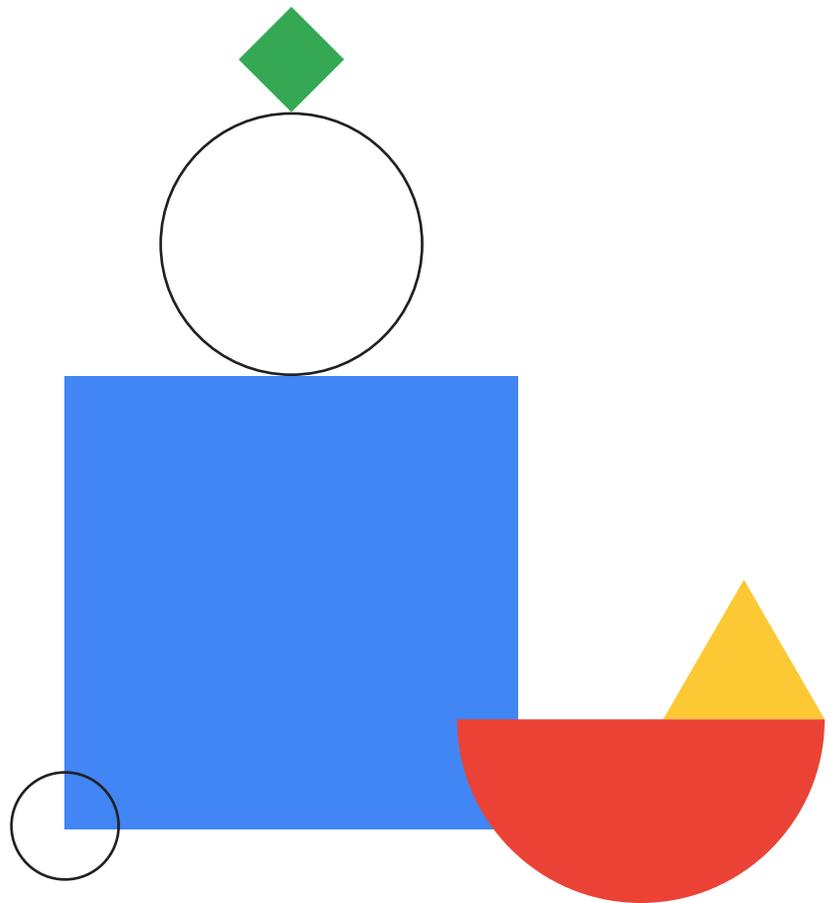


# Cloud Digital Leader Study Guide

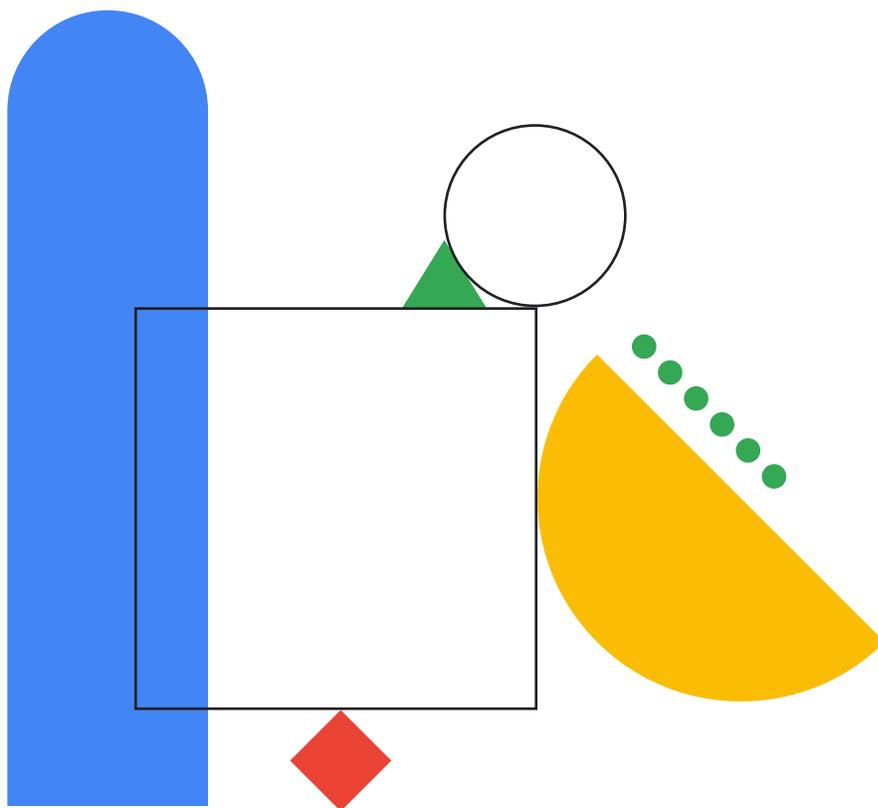


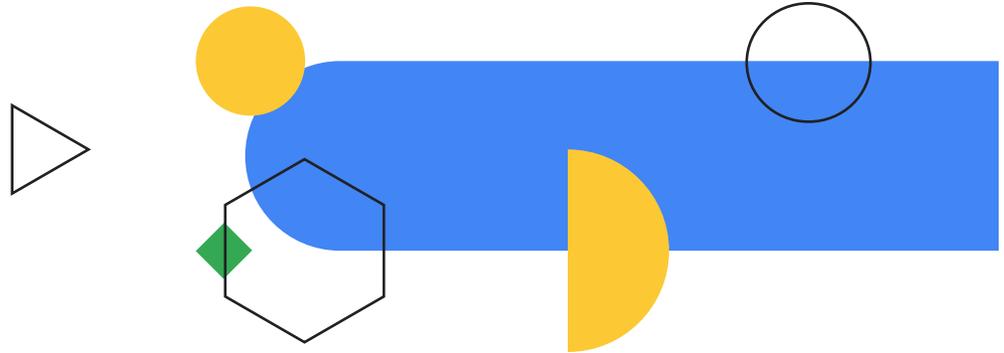
# Introduction

The Google Cloud Digital Leader training and exam are intended for tech-adjacent individuals who want to demonstrate an overall knowledge of cloud technology concepts and Google Cloud.

