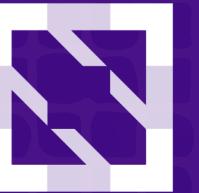




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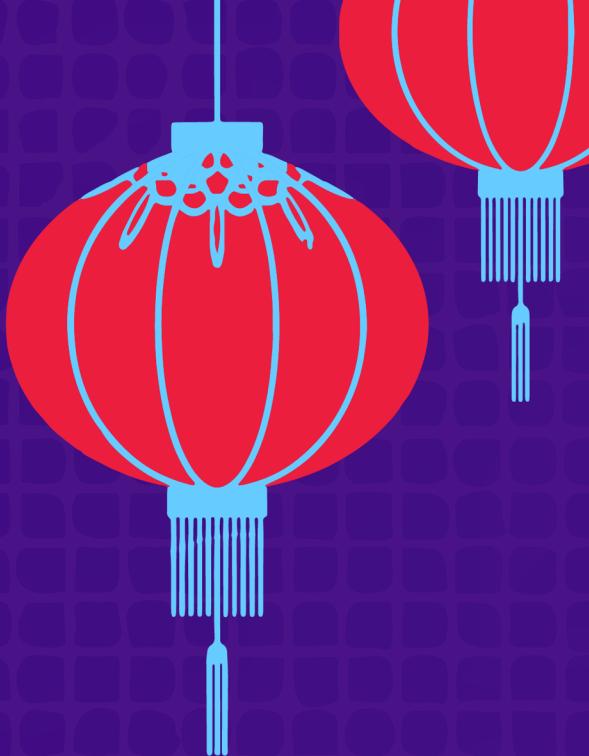


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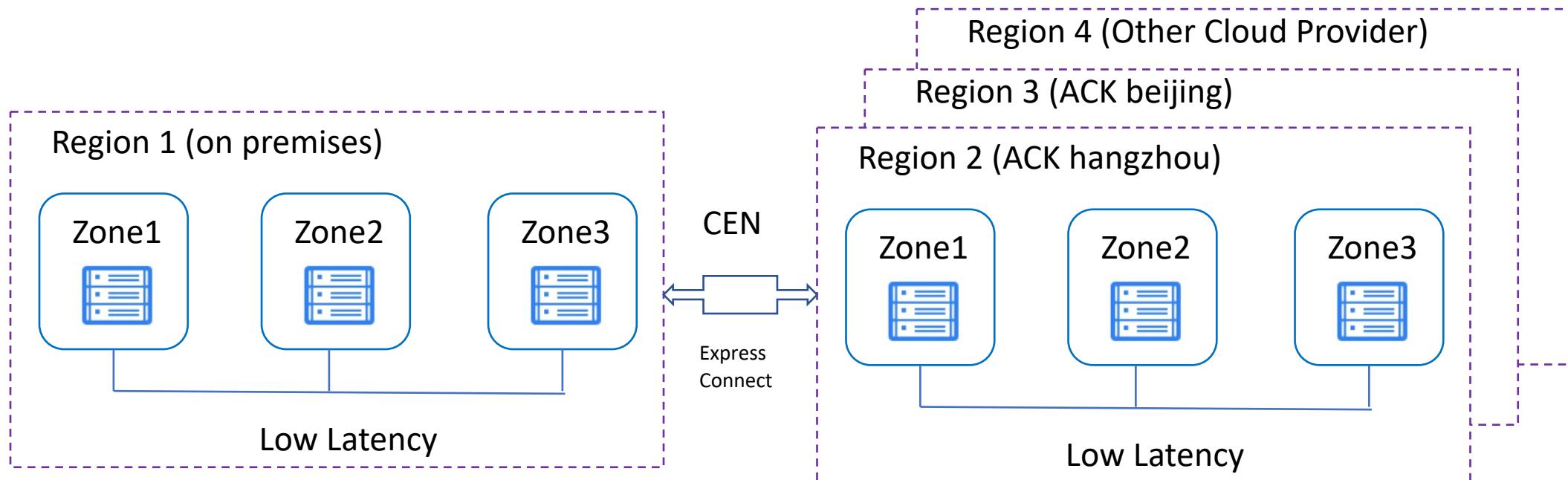
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Using Istio to Manage the Cross-Regional & Cross-Cluster Microservices

Xi Ning Wang(王夕宁), Alibaba Cloud
Xiao Zhong Liu(刘晓忠), UniCareer

Why need the multiple regions/clusters?

1. Business Continuity/Disaster Recovery
2. Geographically distributed end users
 - Reduce the access latency
 - Meet local legal and data regulatory compliance
3. Lower barrier to setup the network connectivity b/w regions & clusters



What does multi-region/cluster mean to ACK?



