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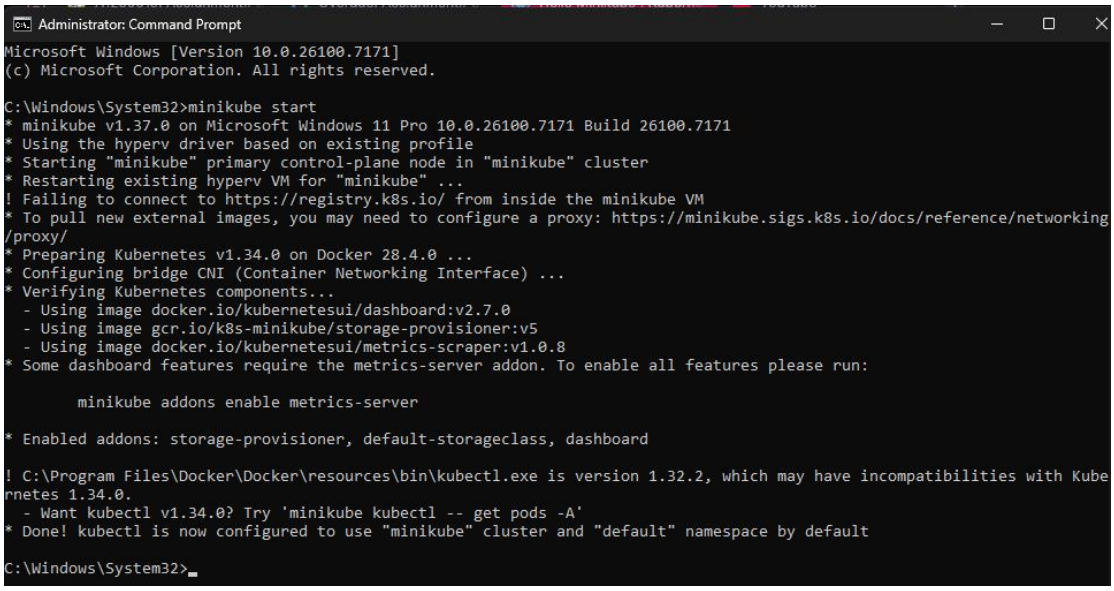
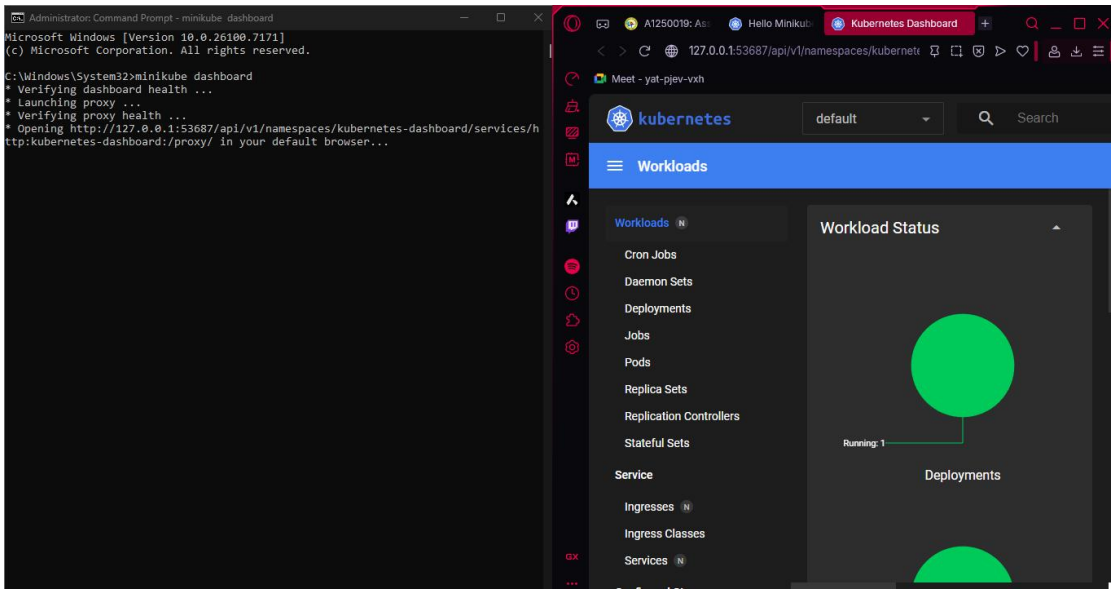
Assignment #5 - Kubernetes Home Lab Activity

