Google Cloud

Student Slides

Infrastructure and Application Modernization with Google Cloud

Modules

01 Modernizing IT Infrastructure with Google Cloud

02 Application modernization

03 Application Programing Interfaces

Google Cloud

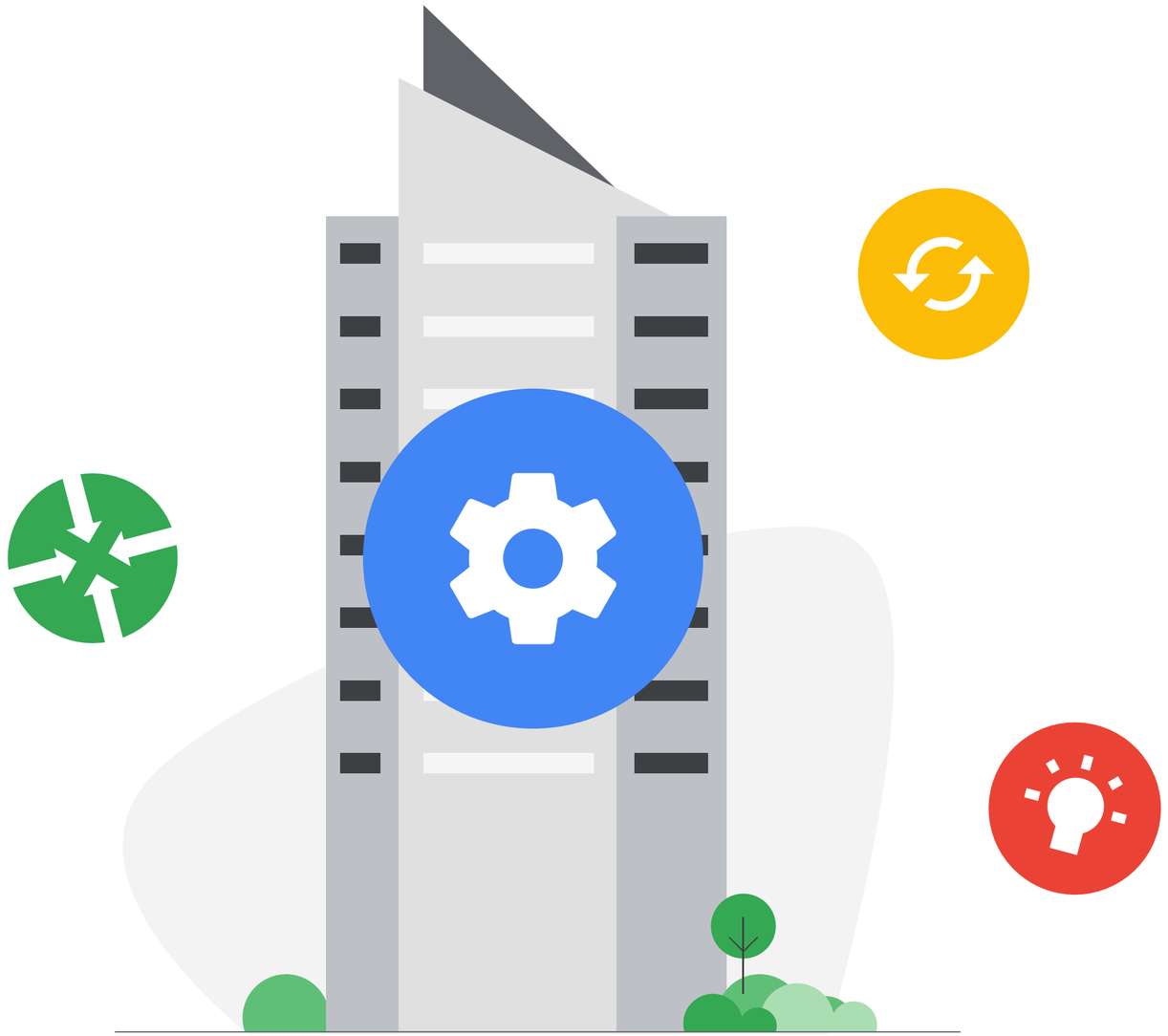
Module 1: Student Slides