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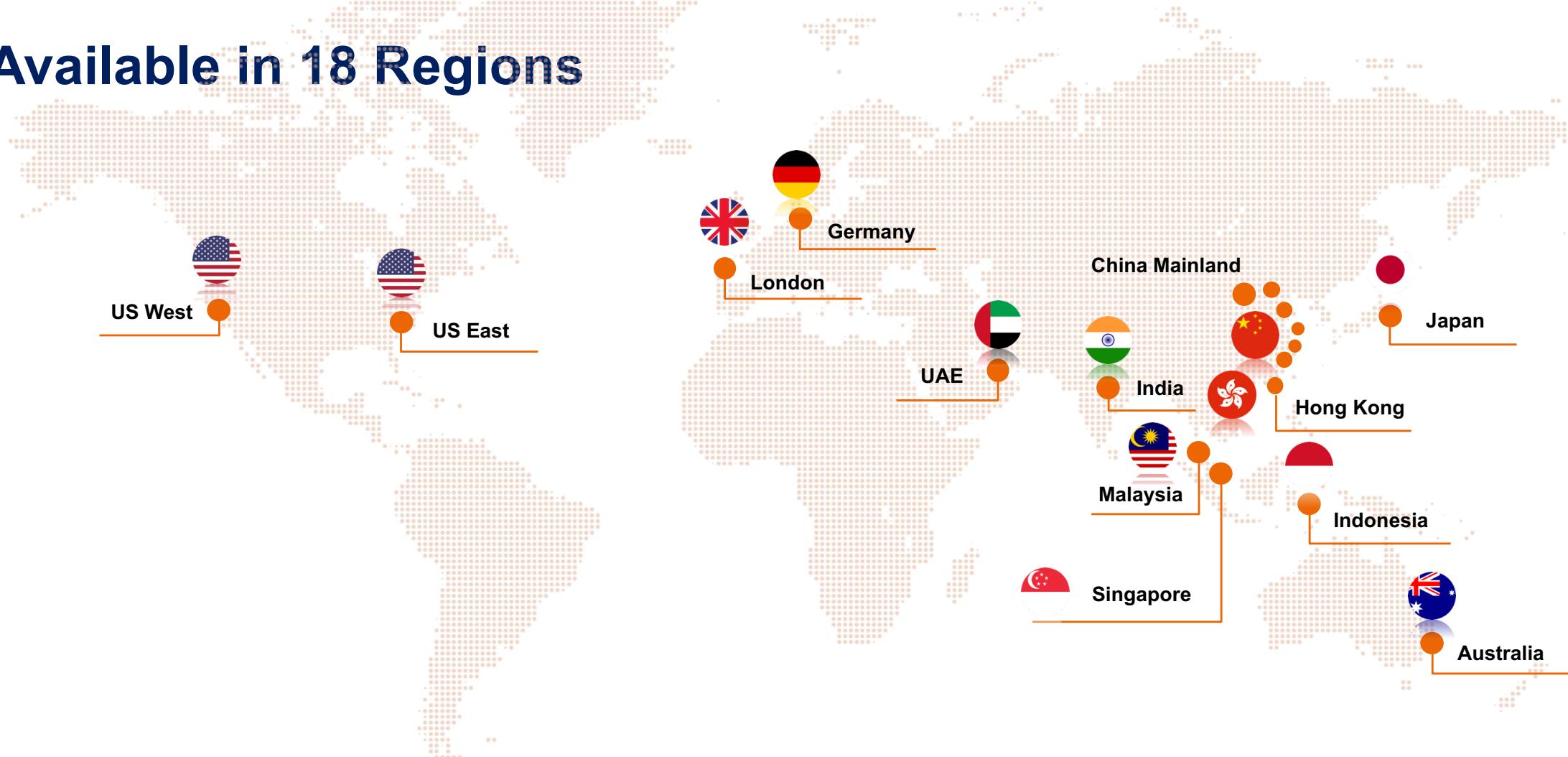
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ACK: Alibaba Container Service for Kubernetes

