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Batch : A3

Module 1:

Cluster Initiated:

```
controlplane $ kubectl cluster-info
Kubernetes control plane is running at https://172.30.1.2:6443
CoreDNS is running at https://172.30.1.2:6443/api/v1/namespaces/kube-system/services/kube-dns:dns/proxy

To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.
controlplane $ kubectl get nodes
NAME           STATUS    ROLES           AGE    VERSION
controlplane   Ready     control-plane   18h    v1.29.0
node01         Ready     <none>          18h    v1.29.0
controlplane $
```

Module 2:

Deploying on cluster:
Nginx deployment:

```
controlplane $ kubectl create deployment nginx --image=nginx
deployment.apps/nginx created
controlplane $ kubectl expose deployment nginx --port=80 --type=LoadBalancer
service/nginx exposed
controlplane $ kubectl get service nginx
NAME    TYPE            CLUSTER-IP      EXTERNAL-IP    PORT(S)        AGE
nginx   LoadBalancer    10.98.141.203   <pending>      80:31165/TCP   6s
controlplane $ kubectl get deployments
NAME    READY    UP-TO-DATE    AVAILABLE    AGE
nginx   1/1      1             1            78s
controlplane $ kubectl get service nginx
NAME    TYPE            CLUSTER-IP      EXTERNAL-IP    PORT(S)        AGE
nginx   LoadBalancer    10.98.141.203   <pending>      80:31165/TCP   77s
```

Exposing deployment:

```
controlplane $ kubectl get service nginx
NAME    TYPE            CLUSTER-IP      EXTERNAL-IP    PORT(S)        AGE
nginx   LoadBalancer    10.98.141.203   <pending>      80:31165/TCP   77s
controlplane $ kubectl proxy
Starting to serve on 127.0.0.1:8001
```

Curling on second tab:

```
controlplane $ curl http://127.0.0.1:8001
{
  "paths": [
    "/.well-known/openid-configuration",
    "/api",
    "/api/v1",
    "/apis",
    "/apis/",
    "/apis/admissionregistration.k8s.io",
    "/apis/admissionregistration.k8s.io/v1",
    "/apis/apiextensions.k8s.io",
    "/apis/apiextensions.k8s.io/v1",
    "/apis/apiregistration.k8s.io",
    "/apis/apiregistration.k8s.io/v1",
    "/apis/apps",
    "/apis/apps/v1",
    "/apis/authentication.k8s.io",
    "/apis/authentication.k8s.io/v1",
    "/apis/authorization.k8s.io",
    "/apis/authorization.k8s.io/v1",
    "/apis/autoscaling",
    "/apis/autoscaling/v1",
    "/apis/autoscaling/v2",
    "/apis/batch",
    "/apis/batch/v1",
    "/apis/certificates.k8s.io",
    "/apis/certificates.k8s.io/v1",
    "/apis/coordination.k8s.io",
    "/apis/coordination.k8s.io/v1",
    "/apis/crd.projectcalico.org",
    "/apis/crd.projectcalico.org/v1",
    "/apis/discovery.k8s.io",
    "/apis/discovery.k8s.io/v1",
    "/apis/events.k8s.io",
```

```
    "/healthz/poststarthook/start-kube-apiserver-identity-lease-garbage-collector",
    "/healthz/poststarthook/start-legacy-token-tracking-controller",
    "/healthz/poststarthook/start-service-ip-repair-controllers",
    "/healthz/poststarthook/start-system-namespaces-controller",
    "/healthz/poststarthook/storage-object-count-tracker-hook",
    "/livez",
    "/livez/autoregister-completion",
    "/livez/etcd",
    "/livez/log",
    "/livez/ping",
    "/livez/poststarthook/aggregator-reload-proxy-client-cert",
    "/livez/poststarthook/apiservice-discovery-controller",
    "/livez/poststarthook/apiservice-openapi-controller",
    "/livez/poststarthook/apiservice-openapiv3-controller",
    "/livez/poststarthook/apiservice-registration-controller",
    "/livez/poststarthook/apiservice-status-available-controller",
    "/livez/poststarthook/bootstrap-controller",
    "/livez/poststarthook/crd-informer-synced",
    "/livez/poststarthook/generic-apiserver-start-informers",
    "/livez/poststarthook/kube-apiserver-autoregistration",
    "/livez/poststarthook/priority-and-fairness-config-consumer",
    "/livez/poststarthook/priority-and-fairness-config-producer",
    "/livez/poststarthook/priority-and-fairness-filter",
    "/livez/poststarthook/rbac/bootstrap-roles",
    "/livez/poststarthook/scheduling/bootstrap-system-priority-classes",
    "/livez/poststarthook/start-apiextensions-controllers",
    "/livez/poststarthook/start-apiextensions-informers",
    "/livez/poststarthook/start-cluster-authentication-info-controller",
    "/livez/poststarthook/start-kube-aggregator-informers",
    "/livez/poststarthook/start-kube-apiserver-admission-initializer",
    "/livez/poststarthook/start-kube-apiserver-identity-lease-controller",
    "/livez/poststarthook/start-kube-apiserver-identity-lease-garbage-collector",
    "/livez/poststarthook/start-legacy-token-tracking-controller",
    "/livez/poststarthook/start-service-ip-repair-controllers",
```

```
    "/readyz",
    "/readyz/autoregister-completion",
    "/readyz/etcd",
    "/readyz/etcd-readiness",
    "/readyz/informer-sync",
    "/readyz/log",
    "/readyz/ping",
    "/readyz/poststarthook/aggregator-reload-proxy-client-cert",
    "/readyz/poststarthook/apiservice-discovery-controller",
    "/readyz/poststarthook/apiservice-openapi-controller",
    "/readyz/poststarthook/apiservice-openapiv3-controller",
    "/readyz/poststarthook/apiservice-registration-controller",
    "/readyz/poststarthook/apiservice-status-available-controller",
    "/readyz/poststarthook/bootstrap-controller",
    "/readyz/poststarthook/crd-informer-synced",
    "/readyz/poststarthook/generic-apiserver-start-informers",
    "/readyz/poststarthook/kube-apiserver-autoregistration",
    "/readyz/poststarthook/priority-and-fairness-config-consumer",
    "/readyz/poststarthook/priority-and-fairness-config-producer",
    "/readyz/poststarthook/priority-and-fairness-filter",
    "/readyz/poststarthook/rbac/bootstrap-roles",
    "/readyz/poststarthook/scheduling/bootstrap-system-priority-classes",
    "/readyz/poststarthook/start-apiextensions-controllers",
    "/readyz/poststarthook/start-apiextensions-informers",
    "/readyz/poststarthook/start-cluster-authentication-info-controller",
    "/readyz/poststarthook/start-kube-aggregator-informers",
    "/readyz/poststarthook/start-kube-apiserver-admission-initializer",
    "/readyz/poststarthook/start-kube-apiserver-identity-lease-controller",
    "/readyz/poststarthook/start-kube-apiserver-identity-lease-garbage-collector",
    "/readyz/poststarthook/start-legacy-token-tracking-controller",
    "/readyz/poststarthook/start-service-ip-repair-controllers",
    "/readyz/poststarthook/start-system-namespaces-controller",
    "/readyz/poststarthook/storage-object-count-tracker-hook",
    "/readyz/shutdown",
```

