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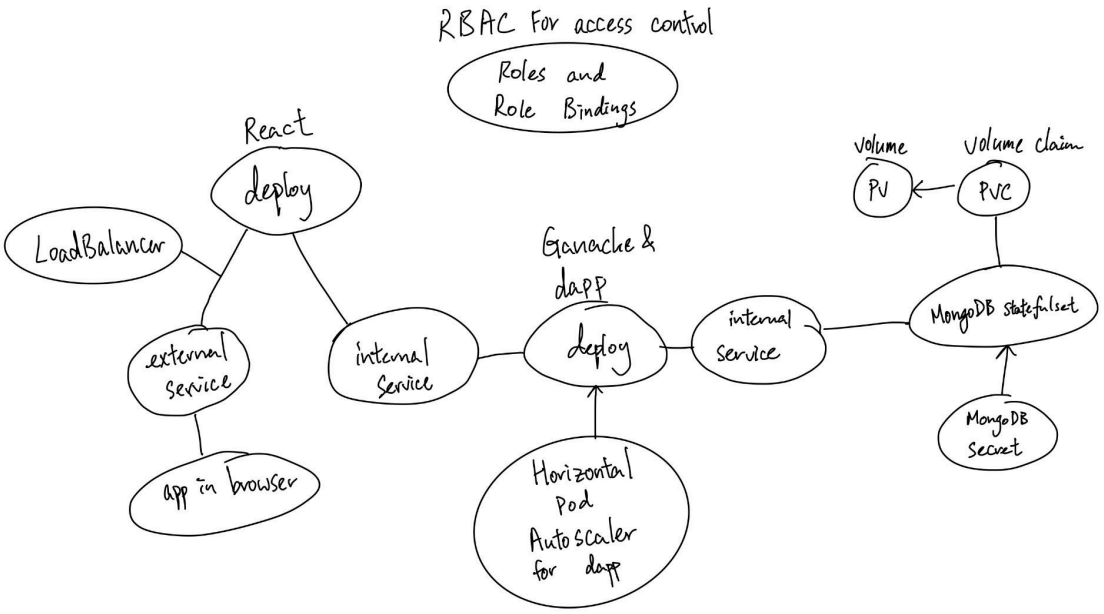
Lab4: Design Kubernetes Deployment Architecture



There are a total of three Deployments and one deployment option with StatefulSets. In this assignment, I added the mongodb as the database to manage data storage in the future application. The deployment option for mongodb is statefulset, because statefulset can provide stable network identities and persistent storage for each pod in the set. The stable hostname is well suited to mongodb to manage data because it allows other applications to reliably connect to a specific database pod, even if the pod is rescheduled or restarted. Also, statefulset supports the use of Persistent Volumes and Persistent Volume Claims, which was used in this application as well as storage. The Persistent storage ensures that data is not lost when a pod is terminated or rescheduled, which fits the purpose of using mongodb.

Besides, the Secret object is also used in the mongodb that allows to store and manage the username and password that are used as the authentication for connecting the database. Also, it is noted that images for dapp, react and ganache were loaded from local docker images built with ethereum-docker.