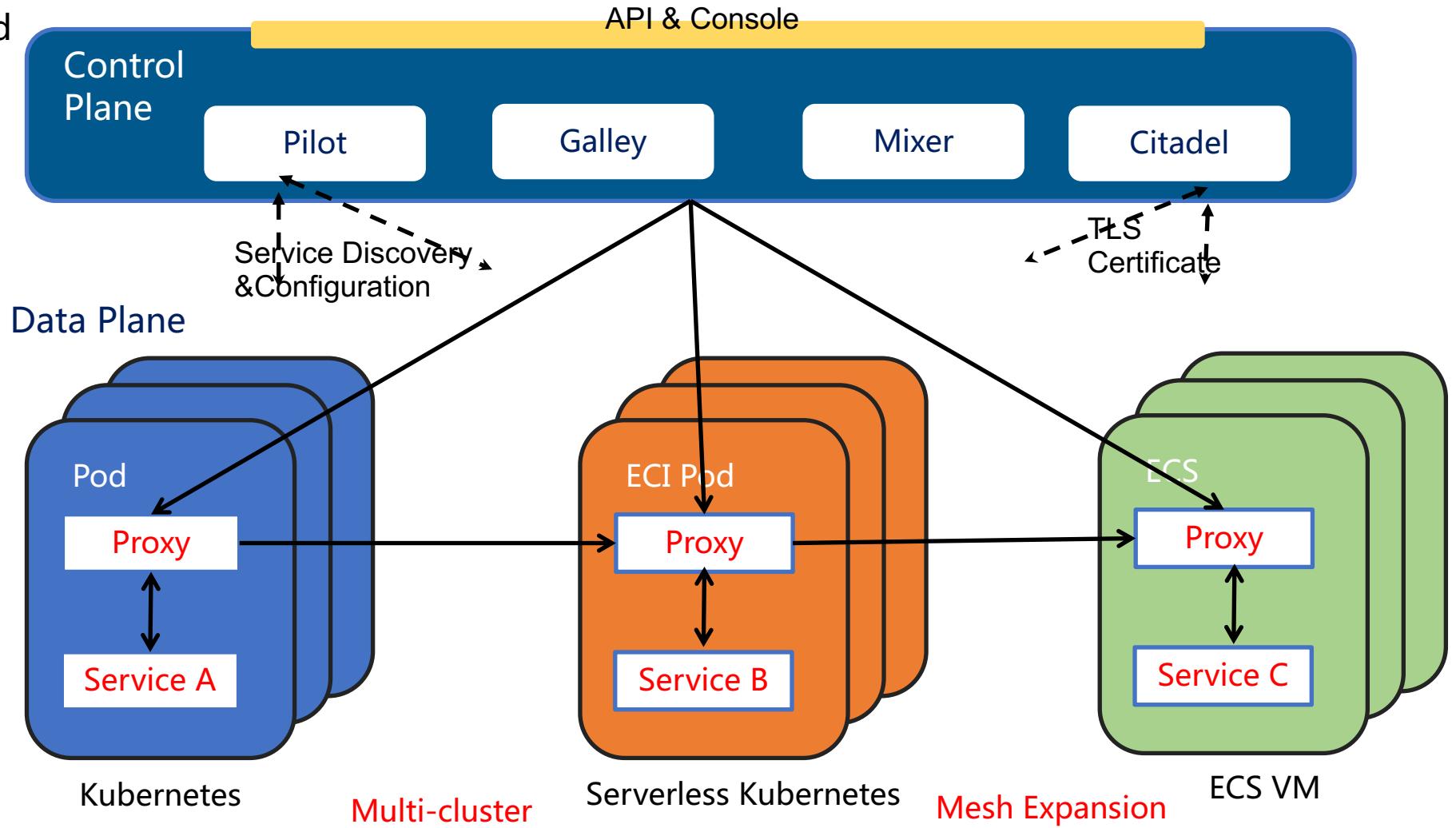
Available in 18 Regions



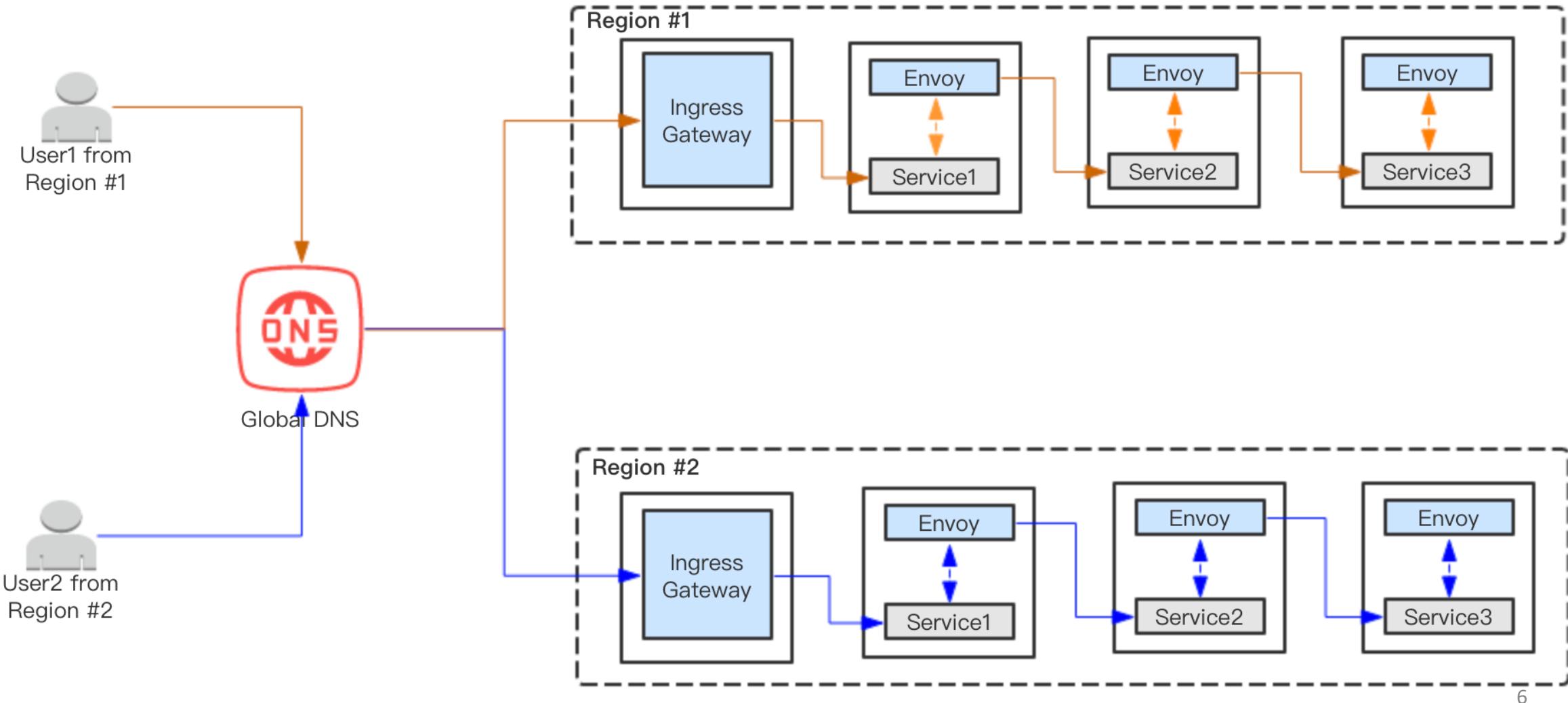
Istio on ACK

Integration with Alibaba Cloud