1. Helm에 eks-chart 추가

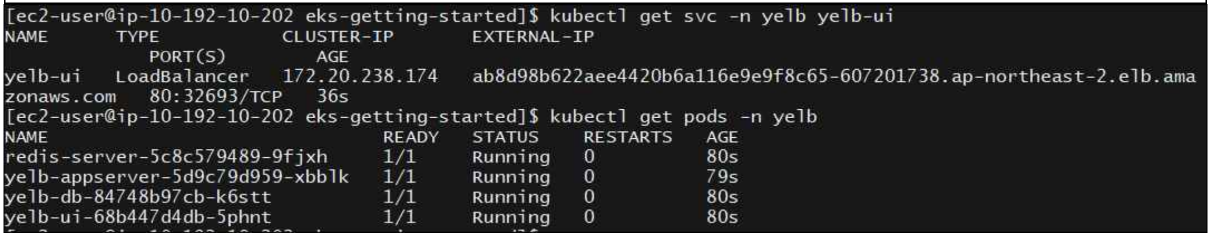
```
$ helm repo add eks https://aws.github.io/eks-charts
```

2. App Mesh Controller를 설치하기

```
$ kubectl create ns appmesh-system
$ helm upgrade -i appmesh-controller eks/appmesh-controller -n appmesh-system
$ kubectl get pods -n appmesh-system
```

