Other Important Google Cloud Services

Cloud Scheduler

In28 Minutes

- **Fully managed, enterprise-grade scheduler**
  - Schedule all kinds of jobs
    - Batch, big data jobs, cloud infrastructure operations etc
  - Uses Unix cron format
- Integrates with App Engine, Cloud Pub/Sub, Cloud Logging and any HTTP endpoint
- Manage all your automation tasks from one place
- Provides **automated retries**
- **Use Case**: Schedule tasks across a fleet of Compute Engine instances
  - Use Cloud Scheduler for scheduling a message on Pub/Sub
  - Compute Engine instances can process messages from Pub/Sub
- (REMEMBER) Needs an App Engine App in the Project
  - **Earlier Alternative**: App Engine Cron Service

Cloud Emulators

In 28 Minutes

- How do you **develop GCP applications in your local machine** without connecting to GCP?
  - Setup local development environment with Cloud Emulators
- Supports **emulation of**:
  - Cloud Bigtable
  - Cloud Datastore
  - Cloud Firestore
  - Cloud Pub Sub
  - Cloud Spanner
- You can **develop your applications locally** using emulators!

Cloud DNS

- What would be the **steps in setting up a website** with a domain name (for example, in28minutes.com)?
  - **Step I** : Buy the domain name in28minutes.com (Domain Registrar)
  - **Step II** : Setup your website content (Website Hosting)
  - **Step III** : Route requests to in28minutes.com to the my website host server (DNS)
- **Cloud DNS = Global Domain Name System** (Step III)
  - Setup your DNS routing for your website (in28minutes.com)
    - Route api.in28minutes.com to the IP address of api server
    - Route static.in28minutes.com to the IP address of http server
    - Route email (ranga@in28minutes.com) to the mail server(mail.in28minutes.com)
  - Public and private managed DNS zones (container for records)

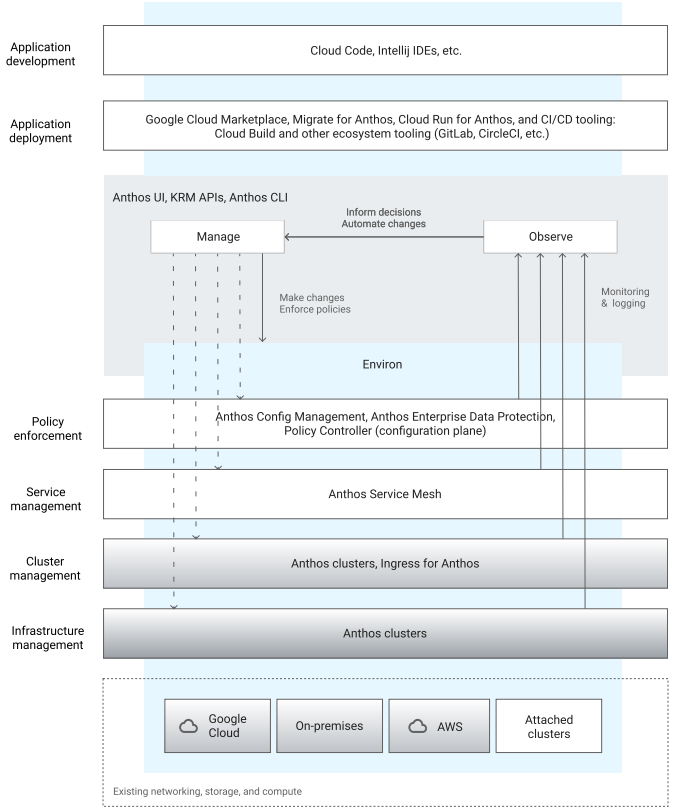
Pricing Calculator

In 28 Minutes

- **Estimating** the cost of a Google Cloud solution **is NOT easy**
- You would need to take a **number of factors** into account
- How do you estimate the cost of your GCP solution?
  - Use **Google Cloud Pricing Calculator**
- Estimates for **40+ Services**:
  - Compute Engine
  - Google Kubernetes Engine
  - Cloud Run
  - App Engine
  - Cloud Storage
  - etc
- (REMEMBER) **These are Estimates! (NOT binding on GCP**)

