

Google Cloud

Next '24

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



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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



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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

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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

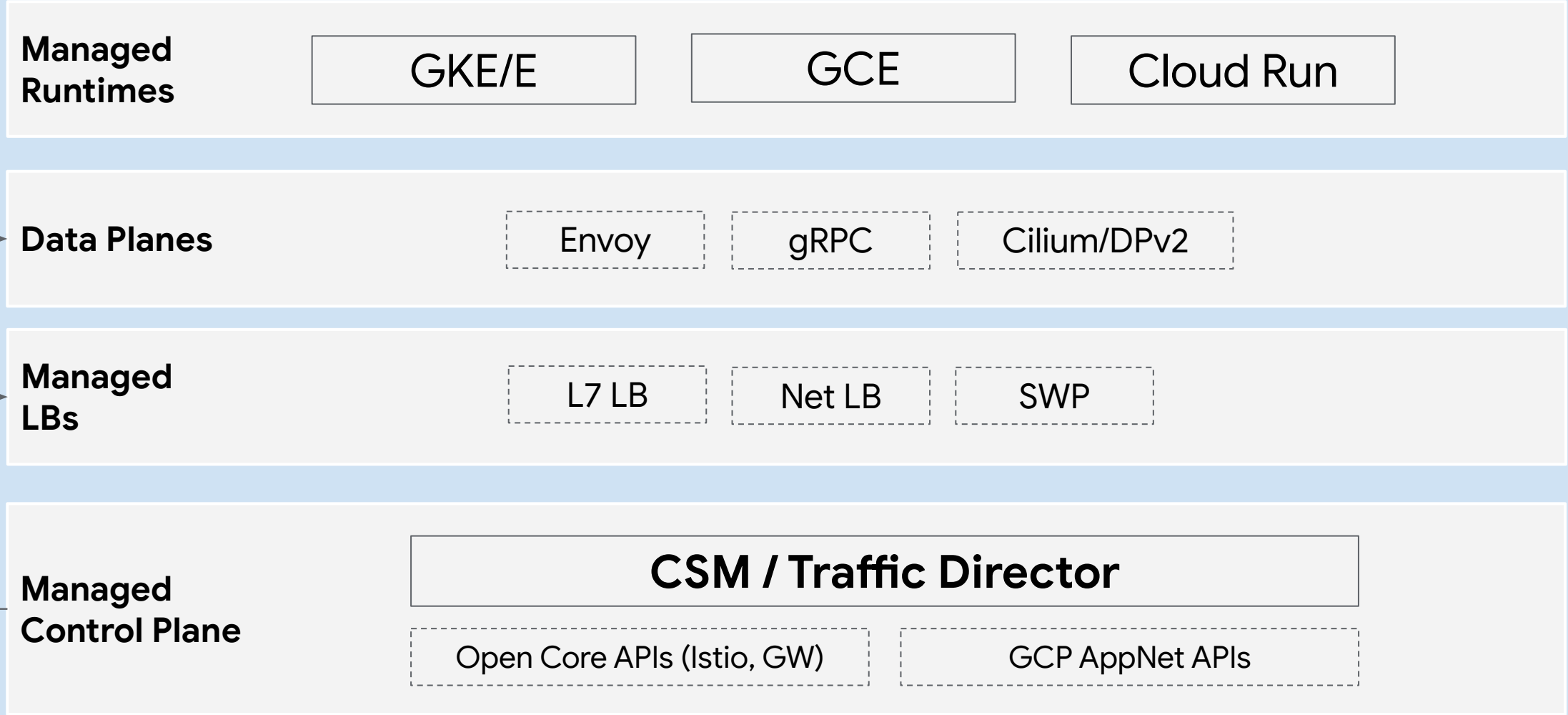
Cloud Run

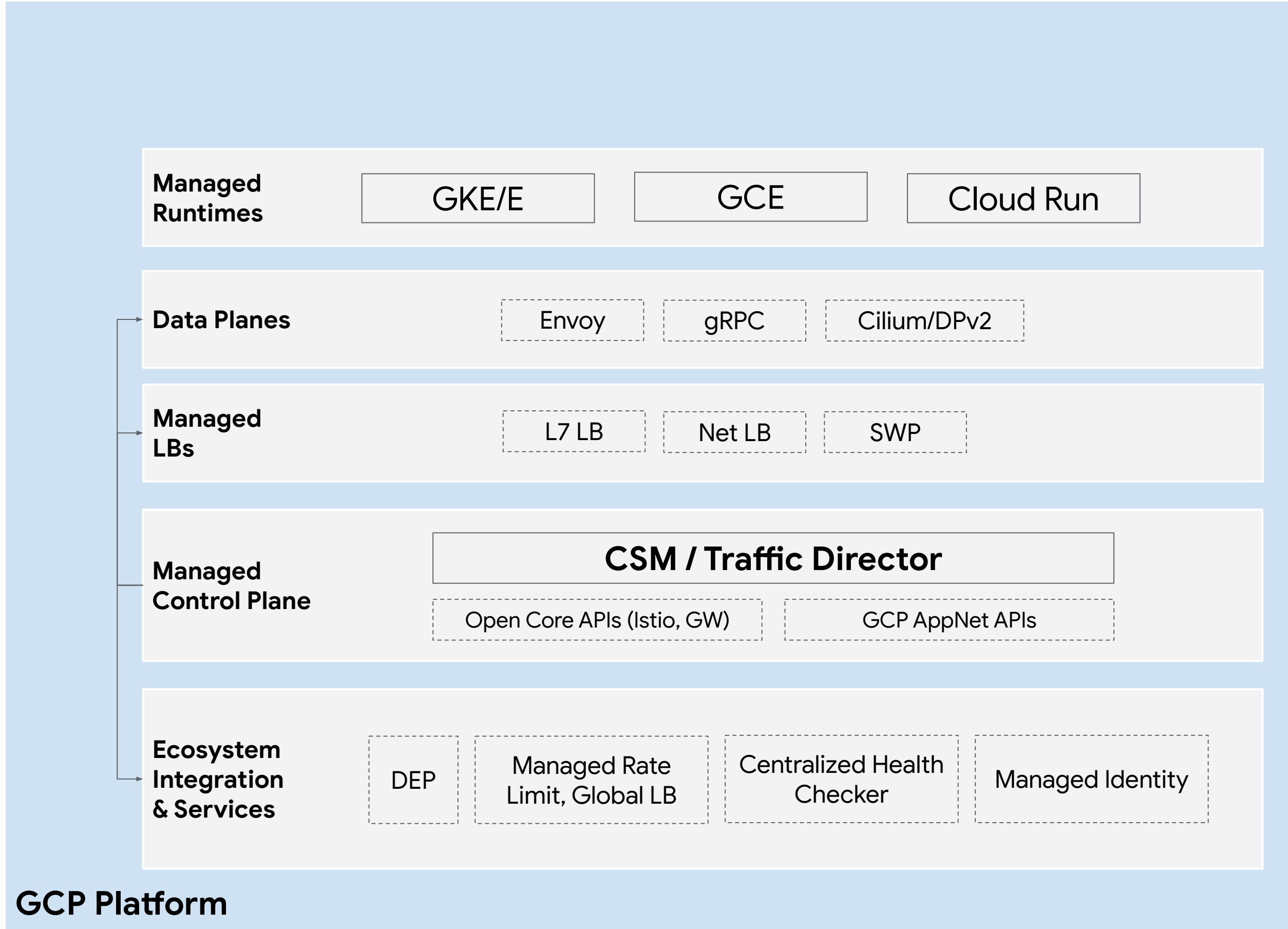
**Managed
LBs**

L7 LB

Net LB

SWP





Customer
Manages

Apps, Services, Workloads

**Application
Management**

App Hub

**Managed
Runtimes**

GKE/E

GCE

Cloud Run

Data Planes

Envoy

gRPC

Cilium/DPv2

**Managed
LBs**

