Tanzu Lab Manual

Agenda:

Day. 1:

1. Environment walk through and intros – 8-8:15 am

vSphere with Tanzu (Demos and walkthrough because of VPN issue progressive is having):

1.	Overview of vSphere with Tanzu	8-15-9:15 am

Cluster LCM

1.	Create and Configure Namespaces	9:15-11:15 am
2.	Provision TKG Cluster	
3.	Supervisor Cluster and TKG Networking (NSX, VDS/AVI)	
3.	Monitor and Manage resource	
4.	Authenticating with Supervisor and TKG cluster	
5.	Grant Developer access to TKG Clusters	
6.	Deploy application	
7.	Supervisor Cluster and TKG Networking (NSX, VDS/AVI)	
8.	Deploy vSphere pods	
9.	Scale TKG Cluster	
10.	Delete TKG Cluster	
11	Upgrade TKG Cluster walk through	11:15-12 pm
12	Upgrade supervisor cluster walk through	
13	Add host to a supervisor cluster walk through	
14	Remove host from a supervisor cluster walk through	

Lunch Break – 12-1 pm

TKG multi cloud (Demos and hands on):

1.	Overview of TKG – 1.3	1-2 pm
2.	TKG Networking (VDS with AVI)	

Cluster LCM / Application

0	Management Cluster demo	2-3:30 pm
1.	Provision TKG Cluster	
3.	Scale TKG Cluster	
4.	Delete TKG Cluster	
5.	Kill a worker node	
6.	Upgrade TKG Cluster walk through with zero downtime	

7.	Automated Load Balancing configuration and wiring from VIP to pod for a given application using k8s standard objects	
8.	Demonstrate User Access to k8s leveraging RBAC controls and integration with Enterprise Identity Management Systems	

Configuration and Management

1.	Base templates for cluster configuration and customization	3:30 – 4 pm
2.	How to use TKRs - demo	

Extensions:

1.	Push / Pull images to private registry	4-4:30 pm
2.	Demonstrate Image security scanning	
3.	Contour ingress	
4.	Show application log aggregation and forwarding capabilities with integration	
5.	Demonstrate integration with Wavefront to monitor k8s clusters, containers/pods and apps running on them	

LAB Access:

Ubuntu VM SSH:
10.254.202.10
Ubuntu\WWTwwt1!

VCenter login:

poc6207-vc01.wwtpoc.local
10.254.176.150
Administrator@vsphere.local\WWTatc123!

TKG-VIP

Network: 10.254.202.160/27 * VLAN ID: 470
Default Gateway: 10.254.202.161 Type: ATC Core Hosted

TKG-MGMT

Network: 10.254.207.0/24 * VLAN ID: 471
Default Gateway: 10.254.207.1 Type: ATC Core Hosted

DHCP Scope: 10.254.207.41-252

TKG-WKLD

Network: 10.254.208.0/24 * VLAN ID: 472
Default Gateway: 10.254.208.1 Type: ATC Core Hosted

DHCP Scope: 10.254.208.41-252

TKG:

Open Two putty sessions. Once you have two terminals, export this env variables.
export TANZU_CLI_PINNIPED_AUTH_LOGIN_SKIP_BROWSER=true

Cluster Life-Cycle Management (Cluster API)

Login to a management cluster

tanzu login

```
ubuntu@ubuntu:~/TSM/acme_fitness_demo/kubernetes-manifests$ tanzu login
? Select a server  [Use arrows to move, type to filter]
  tkg-mgmt             ()
> tkg-mgmt-ha          ()
  + new server
```

tanzu cluster list --include-management-cluster

```
ubuntu@ubuntu:~/TSM/acme_fitness_demo/kubernetes-manifests$ tanzu cluster list  --include-management-cluster
 NAME                     NAMESPACE   STATUS   CONTROLPLANE  WORKERS  KUBERNETES        ROLES           PLAN
 tkg-acmefitness-2        default     running  1/1           3/3      v1.20.5+vmware.2  <none>          dev
 tkg-cluster-acmefitness-1  default     running  1/1           3/3      v1.20.5+vmware.2  <none>          dev
 tkg-services             default     running  3/3           3/3      v1.20.5+vmware.2  tanzu-services  prod
 tkg-with-harbor          default     running  1/1           1/1      v1.20.5+vmware.2  <none>          dev
 tkg-mgmt-ha              tkg-system  running  3/3           1/1      v1.20.5+vmware.2  management      prod
```

