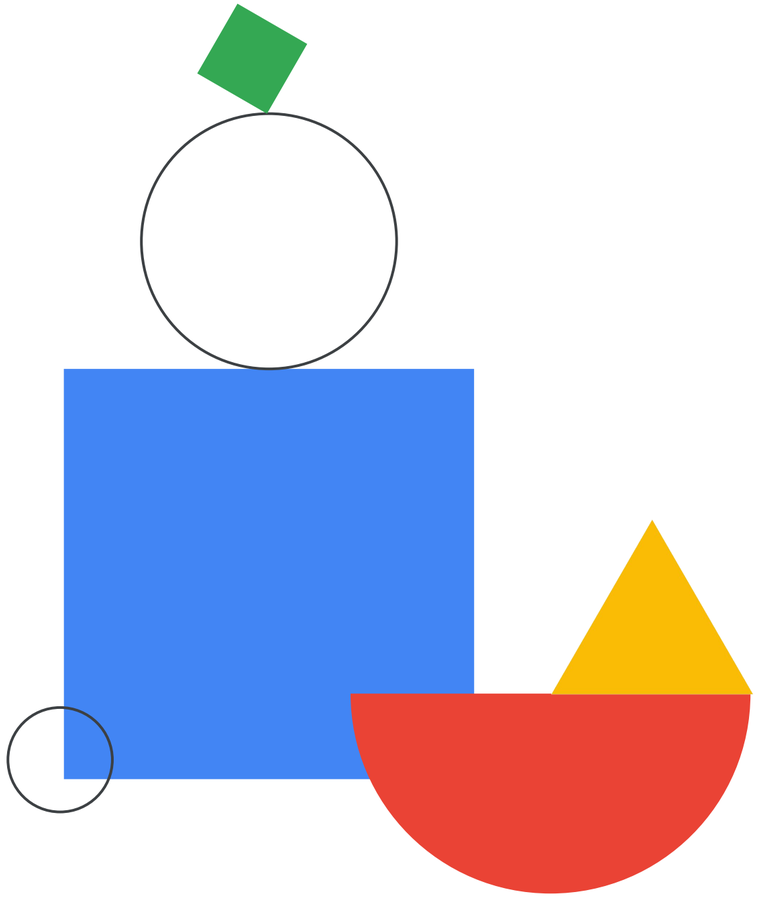
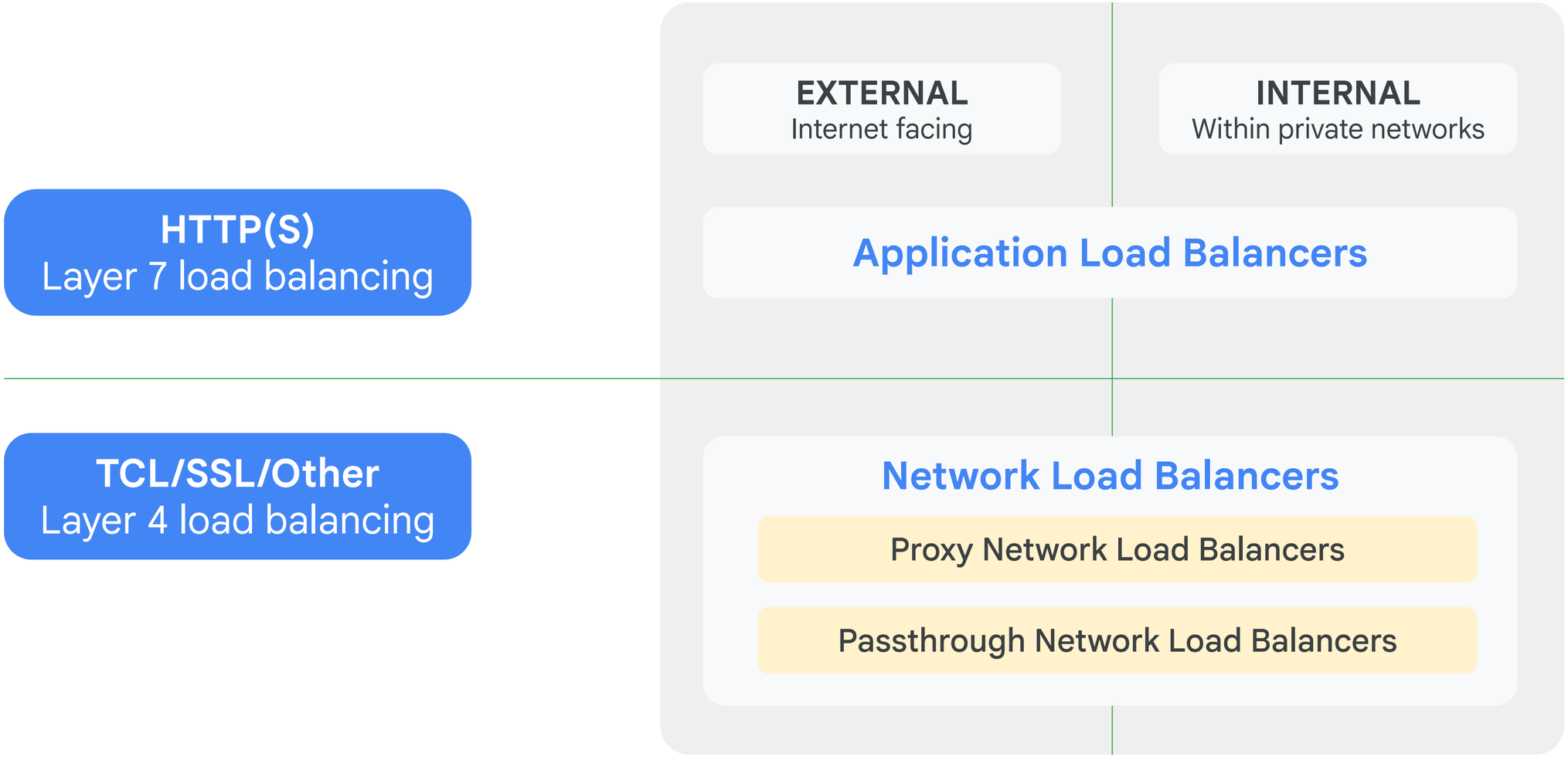
Google Cloud

Load Balancing and Autoscaling

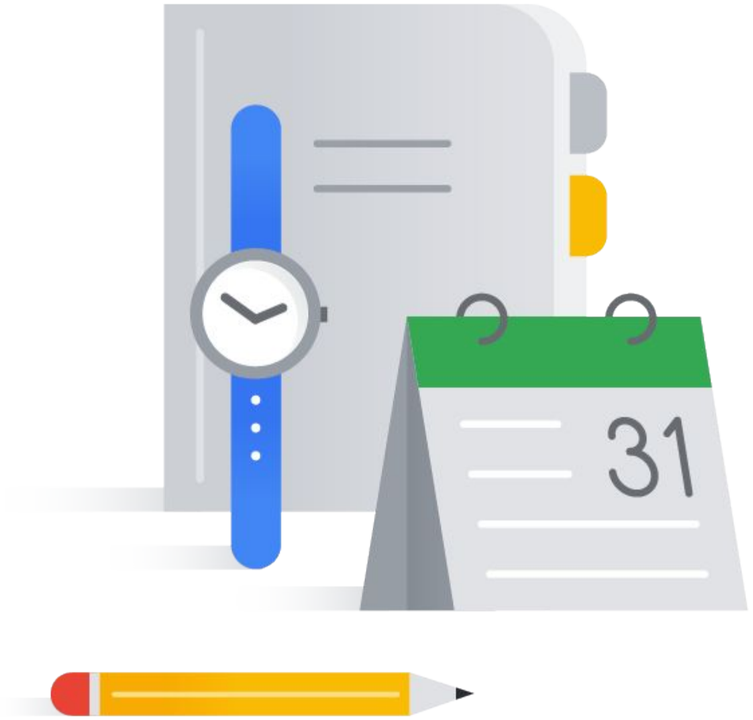


Types of load balancers



Agenda

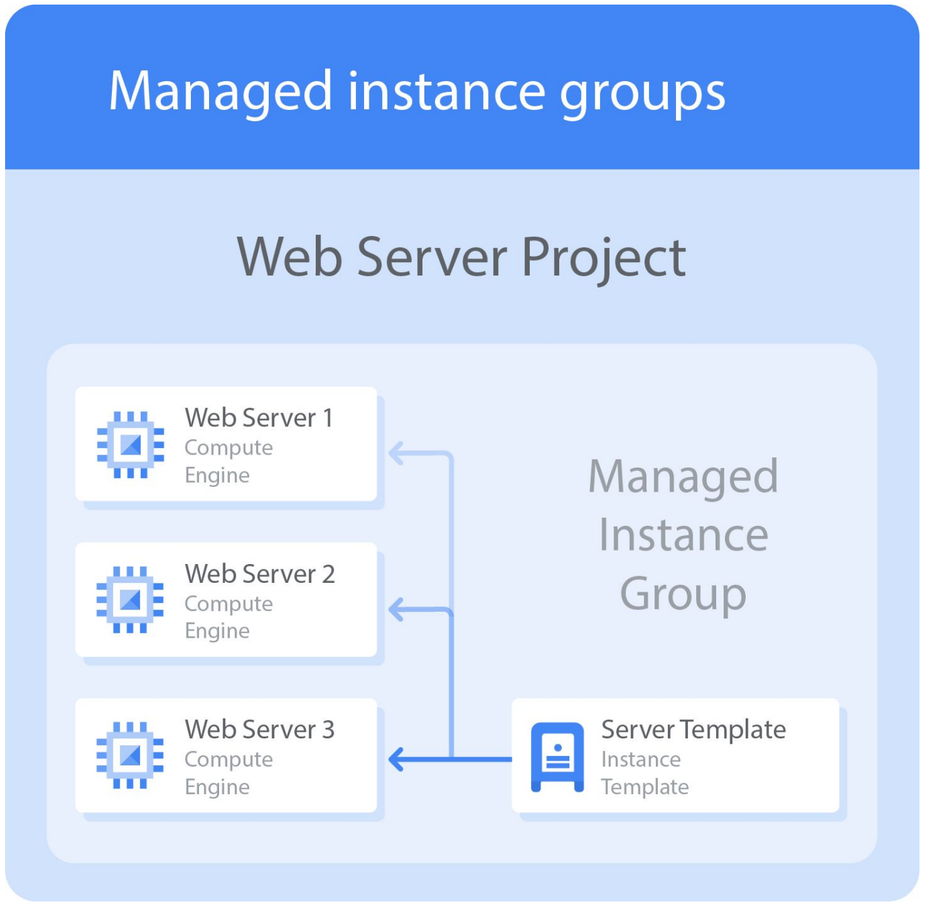
01	Managed Instance Groups
02	Application Load Balancers Lab: Configure an Application Load Balancer (HTTP) with Autoscaling
03	Cloud CDN
04	Network Load Balancing
05	Internal Load Balancing Lab: Configure an Internal Network Load Balancer
06	Choosing a Load Balancer



