Lab 9

Environment:

Windows + Docker Desktop (Kubernetes enabled)

Local container registry running

kubectl and curl available

Part 1. Knative Functions

Objective

Enable a simple development workflow to create and build stateless event-driven functions without understanding containers or Kubernetes internals.

Steps

1. Initialize a Knative function project using CLI or templates.
2. Configure function build to push images into a local registry instead of remote cloud registry.
3. Build the function code into an OCI container image stored in the local registry.
4. (Skip deploy step as requested in instructions.)

Notes

- Knative Functions automatically generates container images when building functions.
- No Dockerfile is required.
- Developers interact using "func" or "kn func" commands.
- Image builds update automatically after code changes.
- Images are stored in a registry and can later be deployed as Knative services.

Part 2. Knative Serving

Objective

Deploy a serverless application using Knative Serving and observe activation and autoscaling behavior.

Steps

1. Copy and save the YAML below into a file named hello.yaml:

```
apiVersion: serving.knative.dev/v1
kind: Service
metadata:
  name: hello
spec:
  template:
    spec:
      containers:
        - image: ghcr.io/knative/helloworld-go:latest
          ports:
            - containerPort: 8080
          env:
            - name: TARGET
              value: "World"
```

2. Deploy the service using:

```
kubectl apply -f hello.yaml
```

3. Confirm Knative Service creation using:

```
kubectl get ksvc hello
```

4. Retrieve the external URL via:

```
kubectl get ksvc
```

5. Send a request to the service:

```
curl http://<service-url>
```

Expected behavior:

- Knative activates pods on request.
- Returns “Hello World!”

Part 3. Knative Eventing

Objective

Enable event-driven execution by wiring event producers and consumers through Knative Eventing components.

Steps

1. Ensure Knative Eventing is installed.
2. Create a Broker to receive events:

```
kubectl apply -f broker.yaml
```

3. Create a Trigger to select events and forward them to the Knative Service:

```
kubectl apply -f trigger.yaml
```

4. Send a CloudEvent manually into Broker:

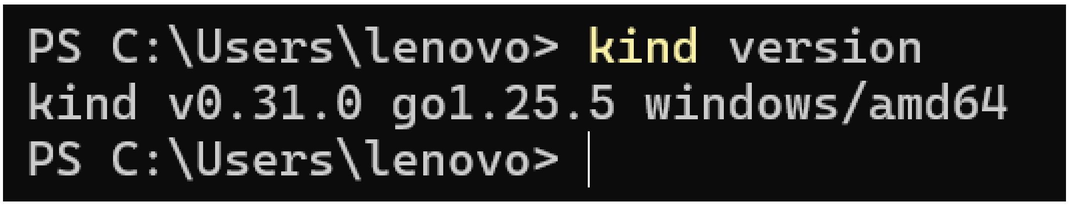
```
kubectl -n default run -i --tty event-sender \
  --image=ghcr.io/knative/eventing-sender \
  -- -target http://broker.default.svc.cluster.local
```