1. Hello Minikube

- Creating a Minikube Cluster



- Opening the Kubernetes Dashboard



- Creating a Deployement

```
C:\Windows\System32>kubectl create deployment hello-node --image=registry.k8s.io/e2e-test-images/agnhost:2.53 -- /agnhos
t netexec --http-port=8080
deployment.apps/hello-node created
```

- View the Deployments

```
C:\Windows\System32>kubectl get deployments
NAME         READY   UP-TO-DATE   AVAILABLE   AGE
hello-node   1/1     1            1           88s

C:\Windows\System32>
```

- View the Pods

```
C:\Windows\System32>kubectl get pods
NAME                          READY   STATUS    RESTARTS   AGE
hello-node-6c9b5f4b59-2f2gf   1/1     Running   0          2m6s

C:\Windows\System32>
```

- View Cluster Events

```
C:\Windows\System32>kubectl get events
LAST SEEN   TYPE     REASON                    OBJECT
MESSAGE
2m27s       Normal   Scheduled                 pod/hello-node-6c9b5f4b59-2f2gf
Successfully assigned default/hello-node-6c9b5f4b59-2f2gf to minikube
2m26s       Normal   Pulling                   pod/hello-node-6c9b5f4b59-2f2gf
Pulling image "registry.k8s.io/e2e-test-images/agnhost:2.53"
2m16s       Normal   Pulled                    pod/hello-node-6c9b5f4b59-2f2gf
Successfully pulled image "registry.k8s.io/e2e-test-images/agnhost:2.53" in 9.815s
 (9.815s including waiting). Image size: 139374622 bytes.
2m16s       Normal   Created                   pod/hello-node-6c9b5f4b59-2f2gf
Created container: agnhost
2m16s       Normal   Started                   pod/hello-node-6c9b5f4b59-2f2gf
Started container agnhost
2m27s       Normal   SuccessfulCreate          replicaset/hello-node-6c9b5f4b59
Created pod: hello-node-6c9b5f4b59-2f2gf
2m27s       Normal   ScalingReplicaSet         deployment/hello-node
Scaled up replica set hello-node-6c9b5f4b59 from 0 to 1
3m27s       Normal   Starting                  node/minikube
Starting kubelet.
3m27s       Normal   NodeAllocatableEnforced   node/minikube
Updated Node Allocatable limit across pods
3m26s       Normal   NodeHasSufficientMemory   node/minikube
Node minikube status is now: NodeHasSufficientMemory
3m26s       Normal   NodeHasNoDiskPressure     node/minikube
Node minikube status is now: NodeHasNoDiskPressure
3m26s       Normal   NodeHasSufficientPID      node/minikube
Node minikube status is now: NodeHasSufficientPID
3m23s       Normal   NodeReady                 node/minikube
Node minikube status is now: NodeReady
3m23s       Normal   RegisteredNode            node/minikube
Node minikube event: Registered Node minikube in Controller
3m20s       Normal   Starting                  node/minikube
```

- View the kubectl configuration

```
C:\Windows\System32>kubectl config view
apiVersion: v1
clusters:
- cluster:
    certificate-authority: C:\Users\admin  pc\.minikube\ca.crt
    extensions:
    - extension:
        last-update: Mon, 01 Dec 2025 20:50:38 +08
        provider: minikube.sigs.k8s.io
        version: v1.37.0
      name: cluster_info
    server: https://172.29.106.254:8443
  name: minikube
contexts:
- context:
    cluster: minikube
    extensions:
    - extension:
        last-update: Mon, 01 Dec 2025 20:50:38 +08
        provider: minikube.sigs.k8s.io
        version: v1.37.0
      name: context_info
    namespace: default
    user: minikube
  name: minikube
current-context: minikube
kind: Config
preferences: {}
users:
- name: minikube
  user:
    client-certificate: C:\Users\admin  pc\.minikube\profiles\minikube\client.crt
    client-key: C:\Users\admin  pc\.minikube\profiles\minikube\client.key
```

