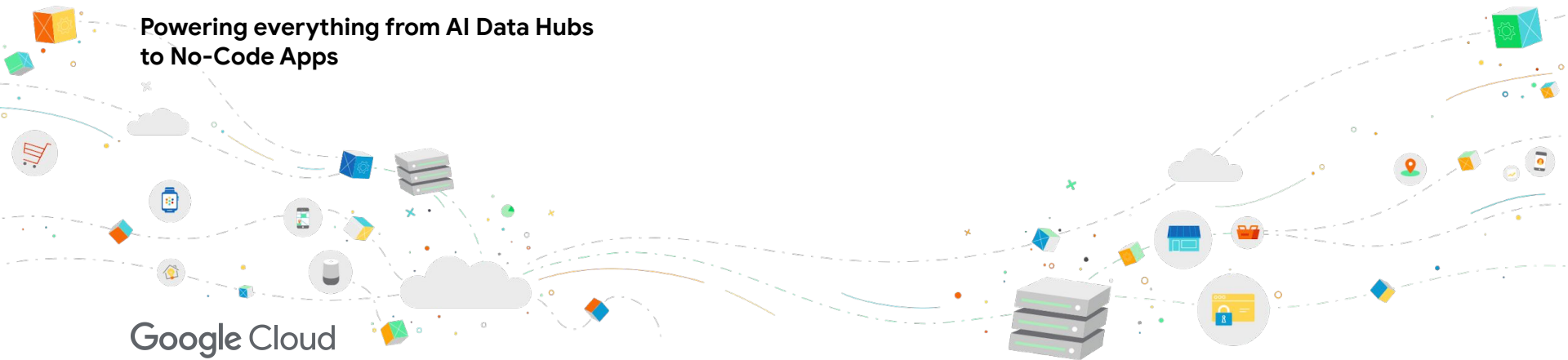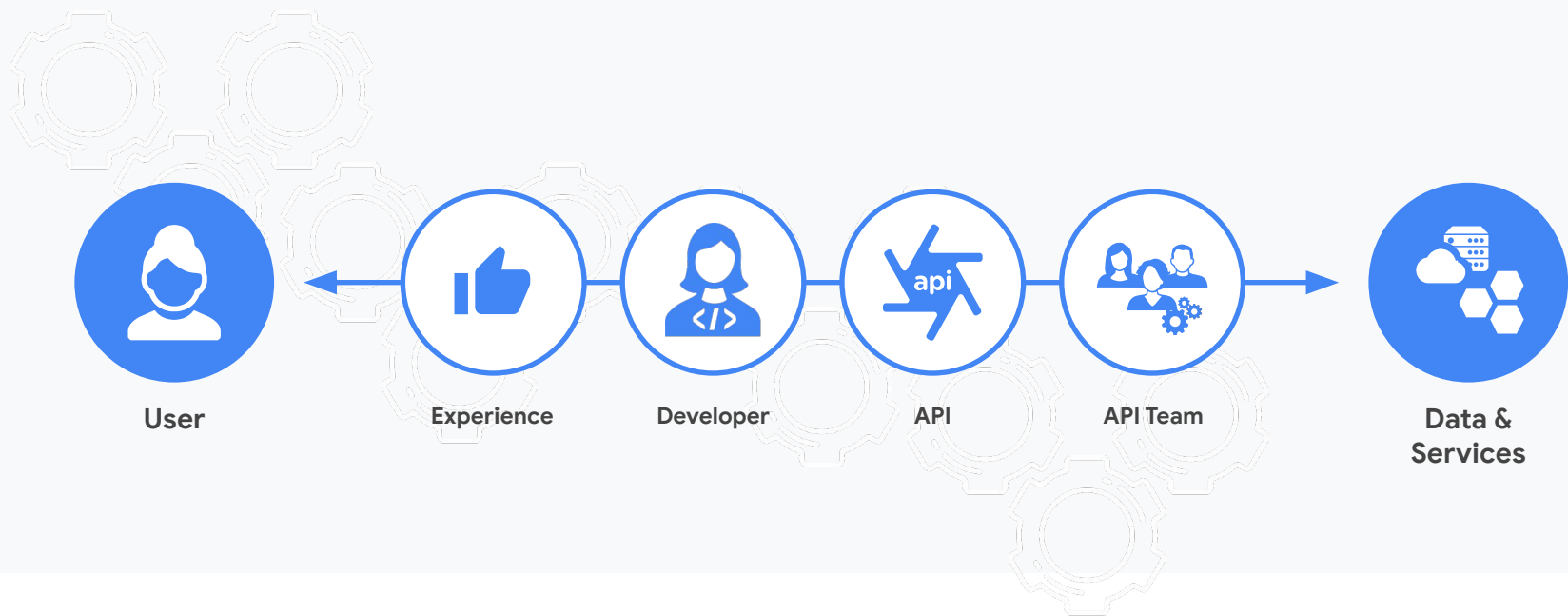# Apigee API Management

Powering everything from AI Data Hubs to No-Code Apps

Google Cloud
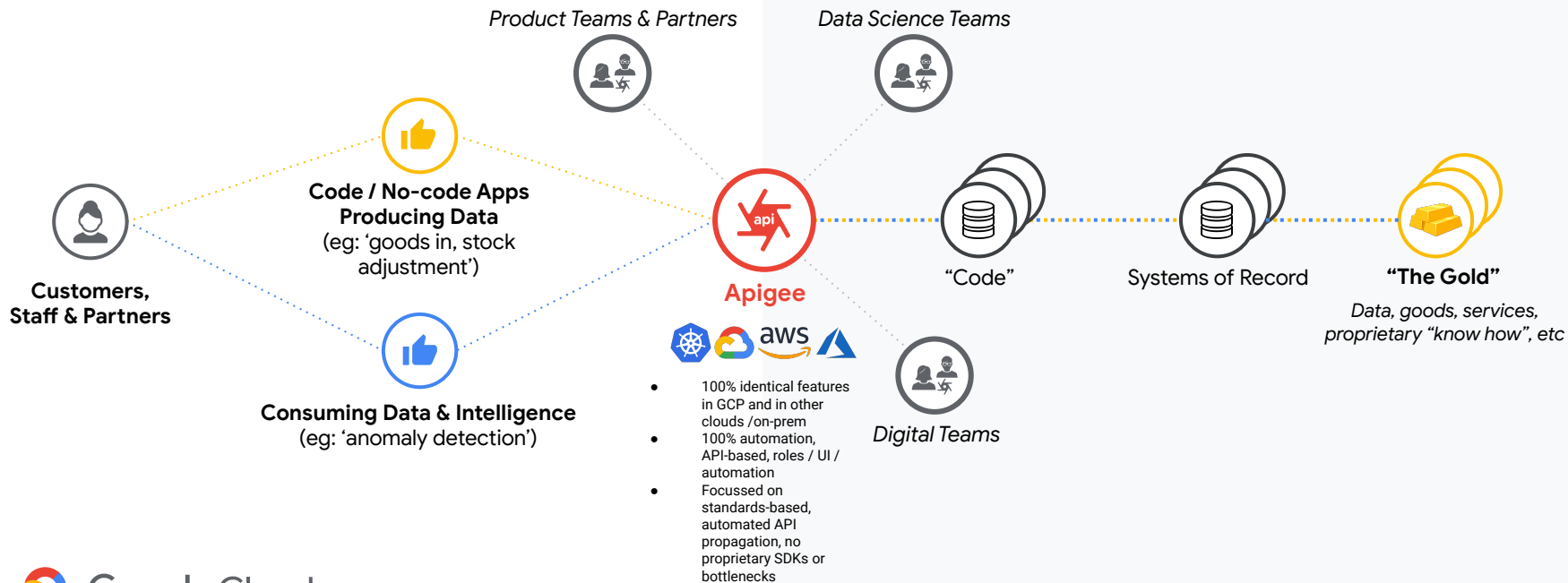
Delivers value across the Digital Value Chain

User

Experience

Developer

API
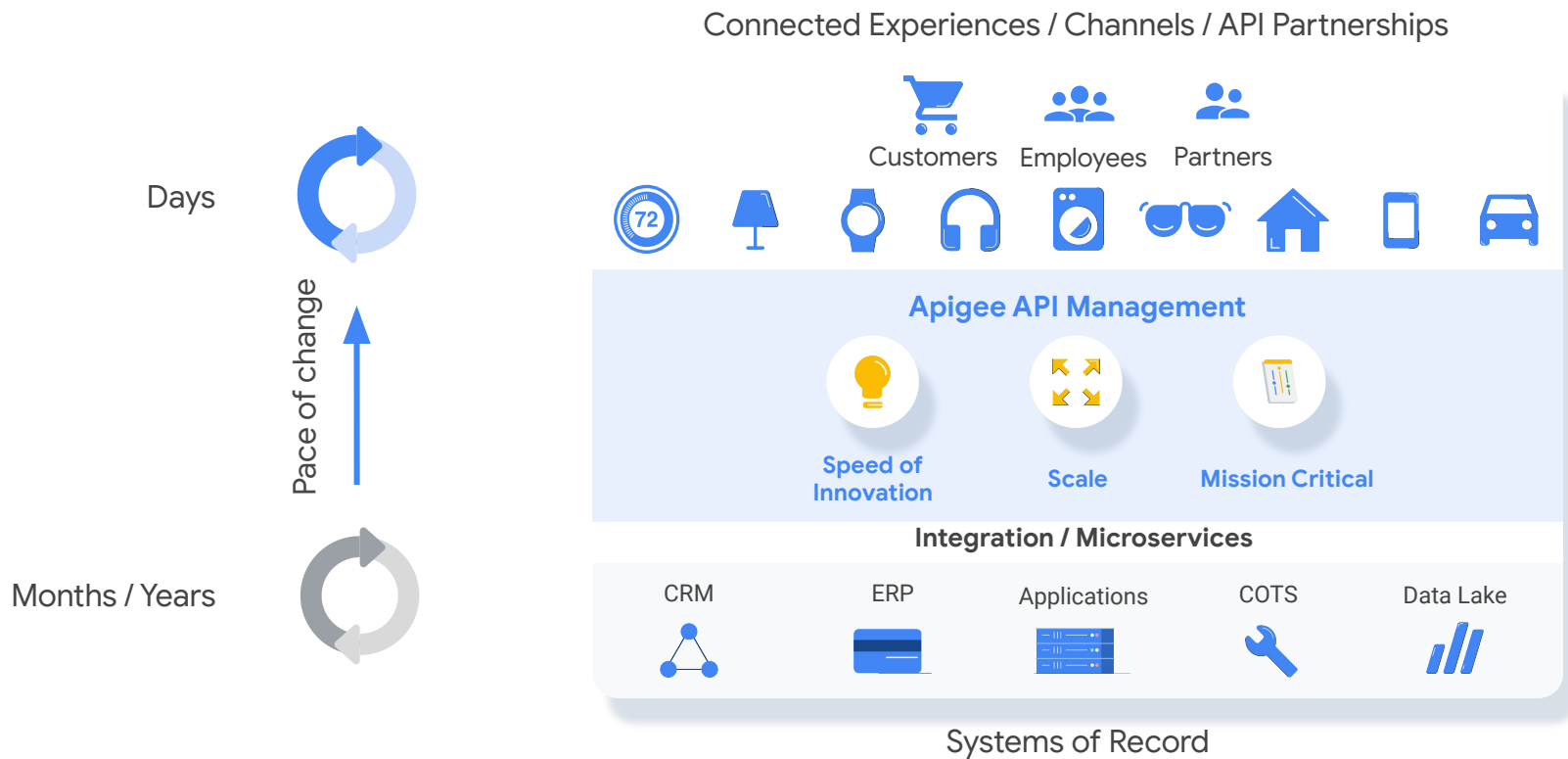
API Team

Data & Services

Google Cloud

Scaling data & integration use-cases through APIs

Lines of Business get: Consistency, personalization, & **measurement** of customer experiences across moments

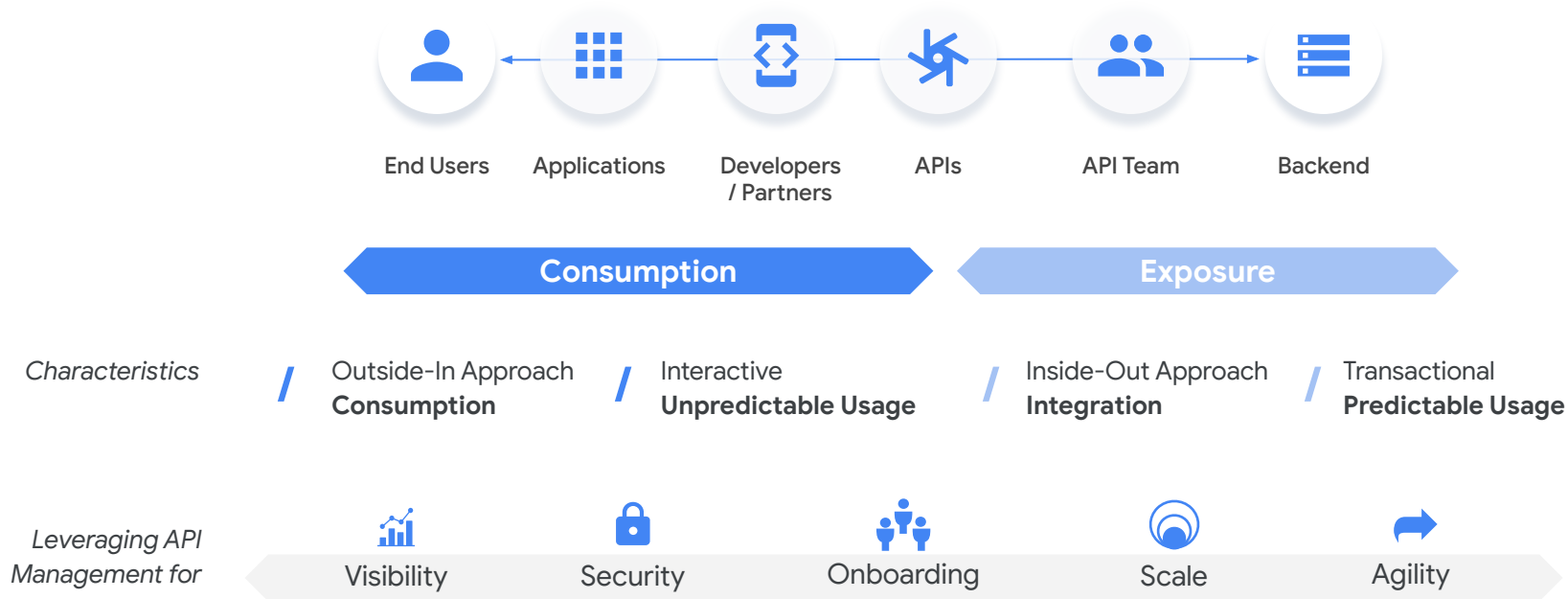**Builders get:** A Digital Business Platform - for refining core value into reusable digital assets (APIs)

