Google Cloud

Next '24

Introducing Cloud Service Mesh: A fully managed global scale service mesh

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Product Manager,

Google Cloud

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Technical Lead Service Mesh,

Google Cloud

Agenda

01 Why service mesh?
02 Cloud Service Mesh
03 Evolution of mesh
04 Ambient Mesh
05 API
06 Extensibility
07 Istio
08 Demo

Why Service Mesh?

Scale and Reliability

Run **globally scalable and reliable** applications

Why Service Mesh?

Scale and Reliability

Run **globally scalable and reliable** applications

Security and Policy

Architect **zero trust and policy driven** networks

Why Service Mesh?

Scale and Reliability

Run **globally scalable and reliable** applications

Security and Policy

Architect **zero trust and policy driven** networks

Service Management

Service-centric telemetry and application management

Complexity and supportability of Mesh

Complexity

Onboarding

Lifecycle Management

Integration with other Services

Supportability

Self supported

Strong Community Reliance

Large scale production support challenges

Reliability

Requires strong community

Requires strong adoption

Consistent innovation and features

Google Service Mesh products

Anthos Service Mesh

Istio API based (Kubernetes CRDs)

Google Cloud and non Google Cloud environments

Managed and *hosted* on GCP Managed and *local* on non GCP

Platform Admin/Service Operators

Traffic Director

GCP API based

Google Cloud environments

Multiple GCP compute runtime support

GCP networking services integration

Managed and hosted on GCP

Network Admins

Introducing Cloud Service Mesh

A globally scalable, fully managed, Google platform integrated service mesh for all enterprises

Global control plane
Run anywhere

A globally scalable, fully managed, Google platform integrated service mesh for all enterprises

Global control plane
Run anywhere

Google managed
control/data plane &
Mesh/CA Services

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Integrated with
Google
Networking
Services

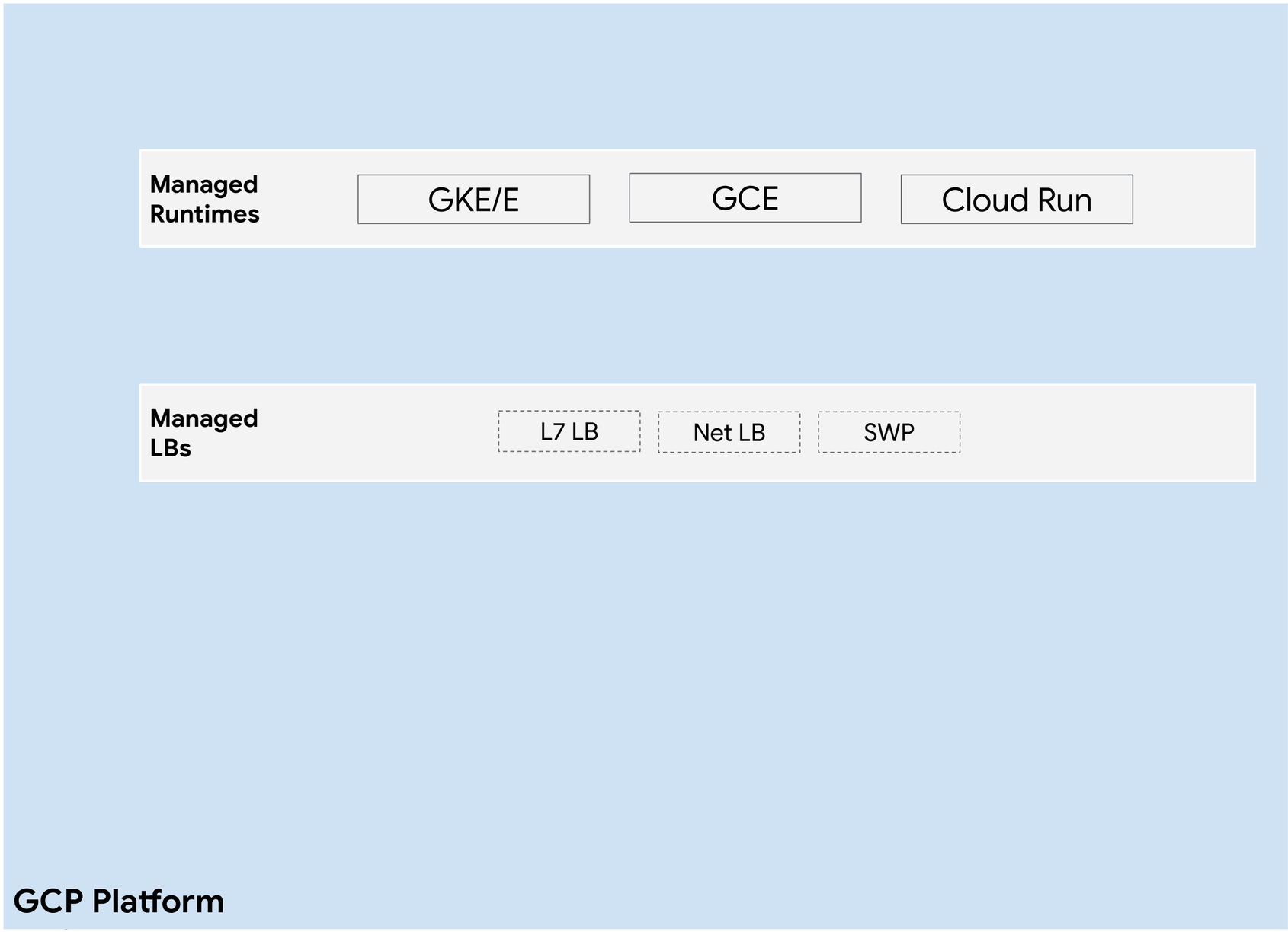
Global control plane
Run anywhere

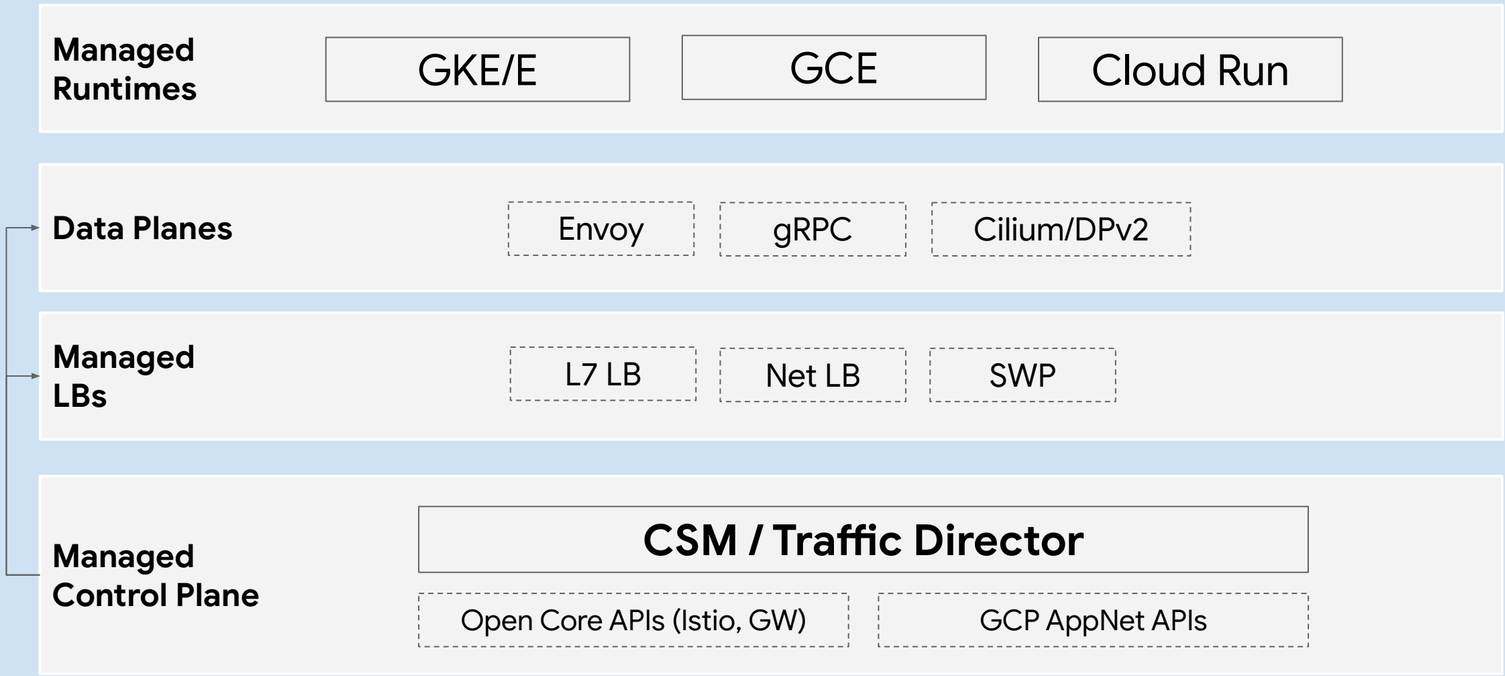
Google managed control/data plane & Mesh/CA Services

A globally scalable, fully managed, Google platform integrated service mesh for all enterprises

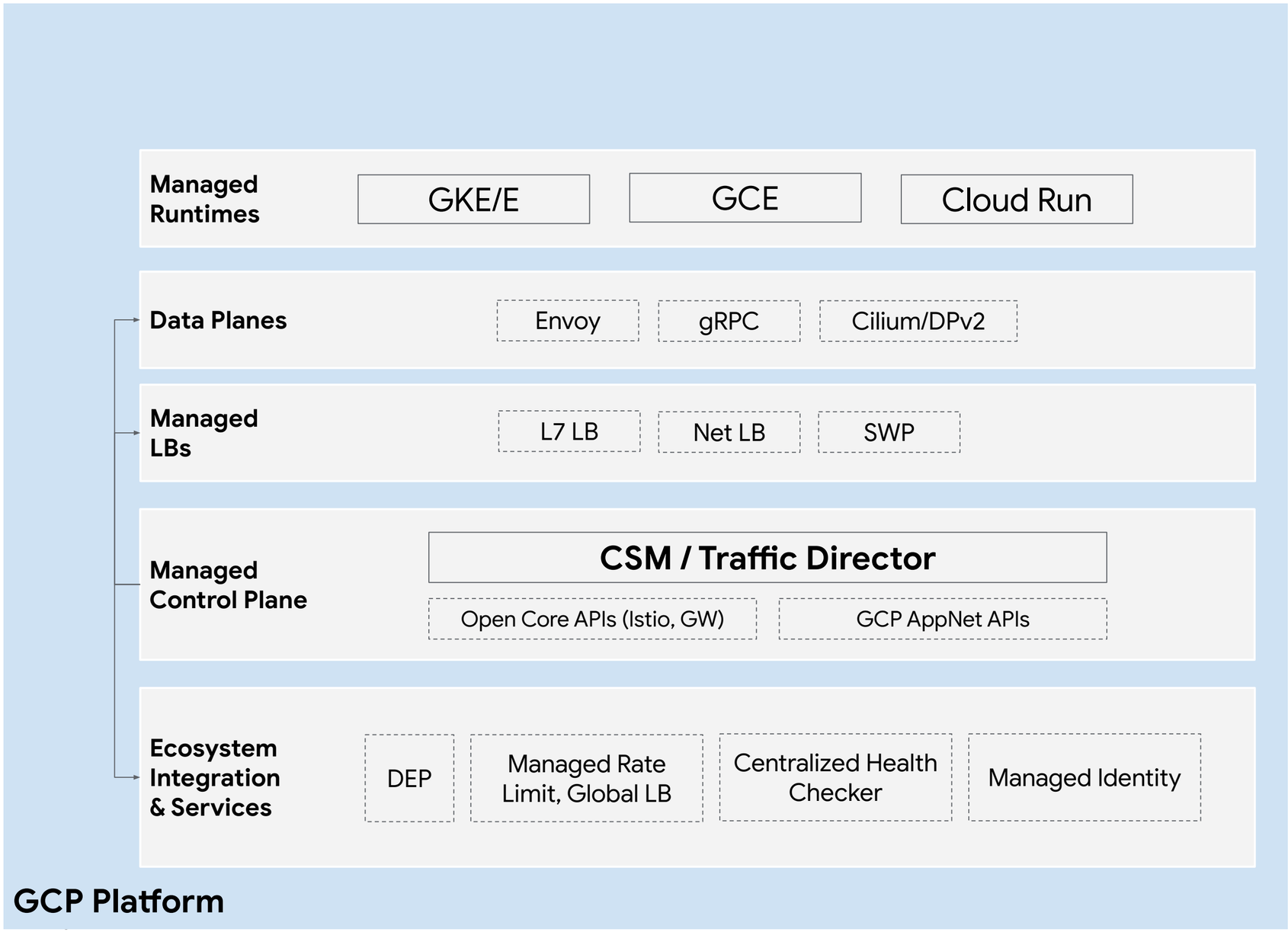
Integrated with Google Networking Services and compute platforms