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**Managed
Control Plane**

CSM / Traffic Director

Open Core APIs (Istio, GW)

GCP AppNet APIs

**Ecosystem
Integration
& Services**

DEP

Managed Rate
Limit, Global LB

Centralized Health
Checker

Managed Identity

GCP Platform

Customer
Manages

Apps, Services, Workloads

**Application
Management**

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Services, Workloads

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Runtimes**

GKE/E

GCE

Cloud Run

On-prem

Multi-cloud

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Istiod

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Off-GCP

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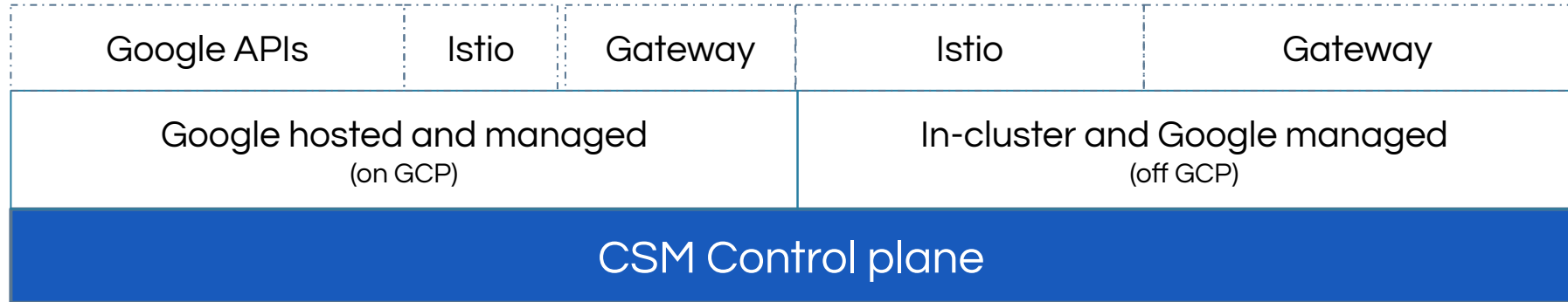
Centralized Health
Checker