Product Teams & Partners

Data Science Teams

Code / No-code Apps Producing Data
(eg: 'goods in, stock adjustment')

Customers, Staff & Partners

Apigee

"Code"

Systems of Record

"The Gold"

Data, goods, services, proprietary "know how", etc

Consuming Data & Intelligence
(eg: 'anomaly detection')

Digital Teams

- 100% identical features in GCP and in other clouds /on-prem
- 100% automation, API-based, roles / UI / automation
- Focussed on standards-based, automated API propagation, no proprietary SDKs or bottlenecks

Google Cloud

Bridging the gap between systems of record and new demand

Days

Pace of change

Months / Years

Connected Experiences / Channels / API Partnerships

Customers Employees Partners

Apigee API Management

Speed of Innovation

Scale

Mission Critical

Integration / Microservices

CRM ERP Applications COTS Data Lake

Systems of Record

Google Cloud

Digital Value Chain

Focus on the **consumers** - and build APIs that deliver value to them

End Users	Applications	Developers / Partners	APIs	API Team	Backend

Consumption	Exposure

Characteristics

/ Outside-In Approach **Consumption**

/ Interactive **Unpredictable Usage**

/ Inside-Out Approach **Integration**

/ Transactional **Predictable Usage**

Leveraging API Management for

Visibility	Security	Onboarding	Scale	Agility
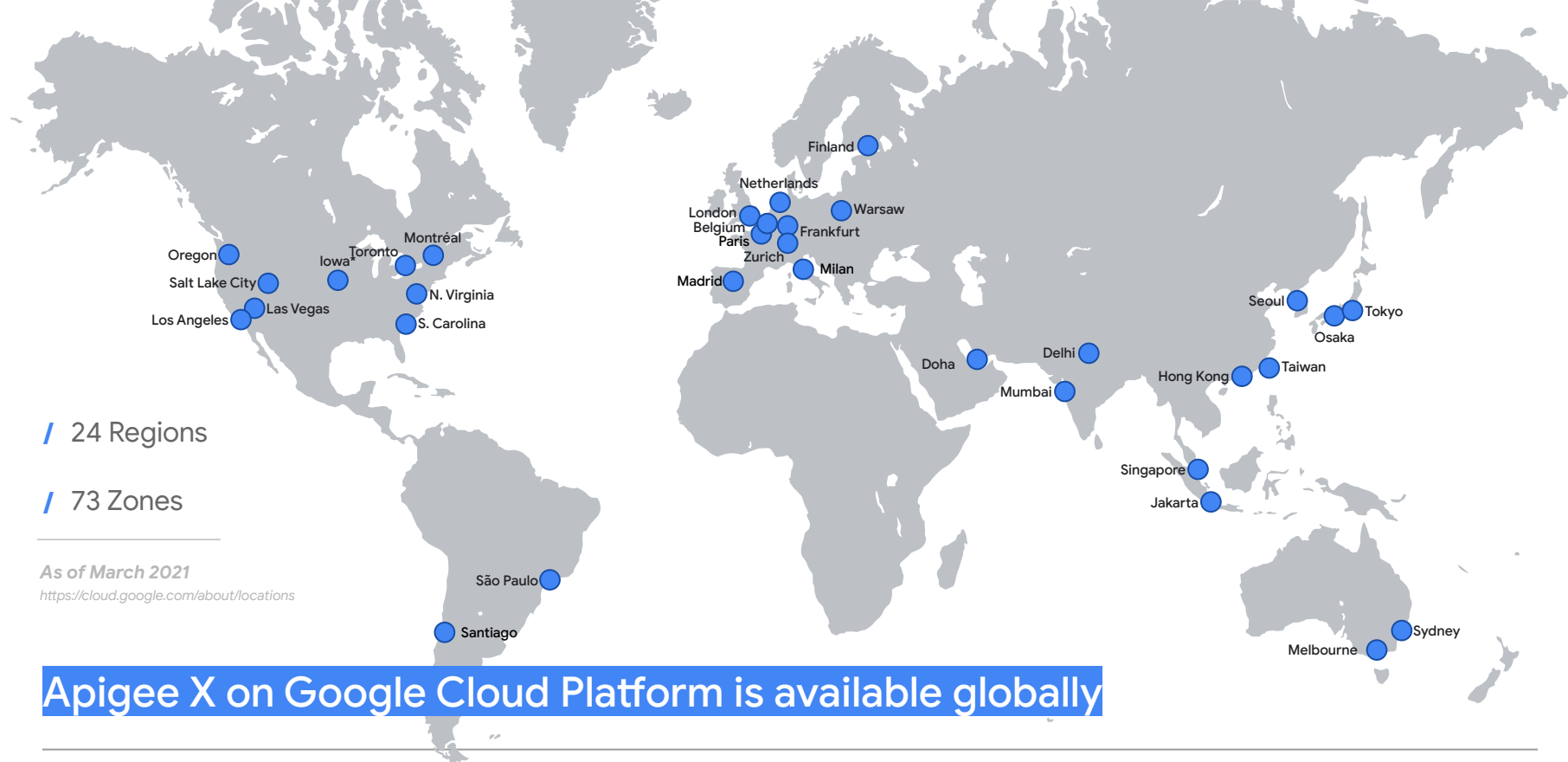
Google Cloud

/ 24 Regions

/ 73 Zones

As of March 2021
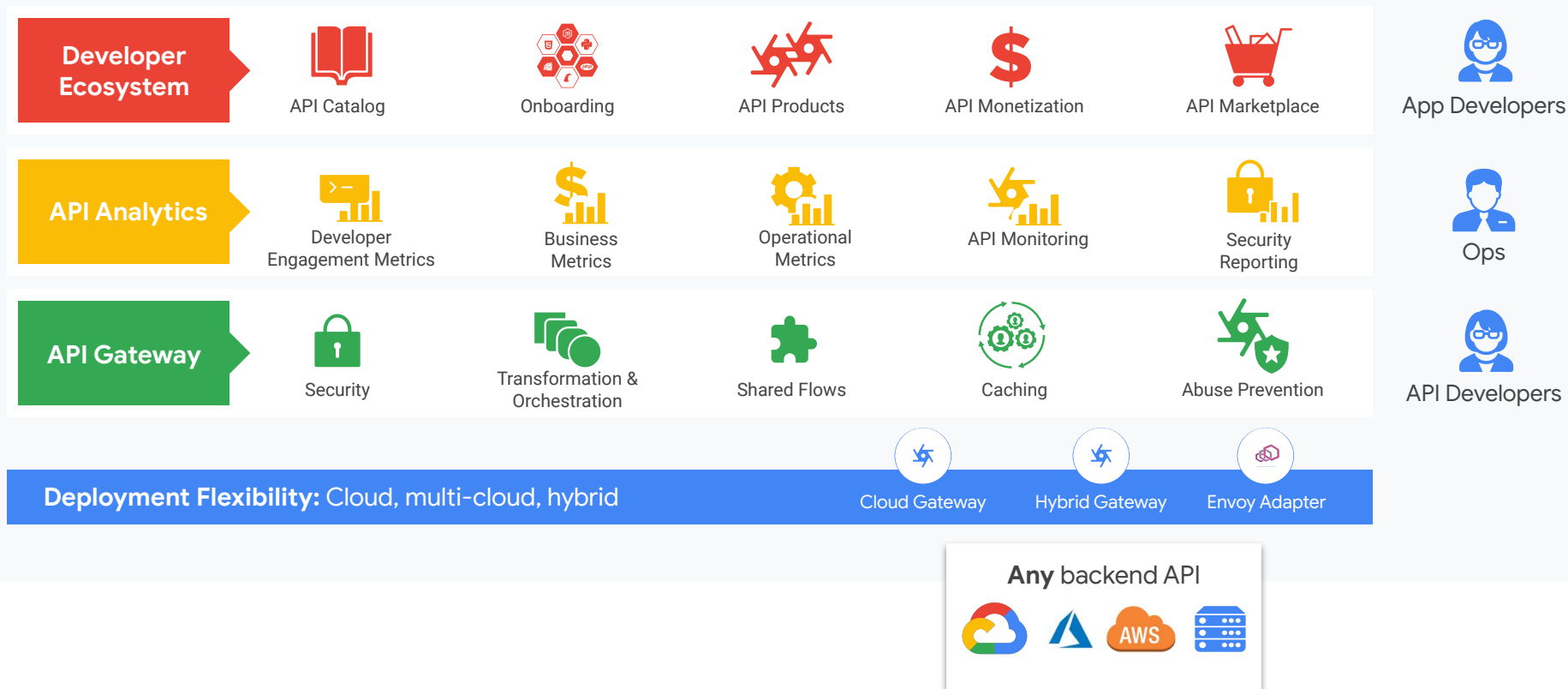*https://cloud.google.com/about/locations*

Apigee X on Google Cloud Platform is available globally

Google-managed runtime plane:
Multi-region deployments | Distributed API caching | Auto-scaling

Google Cloud

Apigee API Management Capabilities

Developer Ecosystem
- API Catalog
- Onboarding
- API Products
- API Monetization
- API Marketplace

App Developers

API Analytics
- Developer Engagement Metrics
- Business Metrics
- Operational Metrics
- API Monitoring
- Security Reporting

Ops

API Gateway
- Security
- Transformation & Orchestration
- Shared Flows
- Caching
- Abuse Prevention

API Developers

Deployment Flexibility: Cloud, multi-cloud, hybrid

Cloud Gateway   Hybrid Gateway   Envoy Adapter

Any backend API

Google Cloud

Apigee X

New release of Google Cloud's API management platform

✓ **Enhanced security** with an integrated approach to web application firewall and identity management

✓ **Enhanced scale & performance** of APIs with the power of Google's global private network

✓ **Enhanced automation** for API operations and security powered by AI and machine learning

Powering API programs for enhanced scale, security & automation

Cloud CDN   Cloud Armor

Apigee   +

Cloud IAM   ReCaptcha

. . .

Google Cloud

One Platform Across the Entire API Lifecycle

Design

Develop

Secure

Publish

Scale

Monitor

Analyze

Monetize

Apigee

Google Cloud

API Proxy Development

- **Configuration**: Over 40 ready-to-use, configurable policies

- **Code**: Built-in support for JavaScript, Java and Python

- **Visualize**: See the flow of your API requests with the online proxy editor

- **Reusability**: Abstract commonly used sequence of policies into reusable artifacts

Google Cloud
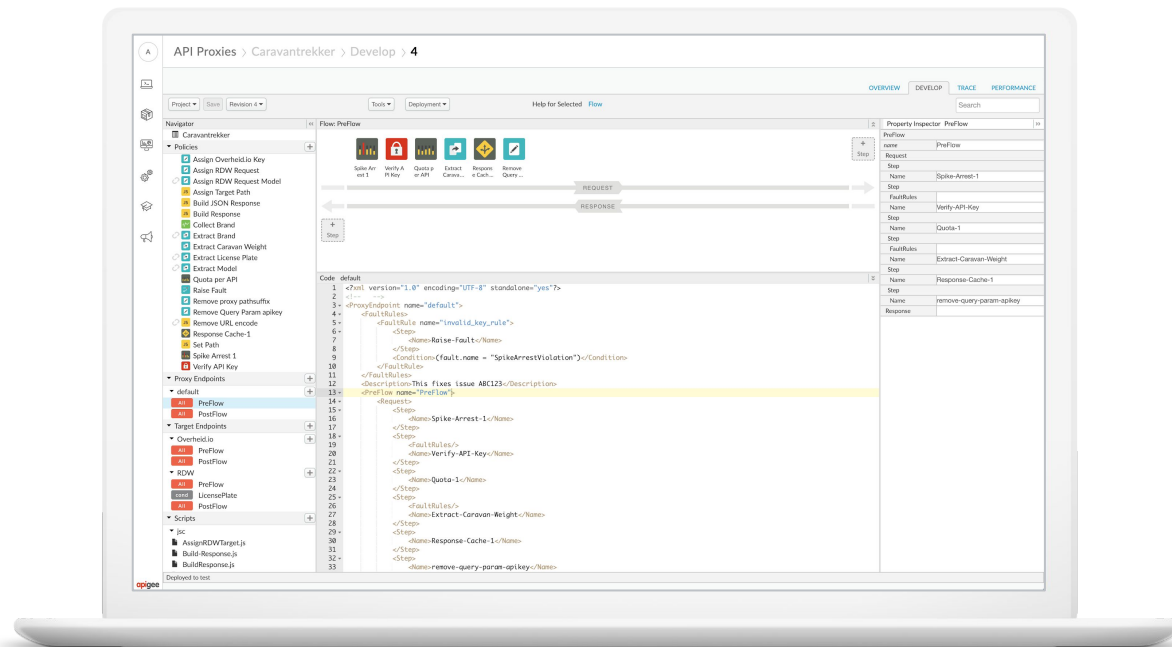
Out-of-the-box Configurable Policies

