

Scalable Microservices Architecture using Docker + Kubernetes + NodePort

Microservices:

- **User Service** (/users)
- **Product Service** (/products)
- **Order Service** (/orders)

Step 1: Development for each microservice (Setup Dockerfile and pages of each service)

Common structure (for all 3 services)

Each folder will have:

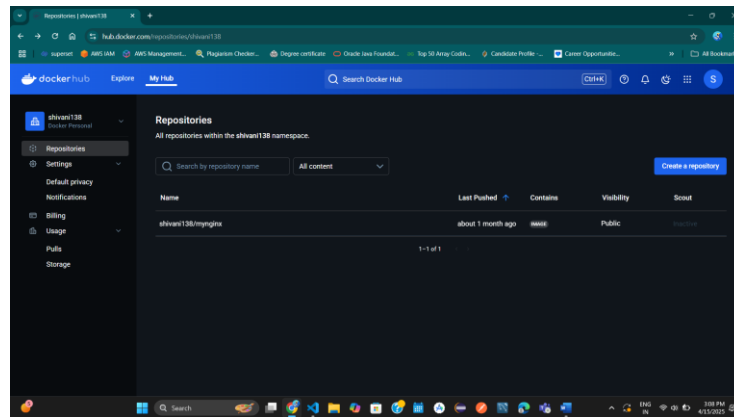
- app.py (or JS file if using Node)
- requirements.txt (for Flask)
- Dockerfile



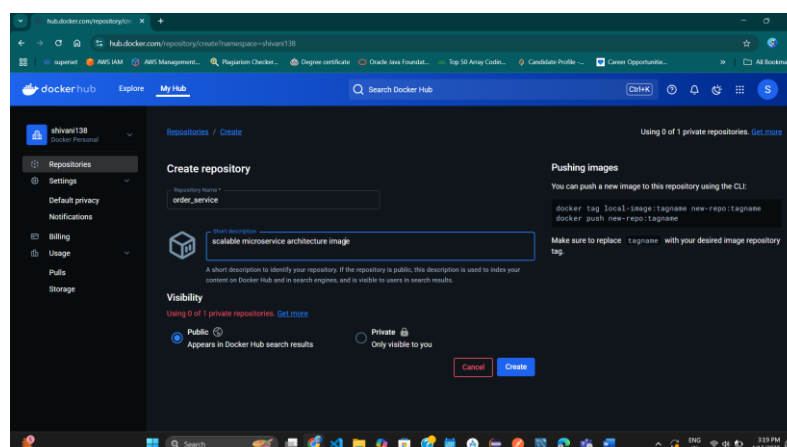
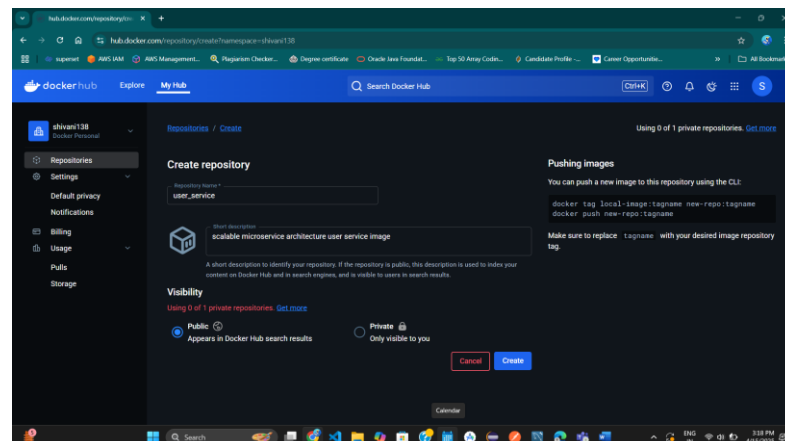
```
File Edit Selection View Go Run ... < -> k8s scalable microservice 08 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 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2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 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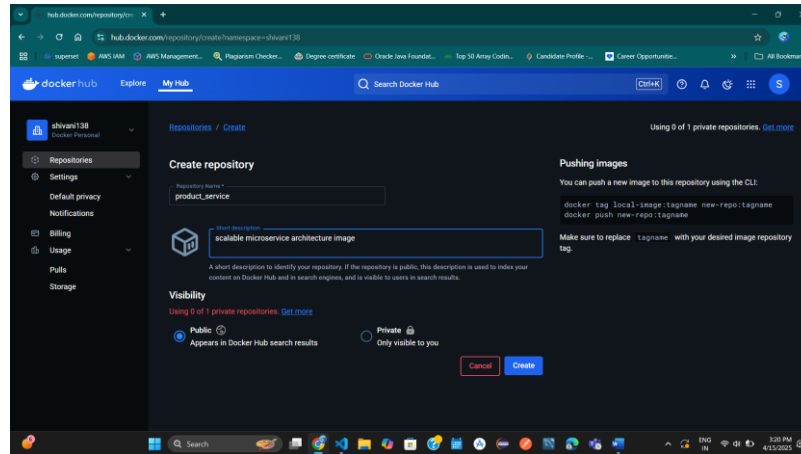
Step 2: Build and Push Docker Images (create image from dockerfile and push images to dockerhub)

- Login to docker hub account on browser



- Create repo to store image





- **Generate personal access token**

Dockerhub on browser → profile → account settings → personal access token → generate.

- **Login to dockerhub account on desktop powershell**

docker login – provide dockerhub username and token as password

- **Run these commands for each microservice: (Repeat for 3 services)**

- 1) Create image from dockerfile
docker build -t userimage .