Enterprise grade mesh to run secure, reliable and managed services


Managed Runtimes
GKE/E
GCE
Cloud Run
Managed LBs
L7 LB
Net LB
SWP
GCP Platform



GCP Platform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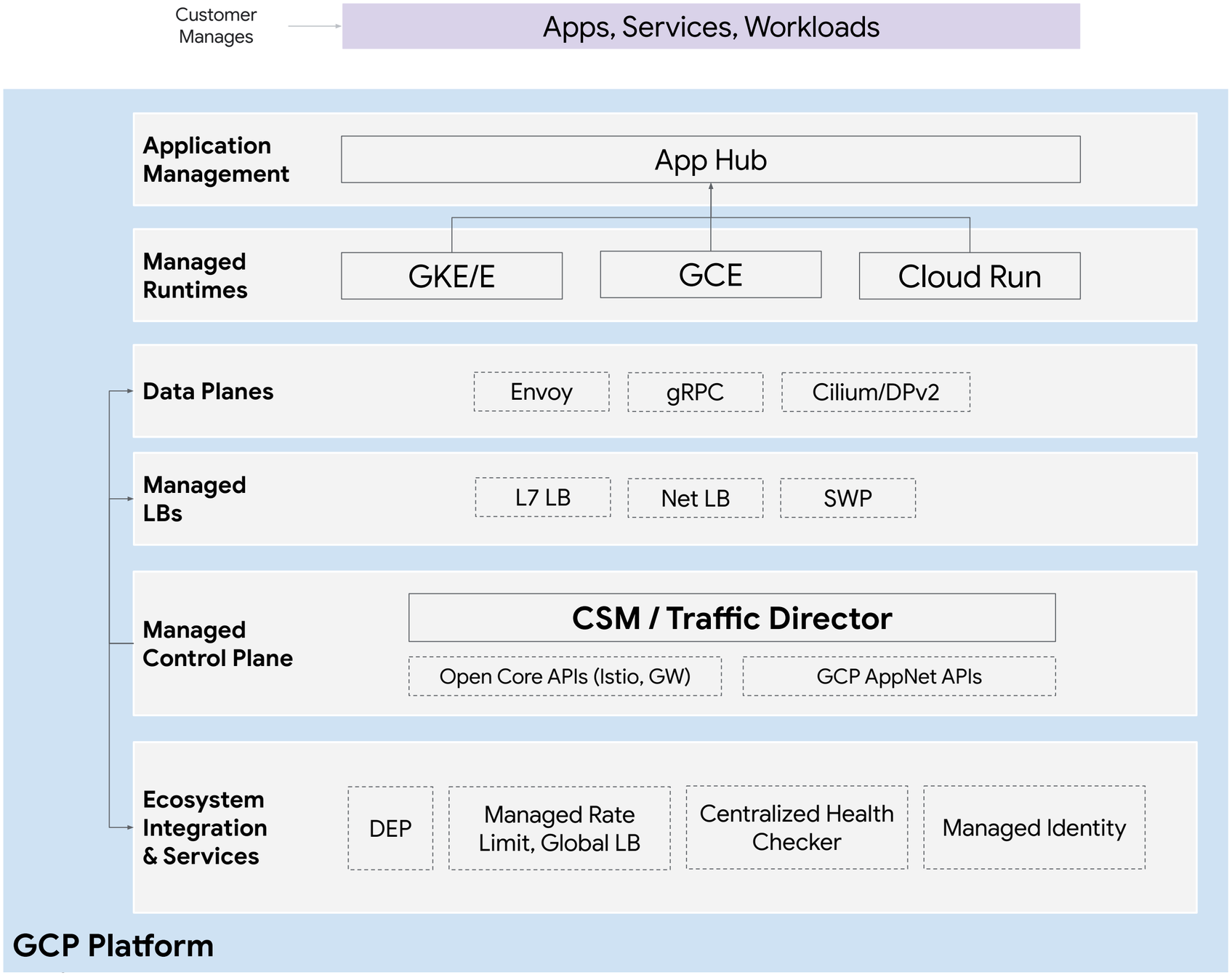
GCP AppNet APIs
Ecosystem Integration & Services
DEP
Managed Rate Limit, Global LB
Centralized Health Checker
Managed Identity
GCP Platform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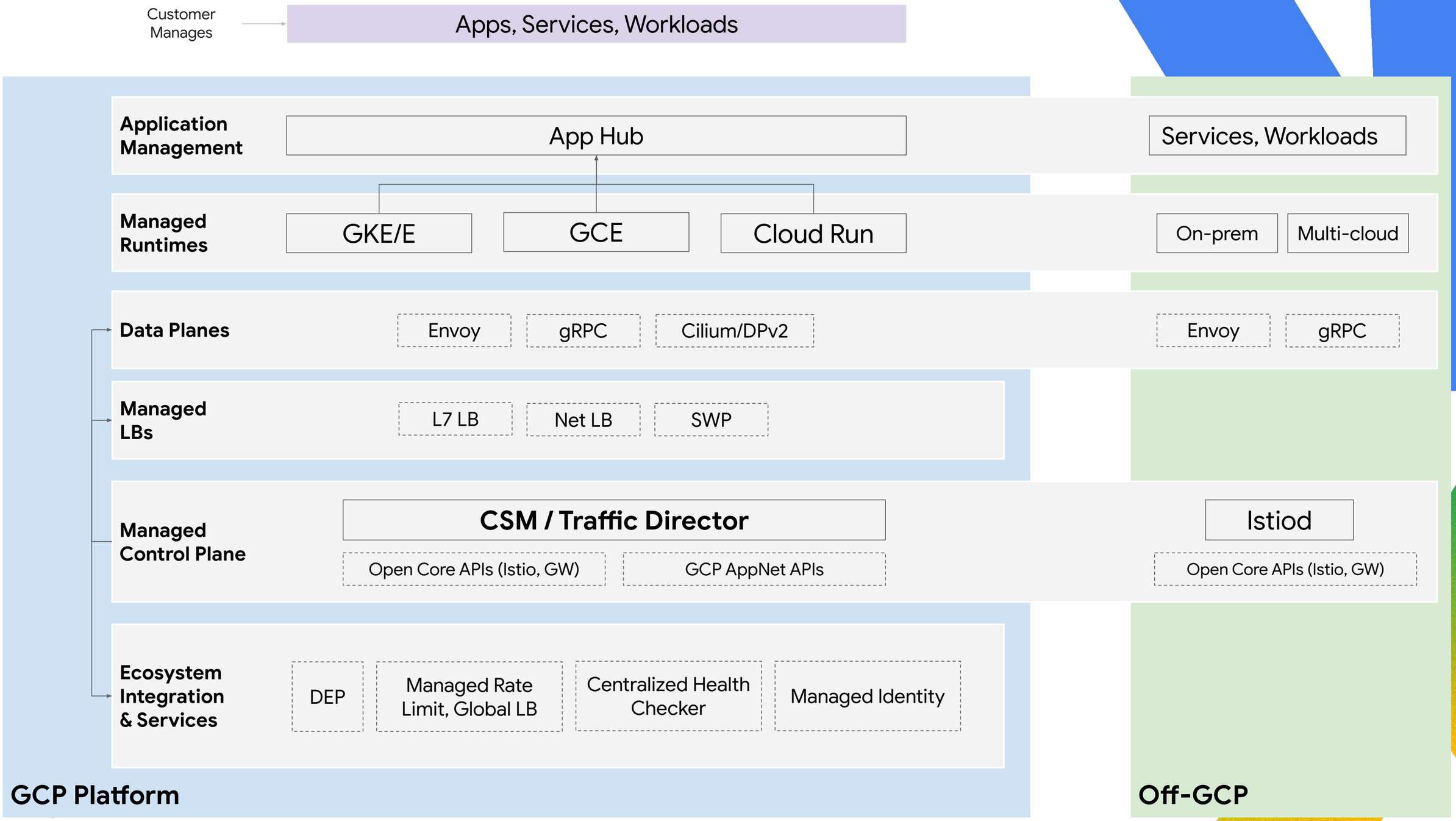
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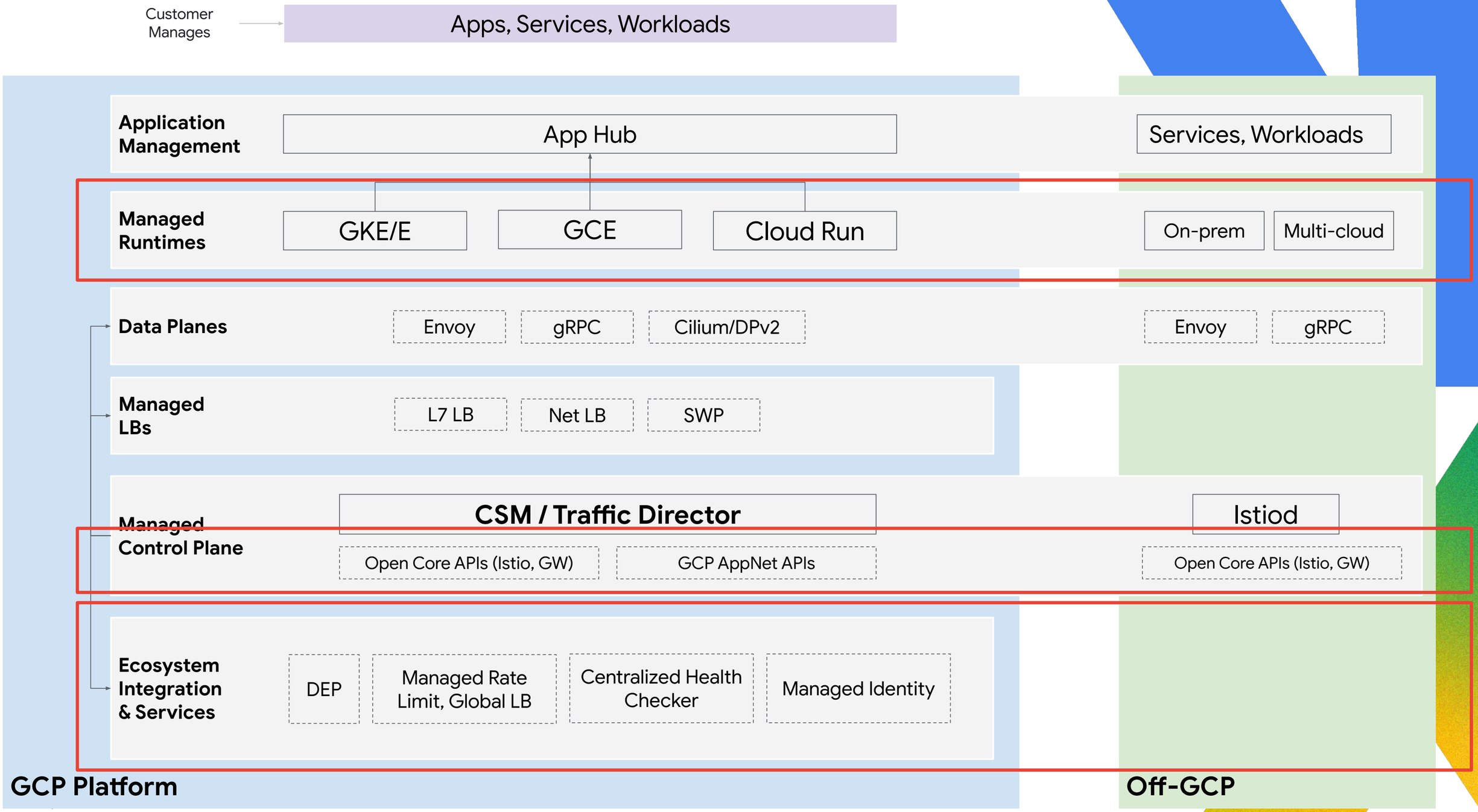
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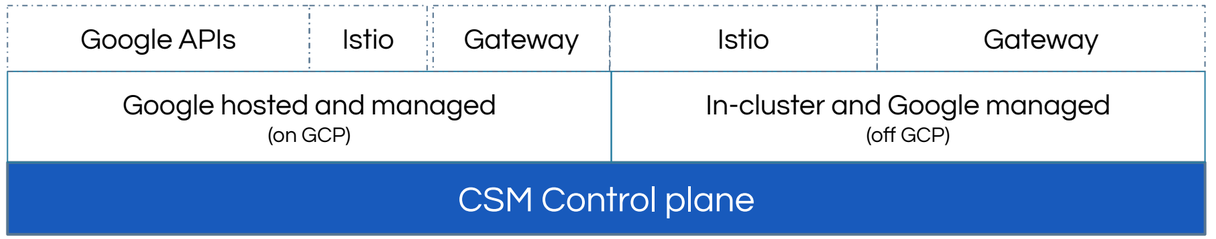
Cloud Service Mesh Architecture



