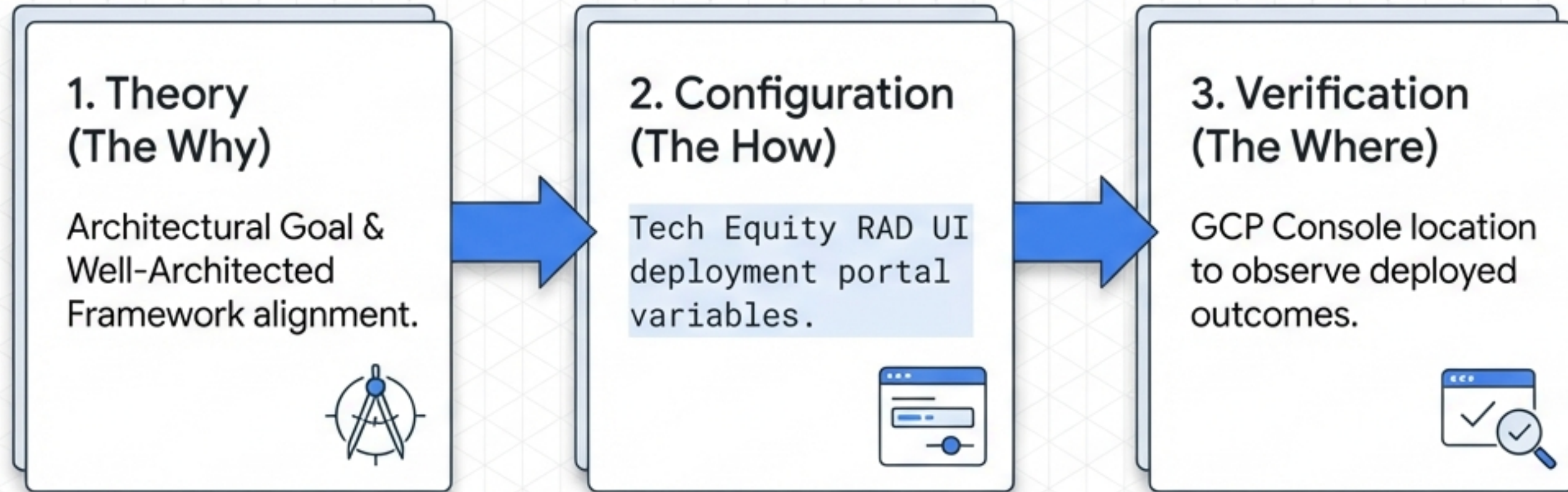




Blueprint to Reality

Mastering Cloud Architecture for
the PCA Exam (Section 1)