The exam validates a candidate's ability to complete the following course objectives:

- Recall fundamental cloud terminology
- Identify Google Cloud products and solutions that support digital transformation
- Explain how cloud technology and data can be leveraged to innovate within organizations
- Explain infrastructure and application modernization with Google Cloud
- Describe contributing factors to the success of cloud operations and security





## Learn more about the exam

A Cloud Digital Leader can distinguish and evaluate the various capabilities of Google Cloud core products and services and how they can be used to achieve desired business goals. A Cloud Digital Leader is well-versed in fundamental cloud concepts and can demonstrate a broad application of cloud computing knowledge in a variety of applications.

The Cloud Digital Leader exam is job-role independent. The exam assesses the knowledge and skills of any individuals who want (or are required to) understand the purpose and application of Google Cloud products.

The Cloud Digital Leader exam assesses knowledge in four areas:

- General cloud knowledge (approximately 10% of the exam)
- Innovating with data and Google Cloud (approximately 30% of the exam)
- Modernizing infrastructure and applications with Google Cloud (approximately 30% of the exam)
- Understanding Google Cloud security and operations (approximately 30% of the exam)

Sign up for the Cloud Digital Leader Learning Path via [Google Cloud Skills Boost](#), [Coursera](#) or [Pluralsight](#).

Prepare for the exam with [sample questions](#).

Learn more about how and where to take the exam on the [Cloud Digital Leader website](#).

# Outline of learning path content

\*For learners who have taken Google Cloud's instructor-led training the terminology differs slightly, each course listed here refers to one module, and each module refers to a lesson.



## Course 1

### Introduction to Digital Transformation with Google Cloud

**Module 1:** Why cloud technology is revolutionizing business

**Module 2:** Digital transformation with Google Cloud

**Module 3:** Scaling the innovation mindset

1 0 1 0 0 1 1 1  
0 1 1 0 1 1 1 0

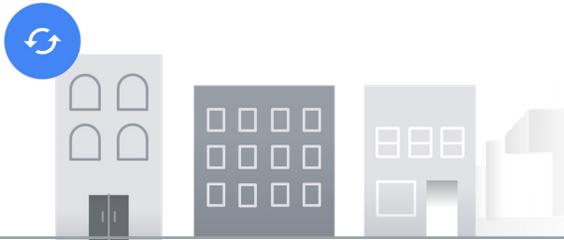
## Course 2

### Innovating with Data and Google Cloud

**Module 1:** The value of data

**Module 2:** Data consolidation and analytics

**Module 3:** Innovation with machine learning



### Course 3

## Infrastructure and Application Modernization with Google Cloud

**Module 1:** Modernizing IT infrastructure with Google Cloud

**Module 2:** Modernizing applications with Google Cloud

**Module 3:** The value of APIs



### Course 4

## Understanding Google Cloud Security and Operations

**Module 1:** Financial governance in the cloud

**Module 2:** Security in the cloud

**Module 3:** Monitoring cloud IT services and operations

# Course 1: Introduction to Digital Transformation with Google Cloud

## Module 1: Why cloud technology is revolutionizing business

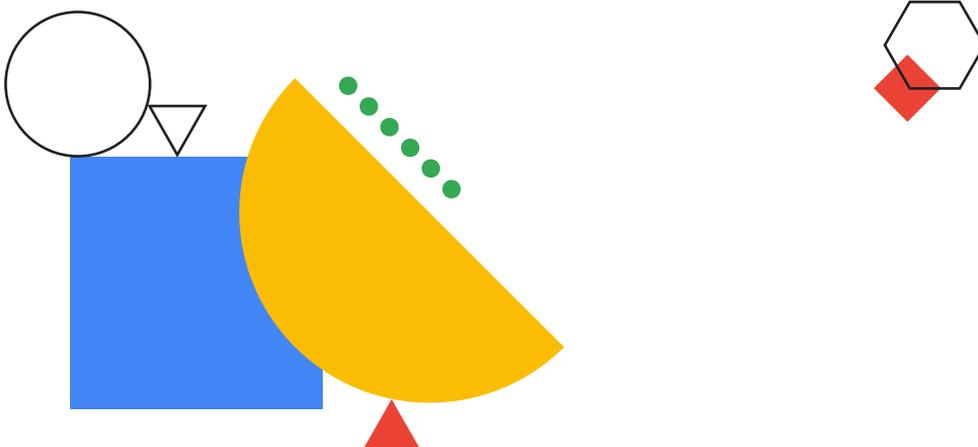
This module covers innovations throughout history that led to paradigm shifts, and looks at how cloud technology is enabling a new wave of digital transformation. It breaks down the trends in compute power and data processing capabilities. It also demonstrates how cloud computing uses industrial-scale compute power and vast amounts of data to create exponential value for businesses.

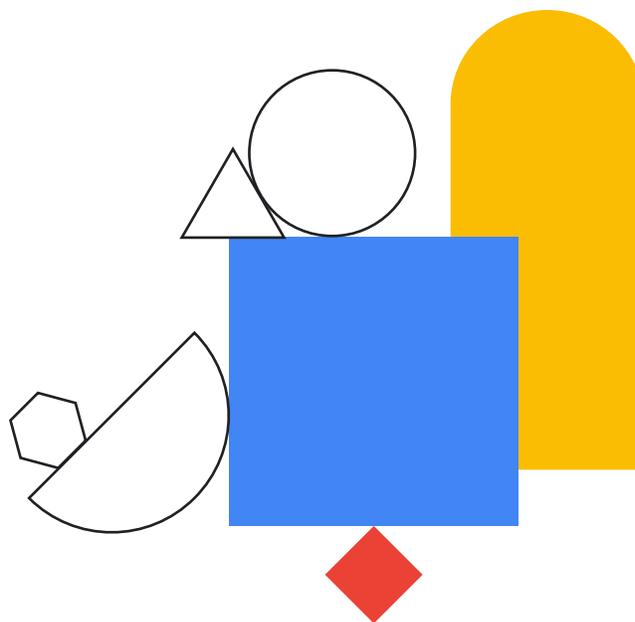
## Module 2: Digital transformation with Google Cloud

This module explores the business and technical considerations that organizations need to consider as they adopt the cloud. It addresses traditional IT infrastructure challenges and looks at how businesses should think about modernization. It explores the nature and history of company-wide applications. It explains the importance of data and touches on critical security considerations that must be built into an organization's cloud adoption journey. Finally, it gives an overview of Google Cloud Solutions for digital transformation.

## Module 3: Scaling the innovation mindset

This module discusses culture change. It explores six focus areas that are essential to transforming culture. It covers three rules that help organizations scale the innovation mindset and applies them to real-world examples from the banking industry. It also covers some questions to help reframe the way you approach your work and to demonstrate how you can adopt an innovative mindset.