5. Confirm event delivery by checking logs:

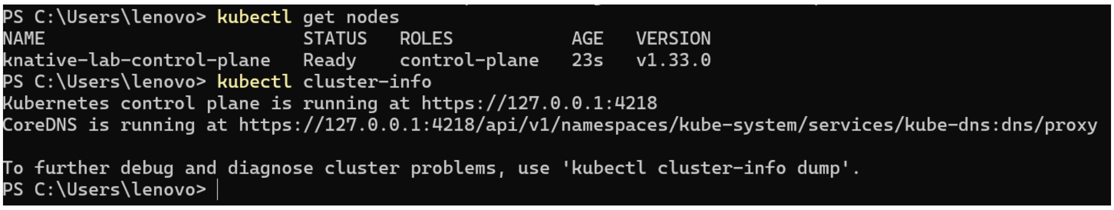
kubectl logs <pod-name>

Notes

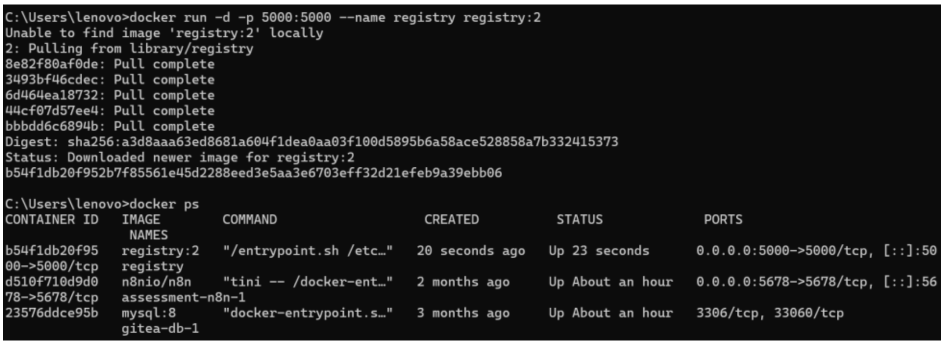
- Event-driven processing decouples event producers and consumers.
- Knative components involved: Broker, Trigger, Sink, Event Source.
- Events follow CloudEvents specification.



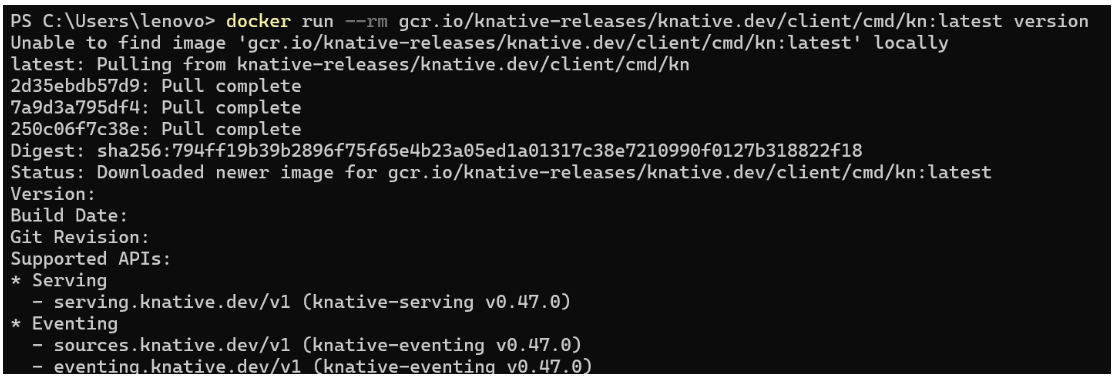
```
PS C:\Users\lenovo> kind version
kind v0.31.0 go1.25.5 windows/amd64
PS C:\Users\lenovo>
```



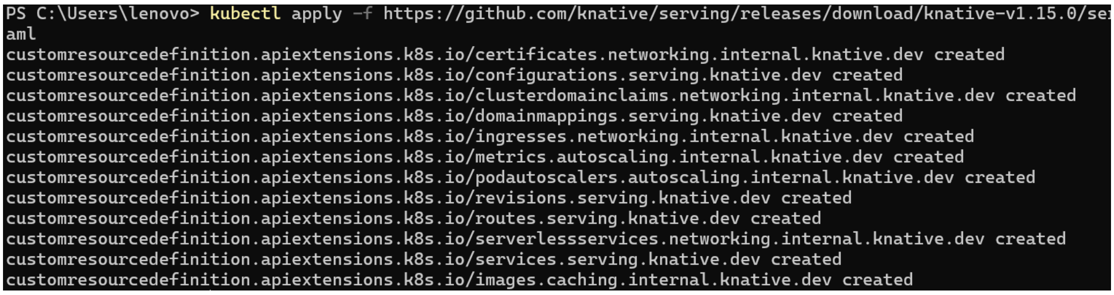
```
PS C:\Users\lenovo> kubectl get nodes
NAME                        STATUS   ROLES           AGE   VERSION
knative-lab-control-plane   Ready    control-plane   23s   v1.33.0
PS C:\Users\lenovo> kubectl cluster-info
Kubernetes control plane is running at https://127.0.0.1:4218
CoreDNS is running at https://127.0.0.1:4218/api/v1/namespaces/kube-system/services/kube-dns:dns/proxy

To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.
PS C:\Users\lenovo>
```