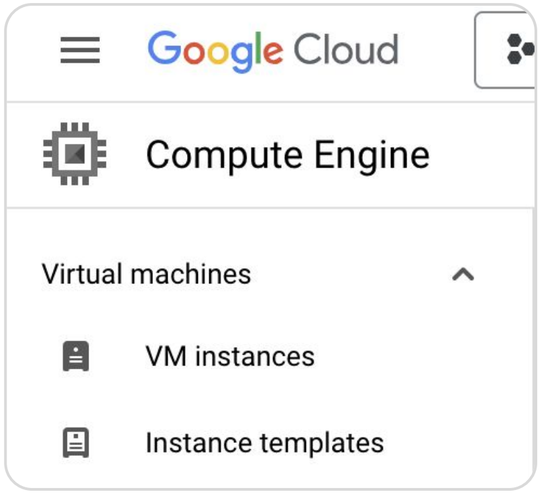
Managed Instance Groups

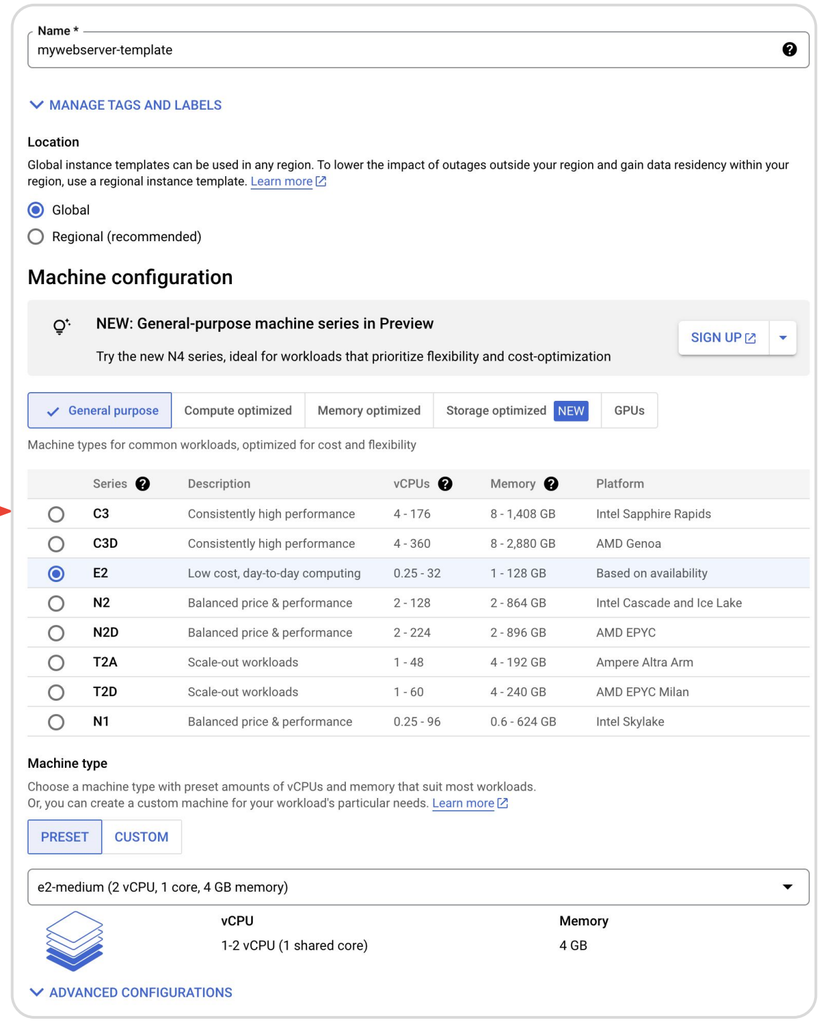
Managed instance groups

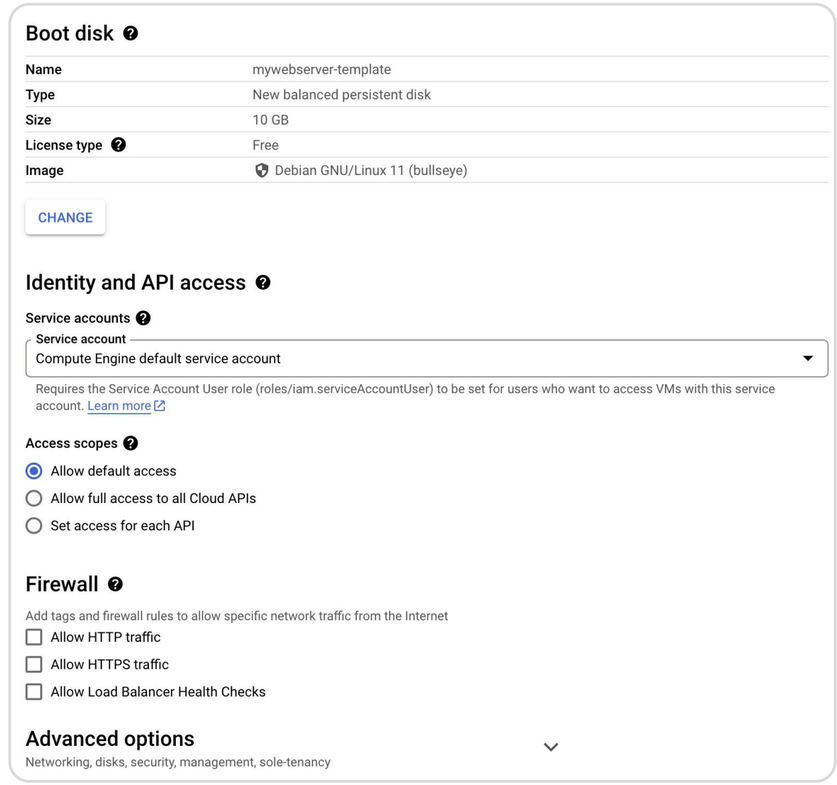
- Deploy identical instances based on instance template
- Instance group can be resized
- Manager ensures all instances are RUNNING
- Typically used with autoscaler
- Can be single zone or regional



Create an instance template







Create a managed instance group

01

Create Instance Group

New managed instance group (stateless)
Automatically manage groups of VMs that do stateless serving and batch processing.

New managed instance group (stateful)
Automatically manage groups of VMs that have persistent data or configurations (such as databases or legacy applications).

New unmanaged instance group
Manually manage groups of load balancing VMs.

02

Set up automatic management for a group of stateless VMs, including updates, regional deployments, load balancing, autoscaling, and autohealing. Learn more

Name *
instance-group-1
Name is permanent

Description

03

Location

For higher availability, select multiple zones in a region instead of a single zone. Learn more

Single zone
Multiple zones

Region *
us-west1 (Oregon)

Zones
us-west1-b, us-west1-c, and ...

Target distribution shape
Even

04

Instance template *
mywebserver-template
f1-micro, mywebserver, global

05

Autoscaling

Use autoscaling to automatically add and remove instances to the group for periods of high and low load. Learn more

Autoscaling mode
On: add and remove instances to the group

Minimum number of instances *
1

Maximum number of instances *
2

Autoscaling signals

Use signals to help determine when to scale the group. Learn more

CPU utilization: 60% (default)
Predictive autoscaling is off

06

Autohealing

Autohealing recreates VM instances if your application cannot be reached by the health check. Learn more

Health check
Compute Engine will recreate VM instances only when they're not running.

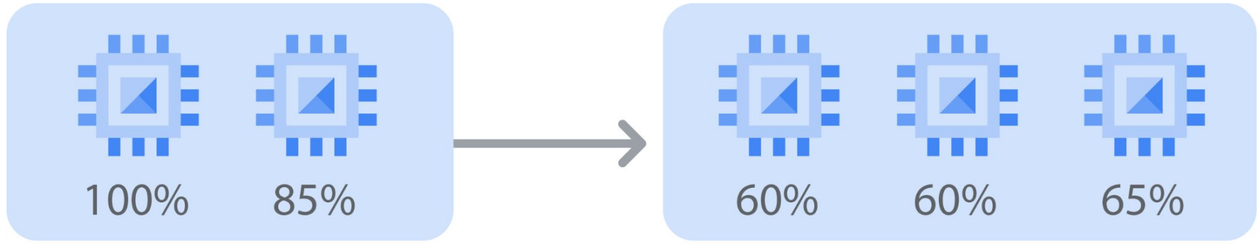
Managed instance groups offer autoscaling capabilities

Dynamically add/remove instances:

- Increases in load
- Decreases in load

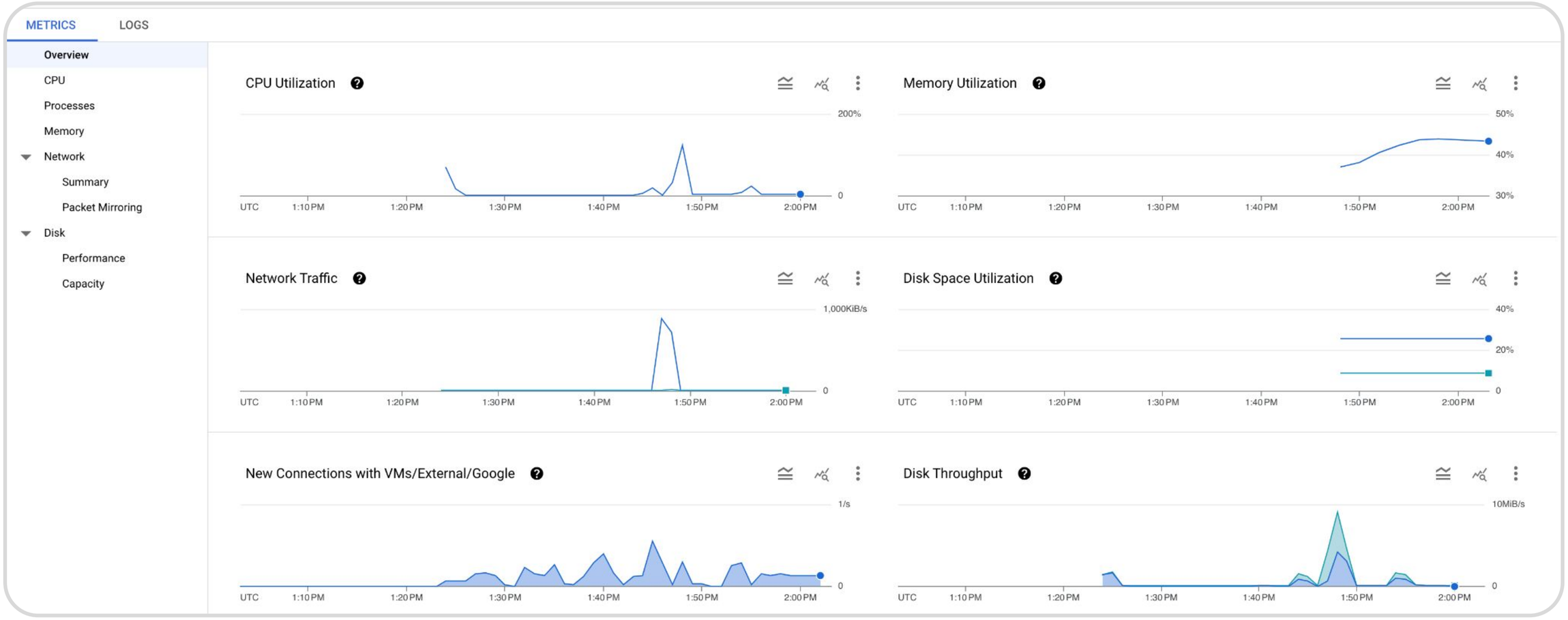
Autoscaling policy:

- CPU utilization
- Load balancing capacity
- Monitoring metrics
- Queue-based workload
- Schedule-based

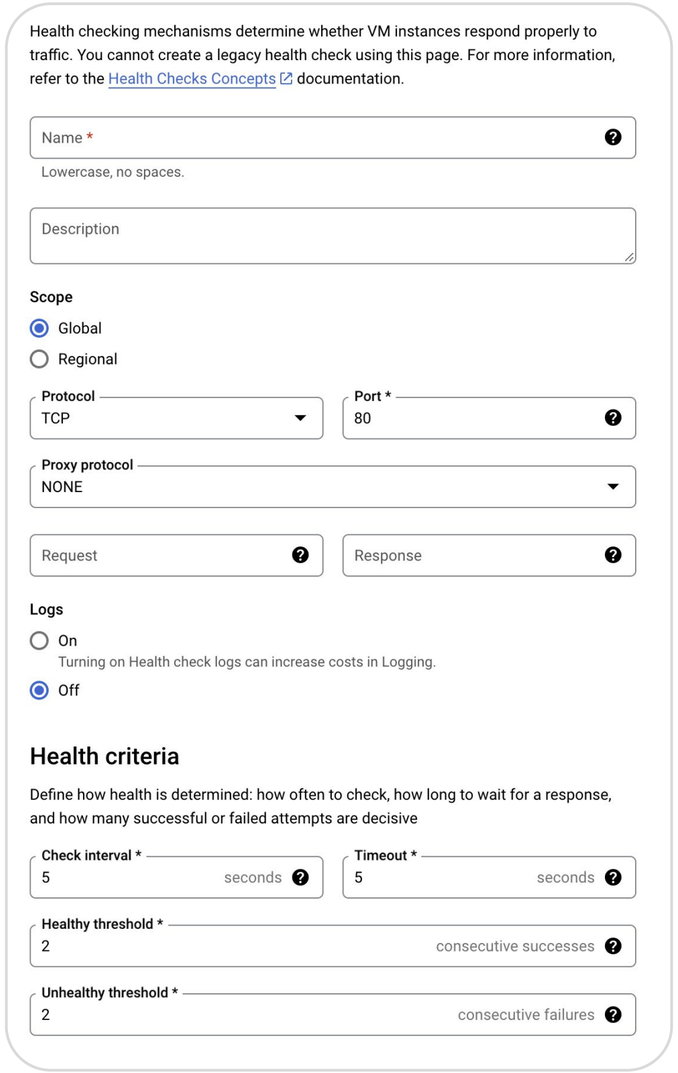


Target CPU utilization = 75%

VM graph helps set CPU utilization



Create a health check



Elapsed time (seconds)	Event duration (seconds)	
1	1	wait
2	2	wait
3	3	wait
4	4	wait
5	5	wait
6	1	**health check #1 starts**
7	2	wait
8	3	wait
9		**health check #1 fails**
10		wait
11	1	**health check #2 starts**
12	2	wait
13	3	wait
14		**health check #2 fails**
15		**Unhealthy threshold reached**

Configuring stateful IP addresses

Preserve the unique state of each MIG VM instance on machine restart, recreation, auto-healing, or update event. Useful in the following scenarios:

- IP address to remain static after it has been assigned.
- Configuration depends on specific IP addresses.
- Server is accessed through a dedicated static IP address.
- Migrate workloads without changing network configuration.

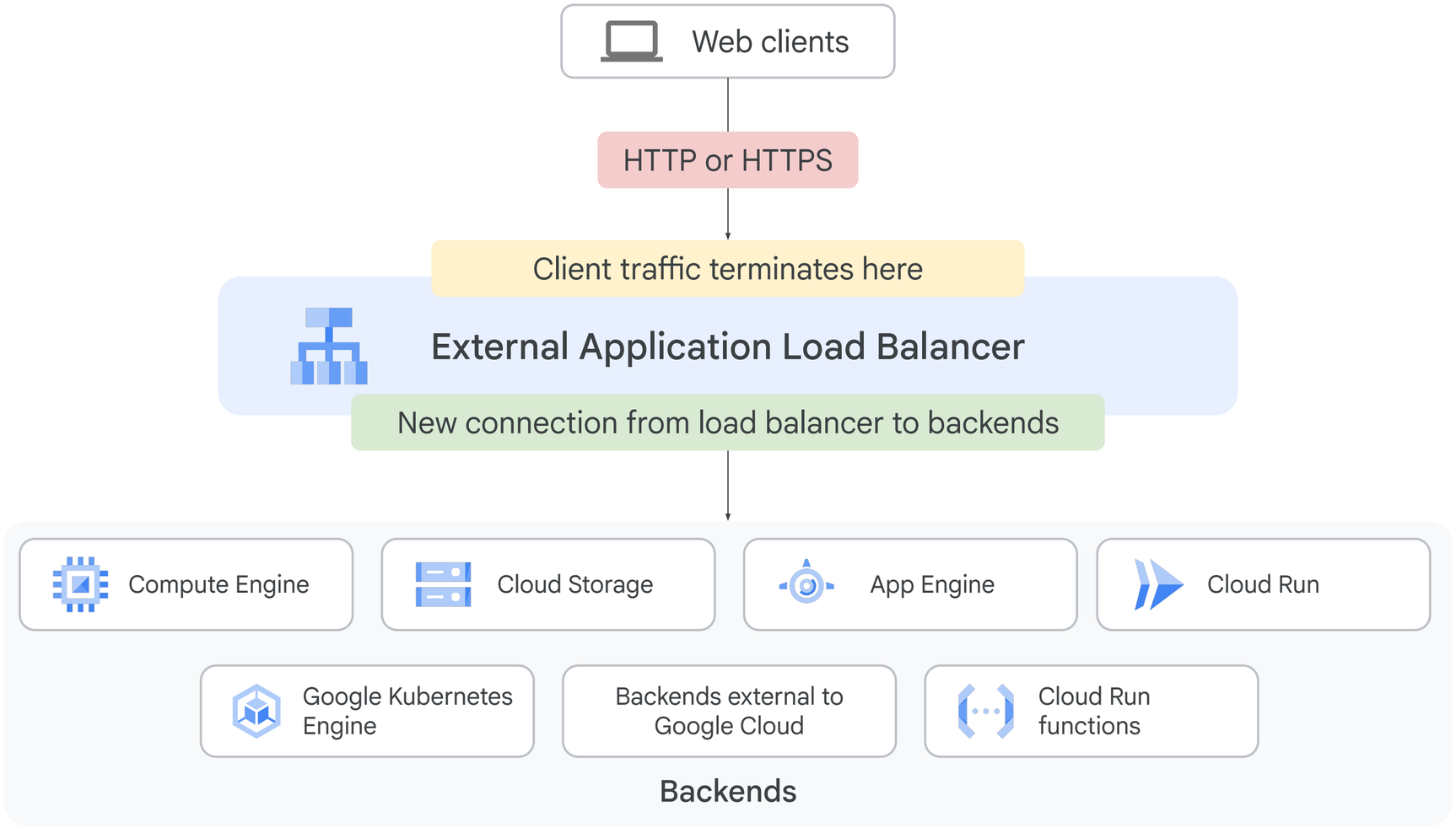
- Configure IP addresses as stateful for all existing and future instances in the group.
- Update the existing stateful configuration for IP addresses.