- View Application Logs from Containers

```
C:\Windows\System32>kubectl logs hello-node-6c9b5f4b59-2f2gf
I1201 12:50:45.766007       1 log.go:245] Started HTTP server on port 8080
I1201 12:50:45.766364       1 log.go:245] Started UDP server on port  8081

C:\Windows\System32>
```

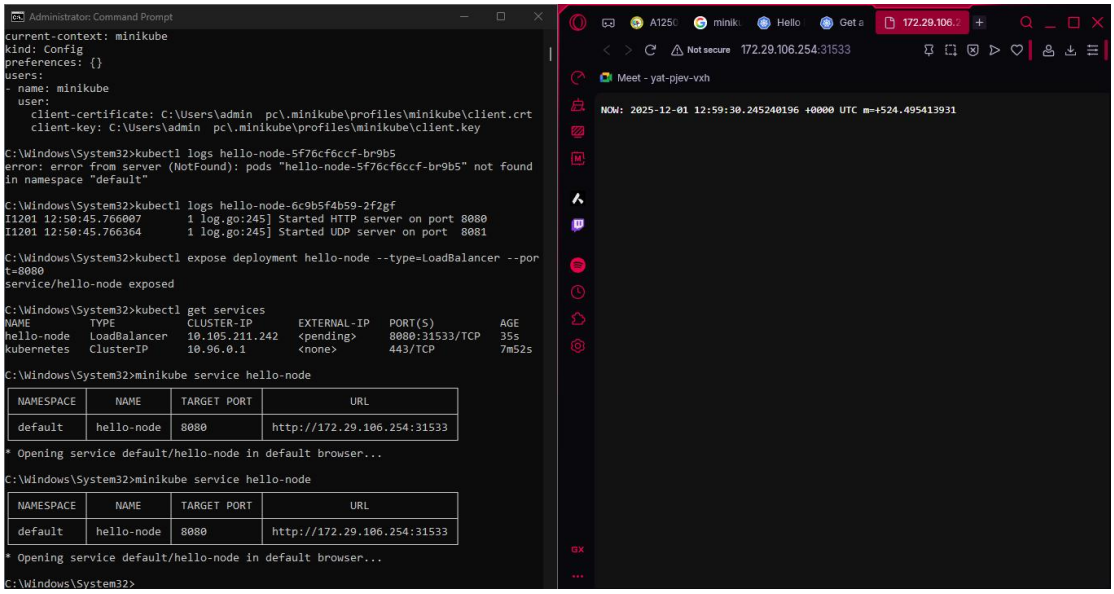
- Exposing the Pod to the public internet

```
C:\Windows\System32>kubectl expose deployment hello-node --type=LoadBalancer --por
t=8080
service/hello-node exposed

C:\Windows\System32>
```

- View the Created Services

```
C:\Windows\System32>kubectl get services
NAME         TYPE           CLUSTER-IP       EXTERNAL-IP   PORT(S)          AGE
hello-node   LoadBalancer   10.105.211.242   <pending>     8080:31533/TCP   35s
kubernetes   ClusterIP      10.96.0.1        <none>        443/TCP          7m52s

C:\Windows\System32>
```

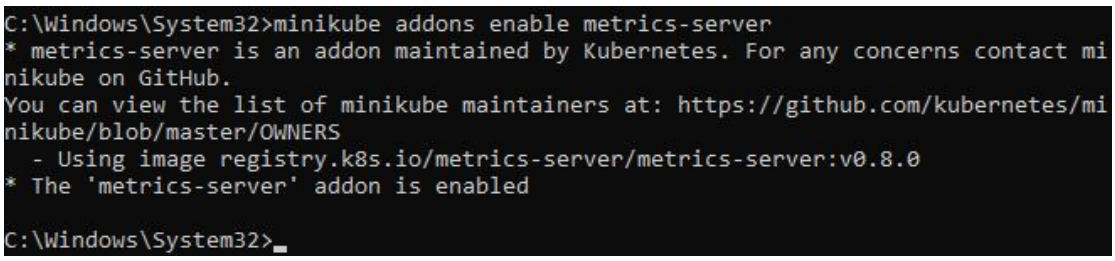
- Opening up a browser window that serves your app and shows the app's response.