```
PS C:\Users\shivani\OneDrive\Desktop\Fortune\Project\docker + k8s projects\k8s scalable microservice\users> docker build -t userimage .
[+] Building 08.5s (11/11) FROTHED
=> [internal] load build definition from Dockerfile
=> transferring Dockerfile: 160B
=> [internal] load metadata for docker.io/library/python:3.9
=> [auth] library/python:pull token for registry-1.docker.io
=> [internal] load dockerignore
=> transferring context: 2B
=> [internal] load build context
=> transferring context: 581B
=> [1/5] FROM docker.io/library/python:3.9@sha256:ab471124e080e2d03bb774c46bb1619bd37862f62b7e48eebe425a16dc153b
=> resolve docker.io/library/python:3.9@sha256:ab471124e080e2d03bb774c46bb1619bd37862f62b7e48eebe425a16dc153b
=> sha256:2a01b6fe192f426faef19a87bf4a624ebf9b7aa83a8e573fa261bf4a0c4061 2.32kB / 2.32kB
=> sha256:a32c68add188c788f143918c36677c3defdc8a358e5465e83c2c6bd808ef9 6.18kB / 6.18kB
=> sha256:33b7d3eaf1c29256a4e578ce2782779a85e4d8189731600c4b6d33849 48.40kB / 48.40kB
=> sha256:67d1b5a933d2dfc3d0d589d0e28534825e4a5377b086adcb5b8e5a1f20985 24.01kB / 24.01kB
=> sha256:1e898da8aeb4a24afac9ca3626a46feedd8d56d159cca9ba3520574ae7 64.40kB / 64.40kB
=> sha256:ab471124e080e2d03bb774c46bb1619bd37862f62b7e48eebe425a16dc153b 18.35kB / 18.35kB
=> sha256:b617a119f8a2798277409ecdeb373aac3d8d6fc234c865813926cf596ae021 211.33kB / 211.33kB
=> extracting sha256:3787d26ef1c29256a4e578ce2782779a85e4d8189731600c4b6d33849 3.3s
=> sha256:5893f2ab5418ad35eb7279548d6a2689599e97b3ea3ab9efabab3c261d537 6.16kB / 6.16kB
=> extracting sha256:87d1b5a933d2dfc3d0d589d0e28534825e4a5377b086adcb5b8e5a1f20985 0.9s
=> sha256:b3c4320af4838d6d8e4e557979ef478d6c118d6d9aa85ef193122ea 19.45kB / 19.45kB
=> sha256:1e898da8aeb4a24afac9ca3626a46feedd8d56d159cca9ba3520574ae7 34.5s
=> sha256:cc381ea1a988eda578c90732b81eece7d183a1c7114da21bca12886d769948 249B / 249B
=> extracting sha256:b617a119f8a2798277409ecdeb373aac3d8d6fc234c865813926cf596ae021 6.5s
=> extracting sha256:5893f2ab5418ad35eb7279548d6a2689599e97b3ea3ab9efabab3c261d537 0.3s
=> extracting sha256:b3c4320af4838d6d8e4e557979ef478d6c118d6d9aa85ef193122ea 0.9s
=> extracting sha256:cc381ea1a988eda578c90732b81eece7d183a1c7114da21bca12886d769948 0.9s
[2/5] WORKDIR /app
[3/5] COPY requirements.txt
[4/5] RUN pip install -r requirements.txt
[5/5] COPY
=> exporting image
=> exporting layers
=> writing image sha256:f0823ca4b3888a5f82e24f6d0b0823cf78ed0be99fca8aa192c485a375afddd
=> naming to docker.io/library/userimage
PS C:\Users\shivani\OneDrive\Desktop\Fortune\Project\docker + k8s projects\k8s scalable microservice\users> |
```

2) Tag image

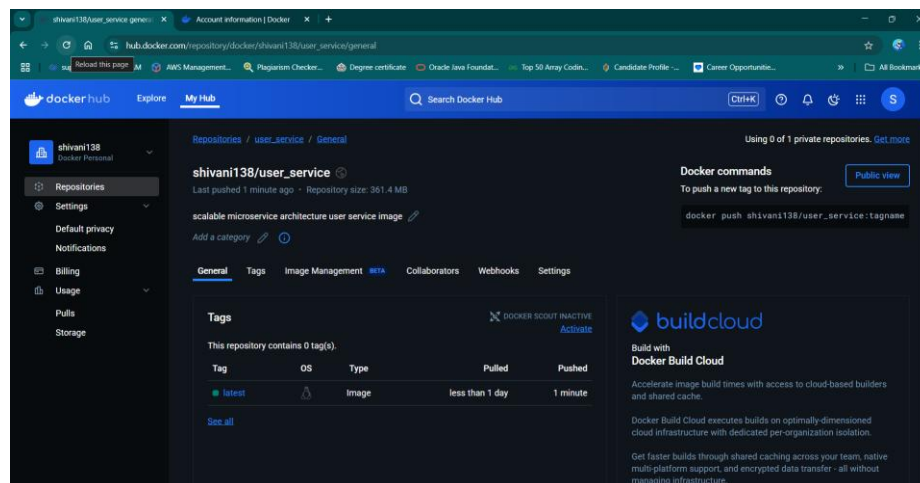
Docker tag image_username/repo_name