Get admin kubeconfig for a specific workload cluster. In this case its tkg-with-harbor
tanzu cluster kubeconfig get tkg-with-harbor –admin
kubectl config use-context tkg-with-harbor-admin@tkg-with-harbor

```
ubuntu@ubuntu:~/TSM/acme_fitness_demo/kubernetes-manifests$ tanzu cluster kubeconfig get tkg-with-harbor --admin
Credentials of cluster 'tkg-with-harbor' have been saved
You can now access the cluster by running 'kubectl config use-context tkg-with-harbor-admin@tkg-with-harbor'
```

Provision TKG Cluster

cd ~/.tanzu/tkg/clusterconfigs/
cp tkg-acmefitenss-cluster-2.yaml tkg-cluster-1-<yourname>.yaml

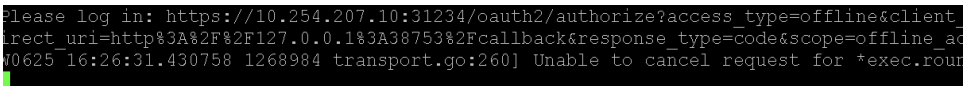
Vi tkg-cluster-1-<yourname>.yaml

Change clutser name:
CLUSTER_NAME: tkg-cluster-1-<yourname>

Provide a static ip to workload control plane node: (make sure that this ip is not in use or someone is not planning to use. Start with 10.254.208.15
VSPHERE_CONTROL_PLANE_ENDPOINT: 10.254.208.15

tanzu cluster create --file tkg-cluster-1-<yourname>.yaml --tkr v1.19.9---vmware.2-tkg.1
tanzu cluster kubeconfig get tkg-cluster-1-<yourname> --export-file tkg-cluster-1-<yourname>.cred
Kubectl get ns --kubeconfig tkg-cluster-1-<yourname>.cred

This would be an OIDC enabled cluster. Since this ubuntu machine does not have a browser, it will give you a url that you need to paste in browser in windows jump box and enter credentials.



Alana\VMware1VMware1

Once authenticated, copy the localhost url from browser and paste it in another putty session. This way you would be able to login to workload cluster.

Curl –L ‘url’

Manage your workload cluster with Tanzu Mission Control.

You will not be able to list resources since there are no role bindings for user alana. Let’s create a role binding by adding cluster to TMC.

- In the left navigation pane of the Tanzu Mission Control console, click Administration, and then click the Management clusters tab.
- In the table of management clusters, click the management cluster that contains the workload cluster you want to add.
- On the management cluster detail page, click the Workload clusters tab.
- In the list of workload clusters, select the clusters you want to add by clicking the checkbox next to the name, and then click Manage # Cluster(s).
- In the confirmation dialog, select the cluster group(pgrdveops) to which you want to add the clusters, and then click Manage.