- Viewing currently supported addons

```
C:\Windows\System32>minikube addons list
|-----------------------------|----------|--------------|--------------------------------|
|         ADDON NAME          | PROFILE  |    STATUS    |           MAINTAINER           |
|-----------------------------|----------|--------------|--------------------------------|
| ambassador                  | minikube | disabled     | 3rd party (Ambassador)         |
| amd-gpu-device-plugin       | minikube | disabled     | 3rd party (AMD)                |
| auto-pause                  | minikube | disabled     | minikube                       |
| cloud-spanner               | minikube | disabled     | Google                         |
| csi-hostpath-driver         | minikube | disabled     | Kubernetes                     |
| dashboard                   | minikube | disabled     | Kubernetes                     |
| default-storageclass        | minikube | enabled ☑    | Kubernetes                     |
| efk                         | minikube | disabled     | 3rd party (Elastic)            |
| freshpod                    | minikube | disabled     | Google                         |
| gcp-auth                    | minikube | disabled     | Google                         |
| gvisor                      | minikube | disabled     | minikube                       |
| headlamp                    | minikube | disabled     | 3rd party (kinvolk.io)         |
| inaccel                     | minikube | disabled     | 3rd party (InAccel [info@i
naccel.com]) |
| ingress                     | minikube | disabled     | Kubernetes                     |
| ingress-dns                 | minikube | disabled     | minikube                       |
| inspektor-gadget            | minikube | disabled     | 3rd party (inspektor-gadge
t.io)
| istio                       | minikube | disabled     | 3rd party (Istio)              |
| istio-provisioner           | minikube | disabled     | 3rd party (Istio)              |
```

- Enabling an addon (Metrics Services)



```
C:\Windows\System32>minikube addons enable metrics-server
* metrics-server is an addon maintained by Kubernetes. For any concerns contact mi
nikube on GitHub.
You can view the list of minikube maintainers at: https://github.com/kubernetes/mi
nikube/blob/master/OWNERS
  - Using image registry.k8s.io/metrics-server/metrics-server:v0.8.0
* The 'metrics-server' addon is enabled

C:\Windows\System32>
```

- View the Pod Services your created with the addon installed

```
C:\Windows\System32>kubectl get pod,svc -n kube-system
NAME                                   READY   STATUS    RESTARTS   AGE
pod/coredns-66bc5c9577-blkd7           1/1     Running   0          12m
pod/etcd-minikube                      1/1     Running   0          12m
pod/kube-apiserver-minikube            1/1     Running   0          12m
pod/kube-controller-manager-minikube   1/1     Running   0          12m
pod/kube-proxy-c557t                   1/1     Running   0          12m
pod/kube-scheduler-minikube            1/1     Running   0          12m
pod/metrics-server-85b7d694d7-m52f9    0/1     Running   0          54s
pod/storage-provisioner                1/1     Running   0          12m

NAME                     TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)
         AGE
service/kube-dns         ClusterIP   10.96.0.10     <none>        53/UDP,53/TCP,91
53/TCP   12m
service/metrics-server   ClusterIP   10.98.74.242   <none>        443/TCP
         54s

C:\Windows\System32>
```

- Check the output from metrics-server

```
C:\Windows\System32>kubectl top pods
NAME                          CPU(cores)   MEMORY(bytes)
hello-node-6c9b5f4b59-2f2gf   1m           5Mi

C:\Windows\System32>
```

- Disable the metrics-server addon

```
C:\Windows\System32>minikube addons disable metrics-server
* "The 'metrics-server' addon is disabled

C:\Windows\System32>
```