Modernizing IT Infrastructure with Google Cloud

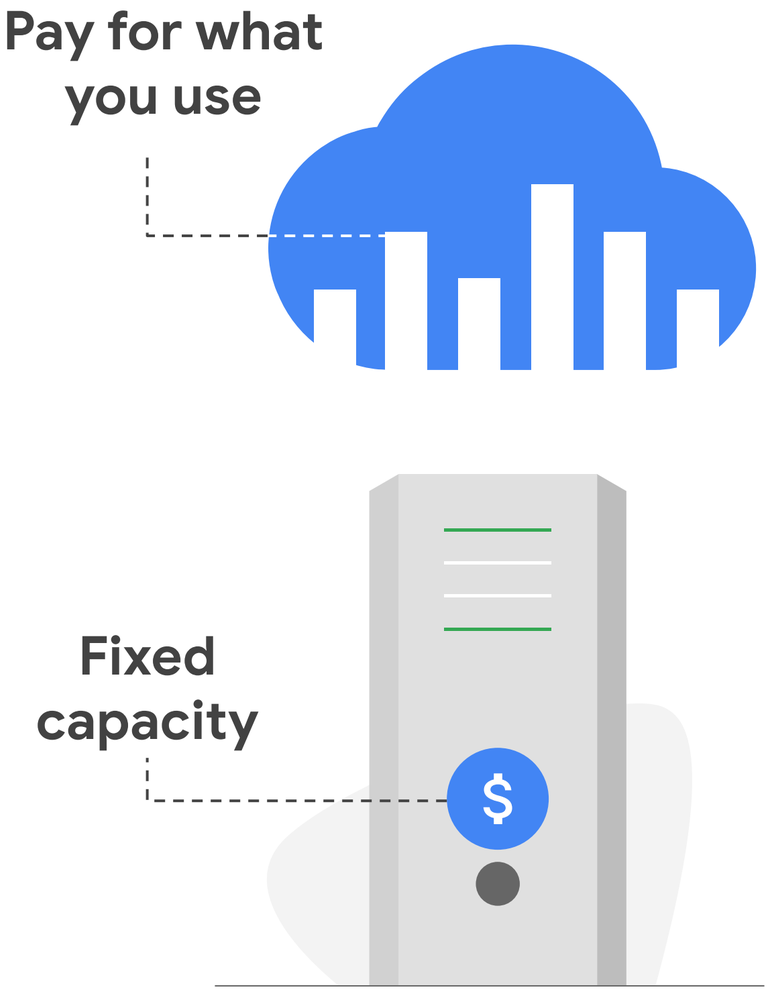
Topics covered

- Modernizing IT infrastructure
- Available compute options
- Private, hybrid and multi-cloud architectures
- Google Cloud global infrastructure
- Google Cloud compute solutions