Scale workload cluster

tanzu cluster scale tkg-cluster-1-<yourname> --worker-machine-count=3

Upgrade workload cluster

tanzu kubernetes-release get

tanzu cluster upgrade tkg-cluster-1-<yourname>

Push / Pull images to private registry

Harbor is already setup as an in-cluster extension in shared services cluster. Let's inspect shared services. Cluster.

kubectl config use-context tkg-services-admin@tkg-services

kubectl get po -n tanzu-system-registry

```
ubuntu@ubuntu:~/.tanzu/tkg/clusterconfigs$ kubectl get po -n tanzu-system-registry
NAME                                  READY   STATUS    RESTARTS   AGE
harbor-clair-6b45ccc6d7-9ncc2         2/2     Running   532        3d16h
harbor-core-7d7bfdffd4-qtn9c          1/1     Running   0          3d16h
harbor-database-0                     1/1     Running   0          3d16h
harbor-jobservice-764dcf7b69-wl871    1/1     Running   0          3d16h
harbor-notary-server-747bcddcdb-5h7dv 1/1     Running   0          3d16h
harbor-notary-signer-9db7d5984-mzfj7  1/1     Running   0          3d16h
harbor-portal-cb5756ffd-7hd2n         1/1     Running   0          3d16h
harbor-redis-0                        1/1     Running   0          3d16h
harbor-registry-7847bc96fd-b9224      2/2     Running   0          3d16h
harbor-trivy-0                        1/1     Running   0          3d16h
```

docker login pgrharbor.wwtpoc.local -u admin

TMC:

TMC runs pinniped on all clusters and configures it with a webhook which points to a TMC backend endpoint. The endpoint is just used by pinniped to validate the incoming opaque token. Kubeconfig provided by TMC uses the tmc CLI to perform the credential exchange. When the user issues a kubectl command using the kubeconfig, this is the high level flow that gets triggered-

- tmc CLI calls TMC backend to fetch a user cluster opaque token in exchange for CSP access + ID token
- CLI calls the tokencredentialrequest endpoint on pinniped passing in the user opaque token
- Pinniped uses the webhook endpoint to validate the incoming token.
- Once validated, pinniped generates a cert + key pair and returns that to the tmc CLI
- The tmc CLI uses that as the ExecCredential response to kubectl which allows kubectl to use the credentials to authenticate all outgoing calls to the apiserver

Follow this git repo below.

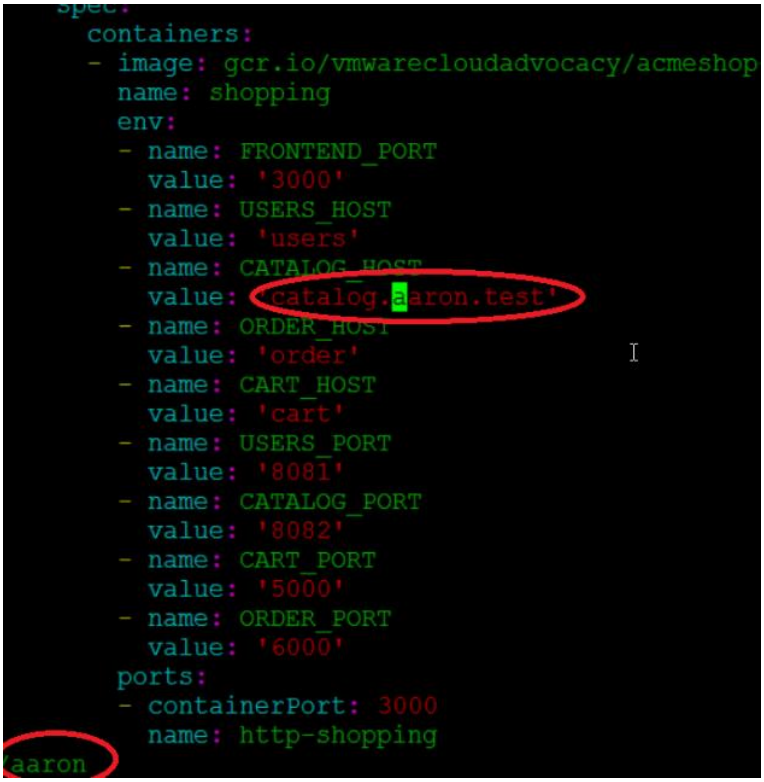
https://github.com/bmullan-pivotal/tmc-policy-demonstration

TSM:

Deploy to cluster1:

Change your kubeconfig context to your cluster 1.

