args = [-format]
STARTUP_MSG:   version = 2.7.5
STARTUP_MSG:   classpath = /usr/local/hadoop/etc/hadoop/:/usr/local/hadoop/share/hadoop/common/lib/curator-recipes-2.7.1.jar:/usr/local/hadoop/share/hadoop/common/lib/snappy-java-1.0.4.1.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-configuration-1.6.jar:/usr/local/hadoop/share/hadoop/common/lib/httpclient-4.2.5.jar:/usr/local/hadoop/share/hadoop/common/lib/jetty-util-6.1.26.jar:/usr/local/hadoop/share/hadoop/common/lib/mockito-all-1.8.5.jar:/usr/local/hadoop/share/hadoop/common/lib/hadoop-annotations-2.7.5.jar:/usr/local/hadoop/share/hadoop/common/lib/curator-client-2.7.1.jar:/usr/local/hadoop/share/hadoop/common/lib/hadoop-auth-2.7.5.jar:/usr/local/hadoop/share/hadoop/common/lib/jsch-0.1.54.jar:/usr/local/hadoop/share/hadoop/common/lib/jettison-1.1.jar:/usr/local/hadoop/share/hadoop/common/lib/api-util-1.0.0-M20.jar:/usr/local/hadoop/share/hadoop/common/lib/jsr305-3.0.0.jar:/usr/local/hadoop/share/hadoop/common/lib/netty-3.6.2.Final.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-httpclient-3.1.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-io-2.4.jar:/usr/local/hadoop/share/hadoop/common/lib/jsp-api-2.1.jar:/usr/local/hadoop/share/hadoop/common/lib/htrace-core-3.1.0-incubating.jar:/usr/local/hadoop/share/hadoop/common/lib/jetty-sslengine-6.1.26.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-digester-1.8.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-lang-2.6.jar:/usr/local/hadoop/share/hadoop/common/lib/java-xmlbuilder-0.4.jar:/usr/local/hadoop/share/hadoop/common/lib/curator-framework-2.7.1.jar:/usr/local/hadoop/share/hadoop/common/lib/jackson-core-asl-1.9.13.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-net-3.1.jar:/usr/local/hadoop/share/hadoop/common/lib/jackson-xc-1.9.13.jar:/usr/local/hadoop/share/hadoop/common/lib/zookeeper-3.4.6.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-collections-3.2.2.jar:/usr/local/hadoop/share/hadoop/common/lib/protobuf-java-2.5.0.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-logging-1.1.3.jar:/usr/local/hadoop/share/hadoop/common/lib/gson-2.2.4.jar:/usr/local/hadoop/share/hadoop/common/lib/httpcore-4.2.5.jar:/usr/local/hadoop/share/hadoop/common/lib/jersey-json-1.9.jar:/usr/local/hadoop/share/hadoop/common/lib/hamcrest-core-1.3.jar:/usr/local/hadoop/share/hadoop/common/lib/jackson-mapper-asl-1.9.13.jar:/usr/local/hadoop/share/hadoop/common/lib/guava-11.0.2.jar:/usr/local/hadoop/share/hadoop/common/lib/stax-api-1.0-2.jar:/usr/local/hadoop/share/hadoop/common/lib/xmlenc-0.52.jar:/usr/local/hadoop/share/hadoop/common/lib/log4j-1.2.17.jar:/usr/local/hadoop/share/hadoop/common/lib/junit-4.11.jar:/usr/local/hadoop/share/hadoop/common/lib/jersey-server-1.9.jar:/usr/local/hadoop/share/hadoop/common/lib/apacheds-kerberos-codec-2.0.0-M15.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-math3-3.1.1.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-cli-1.2.jar:/usr/local/hadoop/share/hadoop/common/lib/activation-1.1.jar:/usr/local/hadoop/share/hadoop/common/lib/avro-1.7.4.jar:/usr/local/hadoop/share/hadoop/common/lib/api-asn1-api-1.0.0-M20.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-beanutils-core-1.8.0.jar:/usr/local/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.10.jar:/usr/local/hadoop/share/hadoop/common/lib/servlet-api-2.5.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-beanutils-1.7.0.jar:/usr/local/hadoop/share/hadoop/common/lib/slf4j-api-1.7.10.jar:/usr/local/hadoop/share/hadoop/common/lib/jackson-jaxrs-1.9.13.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-compress-1.4.1.jar:/usr/local/hadoop/share/hadoop/common/lib/jetty-6.1.26.jar:/usr/local/hadoop/share/hadoop/common/lib/xz-1.0.jar:/usr/local/hadoop/share/hadoop/common/lib/jets3t-0.9.0.jar:/usr/local/hadoop/share/hadoop/common/lib/jaxb-impl-2.2.3-1.jar:/usr/local/hadoop/share/hadoop/common/lib/jaxb-api-2.2.2.jar:/usr/local/hadoop/share/hadoop/common/lib/jersey-core-1.9.jar:/usr/local/hadoop/share/hadoop/common/lib/commons-codec-1.4.jar:/usr/local/hadoop/share/hadoop/common/lib/asm-3.2.jar:/usr/local/hadoop/share/hadoop/common/l
```

5. install helm if it is not installed by:

curl -fsSL -o get_helm.sh https://raw.githubusercontent.com/helm/helm/master/scripts/get-helm-3

chmod 700 get_helm.sh

./get_helm.sh

6. inside k8s folder, run "helm install spark ./spark" to deploy spark microservice

```
[→  k8s git:(master) ✗ helm install spark ./spark
NAME: spark
LAST DEPLOYED: Fri Nov 19 21:42:52 2021
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
NOTES:
```

7. get the pod name of terminal deployment, use "kubectl get pods"

8. enter shell of the terminal pod, use "kubectl exec -it --namespace=default sa-terminal-app-xxxxxxxxx-xxxxx -- /bin/bash"
9. User can run terminal app from here by "python3 main.py"

```
➜  k8s git:(master) ✗ kubectl exec -it --namespace=default sa-terminal-app-5545696f8f-xx2tv -- /bin/bash
root@sa-terminal-app-5545696f8f-xx2tv:/usr/src/myapp# python3 main.py
Welcome to Big Data Processing Application
Please type the number that corresponds to which application you woule like to run:
1. Apache Hadoop
2. Apache Spark
3. Jupyter Notebook
4. SonarQube and SonarScanner

Type the number here (type "q" to quit)>
```

NOTE: one static IP address is used for all microservices, in my cluster the static IP address is 35.227.16.143.
For testing and grading, please change the LoadBalancer IP in each service.yaml file
In the terminal app, the static IP is hardcoded, which should also be replaced with testing service IP address to access
the microservices.
Different microservices run on different ports:
Jupyter-8888; Hadoop-9870; Spark-8081; sonarqube and sonar-scanner - 9000

10. To use the sonar-scanner cli, one need to get into the pod of sonarqube by
"kubectl exec -it --namespace=default sa-sonar-xxxxxxxxx-xxxxx -- /bin/bash" and then run "sonar-scanner"
(with -D options if wanted) to start the sonar-scanner.