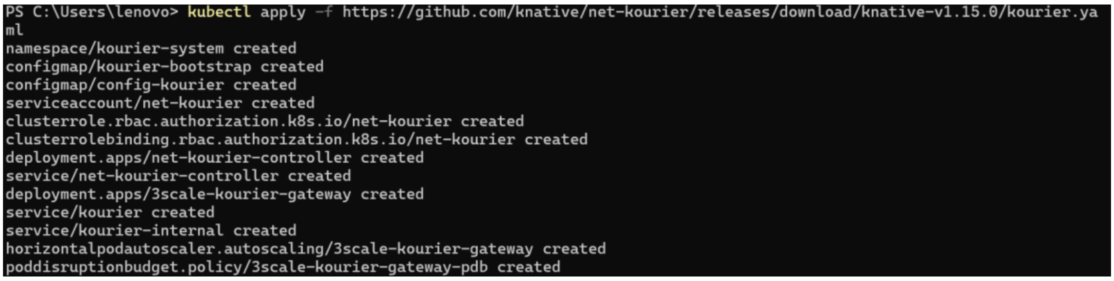
```
C:\Users\lenovo>docker run -d -p 5000:5000 --name registry registry:2
Unable to find image 'registry:2' locally
2: Pulling from library/registry
8e82f80af0de: Pull complete
3493bf46cdec: Pull complete
6d464ea18732: Pull complete
44cf07d57ee4: Pull complete
bbbdd6c6894b: Pull complete
Digest: sha256:a3d8aaa63ed8681a604f1dea0aa03f100d5895b6a58ace528858a7b332415373
Status: Downloaded newer image for registry:2
b54f1db20f952b7f85561e45d2288eed3e5aa3e6703eff32d21efeb9a39ebb06

C:\Users\lenovo>docker ps
CONTAINER ID   IMAGE        COMMAND                  CREATED          STATUS           PORTS
                NAMES
b54f1db20f95   registry:2   "/entrypoint.sh /etc…"   20 seconds ago   Up 23 seconds    0.0.0.0:5000->5000/tcp, [::]:50
00->5000/tcp   registry
d510f710d9d0   n8nio/n8n    "tini -- /docker-ent…"   2 months ago     Up About an hour   0.0.0.0:5678->5678/tcp, [::]:56
78->5678/tcp   assessment-n8n-1
23576ddce95b   mysql:8      "docker-entrypoint.s…"   3 months ago     Up About an hour   3306/tcp, 33060/tcp
               gitea-db-1
```