The Architect's Framework: Theory to Reality

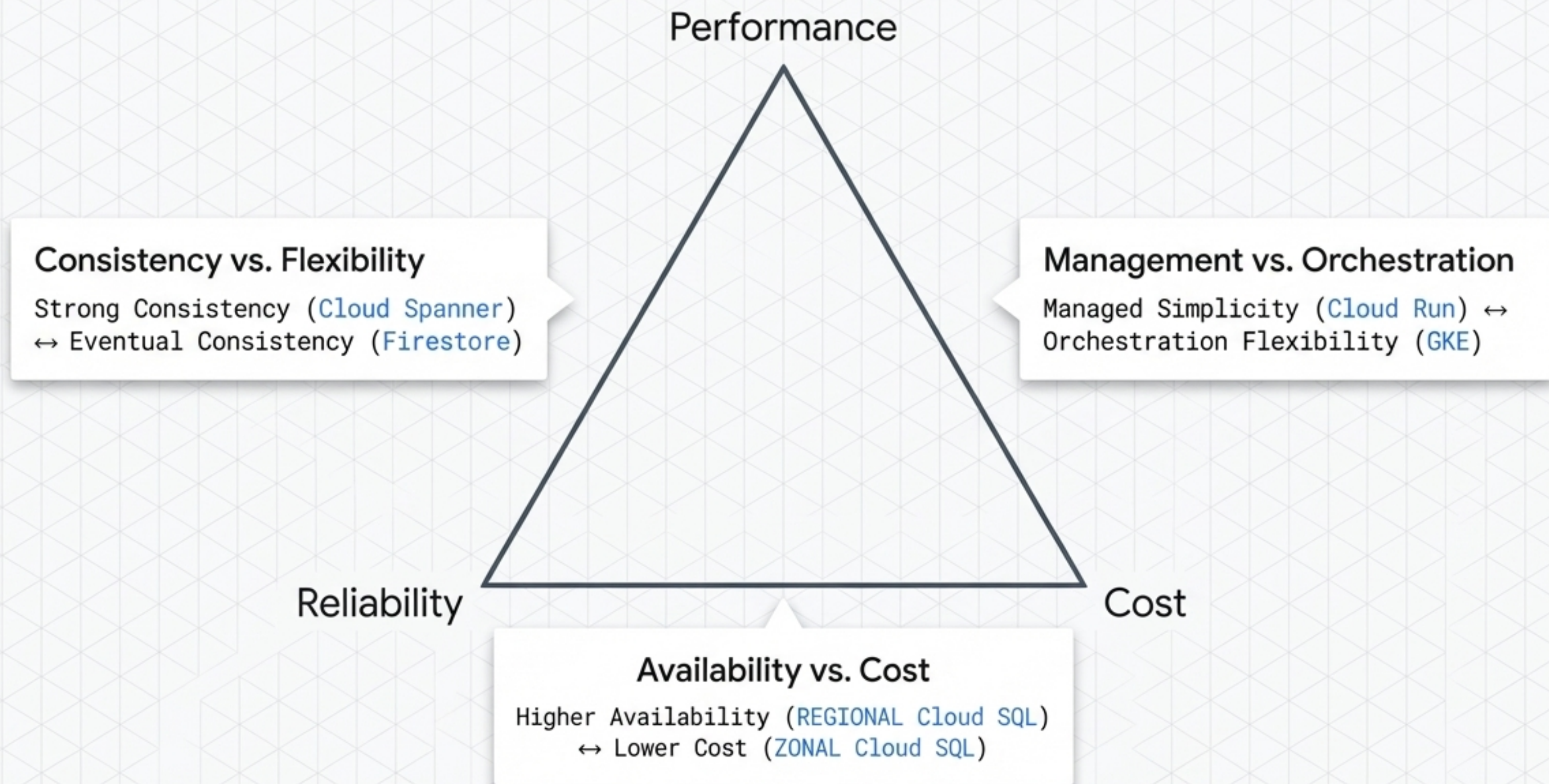


- Altostrat Media:** Global content delivery & streaming.
- Cymbal Retail:** Data, analytics & inventory modernization.
- EHR Healthcare:** Strict HIPAA & data sovereignty.
- KnightMotives:** Generative AI transformation.