services & open source

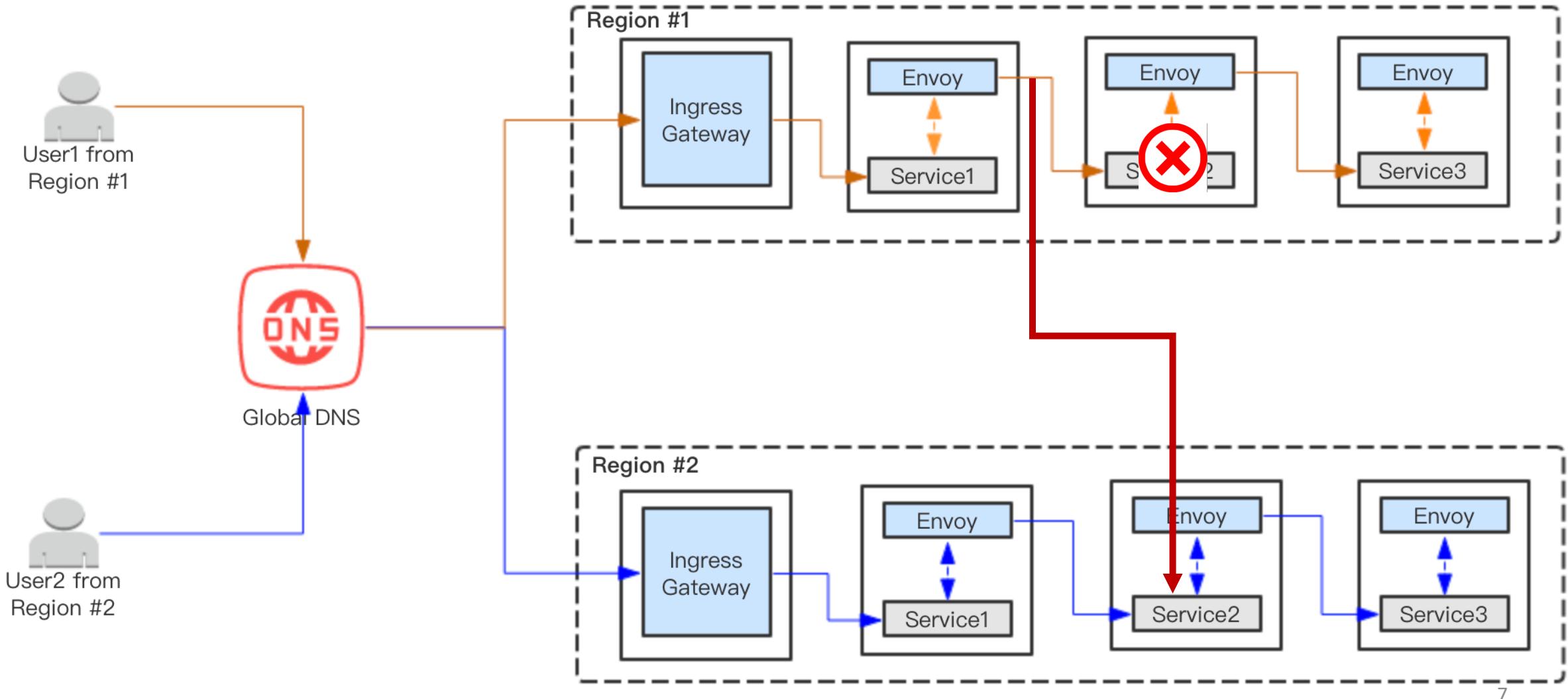
- Log Service
- Tracing Analysis
- Cloud Monitor
- Prometheus+TSDB
- Grafana
- Kiali
-