- Deploy the Istio gateways - “kubectl apply -f acme_fitness_demo/istio-manifests/gateway.yaml”
- Deploy the secrets – “kubectl apply -f acme_fitness_demo/kubernetes-manifests/secrets.yaml”
- Before deploying the application itself, we need to change the YAML file to indicate what will be the name of the Catalog service the Frontend will try to reach. Select a GNS domains name (e.g. gnstest.local)
- Edit the manifest with “vim acme_fitness_demo/kubernetes-manifests/acme_fitness_cluster1.yaml” and search for “catalog” (in VIM you should press “/catalog”), you should see the placeholder name of GNS like this:



Change the suffix to your GNS domain name of choosing (e.g. acmegns.local) and save the file

```
    spec:
      containers:
      - image: gcr.io/vmwarecloudad
        name: shopping
        env:
        - name: FRONTEND_PORT
          value: '3000'
        - name: USERS_HOST
          value: 'users'
        - name: CATALOG_HOST
          value: 'catalog.acmegns.1
        - name: ORDER_HOST
          value: 'order'
        - name: CART_HOST
          value: 'cart'
        - name: USERS_PORT
          value: '8081'
        - name: CATALOG_PORT
          value: '8082'
        - name: CART_PORT
          value: '5000'
        - name: ORDER_PORT
          value: '6000'
        ports:
        - containerPort: 3000
          name: http-shopping
---
apiVersion: v1
kind: Service
metadata:
:x
```

- Now you can deploy the cluster1 services using “kubectl apply -f acme_fitness_demo/kubernetes-manifests/acme_fitness_cluster1.yaml”
- Monitor the services until you see the following services up: watch kubectl get po

```
+ kubectl get pods
NAME                              READY   STATUS    RESTARTS
cart-74d99f6c4-kx42x              2/2     Running   0
cart-redis-7fcbbc4f64-ldpqf       2/2     Running   0
order-8f64cc8d-gdhx9              2/2     Running   0
order-mongo-994ddf9d4-h9kdd       2/2     Running   0
payment-6767b9444f-7bxbp          2/2     Running   0
shopping-74fd757986-nvpws         2/2     Running   0
users-66984ff6f4-88rdf            2/2     Running   0
users-mongo-7979895bf8-tm589      2/2     Running   0
```

- You can see that each pod has 2 containers, this shows that the Envoy proxy has been injected
    - At this point figure out the ingress IP to access the application (depending on your load balancing and CNI solution you should get a “public” IP to interact with the application. To do this run “ kubectl get services -n istio-system | grep istio-ingressgateway” The external IP will be the second
- Navigate using a browser to http://<ingress IP>, you should see the Acme store but without pictures of products (we haven’t connected the catalog service yet). Also if clicking on catalog on the top should not show any products

Deploy to Cluster 2:

Change your kubeconfig context to cluster 2:

This cluster will run the catalog service and its catalog database. We will connect The frontend on K8s1 to the catalog on K8s2 in the following step. To deploy after you labeled the Default namespace with Istio injection run:

- Deploy the Istio gateways - “kubectl apply -f acme_fitness_demo/istio-manifests/gateway.yaml”
- Deploy the secrets – “kubectl apply -f acme_fitness_demo/kubernetes-manifests/secrets.yaml”
- Deploy the cluster2 services “kubectl apply -f acme_fitness_demo/kubernetes-manifests/acme_fitness_cluster2.yaml”