Managed Identity

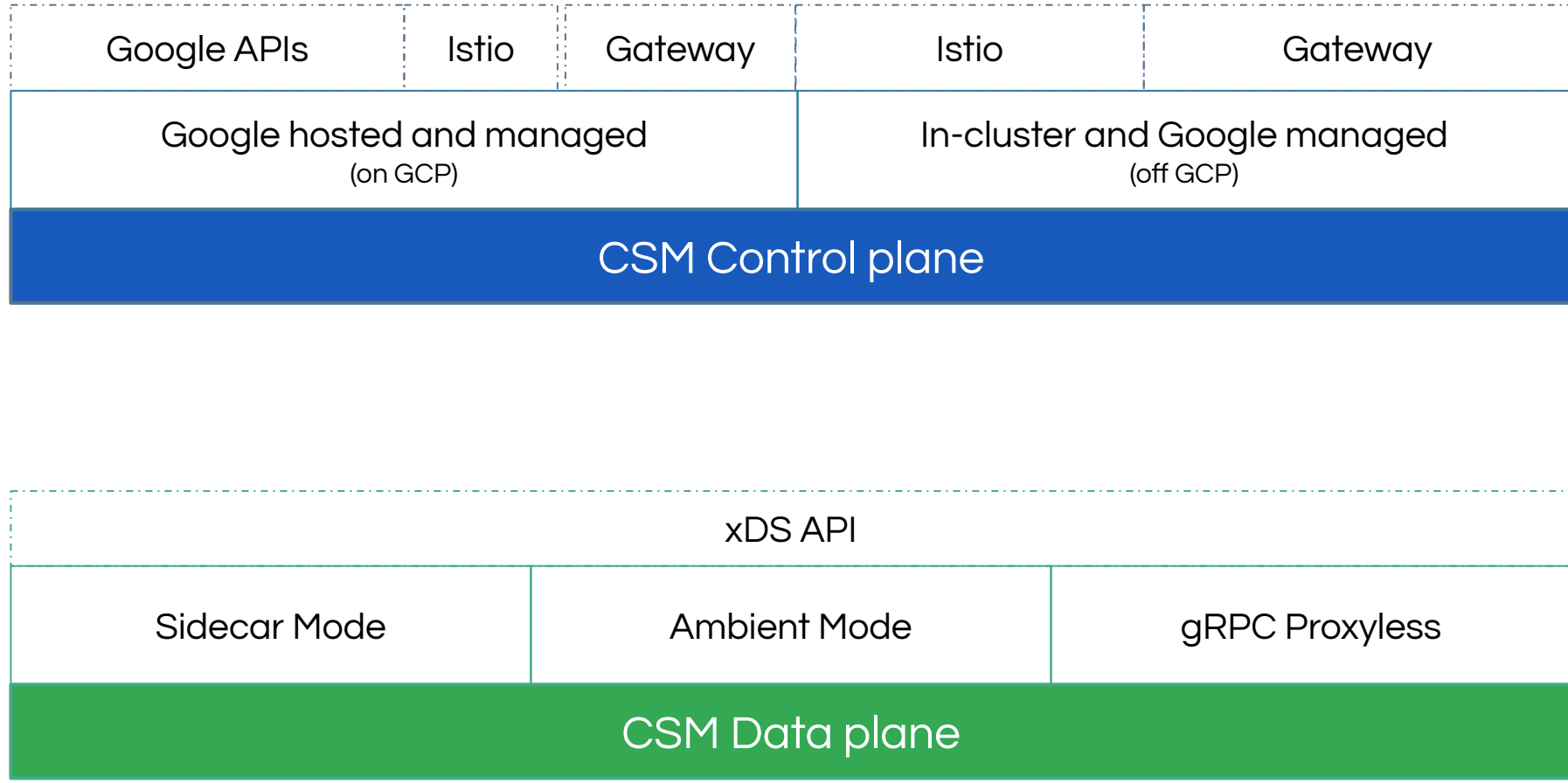
GCP Platform

Off-GCP

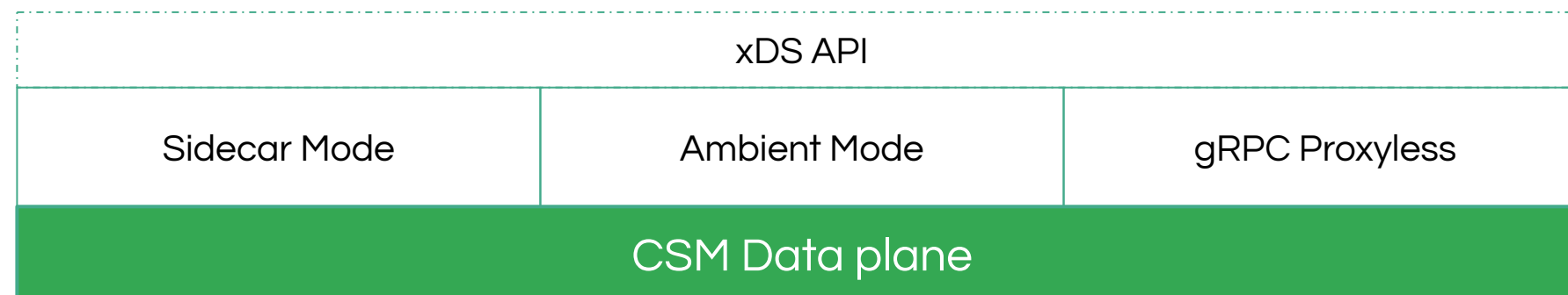
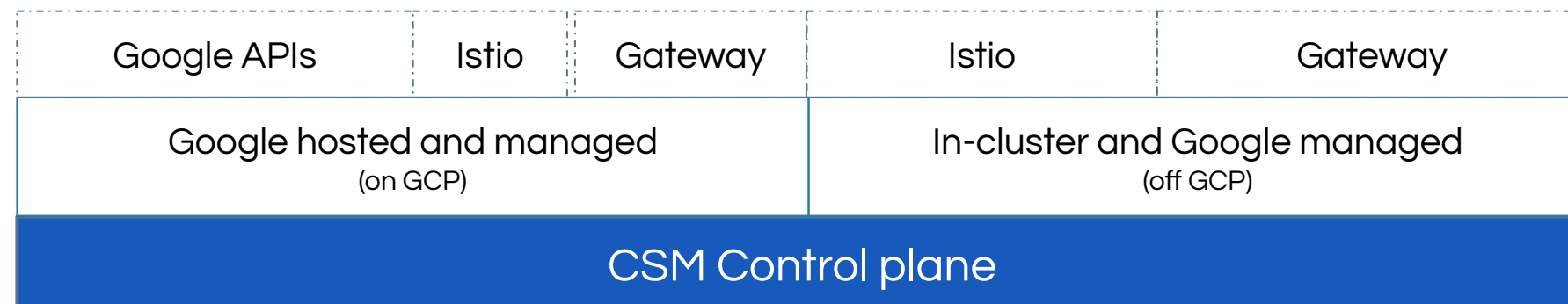
Cloud Service Mesh Architecture