Anthos

- Run K8S clusters on cloud & on-premises
  - **Multi-cluster management**: Consistent managed K8S
  - Consistent development and operations experience
- **Centralized** config management (Git repo)
  - Logically group and normalize clusters as environs
    - Define policies - Kubernetes API, Access control
  - Deploy to clusters on new commits
    - Use Namespaces, labels, and annotations to decide which clusters to apply changes on
- Provides **Service Mesh** (based on **Istio**)
  - **Sidecar** to implement common microservice features
    - Authentication & authorization (service accounts)
    - Distributed Tracing, Automatic metrics, logs & dashboards
    - A/B testing, canary rollouts (even track SLIs & error budgets)
    - Cloud Logging & Cloud Monitoring Support



https://cloud.google.com

REST API Challenges

- Most applications today are built around REST API:
  - Resources (`/todos`, `/todos/{id}`, etc.)
  - Actions - HTTP Methods - GET, PUT, POST, DELETE etc.
- Management of REST API is not easy:
  - You've to take care of authentication and authorization
  - You've to be able to set limits (rate limiting, quotas) for your API consumers
  - You've to take care of implementing multiple versions of your API
  - You would want to implement monitoring, caching and a lot of other features..

Apigee API Management

- **Design, secure, publish**, analyze, monitor, monetize and scale APIs anywhere
  - On-premises, Google Cloud, or hybrid
- Manage **Complete API life cycle**
- Provides AI-powered API monitoring (Get actionable insights)
- Enable Caching with Cloud CDN
- Create **Developer Portals** :
  - Allow developers to easily explore the APIs, get API keys etc. Example: Apigee integrated portal
- **Use Case**: Abstraction layer on top of legacy services
- **Use Case**: Expose your assets (ML Models) as APIs

Apigee API Platform

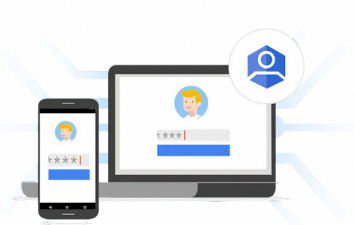
Machine Learning in Google Cloud

In 28 Minutes

Service	Discussion
Prebuilt APIs	Needs no in-house ML expertise. Easy to Use. Examples: Vision API, Video API, Natural Language API, Speech-to-Text API, Text-to-Speech API, and Translation API
Cloud AutoML	Build custom ML models with developers having limited ML expertise
AI Platform	Help data scientists build custom models (based on Tensorflow Enterprise) Serverless, scalable training and serving capabilities for custom ML models Take ML projects from concept to production quickly Explainable AI - interpret models with confidence
Data management	Cloud Storage and BigQuery BigQuery ML - Build ML models directly from data in BigQuery
Automation and instrumentation	AI Platform Pipelines & Cloud Composer - Orchestrate/automate data/ML pipelines Cloud Build and Container Registry - Build and deploy custom ML systems

Getting Started with Identity Platform

- **Identity Platform:** Customer identity and access management
- **What's the difference**: Cloud IAM vs Identity Platform
  - **Cloud IAM**: Employees and Partners Authorization
    - Control access to Google Cloud Resources
    - Member, Roles, Policy, Service Accounts
  - **Identity Platform**: Customer identity and access management (CIAM)
    - Authentication and Authorization for your applications and services
- **Identity Platform**: Key Features
  - Authentication & authorization for web & mobile apps (iOS, Android, ..)
  - Multiple authentication methods
    - SAML, OIDC, email/password, phone, social - Google/Facebook/Twitter/..
  - Features: User sign-up and sign-in, MFA etc.
  - An upgrade from Firebase Authentication Legacy
  - Integrates well with Identity-Aware Proxy



Cloud IAM vs Identity Platform - Scenarios

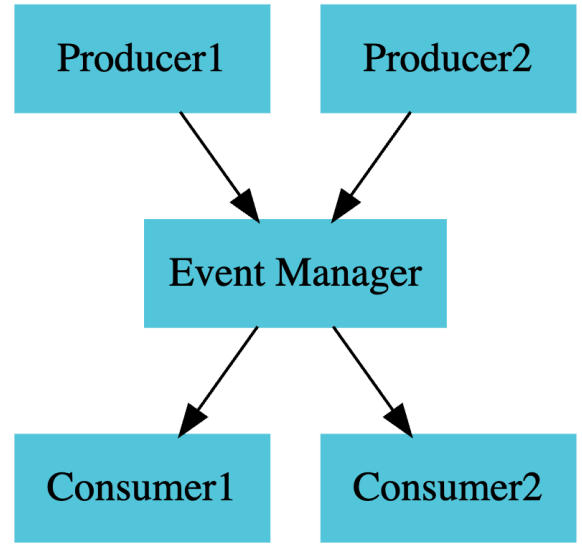
In28 Minutes

Scenario	Solution
An Application on a GCE VM needs access to cloud storage	Cloud IAM - Service Account
An enterprise user need access to upload objects to a Cloud Storage bucket	Cloud IAM
I want to manage end users for my application	Identity Platform
I want to enable "Login using facebook/twitter" for my application	Identity Platform
I want to create user sign-up and sign-in workflows for my application	Identity Platform