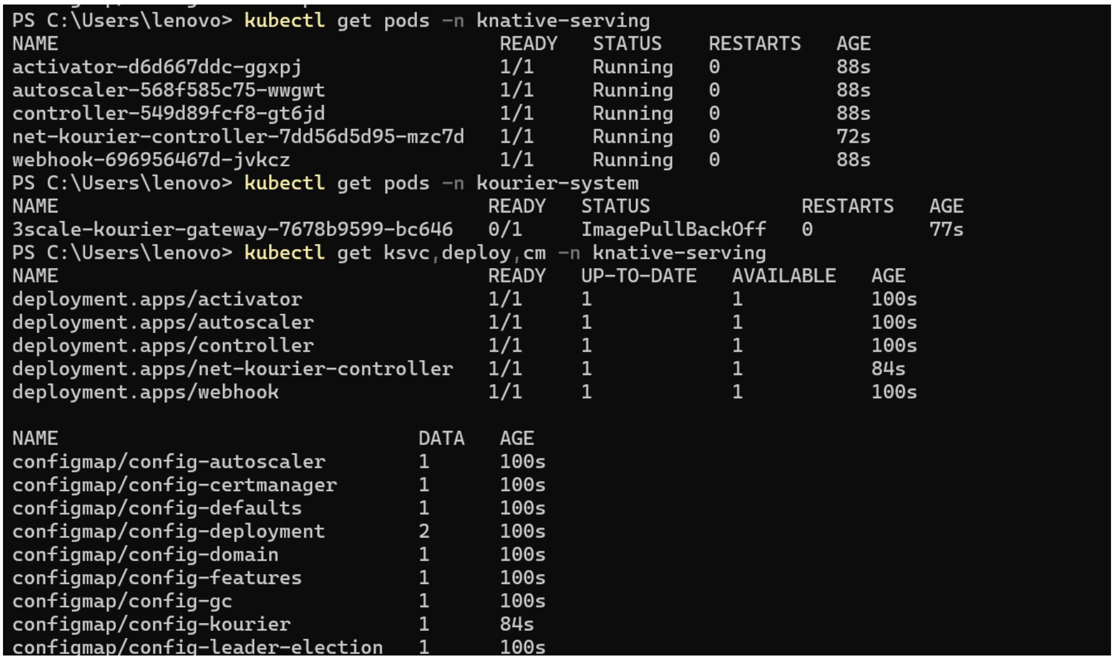
```
PS C:\Users\lenovo> docker run --rm gcr.io/knative-releases/knative.dev/client/cmd/kn:latest version
Unable to find image 'gcr.io/knative-releases/knative.dev/client/cmd/kn:latest' locally
latest: Pulling from knative-releases/knative.dev/client/cmd/kn
2d35ebdb57d9: Pull complete
7a9d3a795df4: Pull complete
250c06f7c38e: Pull complete
Digest: sha256:794ff19b39b2896f75f65e4b23a05ed1a01317c38e7210990f0127b318822f18
Status: Downloaded newer image for gcr.io/knative-releases/knative.dev/client/cmd/kn:latest
Version:
Build Date:
Git Revision:
Supported APIs:
* Serving
  - serving.knative.dev/v1 (knative-serving v0.47.0)
* Eventing
  - sources.knative.dev/v1 (knative-eventing v0.47.0)
  - eventing.knative.dev/v1 (knative-eventing v0.47.0)
```



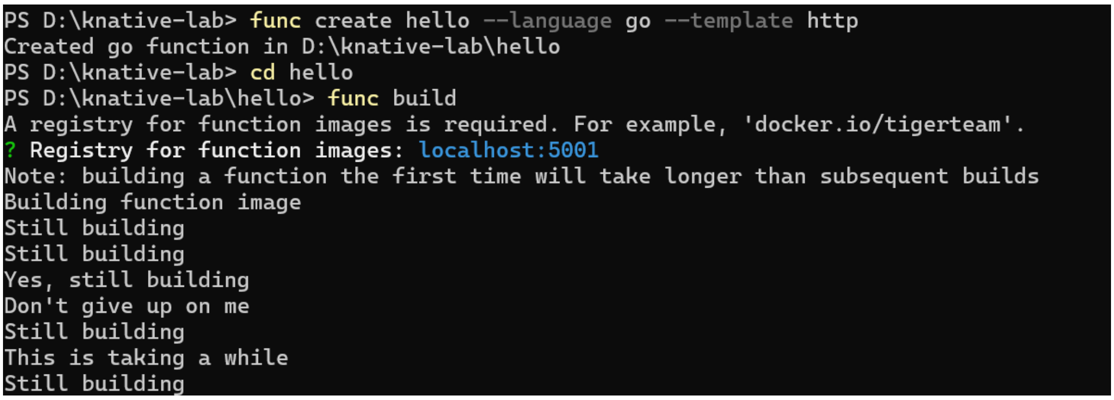
```
PS C:\Users\lenovo> kubectl apply -f https://github.com/knative/serving/releases/download/knative-v1.15.0/se
aml
customresourcedefinition.apiextensions.k8s.io/certificates.networking.internal.knative.dev created
customresourcedefinition.apiextensions.k8s.io/configurations.serving.knative.dev created
customresourcedefinition.apiextensions.k8s.io/clusterdomainclaims.networking.internal.knative.dev created
customresourcedefinition.apiextensions.k8s.io/domainmappings.serving.knative.dev created
customresourcedefinition.apiextensions.k8s.io/ingresses.networking.internal.knative.dev created
customresourcedefinition.apiextensions.k8s.io/metrics.autoscaling.internal.knative.dev created
customresourcedefinition.apiextensions.k8s.io/podautoscalers.autoscaling.internal.knative.dev created
customresourcedefinition.apiextensions.k8s.io/revisions.serving.knative.dev created
customresourcedefinition.apiextensions.k8s.io/routes.serving.knative.dev created
customresourcedefinition.apiextensions.k8s.io/serverlessservices.networking.internal.knative.dev created
customresourcedefinition.apiextensions.k8s.io/services.serving.knative.dev created
customresourcedefinition.apiextensions.k8s.io/images.caching.internal.knative.dev created
```