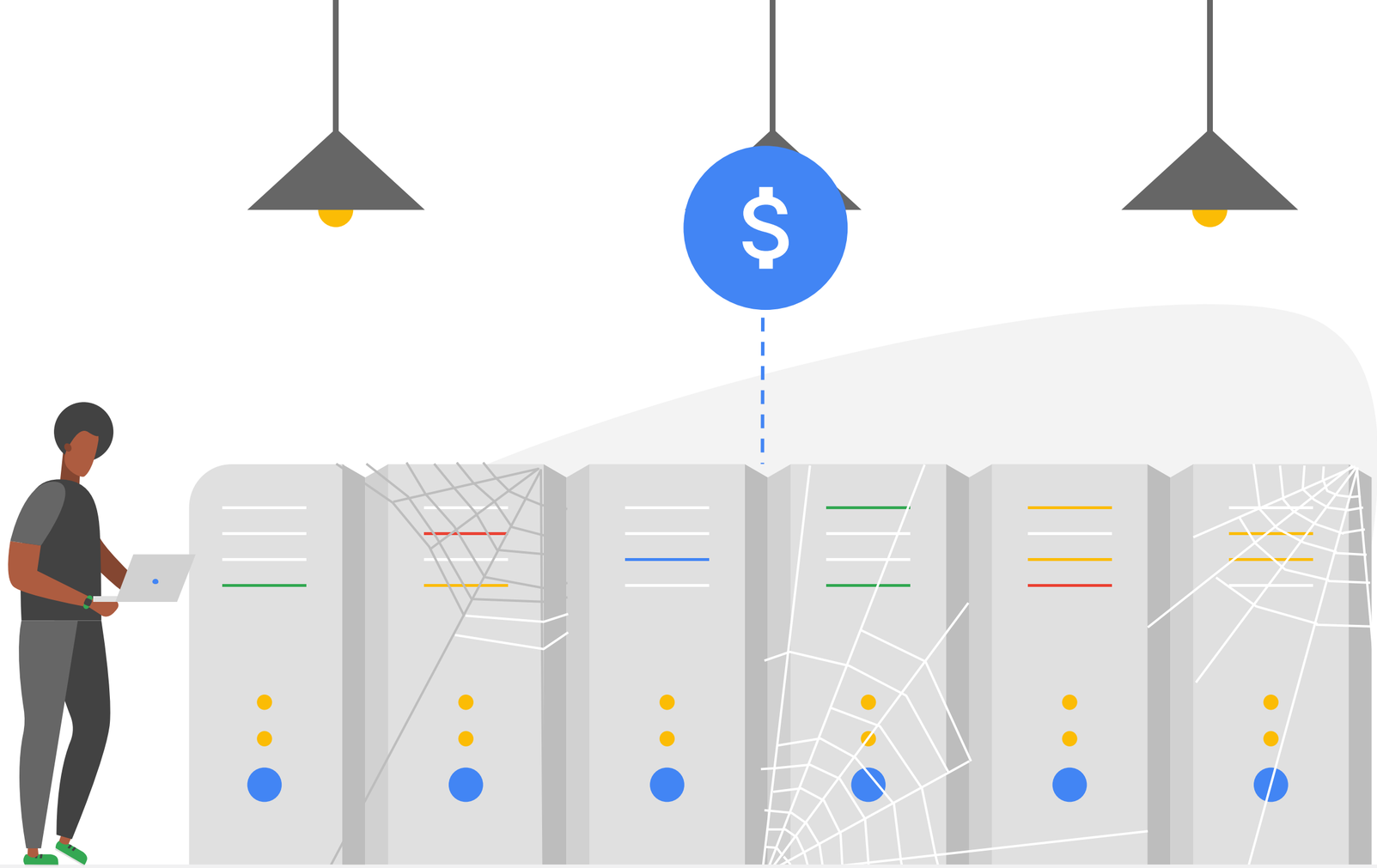
Central to an organization’s ability to thrive in the new era is the way in which they structure and use their IT resources. This could mean moving away from investing resources to run and maintain existing IT infrastructure.