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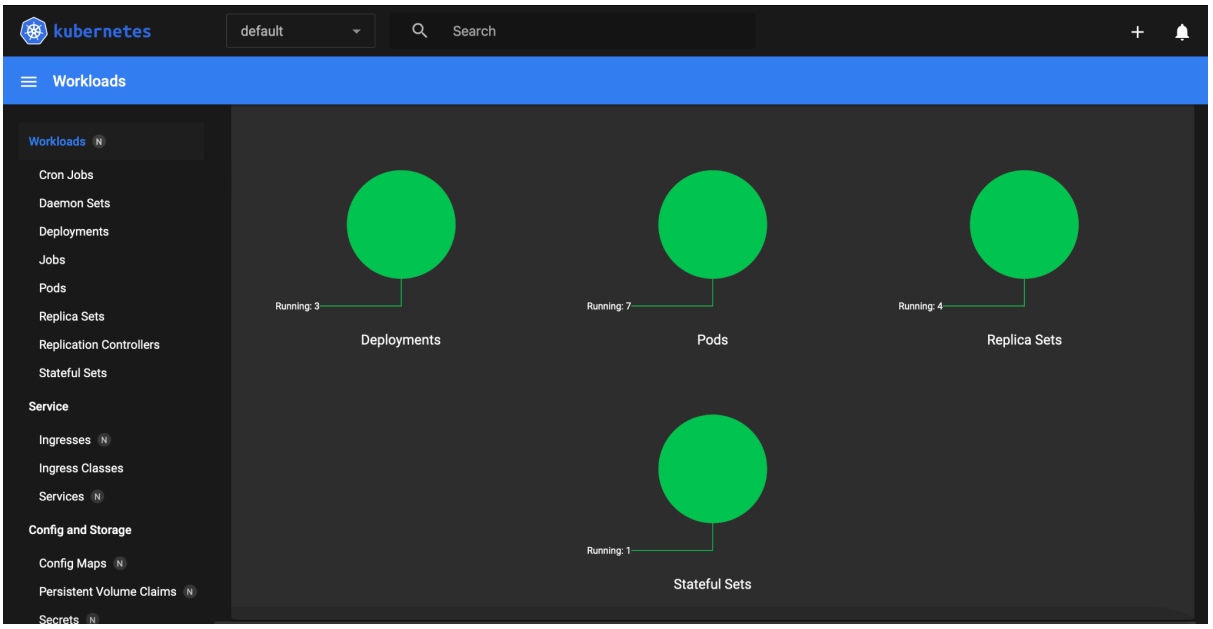
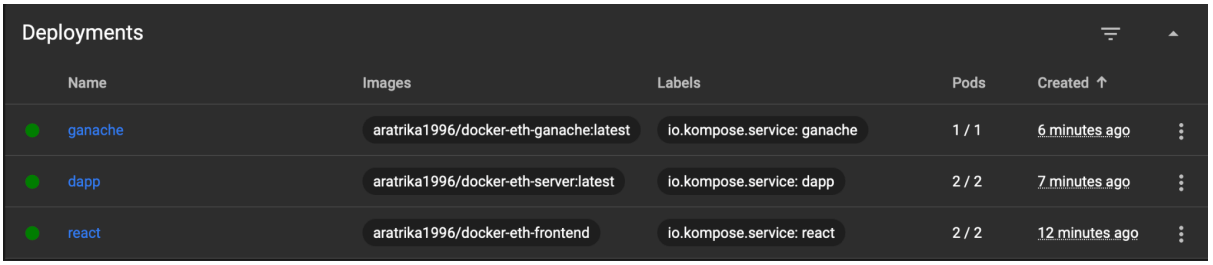
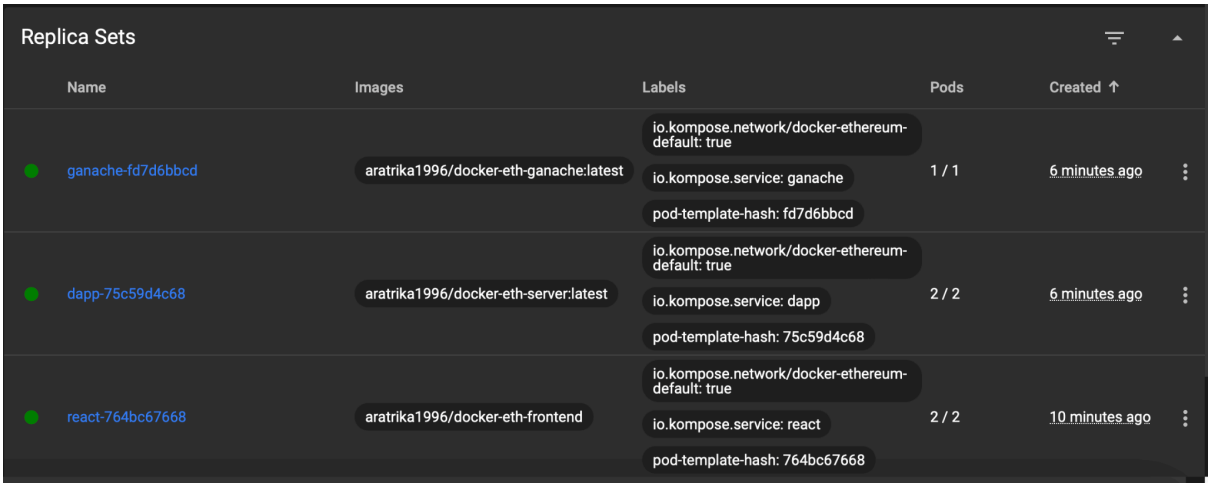
Screenshots from the dashboard







