



Compute & Networking

GCP Associate Cloud Engineer | Compute Engine, GKE, Serverless, VPC & Load Balancing

Compute Engine

Compute Engine IaaS virtual machines	GKE Managed Kubernetes
Cloud Run Serverless containers	Cloud Functions Event-driven FaaS
App Engine Fully managed PaaS	Bare Metal Dedicated hardware

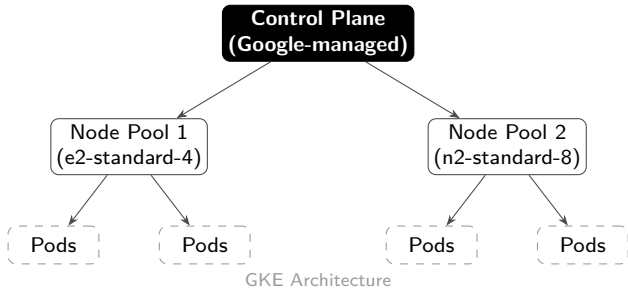
Compute Engine provides IaaS virtual machines running on Google's infrastructure. VMs are created in a specific zone, with options for machine type, boot disk, networking, and availability policies.

Machine families	General-purpose (E2, N2, N2D, T2D), Compute-optimized (C2, C2D, H3), Memory-optimized (M1, M2, M3), Accelerator-optimized (A2, A3 with GPUs)
Preemptible/Spot VMs	Up to 91% cheaper. Can be terminated anytime with 30s notice. Use for batch, CI/CD, fault-tolerant workloads.
Sole-tenant nodes	Dedicated physical servers for compliance or licensing requirements. No sharing with other projects.
Instance templates	Reusable VM configuration (machine type, disk, network, startup script). Used by MIGs.
Managed Instance Groups (MIG)	Group of identical VMs from a template. Supports autoscaling, autohealing, rolling updates, load balancing.
Unmanaged Instance Groups	Group of heterogeneous VMs. No autoscaling. Use only for legacy workloads.

Key gcloud Commands

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Commands
gcloud compute instances create NAME --zone=ZONE --machine-type=TYPE --image-family=IMAGE
gcloud compute instances stop/start/delete NAME --zone=ZONE
gcloud compute ssh NAME --zone=ZONE
gcloud compute instance-groups managed create NAME --template=TEMPLATE --size=N --zone=ZONE
gcloud compute instance-groups managed set-autoscaling NAME --max-num-replicas=N
↳ --target-cpu-utilization=0.7
```

Kubernetes Engine (GKE)

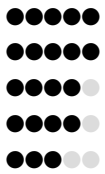


Feature	GKE Standard	GKE Autopilot
Node management	You manage node pools	Google manages nodes
Pricing	Pay per node (VM)	Pay per pod resources
Scaling	Cluster autoscaler + node auto-provisioning	Automatic
Security	Manual hardening	Pre-hardened, restricted
Best for	Full control, GPU/TPU workloads	Most workloads, simpler ops

- Workload Identity: map K8s service accounts to GCP service accounts (preferred over node SA)