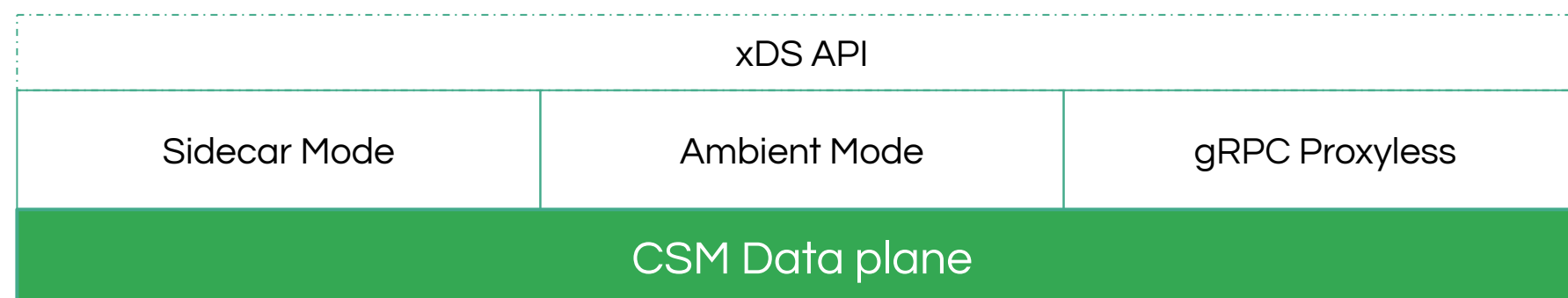
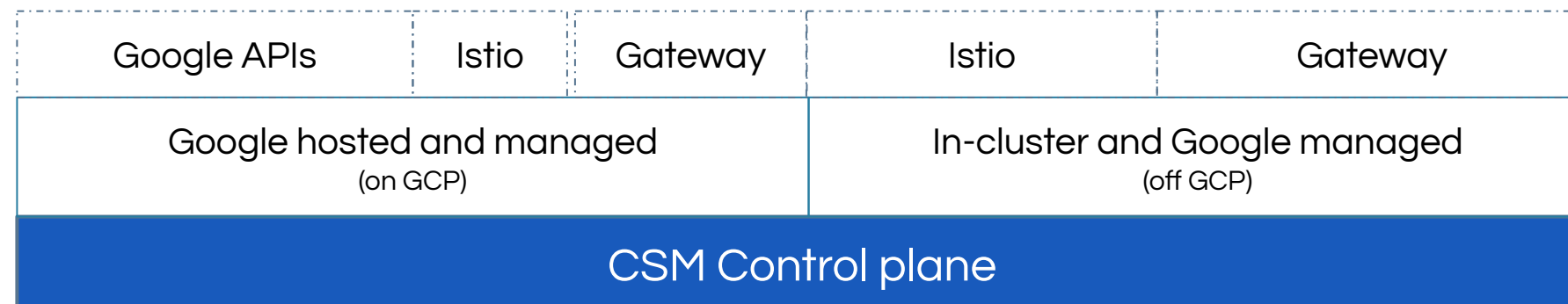
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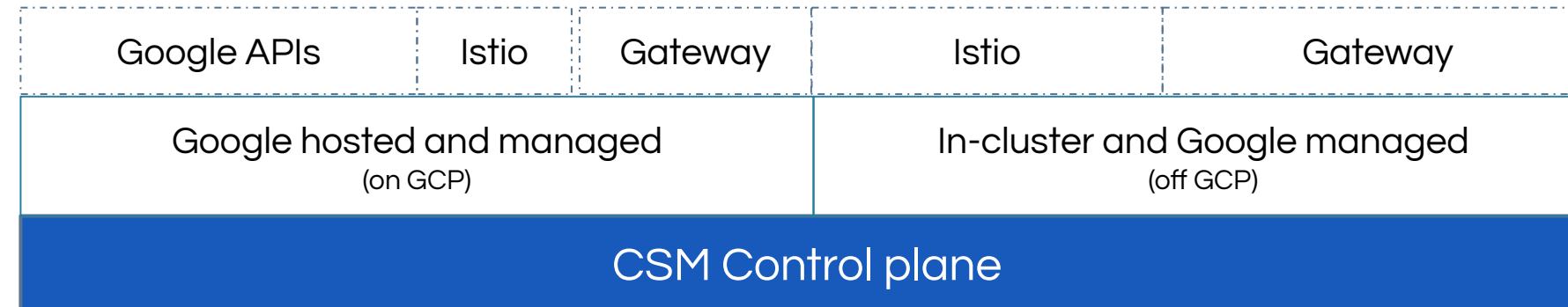


