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Europe 2021

Virtual



Forward Together »



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Gateway API

A New Set of Kubernetes APIs
for Advanced Traffic Routing

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Harry Bagdi, Kong
Rob Scott, Google



Outline



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- Background
- A Quick Example
- Key Concepts
- Demos
- Roadmap



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Introduction

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The Beginning



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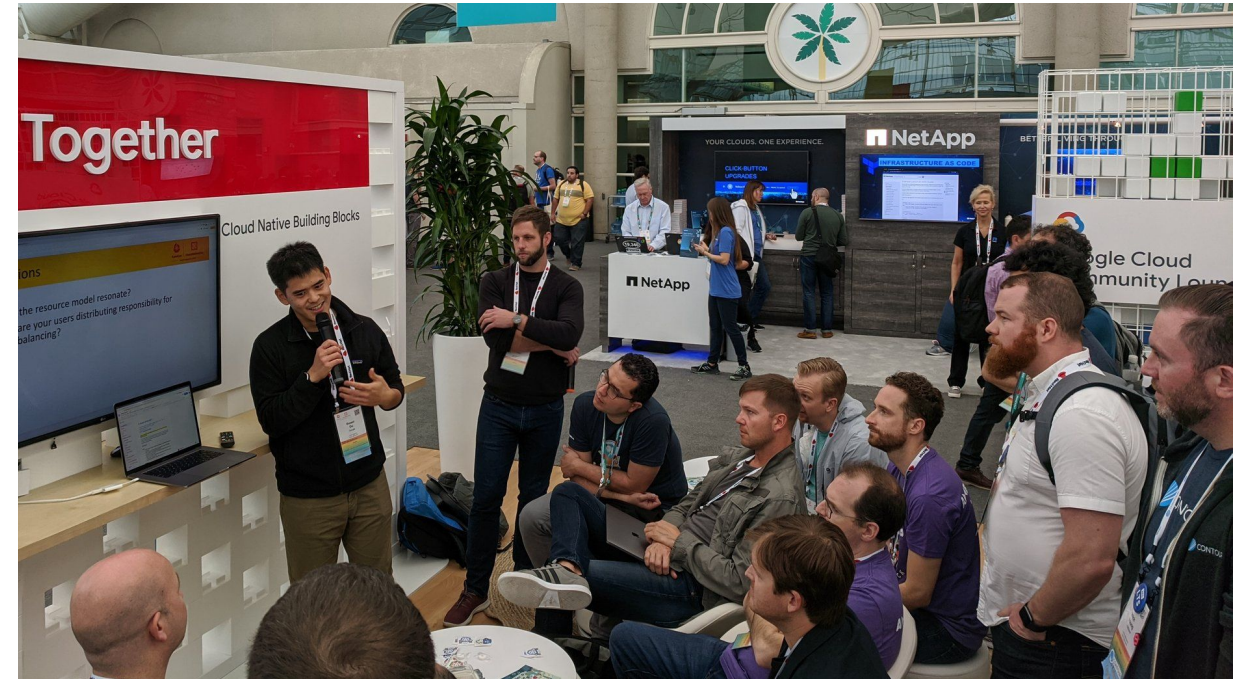


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- Ingress resource was too simple to support advanced use cases
- Service resource kept on getting new load balancing features bolted on that became difficult to manage
- This working group truly started at KubeCon San Diego





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A Quick Example

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Acme Company



Alice

Infrastructure Provider



Bob

Cluster Operator



Carol

Application Developer

Gateway Classes



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- Alice ensures that each cluster gets provisioned with internal and external Gateway classes

```
kind: GatewayClass
metadata:
  name: external-lb
spec:
  controller: acme.io/gateway-controller
  parametersRef:
    group: k8s.acme.io
    kind: GatewayClassParams
    name: external-lb
```

```
kind: GatewayClass
metadata:
  name: internal-lb
spec:
  controller: acme.io/gateway-controller
  parametersRef:
    group: k8s.acme.io
    kind: GatewayClassParams
    name: internal-lb
```



Alice

Infrastructure Provider

Gateways



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- Bob creates a simple external HTTP Gateway in the cluster:

```
kind: Gateway
metadata:
  name: acme-external
spec:
  gatewayClassName: external-lb
  listeners:
  - protocol: HTTP
    port: 80
    routes:
      kind: HTTPRoute
      selector:
        matchLabels:
          gateway: acme-external
```



Bob

Cluster Operator

- Carol creates a simple HTTPRoute for her app:

```
kind: HTTPRoute
metadata:
  name: acme-store
  labels:
    gateway: acme-external
spec:
  hostnames:
  - acme.io
  rules:
  - matches:
    - path:
        value: /store
    forwardTo:
    - serviceName: acme-store
      port: 8080
```



Carol

Application Developer



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But Why Use Gateway?

Existing APIs already cover the simple use cases well,
Gateway thrives with day 2 operations.

Rolling out v2



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- Carol wants to do a canary roll out for a new version of her app

```
kind: HTTPRoute
...
rules:
- matches:
  - path:
      value: /store
    forwardTo:
      - serviceName: acme-store
        port: 8080
        weight: 9
      - serviceName: acme-store-canary
        port: 8080
        weight: 1
```



Carol

Application Developer

Upgrading Gateways



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- Bob wants to upgrade to the latest kind of load balancer

```
kind: Gateway
metadata:
  name: acme-external
spec:
  gatewayClassName: external-lb
  listeners:
  - protocol: HTTP
    port: 80
    routes:
      kind: HTTPRoute
      selector:
        matchLabels:
          gateway: acme-external
```

```
kind: Gateway
metadata:
  name: acme-external-v2
spec:
  gatewayClassName: external-lb-v2
  listeners:
  - protocol: HTTP
    port: 80
    routes:
      kind: HTTPRoute
      selector:
        matchLabels:
          gateway: acme-external
```



Bob

Cluster Operator

Consistent Environments



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- Alice wants to start provisioning clusters on a new provider but still provide a consistent experience across environments

```
kind: GatewayClass
metadata:
  name: external-lb
spec:
  controller: vendor-a.io/gateway-controller
  parametersRef:
    group: k8s.vendor-a.io
    kind: GatewayClassParams
    name: external-lb
```

```
kind: GatewayClass
metadata:
  name: external-lb
spec:
  controller: vendor-b.io/gateway-controller
  parametersRef:
    group: k8s.vendor-b.io
    kind: GatewayClassParams
    name: external-lb
```