Manage traffic on with APIs and optimize performance

Traffic Management

Quota

Reset Quota

Spike Arrest

Response Cache

Lookup Cache

Populate Cache

Invalidate Cache

Secure APIs and protect back-end systems from attack

Security

XML Threat Protection

JSON Threat Protection

Regular Expression Protection

OAuth v2.0

HMAC

JWT & JWS encode, decode

Verify API Key

Access Control

Generate SAML Assertion

Validate SAML Assertion

Transform, translate and reformat data for consumption

Mediation

JSON to XML

XML to JSON

Raise Fault

XSL Transform

SOAP Message Validation

Assign Message

Extract Variables

Access Entity

Key Value Map Operations

OAS Validation

Extend with programming when you need it

Extension

Java Callout

JavaScript Callout

Python Callout

Service Callout

Data Capture
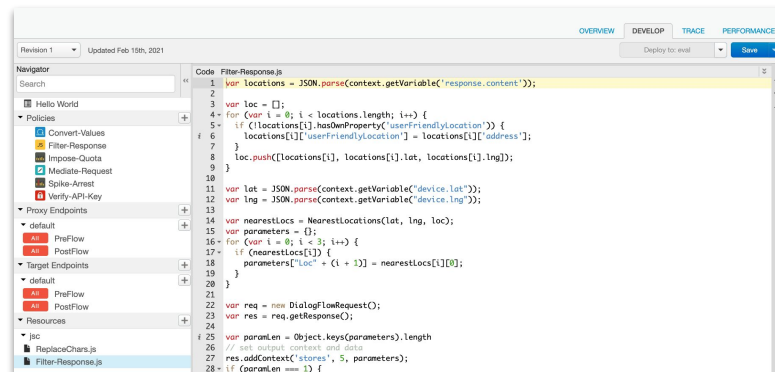
Message Logging

Flow Callout

Configuration and Code

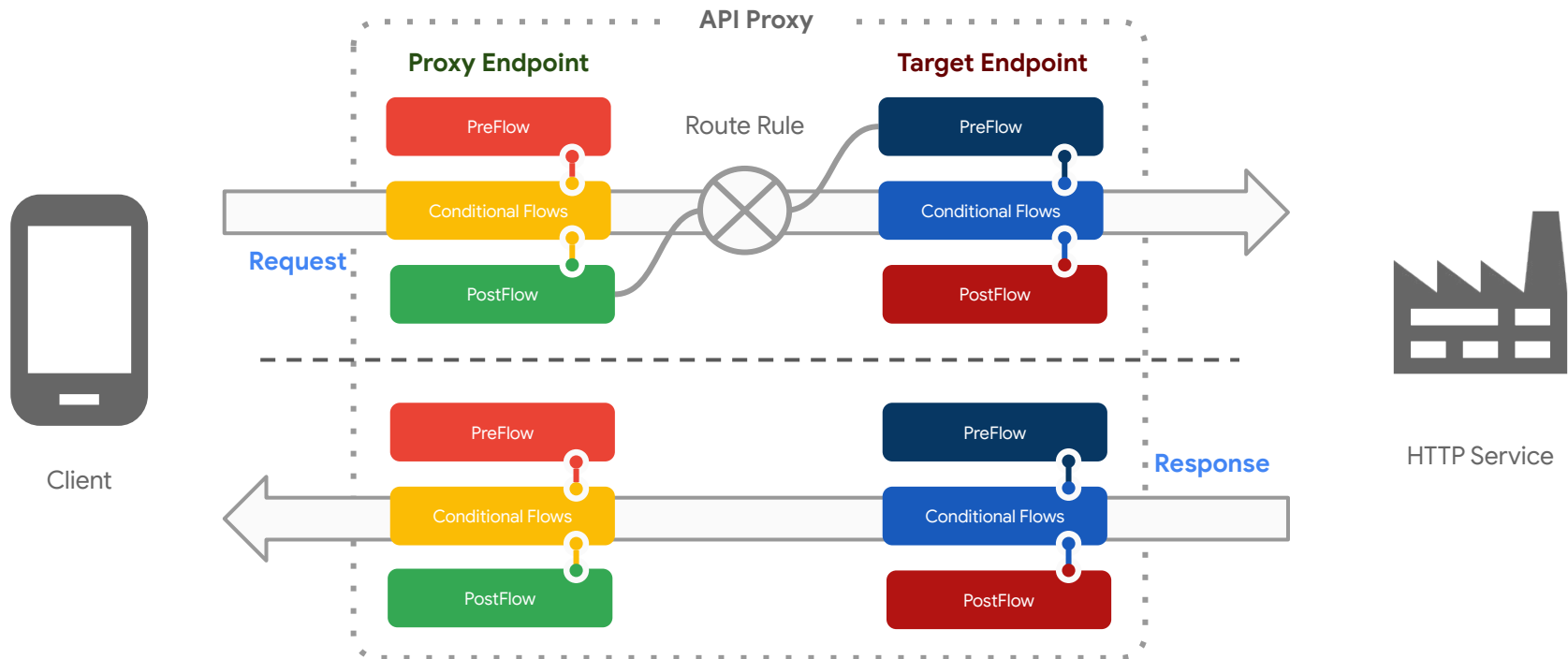Optimized Apigee Policies

Configuration with policies
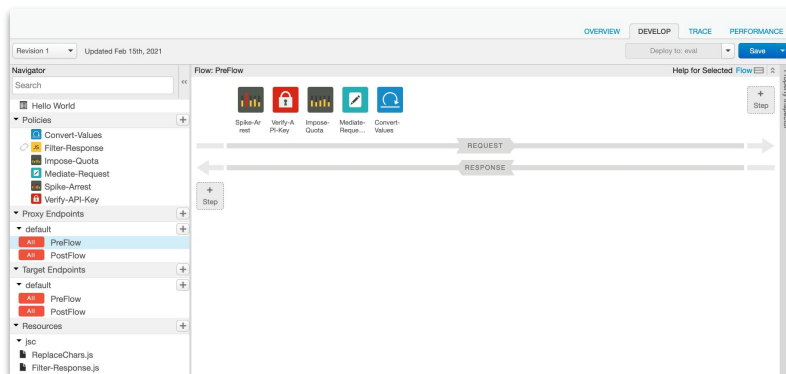
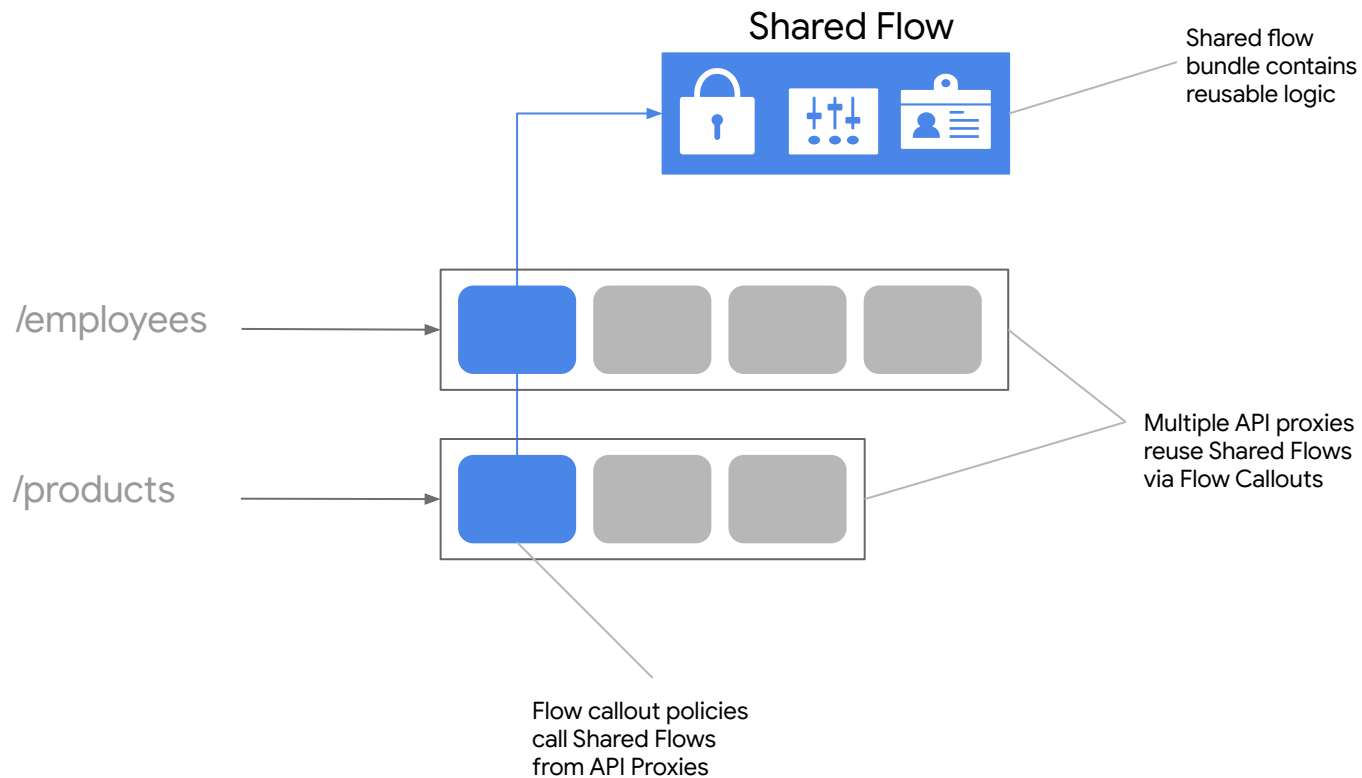## Extensible with code

Google Cloud

API proxy & fine-grained controls

Segment each part of the flow, including default and conditional paths, as well as pre-flow and post-flow for both request and response.
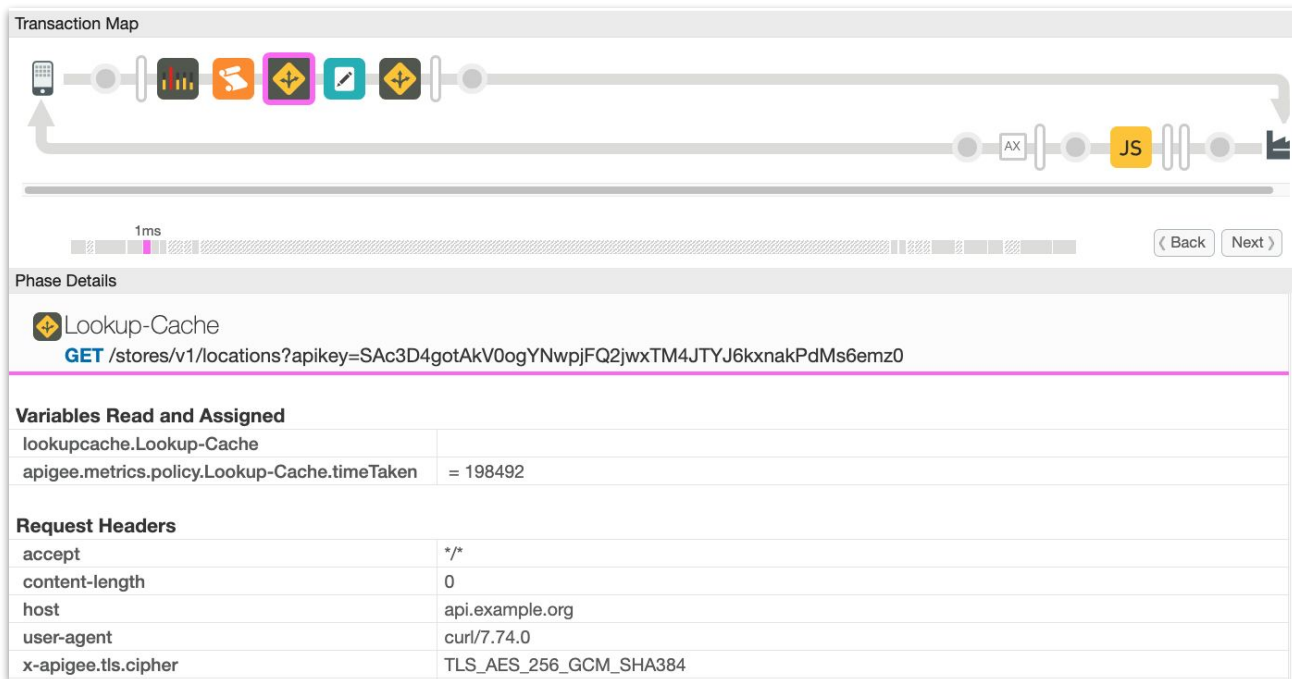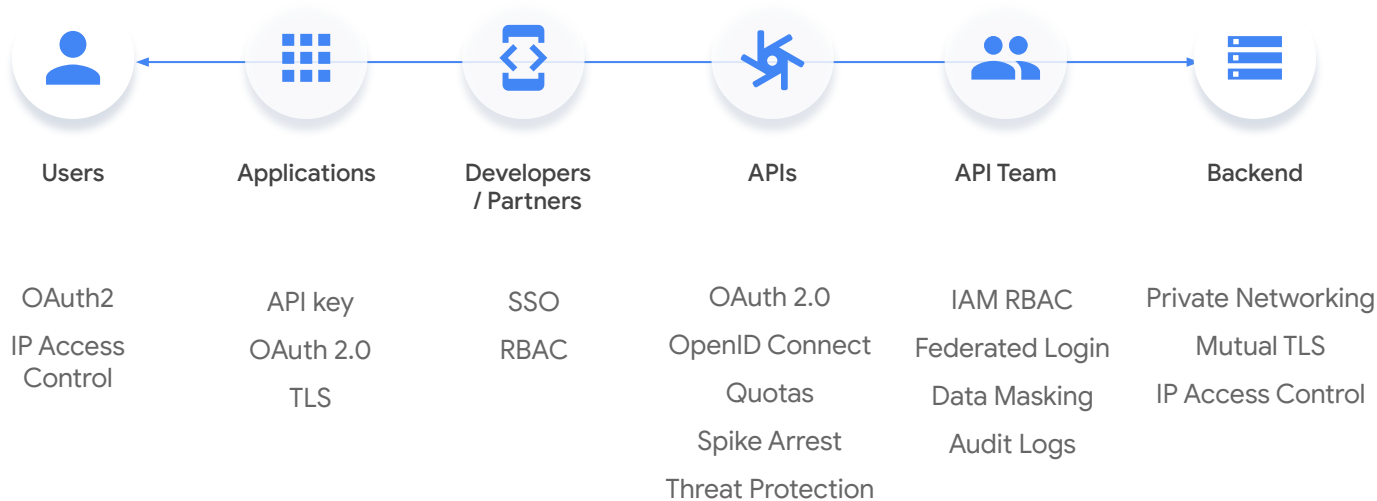

Google Cloud

Shared Flows

Shared Flow

Shared flow bundle contains reusable logic

/employees

/products

Multiple API proxies reuse Shared Flows via Flow Callouts

Flow callout policies call Shared Flows from API Proxies

Google Cloud

Easily Debug APIs

Trace API requests to accelerate debugging and development

Secure all points of engagement

Users	Applications	Developers / Partners	APIs	API Team	Backend
OAuth2	API key	SSO	OAuth 2.0	IAM RBAC	Private Networking
IP Access Control	OAuth 2.0	RBAC	OpenID Connect	Federated Login	Mutual TLS
	TLS		Quotas	Data Masking	IP Access Control
			Spike Arrest	Audit Logs	
			Threat Protection		