```
Commands
gcloud container clusters create NAME --zone=ZONE --num-nodes=3
gcloud container clusters get-credentials NAME --zone=ZONE (configure kubectl)
kubectl apply -f deployment.yaml / kubectl get pods / kubectl expose deployment
```

- Compute Engine control
- GKE portability
- Cloud Run simplicity
- Functions event-driven
- App Engine zero-ops



Serverless Compute

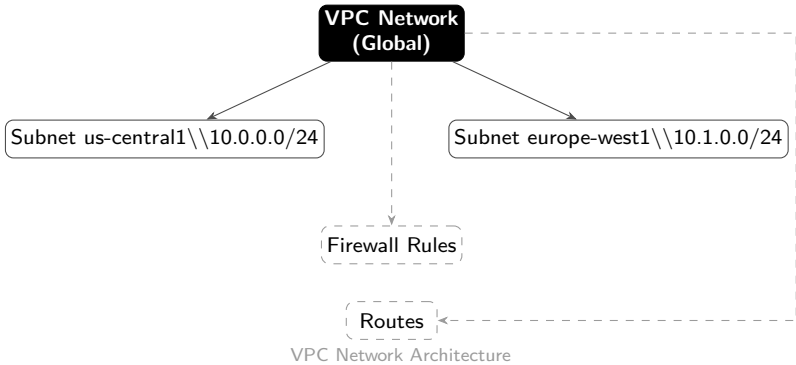
Service	Unit	Use Case	Max Timeout
Cloud Run	Container	HTTP APIs, web apps, async processing	60 min (jobs)
Cloud Functions	Function	Event-driven triggers (Pub/Sub, GCS, HTTP)	9 min (gen1), 60 min (gen2)
App Engine Standard	Application	Web apps with auto-scaling to zero	10 min
App Engine Flexible	Container	Custom runtimes, WebSocket, SSH access	60 min

Cloud Run Run any container that listens on a port. Scales to zero. Supports traffic splitting, revisions, custom domains. Gen2 Cloud Functions runs on Cloud Run.

Cloud Functions Event-driven serverless functions. Gen2 (recommended) built on Cloud Run + Eventarc. Supports Pub/Sub, GCS, Firestore, HTTP triggers.

App Engine Original GCP PaaS. Standard: sandboxed runtimes, scales to zero. Flexible: Docker containers on VMs, doesn't scale to zero.

VPC Networking



VPC Global resource. Subnets are regional. Auto mode creates subnets in all regions; custom mode gives full control.

Firewall rules Stateful, applied at instance level. Priority 0-65535 (lower = higher). Default: deny all ingress, allow all egress.

VPC Peering Private connectivity between two VPCs (same or different projects). Non-transitive, no overlapping CIDRs.

Shared VPC Centralized network in host project, shared with service projects. Best for org-wide networking.

Cloud NAT Managed NAT for VMs without external IPs to access the internet. Regional, no VM needed.

Private Google Access VMs with internal IPs only can reach Google APIs (BigQuery, GCS, etc.). Enable per subnet.

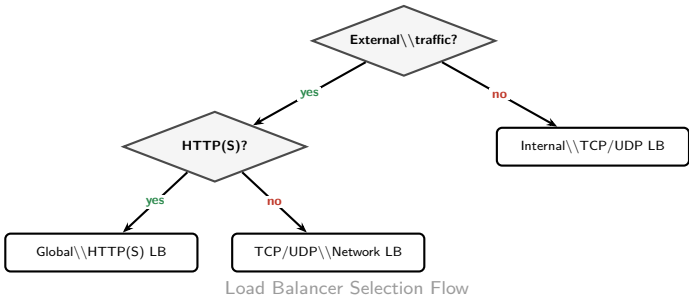
Cloud DNS Managed authoritative DNS. Public and private zones. DNSSEC supported.

- Auto Mode VPC
- Custom Mode VPC
- Shared VPC
- VPC Peering

Load Balancing

Type	Layer	Scope	Use Case
External HTTP(S) LB	L7	Global	Web apps, CDN, SSL termination
Internal HTTP(S) LB	L7	Regional	Internal microservices
External TCP/UDP Network LB	L4	Regional	Non-HTTP traffic, gaming, VoIP
Internal TCP/UDP LB	L4	Regional	Internal TCP/UDP services
External TCP Proxy	L4	Global	Non-HTTP with SSL, global reach
External SSL Proxy	L4	Global	SSL traffic, non-HTTP

- Cloud CDN integrates with External HTTP(S) LB for static content caching at edge
- Cloud Armor protects HTTP(S) LBs with WAF rules and DDoS defense
- Backend services support instance groups, NEGs, Cloud Run, Cloud Functions
- Health checks determine backend availability — configure interval, threshold, protocol



91%

Max Spot VM Discount

For fault-tolerant batch workloads

Official resources

⚠ Check the current exam guide

Google Cloud is updating its exams to the products announced at Google Cloud Next '26 (Gemini Enterprise Agent Platform, the data and analytics stack), per the certification hub checked 2026-10-05: read the current exam guide before these sheets.

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Total 40.5 h · 6.8 weeks at 6 h/week · 40.5 h free			