Alice

Infrastructure Provider



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Key Concepts

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Resource Model



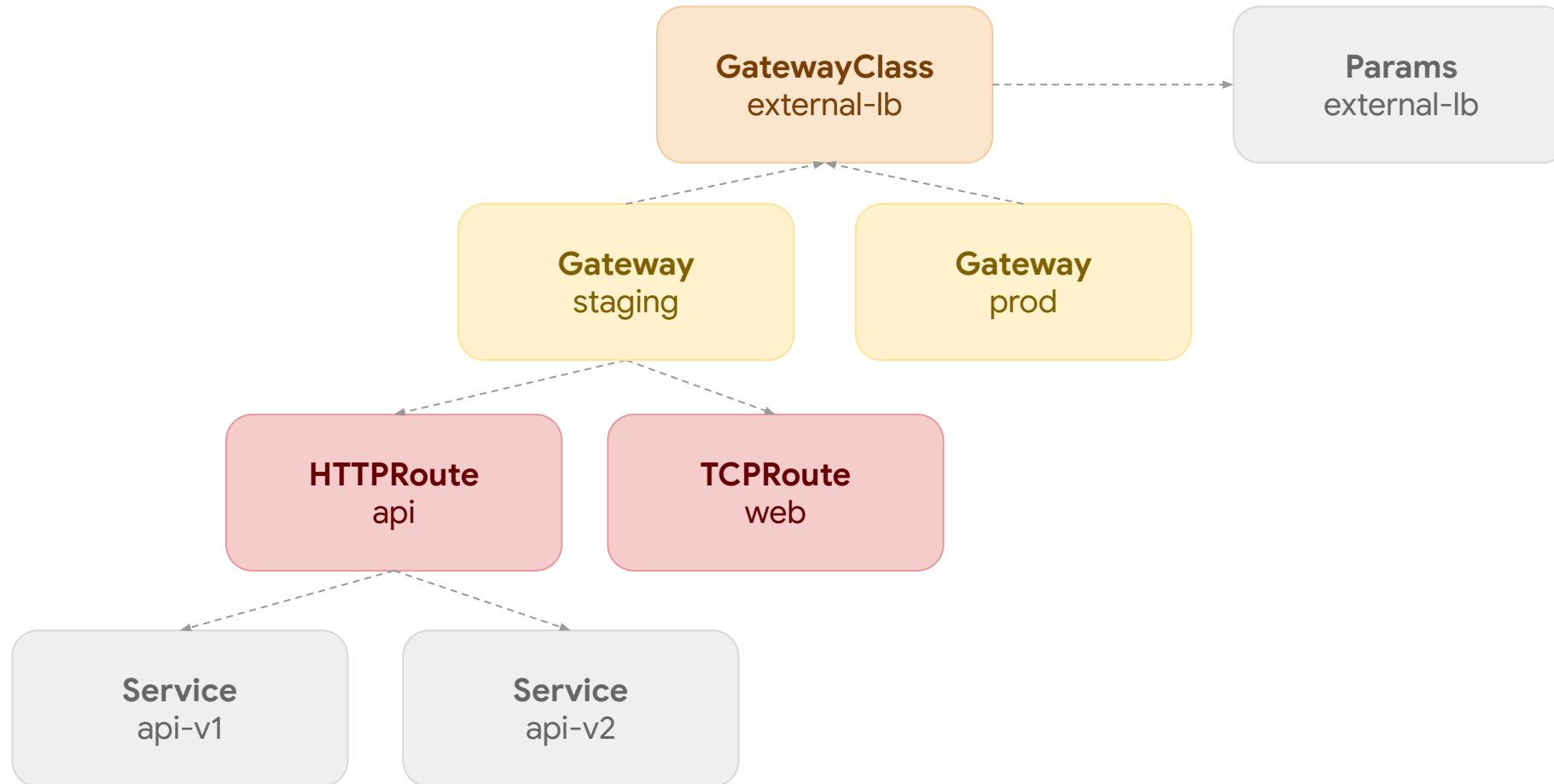
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Resource Model



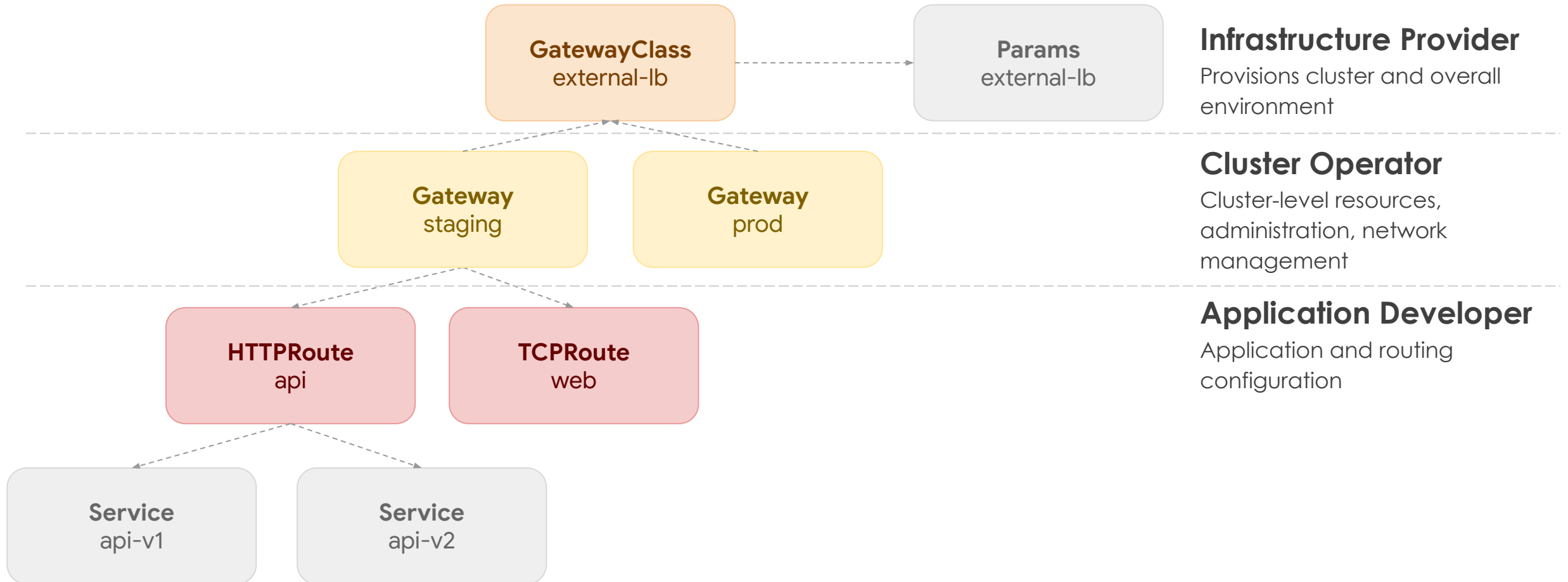
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Primary Goals



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- The Gateway API is:
 - **role-oriented** to enable management of different components by different roles.
 - **portable** across many implementations.
 - **expressive** enough to support concepts like header-based matching and traffic splitting.
 - **extensible** for more advanced use cases, with well defined extension points in the API.

How Can this be Portable?