VPC controls for Apigee

Prevent data exfiltration from a secure zone (VPC)

Grant controlled access based on request origin

Privately access GCP services from GCP or on-premise using hybrid connectivity options

Apigee API

- API first approach to configure and operate the platform with administrative Google Cloud APIs

- Enables full API lifecycle management

- Allows for automation such as deployment pipelines and other CI/CD toolchains

https://cloud.google.com/apigee/docs/reference/apis/apigee/rest

Google Cloud

Automation & Deployments

Developer

Check in API configuration

Fetch sources from SCM

GitLab

OPEN API
INITIATIVE

Update API docs (sandbox environments)

Run code quality analysis using eslint

ESLint

- API enabled CI/CD

- Promote APIs through runtime environments

- Familiar tooling

- Industry standards

JIRA

Publish reports

Run unit tests with test coverage analysis

chai

Jasmine   mocha

Run integration test

Gatling
LOAD TESTING

Build, deploy & configure API Bundle

maven
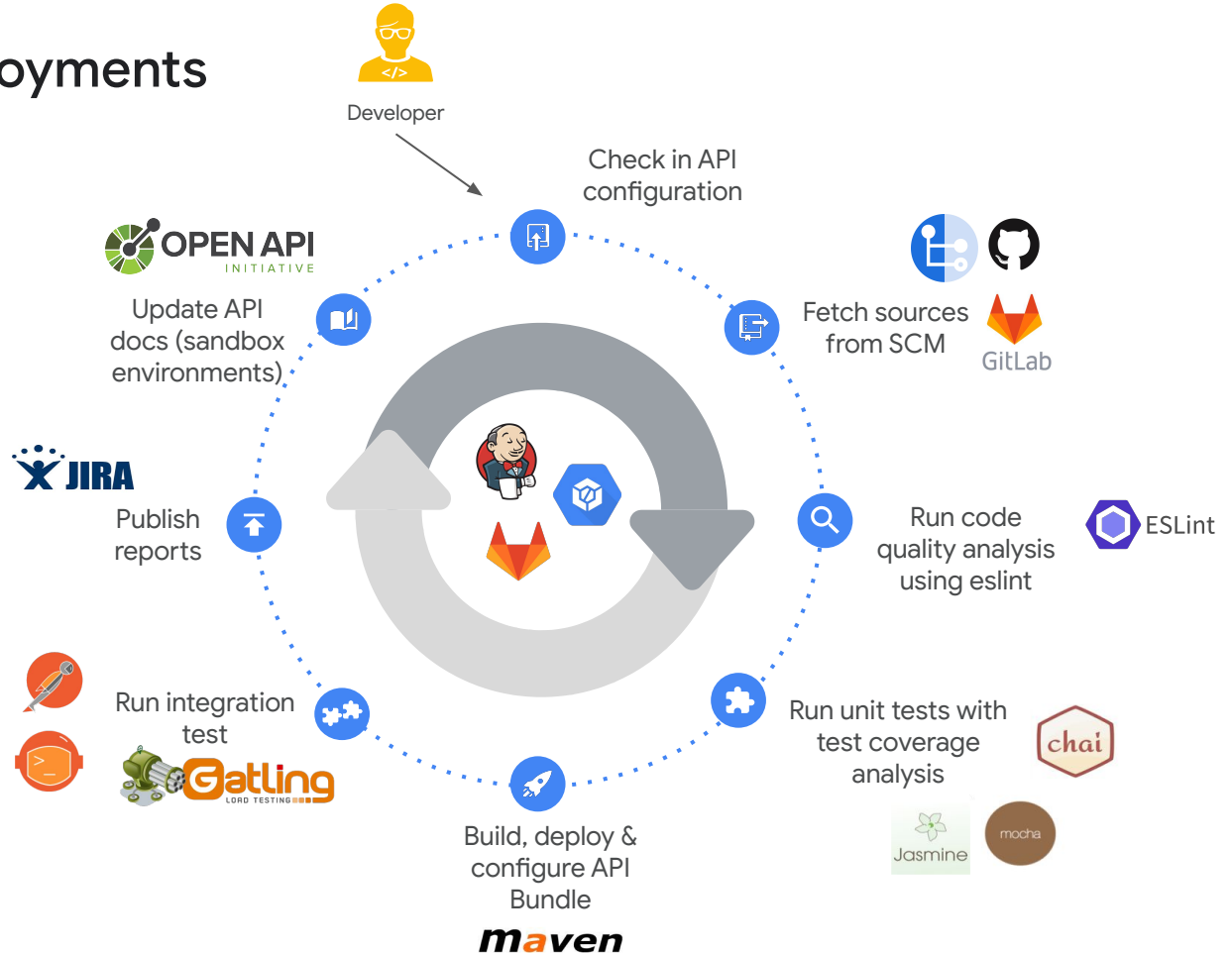
Unified API Analytics

- Out of the box dashboards

- Custom metrics & reports

- Enrich with custom fields

- Query via API

- Export to BigQuery or Storage buckets

How is our app using APIs?

App Developer

How is our API performing?

API Team

How is the business using the platform?

Business Owner

How are the backends coping?

Operations
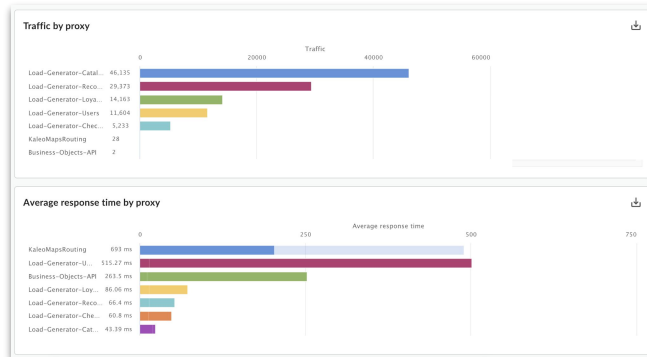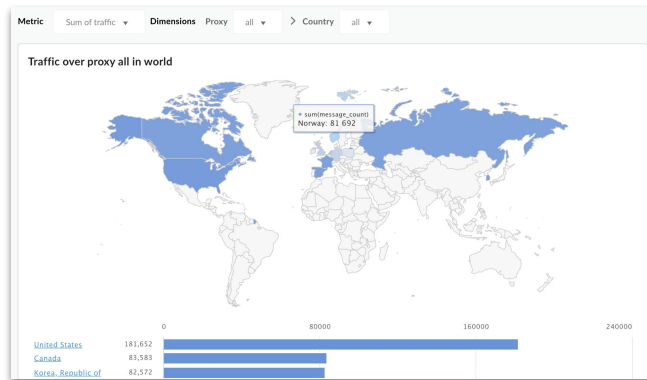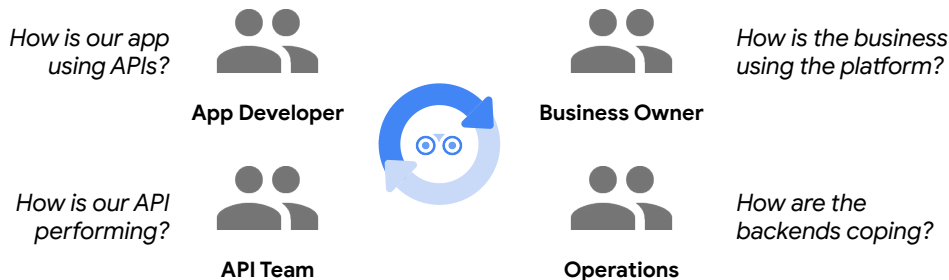
Google Cloud

API Monitoring

- Near real time monitoring of API metrics and telemetry data

- Integrated with Google Cloud Monitoring; part of the Google Cloud Operations Suite

- Drill down into metrics for richer analysis

- Configure alerts to a variety of channels such as email, Cloud Pub/Sub, PagerDuty and Slack

- Option to plug in with Cloud Trace for distributed tracing
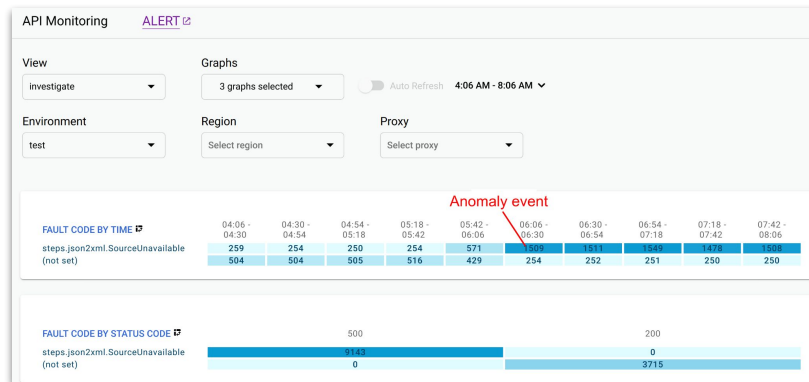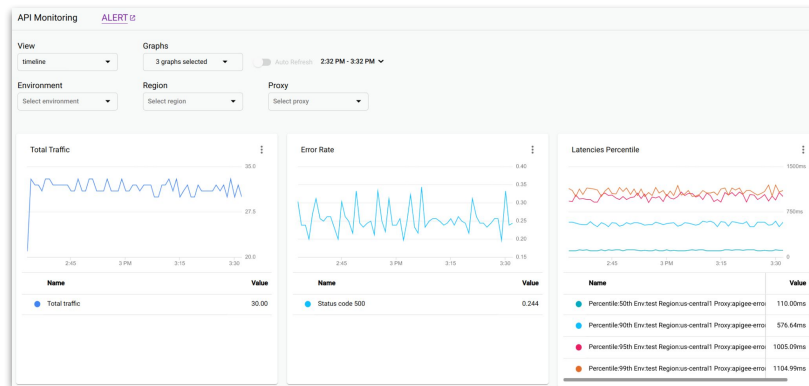
Developer Portal

- Interactive API documentation

- Self-service
    - Developer onboarding
    - App registration
    - Credential management

- Developer Portal Options
    - Turnkey "Integrated" portal
    - Customizable Drupal portal
    - DIY portal using Apigee APIs
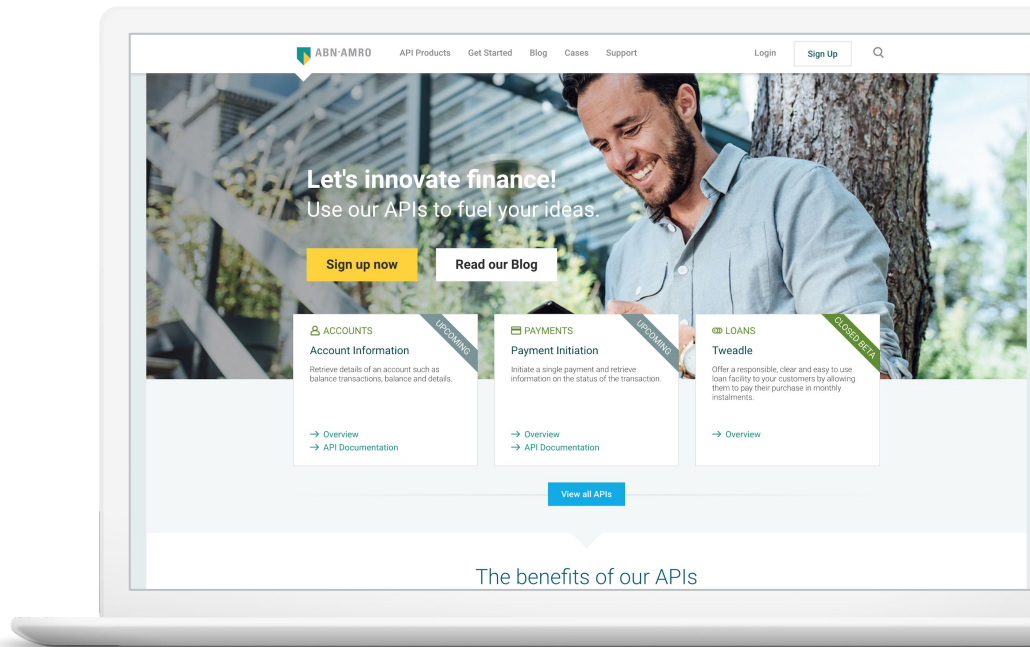
Apigee Role Based Access Control (RBAC)

- Google Cloud Identity and **IAM**

- **Pre-defined** Apigee roles for a variety of personas using the platform

- Create **custom roles** with per-operation Apigee specific permissions

- Provision **Service Accounts** for machine users

- Assign roles to identities for specific Apigee **Environments**

Roles   + CREATE ROLE   ☐ CREATE ROLE FROM SELECTION   — DISABLE

	Type	Title	Used in	Status	
☐	◉	Apigee Analytics Agent	Apigee	Enabled	⋮
☐	◉	Apigee Analytics Editor	Apigee	Enabled	⋮
☐	◉	Apigee Analytics Viewer	Apigee	Enabled	⋮
☐	◉	Apigee API Admin	Apigee	Enabled	⋮
☐	◉	Apigee API Reader	Apigee	Enabled	⋮
☐	◉	Apigee Connect Admin	Apigee	Enabled	⋮
☐	◉	Apigee Connect Agent	Apigee	Enabled	⋮
☐	◉	Apigee Developer Admin	Apigee	Enabled	⋮
☐	◉	Apigee Environment Admin	Apigee	Enabled	⋮
☐	◉	Apigee Integration Admin	Other	Enabled	⋮
☐	◉	Apigee Organisation Admin	Apigee	Enabled	⋮
☐	◉	Apigee Portal Admin	Apigee	Enabled	⋮
☐	◉	Apigee Read-only Admin	Apigee	Enabled	⋮
☐	◉	Apigee Runtime Agent	Apigee	Enabled	⋮
☐	◉	Apigee Service Agent	Service agents	Enabled	⋮
☐	◉	Apigee Synchronizer Manager	Apigee	Enabled	⋮

Google Cloud

Audit Logging

- Automatically capture an audit of Apigee administrative operations such as:

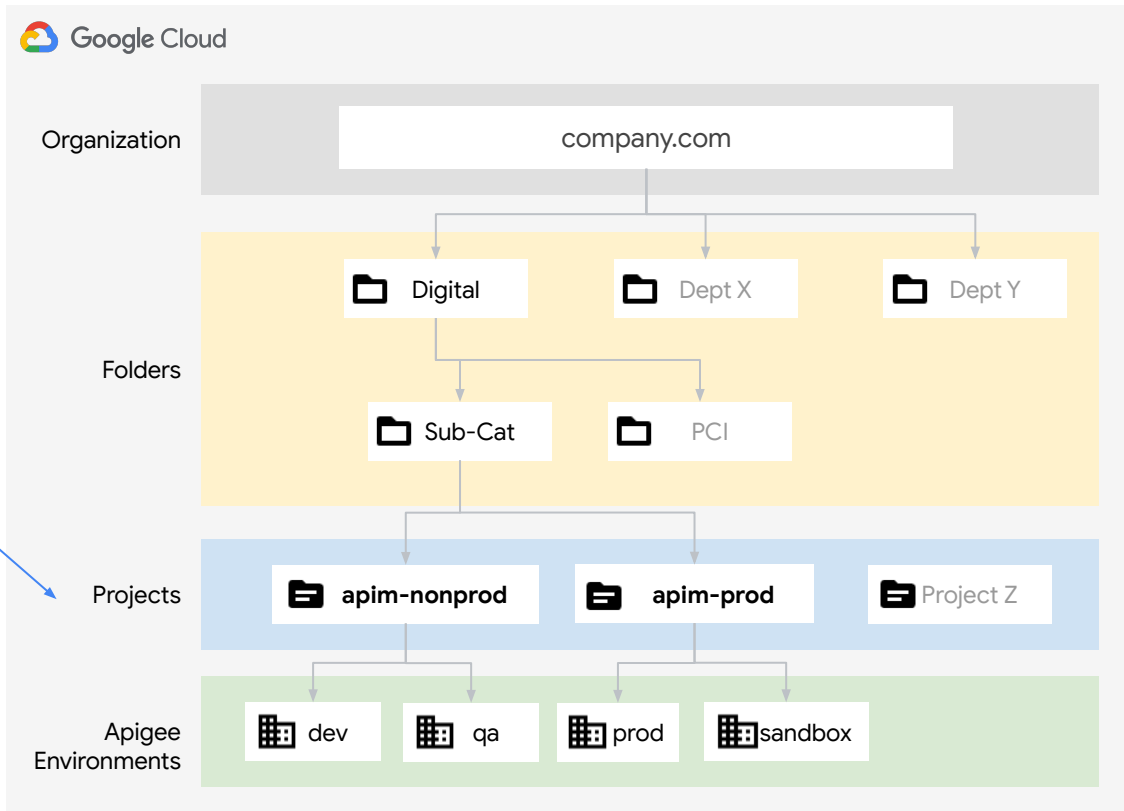 - Proxy deployments

  - Developer & app registrations

  - Environment administration
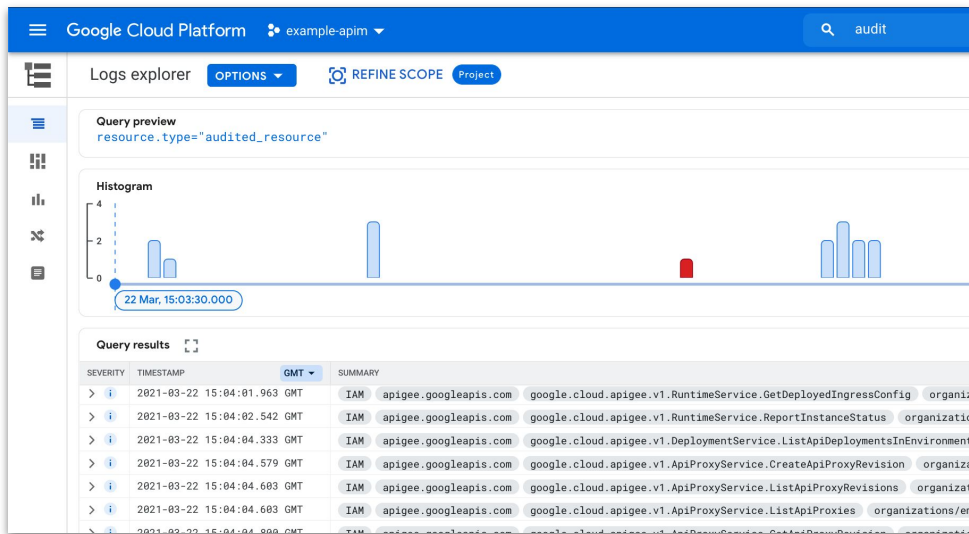
Apigee Organization Hierarchy

Apigee Organization(s)

Apigee Organizations, Environments, Environment Groups

Organization

A container for all the objects in an Apigee account, including API proxies, API products, API packages, apps, and developers.
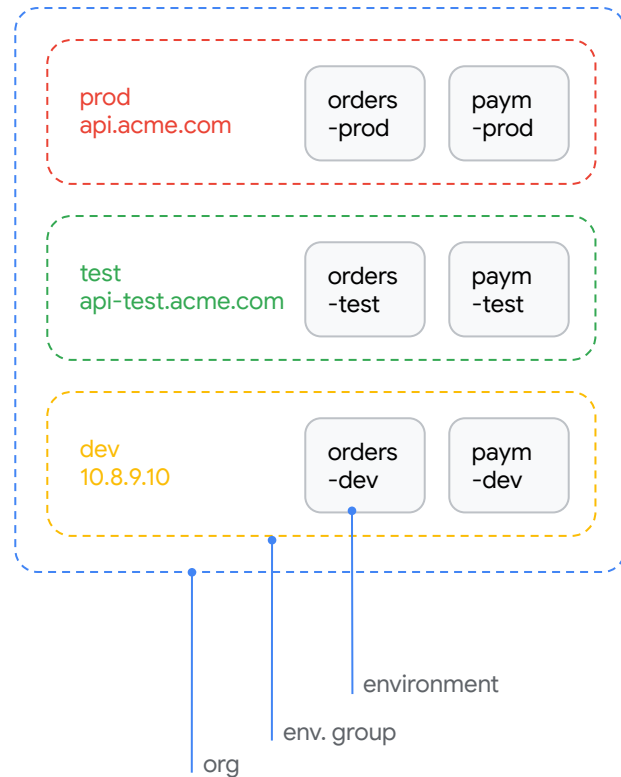
A user account is required for each organization for which you are a member (most users will have an account in only one organization).

Env. Group

A logical grouping of environments. Each environment group may be configured to expose an external **ingress service**.

Environment

A runtime execution context for API proxies. An API proxy must be deployed to an environment before it's accessible over the network.

prod
api.acme.com

| orders -prod | paym -prod |

test
api-test.acme.com

| orders -test | paym -test |

dev
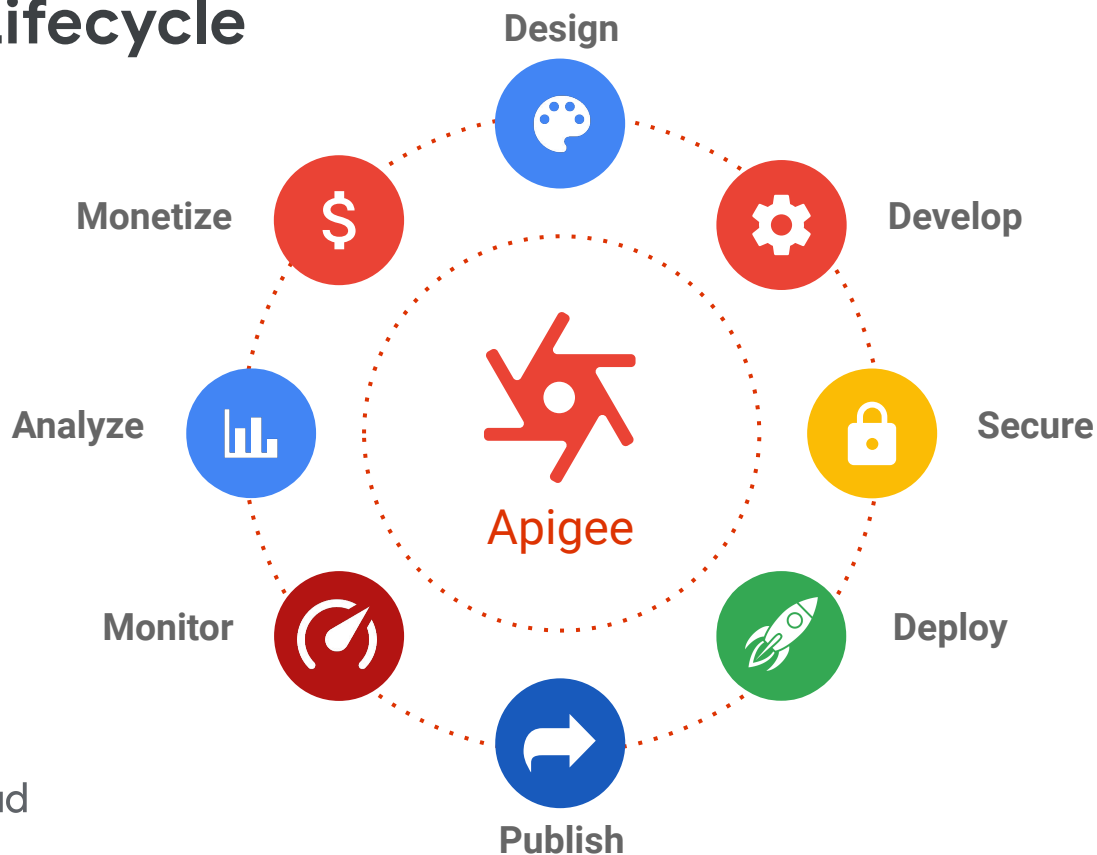10.8.9.10

| orders -dev | paym -dev |

environment

env. group

org

💡 The ingress service receives inbound requests, and forwards them to different environments within the group, according to the basepath.

Google Cloud

Architecture

Google Cloud

Full API Lifecycle

Design

Develop

Secure

Deploy

Publish

Monitor

Analyze

Monetize

Apigee

Google Cloud

Apigee API Management Platform

Developer Ecosystem

| API Catalog | Smart Docs | API Products | API Monetization | API Marketplace |

API Analytics

| Developer Engagement Metrics | Business Metrics | Operational Metrics | API Program Metrics | API Monitoring |

Mediation Engine

| Security | Transformation | Extensions | Orchestration | API Abuse Prevention |

API Runtime

| SaaS Runtime | Hybrid Runtime | Envoy Adapter |

On-Prem & Multiple Clouds

Google Cloud

Apigee in Hybrid Cloud architecture: Overview

Apigee in Hybrid Cloud architecture: Overview

← API products, credentials
→ API analytics

Apigee Edge

SaaS

SaaS

User and/or App

Apigee Envoy adapter

Istio

Public Cloud

Microservices (Service mesh)