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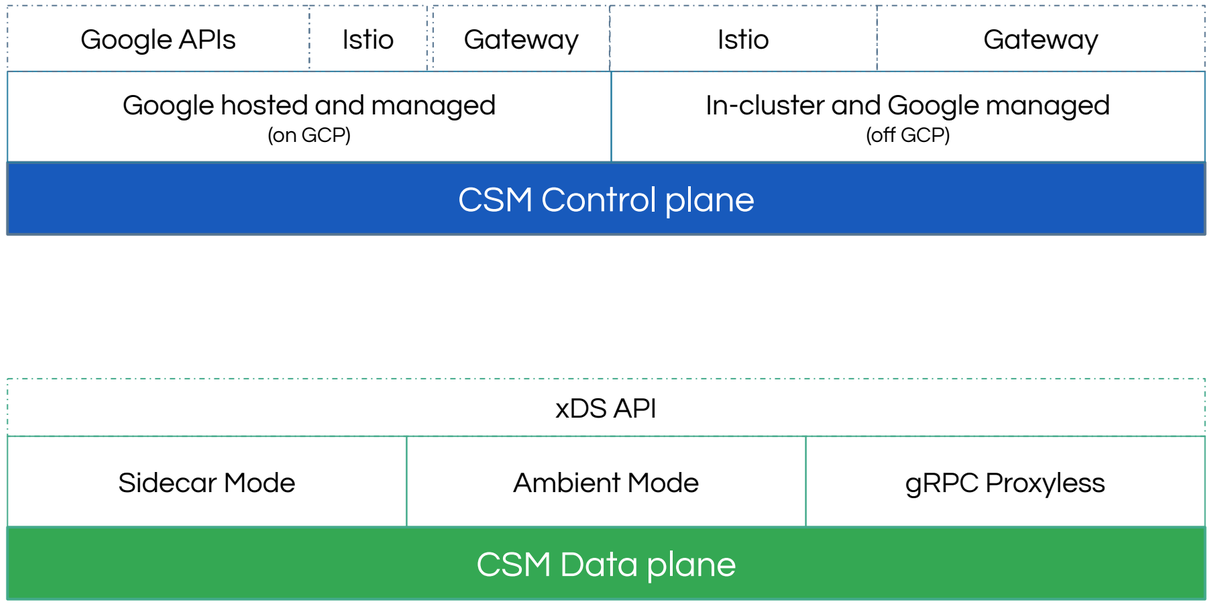

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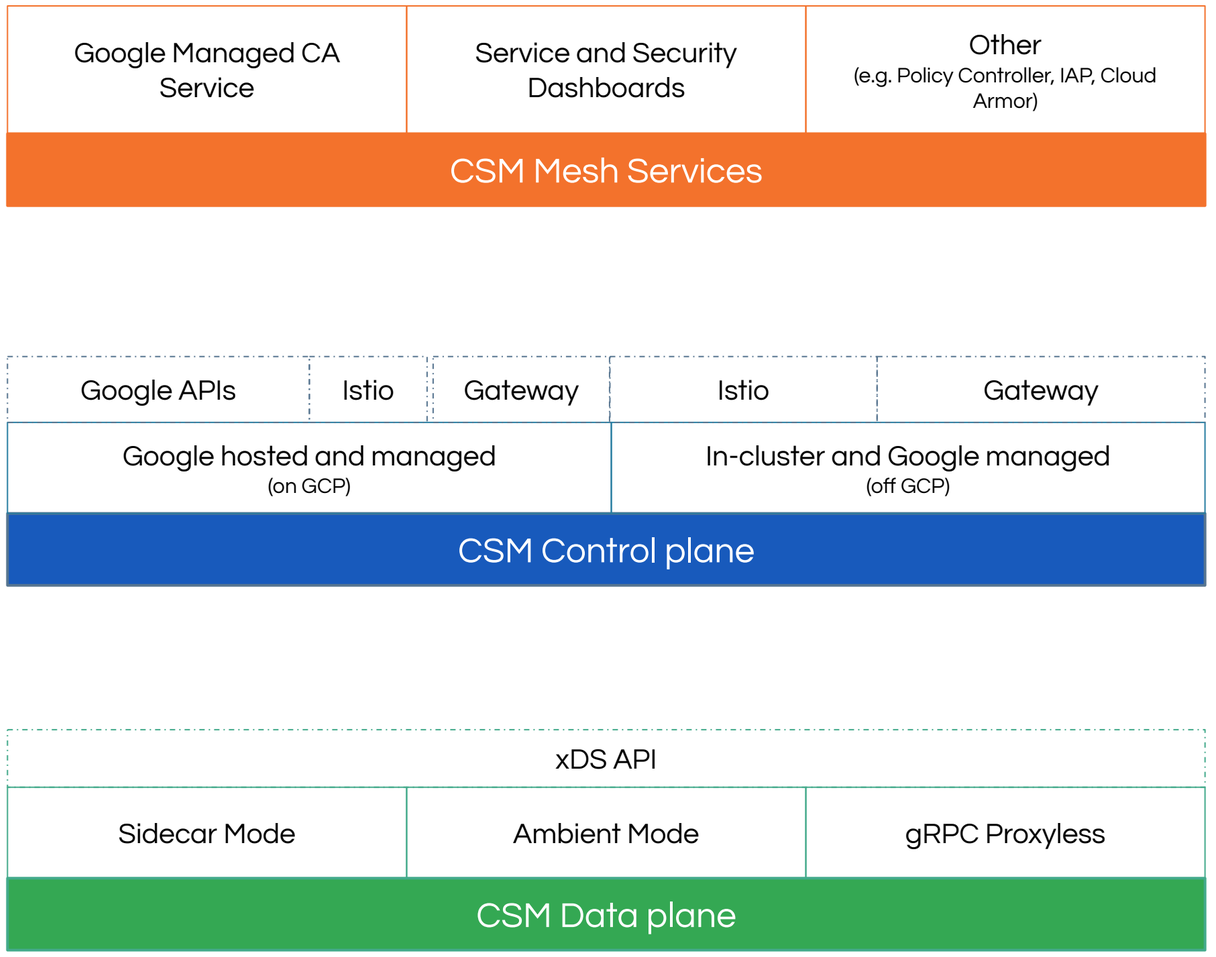