- Cleaning Up

```
C:\Windows\System32>kubectl delete service hello-node
service "hello-node" deleted

C:\Windows\System32>kubectl delete deployment hello-node
deployment.apps "hello-node" deleted

C:\Windows\System32>
```

- Stopping the Minikube

2. Get A Shell to a Running Container

- Creating the Pod and Verifying if it's running

```
C:\Windows\System32>kubectl apply -f https://k8s.io/examples/application/shell-dem
o.yaml
pod/shell-demo created

C:\Windows\System32>kubectl get pod shell-demo
NAME         READY   STATUS              RESTARTS   AGE
shell-demo   0/1     ContainerCreating   0          8s

C:\Windows\System32>
```

- Get a Shell to the Running Container and list the root directory

```
C:\Windows\System32>kubectl exec --stdin --tty shell-demo -- /bin/bash
root@minikube:/# ls /
bin   docker-entrypoint.d   home   media  proc  sbin  tmp
boot  docker-entrypoint.sh  lib    mnt    root  srv   usr
dev   etc                   lib64  opt    run   sys   var
```

- Writing the Root Page for Nginx

```
root@minikube:/# echo 'Hello shell demo' > /usr/share/nginx/html/index.html
```

- Sending a GET request to the nginx server

```
root@minikube:/# apt-get update
Get:1 http://deb.debian.org/debian trixie InRelease [140 kB]
Get:2 http://deb.debian.org/debian trixie-updates InRelease [47.3 kB]
Get:3 http://deb.debian.org/debian-security trixie-security InRelease [43.4 kB]
Get:4 http://deb.debian.org/debian trixie/main amd64 Packages [9670 kB]
Get:5 http://deb.debian.org/debian trixie-updates/main amd64 Packages [5412 B]
Get:6 http://deb.debian.org/debian-security trixie-security/main amd64 Packages [7
6.0 kB]
Fetched 9982 kB in 2s (5904 kB/s)
Reading package lists... Done
root@minikube:/# apt-get install curl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
curl is already the newest version (8.14.1-2+deb13u2).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
root@minikube:/# curl http://localhost/
Hello shell demo
root@minikube:/#
```

- Exiting the Shell

```
root@minikube:/# exit
exit

C:\Windows\System32>
```

3. Deploying WordPress and MySQL with Persistent Volumes

- Downloading the MySQL and Wordpress Deployment YAMLS.

```
PS C:\Users\Admin> # Download MySQL YAML
>> Invoke-WebRequest -Uri "https://k8s.io/examples/application/wordpress/mysql-deployment.yaml" -OutFile "mysql-deployment.yaml"
>>
>> # Download WordPress YAML
>> Invoke-WebRequest -Uri "https://k8s.io/examples/application/wordpress/wordpress-deployment.yaml" -OutFile "wordpress-deployment.yaml"
>>
PS C:\Users\Admin>
```

- Creating a Kustomization.yaml with a secret generator.

```
PS C:\Users\Admin> @"
>> secretGenerator:
>> - name: mysql-pass
>>   literals:
>>   - password=GEEWONII
>> "@ > kustomization.yaml
>>
```

- Append the MySQL and WordPress YAML files to kustomization.yaml

```
PS C:\Users\Admin> @"
>> resources:
>>   - mysql-deployment.yaml
>>   - wordpress-deployment.yaml
>> "@ >> kustomization.yaml
>>
PS C:\Users\Admin>
```

- Deploying all resources to the cluster

```
PS C:\Users\Admin> kubectl apply -k .\
>>
secret/mysql-pass-fkgkd7hf27 created
service/wordpress created
Warning: spec.SessionAffinity is ignored for headless services
service/wordpress-mysql created
persistentvolumeclaim/mysql-pv-claim created
persistentvolumeclaim/wp-pv-claim created
deployment.apps/wordpress created
deployment.apps/wordpress-mysql created
PS C:\Users\Admin>
```

- Check if the Secret exists

```
PS C:\Users\Admin> kubectl get secrets
>>
NAME                    TYPE     DATA   AGE
mysql-pass-fkgkd7hf27   Opaque   1      42s
PS C:\Users\Admin>
```