Cloud Service Mesh Architecture



Terraform
gcloud (API)
UI

CSM Control plane



On GCP

Hosted

Managed upgrades and patches

Supports Google, Istio and Gateway APIs

GCP platform integrations

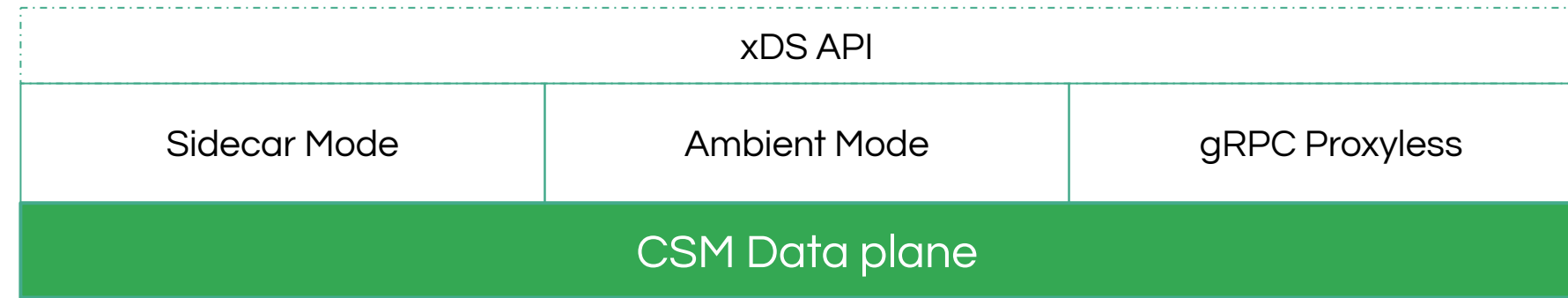
Off GCP

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

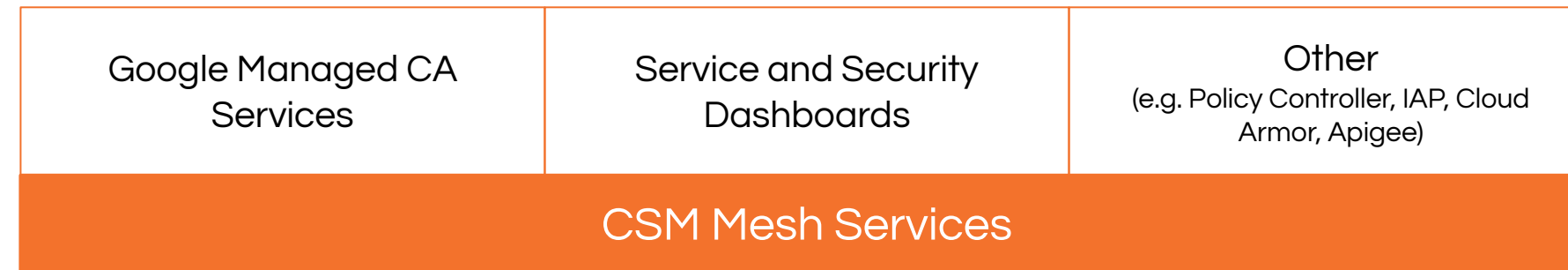
Integrated with gRPC application

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

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Open Core APIs

Multi Data Plane Support

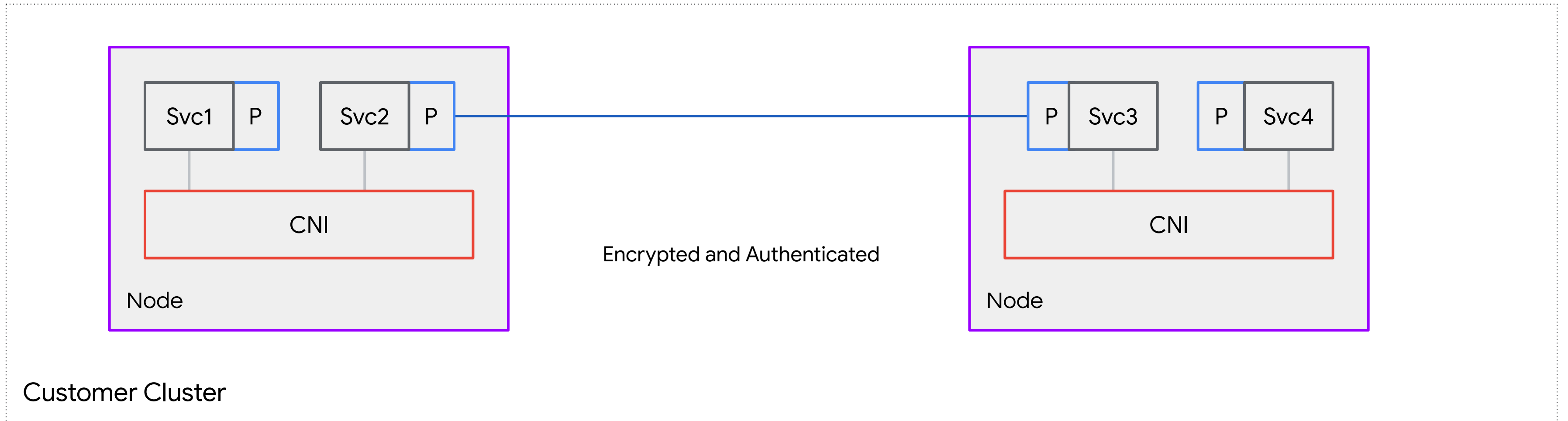
Envoy Sidecar

Proxyless gRPC

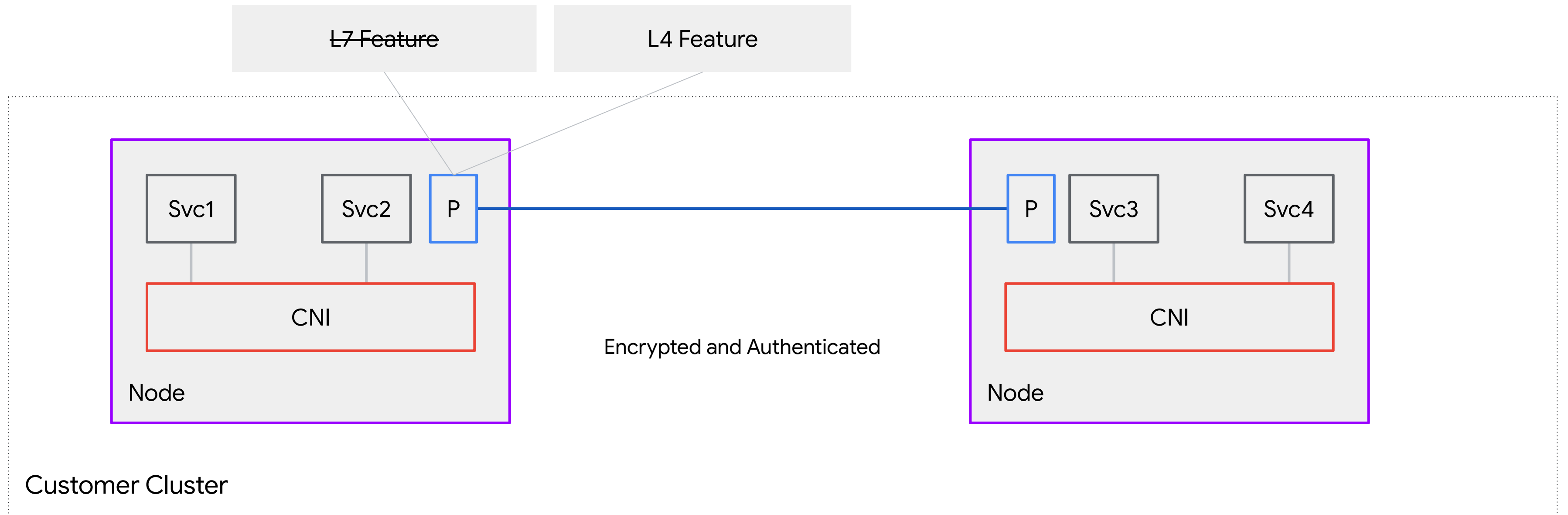
GKE native, Managed load balancer
integrated Ambient mode