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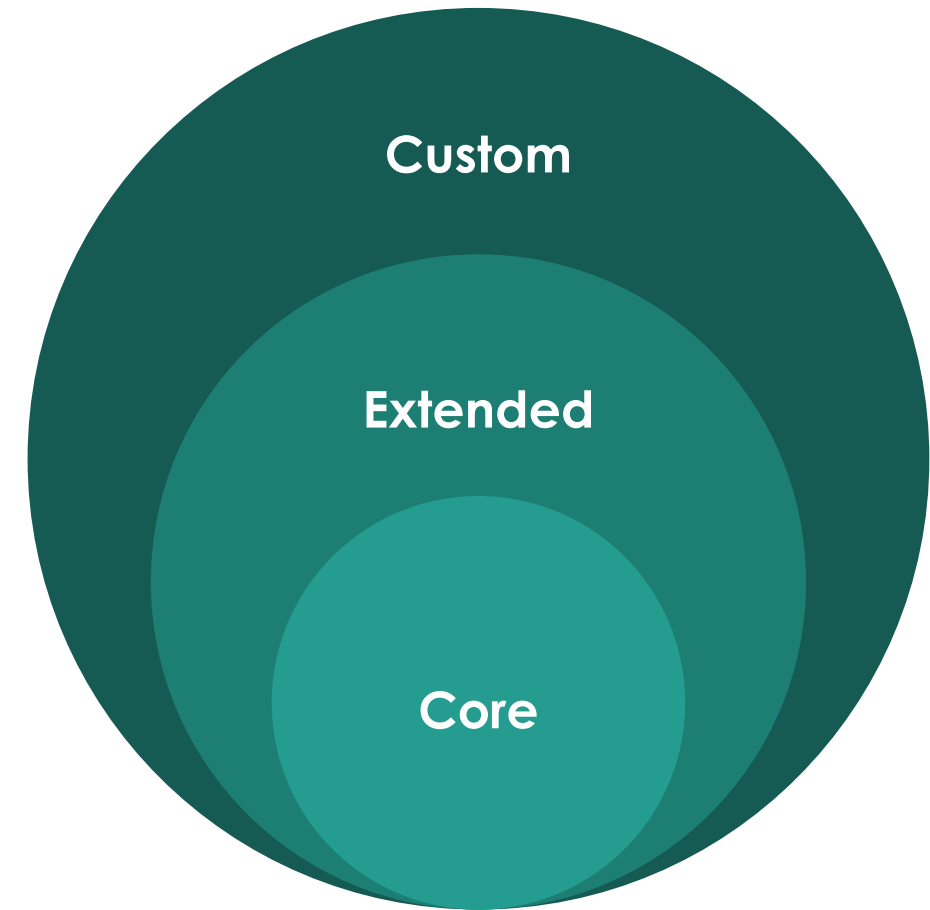


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- To help this API succeed, we focused on:
 - Providing a wide set of functionality in the API
 - Including clear extension points all throughout the API
 - Establishing unique conformance levels for each feature



Route Types



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- The API includes core routes for HTTP, TLS, TCP, and UDP
- Each route shares a core set of characteristics, including:
 - Gateway selection
 - Traffic splitting
- Implementations can create their own custom Route types for their own unique use cases

Route Types



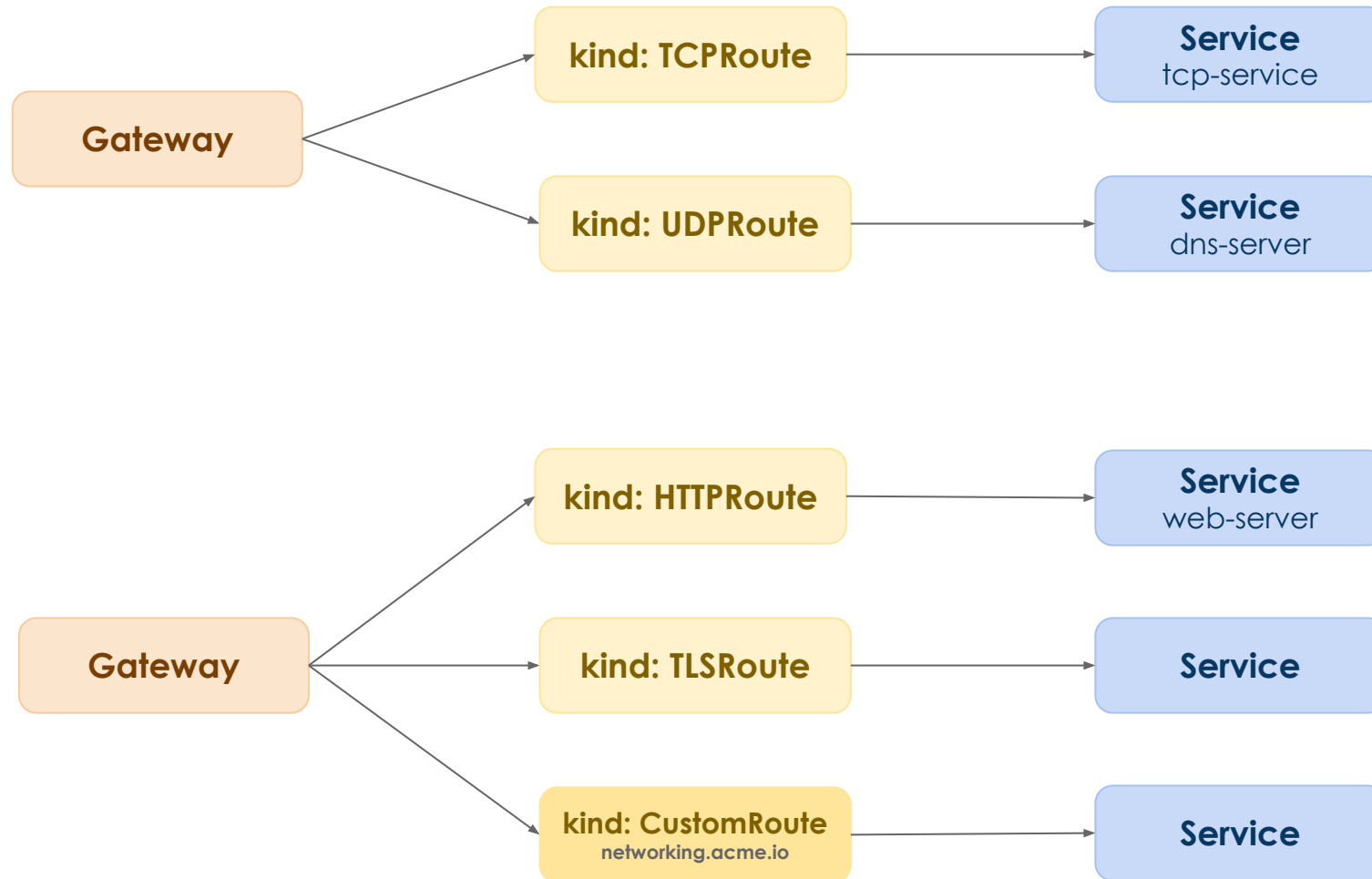
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Gateway Route Binding