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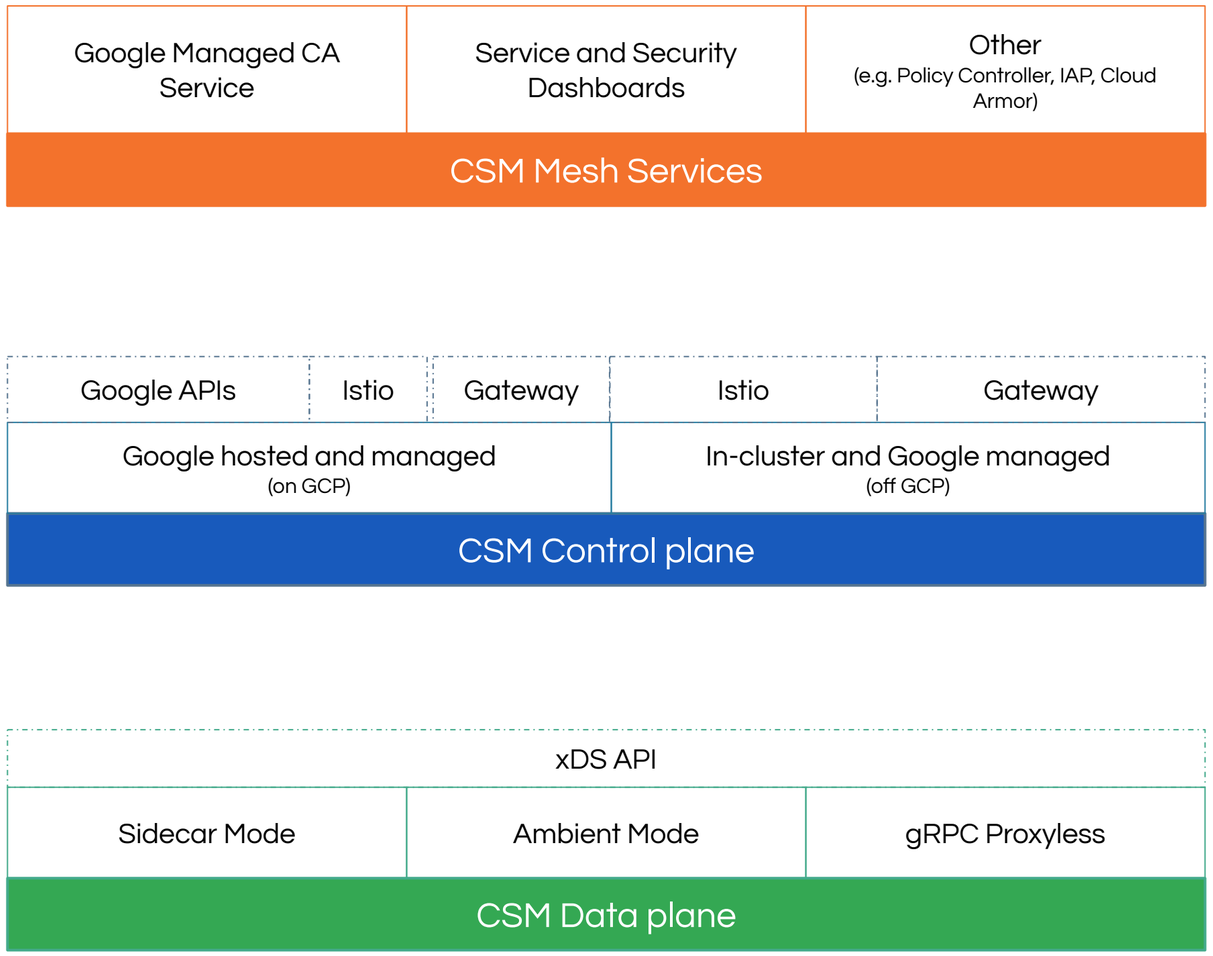
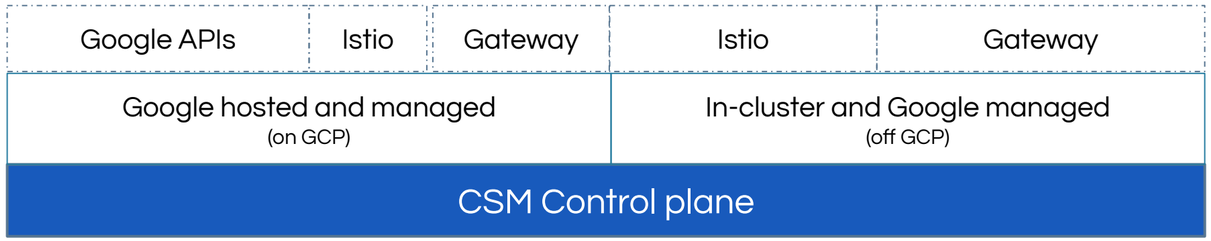


Terraform

gcloud (API)

UI

CSM Control plane



On GCP

Hosted

Managed upgrades and patches

Supports Google, Istio and Gateway APIs

GCP platform integrations

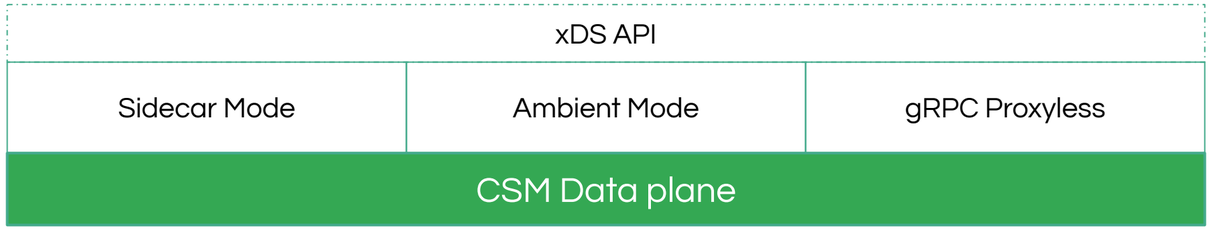
Off GCP

In cluster

Managed upgrades and patches

Supports Istio, Gateway APIs

CSM Data plane



Sidecar Mode

Sidecar Proxy per workload

Proxy lifecycle is application disruptive

Higher resource consumption and latency

No shared proxies

Single proxy for L4 and L7 functions

Ambient Mode

Shared ultra light proxy per node

Shared proxy handles L4 (standard) functions

Optional per-service proxy handles L7 (advanced) functions

Non-disruptive to applications

Lower resource consumption

Better performance

gRPC Proxyless

xDS protocol in gRPC libraries

Integrated with gRPC application

Lighter weight (vs sidecar)

Better performance (vs sidecar)

mTLS to the App

CSM Mesh Services

Certificate Authority

Google-managed CA Service

- Option of two CAs

Self-managed in-cluster CA

Service and API Management

Services Dashboards

SLOs and Alerting

Cloud Operations (logs, tracing, custom dashboards)

Policy Controller

Security Insights

Anthos and Traffic Director Users

ASM for GCP

Managed Control Plane migrated to TD control plane (gradual, managed, reliable process)

No change to:

- Istio APIs
- Managed Data Plane
- Metrics
- CAs
- Service UI

Anthos and Traffic Director Users

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ASM Off-GCP

No changes short term

Direction:

- Remain Open Core APIs
- More managed environment => remove toil
- Federation with GCP control plane

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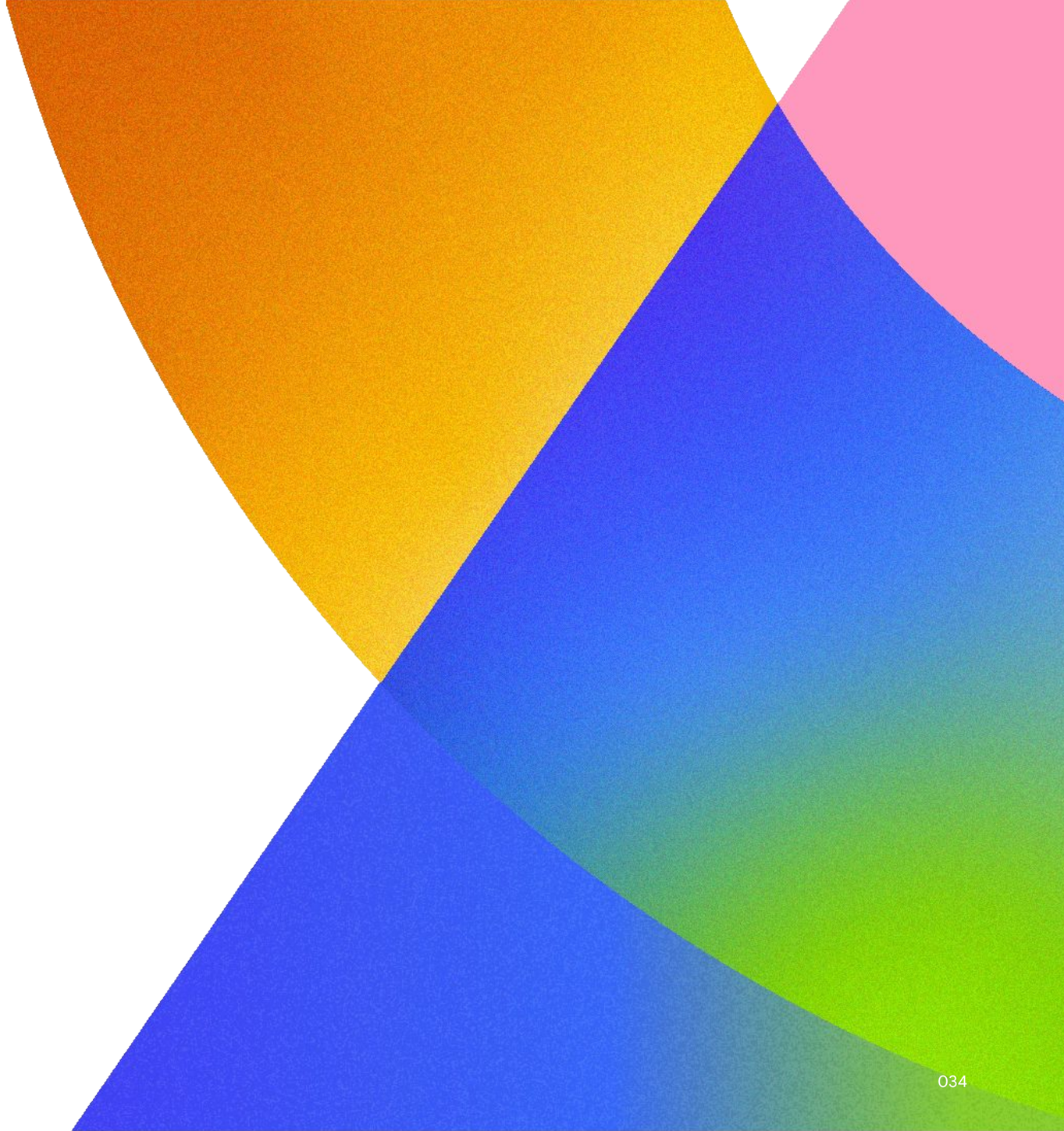
Traffic Director

Existing customers see no changes.

Direction:

- Tighter integration with GCP Networking
- GCP API

Evolution of Mesh



Evolution of Mesh

GCP Integrations

GKE, Cloud Run, GCE VM

Global load balancing,
Centralized health checking

Traffic Driven Autoscaling

Global rate limiting

PSC

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API

GCP APIs

Open Core APIs

Multi Data Plane Support

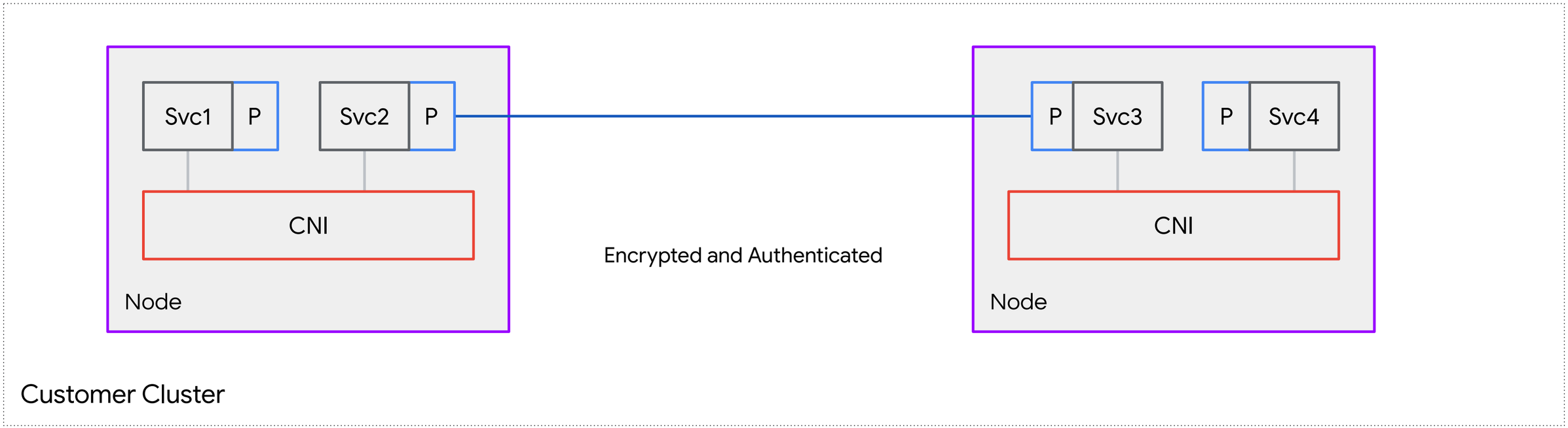
Envoy Sidecar

Proxyless gRPC

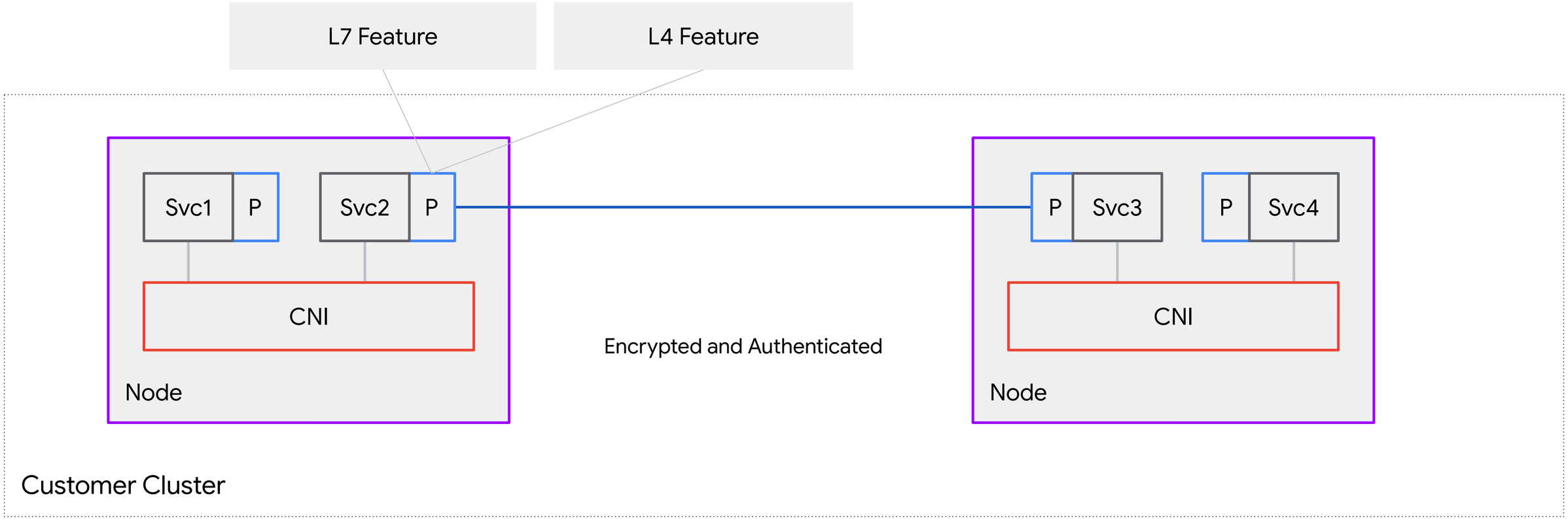
GKE native, Managed load balancer integrated Ambient mode