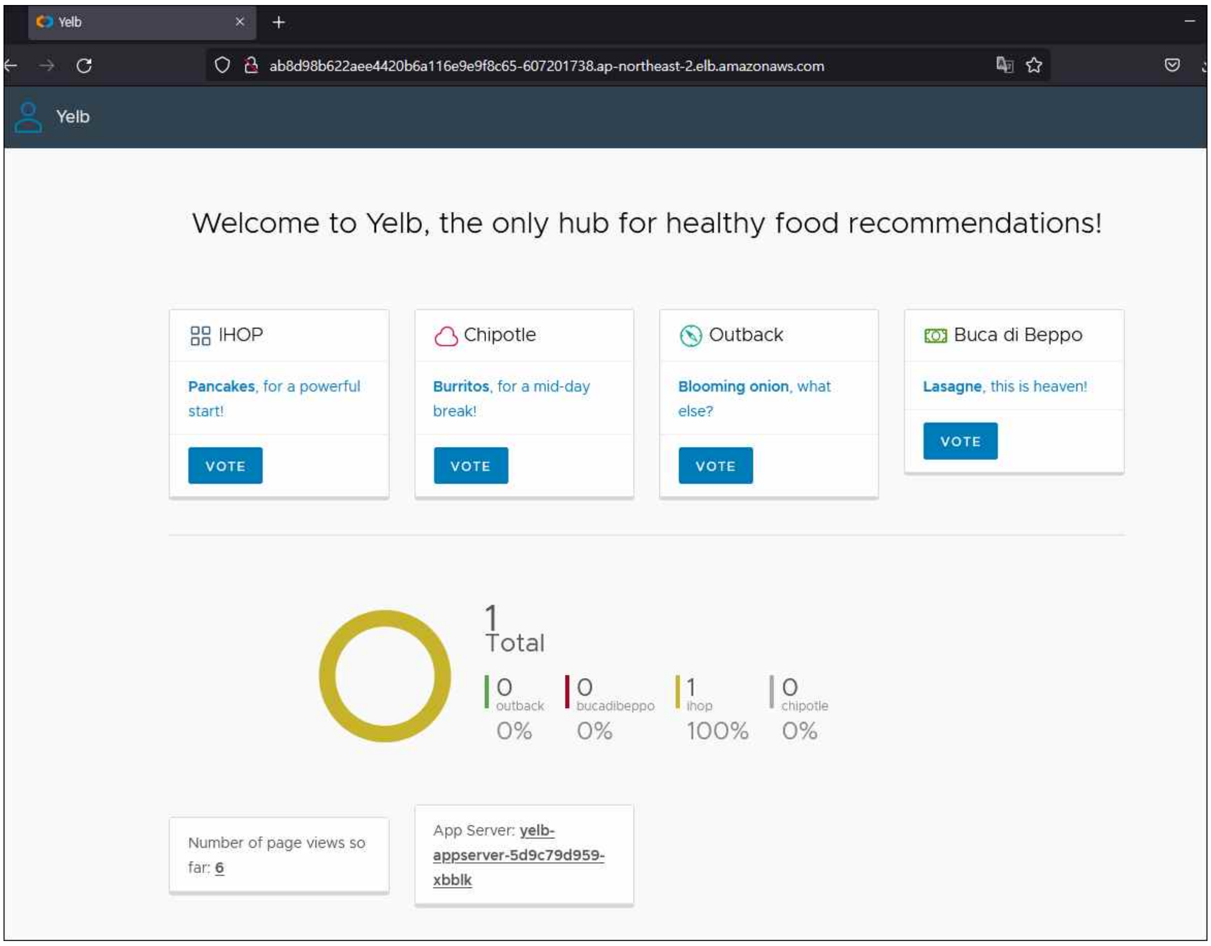
3. Deploy Demo Application

```
$ git clone https://github.com/aws/aws-app-mesh-examples.git
$ kubectl create ns yelb
$ cd aws-app-mesh-examples/walkthroughs/eks-getting-started/
$ kubectl apply -f infrastructure/yelb_initial_deployment.yaml
$ kubectl get pods -n yelb
$ kubectl get svc -n yelb yelb-ui
```



```
[ec2-user@ip-10-192-10-202 eks-getting-started]$ kubectl get svc -n yelb yelb-ui
NAME      TYPE           CLUSTER-IP      EXTERNAL-IP
             PORT(S)        AGE
yelb-ui   LoadBalancer   172.20.238.174   ab8d98b622aee4420b6a116e9e9f8c65-607201738.ap-northeast-2.elb.ama
zonaws.com   80:32693/TCP   36s
[ec2-user@ip-10-192-10-202 eks-getting-started]$ kubectl get pods -n yelb
NAME                              READY   STATUS    RESTARTS   AGE
redis-server-5c8c579489-9fjxh     1/1     Running   0          80s
yelb-appserver-5d9c79d959-xbblk   1/1     Running   0          79s
yelb-db-84748b97cb-k6stt          1/1     Running   0          80s
yelb-ui-68b447d4db-5phnt          1/1     Running   0          80s
```

그리고 LoadBalancer의 External-IP로 접근해보자.


Yelb
ab8d98b622aee4420b6a116e9e9f8c65-607201738.ap-northeast-2.elb.amazonaws.com
Yelb
Welcome to Yelb, the only hub for healthy food recommendations!
IHOP
Pancakes, for a powerful start!
VOTE
Chipotle
Burritos, for a mid-day break!
VOTE
Outback
Blooming onion, what else?
VOTE
Buca di Beppo
Lasagne, this is heaven!
VOTE
1 Total
0 outback 0%
0 bucadibeppo 0%
1 ihop 100%
0 chipotle 0%
Number of page views so far: 6
App Server: yelb-appserver-5d9c79d959-xbblk

위와 같은 사이트가 출력되는 것을 볼 수 있다.