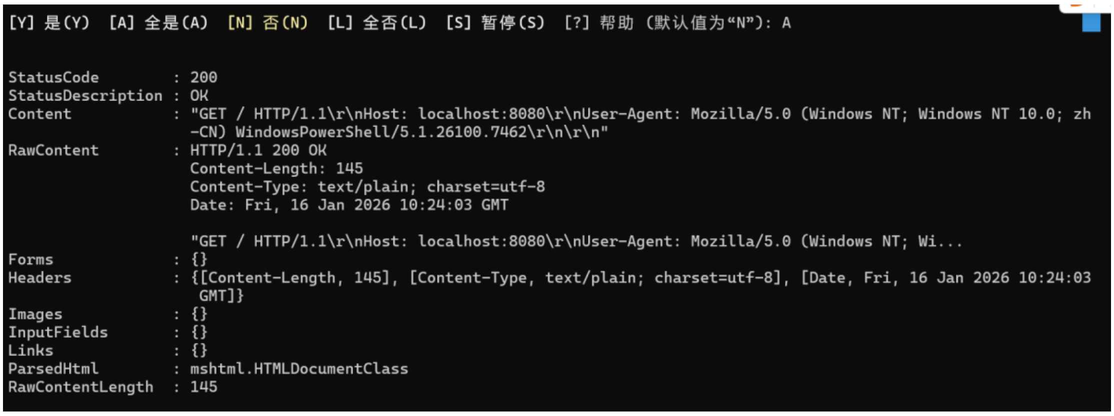
```
PS C:\Users\lenovo> kubectl apply -f https://github.com/knative/net-kourier/releases/download/knative-v1.15.0/kourier.ya
ml
namespace/kourier-system created
configmap/kourier-bootstrap created
configmap/config-kourier created
serviceaccount/net-kourier created
clusterrole.rbac.authorization.k8s.io/net-kourier created
clusterrolebinding.rbac.authorization.k8s.io/net-kourier created
deployment.apps/net-kourier-controller created
service/net-kourier-controller created
deployment.apps/3scale-kourier-gateway created
service/kourier created
service/kourier-internal created
horizontalpodautoscaler.autoscaling/3scale-kourier-gateway created
poddisruptionbudget.policy/3scale-kourier-gateway-pdb created
```



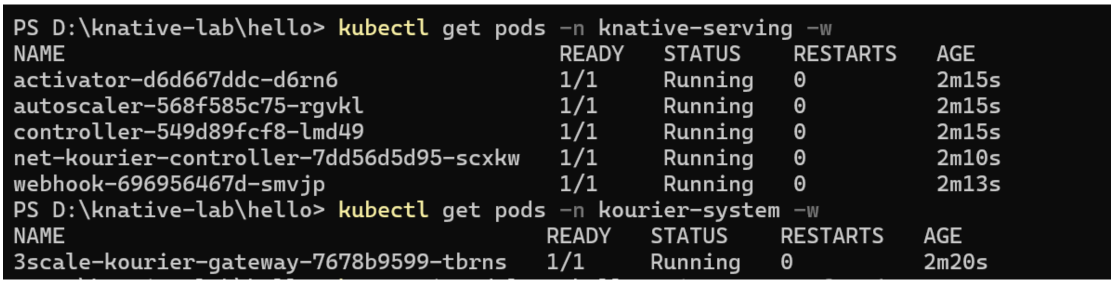
```
PS C:\Users\lenovo> kubectl get pods -n knative-serving
NAME                                      READY   STATUS    RESTARTS   AGE
activator-d6d667ddc-ggxpj                 1/1     Running   0          88s
autoscaler-568f585c75-wwgwt               1/1     Running   0          88s
controller-549d89fcf8-gt6jd               1/1     Running   0          88s
net-kourier-controller-7dd56d5d95-mzc7d   1/1     Running   0          72s
webhook-696956467d-jvkcz                  1/1     Running   0          88s
PS C:\Users\lenovo> kubectl get pods -n kourier-system
NAME                                     READY   STATUS             RESTARTS   AGE
3scale-kourier-gateway-7678b9599-bc646   0/1     ImagePullBackOff   0          77s
PS C:\Users\lenovo> kubectl get ksvc,deploy,cm -n knative-serving
NAME                                     READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/activator                1/1     1            1           100s
deployment.apps/autoscaler               1/1     1            1           100s
deployment.apps/controller               1/1     1            1           100s
deployment.apps/net-kourier-controller   1/1     1            1           84s
deployment.apps/webhook                  1/1     1            1           100s

NAME                               DATA   AGE
configmap/config-autoscaler        1      100s
configmap/config-certmanager       1      100s
configmap/config-defaults          1      100s
configmap/config-deployment        2      100s
configmap/config-domain            1      100s
configmap/config-features          1      100s
configmap/config-gc                1      100s
configmap/config-kourier           1      84s
configmap/config-leader-election   1      100s
```