Ambient Mesh Architecture

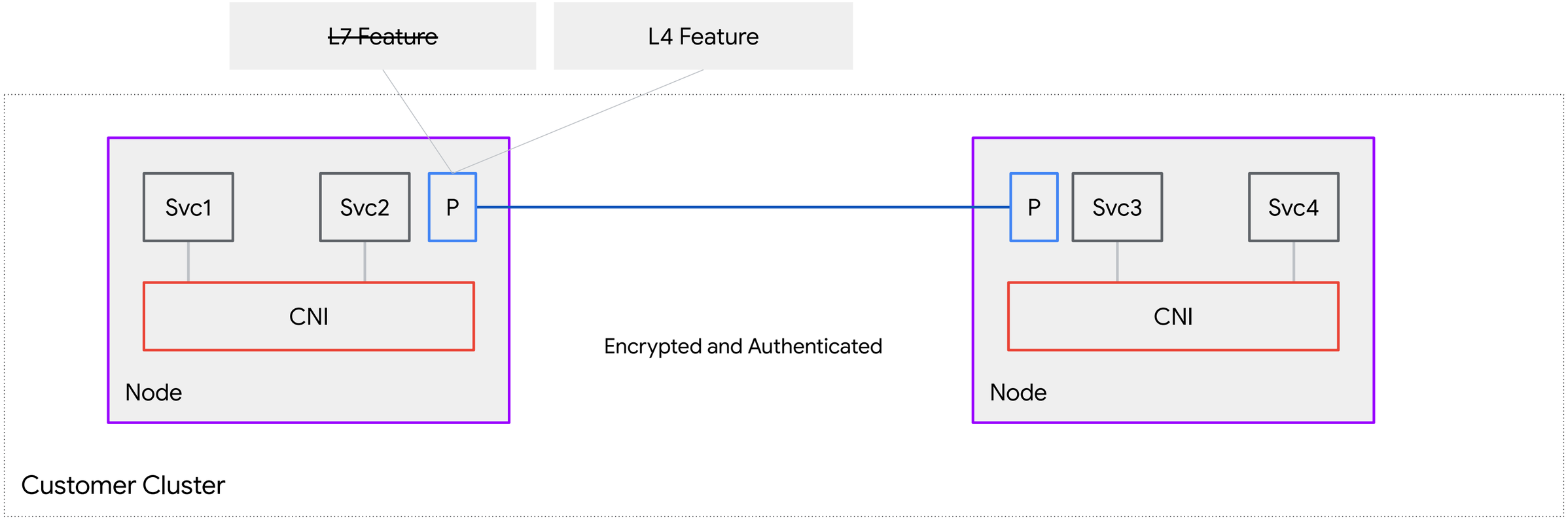
Mesh with sidecars



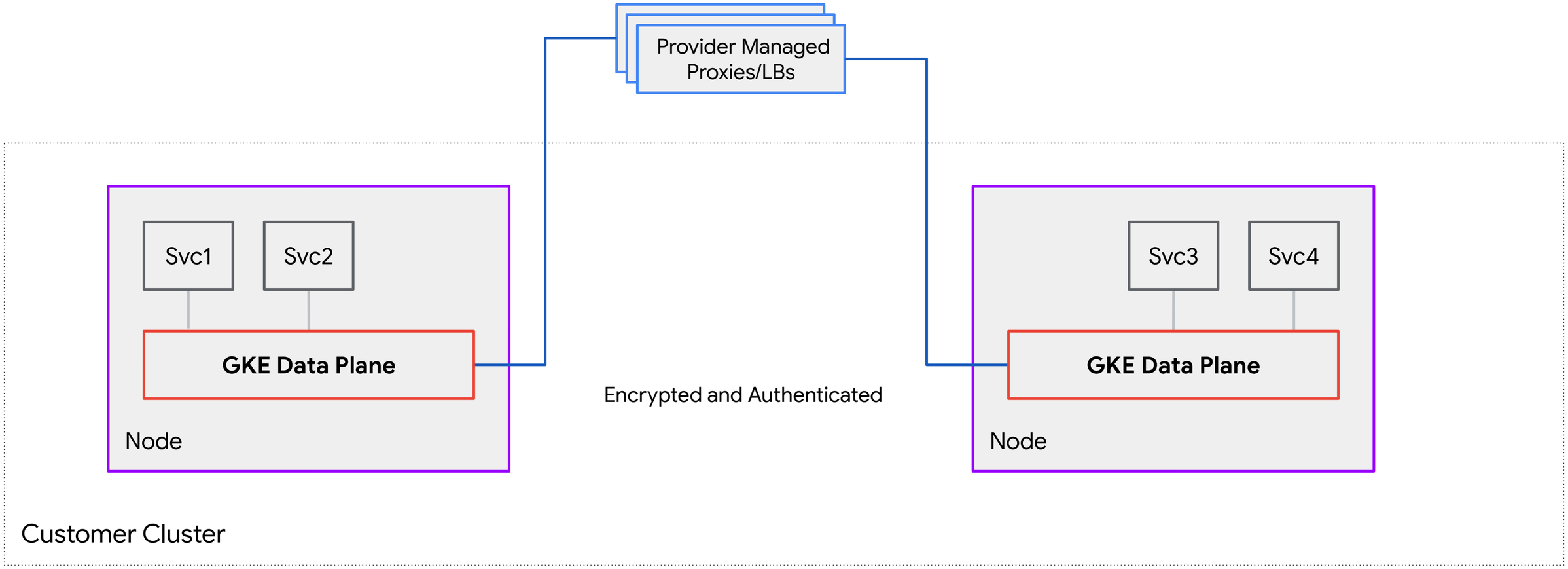
Mesh with sidecars



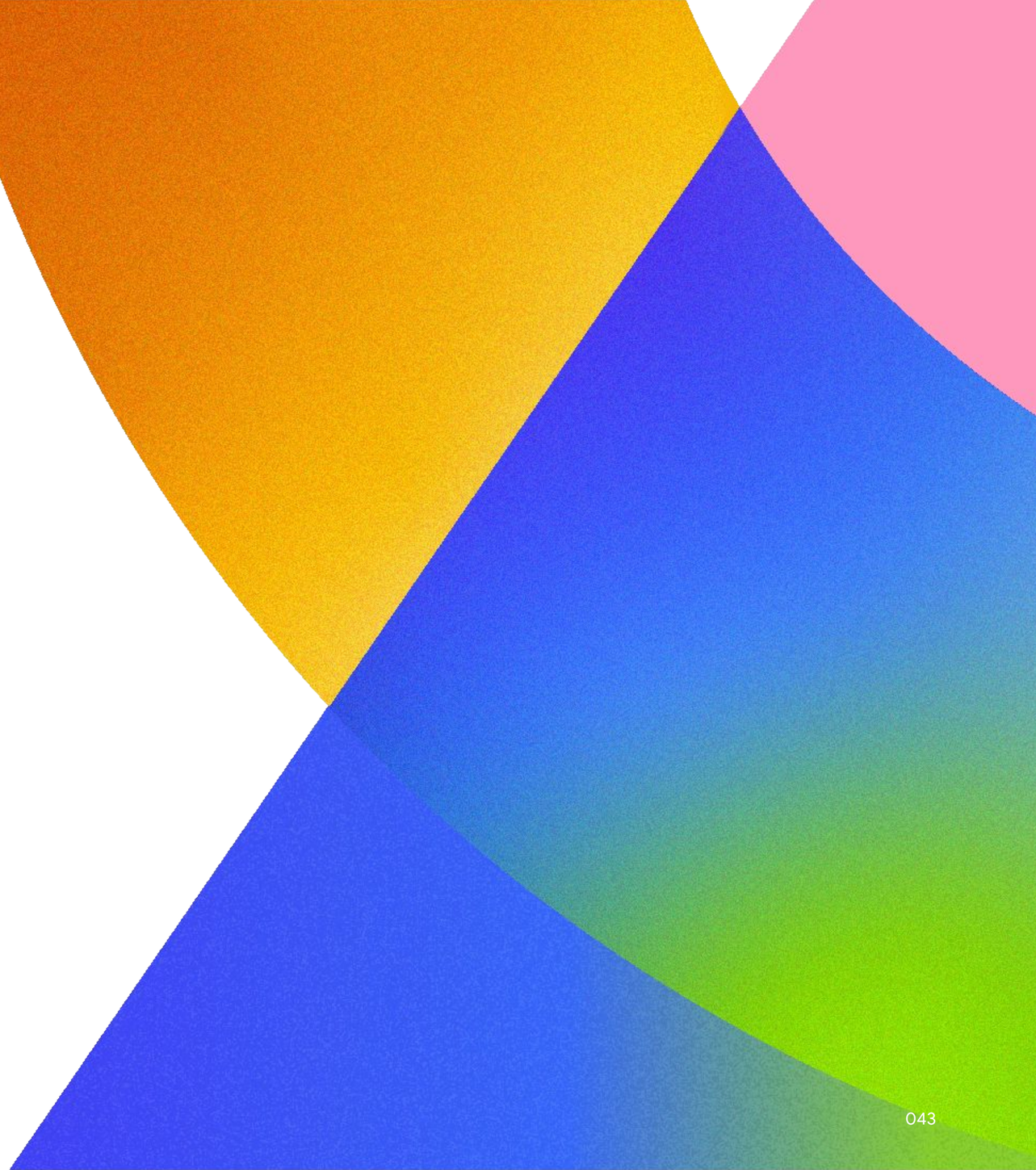
Layer 4 Ambient Mesh



Ambient Mesh with Provider Managed Mesh



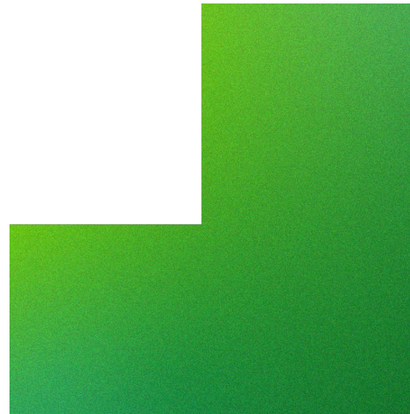
API



API

Istio APIs

Compatible with stable Istio features



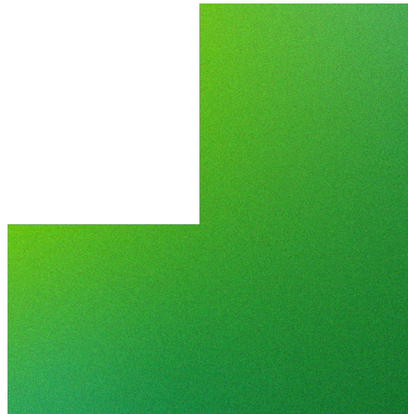
API

Istio APIs

Compatible with stable Istio features

Google APIs

GCP native API surface



API

Istio APIs

Compatible with stable Istio features

Google APIs

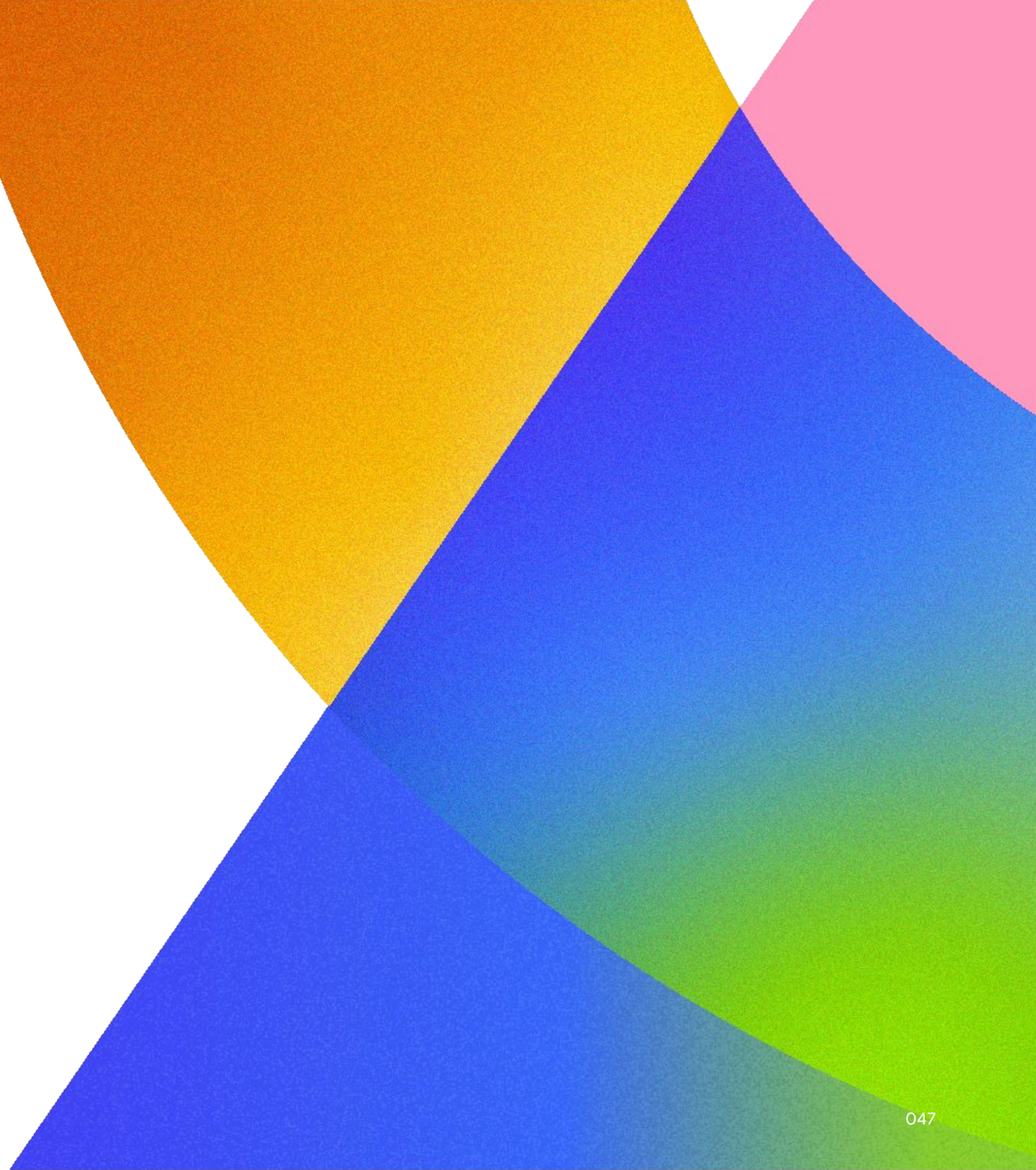
GCP native API surface

Gateway for Mesh API

K8s vendor neutral API surface

GKE vendor extensions

Data Plane Extensibility



Extensibility with CSM

WASM

Web Assembly - Standard mechanism