Application Load Balancing

Overview of an Application Load Balancer

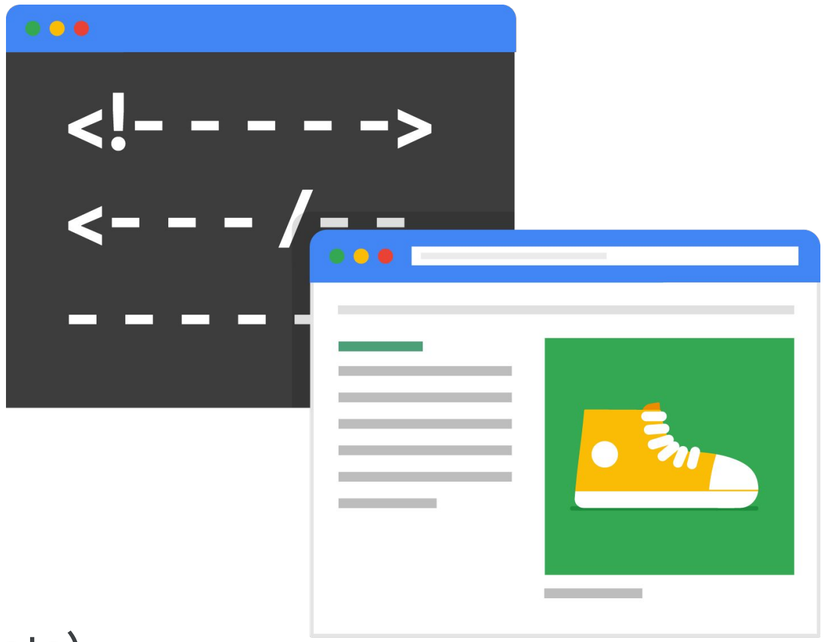
Deployment mode	Network service tier	Load balancing scheme	IP address	Frontend ports
Global external	Premium Tier	EXTERNAL_MANAGED	IPv4 IPv6	Can reference exactly one port from 1-65535
Regional external	Premium or Standard Tier	EXTERNAL_MANAGED	IPv4	
Classic	Global in Premium Tier Regional in Standard Tier	EXTERNAL	IPv4 IPv6 (requires Premium Tier)	

Architecture of an external Application Load Balancer

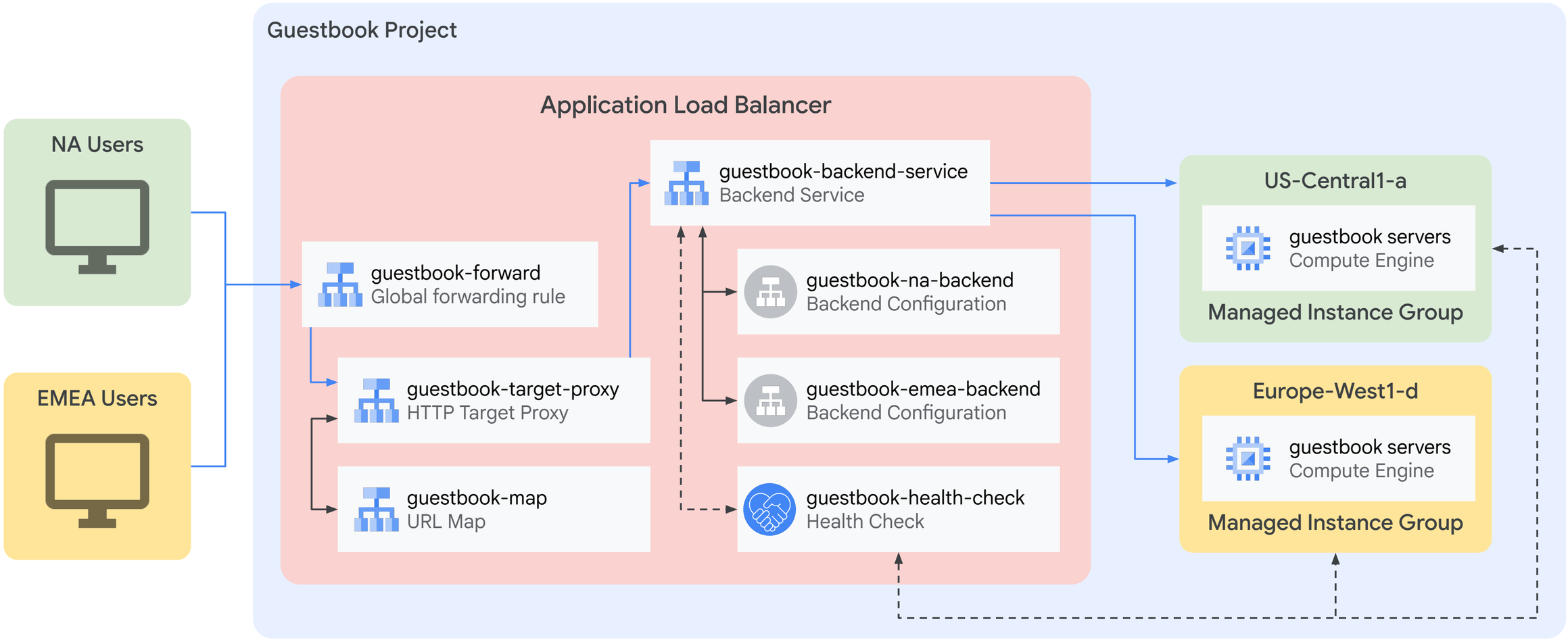


Backend services

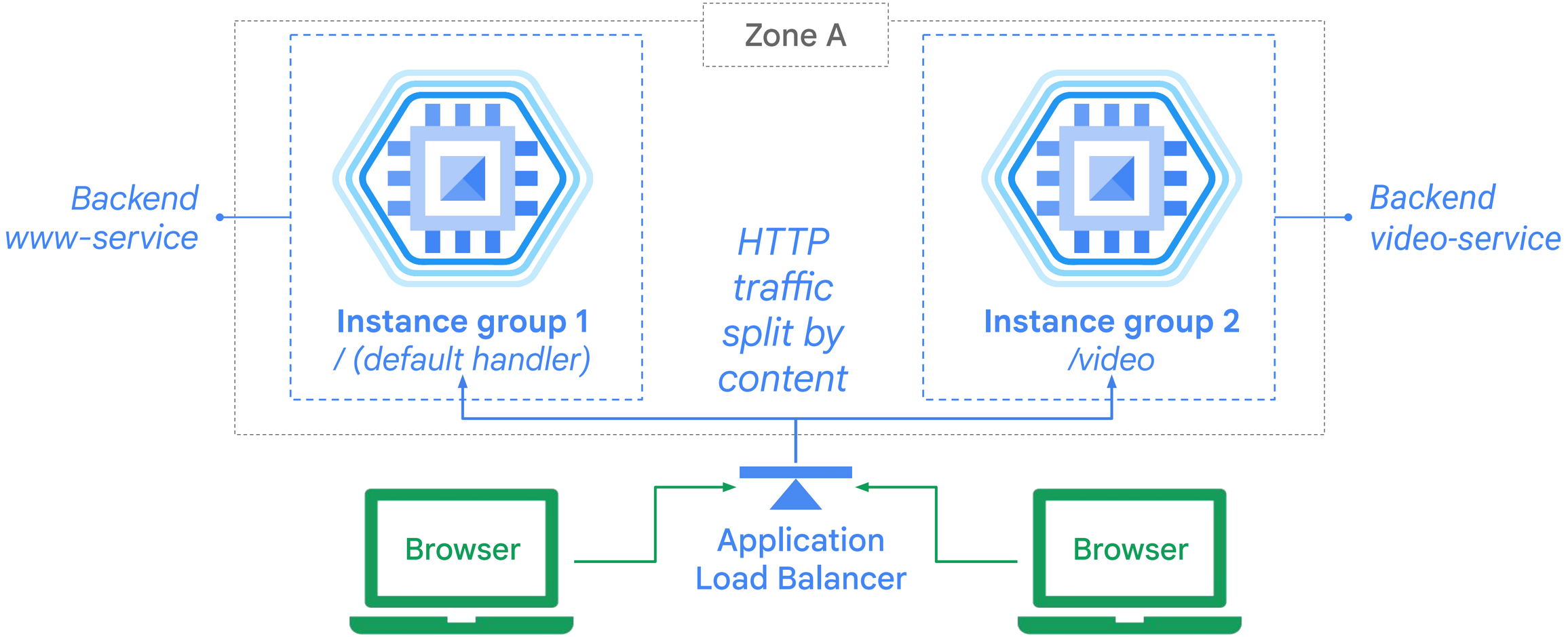
- Health check
- Session affinity (optional)
- Time out setting (30-sec default)
- One or more backends
  - An instance group (managed or unmanaged)
  - A balancing mode (CPU utilization or RPS)
  - A capacity scaler (ceiling percentage of CPU/Rate targets)