## Key terms:

Cloud, cloud technology, compute power, computing, data, innovation

## Focus areas for the exam:

- The difference between cloud technology and traditional or on-premises technology
- How customer expectations have changed as a result of cloud technology
- The business and technical considerations that organizations need to think about when adopting cloud technology

## Additional reading:

[What is cloud computing?](#)

[What is digital transformation?](#)

[Cloud computing 101:](#)

[Frequently asked questions](#)

[What is Infrastructure as a Service \(IaaS\)?](#)

[Google Cloud products list page](#)

[Google's Guide to Innovation](#)

[Google Cloud Adoption Framework](#)

[Impact Study](#)

[Managing Change in the Cloud](#)

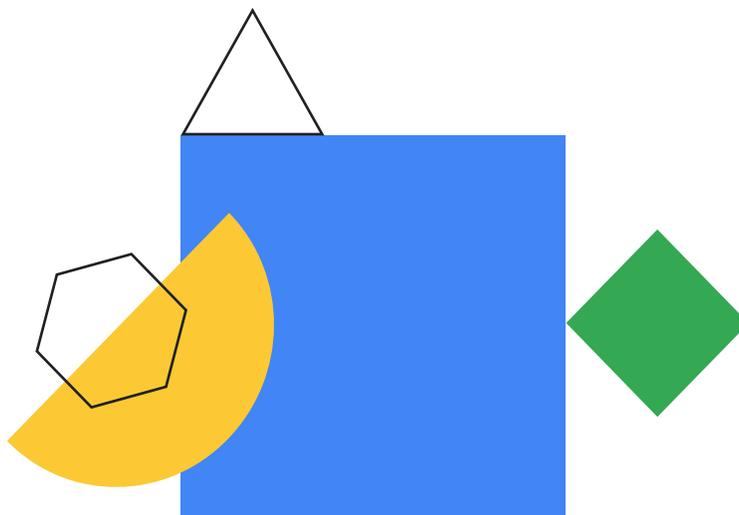
[Cloud Customer Case Studies](#)

[Google Cloud whitepapers](#)

[Cloud locations](#)

[Google Cloud infrastructure](#)

[\(interactive web tool\)](#)



# Course 2: Innovating with Data and Google Cloud

## Module 1: The value of data

This module answers key questions about the nature of data and its role in a business' digital transformation. It discusses how data can be leveraged in an organization, breaks down the different types of data, and covers some important data considerations for every business using data in the cloud.

## Module 2: Data consolidation and analytics

This module compares traditional data management methods with the benefits of migrating data to the Cloud. It defines key terms related to data management and covers some use cases and applicable Google Cloud solutions. It also explores business intelligence solutions that enable businesses to gain insight into their data.

## Module 3: Innovation with machine learning

This module defines machine learning (ML) and artificial intelligence (AI). It covers some important data quality considerations that influence the efficacy of ML models. It also highlights several real-world use cases in which customers have leveraged ML to radically transform their business.

## Key terms:

Data, data management, structured data, unstructured data, databases, data warehouses, data lakes, artificial intelligence (AI), machine learning (ML), data coverage, data cleanliness/consistency, data completeness

## Focus areas for the exam:

- How cloud technology enables data to be applied in new ways
- The benefits of storing and managing data in the cloud
- Appropriate use cases for data solutions
- How Google Cloud data products create business insights
- The importance of data quality in ML

## Additional reading:

[What is a data lake?](#)

[What is a data warehouse?](#)

[What is streaming analytics?](#)

[What is business intelligence?](#)

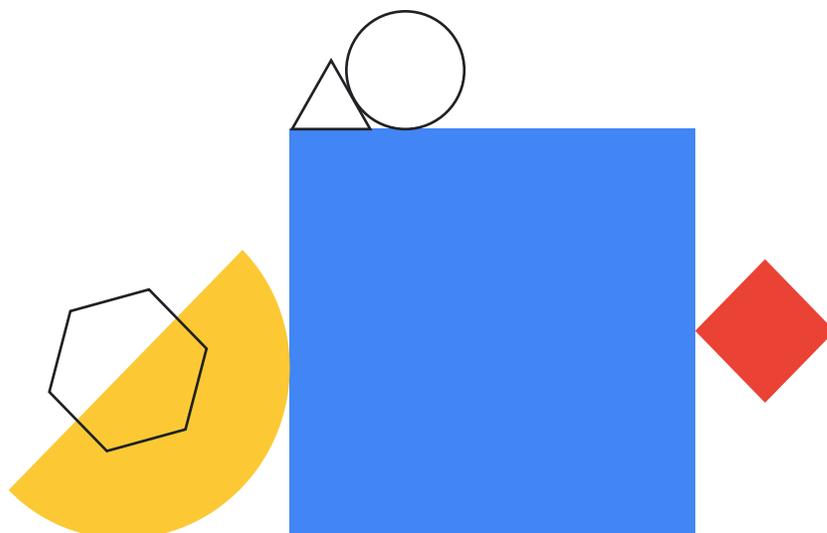
[Build a modern, unified data analytics platform with Google Cloud](#)

[Principles and best practices for data governance in the cloud](#)

[What is machine learning?](#)

[Google Cloud's AI Adoption Framework](#)

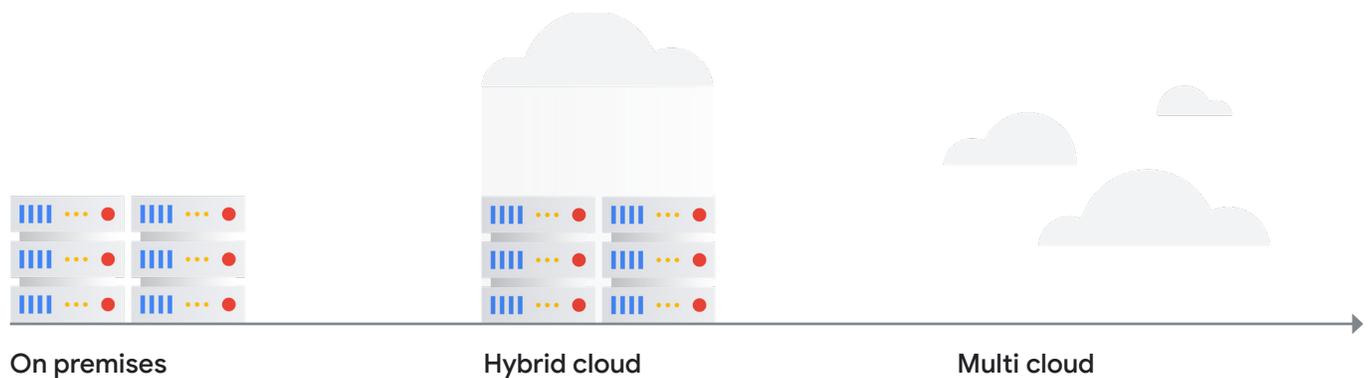
[Google Cloud Responsible AI](#)