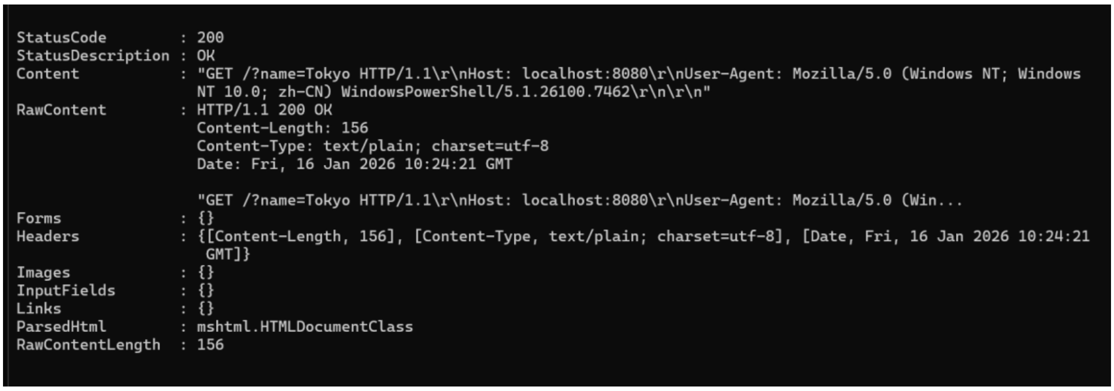
```
PS D:\knative-lab> func create hello --language go --template http
Created go function in D:\knative-lab\hello
PS D:\knative-lab> cd hello
PS D:\knative-lab\hello> func build
A registry for function images is required. For example, 'docker.io/tigerteam'.
? Registry for function images: localhost:5001
Note: building a function the first time will take longer than subsequent builds
Building function image
Still building
Still building
Yes, still building
Don't give up on me
Still building
This is taking a while
Still building
```