Application Load Balancing resources

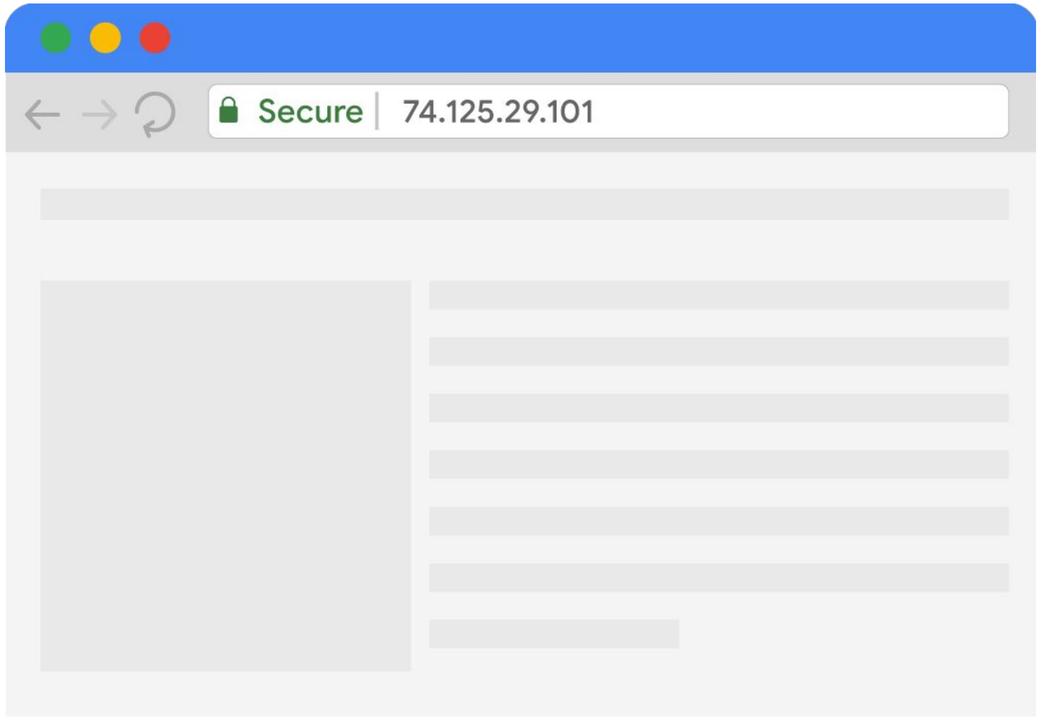


Example: Content-based load balancing



Application Load Balancing - Target HTTPS proxy

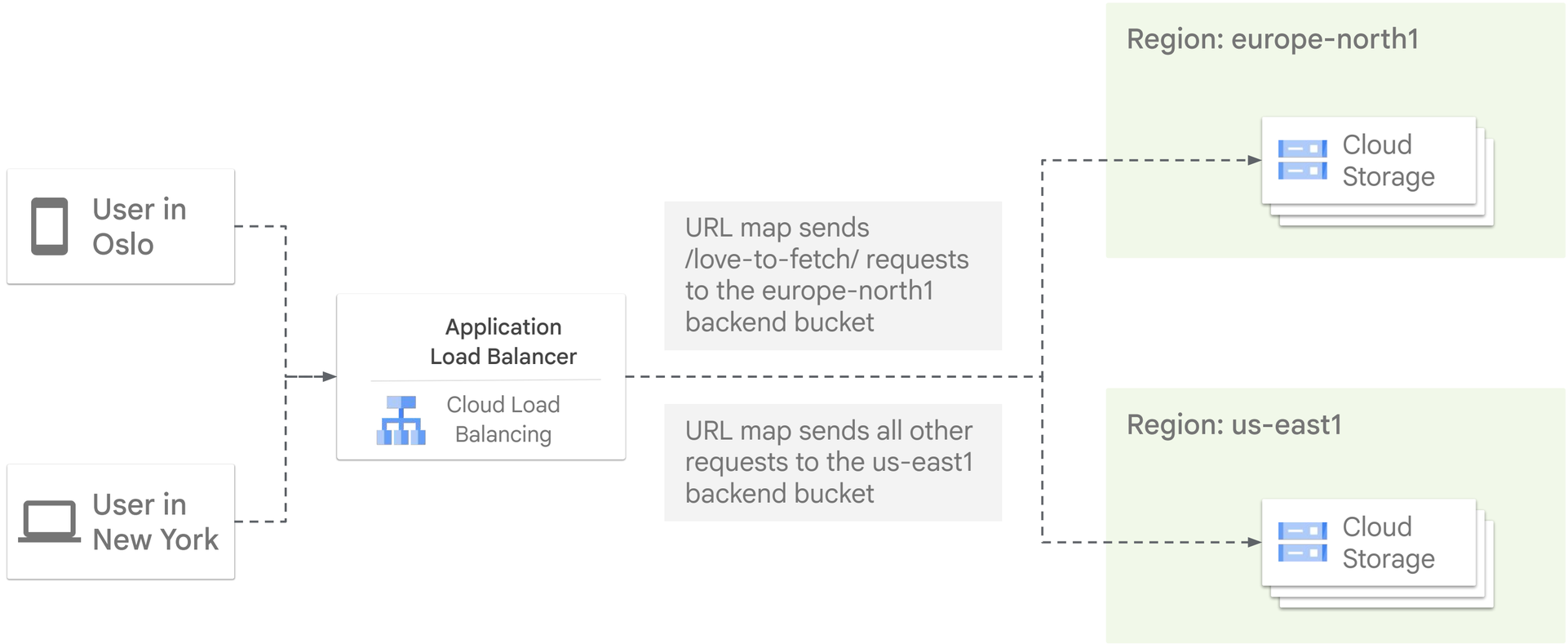
- Target HTTP(S) proxy
- One signed SSL certificate installed (minimum)
- Client SSL session terminates at the load balancer
- Support the QUIC transport layer protocol



SSL certificates

- Required for Application Load Balancing
- Up to 15 SSL certificates (per target proxy)
- Create an SSL certificate resource

Backend buckets



Network endpoint groups (NEG)

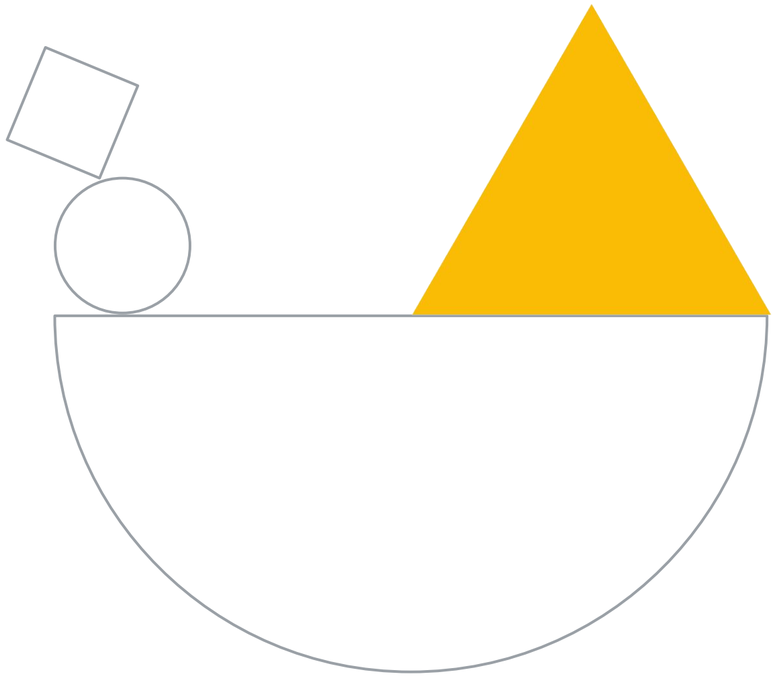
A network endpoint group (NEG) is a configuration object that specifies a group of backend endpoints or services.

There are four types of NEGs:

- Zonal
- Internet
- Serverless
- Hybrid connectivity

Lab Intro

Configure an Application Load Balancer (HTTP) with Autoscaling



Lab objectives

01 Create HTTP and health check firewall rules

02 Create a custom image for a web server

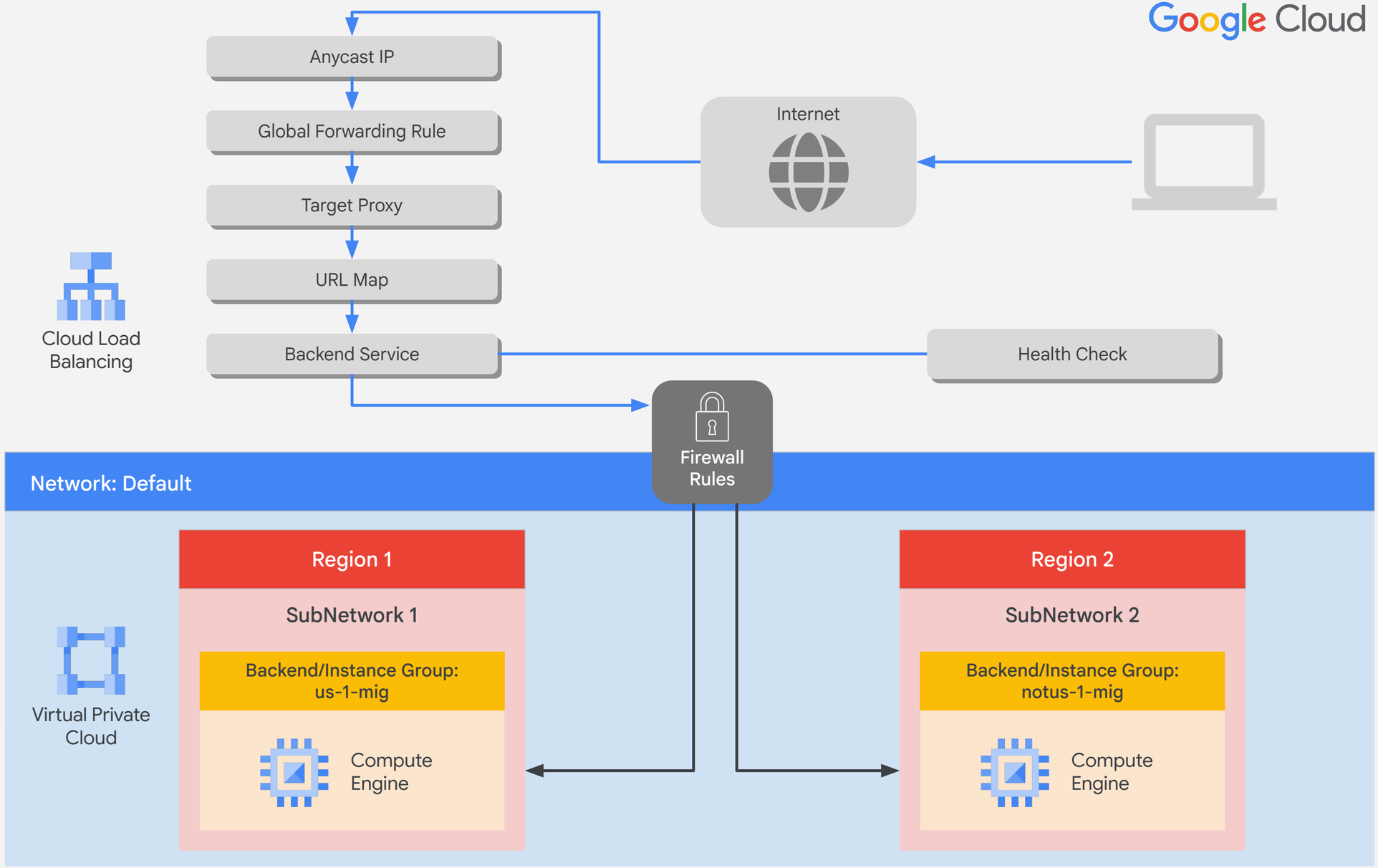
03 Create an instance template based on the custom image

04 Create two managed instance groups

05 Configure an Application Load Balancer with IPv4 and IPv6

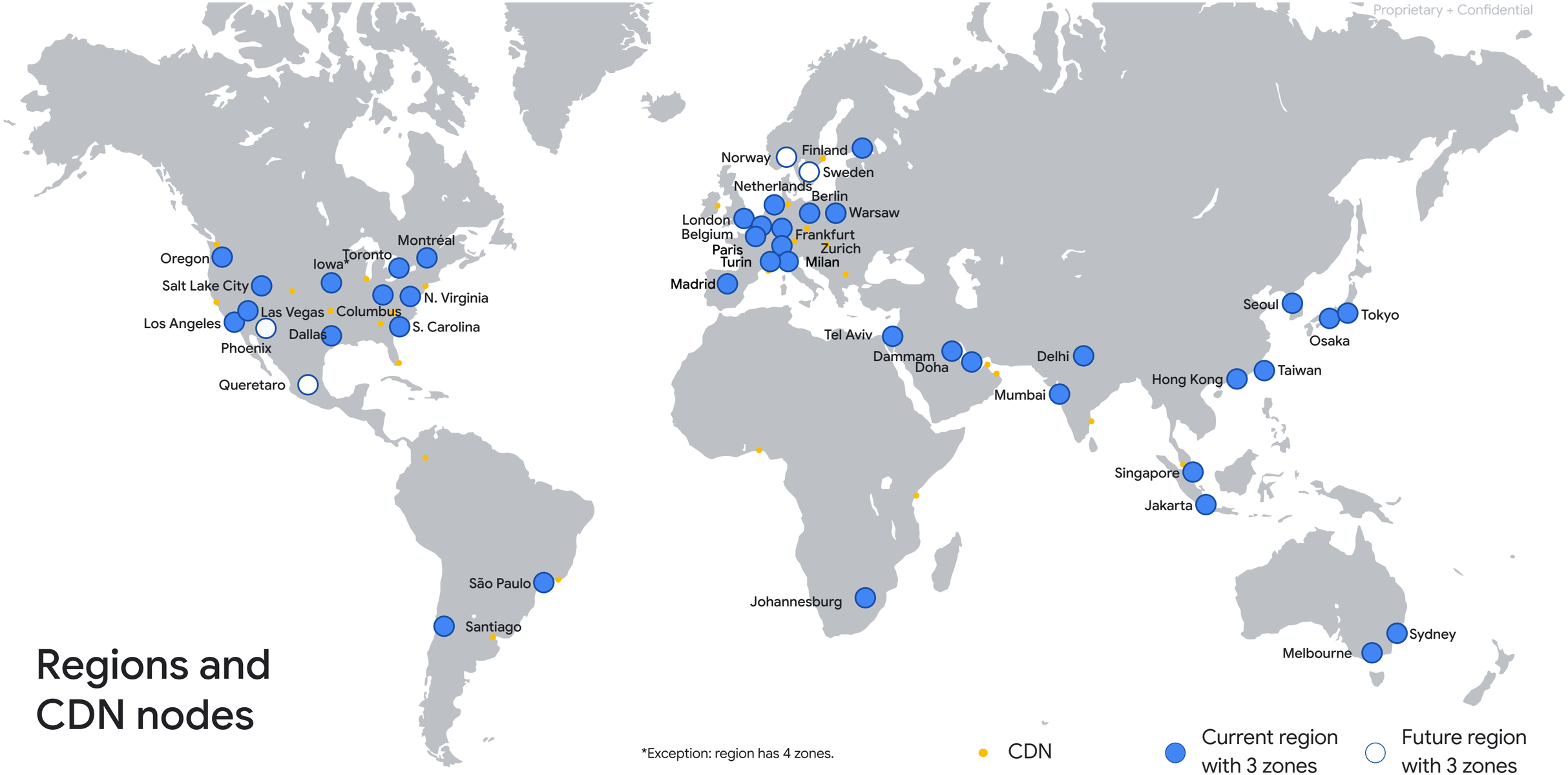
06 Stress test an Application Load Balancer