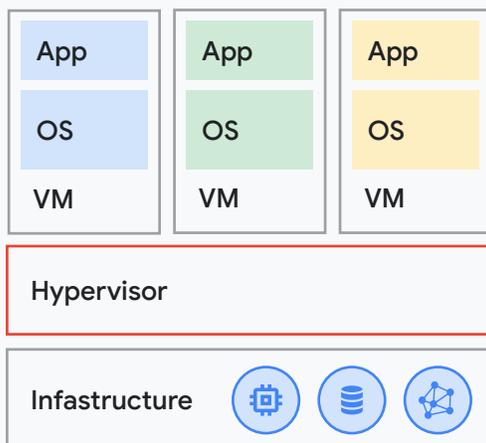
# Course 3: Infrastructure and Application Modernization with Google Cloud

## Module 1: Modernizing IT infrastructure with Google Cloud

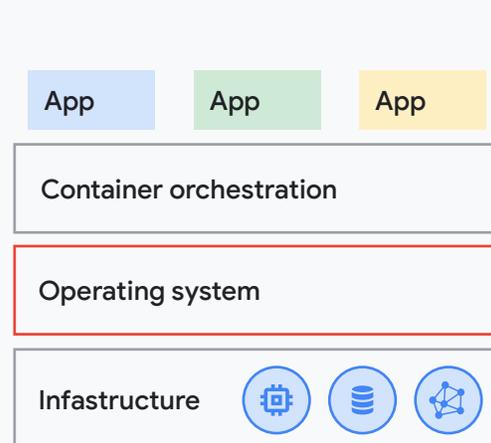
This module covers the challenges of an outdated IT infrastructure and outlines how businesses can modernize IT using cloud technology. The course begins by exploring the different compute options available in the cloud and the benefits of each. Different Google Cloud solutions are presented, including Compute Engine, Bare Metal and Google Kubernetes Engine, along with examples of customers who have successfully used them.



### Virtual Machines



### Containers

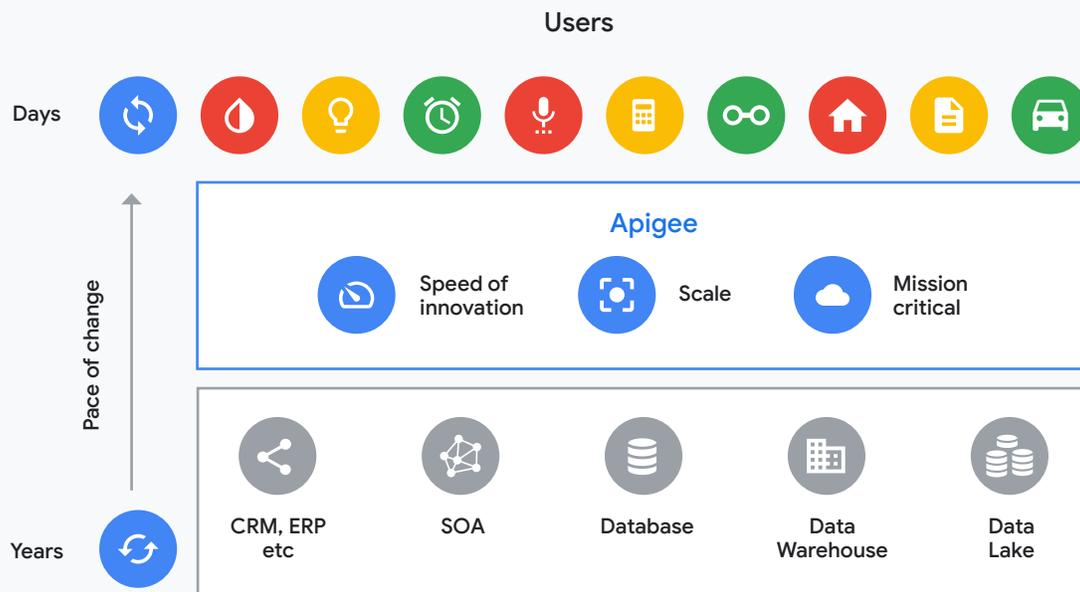
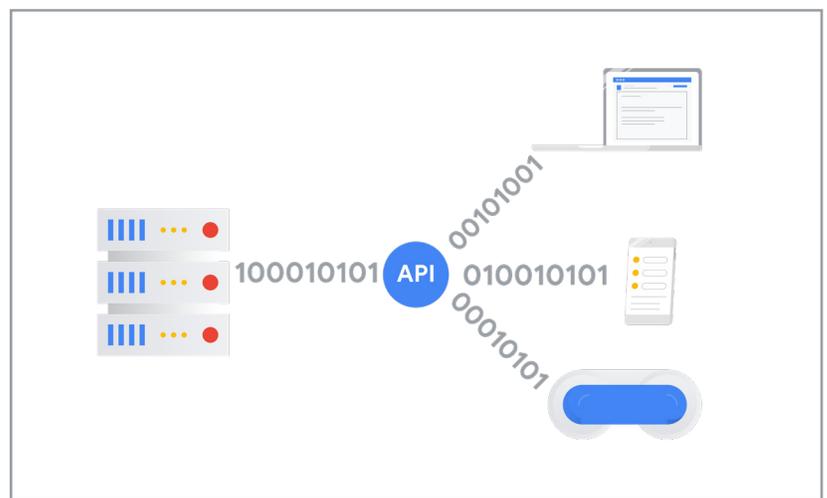


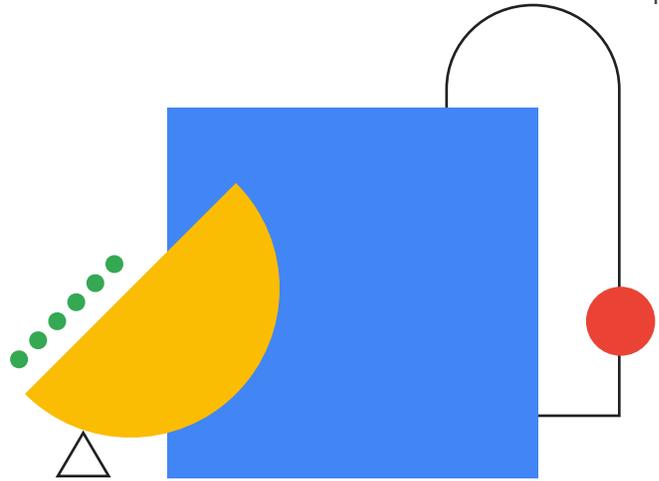
### Module 2: Modernizing applications with Google Cloud

This module explores application modernization and common patterns of moving applications to the cloud such as the greenfield strategy. Multiple examples demonstrate how cloud technologies such as App Engine enables businesses to develop, deploy, and update applications with speed, security, and agility.