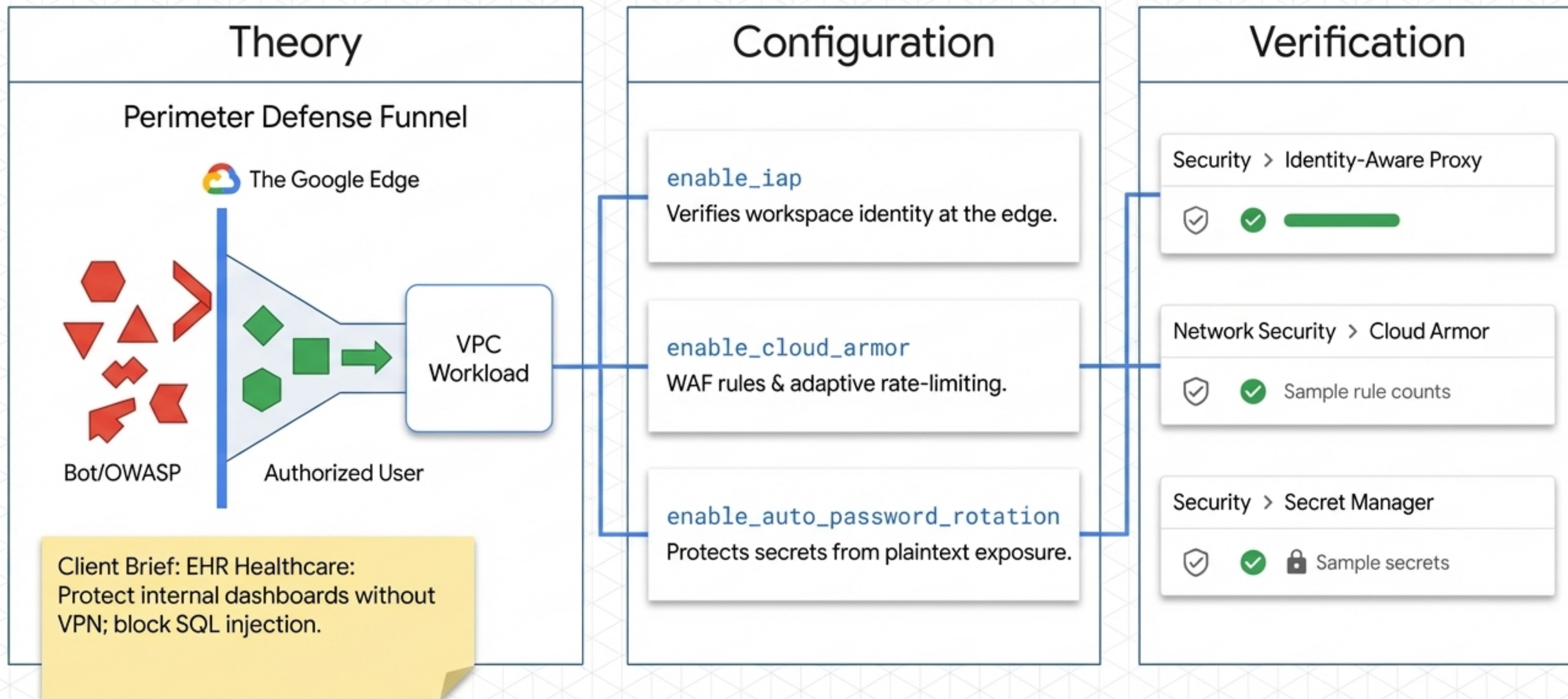
Deconstructing Requirements



The Architect's Dilemma: Design Decision Trade-offs

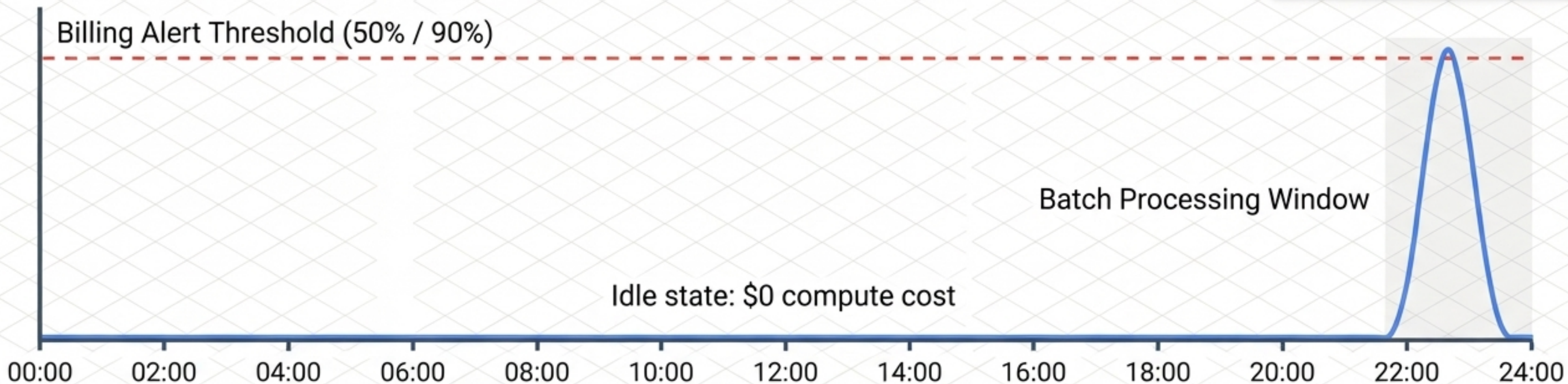


Perimeter Defense & Secret Management



Cost Optimization: Mapping Capacity to Demand

Cymbal Retail:
Prevent runaway OpEx
on nightly batch reports.