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The two way handshake between Gateways and Routes

Gateways	Routes
Define which kinds of Routes they support	Select the Gateways they want to use by label(s) and namespace(s)
Define where those Routes can be	

Ingress and Gateway



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- There are no plans to remove the Ingress API, it will be around for a long time and continue to be a simple option
- Where possible, we're porting new concepts back to Ingress
- The larger scope of Gateway will enable us to do a lot more
- Many of the advanced concepts in Gateway simply don't fit into the smaller scope of Ingress

Cross Namespace Routes



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- Optional content

TLS Configuration



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- Optional content



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Demos

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Demo

Multiple Gateways with Contour and Istio



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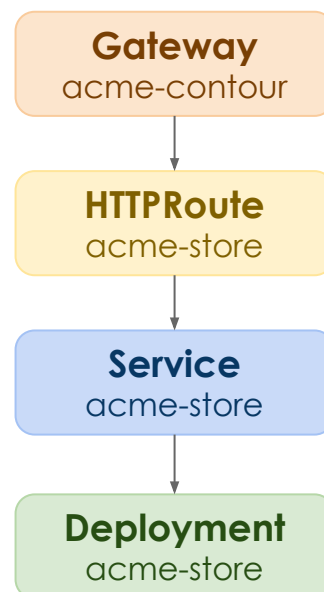


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1. Publish Acme store with Contour





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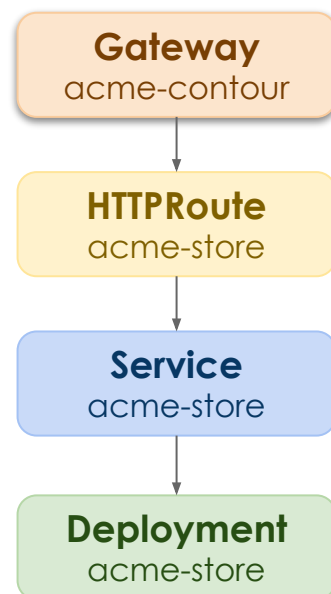


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1. Publish Acme store with Contour



```
kind: Gateway
metadata:
  name: acme-contour
spec:
  gatewayClassName: contour
  listeners:
  - protocol: HTTP
    port: 80
    routes:
      kind: HTTPRoute
      selector:
        matchLabels:
          gateway: acme-external
```



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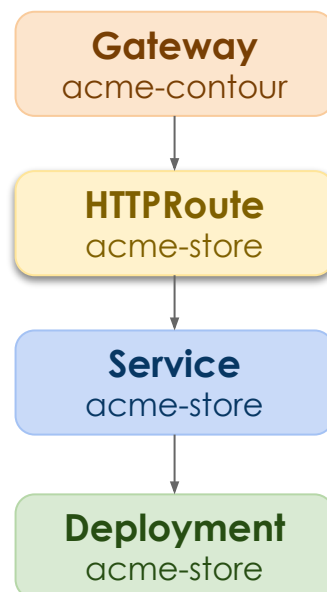


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1. Publish Acme store with Contour



```
kind: HTTPRoute
metadata:
  name: acme-store
  labels:
    gateway: acme-external
spec:
  hostnames:
  - acme.io
  rules:
  - matches:
    - path:
        value: /store
    forwardTo:
    - serviceName: acme-store
      port: 8080
```




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Screen recording: apply yaml, make requests



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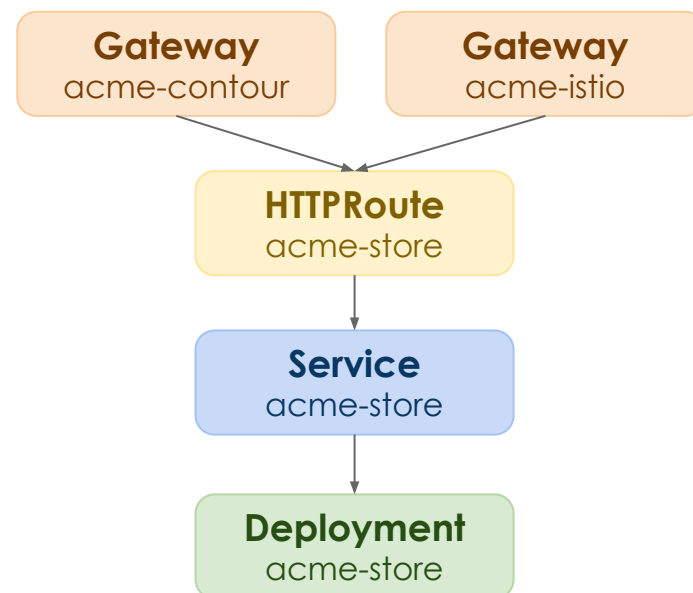


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2. Add an Istio Gateway





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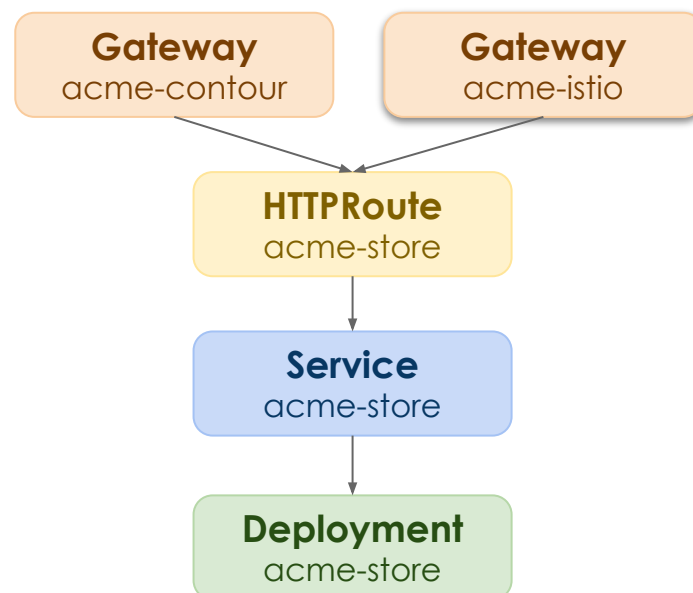


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2. Add an Istio Gateway



```
kind: Gateway
metadata:
  name: acme-istio
spec:
  gatewayClassName: istio
  listeners:
  - protocol: HTTP
    port: 80
    routes:
      kind: HTTPRoute
      selector:
        matchLabels:
          gateway: acme-external
```