### Module 3: The value of APIs

This module covers Application Programming Interfaces (APIs) and how they unlock value from legacy systems, enabling businesses to create new value by making more services to connect to customers. It also explores how Apigee and API management systems address application development gaps.





## Key terms:

Infrastructure modernization, hybrid cloud, multi-cloud, virtual machines, containers, serverless computing, applications, APIs

## Focus areas for the exam:

- The benefits of modernizing infrastructure with cloud technology
- The difference between different architectures and compute options
- Google Cloud solutions for infrastructure modernization and application modernization
- The benefits of cloud-native applications and change patterns
- How APIs modernize legacy systems and create new business value
- The benefits of Apigee

## Additional reading:

[Google Cloud overview](#)

[Google Cloud geography and regions](#)

[Best practices for enterprise organizations](#)

[Google Cloud setup checklist](#)

[What are containers?](#)

[What is hybrid cloud?](#)

[What is a virtual machine?](#)

[What is object storage?](#)

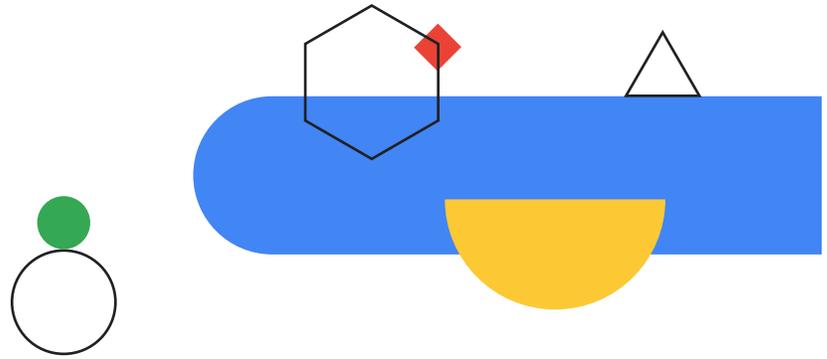
[Migrate workloads to the public cloud: an essential guide & checklist](#)

[Where should I run my stuff? Choosing a Google Cloud compute option](#)

[CIO's Guide to Application Migration](#)

[CIO's Guide to Application Modernization](#)

[Google Cloud Networking overview blog](#)



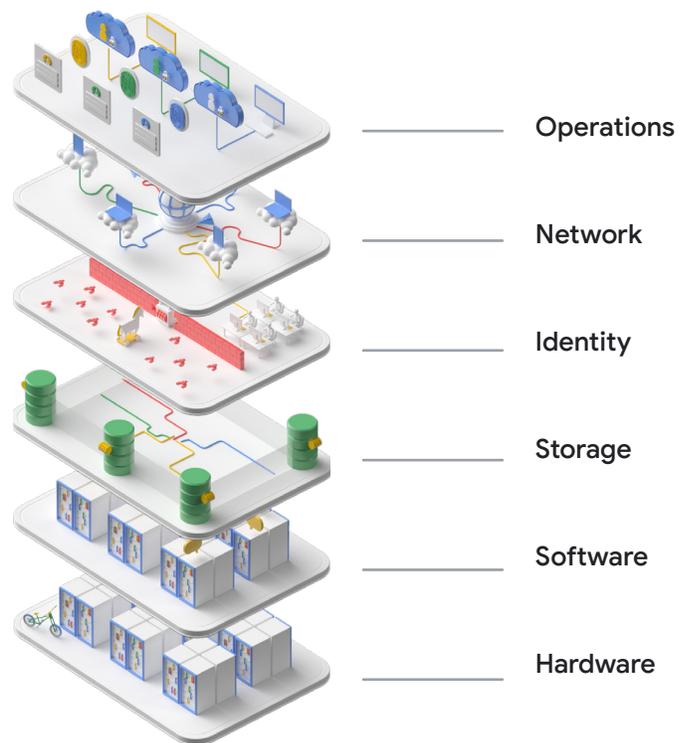
# Course 4: Understanding Google Cloud Security and Operations

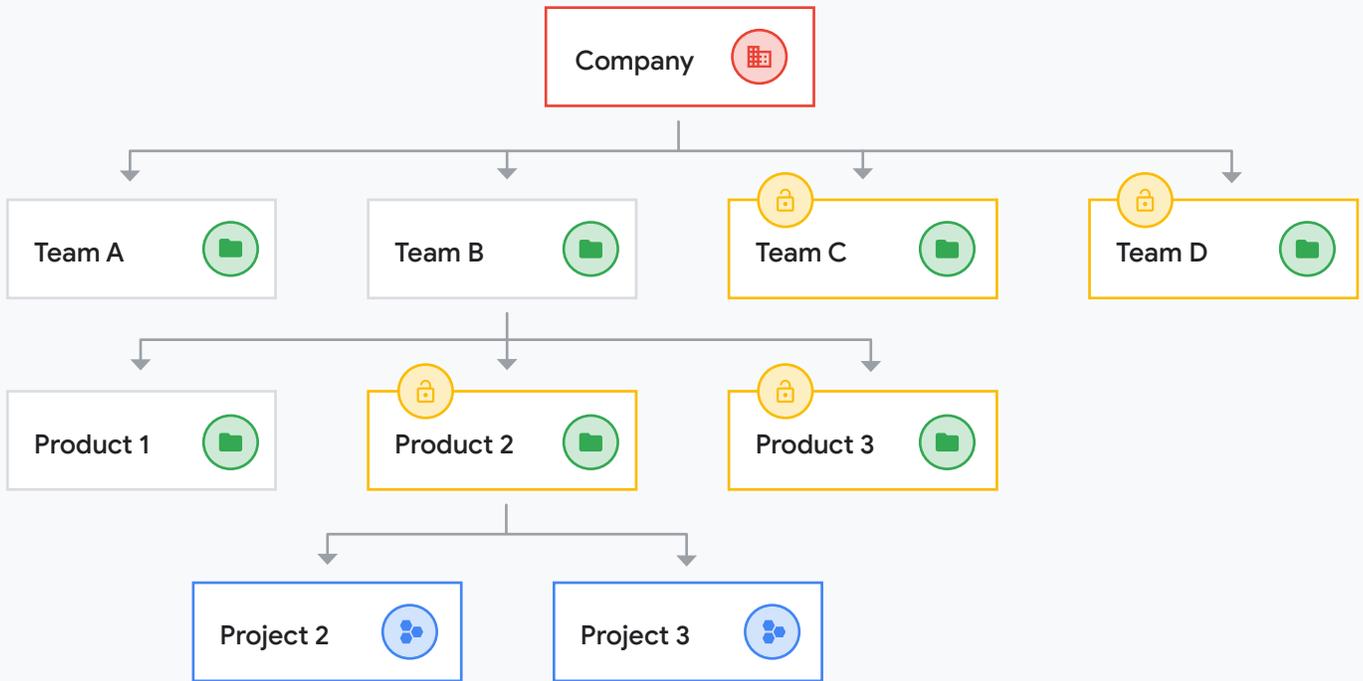
## Module 1: Financial governance in the cloud