Feature Request for multi-region/cluster - Locality based service routing



Feature Request for multi-region/cluster - Automatic Failover



Istio multi-cluster patterns

	Single Mesh	Mesh Federation	
Istio 1.0 <i>* Support for Istio 1.0 ends on June 19th, 2019</i>	<ul style="list-style-type: none">• Single Control Plane• Flat network• All pod CIDRs in every cluster must be routable to each other• Pod/Service CIDR ranges must be unique		
Istio 1.1	<ul style="list-style-type: none">• Same to above in Istio 1.0	<ul style="list-style-type: none">• Single Control Plane• No VPN network• Inter-connectivity through gateways• Pod/Service CIDR ranges may be overlapped	<ul style="list-style-type: none">• Multiple Control Planes• No VPN network• Inter-connectivity through gateways• Pod/Service CIDR ranges may be overlapped

Simplified Installation and Configuration



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Alibaba Cloud Select resource group ▾ Global Search Billing Management Enterprise More 🛍️ 🚤 📦 English

Container Service - Kubernetes ▾

Clusters

Namespaces

Release Name

Version

Pilot Settings

Trace Sampling Percentage (0 to 100) 100

Enable locality based service routing

Control Egress Traffic

Blocked Addresses for External Access All

Release the address range for external access

This parameter is left empty by default. Use commas (,) to separate multiple addresses.

Gateway settings

Create a default ingress gateway

Overview

Clusters

Clusters

Nodes

Volumes

Namespaces

Authorization

Applications

Deployments

Stateful Sets

Daemon Sets

Jobs

Cron Jobs

Pods

Simplified Installation and Configuration (2)

Multi-cluster same control plane mode setting

- Not enabled
- Use Flat network or VPN
- Do not use Flat network or VPN

Step	Status
Pre-Check	pending
Create Istio Resource Definition	pending
Deploy Istio	pending

Deploy Istio

Custom Resource for Istio Operator

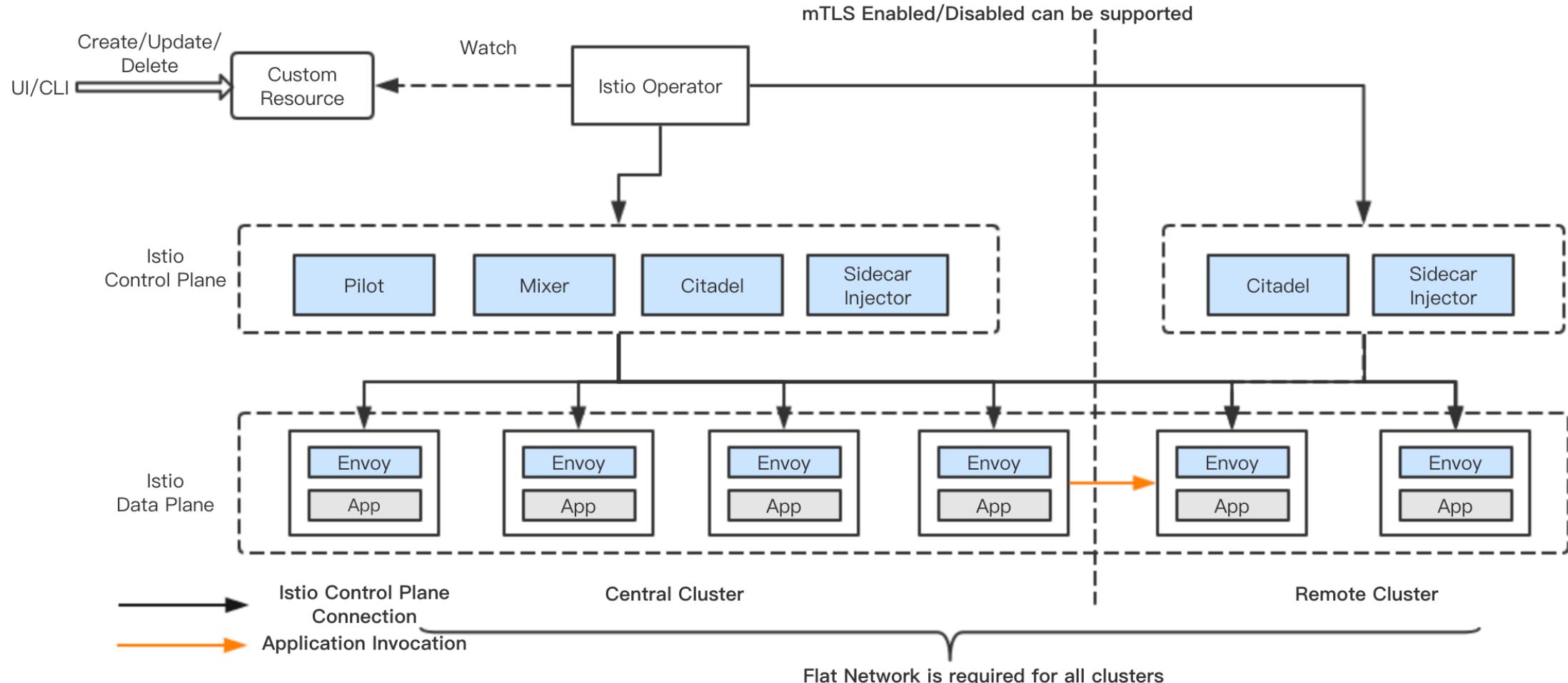
Each K8s cluster running Istio control plane should have one Istio CR(custom resource)

```
1  apiVersion: istio.alibabacloud.com/v1beta1
2  kind: Istio
3  metadata:
4    labels:
5      controller-tools.k8s.io: "1.0"
6      heritage: Tiller
7      release: istio
8    name: istio-config
9  spec:
10   hub: registry-vpc.cn-hangzhou.aliyuncs.com/aliacs-app
11   version: 1.1.8
12   controlPlaneSecurityEnabled: false
13   mtls:
14     enabled: false
15   security:
16     selfSigned: true
17   meshExpansion:
18     enabled: false
19   includeIPRanges: "*"
20   excludeIPRanges: ""
21   outboundTrafficPolicy:
22     mode: "REGISTRY_ONLY"
23   logging:
24     level: "default:info"
25   dockerImage:
26     region: ""
27   gateways:
28     enabled: true
29   ingress:
```