Google Cloud

APIs

On Premises

User and/or App

APIs

Private Cloud

User and/or App
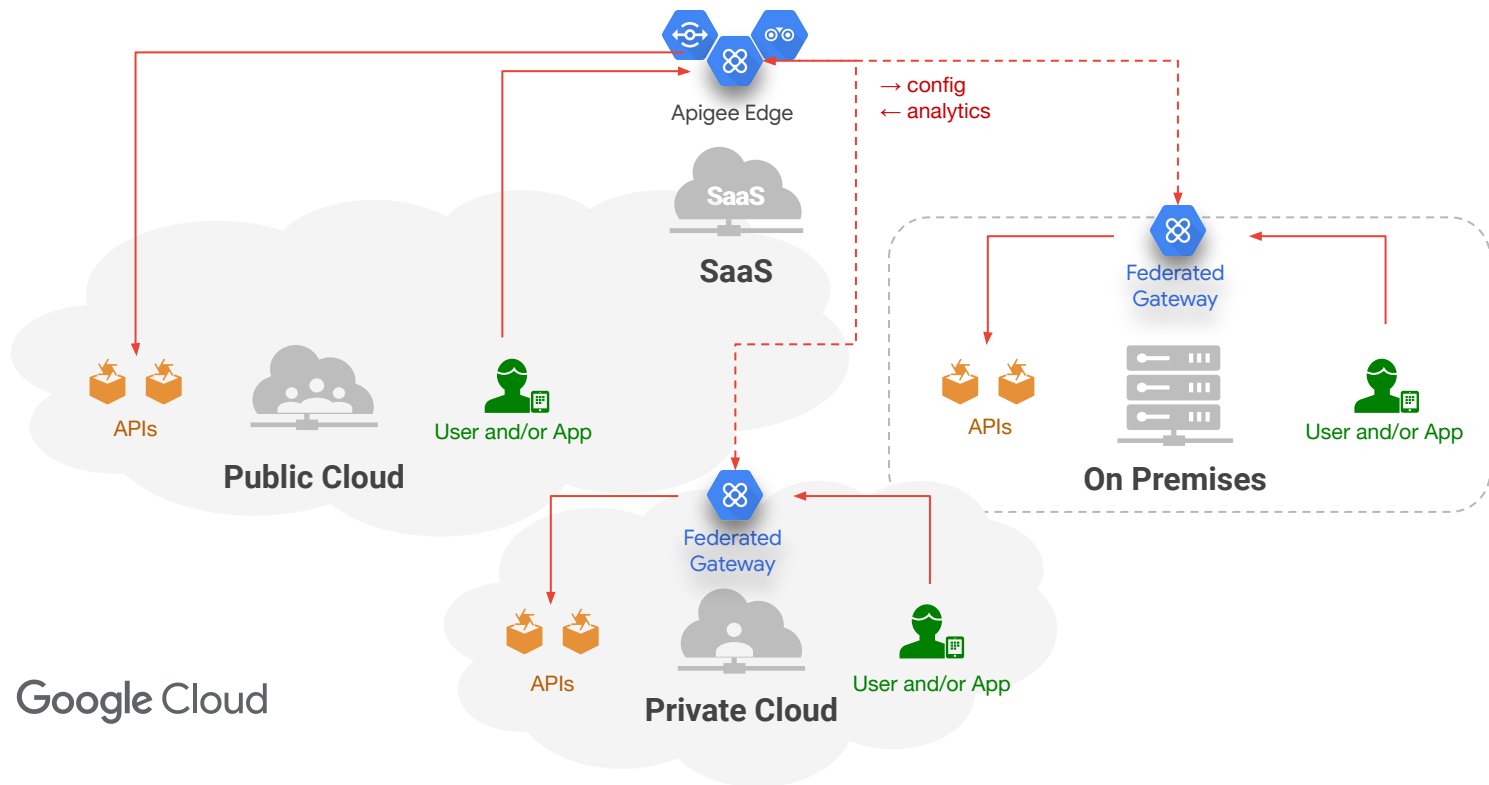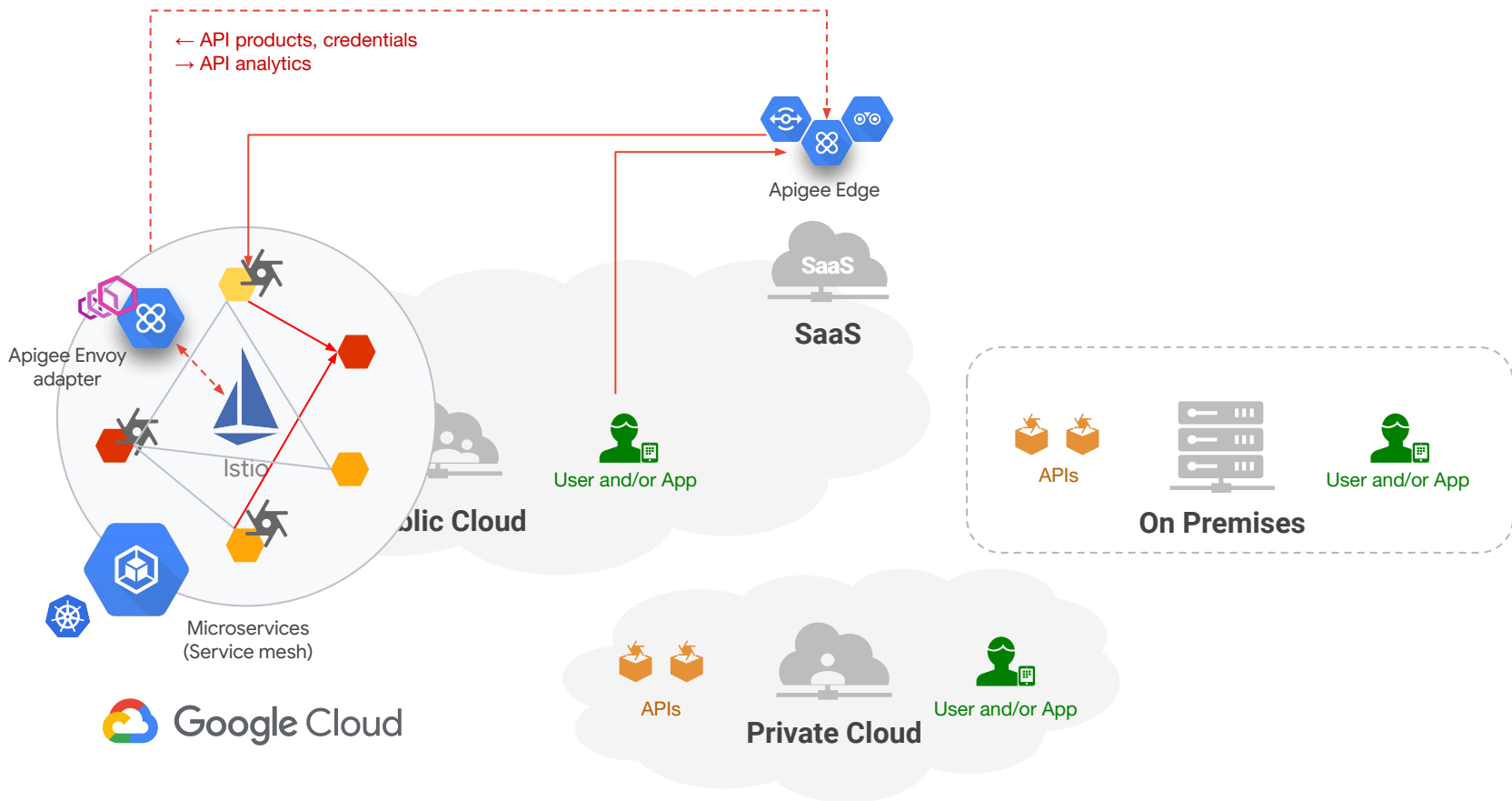
Summary: Apigee in Hybrid Cloud Architectures
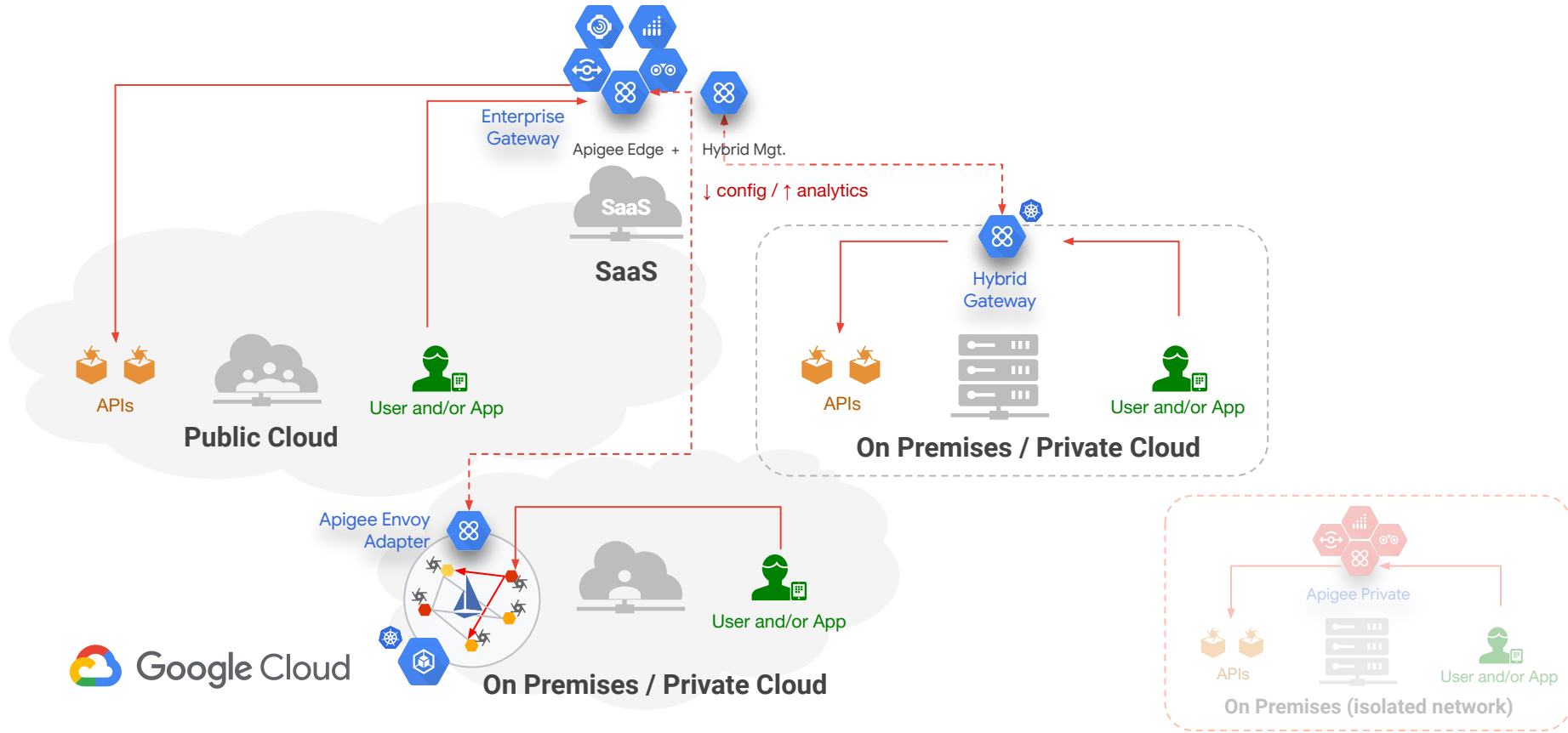
Apigee Runtime Options

Apigee X Architecture

Managed by Google

Google Cloud

Apigee Management Plane

- Mgmt Services
- API Analytics
- Developer Portal

- Cloud Identity
- Cloud Logging
- IAM
- Cloud Monitoring

Apigee Runtime Plane (Tenant Project)

- Apigee Runtime

VPC Peering

Managed by Customer

Google Cloud

- GCP Services

HTTPS / mTLS

Customer VPC

- Ingress/Egress

Private Data Center, 3rd party cloud

- Platforms
- Services

HTTPS / mTLS

HTTPS

Admin

Developer

Client apps

Google Cloud

Apigee hybrid architecture

Managed by Google

Managed by customer

Google Cloud

Management Plane

Apigee Services

Identity

Logging

IAM

Metrics

Projects

Admin

Developer

Google Cloud

GCP, on-prem, 3rd party cloud

Compute

Storage

TLS front-end

HTTPS/mTLS

Runtime Plane

Apigee Runtime

HTTPS

HTTPS

Client apps
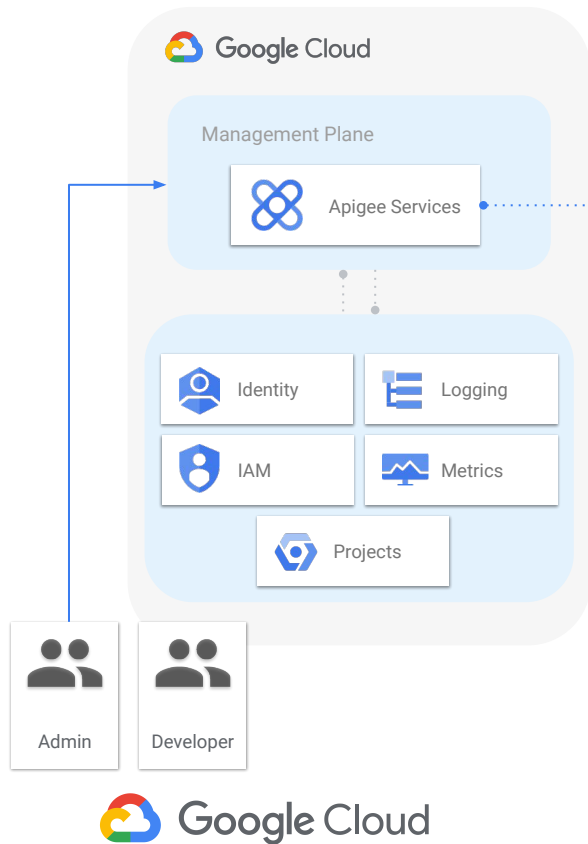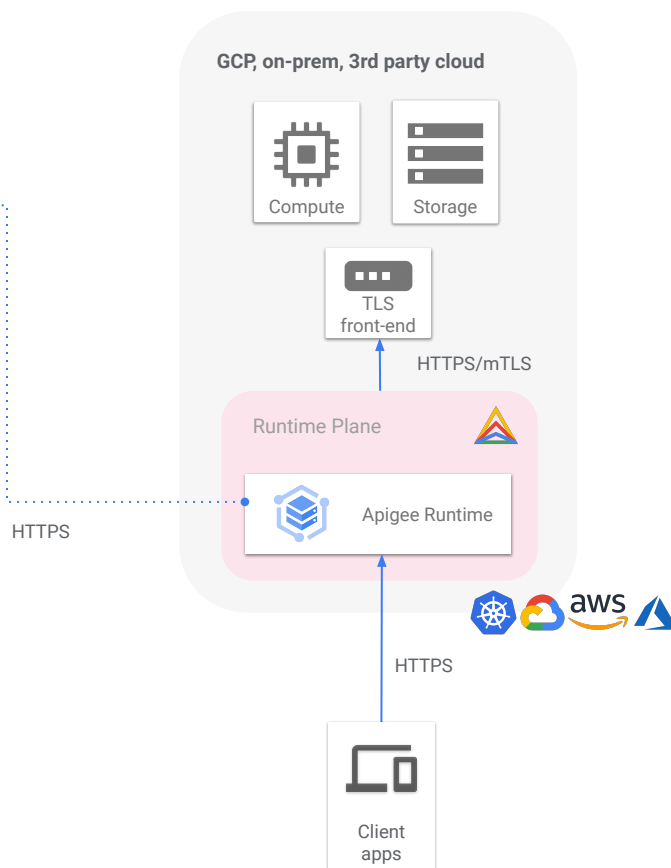
Apigee management plane
API lifecycle management capabilities

API runtime plane
Enterprise API gateways

Containerized runtime
Kubernetes-based, automated updates

Apigee X + hybrid

Apigee Runtime Options

Enterprise Gateway (SaaS)