This module covers the fundamentals of cloud cost management and outlines how businesses can choose to maintain some (or none) of their own infrastructure by purchasing IT services from a cloud provider on an ongoing basis. It also explores the best practices for managing Google Cloud costs.

## Module 2: Security in the cloud

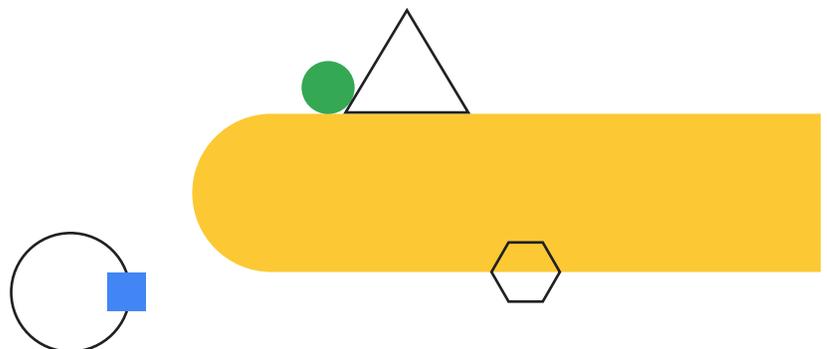
This module examines the shared responsibility model, which refers to how a business that accesses, stores or uses data is responsible for protecting and securing that data alongside the cloud provider. It also looks at the top cyber security threats and the defense-in-depth security built into Google Cloud.

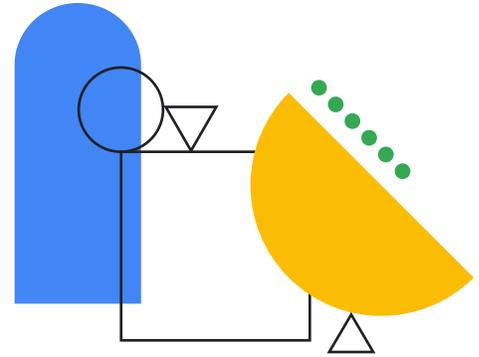




### Module 3: Monitoring cloud IT services and operations

This module discusses how IT teams and business leaders need to rethink IT resource management in the cloud. This includes adjusting expectations to balance service availability and reliability with agile application development, as well as creating a team structure to better serve customers. Finally, the module covers how Google Cloud resource monitoring tools such as Cloud Identity, Cloud Debugger and Cloud Logging can help them to maintain visibility, accountability, control, and intelligence over their cloud environment.





## Key terms:

Total Cost of Ownership (TCO), visibility, accountability, control, intelligence, privacy, availability, security, control, shared responsibility model, resource hierarchy, SLO, SLA, SLI, DevOps, SRE, downtime, monitoring, logging, phishing attack, physical damage, malware and viruses, unsecured third party systems, expert knowledge, data at rest, data in transit, encryption at rest, encryption in transit, zero trust model, least privileged model

## Focus areas for the exam:

- How cloud technology impacts TCO
- Cost management strategies
- Fundamental cloud security terms and top cybersecurity threats
- Security with Google Cloud
- How IT operations need to change in the cloud, including service availability expectations, DevOps and SRE
- Cloud resource monitoring and application performance management

## Additional reading:

[Google Cloud security foundations guide](#)

[Google security](#)

[A guide to financial governance in the cloud](#)

[Google Infrastructure Security Design Overview](#)

[Increasing business value with better IT operations: A guide to site reliability engineering \(SRE\)](#)

[Exploring container security: the shared responsibility model in GKE](#)

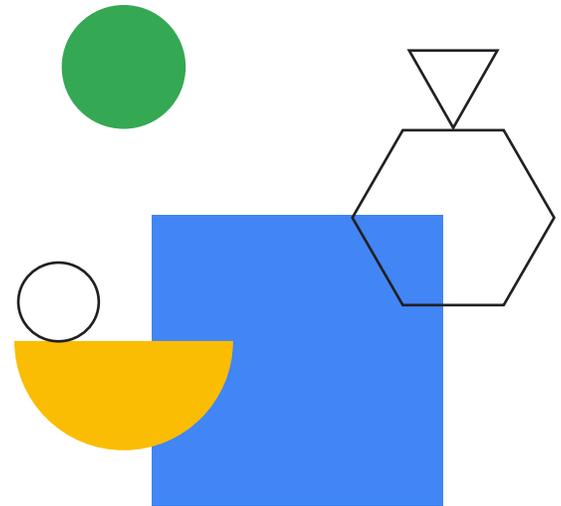
[Resource hierarchy](#)

[AirAsia: adopting a modern identity solution with Google Cloud](#)

[Voyage to the modern workplace](#)

[Encryption at rest in Google Cloud](#)

[Encryption in transit in Google Cloud](#)



# Glossary

## Course 1

**The cloud** – A metaphor for the network of data centers that store and compute information available through the Internet. It includes the complex web of software, computers, networks and security systems involved.