Ambient Mesh Architecture

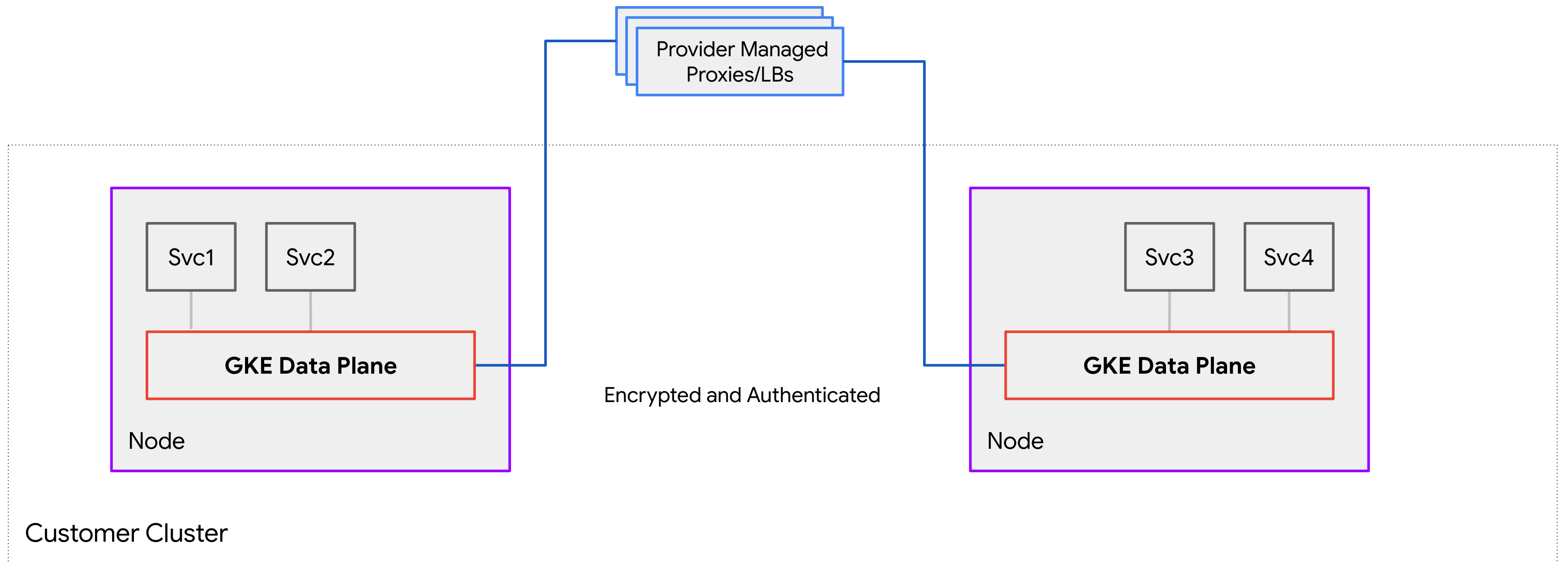
Mesh with sidecars



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

*Alpha and
experimental
features
(unsafe for
production)*

**All Prod and Beta+
features**
(API Compatibility)

Istio and CSM

Istio
Open Source
Unsupported
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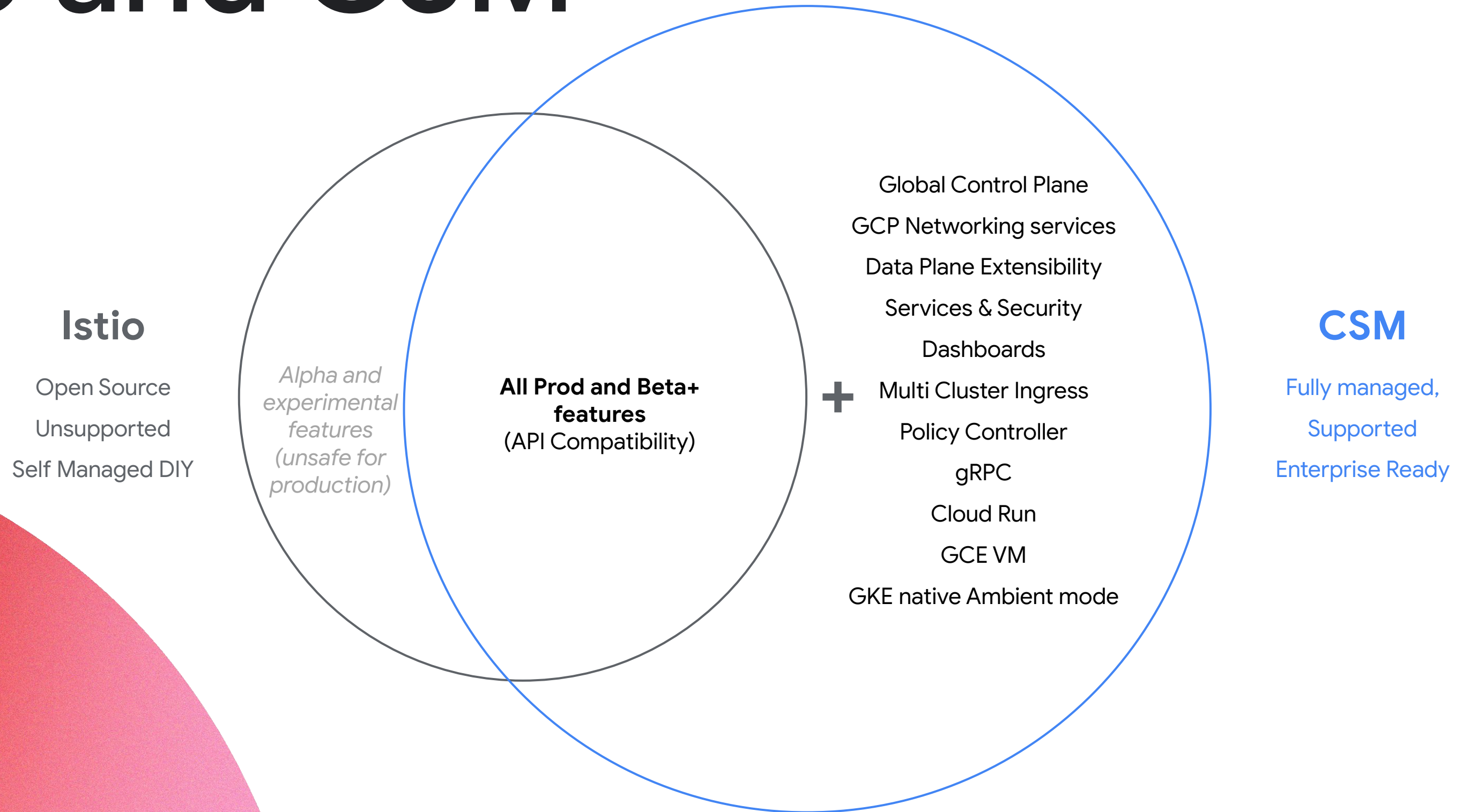
Alpha and experimental features (unsafe for production)

All Prod and Beta+ features (API Compatibility)