Google Cloud



Cloud CDN

Regions and CDN nodes



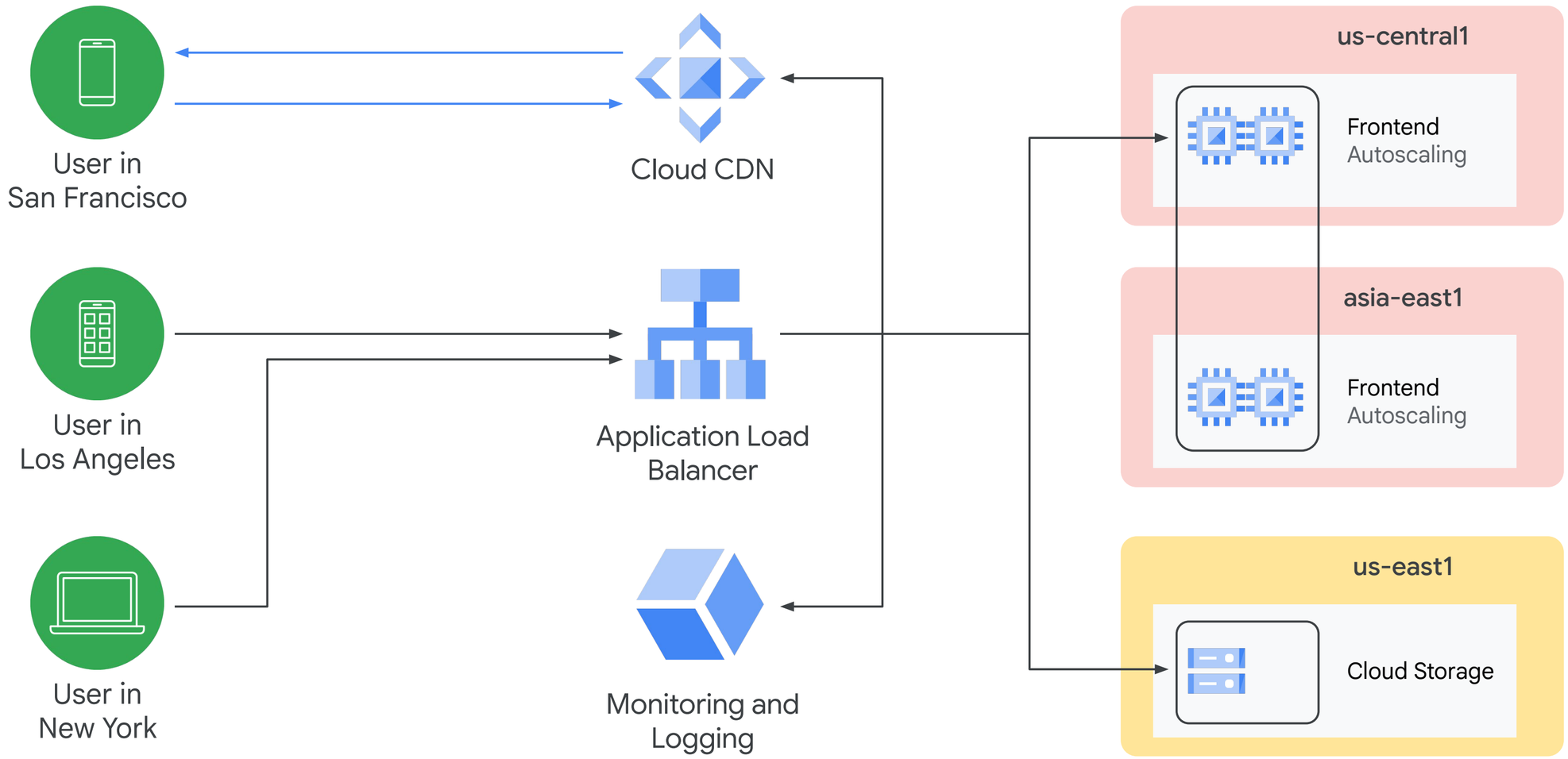
*Exception: region has 4 zones.

CDN

Current region with 3 zones

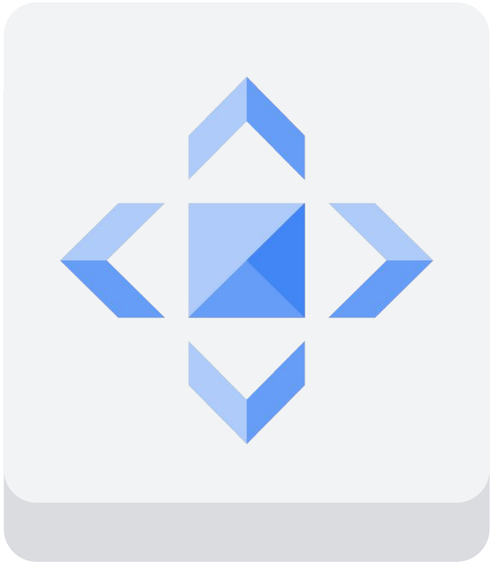
Future region with 3 zones

Caching content with Cloud CDN



Cloud CDN cache modes

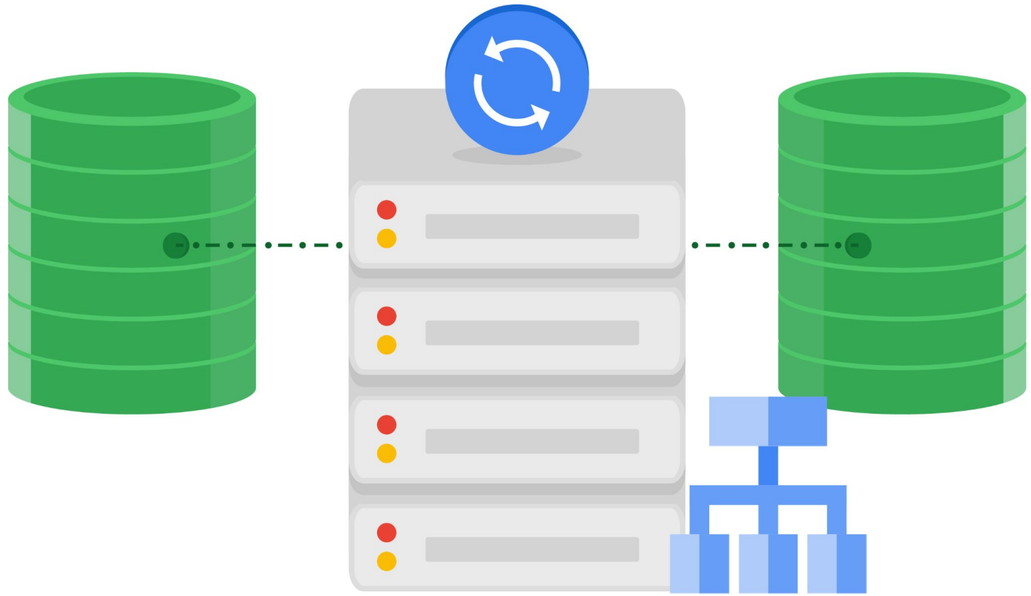
- Cache modes control the factors that determine whether or not Cloud CDN caches your content.
- Cloud CDN offers three cache modes:
  - USE_ORIGIN_HEADERS
  - CACHE_ALL_STATIC
  - FORCE_CACHE_ALL



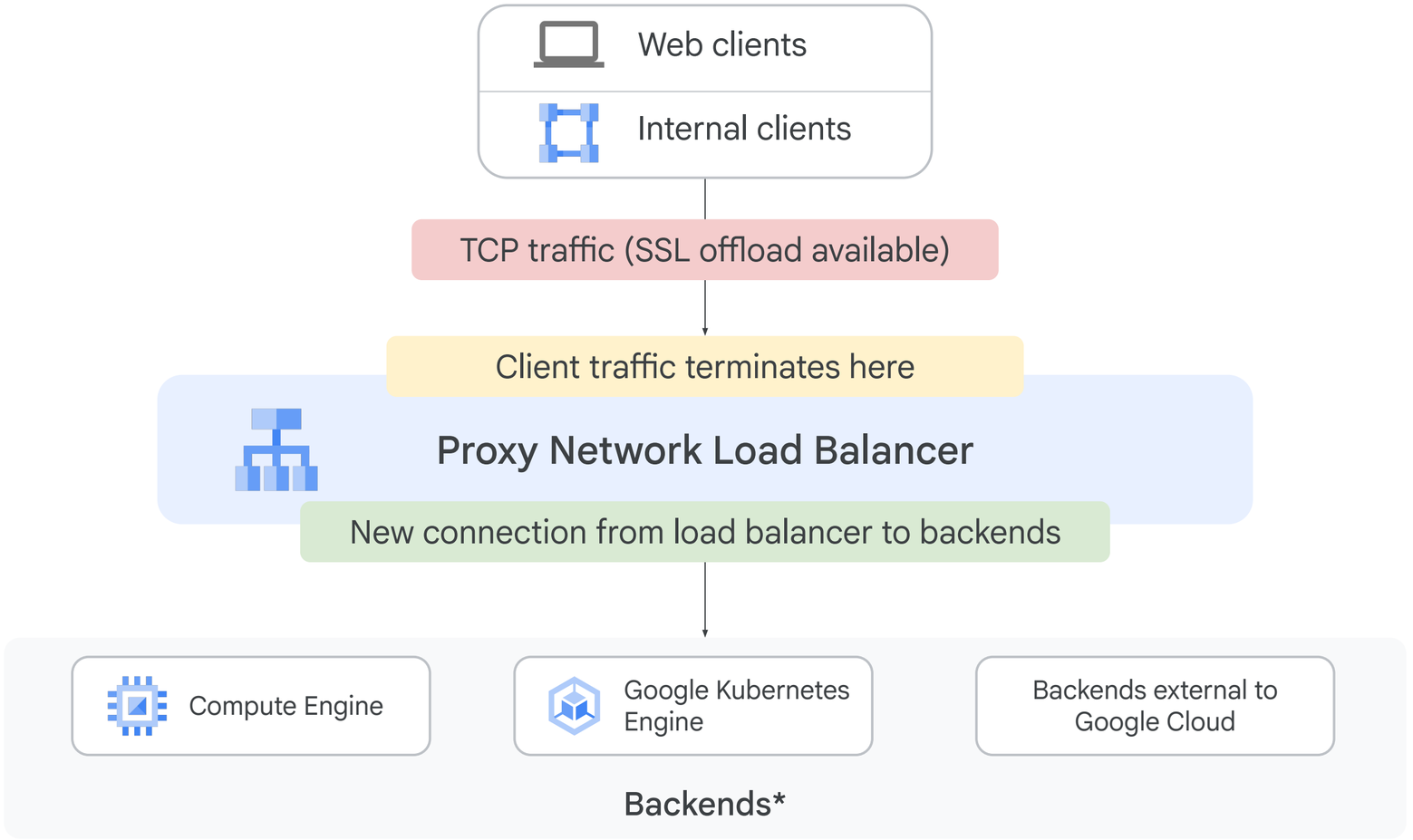
Network Load Balancing

Network load balancing

- Architecture:
  - Proxy
  - Passthrough
- Traffic:
  - TCP/SSL ports
  - UDP, ESP, GRE
  - ICMP, ICMPv6