**Cloud technology/computing** – The technology and processes needed to store, manage, and access data that is transferred over the Cloud (as opposed to data that remains on your computer's hard drive).

**Digital transformation** – When an organization takes advantage of new technologies to redesign and redefine relationships with their customers, employees, and partners. Digital transformation uses modern digital technologies—including all types of public, private, and hybrid cloud platforms—to create or modify business processes, culture, and customer experiences to meet changing business and market dynamics.

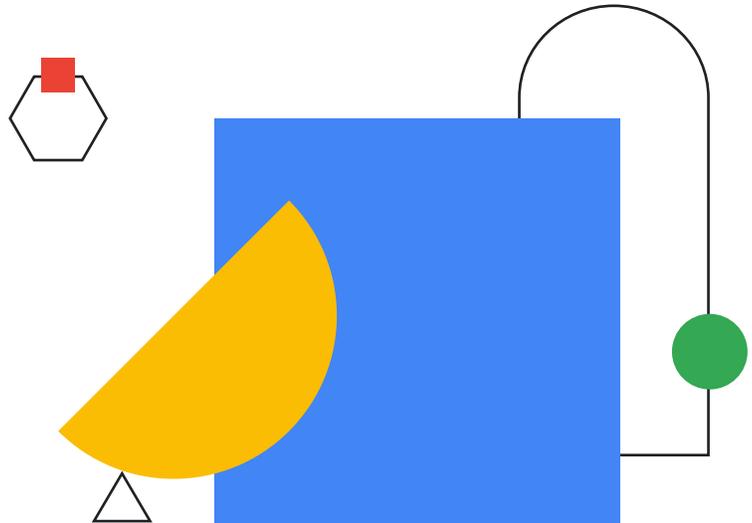
**Computing** – A machine's ability to process, store, retrieve, compare and analyze information, and to automate tasks often done by computer programs (otherwise known as software or applications).

**Compute power** – The speed at which a computer is able to process data.

**Data** – Any information that is useful to an organization. Can be numbers on a spreadsheet, text in an email, audio or video recordings, images, or even ideas in employees' heads. Includes internal and external information.

**Think 10x** – Also 'generating big ideas'. Finding solutions that make improvements by 10 times, rather than 10 percent.

**Launch and iterate** – Also 'continuous learning'. A mindset and a practice where, instead of starting off with a perfect solution, you figure it out through experimentation.



## Course 2

**Data point** – A piece of information (e.g. a customer purchase or return).

**Dataset** – Aggregated data points of one category (e.g. customer transactions).

**Structured data** – Highly organized, quantitative data (e.g. names or credit card numbers). Easily stored and managed in databases.

**Unstructured data** – Data that has no organization and tends to be qualitative (e.g. word processing documents or images). Can be stored as objects, which consist of the data in its native format along with metadata such as unique identifiers.

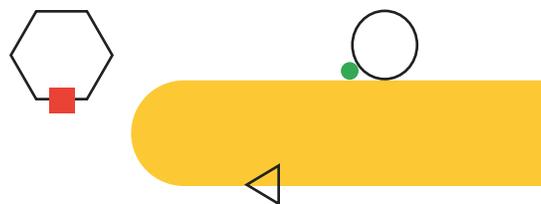
**Object storage** – A data storage architecture for large stores of unstructured data, designating each piece of data as an object (e.g. audio or multimedia files).

**Database** – An organized collection of data generally stored in tables and accessed electronically from a computer system. Built and optimized to enable the efficient ingestion of large amounts of data from many different sources.

**Data integrity** – Also known as transaction integrity, this refers to the accuracy and consistency of data stored in a database.

**Metadata** – Information about objects (e.g. about images or audio).

**Data warehouse** – The central hub for all business data, it assembles data from multiple sources, including databases. When combined with connector tools, it can transform unstructured data into semi-structured data that can be used for analysis. Data warehouses are built to rapidly analyse and report massive and multi-dimensional datasets on an ongoing basis, in real-time.



**Data lake** – A data lake is a repository designed to store, process, and secure large amounts of structured, semistructured, and unstructured data. It can store data in its native format and process any variety of it, ignoring size limits and serves many purposes, such as exploratory data analysis.

**Artificial intelligence (AI)** – A broad field or term that describes any kind of machine capable of a task that normally requires human intelligence, such as visual perception, speech recognition, decision-making, or translation between languages.

**Machine learning (ML)** – A branch within the field of AI. Computers that can “learn” from data and make predictions or decisions without being explicitly programmed to do so, using algorithms or models to analyze data. These algorithms use historical data as input to predict new output values.

## Course 3

**Virtual machines (VM)** – A VM is a virtualized instance of a server that re-creates the functionality of a dedicated physical server. It uses a partitioned space inside a physical server which makes it easy to optimize and reallocate resources and allow multiple systems to run on the same hardware.

**Hypervisor** – The software layer that sits on top of physical hardware. Multiple VMs are built on top of the hypervisor and are enabled by it.

**Container** – Follows the same principle as a VM, providing an isolated environment to run software services and optimize resources from one piece of hardware. Containers are more efficient than VMs because they do not recreate a full representation of the hardware, but only recreate or virtualize the operating system.

**Kubernetes** – An open source cluster management system that provides automated container orchestration.

**Serverless computing** – A cloud computing execution model in which the cloud provider allocates machine resources on demand, taking care of the servers on behalf of their customers. Businesses provide code for the function they want to run and the cloud provider handles all infrastructure management. Resources such as compute power are automatically provisioned behind the scenes as needed.

**Private cloud** – When an organization has virtualized servers in its own data centers to create its own private on-premises environment.

**Hybrid cloud** – When an organization uses some combination of on-premises or private cloud infrastructure and public cloud services.

**Multi-cloud** – When an organization is using multiple public cloud providers as part of its architecture.

**Application (or app)** – A computer program or software that is designed to carry out a specific digital task, typically used or run by an end-user. In this digital age, customers expect applications to be intuitive, well-functioning, and efficient.

**Application programming interface (API)** – A piece of software that interfaces with or connects different applications and enables information to flow between systems. In contrast to a user interface, which connects a computer to a person, an API connects computers or pieces of software to each other. One purpose of APIs is to hide the internal details of how a system works, exposing only those parts a developer wants to allow a user or program to interface with. In this way APIs can help organizations to adapt to modern business needs by allowing access to older legacy systems.