Industry-leading full lifecycle API management as a managed service. Fully featured runtime capable of high scale and high throughput of API traffic. Multi-region and autoscaling built-in.
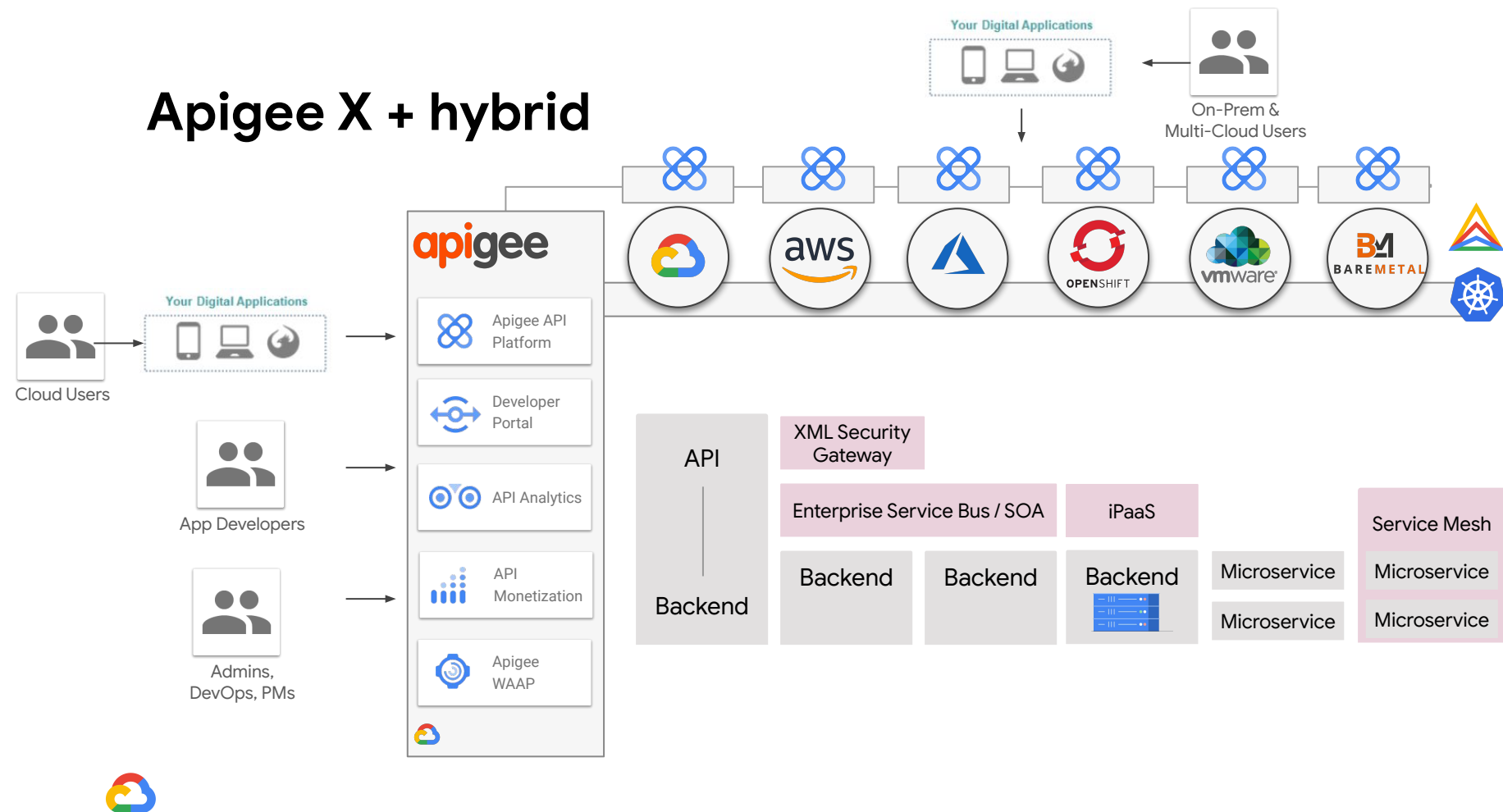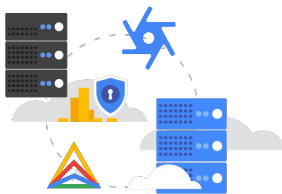

Apigee hybrid

Fully featured runtime identical to the enterprise gateway. Can be deployed in a distributed fashion to multi-cloud and on-premises Kubernetes environments - connected to a management plane.

Apigee Adapter for Envoy

Apigee Adapter for Envoy is an Apigee-managed API gateway that uses Envoy to proxy API traffic. You can run Apigee Adapter for Envoy on premises or in a multi-cloud environment.

Google Cloud

Hybrid Architecture

Istio Gateway (routing and LB)

Istio Pilot (configuration)

Message Processor (API Gateway)

Cassandra (persistence layer)

Synchronizer (replicates data)

MART (management server)

UDCA (analytics back to cloud)
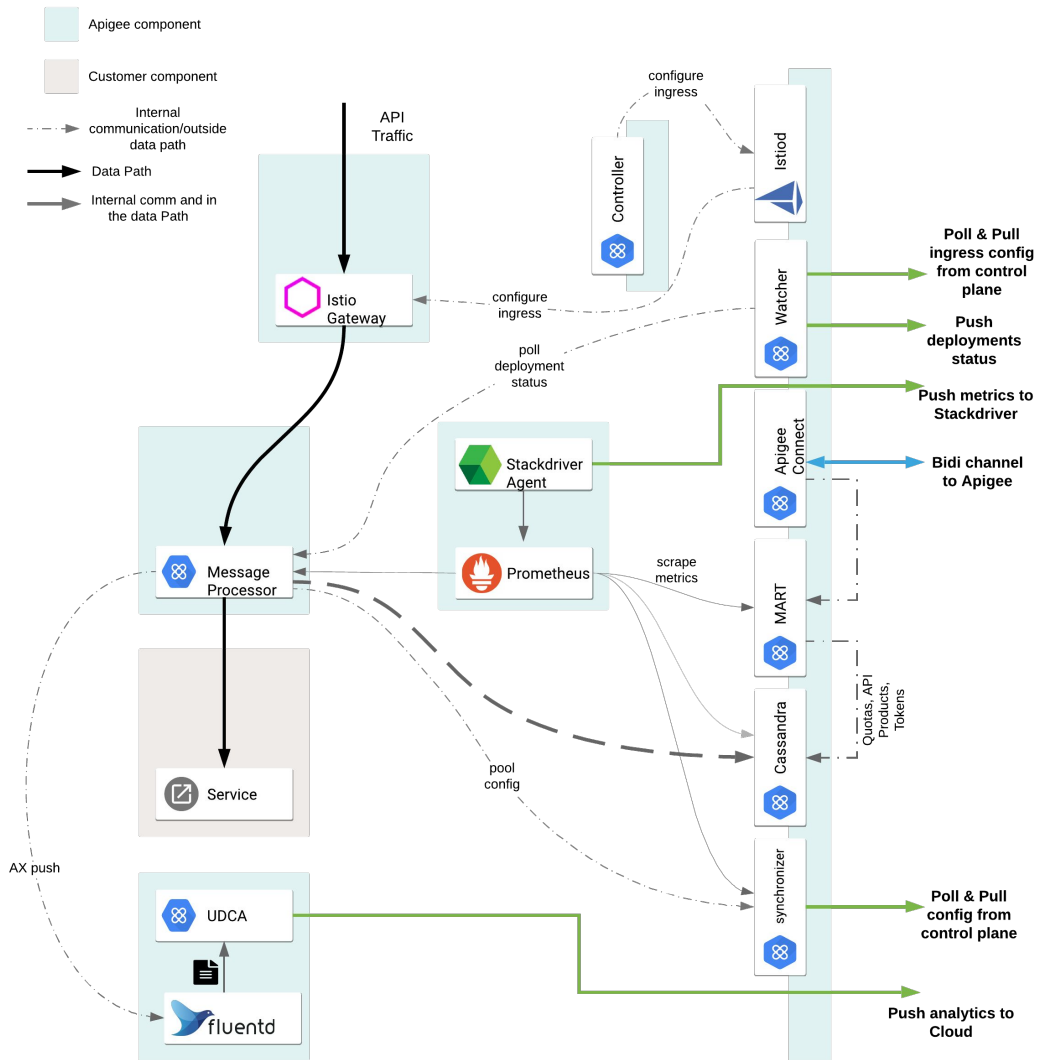
Envoy has a lot of traction for microservice proxies

Envoy @ Google
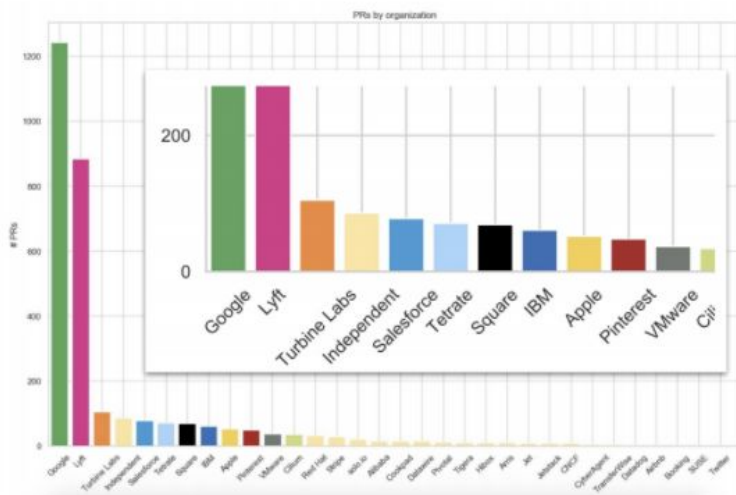
- **> 585 commits** in 2019 (**~38% total**)
- **17 contributors, 3 maintainers**
- Googlers involved in **~every PR review**
- Do the grungy work
- Building trust with big feature contribs for L7 ILB & Istio
- Balancing *internal* vs. *external*
- Community participation:
  - CNCF, community calls, Slack, mailing lists

Google Cloud

Apigee Envoy Adapter
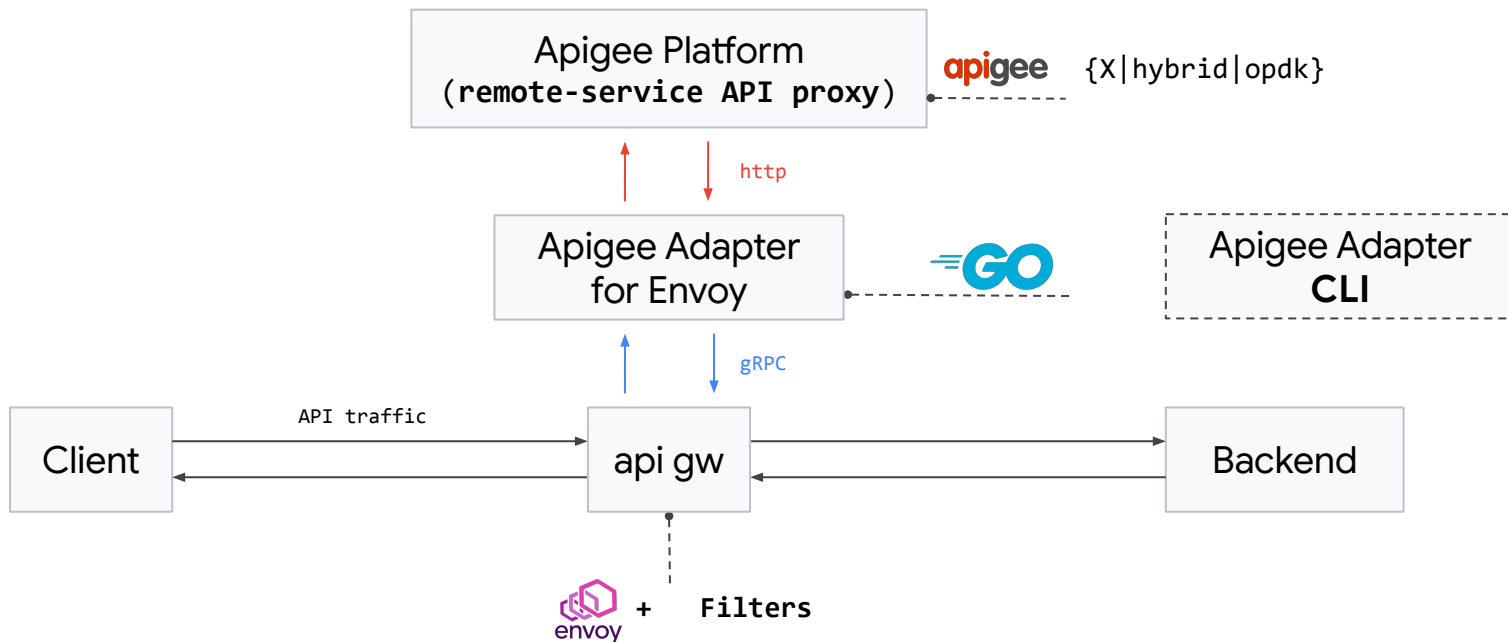
AI & Data Hub Architecture

What does a user flow look like?

User flow

Publish Products

AI Data Product Manager designs and manages the publishing of the products through AI Data Hub.

Ingest Data

Private and public domain specific data sets including
 - R&D: Science Data
 - Commercial: Social, Brand, MSL, other omnichannel data sources
Data is catalogued & discoverable

Consume Products

Any developer, data scientist or business user in the organization can access and subscribe to the products.

Develop AI and data products

Data Scientists and Developers create queries for BigQuery and models with Vertex AI

Ingest Data	>	Develop Product	>	Publish Product	>	Google Cloud Data and AI products

Step 1: Data ingestion, collection, indexing

Data Producing Devices / Ingestion

Data Ingest
Genomics

Ingest private as well as public datasets for AI algorithm development

Private Datasets

Patient Data
Cloud Storage

Public Datasets

1000 Genomes
Cloud Storage

MSSNG Autism
Cloud Storage

GCP, other clouds, any data source

Social, Brand, MSL and other data sources

Brandwatch · x-fly°

Data Ingest
Social/Brand

Ingest Social, Brand, MSL and other omnichannel data sources for NLP processing and AI algorithm development

Private Datasets

Omnichannel Data
Cloud Storage

Enhanced Datasets

Translation API

Natural Language API

Google Cloud

Step 2: Algorithm & AI Service Development

Data Scientists and AI developers can work with any notebook or AI platform to develop algorithms, either in GCP or other environments

Data Scientists & AI Developers

Serverless data science notebooks & tooling

Lab Notebooks
Datalab

Vertex AI offers serverless AI/ML model dev, training and publishing, however your dev platform of choice can of course be used

Vertex AI Model Dev

Vertex AI Pipelines

CI/CD container automation connected to GCP, other clouds, any environment

Analytics

Batch Analytics
Dataflow

Online Analytics
BigQuery

Cloud AI

Transparently use Google Vertex AI services along with custom algorithms

Vertex AI

GCP, other clouds, any data source

AI Service Containers
Container Registry

3rd Party published containers / AI services

All AI algorithms are published to containers that can be flexibly ordered, deployed and utilized by developers from any team, on demand

Deployment Automation

Google Cloud

Step 3: AI Publishing, Marketing, Audience Management

Publish AI product

Both customer & 3rd party AI services (such as Google Vision service, AutoML, any others) can also be offered in the catalog, making the AI Hub truly comprehensive and maximally useful and customer-focused

AI Platform automation, pipelines, containers ready to deploy and be consumed on-demand (see steps 1-2)

3rd party or pre-packaged API services offered through portal for internal consumption (Maps API, Translation API, etc..)