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Demo

Route Header Matching with Traefik



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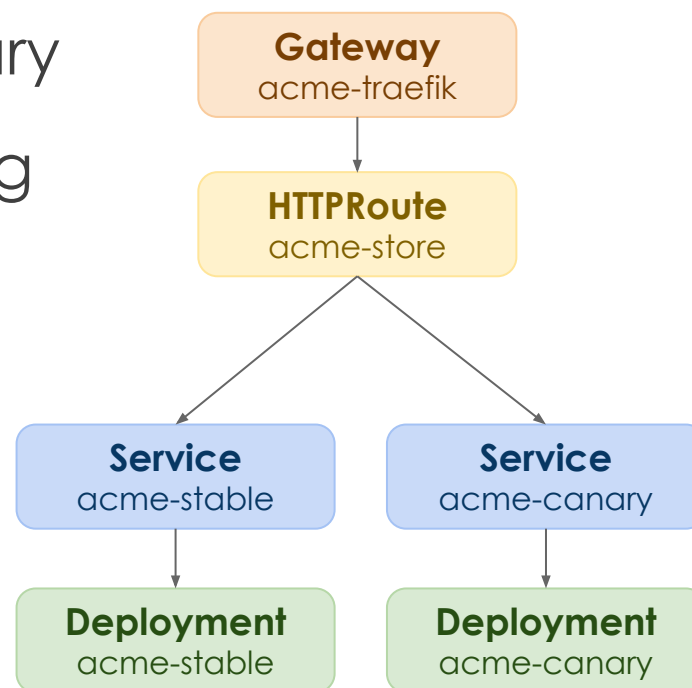


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1. Implement canary header matching with Traefik





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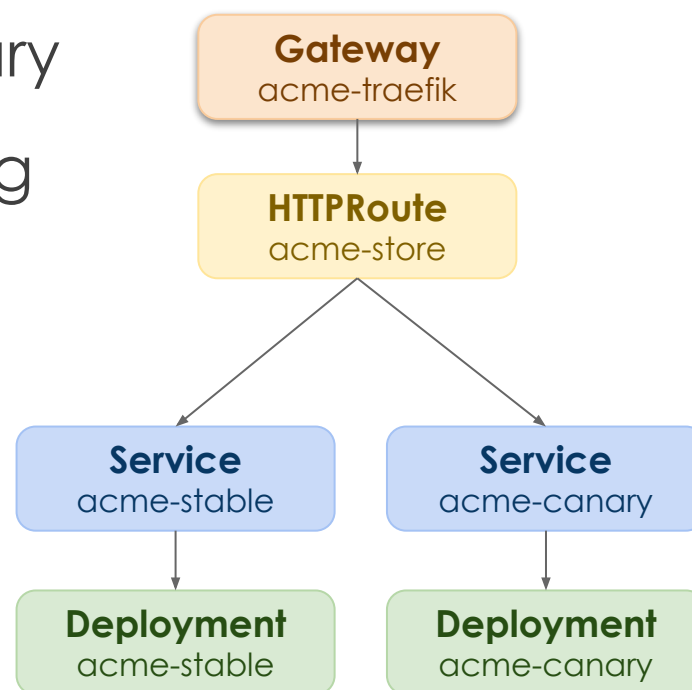


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1. Implement canary header matching with Traefik



```
kind: Gateway
metadata:
  name: acme-traefik
spec:
  gatewayClassName: traefik
  listeners:
  - protocol: HTTP
    port: 80
  routes:
    kind: HTTPRoute
    selector:
      matchLabels:
        gateway: acme-external
```



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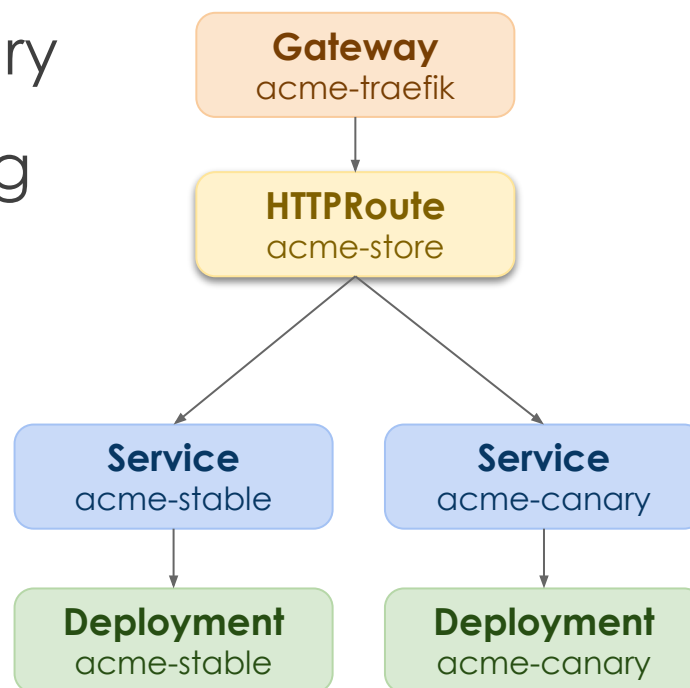


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1. Implement canary header matching with Traefik



```
kind: HTTPRoute
metadata:
  name: acme-store
  labels:
    gateway: acme-external
spec:
  rules:
    - matches:
      - headers:
          values:
            serve: canary
        forwardTo:
          - serviceName: acme-canary
            port: 80
    - matches:
      - path:
          value: /
        forwardTo:
          - serviceName: acme-stable
            port: 80
```



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Screen recording: apply yaml, make requests



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Demo

Multicluster Traffic Splitting with GKE

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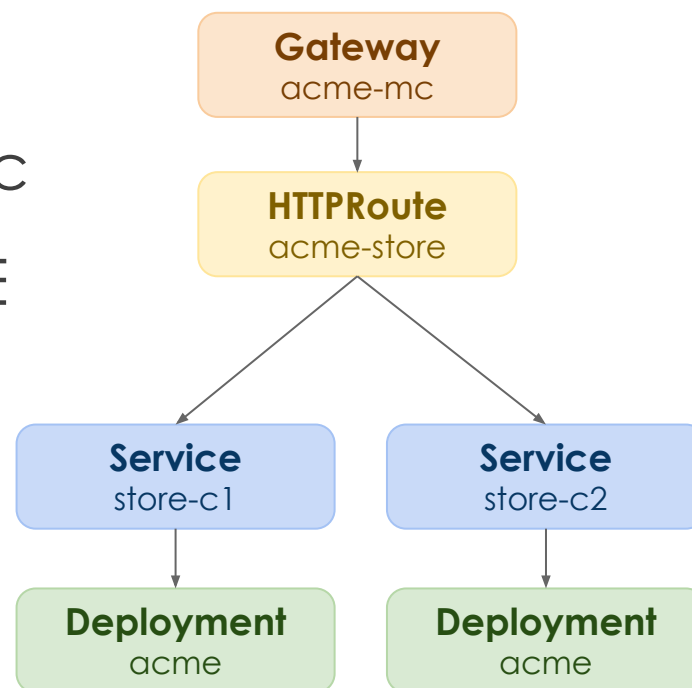