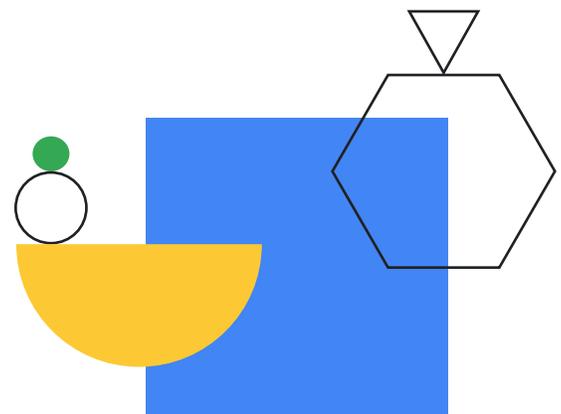
## Course 4

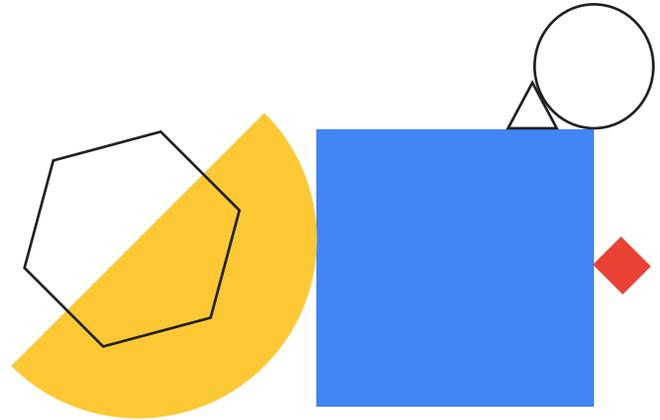
**Total cost of ownership (TCO)** – A comprehensive assessment of all layers within the infrastructure and other associated costs across the business over time. Includes acquiring hardware and software, management and support, communications, and user expenses, and the cost of service downtime, training and other productivity losses.

**Privacy** – The data an organization or an individual has access to, and who they can share that data with.

**Security** – The policies, procedures and controls put in place to keep data and infrastructure safe.

**Availability** – The duration for which the cloud service provider guarantees that client's data and services are up and running or accessible.





**Shared responsibility model** – A model in which the responsibility to secure data is shared between a business and the cloud provider. The cloud service provider is the data processor, while the organization is the data controller.

**Defense-in-depth** – The cloud service provider manages the security of its infrastructure and its data centers, and customers gain the benefits of their infrastructure’s multiple built in security layers.

**Resource hierarchy** – How an IT team can organize a business’s Google Cloud environment and how that service structure maps to the organization’s actual structure. It determines what resources users can access.

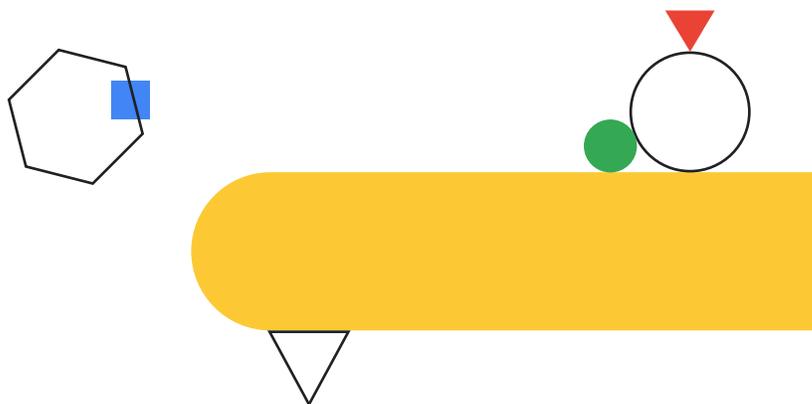
**DevOps** – Developer operations. A philosophy that seeks to create a more collaborative and accountable culture within developer and operations teams. Five objectives of DevOps include reducing silos, accepting failure as normal, implementing gradual change, leveraging tooling and automation and measuring everything.

**SRE** – Site reliability engineering. A discipline that applies aspects of software engineering to operations. The goals of SRE are to create ultra-scalable and highly reliable software systems. Best practices central to SRE align with DevOps objectives.

**Monitoring** – Gathering predefined sets of metrics or logs. Monitoring is the foundation for site reliability engineering because it provides visibility into the performance, uptime, and overall health of cloud powered applications.

**Log file** – A text file where applications (including the operating system) write events. Log files make it easier for developers, DevOps and system administrators to get insights and identify the root cause of issues within applications and the infrastructure.

**Logging** – A process that allows IT teams to analyze selected logs and accelerate application troubleshooting.



# List of Google Products/Solutions

For more information about [Google Cloud products](#)

For more information about [Google Cloud Solutions](#)

Blog: [21 Google Cloud tools, each explained in under 2 minutes](#)

**Cloud SQL** – Google Cloud’s database service (relational database management service)

**Cloud Spanner** – A fully managed Google Cloud database service designed for global scale

**BigQuery** – Google Cloud’s leading data warehouse solution

**Cloud Storage** – Google Cloud’s object storage service for structured, semi-structured and structured data. One of several products used in data lake solutions

**Looker** – Google Cloud business intelligence solution

**Vertex AI** – A unified platform for training, hosting and managing ML models

**TensorFlow** – An end-to-end open source platform for machine learning, with a comprehensive, flexible ecosystem of tools, libraries and community resources, originally created by Google

**Compute Engine** – Virtual machines running in Google’s data center

**VMware Engine** – An engine for migrating and running VMware workloads natively on Google Cloud

**Bare Metal** – Infrastructure to run specialized workloads on Google Cloud

**Google Kubernetes Engine** – An open-source container orchestration system for automating computer application deployment, scaling, and management

**App Engine** – A platform for building scalable web applications and mobile back-ends

**Cloud Run** – A fully managed environment for running containerized apps

**Cloud Functions** – An event-driven compute platform for cloud services and apps

**Apigee API Management** – A platform for developing and managing APIs

**Cost Management** – Tools for monitoring, controlling, and optimizing business costs

**Cloud Identity** – A unified platform for IT administrators to manage user devices and apps

**Cloud Console** – A web-based interface for managing and monitoring cloud apps

**Cloud Monitoring** – A tool monitoring infrastructure and application health with rich metrics

**Cloud Logging** – An audit, platform, and application logs management tool

**Cloud Debugger** – A real-time application state inspection and in-production debugging tool

**Cloud Trace** – A tracing system collecting latency data from applications

**Cloud Profiler** – Continuous CPU and heap profiling to improve performance and reduce costs