WASM As A Service as managed offering

Language Choices

Marketplace integration

Service Callouts

ext_proc callouts from data plane

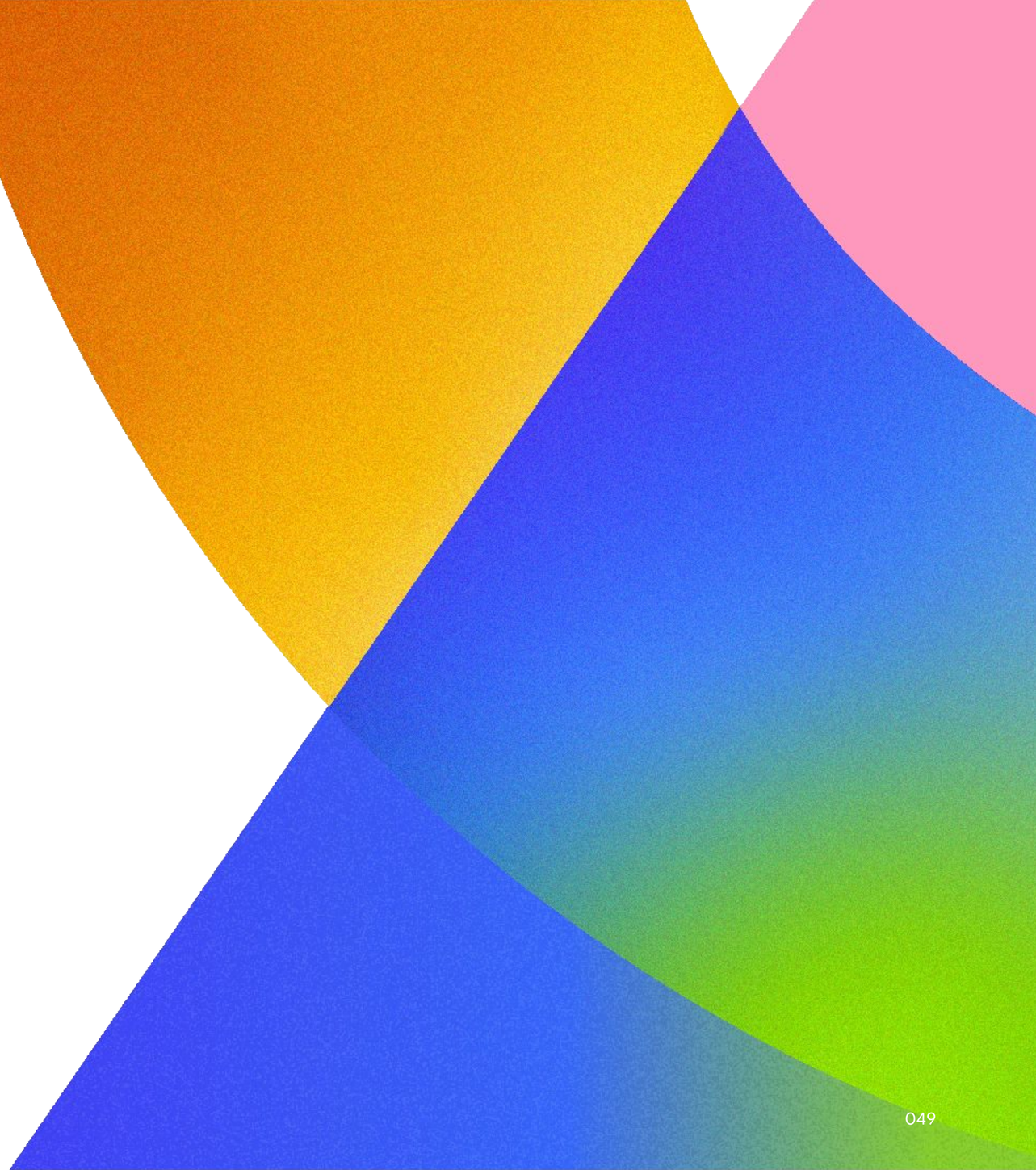
EnvoyFilters

Break glass use cases: For Envoy only

Prefer first class API, WASM & DEP

Evaluating filters for use on a case-by-case basis

Istio



Istio and CSM

Istio

Open Source

Unsupported

Self Managed DIY

** See list of supported Istio features on*

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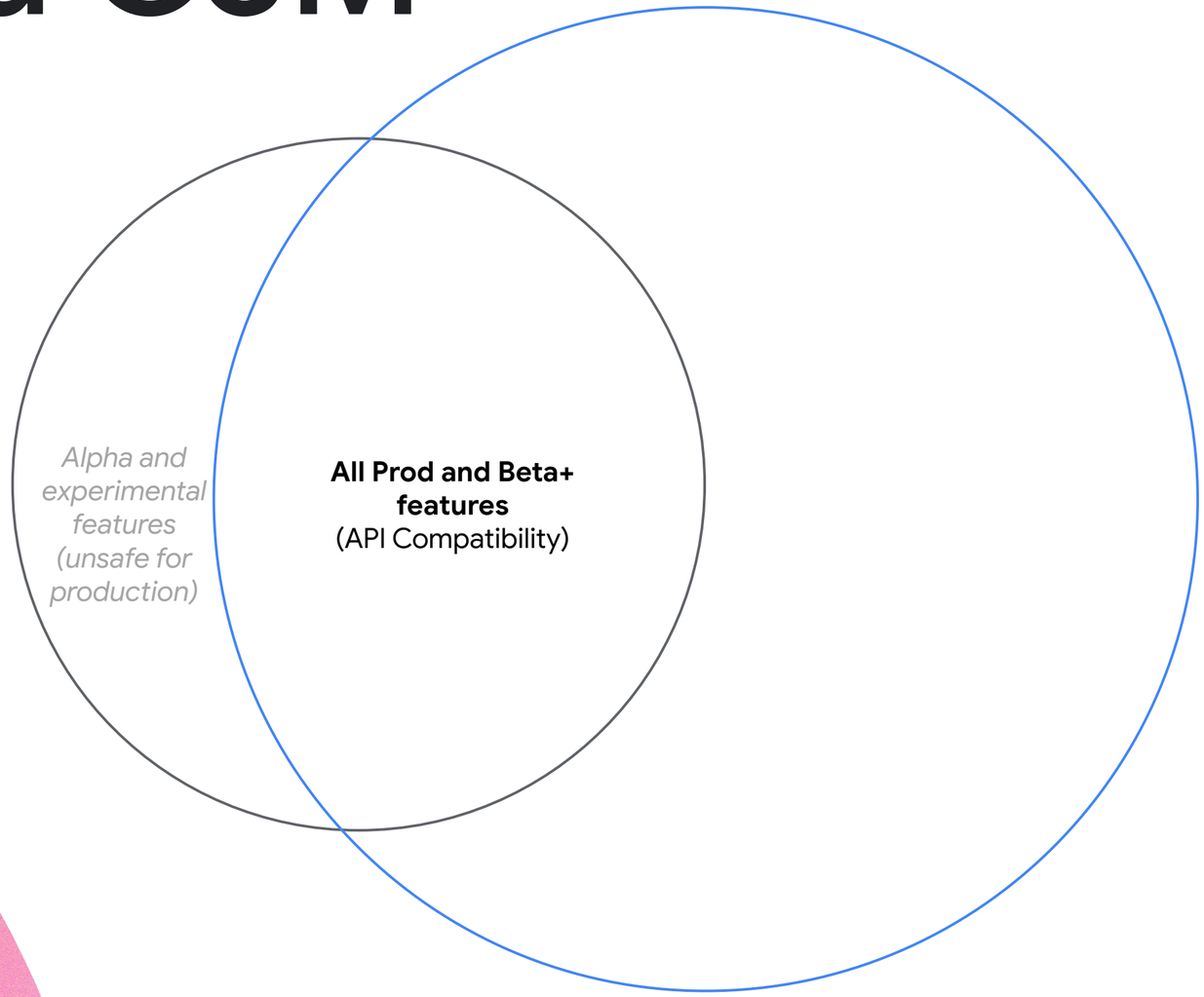

CSM

Fully managed,

Supported

Enterprise Ready

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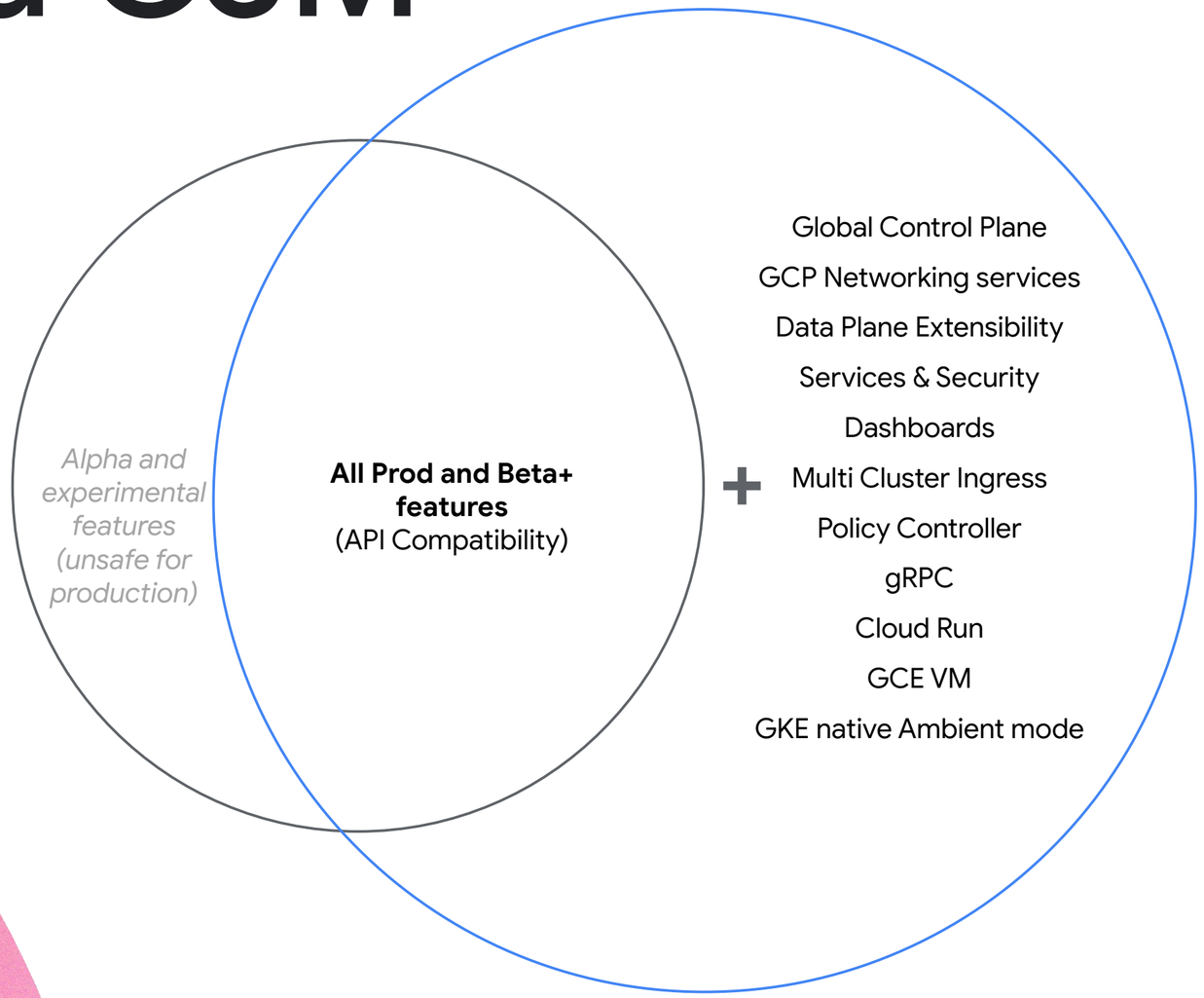

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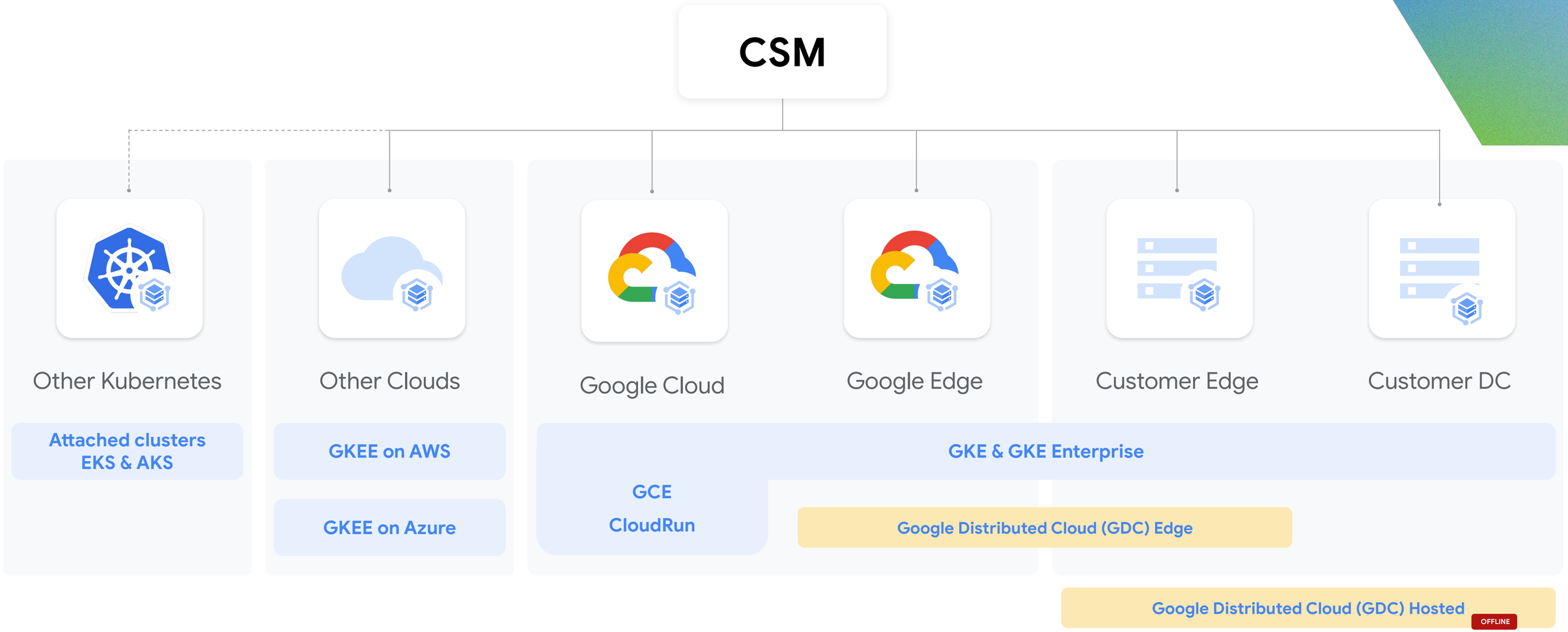
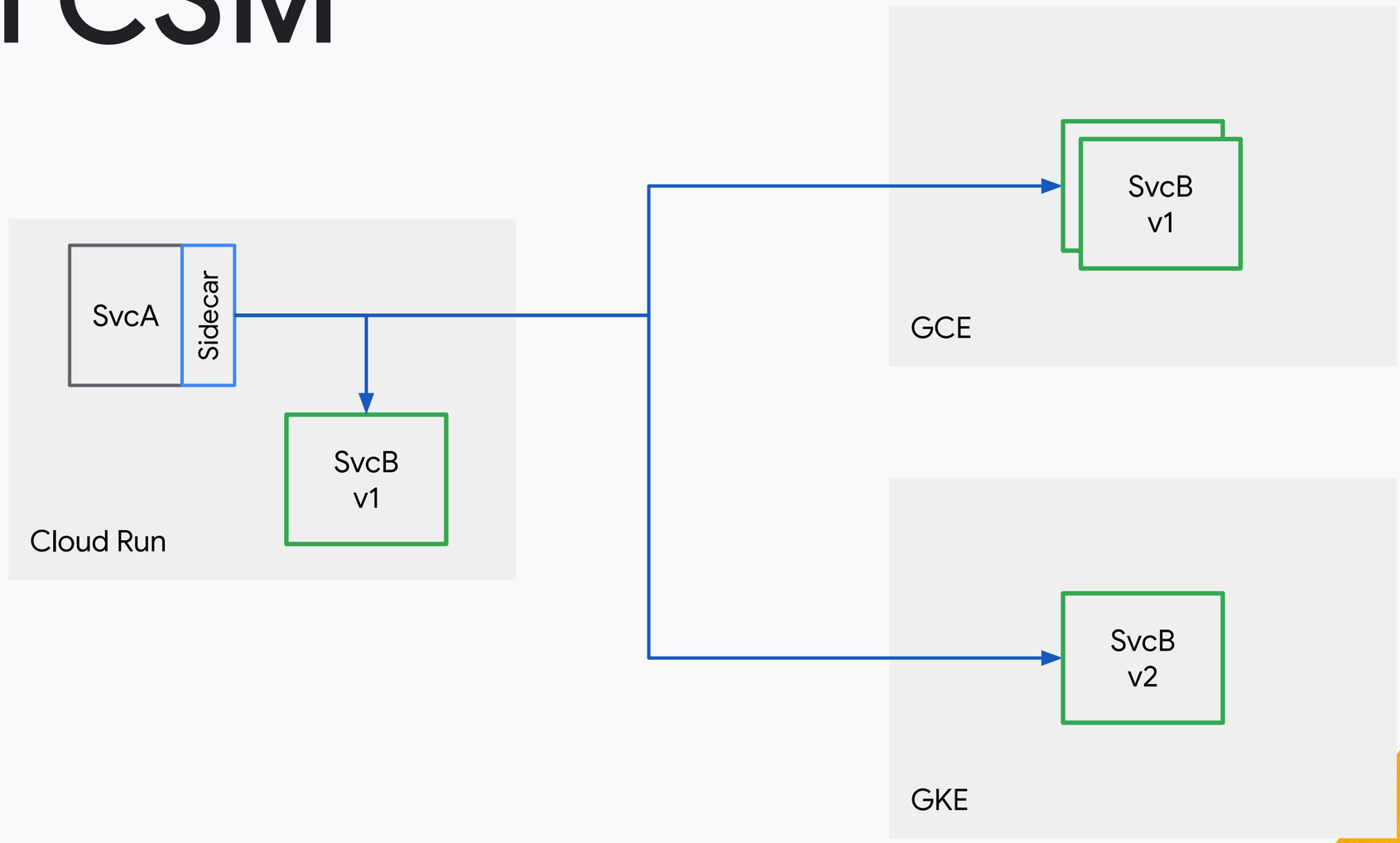
CSM Anywhere