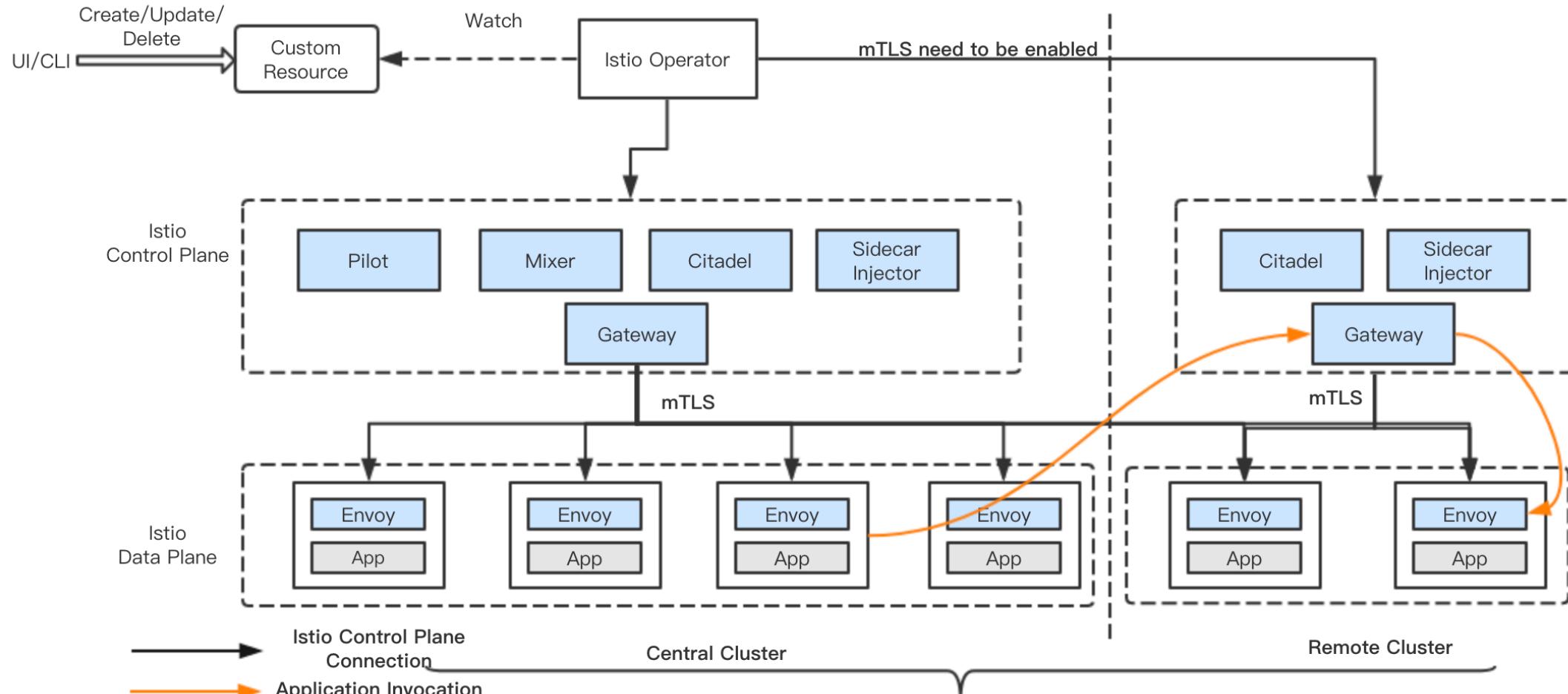
One RemoteIstio custom resource is created for each remote cluster

```
1  apiVersion: istio.alibabacloud.com/v1beta1
2  kind: RemoteIstio
3  metadata:
4    name: localityaware-bj
5    namespace: istio-system
6  spec:
7    autoInjectionNamespaces:
8      - default
9    dockerImage:
10      region: cn-beijing
11    gateways:
12      enabled: true
13      ingress:
14        + enabled: true...
15        k8singress: {}
16    hub: registry.cn-beijing.aliyuncs.com/aliacs-app-catalog
17    includeIPRanges: '*'
18    proxy: {}
19    security: {}
20    sidecarInjector:
21      enabled: true
22    replicaCount: 1
```