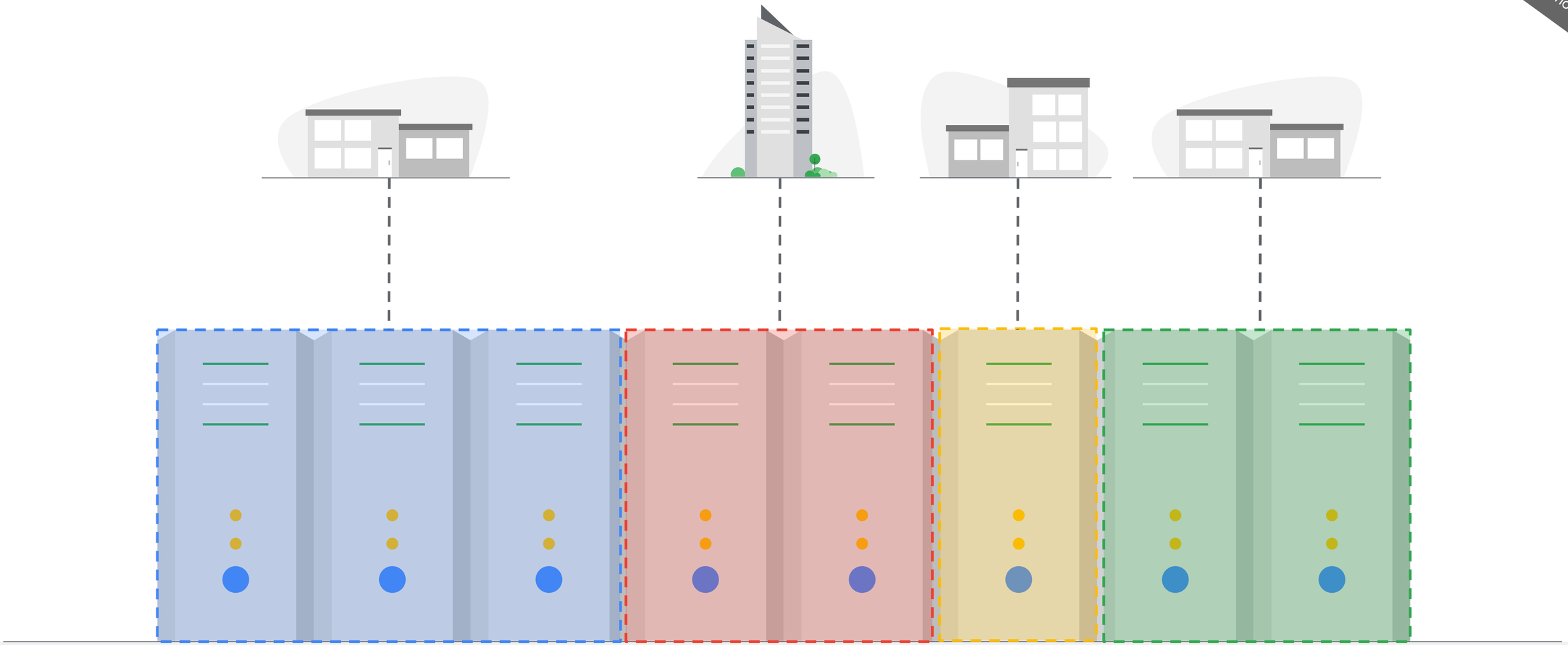
Leveraging cloud technology to truly transform a business requires new collaborative models, changing culture and processes, and enabling team productivity and innovation.