4. Namespace에 sidecar injection label 적용하기

app에 envoy sidecar를 적용하려면 해당 app이 설치된 namespace에 label을 적용시켜줘야 한다. 아래와 같이 애플리케이션에 적용될 mesh 이름과 사이트카 Injector webhook을 활성화하는 Label을 적용해주자.

```
$ kubectl label namespace yelb mesh=yelb
$ kubectl label namespace yelb appmesh.k8s.aws/sidecarInjectorWebhook=enabled
$ kubectl get namespaces --show-labels | grep yelb
```

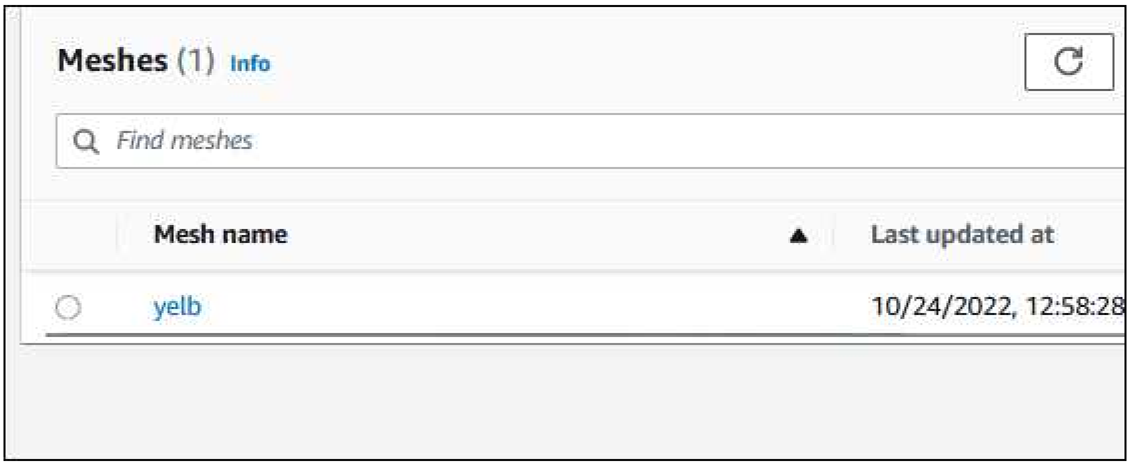
5. App Mesh 컴포넌트 등록

sample app에 mesh를 적용하려면 먼저 Application을 각각의 서비스로 추상화하는 app mesh 컴포넌트들을 생성해야한다.

우선 아래와 같이 mesh를 생성해주자.

```
apiVersion: appmesh.k8s.aws/v1beta2
kind: Mesh
metadata:
  name: yelb
spec:
  namespaceSelector:
    matchLabels:
      mesh: yelb
```

그러면 아래와 같이 app mesh가 생성된 것을 볼 수 있다.