Multi-cluster support of Istio on ACK - Flat network



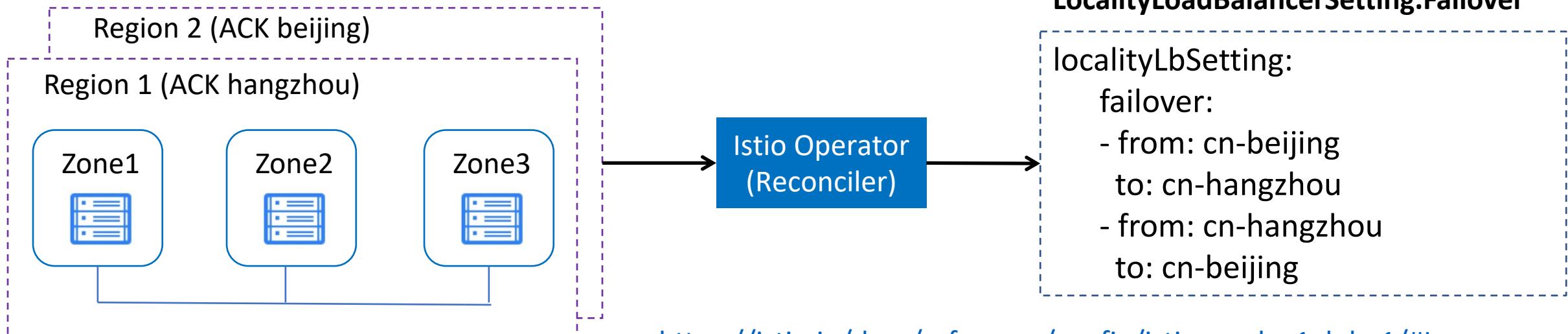
Multi-cluster support of Istio on ACK - Gateway Connected



1. Flat Network is NOT required for all clusters;
2. Cross cluster mTLS requires one shared Root CA;

How to enable locality aware & failover?

- Kubernetes reserves the following labels for Nodes:
 - failure-domain.beta.kubernetes.io/region
 - failure-domain.beta.kubernetes.io/zone
- Automatically retrieve the regions and zones info, and populate the preferred failover regions if no specific region is provided



<https://istio.io/docs/reference/config/istio.mesh.v1alpha1/#LocalityLoadBalancerSetting-Failover>

Customer Case Reference - Unicareer



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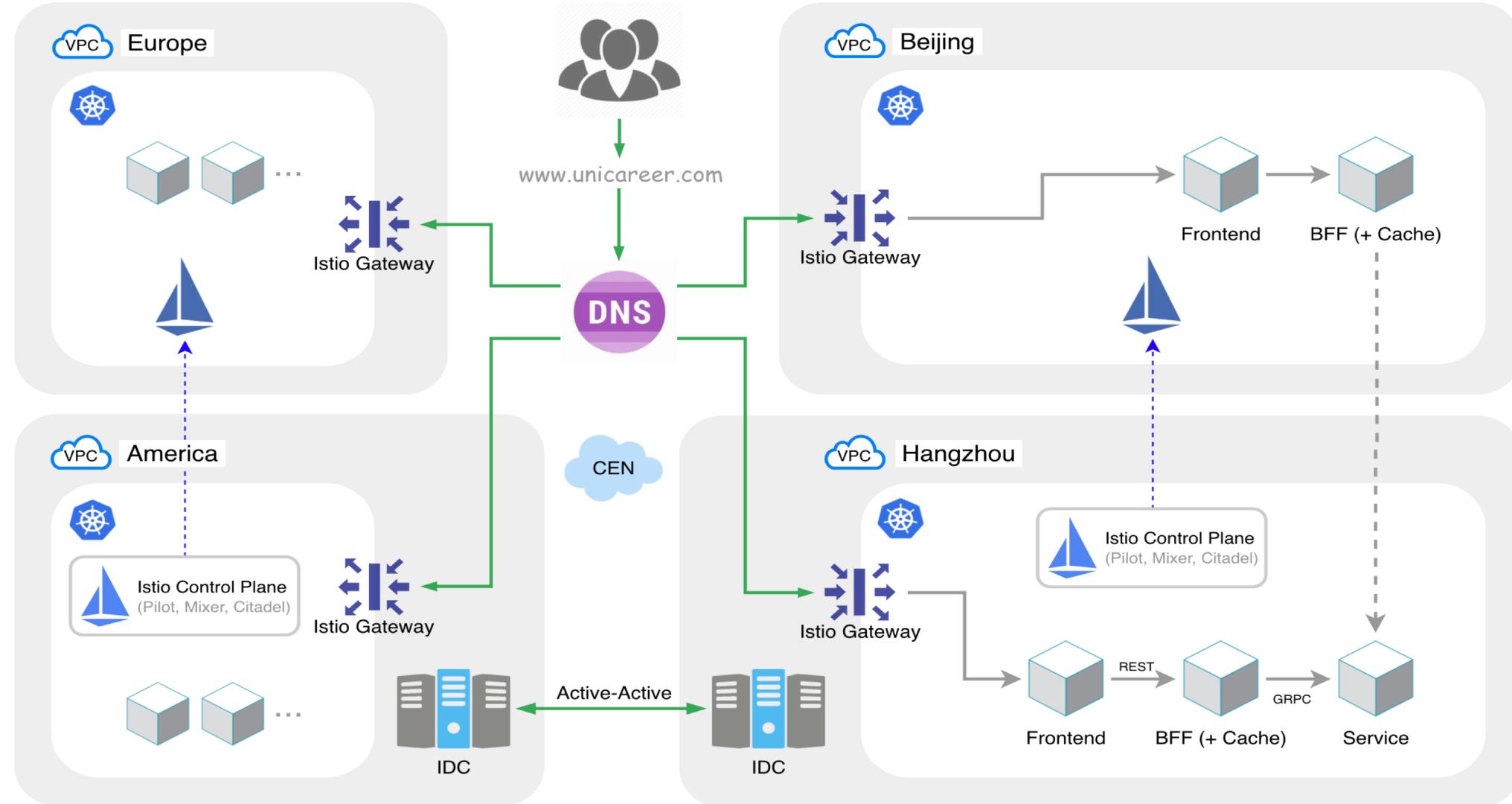
Business Scenario