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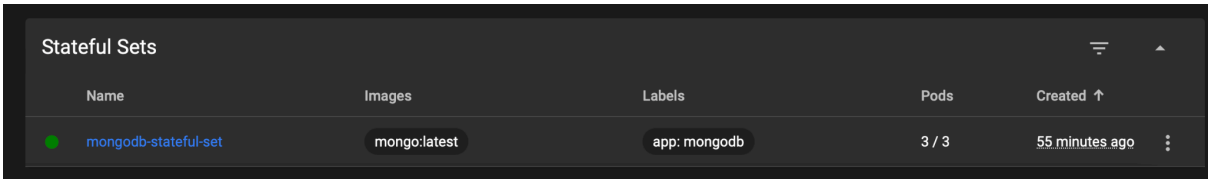

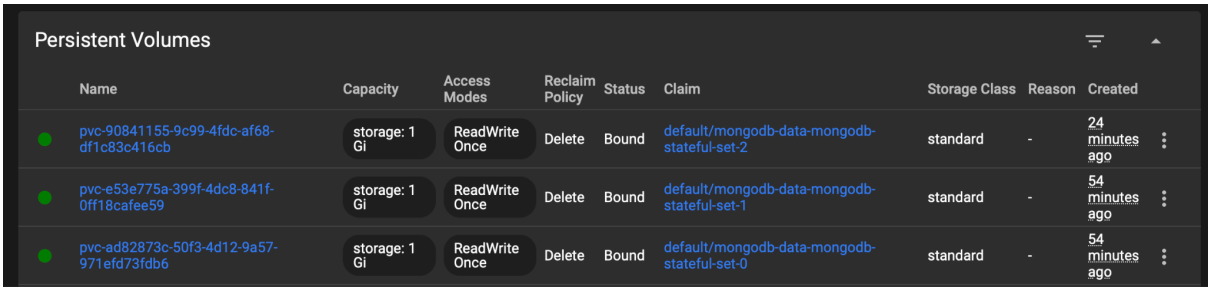

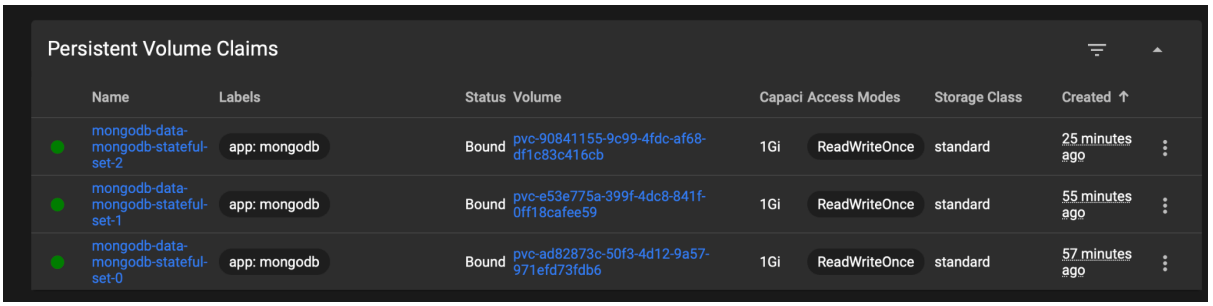

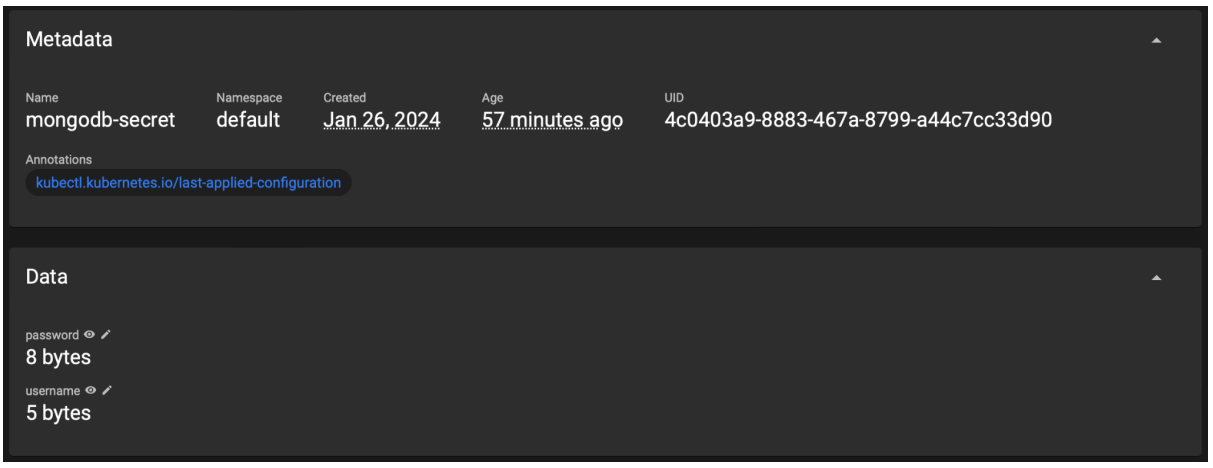

In total, 7 pods were created with 4 replica Sets, where react and dapp have 2 replicas. The replica makes sure two pods are running all the time. The replicas also allowed load balancing to perform. In this case, LoadBalancer was used to distribute incoming load to organize healthy replicas, preventing any single instance from becoming a bottleneck.

For the dapp deployment, there is a Horizontal Pod Autoscaler to control the number of pods in order to handle the additional load. In this application, the maximum replicas for HPA is assigned to be 5.