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Virtual

1. Implement multicluster traffic splitting with GKE





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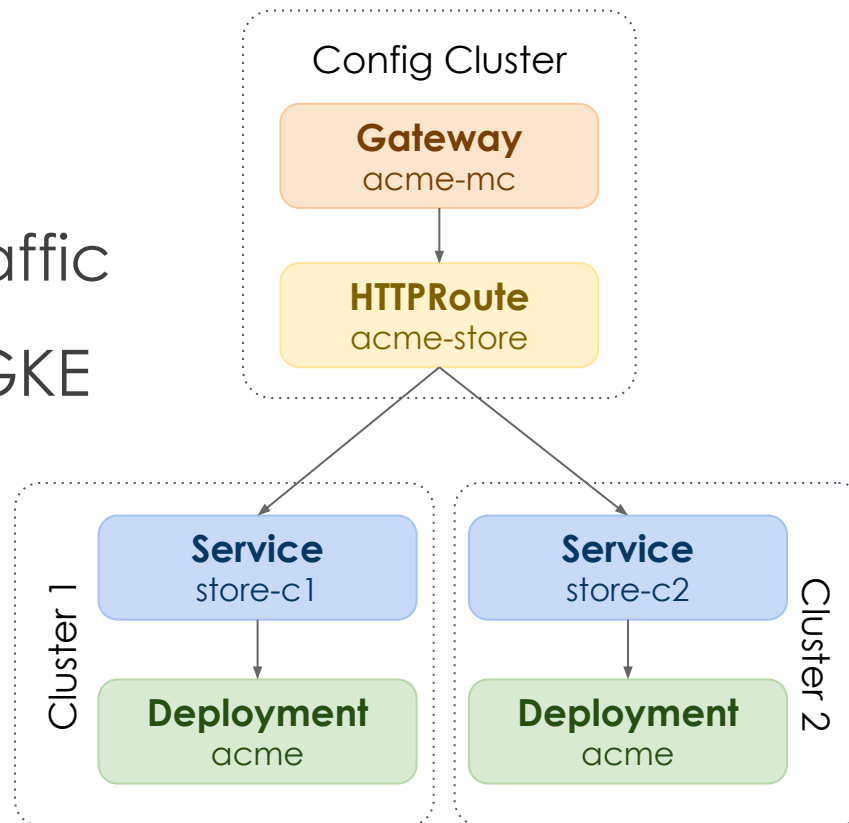


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1. Implement multicloud traffic splitting with GKE





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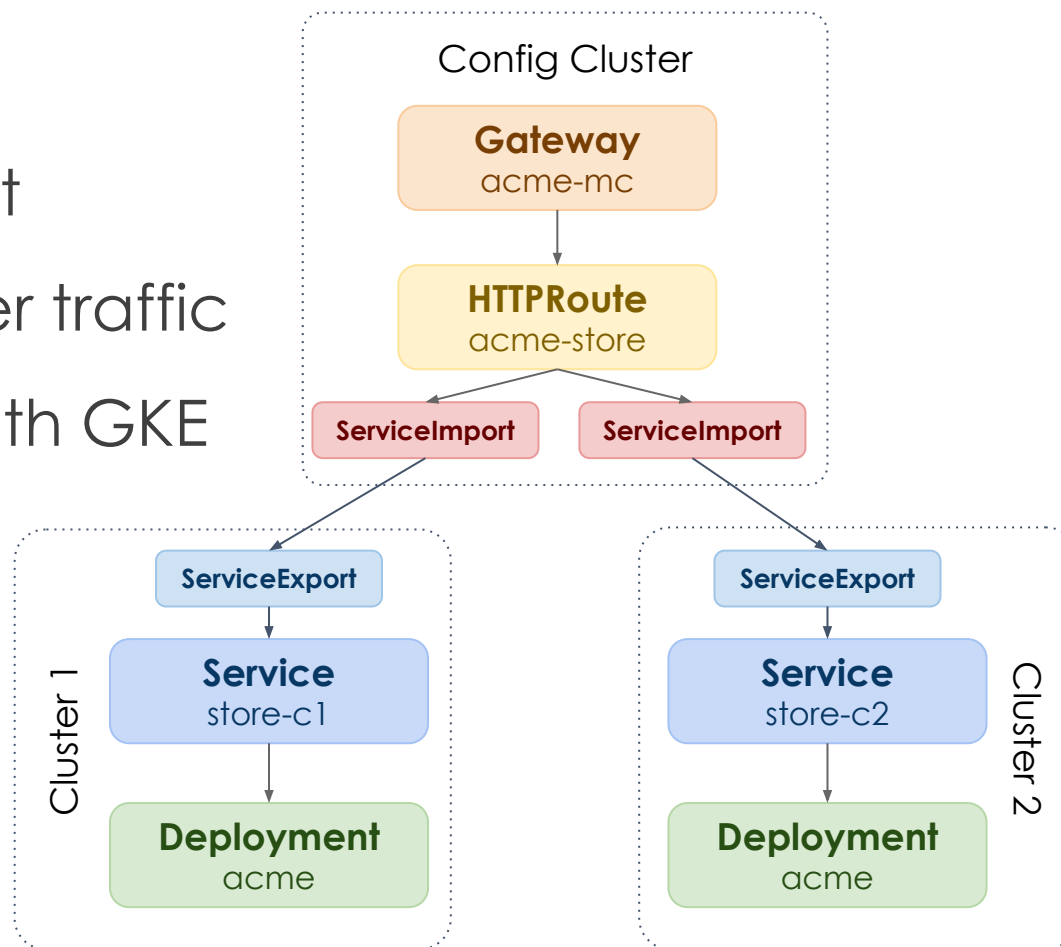


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1. Implement multicluster traffic splitting with GKE