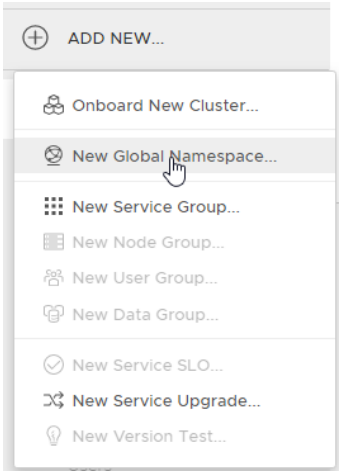
Monitor the services until you see the following services running:

```
+ kubectl get pods
NAME                              READY   STATUS    RESTARTS
catalog-69bd59b758-x8vzv          2/2     Running   0
catalog-mongo-646ffbcf9d-91ggz    2/2     Running   0
```

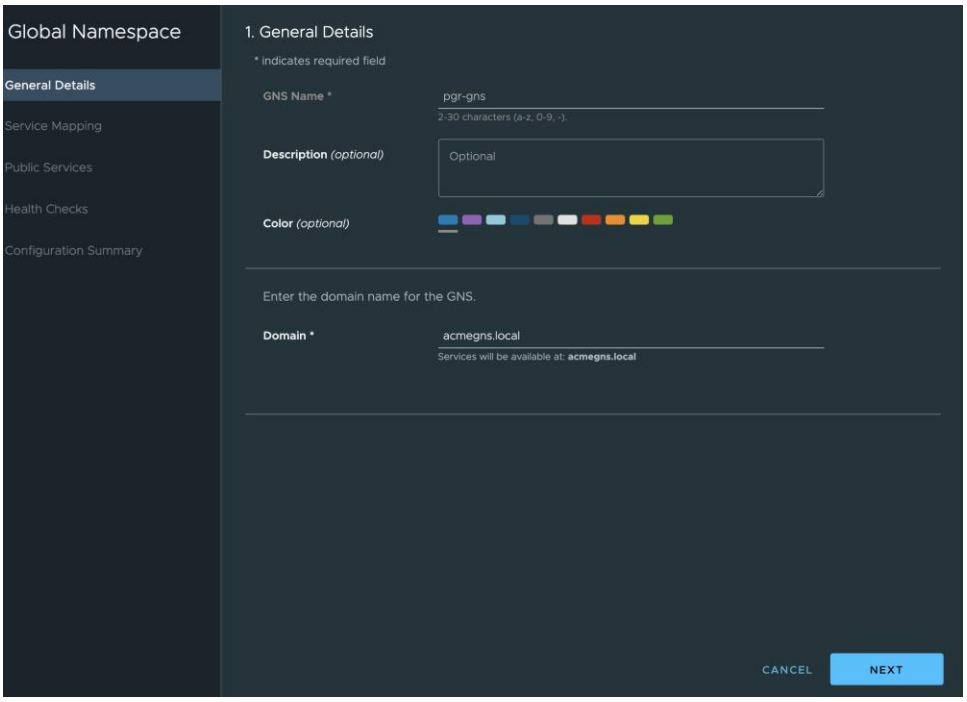
Create GNS

At this point we will create the GNS, once it is created and the virtualservices and the DNS entries are deployed, the Frontend on cluster K8s1 will know how to reach the Catalog on K8s2.