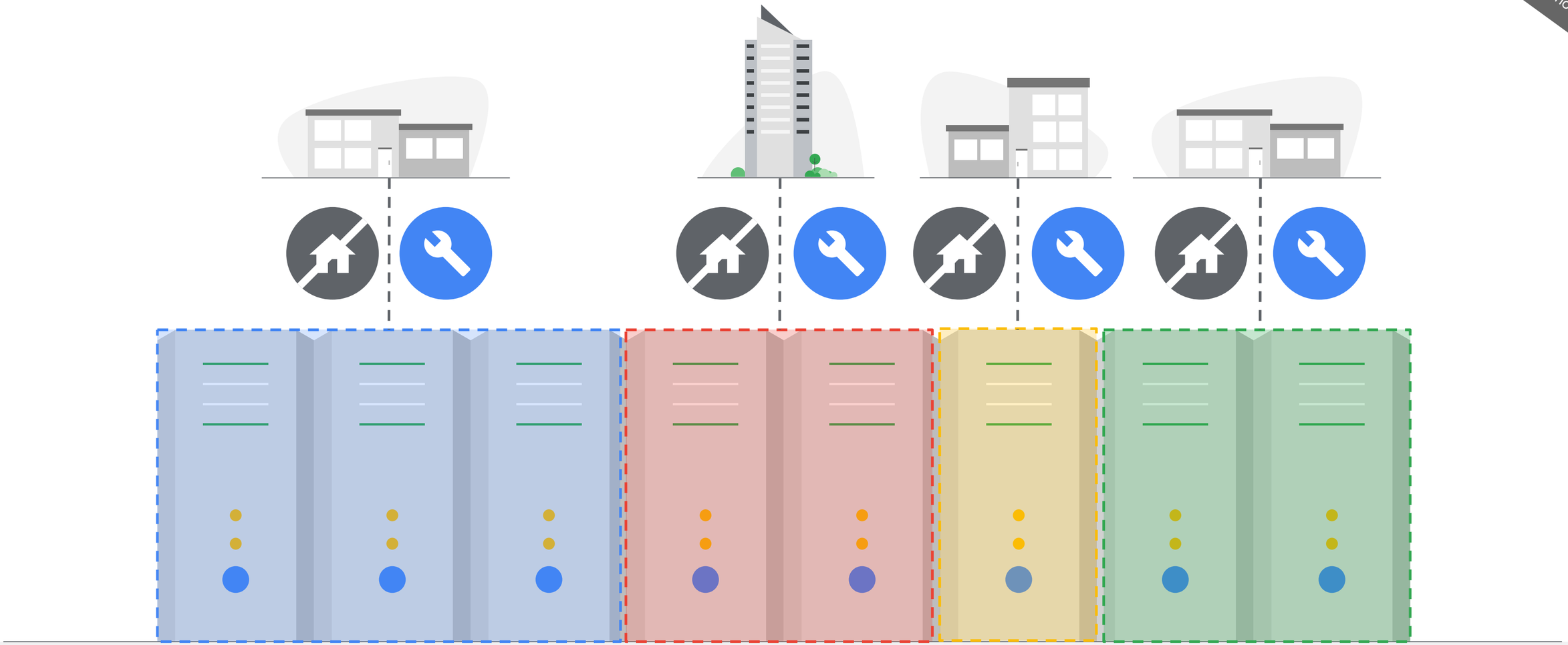
Enterprises are seeing significant financial benefits from adopting cloud, as their approach to IT moves from buying fixed capacity to paying only for what they use.



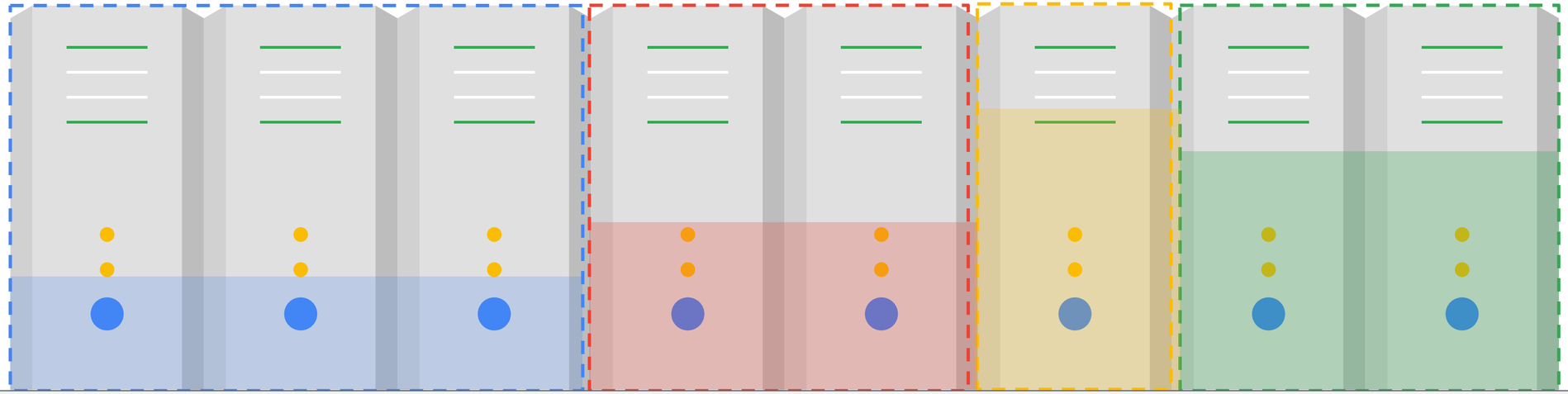
Owning and operating infrastructure limits an organization's staff in several ways: They have to undertake laborious tasks related to infrastructure, they are using legacy systems that are old, and they cannot scale with any ease.