Getting Started with Event Driven Architecture

In28 Minutes

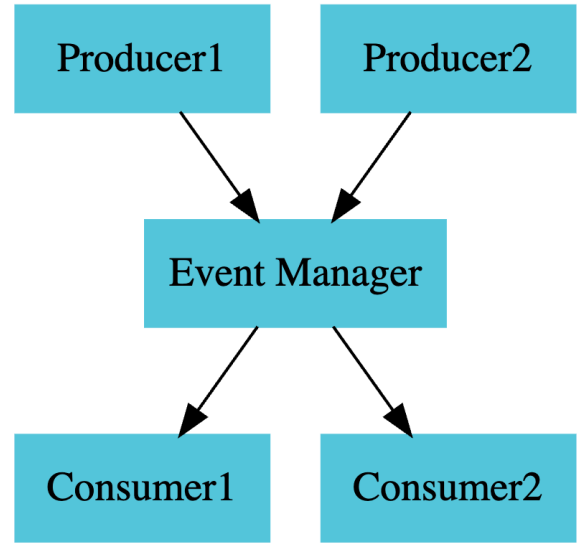
- Microservices calling each other => Tight Coupling
- **Event driven architectures**: Microservices reacting to changes in state (events)
  - **Example**:
    - **1:** Order Service publishes an OrderReceived event
    - **2:** Billing Service receives it and publishes an OrderBilled event
    - **3:** Warehouse Service receives it & publishes an OrderReadyToShip event
    - **4:** Shipping Service receives it and publishes an OrderShipped event
    - **5:** Email Service receives it and sends an email to the user
  - **Advantages:**
    - **Loose Coupling:** Microservices do not know about each other
    - **Flexible Orchestration**: Same event can be processed by multiple services
    - **Resiliency**: Events can be easily retried in case of failures
    - **Asynchronous:** A microservice does not need to wait for the consumer to process the event