RAD Configuration

```
min_instance_count = 0  
max_instance_count  
create_billing_budget  
budget_alert_thresholds
```

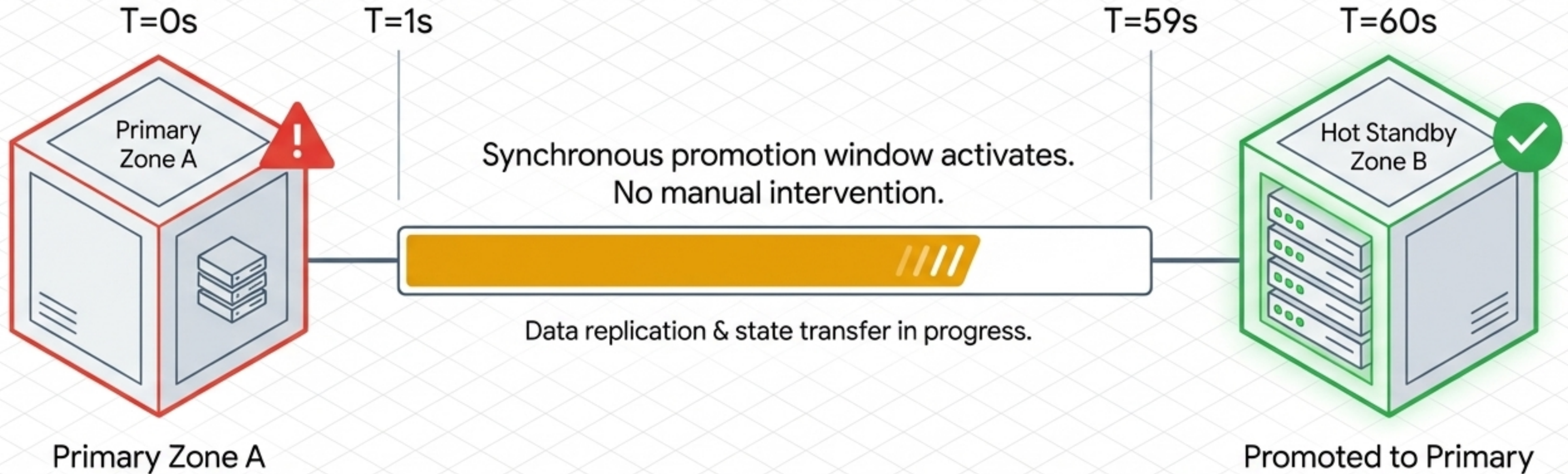
Enables scale-to-zero
Caps expenditure

Console Verification


Cloud Run > Revisions tab
Billing > Budgets & alerts

High Availability: The 60-Second Failover Sequence

Guaranteeing the EHR Healthcare 99.99% Monthly Uptime SLA



RAD Variable:
`postgres_database_availability_type = REGIONAL`

Verification:
SQL > High Availability configuration 

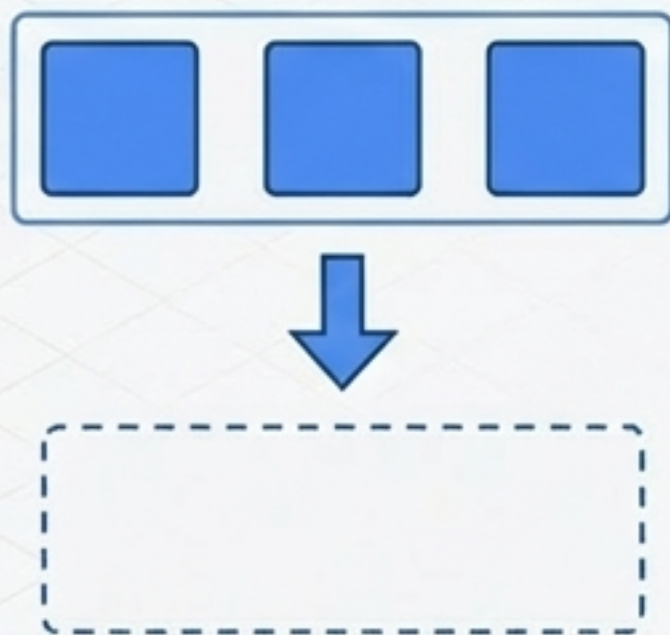
The Compute Disposition Matrix

Architectural Mapping: Cloud Run vs. GKE

	App Cloud Run	App GKE
Operational Overhead	Low, Serverless	High, Complex Orchestration
Scaling Behavior	Rapid scale-to-zero	Persistent baseline capacity
Statefulness	Stateless processing	Persistent state friendly
Autoscaling Mechanism	Native horizontal concurrency	HPA / VPA integration