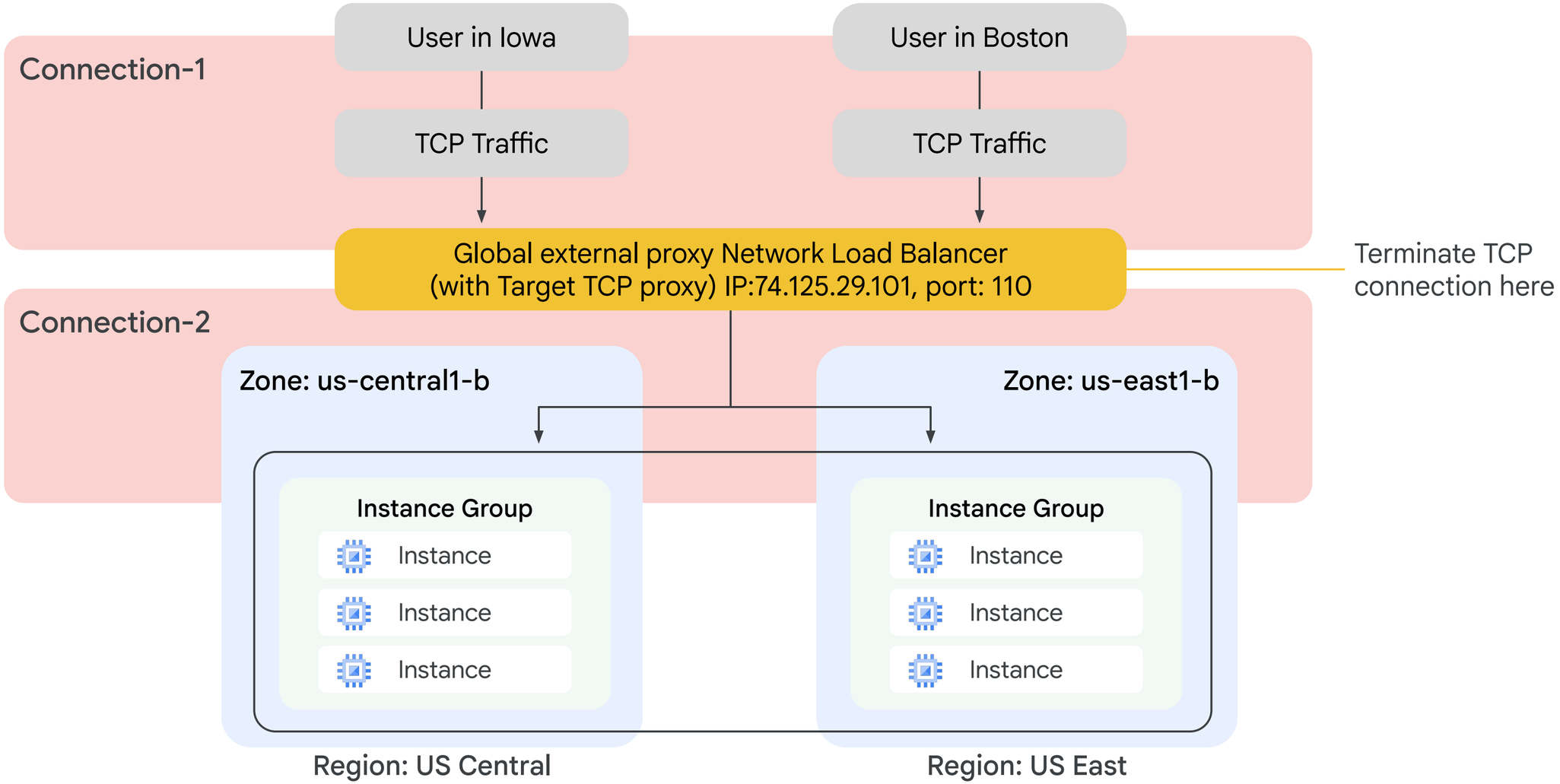


Architecture of a Proxy Network Load Balancer

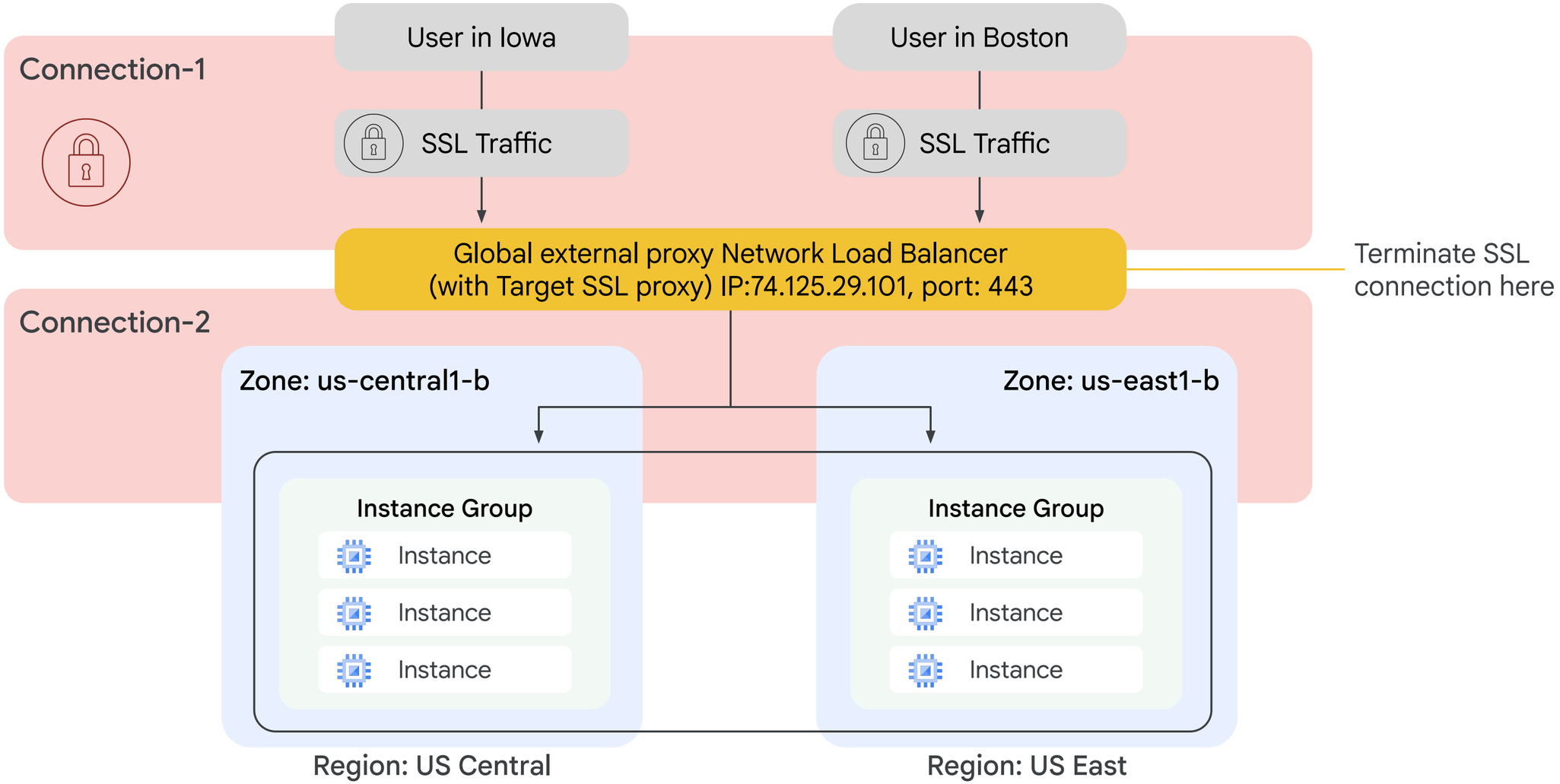


*Backend support differs depending on the deployment mode of the load balancer (internal or external, global or regional).

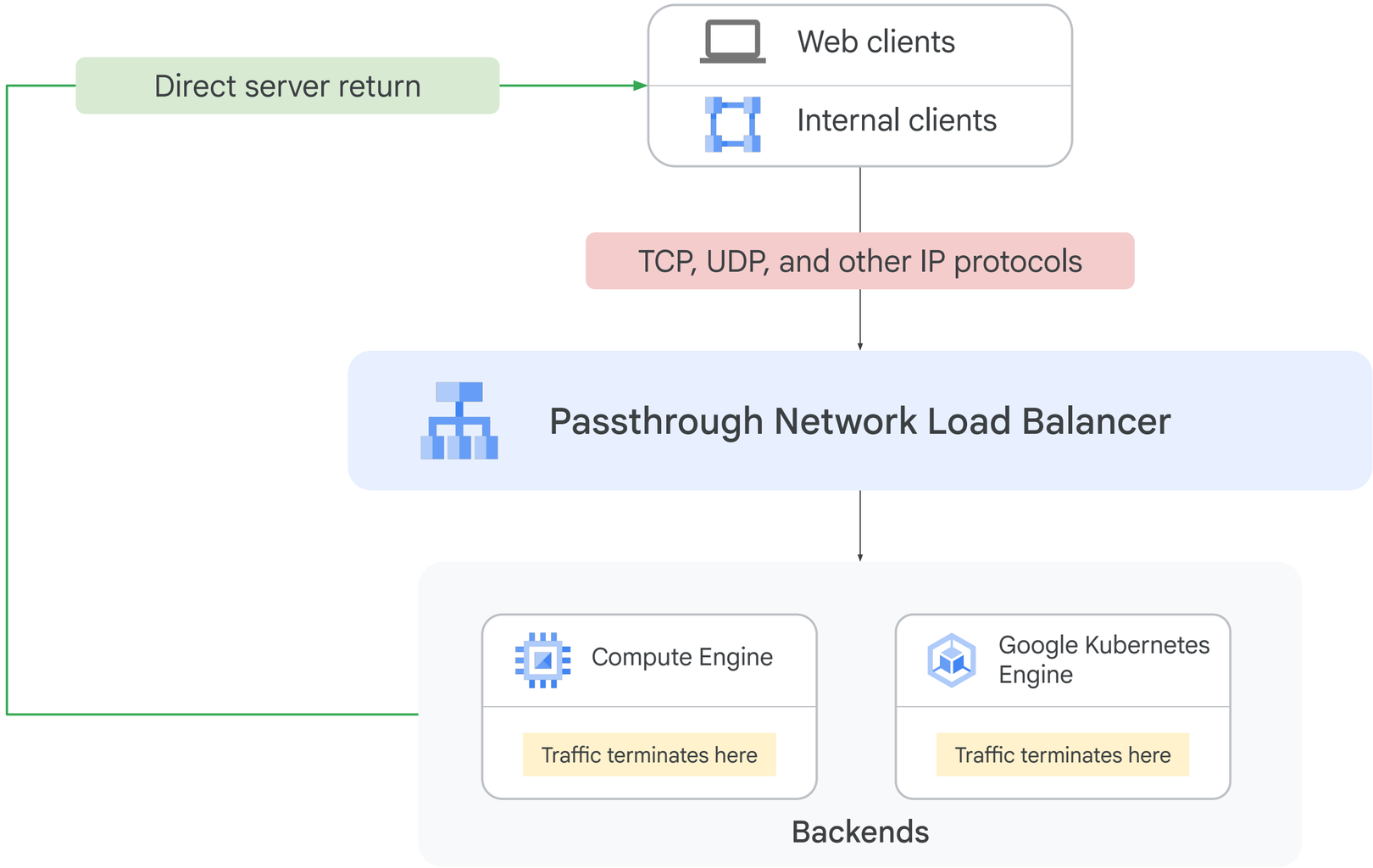
Proxy Network Load Balancer - Target TCP proxy



Proxy Network Load Balancer - Target SSL proxy



Architecture of a passthrough Network Load Balancer



Backend service-based architecture

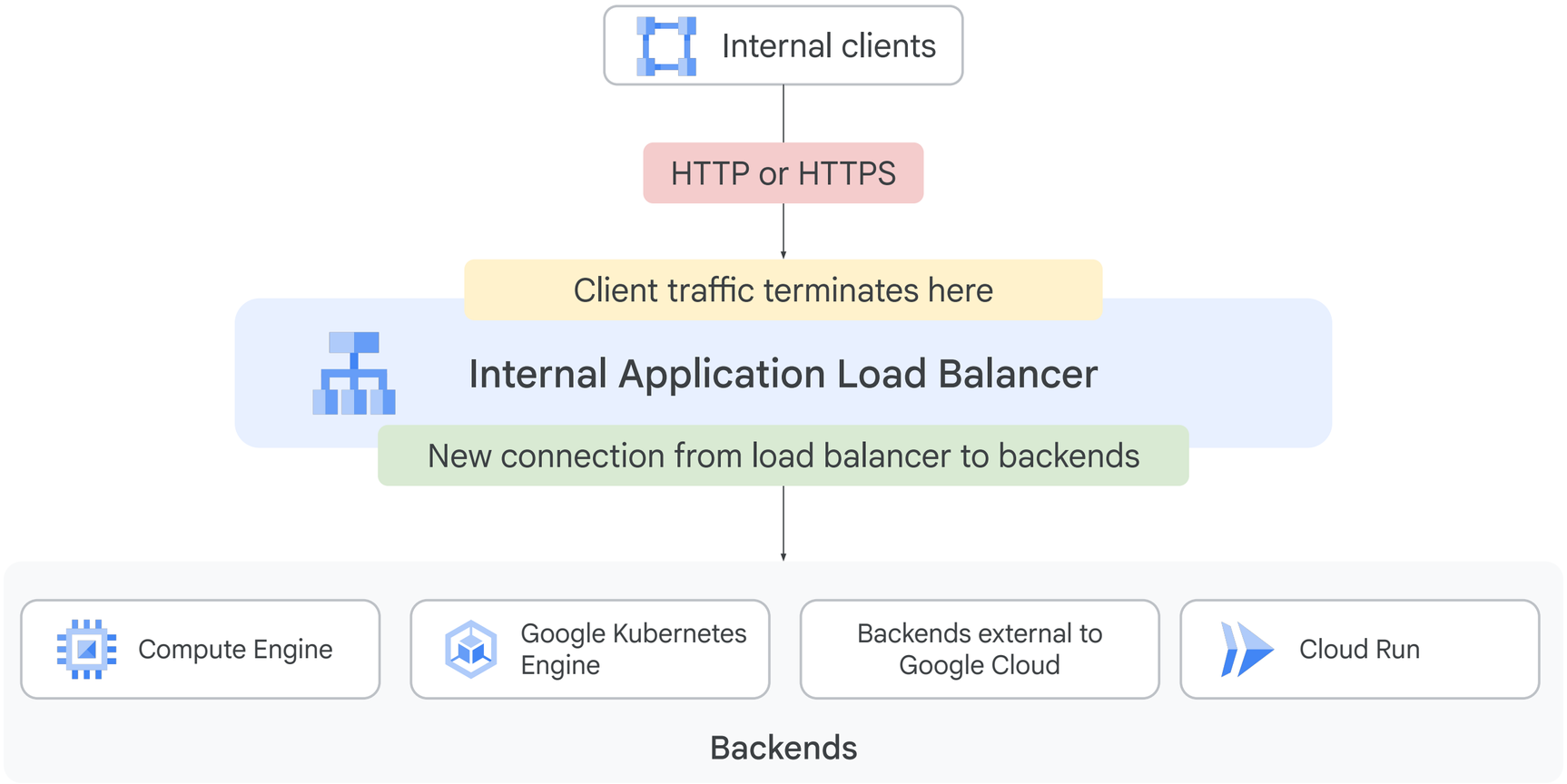
- Regional backend service
- Defines the behavior of the load balancer and how it distributes traffic to its backend instance groups
- Support for IPv4 and IPv6 traffic
- Multiple protocols
- Managed and unmanaged instance groups
- Non legacy health checks

Target pool-based architecture

- Forwarding rules (TCP and UDP)
- Up to 50 per project
- One health check
- Instances must be in the same region

Internal Load Balancing

Architecture of an internal Application Load Balancer



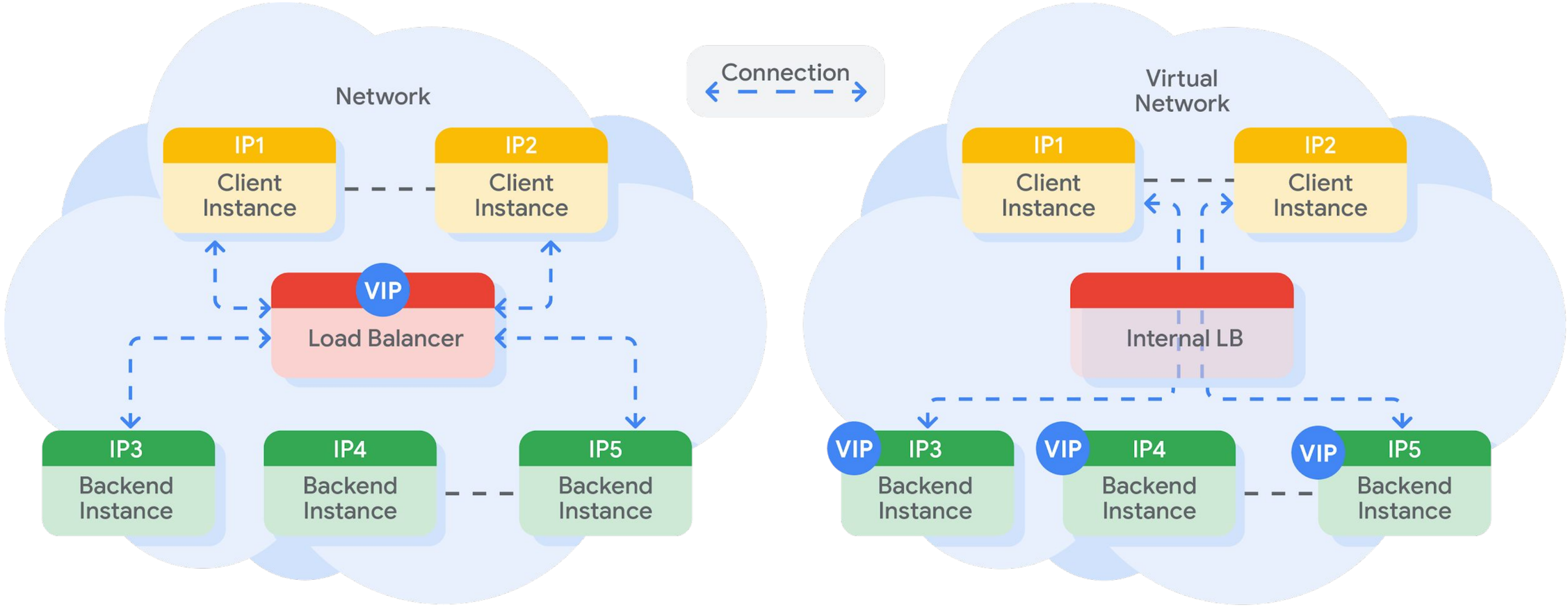
Internal Application Load Balancers

Deployment mode	Network service tier	Load balancing scheme	IP address	Frontend ports
Regional internal	Premium Tier	INTERNAL_MANAGED	IPv4	Can reference exactly one port from 1-65535
Cross-region internal	Premium Tier	INTERNAL_MANAGED	IPv4	