The first step in moving away from an on-premises infrastructure is colocation. A business sets up a large data center and then other organizations rent part of that data center.



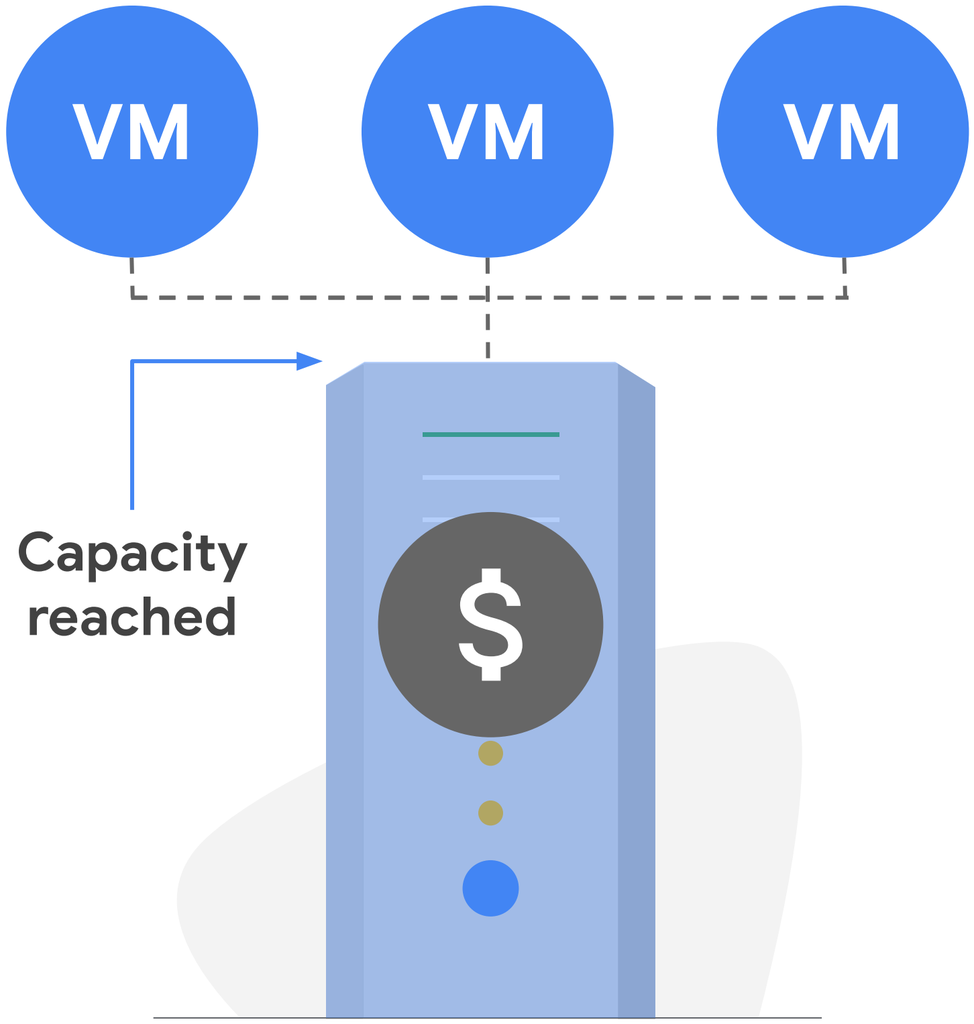
This means organizations no longer have to pay the costs associated with hosting the infrastructure, but they still need to pay to maintain it.