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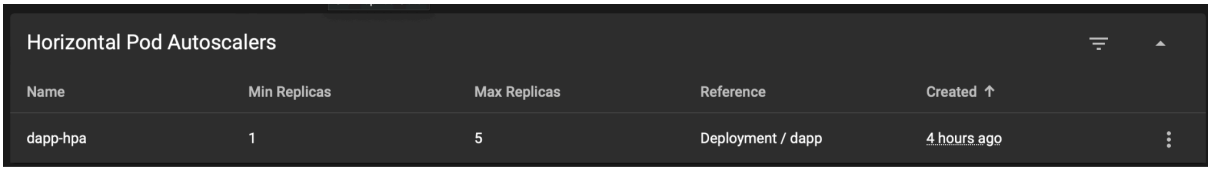
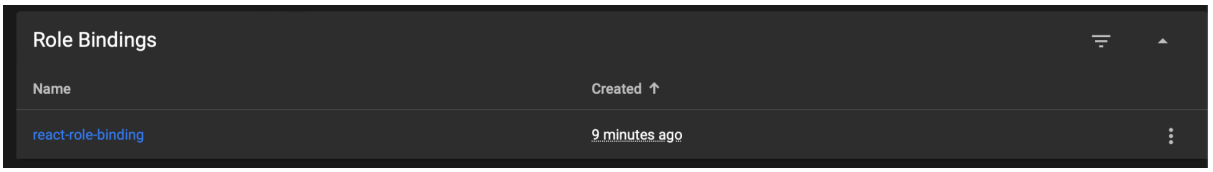
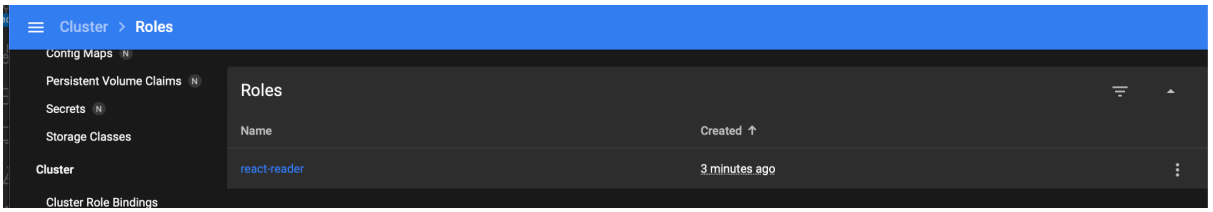


LoadBalancer is also used to manage pod load. LoadBalancer was used because it is a convenient and effective choice for exposing services externally.





For creating users and assigning roles, two YAML files define Kubernetes RBAC (Role-Based Access Control) resources (role.yaml and RoleBinding.yaml). The RoleBinding binds the react-service-account to the react-reader role, granting the specified permissions to that service account, in this situation ["get", "watch", "list"].