Getting Started with CloudEvents

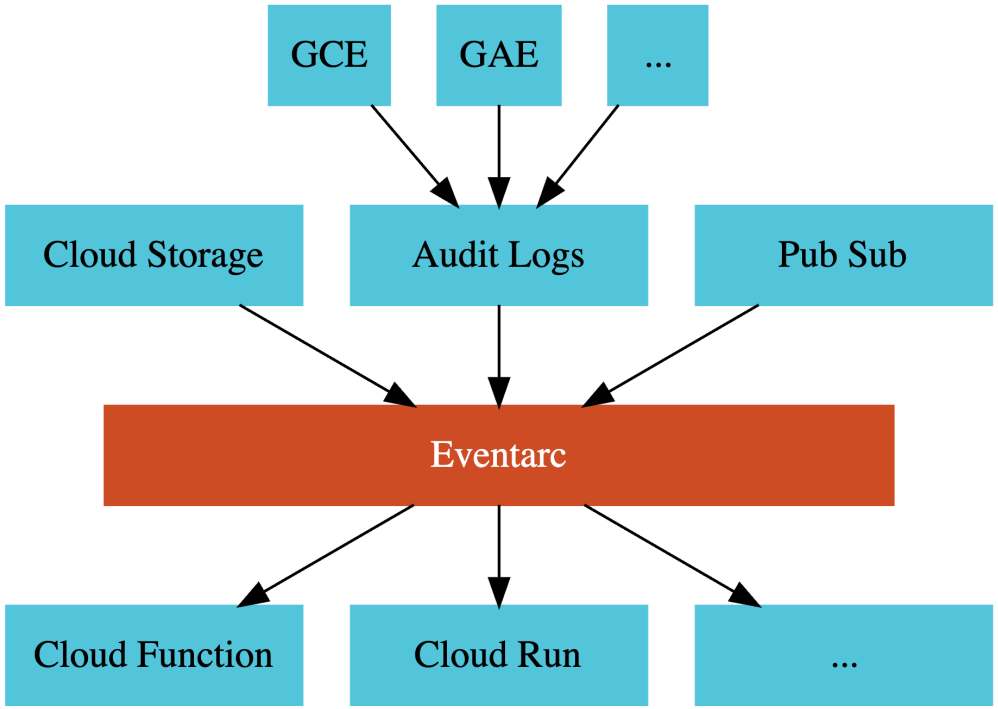
In28 Minutes

- **CloudEvents:** *Standard specification to describe events*
  - Reference: ***https://cloudevents.io***
  - **Challenge**: Different publishers use different formats for events
  - **Goal**: Describe event data in a standard way
    - A project under CNCF - Cloud Native Computing Foundation
  - **Advantages**:
    - **Consistency**: All events have the same structure
    - **Standard Libraries and Tooling**: Enables building common libraries and tooling across different types of infrastructure (AWS/Azure/Google Cloud/On-premise/..) and languages (Python, Go, NodeJS, Java, ..)
    - **Portability**: You are no longer tied to specific infrastructure or language
  - **Example Usecases**:
    - Get alerted when changes happen in storage buckets or database tables
    - Send one event to multiple consumers (fan out)



Getting Started with Eventarc

- **Eventarc:** Simplifies event driven architectures in Google Cloud
  - Adheres to the CloudEvents (cloudevents.io) specification
  - **Event provider**: Who can trigger events?
    - **Direct**: From Pub/Sub, Cloud Storage, Cloud Functions, Cloud IoT, Cloud Memorystore ..
    - **In-Direct:** From Cloud Audit Logs Entries
      - Huge variety of Google Cloud services. Ex: GCE, GAE, Artifact Registry, ...
  - **Event destination**: Who can process events?
    - Cloud Functions (2nd gen), Cloud Run & GKE services,.
  - (BACKGROUND) Uses Pub/Sub topics



Exploring Eventarc Event providers

In 28 Minutes

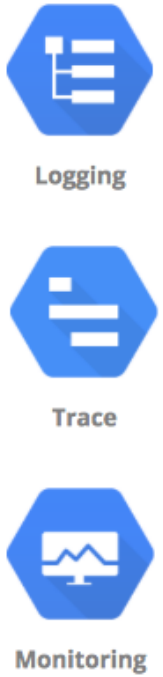
```
gcloud eventarc triggers create my-pub-sub-trigger
  --destination-run-service=$SERVICE_NAME --destination-run-region=$REGION
  --event-filters="type=google.cloud.pubsub.topic.v1.messagePublished"

gcloud eventarc triggers create my-audit-log-trigger
  --destination-run-service=$SERVICE_NAME --destination-run-region=$REGION
  --event-filters="type=google.cloud.audit.log.v1.written"
  --event-filters="serviceName=storage.googleapis.com"
  --event-filters="methodName=storage.objects.create"
```

- **Two Types** of Eventarc Event Providers:
  - **1:** Directly from Google Cloud Services
    - Pub/Sub, Cloud Storage, Cloud Functions, Cloud IoT, Cloud Memorystore ..
      - **type**: `google.cloud.storage.object.v1.archived/deleted/finalized`
      - **type**: `google.cloud.pubsub.topic.v1.messagePublished`
  - **2:** Indirectly from Cloud Audit Logs Entries
    - **type** : `google.cloud.audit.log.v1.written`
      - **serviceName**:appengine.googleapis.com, **methodName**:google.appengine.v1.Applications.CreateApplication
      - **serviceName**:artifactregistry.googleapis.com, **methodName**:google.devtools.artifactregistry.v1.ArtifactRegistry.CreateRepository
      - **serviceName**:compute.googleapis.com, **methodName**:compute.instances.delete

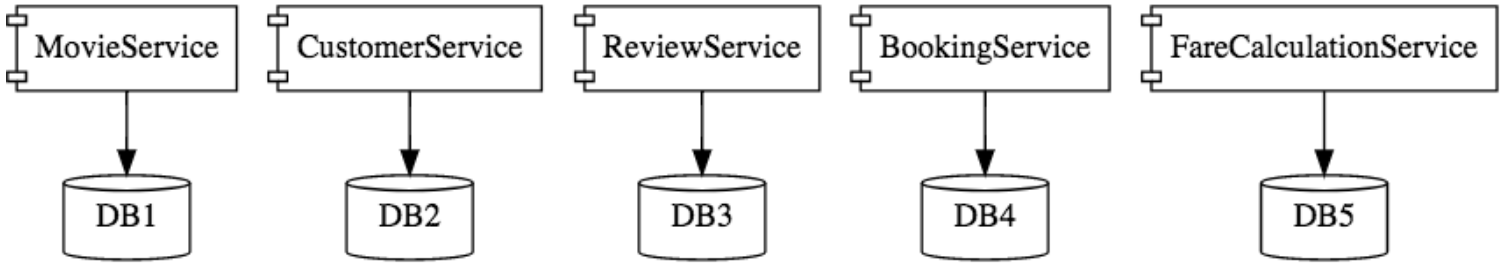
Getting Started with Observability and OpenTelemetry