- Serving global users including China Mainland, America, Europe and Australia, etc.
- No dedicated operations team.
- Need one easy-to-use microservice management solution for our full chain of web apps

Key Problems

- Stable high latency across regions.
- Occasional extreme latency due to cross regional network fluctuation.
- Existing K8s Ingress is weak and inconvenient.
- Multiple programming languages support.
- Decouple application logic from service infrastructure.
- Need to integrate with K8s ecosystem.

Services running on cross-regional K8s clusters





Quick Demo

North China



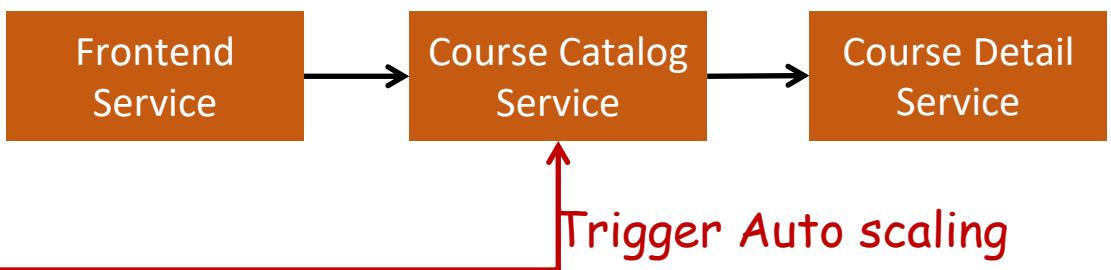
The screenshot shows the course catalog for the '金融' (Finance) category. It features a large orange banner with the text '3分钟/看懂金融行业课程亮点'. Below it, there are two course cards: '金融行业全景概览' (Financial Industry Overview) by 'Kara' and another course card. The footer includes navigation icons for '首页', '课程', and '我的'.

Unicarer Online Course Service
running on ACK Beijing Region



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Unicarer Online Course Service
running on ACK Hangzhou Region



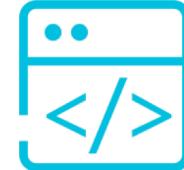
Benefits from Istio on ACK



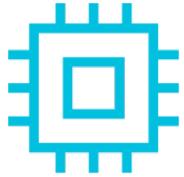
Simplify the Istio deployment and operation, etc.



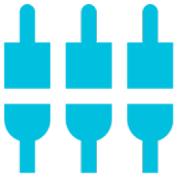
Integrated E2E observability with Alibaba Cloud services



Improved user experience for common scenarios, e.g. canary release, etc.



Assisted problem determination
- Automatic configuration checking and recovery



Unified traffic management for hybrid-cloud, multi-cloud, and cloud migration



Compatible with open source community

Recap

Phase 1

Basic Install & Minor Upgrade



Phase 2

Seamless Upgrades

Phase 3

Full Integration & Lifecycle

Phase 4

Auto Pilot



ACK Istio Operator

- Automated provision and configuration management
- ACK provides one-click UI page to simplify the configuration

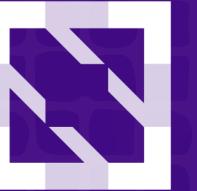
- Seamless upgrades supported
- ACK provides one-click mode to upgrade

- Istio community version does not cover storage management and maintenance
- ACK provides the full integration with Alibaba Cloud services including storage, tracing, logging, etc.

- ACK provides automatic config tuning, abnormal detection and recovery
- ACK provides the multi-cluster management using CRD



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