```
PS C:\Users\shivani.sathe\OneDrive\Desktop\Fortune\Project\docker > k8s projects\k8s scalable microservice\users> docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
userimage            latest             f8023cad8288        About a minute ago 1.01GB
customnginx         latest             43f6da7e9f63        4 weeks ago        133MB
nginx                latest             b52e8b899bc9        2 months ago        192MB
ubuntu              latest             a896c4851c8c        2 months ago        78.1MB
docker/welcome-to-docker latest             c1f619b6d77e        17 months ago        18.6MB
portainer/portainer latest             5f11502196a4        2 years ago         287MB
PS C:\Users\shivani.sathe\OneDrive\Desktop\Fortune\Project\docker > k8s projects\k8s scalable microservice\users> docker tag userimage shivani138/user_service
PS C:\Users\shivani.sathe\OneDrive\Desktop\Fortune\Project\docker > k8s projects\k8s scalable microservice\users> docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
userimage            latest             f8023cad8288        2 minutes ago      1.01GB
shivani138/user_service latest             f8023cad8288        2 minutes ago      1.01GB
customnginx         latest             43f6da7e9f63        4 weeks ago        133MB
nginx                latest             b52e8b899bc9        2 months ago        192MB
ubuntu              latest             a896c4851c8c        2 months ago        78.1MB
docker/welcome-to-docker latest             c1f619b6d77e        17 months ago        18.6MB
portainer/portainer latest             5f11502196a4        2 years ago         287MB
PS C:\Users\shivani.sathe\OneDrive\Desktop\Fortune\Project\docker > k8s projects\k8s scalable microservice\users> |
```

3) Push image to dockerhub

docker push username/repo_name