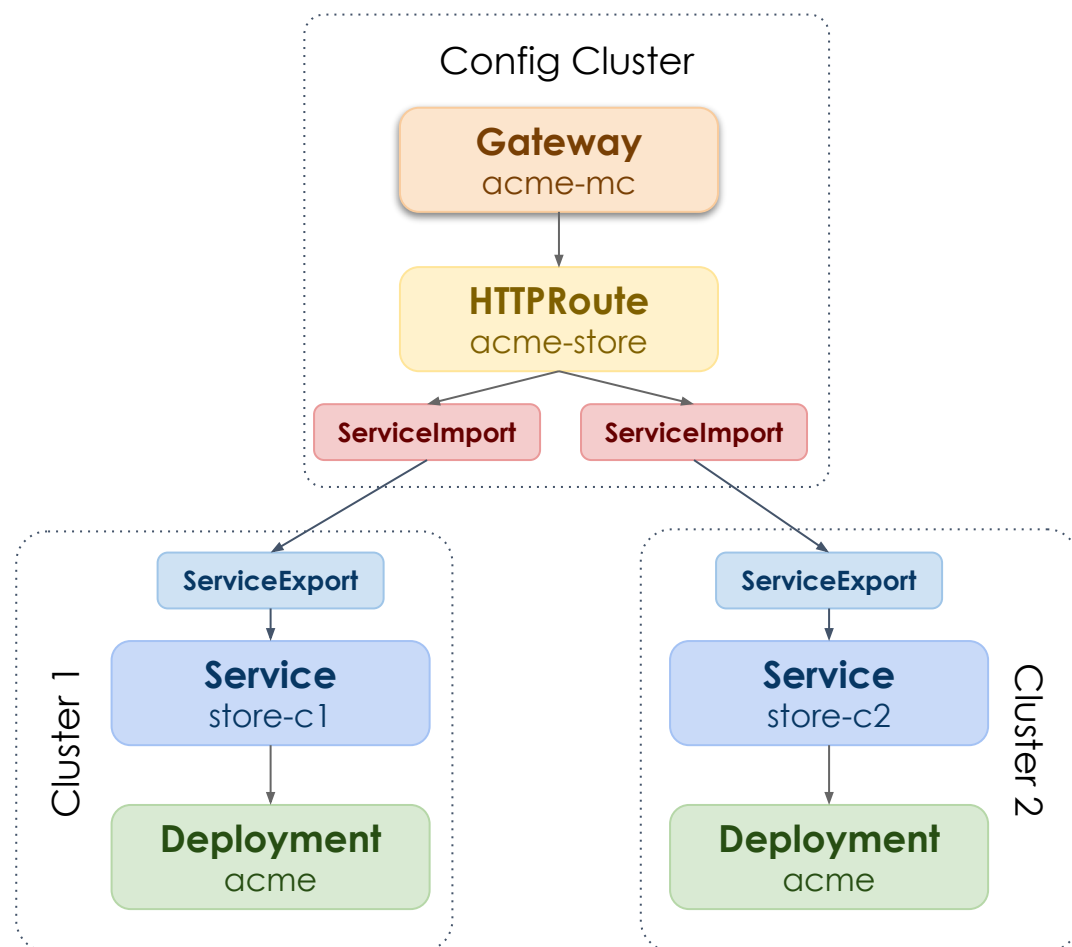
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Virtual



```
kind: Gateway
metadata:
  name: acme-mc
spec:
  gatewayClassName: gke-l7-rilb-mc
  listeners:
  - protocol: HTTP
    port: 80
    routes:
      kind: HTTPRoute
      selector:
        matchLabels:
          gateway: acme-mc
```



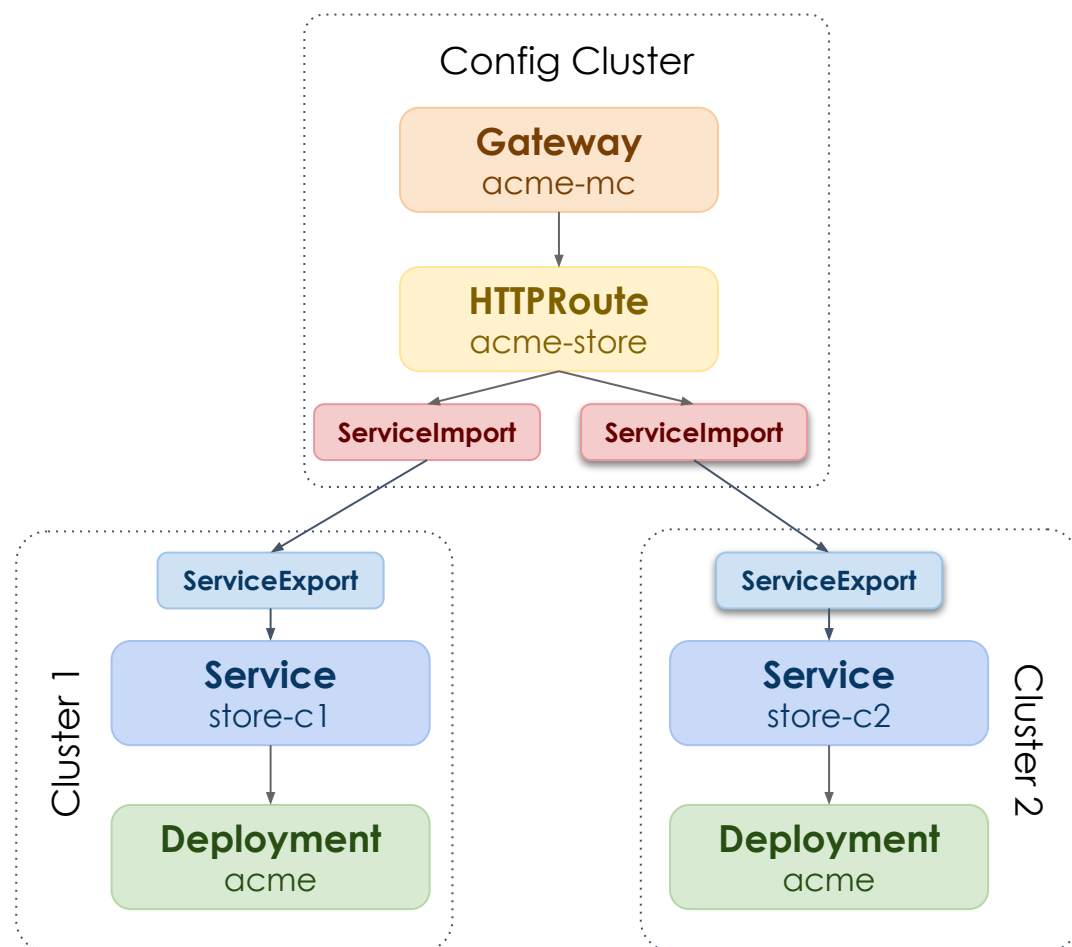
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```
kind: ServiceImport
metadata:
  name: acme-c2
spec:
  ips:
  - 10.101.246.195
  ports:
  - port: 8080
    protocol: TCP
  type: ClusterSetIP
```