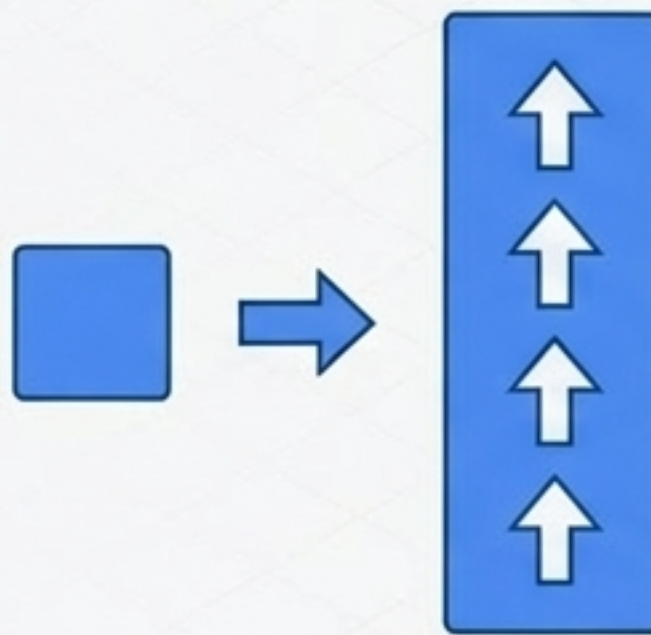
Autoscaling Dynamics: Instances vs. Resources

Cloud Run: Scale-to-Zero



Scales the NUMBER of instances horizontally based on traffic. Drops to exactly zero when idle via `min_instance_count`.

GKE Autopilot: Vertical Pod Autoscaling

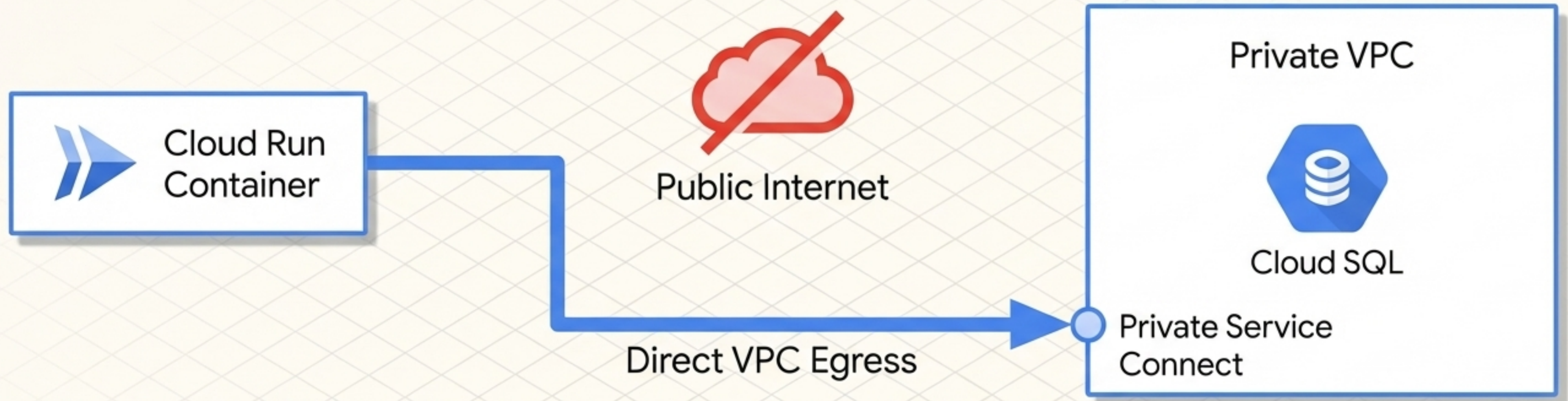


Scales the SIZE of the container dynamically. Right-sizes CPU/Memory requests based on utilization via `enable_vertical_pod_autoscaling`.

Optimizes resource bin-packing efficiency and eliminates wasted provisioning.

Cloud-Native Networking & Secure Egress

Eliminating Public Internet Exposure for Database Credentials



Configuration:
vpc_egress_setting

Verification:
Cloud Run > Networking tab | Network Connectivity > Private Service Connect

The Storage Selection Grid

Altostrat Media Brief:
Map data types to optimal
performance tiers.

Cloud SQL

Data Type:
Relational / Structured

Altostrat Use Case:
Transactional user
subscription records.

RAD Variable:
create_postgres

Cloud Storage

Data Type:
Object / Unstructured

Altostrat Use Case: High-
throughput video file uploads
and rendered thumbnails.