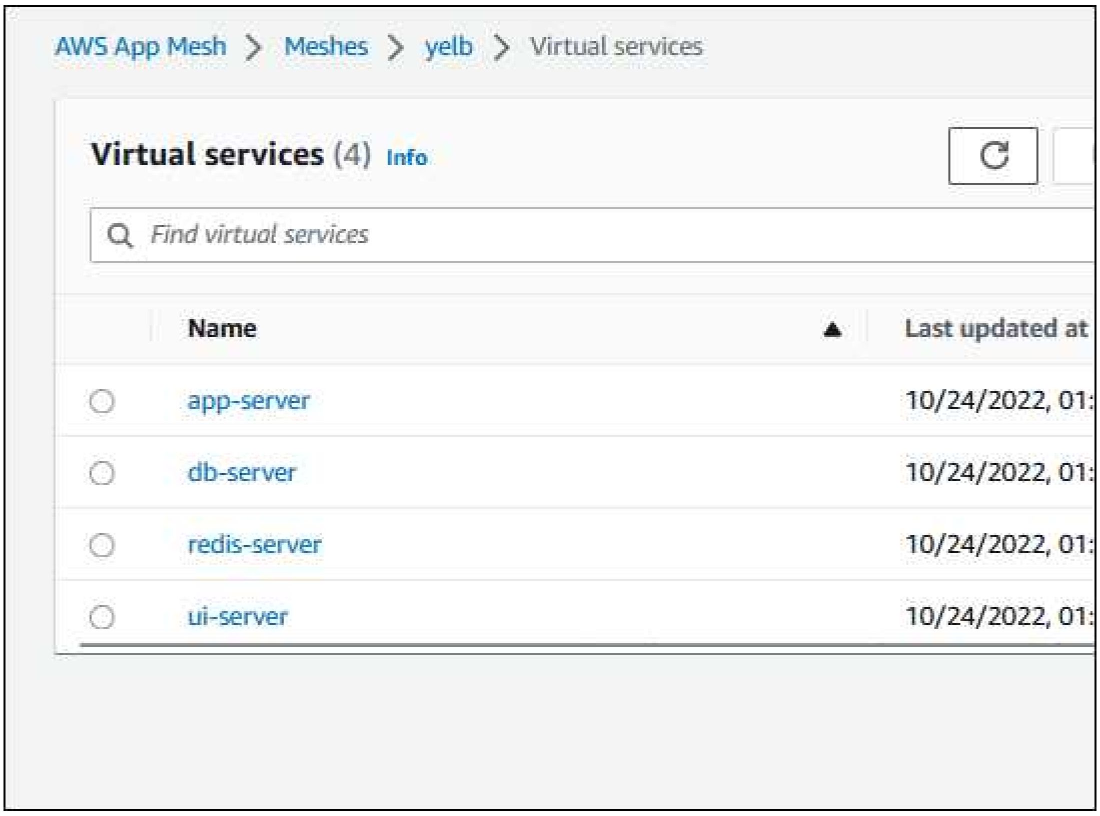


Mesh name	Last updated at
yelb	10/24/2022, 12:58:28

그리고 이제 모든 구성요소 들을 추상화해주자.

```
# redis
apiVersion: appmesh.k8s.aws/v1beta2
kind: VirtualNode
metadata:
  name: redis-server
  namespace: yelb
spec:
  awsName: redis-server-virtual-node
  podSelector:
    matchLabels:
      app: redis-server
  listeners:
    - portMapping:
        port: 6379
        protocol: tcp
  serviceDiscovery:
    dns:
      hostname: redis-server.yelb.svc.cluster.local
---
apiVersion: appmesh.k8s.aws/v1beta2
kind: VirtualService
metadata:
  name: redis-server
  namespace: yelb
spec:
  awsName: redis-server
  provider:
    virtualNode:
      virtualNodeRef:
        name: redis-server

---

# DB
apiVersion: appmesh.k8s.aws/v1beta2
kind: VirtualNode
metadata:
  name: db-server
  namespace: yelb
spec:
  awsName: db-virtual-node
  podSelector:
    matchLabels:
      app: yelb-db
  listeners:
    - portMapping:
        port: 5432
        protocol: tcp
  serviceDiscovery:
    dns:
      hostname: yelb-db.yelb.svc.cluster.local
---
apiVersion: appmesh.k8s.aws/v1beta2
kind: VirtualService
metadata:
  name: db-server
  namespace: yelb
spec:
  awsName: db-server
  provider:
    virtualNode:
      virtualNodeRef:
        name: db-server

# appserver
---
apiVersion: appmesh.k8s.aws/v1beta2
kind: VirtualNode
metadata:
  name: app-server
  namespace: yelb
spec:
  awsName: app-virtual-node
  podSelector:
    matchLabels:
      app: yelb-appserver
  listeners:
    - portMapping:
        port: 4567
        protocol: tcp
  serviceDiscovery:
    dns:
      hostname: yelb-appserver.yelb.svc.cluster.local
---
apiVersion: appmesh.k8s.aws/v1beta2
kind: VirtualRouter
metadata:
  namespace: yelb
  name: app-server
spec:
  awsName: app-server-virtual-router
  listeners:
  - portMapping:
      port: 4567
      protocol: http
  routes:
  - name: route-to-yelb-appserver
    httpRoute:
      match:
        prefix: /
      action:
        weightedTargets:
        - virtualNodeRef:
              name: app-server
          weight: 1
      retryPolicy:
        maxRetries: 2
        perRetryTimeout:
          unit: ms
          value: 2000
        httpRetryEvents:
          - server-error
          - client-error
          - gateway-error
---
apiVersion: appmesh.k8s.aws/v1beta2
kind: VirtualService
metadata:
  name: app-server
  namespace: yelb
spec:
  awsName: app-server
  provider:
    virtualNode:
      virtualNodeRef:
        name: app-server

# UI
---
apiVersion: appmesh.k8s.aws/v1beta2
kind: VirtualNode
metadata:
  name: ui-server
  namespace: yelb
```

```
spec:
  awsName: ui-virtual-node
  podSelector:
    matchLabels:
      app: yelb-ui
  listeners:
    - portMapping:
        port: 80
        protocol: http
  serviceDiscovery:
    dns:
      hostname: yelb-ui.yelb.svc.cluster.local
  backends:
    - virtualService:
       virtualServiceRef:
          name: ui-server
---
apiVersion: appmesh.k8s.aws/v1beta2
kind: VirtualService
metadata:
  name: ui-server
  namespace: yelb
spec:
  awsName: ui-server
  provider:
    virtualNode:
      virtualNodeRef:
        name: ui-server
```
그리고 적용 시켜주면 아래와 같이 Virtual Service와 Virtual Node 등이 생성된 것을 볼 수 있다.