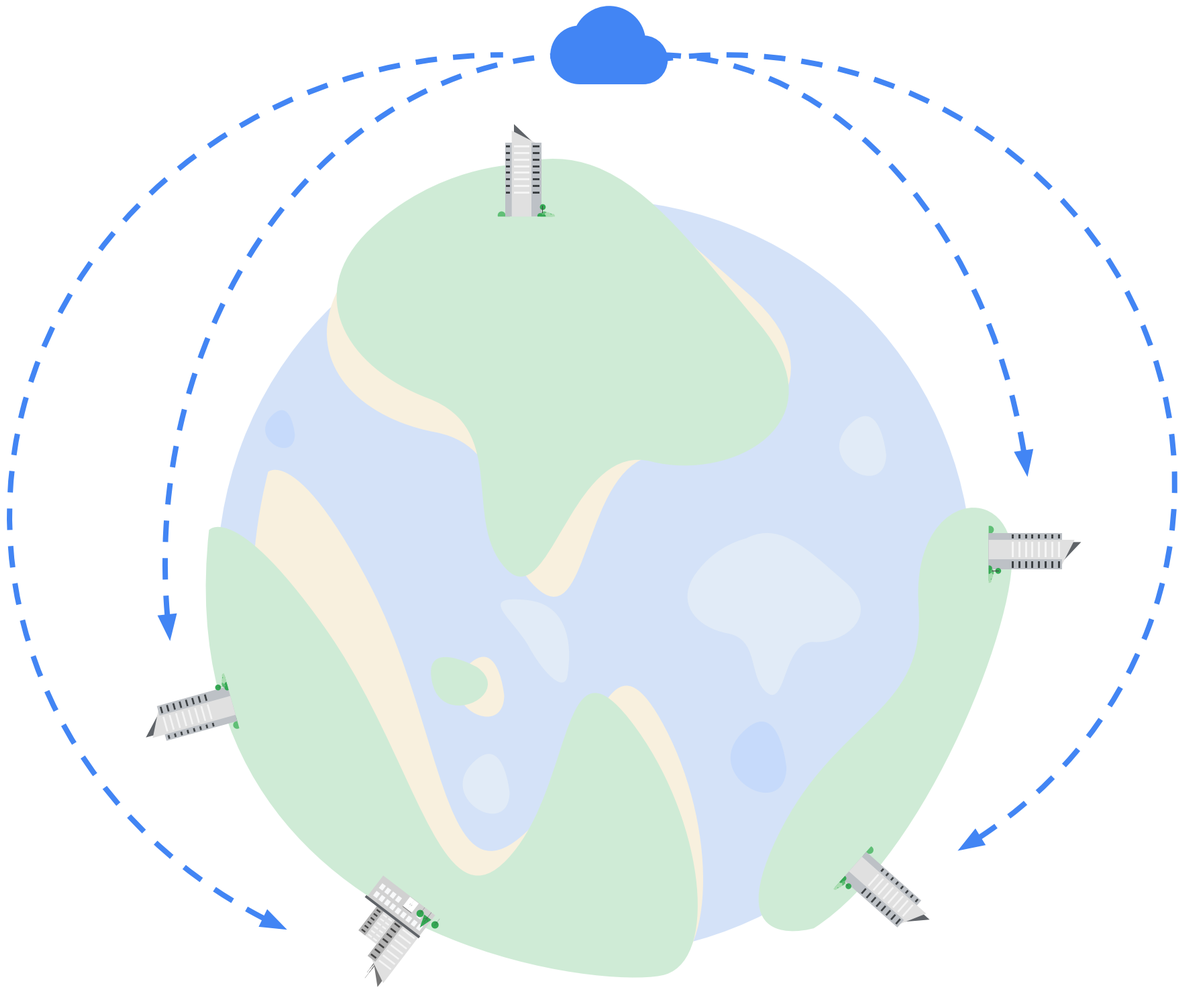
Hardware is often heavily under utilized, even in the colocation model, so engineers packaged applications and their operating systems into a virtual machine.

What are Virtual Machines?