RAD Variable:
storage_buckets

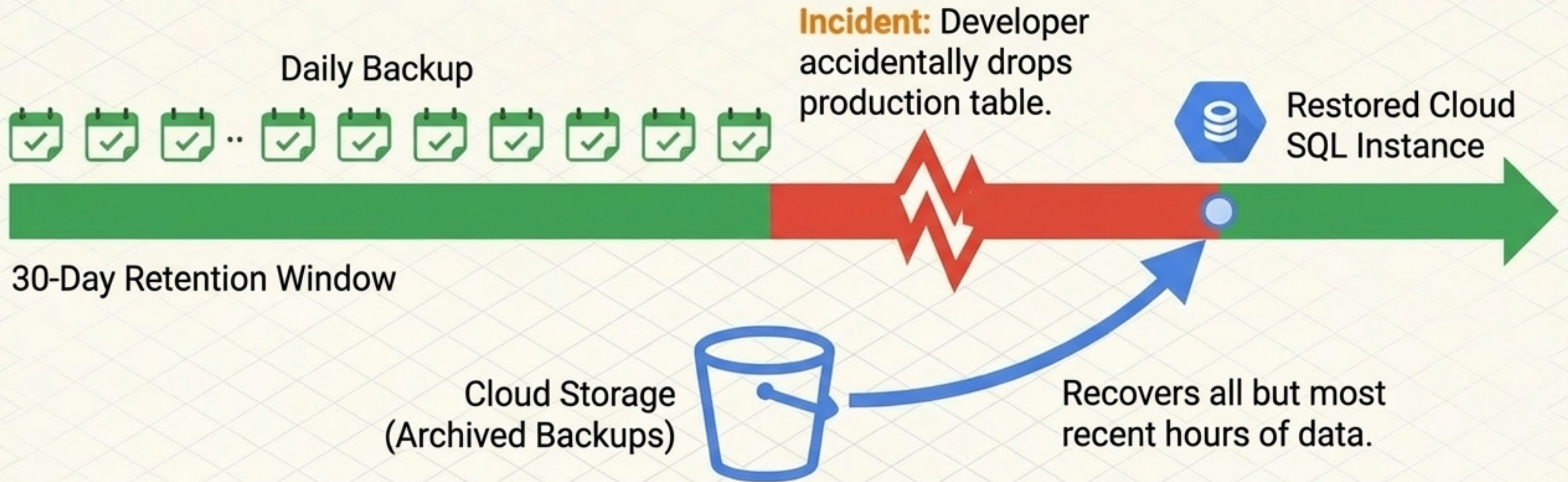
Filestore

Data Type:
File / POSIX NFS

Altostrat Use Case:
Shared NFS mount for
legacy transcoding fleet.

RAD Variable:
create_filestore_nfs

Disaster Recovery: RPO & RTO Guarantees



Automation Variables:
backup_schedule |
backup_retention_days

Execution:
Triggers Cloud Scheduler jobs
streaming via containerized CronJobs.

Verification:
Cloud Scheduler &
Cloud Run > Jobs tab.

Migration Methodology Diagnostic

Lift & Shift (Rehosting)

Speed
Fast

Tech Debt
Retained

Target
Compute Engine (Sole-Tenant for BYOL)

Improve & Move (Replatforming)

Speed
Medium

Tech Debt
Reduced

Target
GKE / Managed MIGs

Rip & Replace (Refactoring)