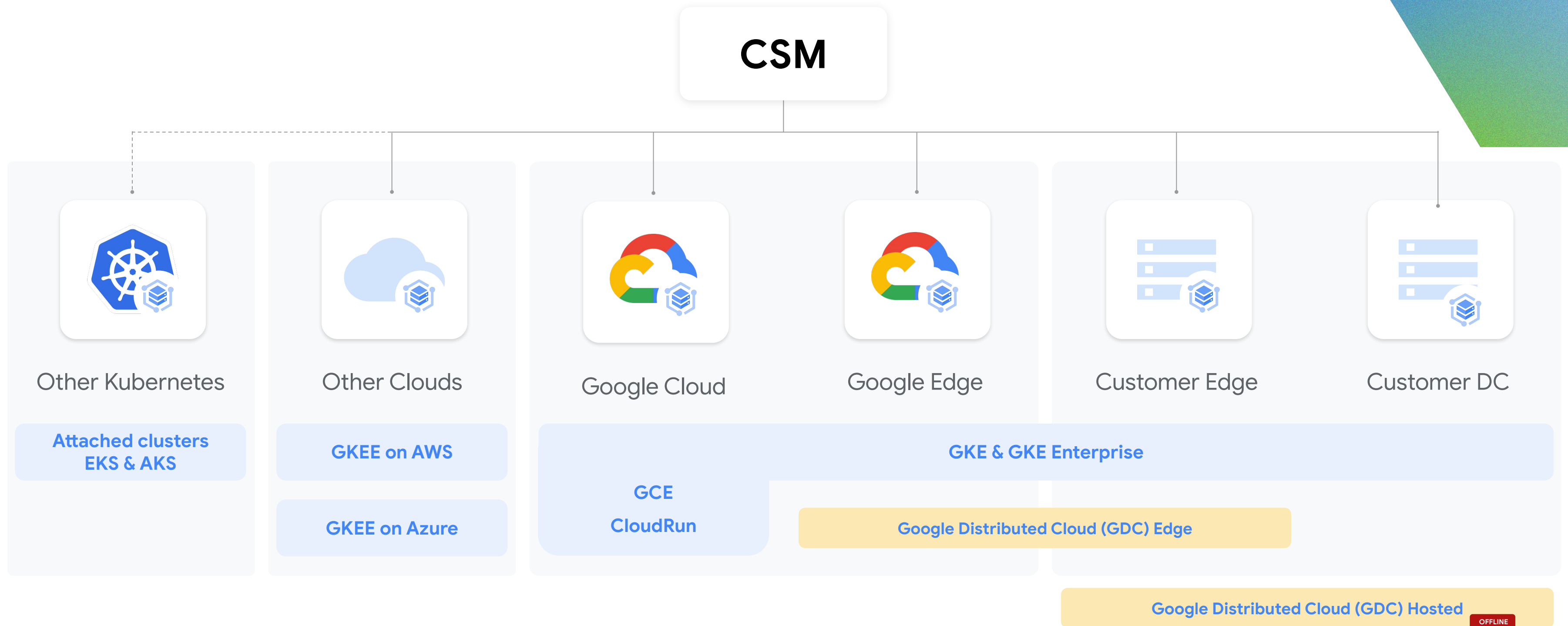
CSM
Fully managed,
Supported
Enterprise Ready

Proprietary

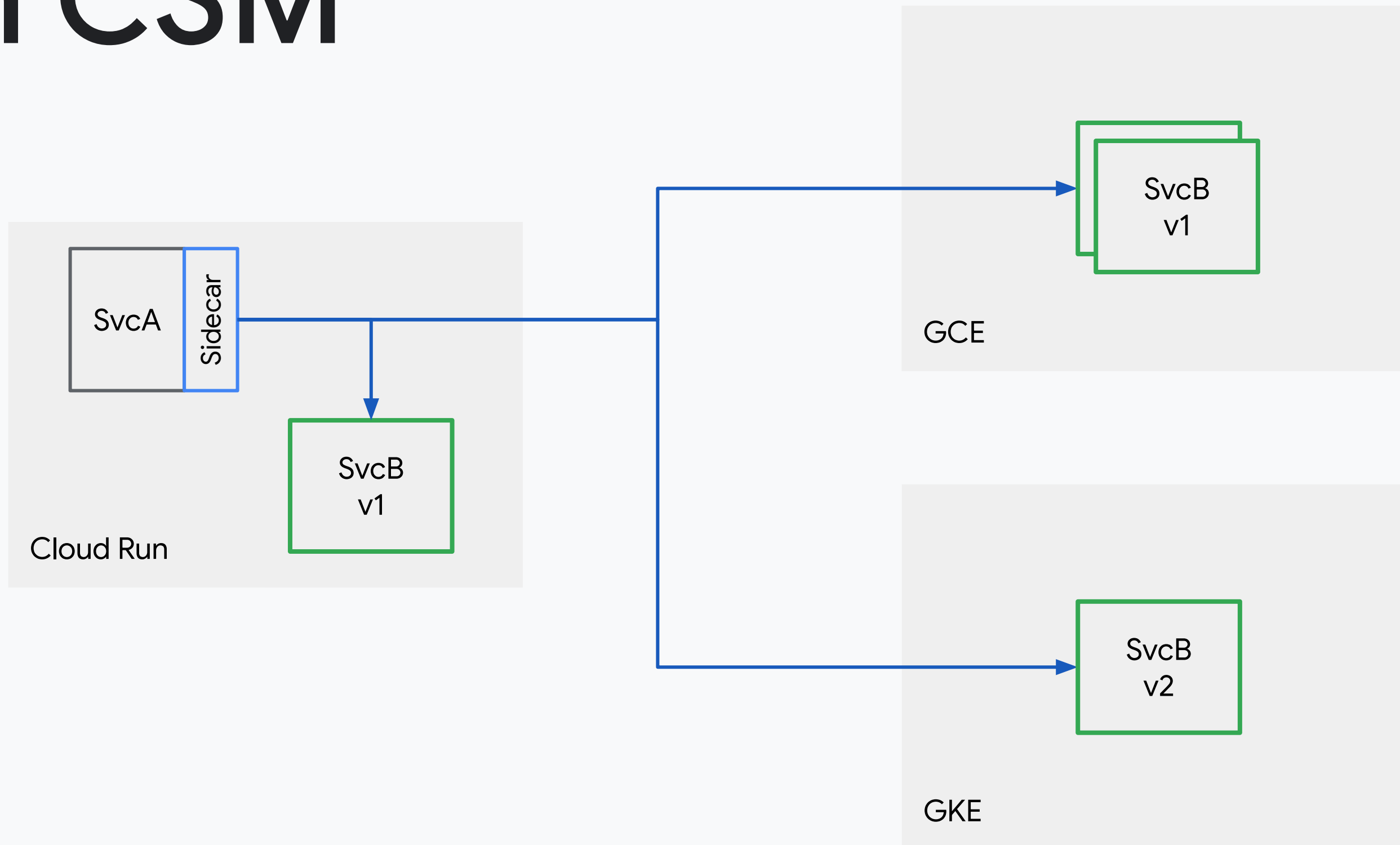
Istio and CSM



CSM Anywhere



Multi runtime architecture with CSM




```
// 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 complete after 41s
```

```
module.mig.module.mig_template.google_compute_instance_template.tpl: Destroying... [id=projects/ianmi-test/global/instanceTemplates/hello-mig-20240310190842353400000001]
```

```
module.mig.module.mig_template.google_compute_instance_template.tpl: Still destroying... [id=projects/ianmi-test/global/instanceTemplates/hello-mig-20240310190842353400000001, 10s elapsed]
```

```
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
```