In 28 Minutes

- **Observability**: "measure the internal state of a system by examining its outputs"
  - **Goal**: Proactively identify problems and fix them
  - THREE PILLARS of observability: logs, metrics and traces
    - Earlier we had different standards for logs, metrics and traces
    - We also had very different approaches across languages
- How about **ONE STANDARD ACROSS PLATFORMS?**
  - **OpenTelemetry**: Collection of technologies (tools, APIs, SDKs) to collect and export telemetry - metrics, traces, and logs (***https://opentelemetry.io***)
    - Open standard
    - A CNCF - Cloud Native Computing Foundation - Project (Kubernetes is another CNCF project)
    - Almost every cloud platform supports OpenTelemetry
    - Steps to use OpenTelemetry:
      - 1: Add OpenTelemetry libraries (for your specific language) to your project
      - 2: Instrument your code to export telemetry

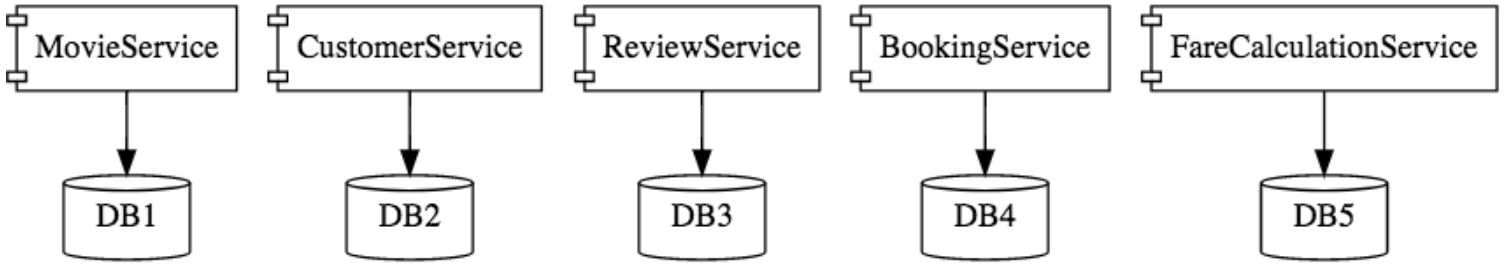


Using Service Directory



- **Service Discovery** - Help microservices find one another
- **Service Directory** - A single place to publish, discover, and connect services
- Your workloads can be running in:
  - Google Cloud
    - (Compute Engine VMs, Google Kubernetes Engine, ..)
  - On-prem
  - Other clouds - AWS, Azure, ..

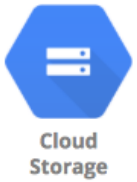
Using Service Directory - Features



- **Managed Service** (highly available and scalable)
- Register/resolve services using **DNS, HTTP, and gRPC**
- Service Directory **client libraries** are available for multiple languages (along with REST/RPC APIs)
  - You can use these libraries to register/resolve service location
- **Audit logging** ("Who did what, where, and when?" - Cloud Logging)
- **Request/response logs** (Cloud Logging)

Cloud Storage - Command Line - gcloud storage

In 28 Minutes



- Earlier, **gsutil** was the recommended CLI for Cloud Storage
  - **GCLOUD STORAGE** is now the recommended CLI for Cloud Storage
    - Advantages:
      - Upto 94% faster storage transfers
      - Better parallel processing
      - Do NOT worry about options/parameters/flags
      - **gcloud storage** will decide the optimal storage transfer approach for you
      - Provides very simple to remember commands (consistent with gcloud):
        - **gcloud storage buckets create gs://BKT_NAME** (Create Cloud Storage bucket)
          - options: --default-encryption-key, --default-storage-class
        - **gcloud storage buckets delete gs://BKT_NAME**
        - **gcloud storage buckets list gs://B***
        - **gcloud storage buckets describe gs://BKT_NAME**
        - **gcloud storage buckets update gs://BKT_NAME**
          - options: --default-encryption-key, --default-storage-class, --[no-]versioning
  - If you have existing scripts that make use of gsutil commands AND
    - You do NOT want to change the scripts AND
    - You want the performance benefits offered by new features in **gcloud storage**
    - Check out **shim** (In boto configuration file, configure use_gcloud_storage=True under GSUtil section)