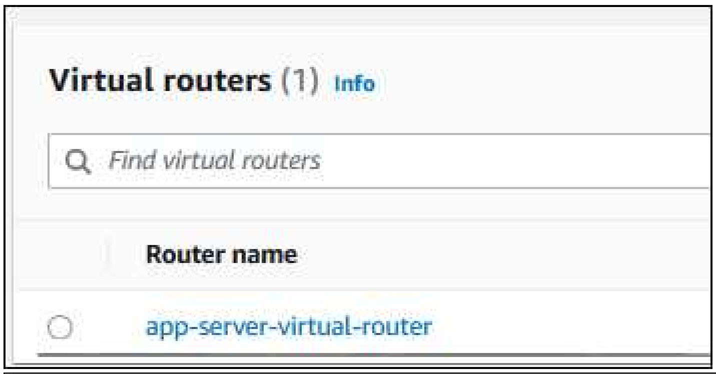


AWS App Mesh > Meshes > yelb > Virtual services

Virtual services (4) Info

Find virtual services

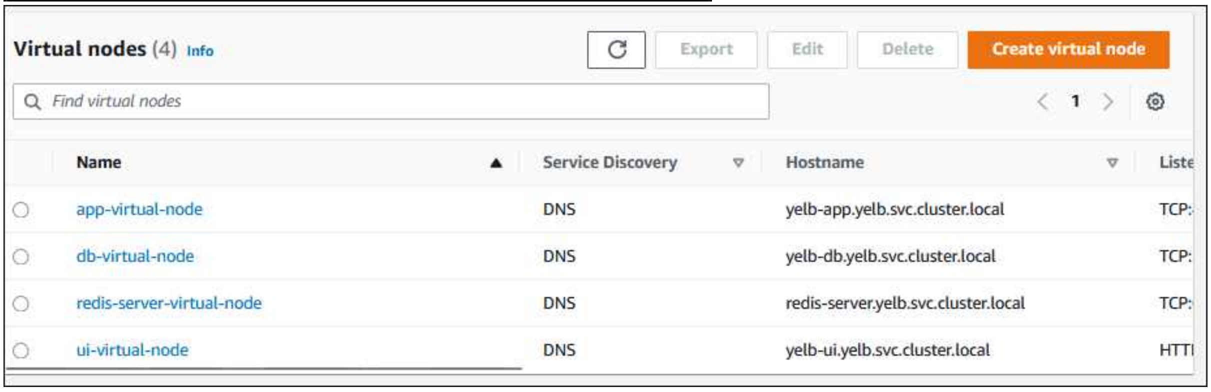
	Name	Last updated at
○	app-server	10/24/2022, 01:
○	db-server	10/24/2022, 01:
○	redis-server	10/24/2022, 01:
○	ui-server	10/24/2022, 01:



Virtual routers (1) Info

Find virtual routers

	Router name
○	app-server-virtual-router



Virtual nodes (4) Info

Find virtual nodes

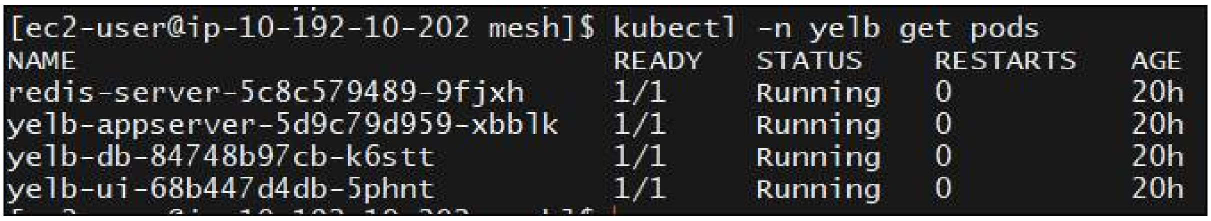
	Name	Service Discovery	Hostname	Liste
○	app-virtual-node	DNS	yelb-app.yelb.svc.cluster.local	TCP:
○	db-virtual-node	DNS	yelb-db.yelb.svc.cluster.local	TCP:
○	redis-server-virtual-node	DNS	redis-server.yelb.svc.cluster.local	TCP:
○	ui-virtual-node	DNS	yelb-ui.yelb.svc.cluster.local	HTTI

5. Envoy SideCar 주입

Mesh의 모든 구성 요소가 준비되었으면 sidecar를 주입해주자. 위에서 app mesh controller를 namespace에 설정하였으므로, Pod를 새로 띄우면 자동으로 주입된다. READY가 1/1에서 2/2로 변경되는 것을 볼 수 있다.

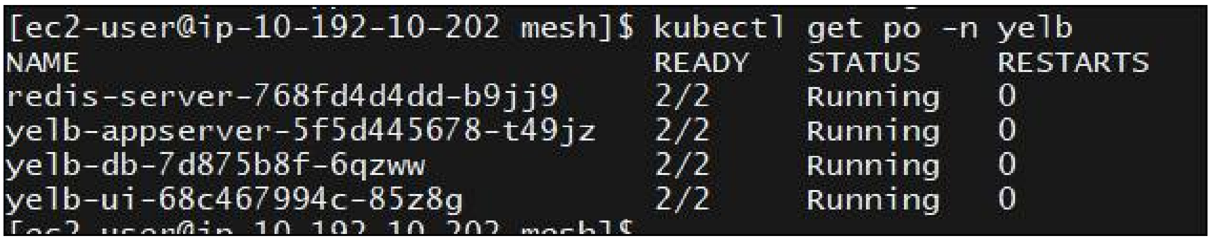
```
$ kubectl rollout restart deployment -n yelb
```

Envory Sidecar 주입 전



```
[ec2-user@ip-10-192-10-202 mesh]$ kubectl -n yelb get pods
NAME                               READY   STATUS    RESTARTS   AGE
redis-server-5c8c579489-9fjxh      1/1     Running   0          20h
yelb-appserver-5d9c79d959-xbblk    1/1     Running   0          20h
yelb-db-84748b97cb-k6stt           1/1     Running   0          20h
yelb-ui-68b447d4db-5phnt           1/1     Running   0          20h
```

Envoy Sidecar 주입 후



```
[ec2-user@ip-10-192-10-202 mesh]$ kubectl get po -n yelb
NAME                                 READY   STATUS    RESTARTS
redis-server-768fd4d4dd-b9jj9        2/2     Running   0
yelb-appserver-5f5d445678-t49jz      2/2     Running   0
yelb-db-7d875b8f-6qzww               2/2     Running   0
yelb-ui-68c467994c-85z8g             2/2     Running   0
[ec2-user@ip-10-192-10-202 mesh]$
```

6. Create VIrtual Gateway & Virtual Router

가상 게이트웨이를 적용하려면 namespace에 label을 명시해줘야한다.