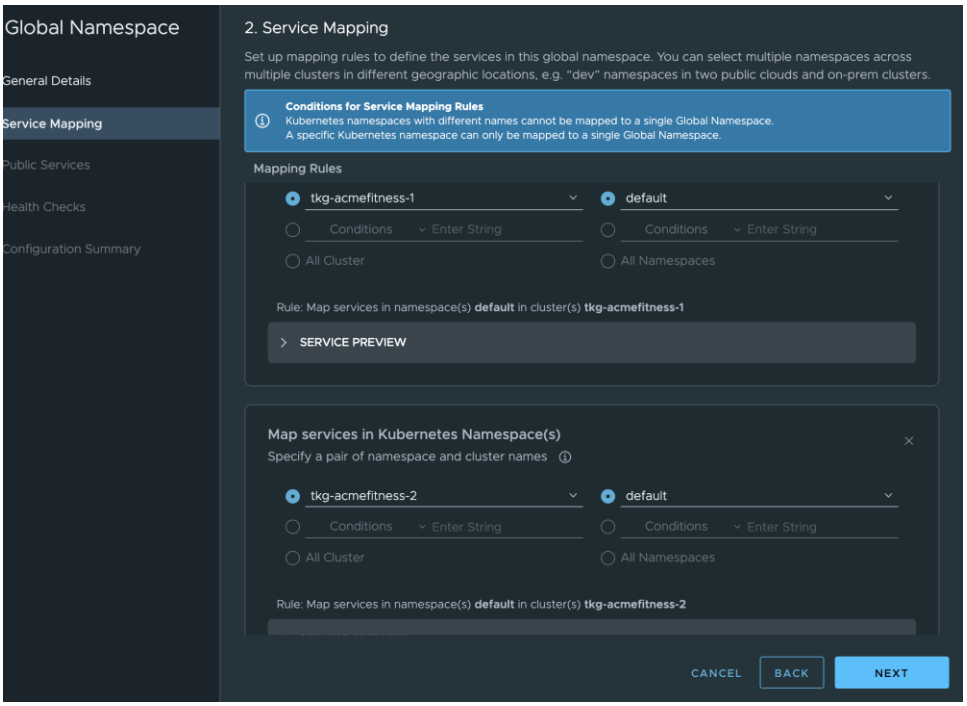
- In the console of NSX-SM, click on “Add new” and “New Global Namespace”



- Give the new GNS a name (in all small letters), in this example we use acmegns, and a domain name, which is the one you configured in a previous step on the “Cluster1” manifest. In our example it is acmegns.local

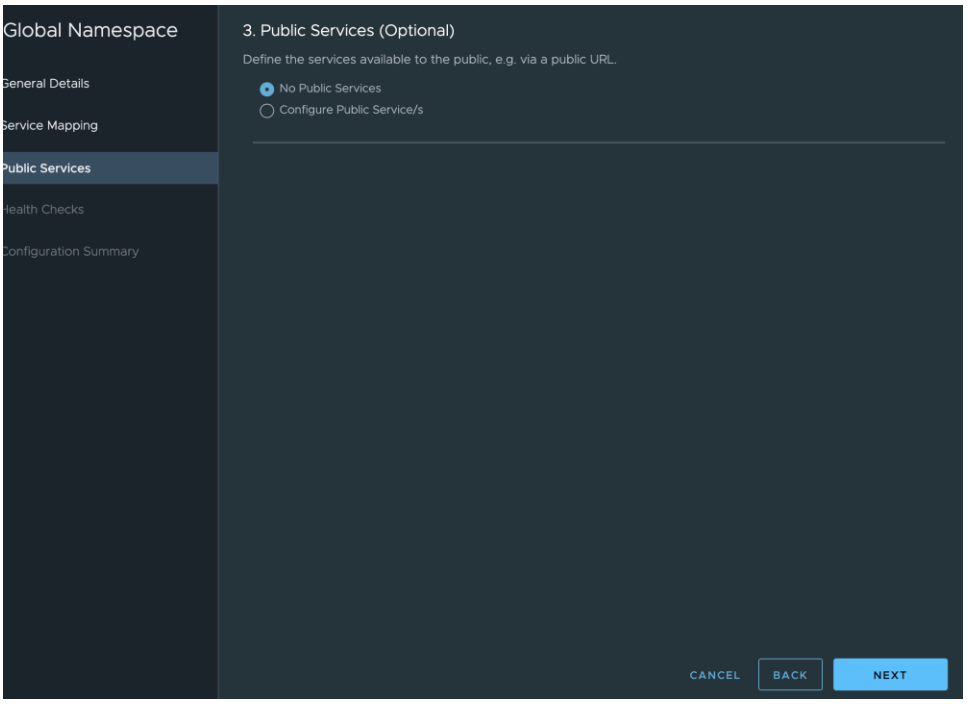


- In the next screen select the “default” namespace on each cluster, check that the system detects the services by expanding the “Service “review” section