```
kind: ServiceExport
metadata:
  name: store-c2
```



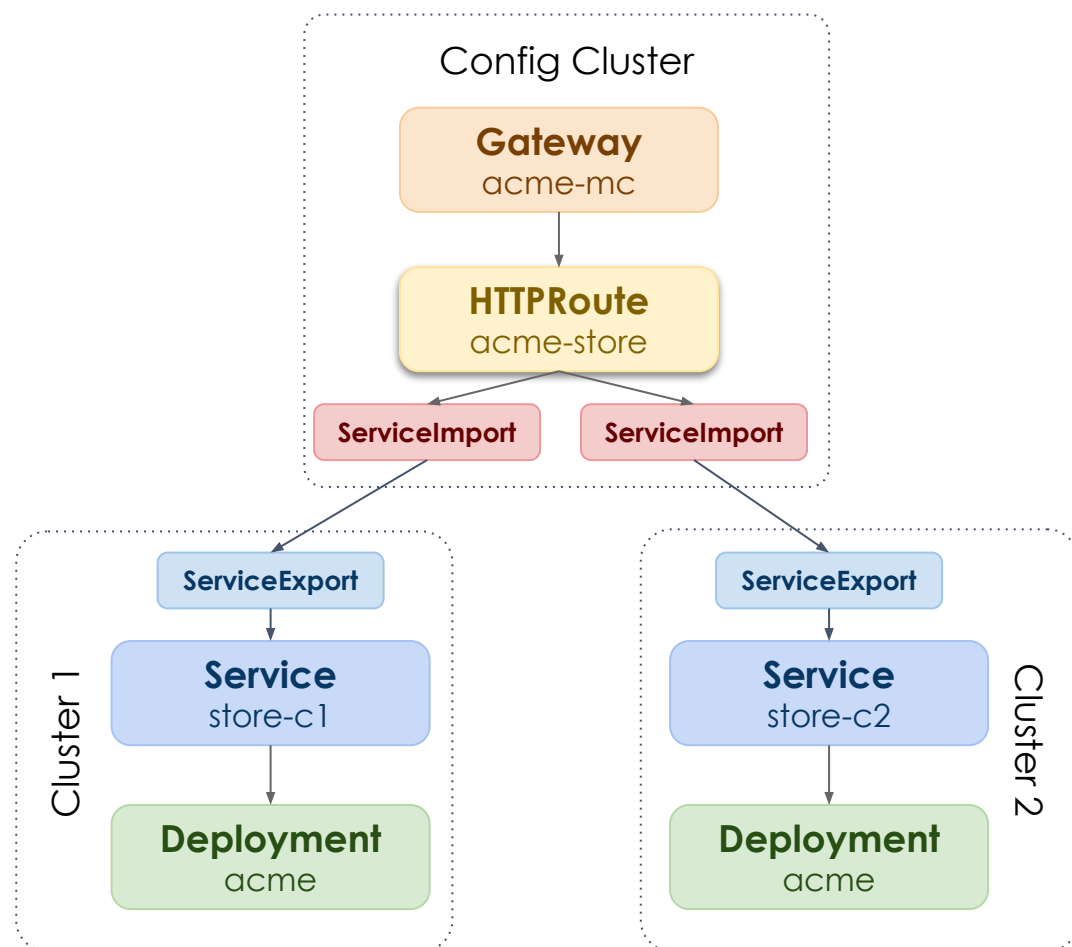
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```
kind: HTTPRoute
metadata:
  name: acme-store
  labels:
    gateway: acme-mc
spec:
  rules:
    - forwardTo:
        - backendRef:
            kind: ServiceImport
            name: store-c1
            port: 8080
            weight: 5
        - backendRef:
            kind: ServiceImport
            name: store-c2
            port: 8080
            weight: 5
```



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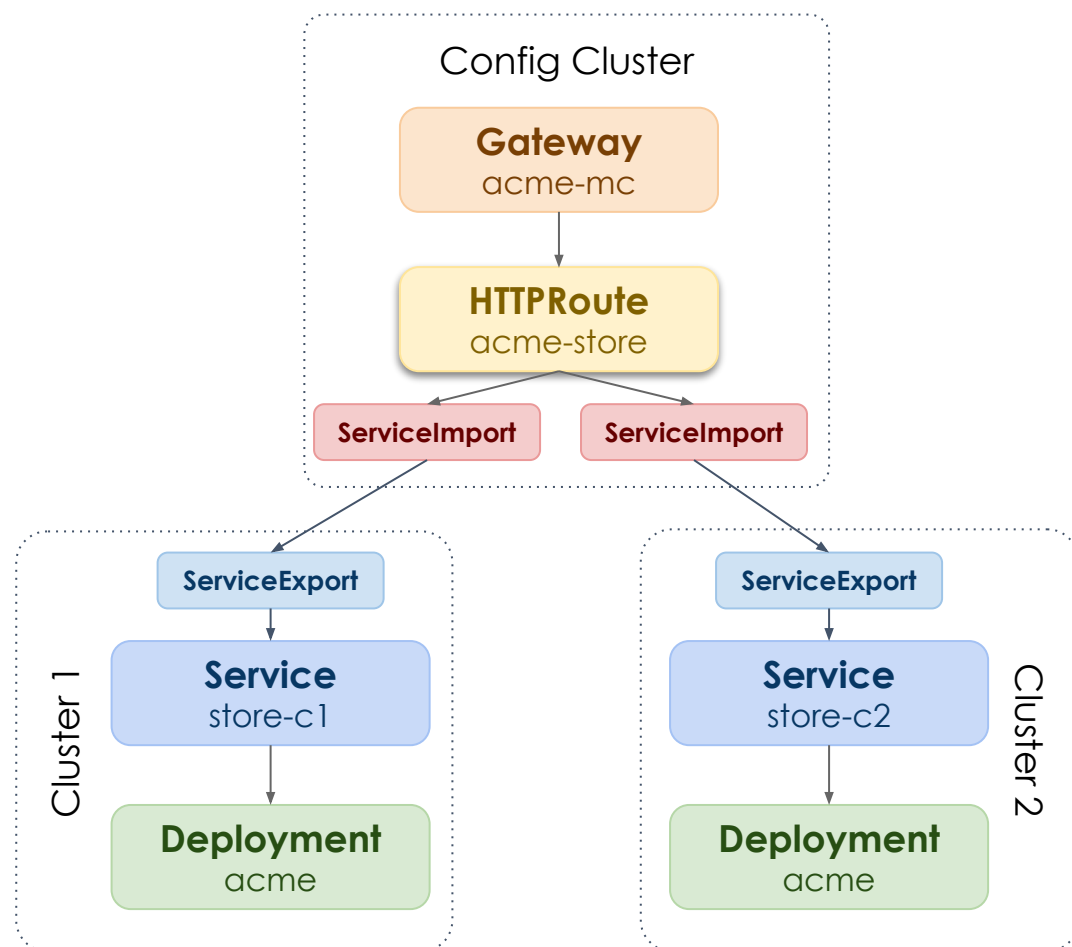


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```

kind: HTTPRoute
metadata:
  name: acme-store
  labels:
    gateway: acme-mc
spec:
  rules:
  - filters:
    - type: RequestMirror
      requestMirror:
        backendRef:
          kind: ServiceImport
          name: store-c2
          port: 8080
  forwardTo:
  - backendRef:
      kind: ServiceImport
      name: store-c1
      port: 8080
  
```



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Screen recording: apply yaml, make requests

There's a lot more



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- These APIs already enable a lot more functionality than we can demo:
 - Header modification
 - Cross-namespace Route selection
 - Advanced TLS configuration
 - Custom Route filters
 - L4 protocols



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Implementations in Progress



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Google Cloud



solo.io



Istio



traefik

Roadmap



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- Launching v1 alpha2 soon
- Conformance tests and webhook validation in progress
- Hoping to release v1 beta1 later this year
- Early feedback is very important
- Community meetings weekly on Wednesdays, all are welcome



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Learn more at:
gateway-api.sigs.k8s.io

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