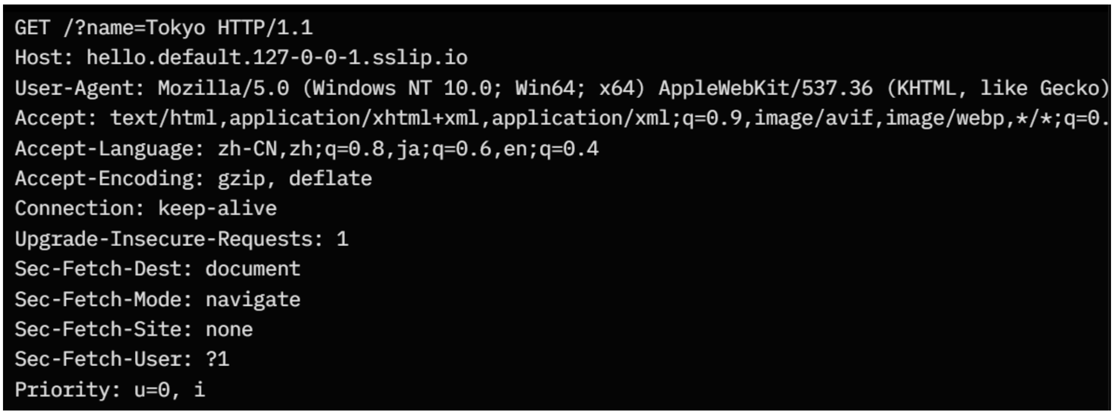
```
[Y] 是(Y)  [A] 全是(A)  [N] 否(N)  [L] 全否(L)  [S] 暂停(S)  [?] 帮助 (默认值为“N”): A


StatusCode        : 200
StatusDescription : OK
Content           : "GET / HTTP/1.1\r\nHost: localhost:8080\r\nUser-Agent: Mozilla/5.0 (Windows NT; Windows NT 10.0; zh
                    -CN) WindowsPowerShell/5.1.26100.7462\r\n\r\n"
RawContent        : HTTP/1.1 200 OK
                    Content-Length: 145
                    Content-Type: text/plain; charset=utf-8
                    Date: Fri, 16 Jan 2026 10:24:03 GMT

                    "GET / HTTP/1.1\r\nHost: localhost:8080\r\nUser-Agent: Mozilla/5.0 (Windows NT; Wi...
Forms             : {}
Headers           : {[Content-Length, 145], [Content-Type, text/plain; charset=utf-8], [Date, Fri, 16 Jan 2026 10:24:03
                     GMT]}
Images            : {}
InputFields       : {}
Links             : {}
ParsedHtml        : mshtml.HTMLDocumentClass
RawContentLength  : 145
```



```
PS D:\knative-lab\hello> kubectl get pods -n knative-serving -w
NAME                                      READY   STATUS    RESTARTS   AGE
activator-d6d667ddc-d6rn6                 1/1     Running   0          2m15s
autoscaler-568f585c75-rgvkl               1/1     Running   0          2m15s
controller-549d89fcf8-lmd49               1/1     Running   0          2m15s
net-kourier-controller-7dd56d5d95-scxkw   1/1     Running   0          2m10s
webhook-6969564 67d-smvjp                 1/1     Running   0          2m13s
PS D:\knative-lab\hello> kubectl get pods -n kourier-system -w
NAME                                     READY   STATUS    RESTARTS   AGE
3scale-kourier-gateway-7678b9599-tbrns   1/1     Running   0          2m20s
```



```
StatusCode        : 200
StatusDescription : OK
Content           : "GET /?name=Tokyo HTTP/1.1\r\nHost: localhost:8080\r\nUser-Agent: Mozilla/5.0 (Windows NT; Windows
                    NT 10.0; zh-CN) WindowsPowerShell/5.1.26100.7462\r\n\r\n"
RawContent        : HTTP/1.1 200 OK
                    Content-Length: 156
                    Content-Type: text/plain; charset=utf-8
                    Date: Fri, 16 Jan 2026 10:24:21 GMT

                    "GET /?name=Tokyo HTTP/1.1\r\nHost: localhost:8080\r\nUser-Agent: Mozilla/5.0 (Win...
Forms             : {}
Headers           : {[Content-Length, 156], [Content-Type, text/plain; charset=utf-8], [Date, Fri, 16 Jan 2026 10:24:21
                     GMT]}
Images            : {}
InputFields       : {}
Links             : {}
ParsedHtml        : mshtml.HTMLDocumentClass
RawContentLength  : 156
```



```
GET /?name=Tokyo HTTP/1.1
Host: hello.default.127-0-0-1.sslip.io
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,*/*;q=0.
Accept-Language: zh-CN,zh;q=0.8,ja;q=0.6,en;q=0.4
Accept-Encoding: gzip, deflate
Connection: keep-alive
Upgrade-Insecure-Requests: 1
Sec-Fetch-Dest: document
Sec-Fetch-Mode: navigate
Sec-Fetch-Site: none
Sec-Fetch-User: ?1
Priority: u=0, i
```