Module 3:

Exploring application:

Get pods:

```
controlplane $ kubectl get pods
NAME                     READY   STATUS    RESTARTS   AGE
nginx-7854ff8877-ckslp   1/1     Running   0          10m
controlplane $ kubectl describe pods
```

Describe pods:

```
controlplane $ kubectl describe pods
Name:               nginx-7854ff8877-ckslp
Namespace:          default
Priority:           0
Service Account:    default
Node:               node01/172.30.2.2
Start Time:         Mon, 04 Mar 2024 09:36:45 +0000
Labels:             app=nginx
                    pod-template-hash=7854ff8877
Annotations:        cni.projectcalico.org/containerID: 935485f6b22e3a999a6f301d4d63b3adea94971f2ef7c15696c17b11be595399
                    cni.projectcalico.org/podIP: 192.168.1.4/32
                    cni.projectcalico.org/podIPs: 192.168.1.4/32
Status:             Running
IP:                 192.168.1.4
IPs:
  IP:               192.168.1.4
Controlled By:      ReplicaSet/nginx-7854ff8877
Containers:
  nginx:
    Container ID:   containerd://1d9bd054a6bea443c7c3c3d10d208886ef9e15f1ebee52819c57b67ee66883c7
    Image:          nginx
    Image ID:       docker.io/library/nginx@sha256:c26ae7472d624ba1fafd296e73cecc4f93f853088e6a9c13c0d52f6ca5865107
    Port:           <none>
    Host Port:      <none>
    State:          Running
      Started:      Mon, 04 Mar 2024 09:36:51 +0000
    Ready:          True
    Restart Count:  0
    Environment:    <none>
```

```
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-kdn4b (ro)
Conditions:
  Type                        Status
  PodReadyToStartContainers   True
  Initialized                 True
  Ready                       True
  ContainersReady             True
  PodScheduled                True
Volumes:
  kube-api-access-kdn4b:
    Type:                    Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds:  3607
    ConfigMapName:           kube-root-ca.crt
    ConfigMapOptional:       <nil>
    DownwardAPI:             true
QoS Class:                   BestEffort
Node-Selectors:              <none>
Tolerations:                 node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                             node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type    Reason     Age   From               Message
  ----    ------     ----  ----               -------
  Normal  Scheduled  11m   default-scheduler  Successfully assigned default/nginx-7854ff8877-ckslp to node01
  Normal  Pulling    11m   kubelet            Pulling image "nginx"
  Normal  Pulled     11m   kubelet            Successfully pulled image "nginx" in 5.277s (5.277s including waiting)
  Normal  Created    11m   kubelet            Created container nginx
  Normal  Started    11m   kubelet            Started container nginx
controlplane $
```