- Check that PersistentVolumeClaims are bound

```
PS C:\Users\Admin> kubectl get secrets
>>
NAME                  TYPE     DATA   AGE
mysql-pass-fkgkd7hf27   Opaque   1      42s
PS C:\Users\Admin> kubectl get pvc
>>
NAME             STATUS   VOLUME                                     CAPACITY   ACCESS MODES   STORAGECLASS   VOLUMEATTRIBUTESCLASS   AGE
mysql-pv-claim   Bound    pvc-3d9e93f8-4518-42f6-928c-a1f67c06cedb   20Gi       RWO            standard       <unset>                 95s
wp-pv-claim      Bound    pvc-e51a71d7-4452-4a2a-bf35-05cf0a6cfaca   20Gi       RWO            standard       <unset>                 95s
PS C:\Users\Admin>
```

- Check that Pods are running:

```
PS C:\Users\Admin> kubectl get pods
>>
NAME                                READY   STATUS    RESTARTS   AGE
hello-minikube-bbcb89c6c-876tl      1/1     Running   0          54m
nginx-66686b6766-47x5v              1/1     Running   0          26m
shell-demo                          1/1     Running   0          23m
wordpress-598b5b87c4-h9n49          1/1     Running   0          2m30s
wordpress-mysql-869ff64b4d-vvgdt    1/1     Running   0          2m30s
PS C:\Users\Admin>
```

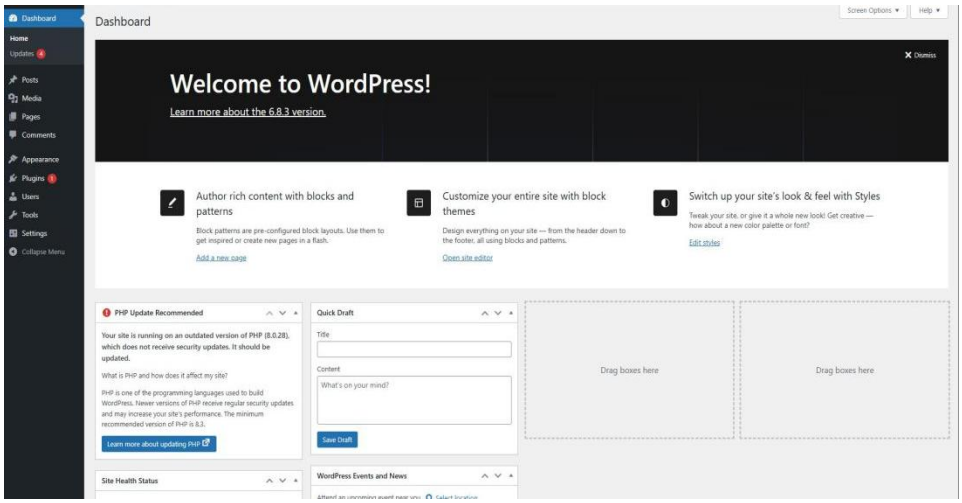
- Check that the WordPress Service exists

```
PS C:\Users\Admin> kubectl get services wordpress
>>
NAME        TYPE           CLUSTER-IP     EXTERNAL-IP   PORT(S)        AGE
wordpress   LoadBalancer   10.104.40.72   <pending>     80:30965/TCP   2m53s
PS C:\Users\Admin>
```

- Get the WordPress URL

```
PS C:\Users\Admin> minikube service wordpress --url
>>
http://192.168.59.100:30965
PS C:\Users\Admin>
```

- Setup Wordpress



- Clean Up

```
PS C:\Users\Admin> kubectl delete -k .\
>>
secret "mysql-pass-fkgkd7hf27" deleted from default namespace
service "wordpress" deleted from default namespace
service "wordpress-mysql" deleted from default namespace
persistentvolumeclaim "mysql-pv-claim" deleted from default namespace
persistentvolumeclaim "wp-pv-claim" deleted from default namespace
deployment.apps "wordpress" deleted from default namespace
deployment.apps "wordpress-mysql" deleted from default namespace
```