```
PS C:\Users\shivani.sathe\OneDrive\Desktop\Fortune\Project\docker > k8s projects\k8s scalable microservice\users> docker push shivani138/user_service
Using default tag: latest
The push refers to repository [docker.io/shivani138/user_service]
558ae507e3cc: Pushed
0e3c72dbd94c: Pushed
b4c31dd3e877: Pushed
57f478862431: Pushed
23443a55ecbb: Mounted from library/python
8d924c9d1e8d: Mounted from library/python
7229c4f4562f: Mounted from library/python
6c7c1b88da61: Mounted from library/python
b2bcbdb8bb2b: Mounted from library/python
7490537f86de: Mounted from library/python
f7f2b29298a5: Mounted from library/python
latest: digest: sha256:ede9252737c38d3ba6e48d8648ec88636de4a24bb56c73a8636af3435b78ccd4 size: 2627
PS C:\Users\shivani.sathe\OneDrive\Desktop\Fortune\Project\docker > k8s projects\k8s scalable microservice\users> |
```



Step 3: Create Kubernetes Deployment and Service Files

user-deployment.yaml

product-deployment.yaml

order-deployment.yaml

Note – code added in repo and create files on master node.

Step 4: Apply YAMLs

kubectl apply -f user-deployment.yaml

kubectl apply -f product-deployment.yaml

kubectl apply -f order-deployment.yaml

```
ubuntu@ip-172-31-3-220: ~$ kubectl apply -f order-deployment.yaml
deployment.apps/order-service created
service/order-service created
ubuntu@ip-172-31-3-220: ~$ kubectl apply -f product-deployment.yaml
deployment.apps/product-service created
service/product-service created
ubuntu@ip-172-31-3-220: ~$ kubectl apply -f user-deployment.yaml
deployment.apps/user-service created
service/user-service created
ubuntu@ip-172-31-3-220: ~$ kubectl get all

NAME                                READY    STATUS    RESTARTS   AGE
pod/order-service-7885ff7d5c-cd8cd   1/1      Running   0           65s
pod/product-service-c788cd55c-c5cgb  1/1      Running   0           19s
pod/user-service-f7d4c6b88-bk2pz     1/1      Running   0           4m

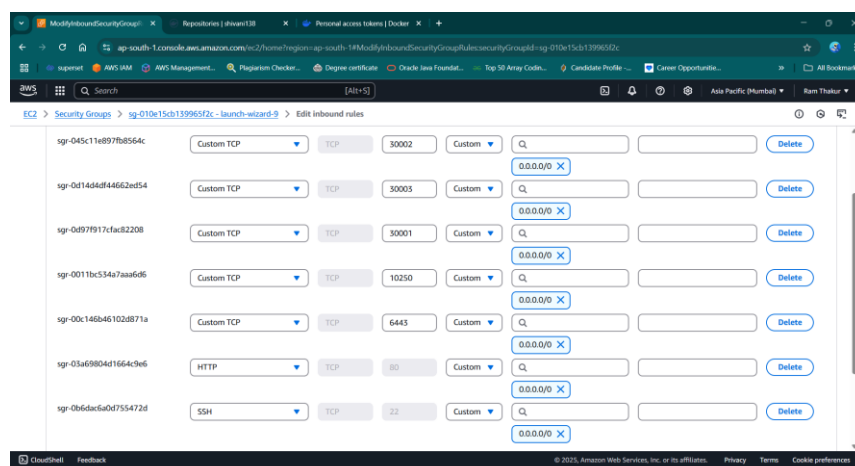
NAME                                TYPE          CLUSTER-IP    EXTERNAL-IP  PORT(S)          AGE
service/kubernetes                  ClusterIP     10.96.0.1     <none>       443/TCP          4h50m
service/order-service               NodePort      10.109.248.194 <none>       80:30003/TCP     65s
service/product-service             NodePort      10.109.198.175 <none>       80:30002/TCP     19s
service/user-service                NodePort      10.105.45.58   <none>       80:30001/TCP     4m

NAME                                READY    UP-TO-DATE   AVAILABLE   AGE
deployment.apps/order-service        1/1      1             1           65s
deployment.apps/product-service      1/1      1             1           19s
deployment.apps/user-service         1/1      1             1           4m

NAME                                DESIRED    CURRENT   READY   AGE
replicaset.apps/order-service-7885ff7d5c  1          1         1       65s
replicaset.apps/product-service-c788cd55c  1          1         1       19s
replicaset.apps/user-service-f7d4c6b88    1          1         1       4m
ubuntu@ip-172-31-3-220: ~$
```

Step 5: Test Microservices

Note - Add port 30001, 30002, 30003 in worker node sg



Go to browser and search

<http://localhost:30001/users>

<http://localhost:30002/products>

<http://localhost:30003/orders>

If using EC2 instance replace localhost with worker node ip