Multi runtime architecture with CSM



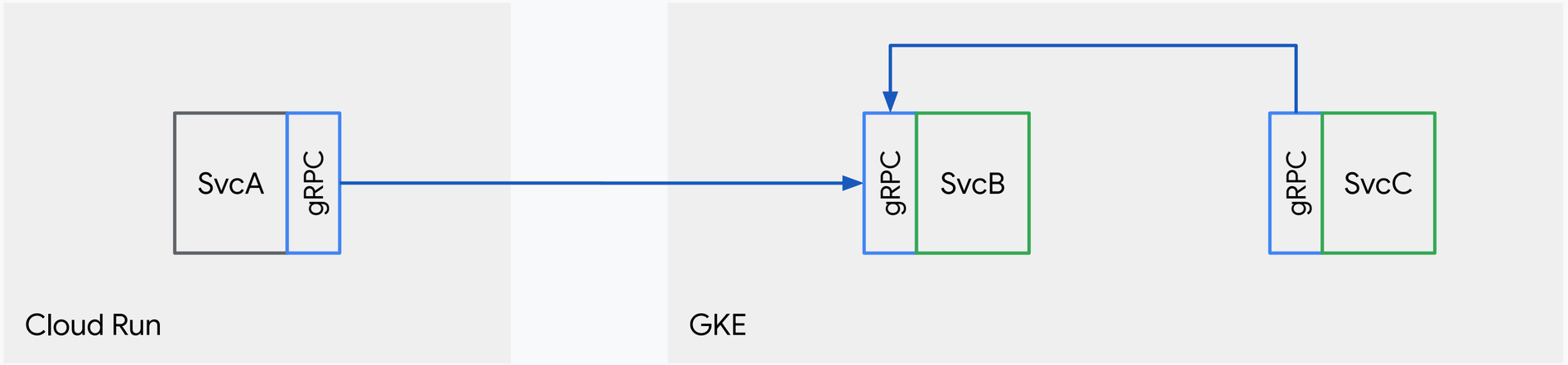
```
File Edit Options Buffers Tools Terraform Help

// HTTP route targetting the GCE MIG, Cloud Run Service, and GKE Service.
resource "google_network_services_http_route" "helloworld" {
  provider = google-beta
  name     = "helloworld-route"
  meshes = [
    google_network_services_mesh.default.id
  ]
  hostnames = [format("hello.%s", var.domain)]
  rules {
    matches {
      full_path_match = "/"
    }
    action {
      url_rewrite {
        path_prefix_rewrite = "/hello"
      }
      # destinations {
      #   service_name = module.mig.backend_service
      # }
      # destinations {
      #   service_name = module.run.backend_service
      # }
      # destinations {
      #   service_name = module.gke.backend_service
      # }
      retry_policy {
        retry_conditions = ["5xx"]
        num_retries = 2
      }
    }
  }
  lifecycle {
    create_before_destroy = true
  }
}

resource "google_cloud_run_service" "mesh-service" {
  name = "hello-mesh-test"
  location = var.region

  metadata {
    annotations = {
        "run.googleapis.com/launch-stage" = "ALPHA"
    }
  }
-UU-:**-  F1  main.tf        42%   L66    (Terraform WK counsel ivy FlyC EditorConfig) ---
```

```
. [id=projects/ianmi-test/regions/us-central1/instanceGroupManagers/hello-mig, 10s elapsed
]
module.mig.google_compute_health_check.http-hello: Destruction complete after 11s
module.mig.module.mig.google_compute_region_instance_group_manager.mig: Still destroying..
. [id=projects/ianmi-test/regions/us-central1/instanceGroupManagers/hello-mig, 20s elapsed
]
module.mig.module.mig.google_compute_region_instance_group_manager.mig: Still destroying..
. [id=projects/ianmi-test/regions/us-central1/instanceGroupManagers/hello-mig, 30s elapsed
]
module.mig.module.mig.google_compute_region_instance_group_manager.mig: Still destroying..
. [id=projects/ianmi-test/regions/us-central1/instanceGroupManagers/hello-mig, 40s elapsed
]
module.mig.module.mig.google_compute_region_instance_group_manager.mig: Destruction comple
te after 41s
module.mig.module.mig_template.google_compute_instance_template.tpl: Destroying... [id=pro
jects/ianmi-test/global/instanceTemplates/hello-mig-20240310190842353400000001]
module.mig.module.mig_template.google_compute_instance_template.tpl: Still destroying... [
id=projects/ianmi-test/global/instanceTemp...s/hello-mig-20240310190842353400000001, 10s e
lapsed]
module.mig.module.mig_template.google_compute_instance_template.tpl: Destruction complete
after 11s

Apply complete! Resources: 0 added, 1 changed, 12 destroyed.
[hi on] ianmi@ianmi:~/git/cloud-run-mesh-samples/http-routing$
```

```
  -n, --interval <secs>  seconds to wait between updates
  -p, --precise          attempt run command in precise intervals
  -r, --no-rerun         do not rerun program on window resize
  -t, --no-title         turn off header
  -w, --no-wrap          turn off line wrapping
  -x, --exec             pass command to exec instead of "sh -c"

 -h, --help     display this help and exit
 -v, --version  output version information and exit

For more details see watch(1).
[hi on] ianmi@ianmi:~$ watch -n 1 curl -v http://127.0.0.1:8080/hello
[hi on] ianmi@ianmi:~$ man lynx
[hi on] ianmi@ianmi:~$ lynx -dump http://127.0.0.1:8080/hello
Hello version: v1, instance: default-xqx9

[hi on] ianmi@ianmi:~$ lynx -dump -error_file=/dev/stderr http://127.0.0.1:8080/hello
   URL=http://127.0.0.1:8080/hello (GET)
STATUS=HTTP/1.0 200 OK
Hello version: v1, instance: default-xtp8

[hi on] ianmi@ianmi:~$ watch -n 1 lynx -dump -error_file=/dev/stderr http://127.0.0.1:8080
/hello
[hi on] ianmi@ianmi:~$
```

```
[mesh-demo0:emacs* 2:python3-                                    "ianmi.c.googlers.com" 19:33 10-Mar-24
```

gRPC data plane with Gateway API



```yaml
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: echo
  namespace: default
spec:
  selector:
    matchLabels:
      app: echo
  replicas: 1
  template:
    metadata:
      labels:
        app: echo
    spec:
      containers:
        - name: echo
          image: gcr.io/istio-testing/app:latest
          args:
            - --port=8080
            - --grpc=50051
          ports:
            - containerPort: 50051
              name: grpc
          livenessProbe:
            initialDelaySeconds: 1
            grpc:
              port: 50051
---
apiVersion: v1
kind: Service
metadata:
  name: echo-grpc
  namespace: default
spec:
  ports:
    - name: grpc
      port: 50051
      targetPort: 50051
  selector:
    app: echo
---
apiVersion: gateway.networking.k8s.io/v1alpha2
kind: GRPCRoute
metadata:
  name: echo
spec:
  parentRefs:
    - name: echo-grpc
      kind: Service
      group: ""
  rules:
    - backendRefs:
        - name: echo-grpc
          port: 50051
---
```

-UU-:--- F1 **grpc_deployment.yaml<gateway-api>** Top L40 Git:main (YAML ARev WK counsel ivy FlyC EditorConfig) ---------

Wrote /usr/local/google/home/ianmi/git/cloud-run-mesh-samples/gateway-api/grpc_deployment.yaml

[hi on] ianmi@ianmi:~$

[mesh-demo0:bash* 1:bash- "ianmi.c.googlers.com" 05:23 19-Mar-24

CSM Big Picture

More Runtimes and Infrastructure

GKE, GCE, Cloud Run

Single, Shared, Peered VPC or multi-network support

Istiod (Federated by TD) for off GCP infrastructure (multi-cloud and hybrid cloud)

Multi data plane support (Envoy, gRPC, Cilium, xLBs)

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Data Plane Extensibility Platform (DEP)

Managed LBs

HCaaS (Health Checking)

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Cross cloud networking

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Cross cloud networking

Focus on Services not mesh

Focus on consuming features, not managing a mesh product

AppHub integration

Intelligent mesh (always on)

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DEV 205 -
Cloud Run: What's New

April 10 @ 3:30

SEC305 -

Certifiably secure: Identities for workloads and devices with Certificate Authority

April 11 @ 1:30 PM

The future of platform engineering is application-specific

April 09 @ 11 AM

Thank you