Internal passthrough Network Load Balancers

- Regional, private load balancing
  - VM instances in same region
  - RFC 1918 IP addresses
- TCP, UDP, ICMP, ICMPv6, SCTP, ESP, AH, and GRE traffic
- Reduced latency, simpler configuration
- Software-defined, fully distributed load balancing

Software-defined, fully distributed load balancing



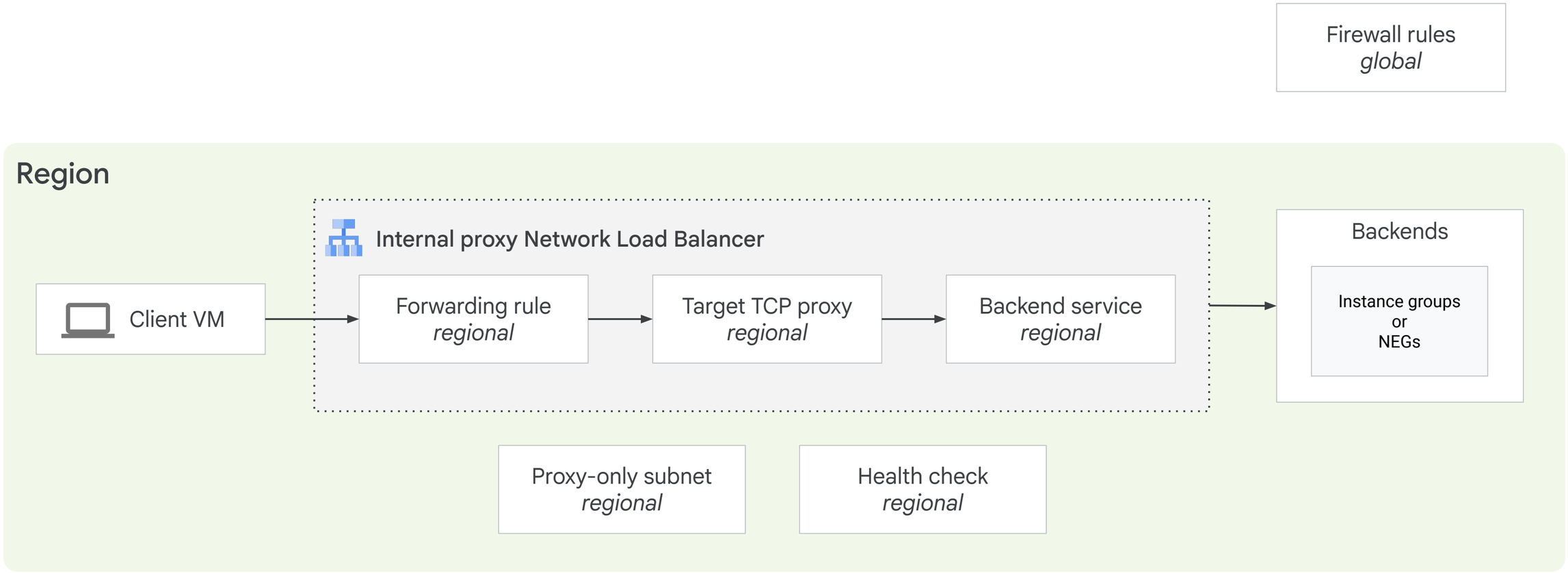
Traditional proxy model of internal load balancing

Internal passthrough Network Load Balancer

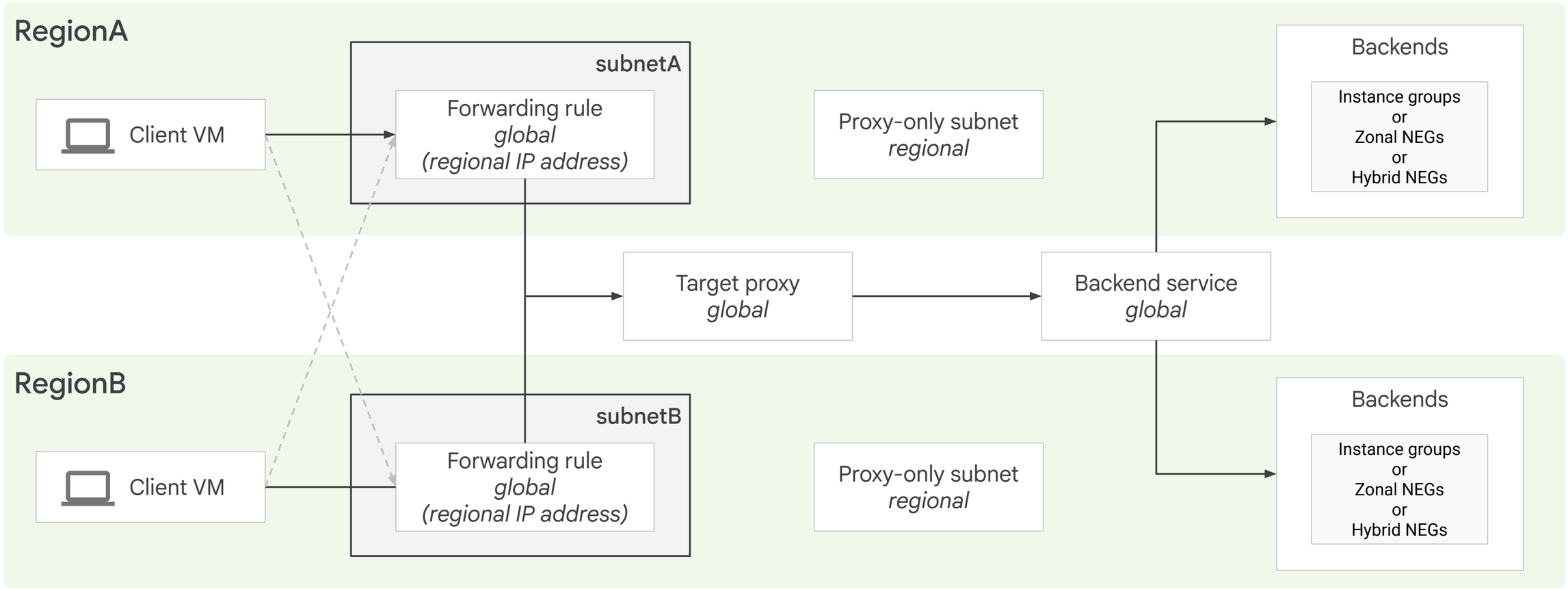
Internal proxy Network Load Balancers

- Proxy-based load balancer
- Balances traffic within your VPN network
- Regional or Cross-region
- Software-defined, fully distributed load balancing

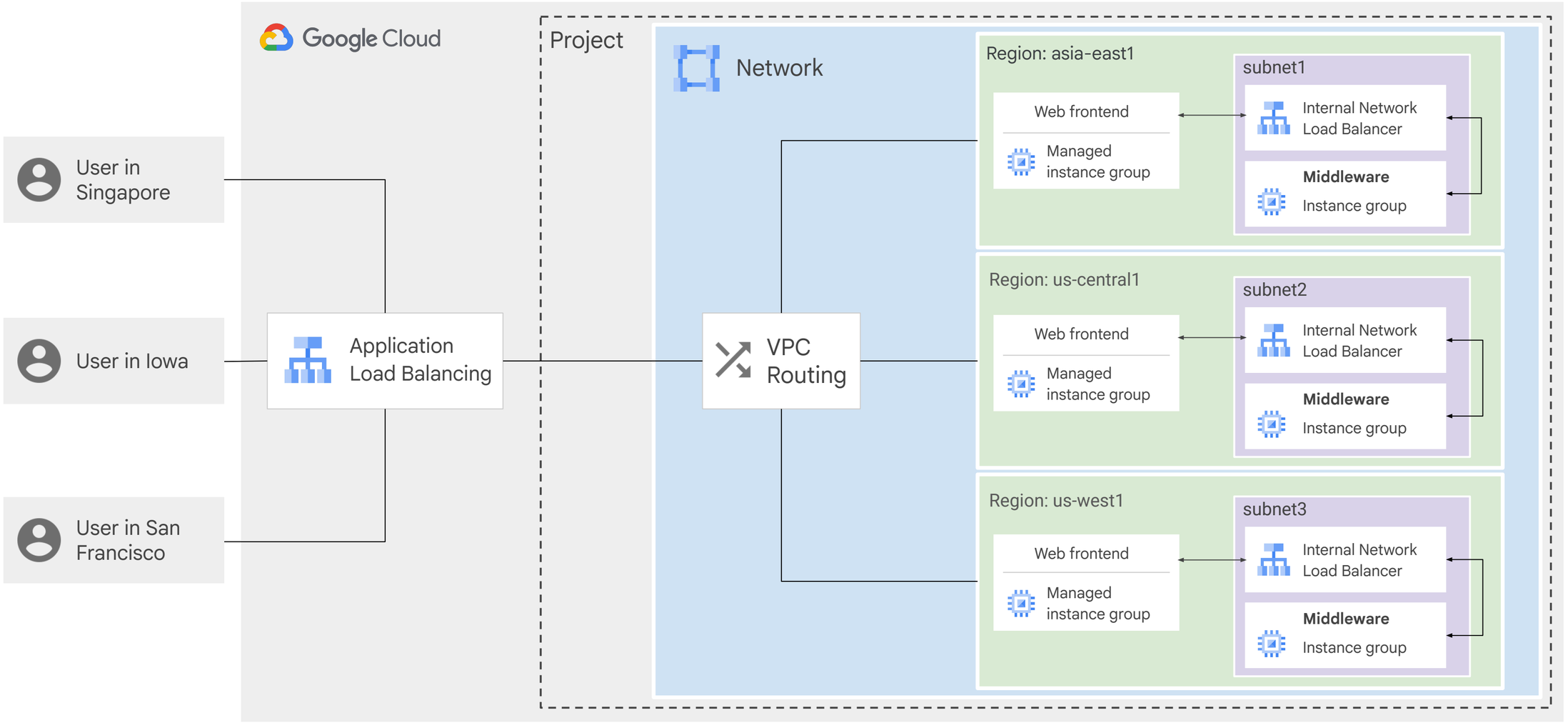
Architecture of a regional internal proxy Network Load Balancer