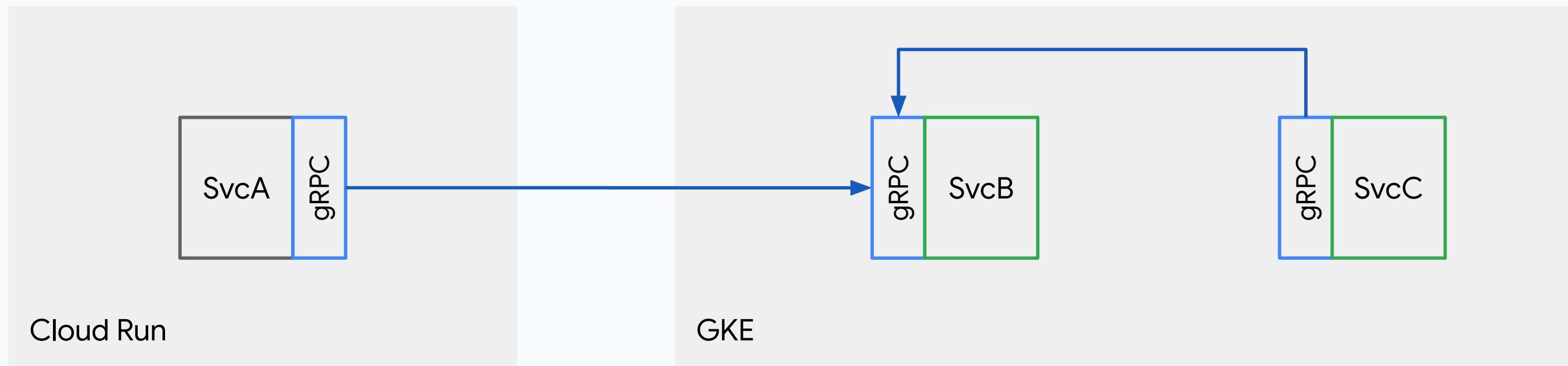
```
Hello version: v1, instance: default-xtp8
```

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

```
/hello
```

```
[hi on] ianmi@ianmi:~$
```


gRPC data plane with Gateway API



```
---
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
[mesh-demo0:~]$
```

```
[hi on] ianmi@ianmi:~$
```

CSM Big Picture

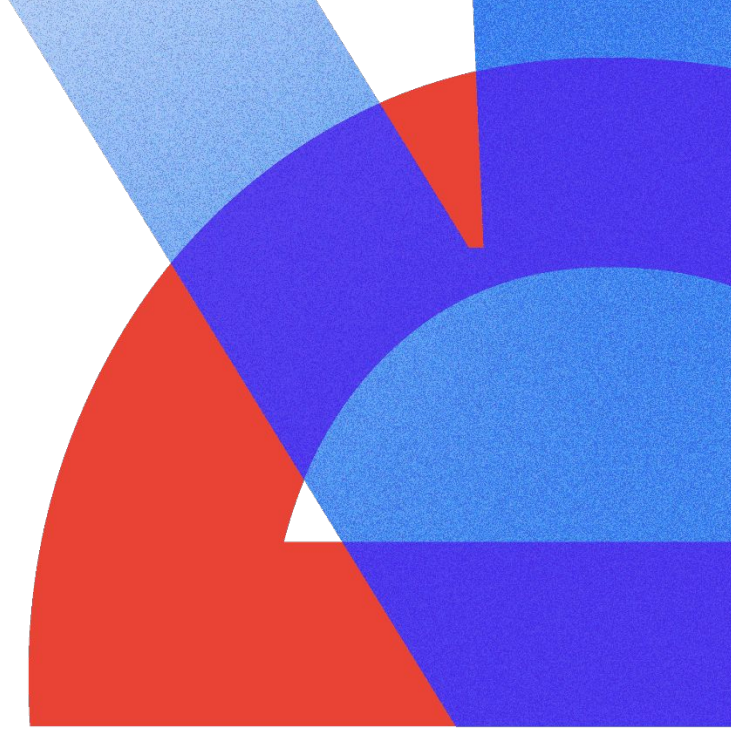
More Runtimes and Infrastructure

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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Better GCP Ecosystem integration

App Hub

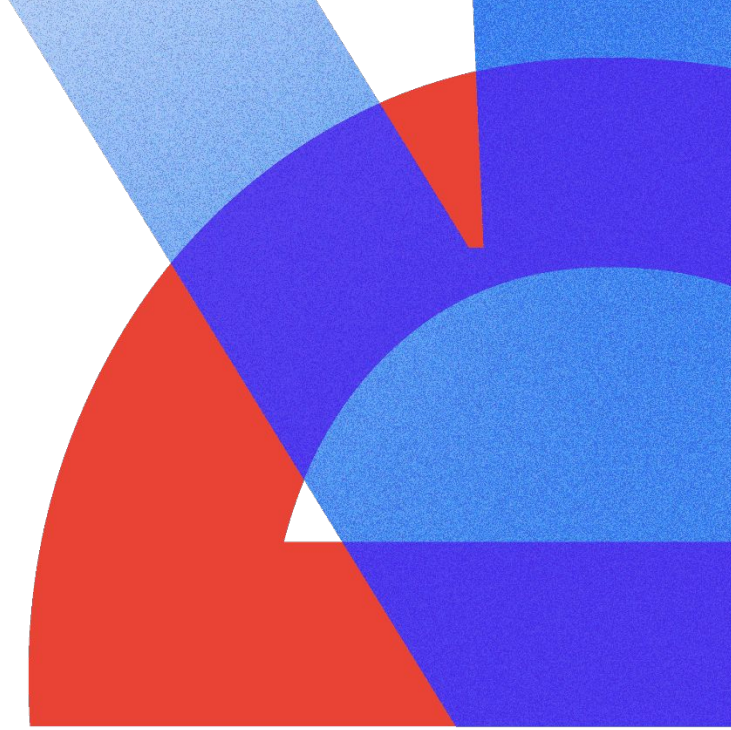
Data Plane Extensibility
Platform (DEP)

Managed LBs

HCaaS (Health Checking)

PSC

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)

Ready to build what's next?

Tap into **special offers** designed to help you **implement what you learned** at Google Cloud Next.

Scan the code to receive personalized guidance from one of our experts.



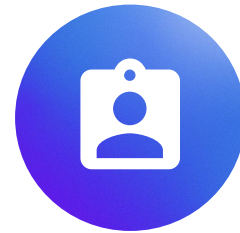
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Continue your learning journey!



**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