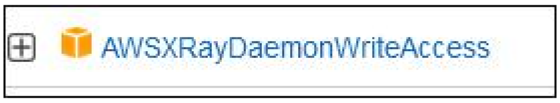
```
$ kubectl label namespace yelb gateway=yelb-gateway
```

```
apiVersion: appmesh.k8s.aws/v1beta2
kind: VirtualGateway
metadata:
  name: yelb-gateway
  namespace: yelb
spec:
  namespaceSelector:
    matchLabels:
      gateway: yelb-gateway
  podSelector:
    matchLabels:
      app: yelb-gateway
  listeners:
    - portMapping:
        port: 8088
        protocol: http
---
apiVersion: appmesh.k8s.aws/v1beta2
kind: GatewayRoute
metadata:
  name: yelbui-gatewayroute
  namespace: yelb
spec:
  httpRoute:
    match:
      prefix: "/"
    action:
      target:
        virtualService:
          virtualServiceRef:
            name: ui-server
---
apiVersion: appmesh.k8s.aws/v1beta2
kind: GatewayRoute
metadata:
  name: yelbapp-gatewayroute
  namespace: yelb
spec:
  httpRoute:
    match:
      prefix: "/api"
    action:
      target:
        virtualService:
          virtualServiceRef:
            name: app-server
```

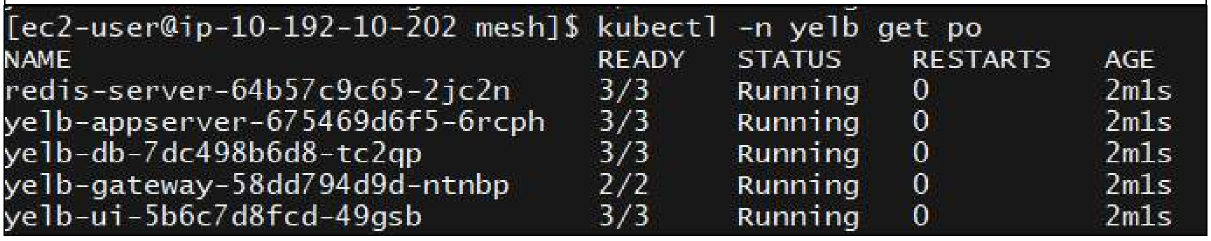
그리고 Envoy로 gateway 생성해서 외부에 서비스 노출하자

7. X-Ray Daemon 적용하기

우선 Worker Node IAM Role에 아래와 같은 권한을 부여해주고 진행한다.


AWSXRayDaemonWriteAccess

```
$ helm upgrade -i appmesh-controller eks/appmesh-controller -n appmesh-system --set
tracing.enabled=true --set tracing.provider=x-ray
$ kubectl rollout restart deployment -n yelb
$ kubectl -n yelb get po
```



```
[ec2-user@ip-10-192-10-202 mesh]$ kubectl -n yelb get po
NAME                               READY   STATUS    RESTARTS   AGE
redis-server-64b57c9c65-2jc2n      3/3     Running   0          2m1s
yelb-appserver-675469d6f5-6rcph    3/3     Running   0          2m1s
yelb-db-7dc498b6d8-tc2qp           3/3     Running   0          2m1s
yelb-gateway-58dd794d9d-ntnbp      2/2     Running   0          2m1s
yelb-ui-5b6c7d8fcd-49gsb           3/3     Running   0          2m1s
```