Architecture of a cross-region internal proxy Network Load Balancer

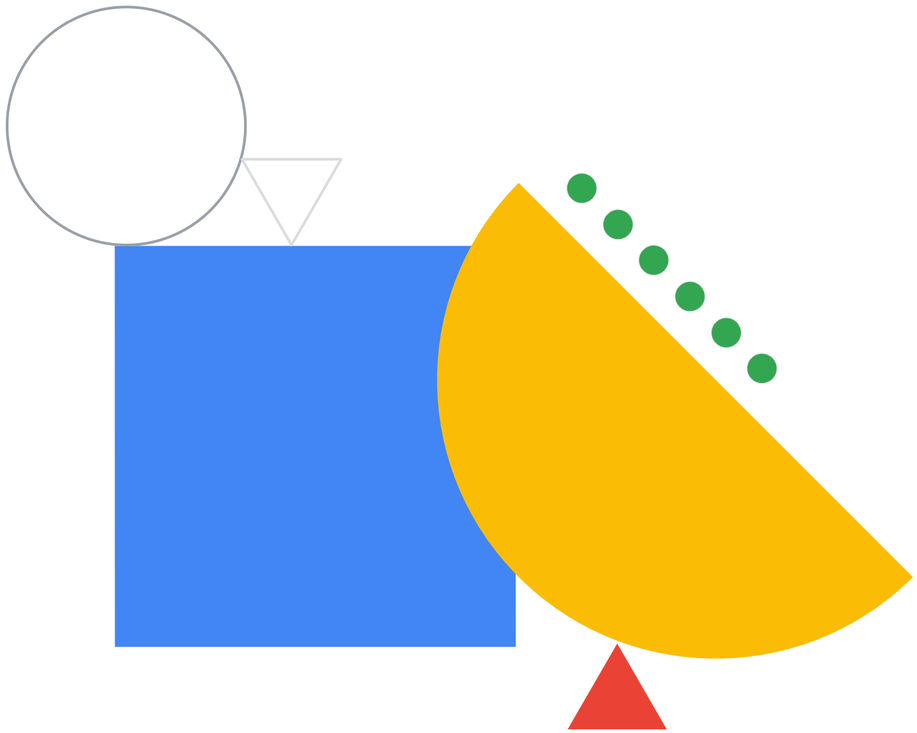


Internal load balancing supports 3-tier web services



Lab Intro

Configure an Internal Network Load Balancer

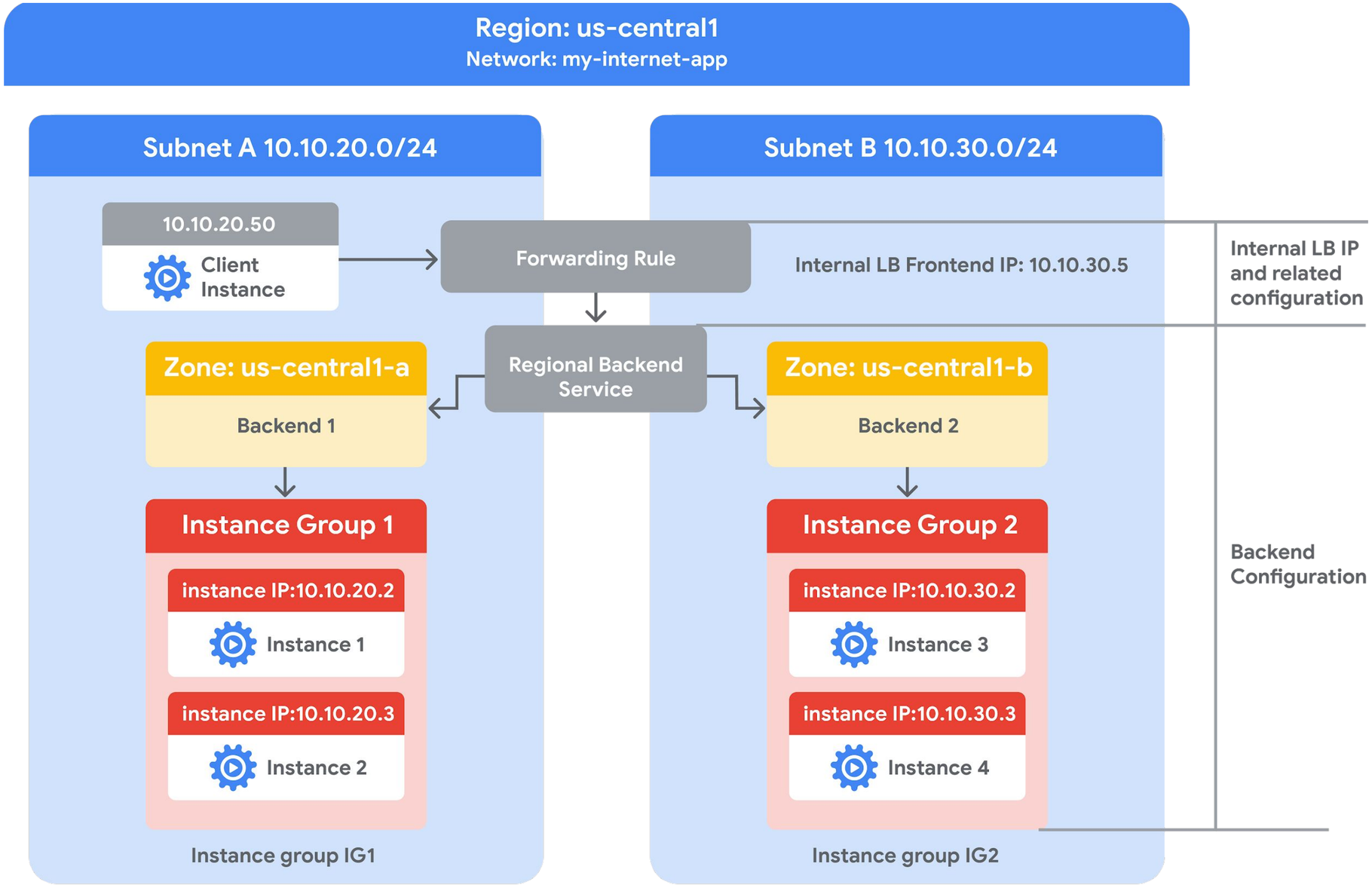


Lab objectives

01 Create HTTP and health check firewall rules

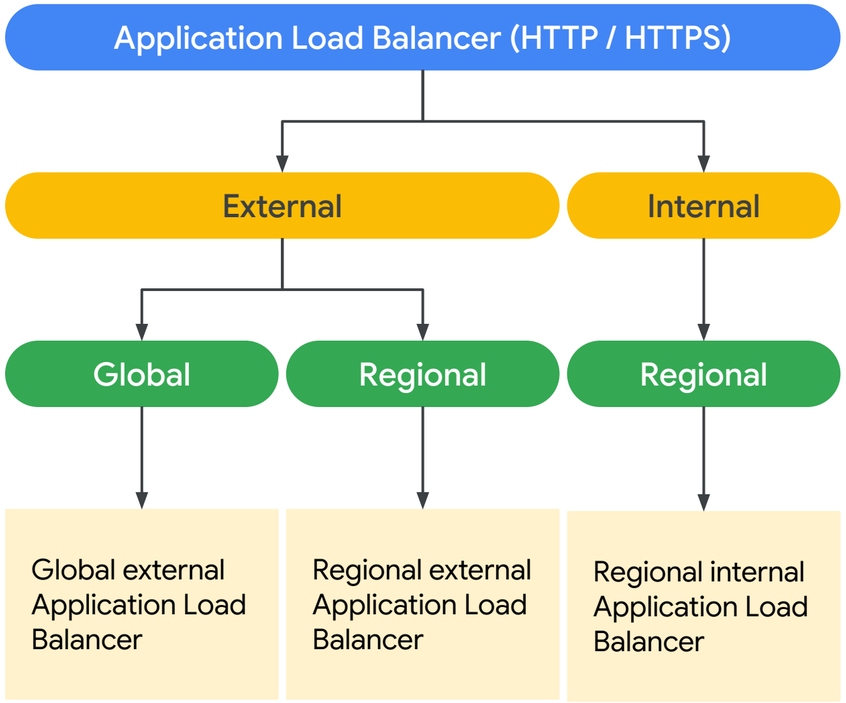
02 Configure two instance templates

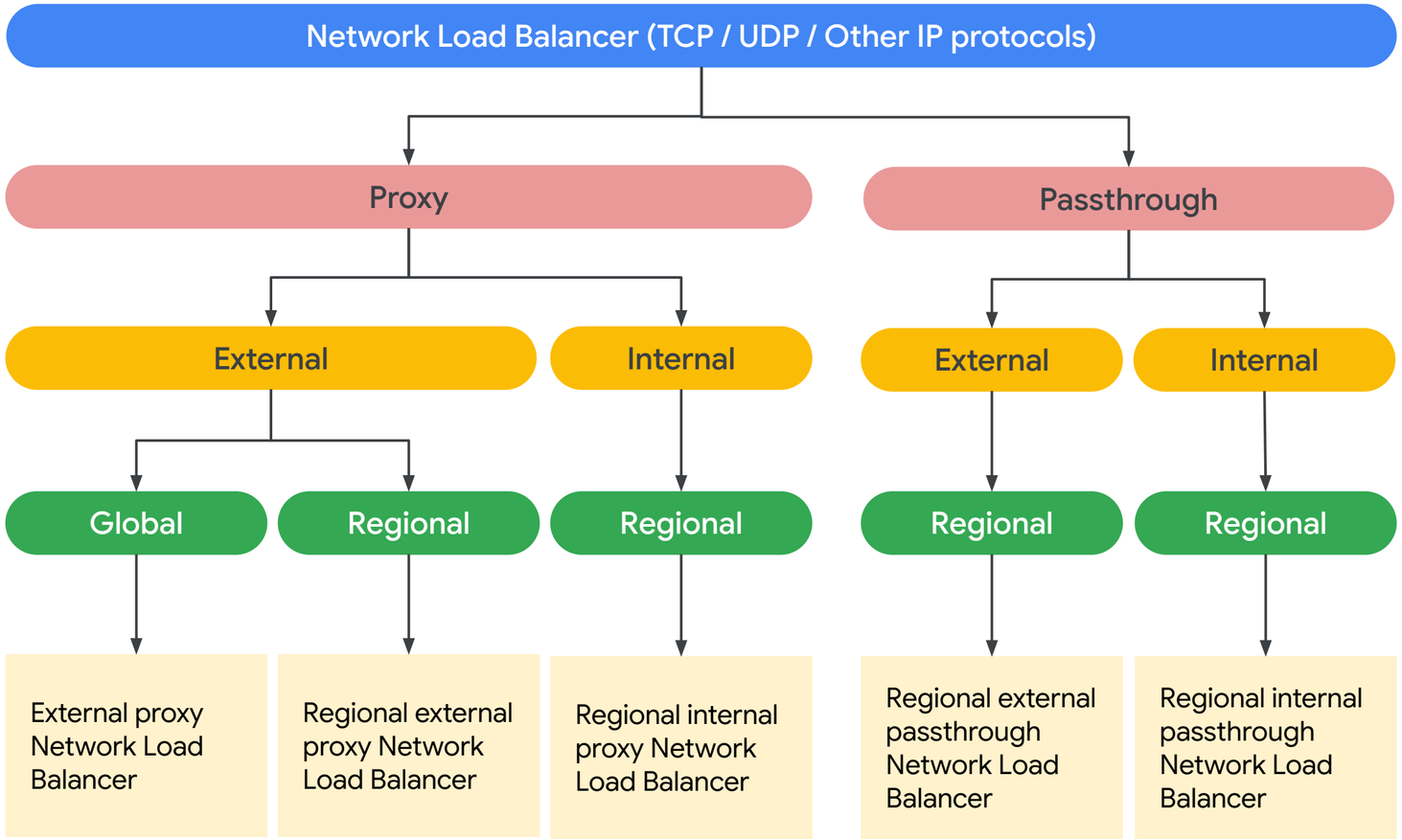
03 Create two managed instance groups



Choosing a Load Balancer

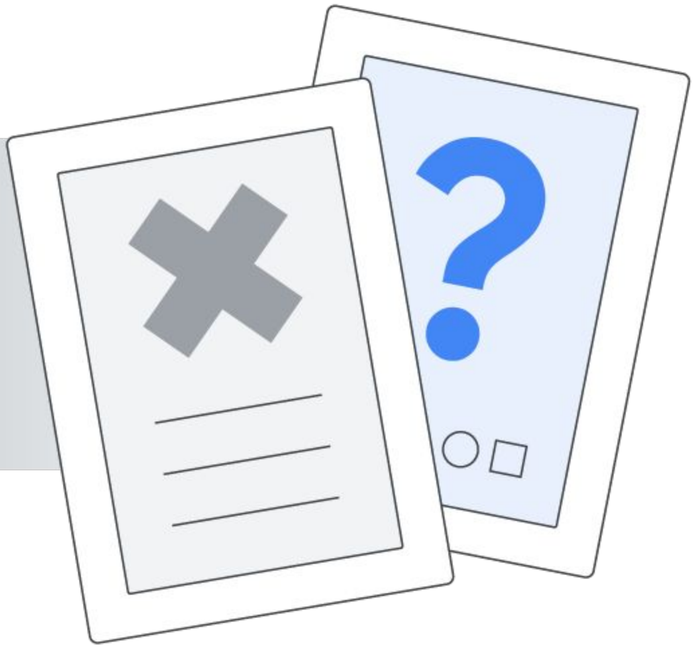
Deployment modes available for Cloud Load Balancing





Summary of Google Cloud load balancers

Load balancer	Deployment mode	Traffic type	Network Service Tier	Load-balancing scheme
Application Load Balancers	**Global external**	HTTP or HTTPS	Premium	EXTERNAL_MANAGED
	Regional external	HTTP or HTTPS	Standard	EXTERNAL_MANAGED
	Classic	HTTP or HTTPS	Global in Premium Regional in Standard	EXTERNAL
	Internal Always regional	HTTP or HTTPS	Premium	INTERNAL_MANAGED
Proxy Network Load Balancers	**Global external**	TCP with optional SSL offload	Global in Premium Regional in Standard	EXTERNAL
	Regional external	TCP	Standard only	EXTERNAL_MANAGED
	Internal Always regional	TCP without SSL offload	Premium only	INTERNAL_MANAGED
Passthrough Network Load Balancers	**External** Always regional	TCP, UDP, ESP, GRE, ICMP, and ICMPv6	Premium or Standard	EXTERNAL
	Internal Always regional	TCP or UDP	Premium only	INTERNAL



Quiz

Question #1

Question

Which of the following is not a Google Cloud load balancing service?

A. Global external Application Load Balancer

B. External proxy Network Load Balancer

C. Regional external proxy Network Load Balancer

D. Global hardware-defined Load Balancer

E. Regional external passthrough Network Load Balancer

F. Regional internal Application Load Balancer

Question #1

Answer

Which of the following is not a Google Cloud load balancing service?

A. Global external Application Load Balancer

B. External proxy Network Load Balancer

C. Regional external proxy Network Load Balancer

D. Global hardware-defined Load Balancer 

E. Regional external passthrough Network Load Balancer

F. Regional internal Application Load Balancer

Question #2

Question

Which load balancer is recommended for HTTP(S) traffic?

A. Regional internal passthrough Network Load Balancer

B. Regional internal proxy Network Load Balancer

C. Global external Application Load Balancer

D. Global external proxy Network Load Balancer

E. Regional external passthrough Network Load Balancer

Question #2

Answer

Which load balancer is recommended for HTTP(S) traffic?

A. Regional internal passthrough Network Load Balancer

B. Regional internal proxy Network Load Balancer

C. **Global external Application Load Balancer** 

D. Global external proxy Network Load Balancer

E. Regional external passthrough Network Load Balancer

Question #3

Question

Which of the following are applicable autoscaling policies for managed instance groups?

A. CPU utilization

B. Load balancing capacity

C. Monitoring metrics

D. Queue-based workload

Question #3

Answer

Which of the following are applicable autoscaling policies for managed instance groups?

A. CPU utilization 

B. Load balancing capacity 

C. Monitoring metrics 

D. Queue-based workload 

Review: Load Balancing and Autoscaling