Speed
Slow

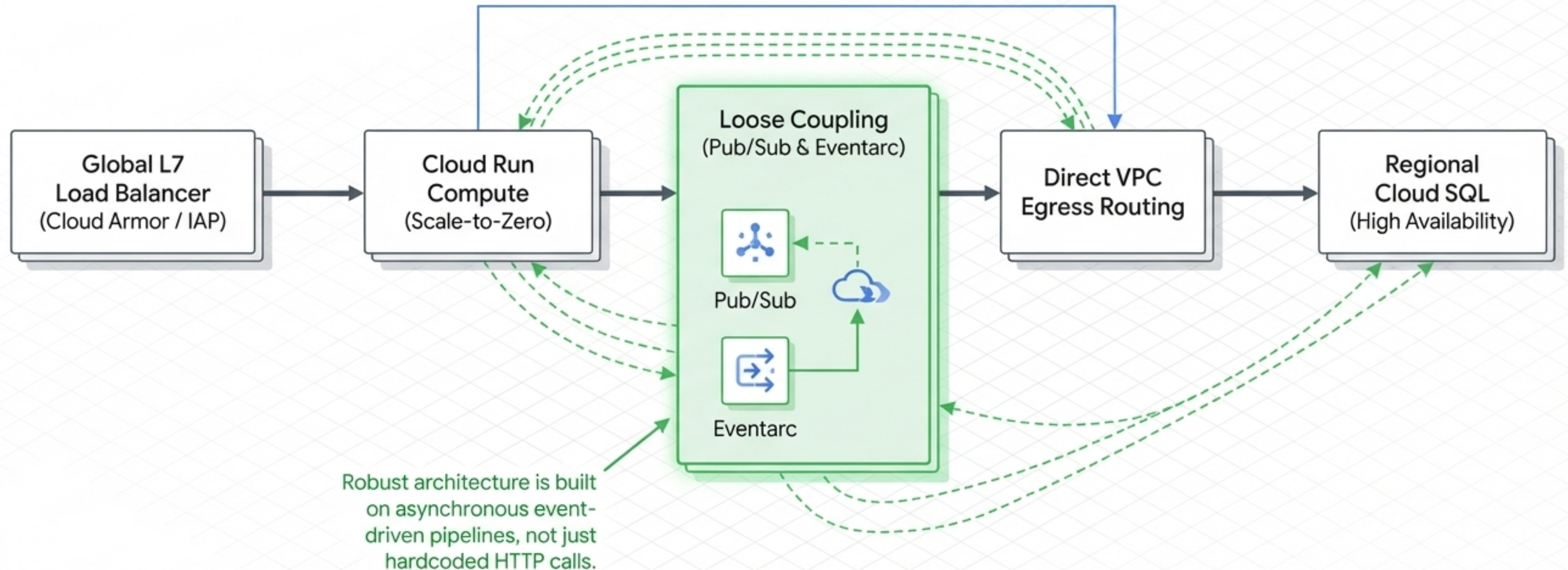
Tech Debt
Eliminated

Target
Cloud Run / Serverless

Hybrid Connectivity Mandate: Use [Cloud Interconnect](#) or [HA VPN](#) for secure transition periods.
Expose legacy on-prem functionality via [Apigee/Cloud Endpoints](#).

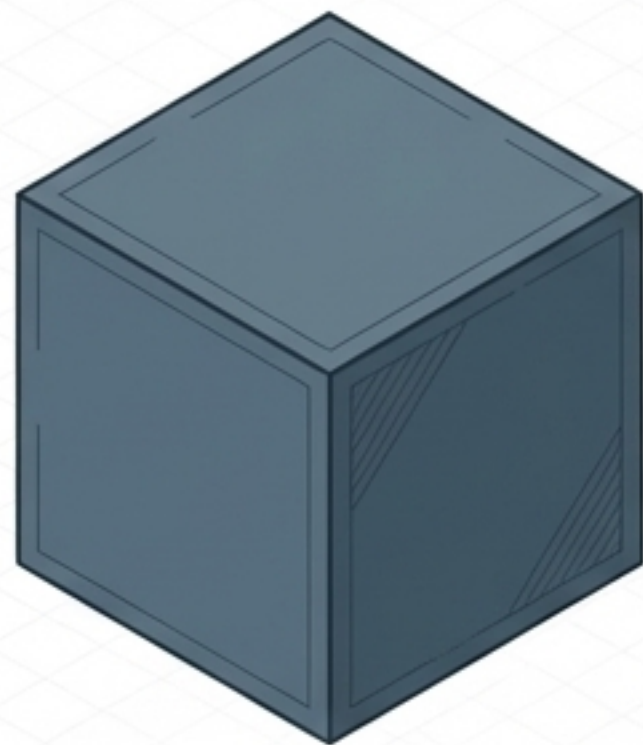
The Cloud-Native Evolution Blueprint

System Integration & The Power of Loose Coupling



Future-Proofing Solutions

Strangling the Monolith & Anticipating Evolution



Legacy Monolith



Modular Cloud Run Services

Strangling the Monolith

Extract capabilities gradually behind an API Gateway. Route traffic seamlessly using weighted routing.

Modular Infrastructure as Code (IaC)

Utilize versioned Terraform **modules** so underlying technology can be upgraded without disruption.

Anticipating Evolution

Adopt managed services (**Cloud Spanner**) and integrate AI (Vertex AI, Gemini LLMs) to evolve beyond lift-and-shift origins.

Architecture is not static; it is a continuous alignment with the Well-Architected Framework.