Exposing on proxy:

```
controlplane $ kubectl proxy
Starting to serve on 127.0.0.1:8001
```

Exlporing pods on another tab:

curl http://localhost:8001/api/v1/pods

```
                    "k:{\"type\":\"PodReadyToStartContainers\"}": {
                      ".": {},
                      "f:lastProbeTime": {},
                      "f:lastTransitionTime": {},
                      "f:status": {},
                      "f:type": {}
                    },
                    "k:{\"type\":\"Ready\"}": {
                      ".": {},
                      "f:lastProbeTime": {},
                      "f:lastTransitionTime": {},
                      "f:status": {},
                      "f:type": {}
                    }
                  },
                  "f:containerStatuses": {},
                  "f:hostIP": {},
                  "f:hostIPs": {},
                  "f:phase": {},
                  "f:podIP": {},
                  "f:podIPs": {
                    ".": {},
                    "k:{\"ip\":\"172.30.2.2\"}": {
                      ".": {},
                      "f:ip": {}
                    }
                  },
                  "f:startTime": {}
                }
              },
              "subresource": "status"
            }
          ]
```

```json
            "path": "/lib/modules",
            "type": ""
          }
        },
        {
          "name": "kube-api-access-5fz6g",
          "projected": {
            "sources": [
              {
                "serviceAccountToken": {
                  "expirationSeconds": 3607,
                  "path": "token"
                }
              },
              {
                "configMap": {
                  "name": "kube-root-ca.crt",
                  "items": [
                    {
                      "key": "ca.crt",
                      "path": "ca.crt"
                    }
                  ]
                }
              },
              {
                "downwardAPI": {
                  "items": [
                    {
                      "path": "namespace",
                      "fieldRef": {
                        "apiVersion": "v1",
                        "fieldPath": "metadata.namespace"
```

```
              ]
            }
          }
        ],
        "defaultMode": 420
      }
    }
  ],
  "containers": [
    {
      "name": "kube-proxy",
      "image": "registry.k8s.io/kube-proxy:v1.29.0",
      "command": [
        "/usr/local/bin/kube-proxy",
        "--config=/var/lib/kube-proxy/config.conf",
        "--hostname-override=$(NODE_NAME)"
      ],
      "env": [
        {
          "name": "NODE_NAME",
          "valueFrom": {
            "fieldRef": {
              "apiVersion": "v1",
              "fieldPath": "spec.nodeName"
            }
          }
        }
      ],
      "resources": {},
      "volumeMounts": [
        {
          "name": "kube-proxy",
          "mountPath": "/var/lib/kube-proxy"
```

```json
          {
            "name": "kube-proxy",
            "mountPath": "/var/lib/kube-proxy"
          },
          {
            "name": "xtables-lock",
            "mountPath": "/run/xtables.lock"
          },
          {
            "name": "lib-modules",
            "readOnly": true,
            "mountPath": "/lib/modules"
          },
          {
            "name": "kube-api-access-5fz6g",
            "readOnly": true,
            "mountPath": "/var/run/secrets/kubernetes.io/serviceaccount"
          }
        ],
        "terminationMessagePath": "/dev/termination-log",
        "terminationMessagePolicy": "File",
        "imagePullPolicy": "IfNotPresent",
        "securityContext": {
          "privileged": true
        }
      }
    ],
    "restartPolicy": "Always",
    "terminationGracePeriodSeconds": 30,
    "dnsPolicy": "ClusterFirst",
    "nodeSelector": {
      "kubernetes.io/os": "linux"
    },
```

```
    ],
    "startTime": "2024-03-03T15:16:21Z",
    "containerStatuses": [
      {
        "name": "local-path-provisioner",
        "state": {
          "running": {
            "startedAt": "2024-03-04T09:20:32Z"
          }
        },
        "lastState": {
          "terminated": {
            "exitCode": 255,
            "reason": "Unknown",
            "startedAt": "2024-03-03T15:29:58Z",
            "finishedAt": "2024-03-04T09:19:19Z",
            "containerID": "containerd://b62a049f602b55a07facfb8a617dd180505fc998d5595f694c9941c971b32e20"
          }
        },
        "ready": true,
        "restartCount": 2,
        "image": "docker.io/rancher/local-path-provisioner:master-head",
        "imageID": "docker.io/rancher/local-path-provisioner@sha256:ad40581f52bc1b8717ddfae5a33257110f11698a11751a95afc48e62d35a
befc",
        "containerID": "containerd://7d75ca4d512aeddf3d104fe77670b75175cec67c96cb0419e02303643c9d2e92",
        "started": true
      }
    ],
    "qosClass": "BestEffort"
  }
}
```

Outcomes:

CO4: Examine various security issues in cloud

Conclusion:

We can conclude that we have learnt about application deployment using Kubernetes (PaaS)