Apigee API Product Publishing & Management Platform

AI Hub Portal

Apigee API Platform

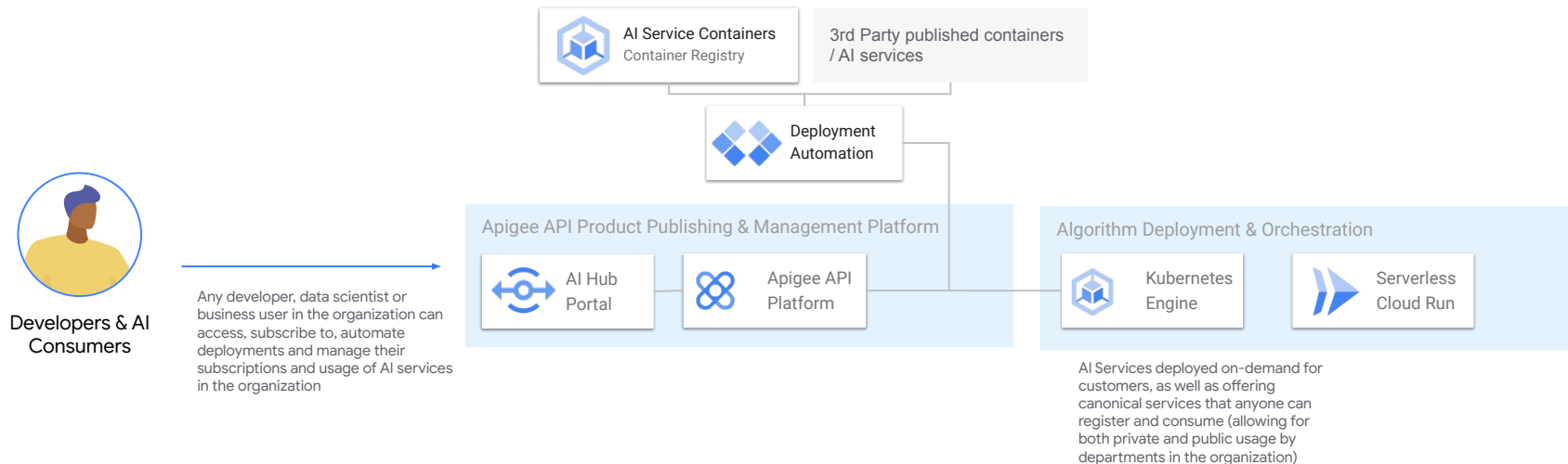**API Analytics**

API Monetization

AI Product Manager

AI Data Product Manager designs and manages the publishing of the products that will offer the AI & data to both internal and external consumers through APIs.

The AI products are modelled in Apigee as API products that developers or other data scientists can register to consume, subscribe to, access and utilize through the AI Hub

AI Product Management always has an overview of usage, consumption, utilization, and where monetization and chargebacks can make sense

Google Cloud

Step 4: AI Service Subscriptions, Consumption, Reuse

AI Service Containers
Container Registry

3rd Party published containers / AI services

Deployment Automation

Developers & AI Consumers

Any developer, data scientist or business user in the organization can access, subscribe to, automate deployments and manage their subscriptions and usage of AI services in the organization

Apigee API Product Publishing & Management Platform

AI Hub Portal

Apigee API Platform

Algorithm Deployment & Orchestration

Kubernetes Engine

Serverless Cloud Run

AI Services deployed on-demand for customers, as well as offering canonical services that anyone can register and consume (allowing for both private and public usage by departments in the organization)

Google Cloud

Overview: AI Data Hub for maximum collaboration and re-use of AI services

Data Producing Devices / Ingestion

Data Scientists = AI & Data Publishers

Business / Devs in the Organization = AI & Data Consumers

Google Cloud

Data Ingest — Genomics

Ingest private as well as public datasets for AI algorithm development

Private Datasets
Patient Data — Cloud Storage

Public Datasets
1000 Genomes — Cloud Storage

MSSNG Autism — Cloud Storage

Analytics
Batch Analytics — Dataflow

Online Analytics — BigQuery

Cloud AI
Transparently use Google Vertex AI services along with custom algorithms

Vertex AI

Serverless data science notebooks & tooling

Lab Notebooks — Datalab

Algorithm Deployment Automation

AI Product Publishing / Consumption Platform
AI Hub Portal

Apigee API Platform

Algorithm Deployment & Orchestration
Kubernetes Engine

Serverless Cloud Run

Orchestrate, access, provision AI services on-demand

On-Prem / Other cloud AI & data services

Consistent APIs & management across all clouds & environments

The AI Hub Portal is the one-stop shop for AI services in the organization - encouraging re-use, collaboration & innovation in a managed way

AI Product Manager
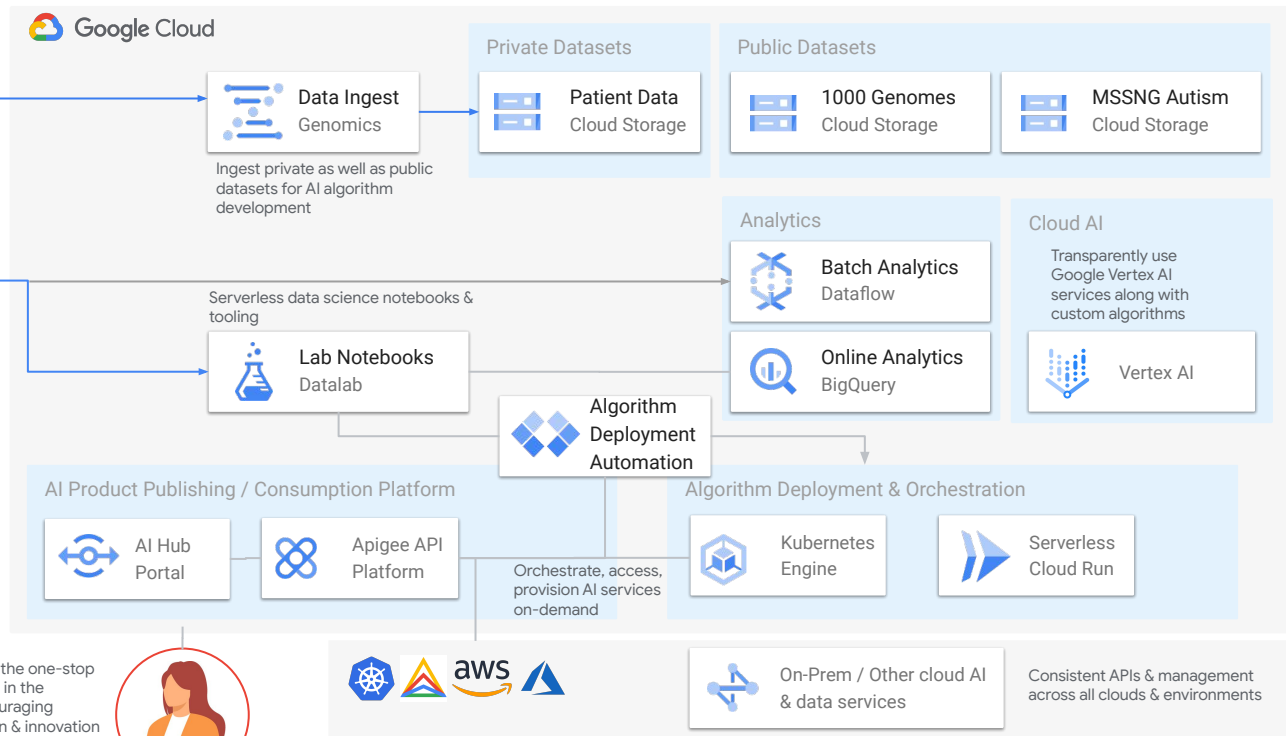
Google Cloud

Connecting Data to No-Code Apps with AppSheet

AppSheet enables rapid app development

AppSheet is a no-code platform that enables organizations to develop and launch applications at scale

IDEA → PROJECT SPEC → DEV TEAM → CODE → **SOLUTION**

NO-CODE, INTENT-DRIVEN, INTELLIGENT PLATFORM

AppSheet enables anyone to create apps fast with no-code

1. Connect your data

2. Customize your app

3. Deploy your app

Google Cloud

AppSheet makes it easy for IT to manage citizen development

No-Code

Eliminate the risk of rogue code and empower an innovative workforce with 10x faster development cycles

Visibility

Gain clear visibility into your organization's challenges and solutions and minimize shadow IT groups

Control

Set guardrails for your organization such as security, privacy, and governance policies

Google Cloud

AppSheet connects to your data

Spreadsheets

Google Sheets and Forms

Excel on Office365

Excel on Dropbox

Excel on OneDrive

Excel on Box

Databases

SQL Server

mySQL

PostgreSQL

AWS DynamoDB

APIs and other platforms

Apigee

Smartsheet

Salesforce

AI-powered authoring, apps & automation

- Collect & manage data
- Automate processes
- Share insights

Cross-Platform

Image Capture

Offline Access

Notifications

Signature capture

Reports

Easy logic
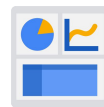
Dashboards

Barcode Scanning

Locations & Maps

AI Models

Integrations

Standardizing on AppSheet: How it works

Governance

App Users

Applications

App Creators
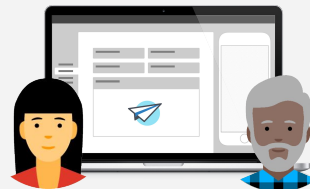
Data

Use-case opportunities

Field Service	Inventory Management	Inspections & Audits	Project Management	Human Resources	Sales & Marketing

Field Service
- Driver Dispatch & Logistics
- On-site Services
- Field Resource Management

Inventory Management
- Inventory Tracking
- Warehouse Automation
- Asset Mgmt

Inspections & Audits
- Quality Control
- Facilities & Maintenance
- Safety Inspections

Project Management
- Project Mgmt
- Worker Management
- Budget Planning & Tracking

Human Resources
- Onboarding & Training
- Team Approval Workflows
- Timesheets

Sales & Marketing
- Customer Tracker
- Event Mgmt
- Proposal Generators

AppSheet is a Leader in Low Code Development

FORRESTER®

"**AppSheet has the most aggressive strategy and road map for empowering business people as developers**.

The vendor is dedicated to software creation without any coding, and it shows in a stellar startup experience and **strong features for mobile app development, data design, application scaling**, and documentation generation, as well as in its commercial model and growth rate.

Reference **customers were highly satisfied** with the product's mobile features and rate of innovation."

	Challengers	Contenders	Strong Performers	Leaders

Stronger current offering

- Caspio
- FileMaker
- Quick Base
- AppSheet
- TrackVia
- Kintone
- Zudy
- Betty Blocks
- Scopeland Technology
- TIBCO Software
- Kissflow
- Airtable

Weaker current offering

Weaker strategy → Stronger strategy

Market presence*
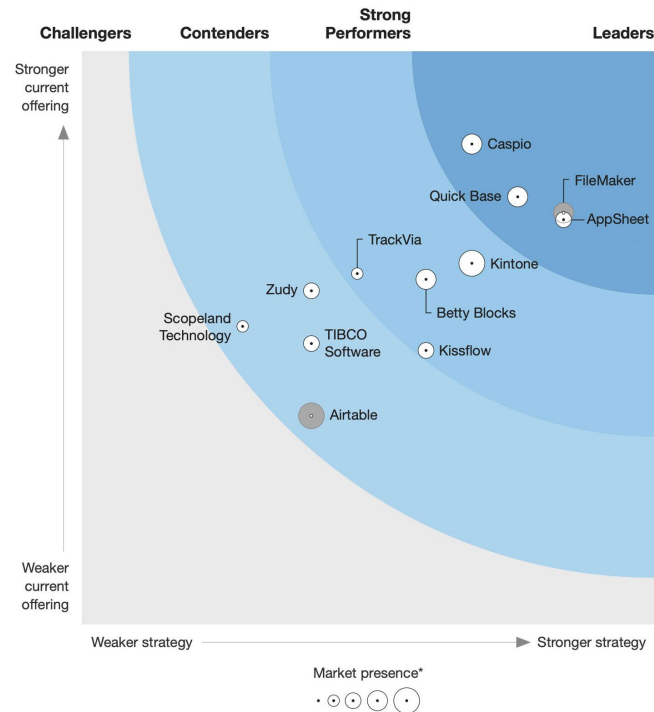
*A gray bubble indicates a nonparticipating vendor.

Download the Forrester Wave™: Low-Code Platforms for Business Developers, Q2 2019 here

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Platform demonstration

1. Connect data

2. Customize functionality

3. Use cross-platform
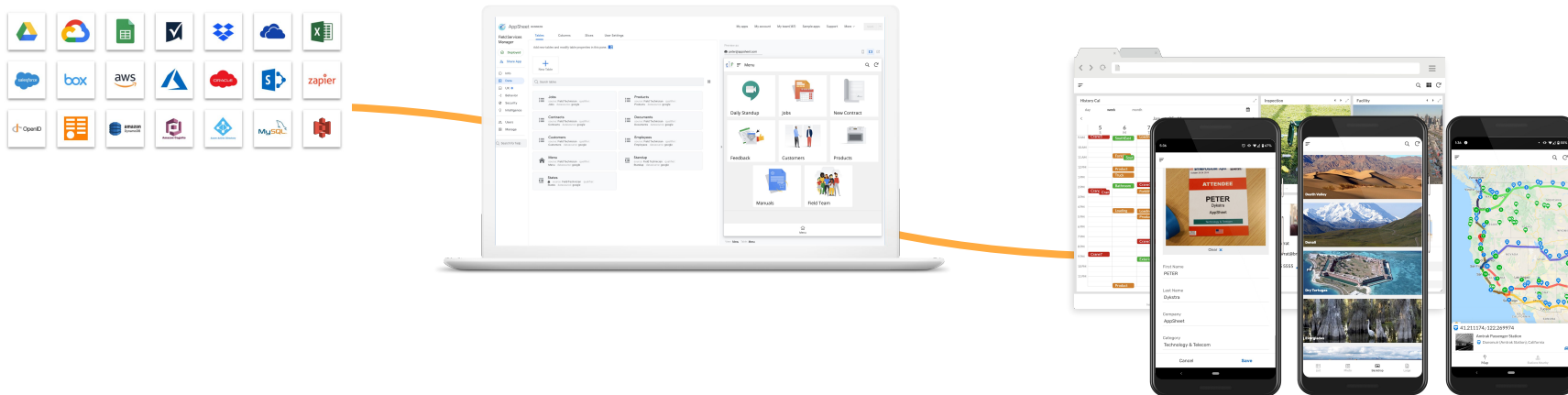
Community and Resources

Active user's community

Collection of sample apps

YouTube video library

Detailed product documentation

Thank you.

Google Cloud