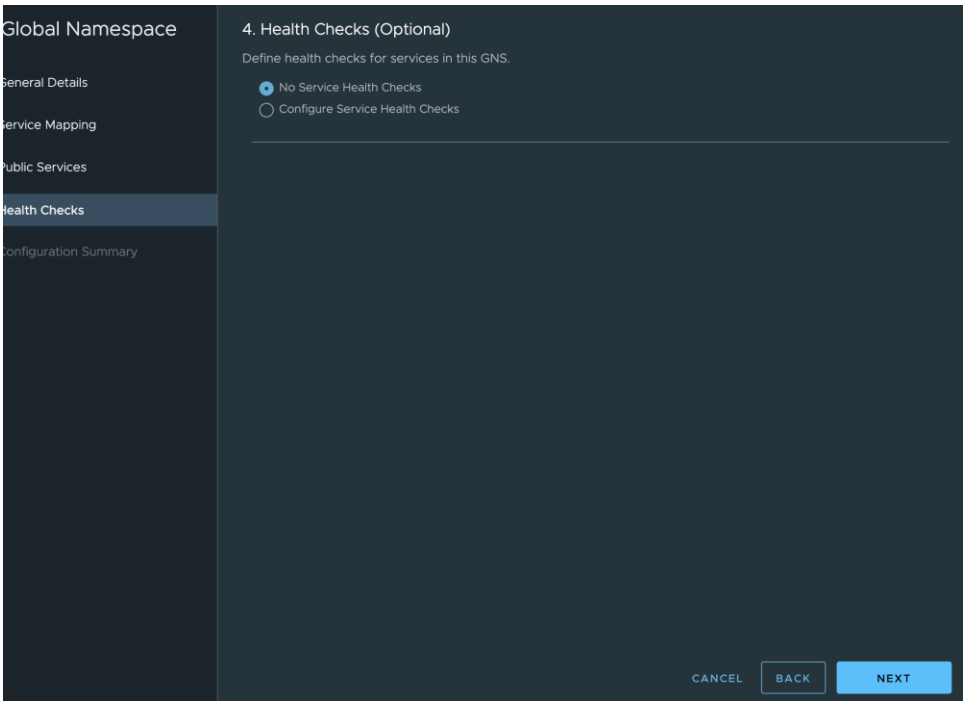


Click “add service mapping” to add all 3 clusters and then click “next”

- In “Public services” keep the default and click next



- Health Check optional



- Click “Finish”
- A message should pop up that the GNS was created successfully

To make sure the GNS is being created correctly run the command “kubectl get virtualservices”

```
kubo@jumper:~$ kubectl get virtualservices
NAME                              GATEWAYS          HOSTS                              AGE
acme                              [acme-gateway]    [*]                                28h
nsxsm.acmegns.cart                                  [cart.acmegns.local]               2m40s
nsxsm.acmegns.cart-redis                            [cart-redis.acmegns.local]         67s
nsxsm.acmegns.catalog                               [catalog.acmegns.local]            48s
nsxsm.acmegns.catalog-mongo                         [catalog-mongo.acmegns.local]      45s
nsxsm.acmegns.kubernetes                            [kubernetes.acmegns.local]         42s
nsxsm.acmegns.order                                 [order.acmegns.local]              2m35s
nsxsm.acmegns.order-mongo                           [order-mongo.acmegns.local]        2m3s
nsxsm.acmegns.payment                               [payment.acmegns.local]            100s
nsxsm.acmegns.shopping                              [shopping.acmegns.local]           2m28s
nsxsm.acmegns.users                                 [users.acmegns.local]              109s
```

To test now access the application again at http://<ingress ip> now you should see the catalog of products