Dockerizing And Orchestrating with Kubernetes (K8S)

Dockerizing refers to the process of packaging an application and its dependencies into a Docker container. This container can run on any system that has Docker installed, ensuring consistency across different environments (development, testing, production, etc.).

Orchestrating with Kubernetes (K8S) involves managing and deploying these Docker containers at scale. Kubernetes handles the deployment, scaling, and operation of containerized applications.

Let's go through the process step by step with an example project.

Example Project: Simple Web Application

1. Dockerizing the Application

Let's assume you have a simple Node.js web application.

Project Structure:

```
go
Copy code
myapp/
│
├── Dockerfile
├── package.json
├── server.js
└── index.html
```

Dockerfile: This file is used to build the Docker image.

```
dockerfile
Copy code
# Use an official Node.js runtime as a parent image
FROM node:14

# Set the working directory
WORKDIR /usr/src/app

# Copy the package.json and install dependencies
COPY package.json ./
RUN npm install

# Copy the rest of the application code
COPY . .

# Expose the port on which the app will run
EXPOSE 8080

# Command to run the application
CMD ["node", "server.js"]
```

server.js: A simple Node.js server script.

```
javascript
```

```
Copy code
const express = require('express');
const app = express();

app.use(express.static('public'));

app.get('/', (req, res) => {
  res.sendFile(__dirname + '/index.html');
});

app.listen(8080, () => {
  console.log('Server is running on port 8080');
});
```

Building the Docker Image: In the terminal, navigate to the project directory and run:

```
bash
Copy code
docker build -t myapp:1.0 .
```

Running the Docker Container:

```
bash
Copy code
docker run -d -p 8080:8080 myapp:1.0
```

This will start your application in a container and make it accessible on `http://localhost:8080`.

2. Orchestrating with Kubernetes

Now, you want to deploy this Dockerized application to a Kubernetes cluster.

Creating a Kubernetes Deployment: Create a deployment YAML file (`deployment.yaml`):

```
yaml
Copy code
apiVersion: apps/v1
kind: Deployment
metadata:
  name: myapp-deployment
spec:
  replicas: 3
  selector:
    matchLabels:
      app: myapp
  template:
    metadata:
      labels:
        app: myapp
    spec:
      containers:
      - name: myapp
        image: myapp:1.0
        ports:
        - containerPort: 8080
```

Creating a Service for the Deployment: Create a service YAML file (`service.yaml`):

```
yaml
Copy code
apiVersion: v1
kind: Service
metadata:
  name: myapp-service
spec:
  selector:
    app: myapp
  ports:
    - protocol: TCP
      port: 80
      targetPort: 8080
  type: LoadBalancer
```

Deploying to Kubernetes: Make sure your Docker image is available in a container registry that your Kubernetes cluster can access (e.g., Docker Hub or a private registry).

Apply the deployment and service to your Kubernetes cluster:

```
bash
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kubectl apply -f deployment.yaml
kubectl apply -f service.yaml
```

Scaling the Application: To scale the application, you can easily increase the number of replicas:

```
bash
Copy code
kubectl scale deployment myapp-deployment --replicas=5
```

Summary

- **Dockerizing** involves creating a Dockerfile and building an image of your application.
- **Orchestrating with Kubernetes** involves creating a deployment and service to manage the Dockerized application at scale.

This setup ensures your application can be consistently deployed, scaled, and managed across different environments.