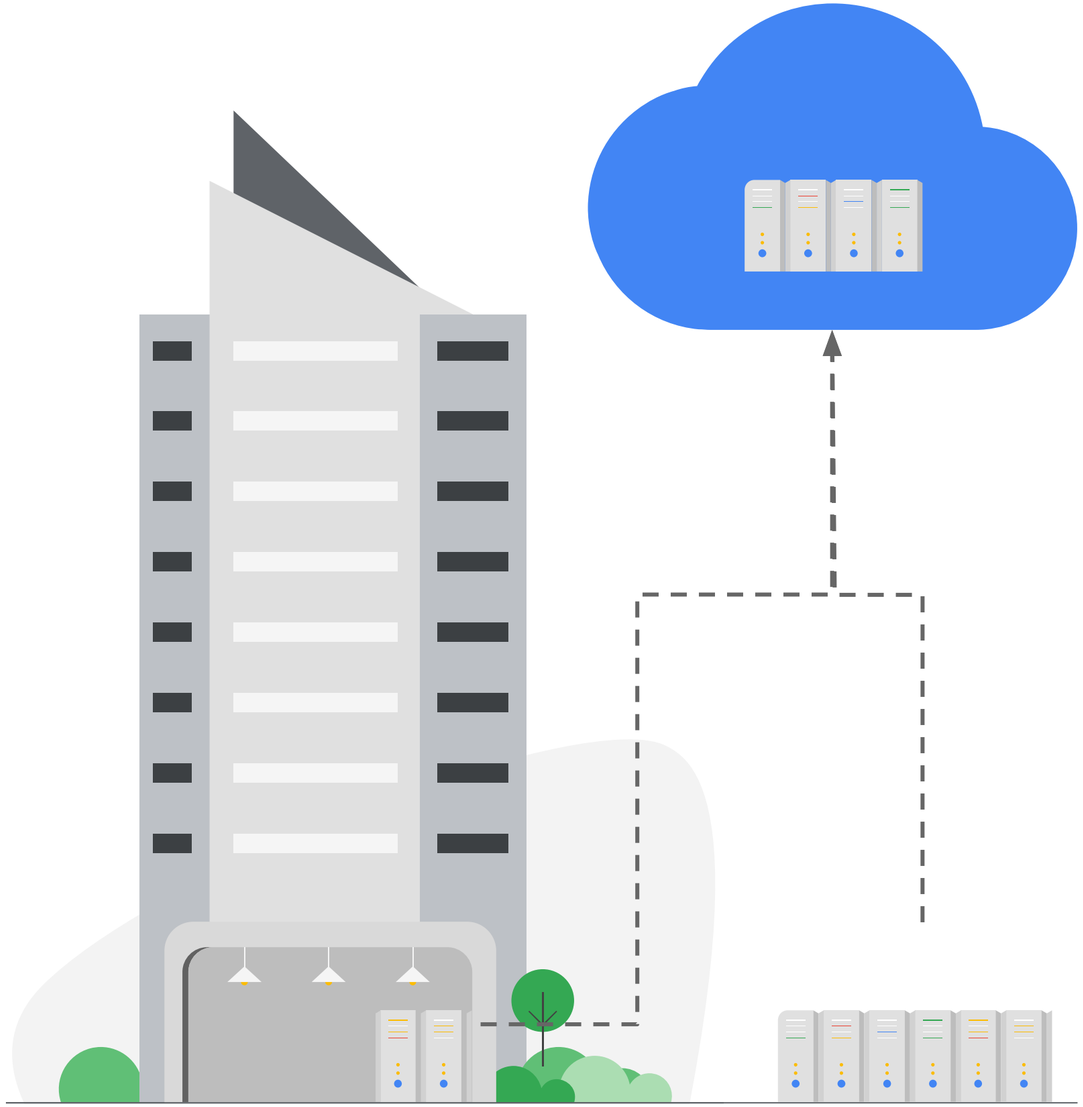
Virtual machines share and optimize the same pool of computer processing, storage, and networking resources. They also enable businesses to have multiple applications running at the same time on a server.



There’s still a cap to the physical capacity of existing servers and companies still have to commit a substantial amount of capital expenditure upfront.

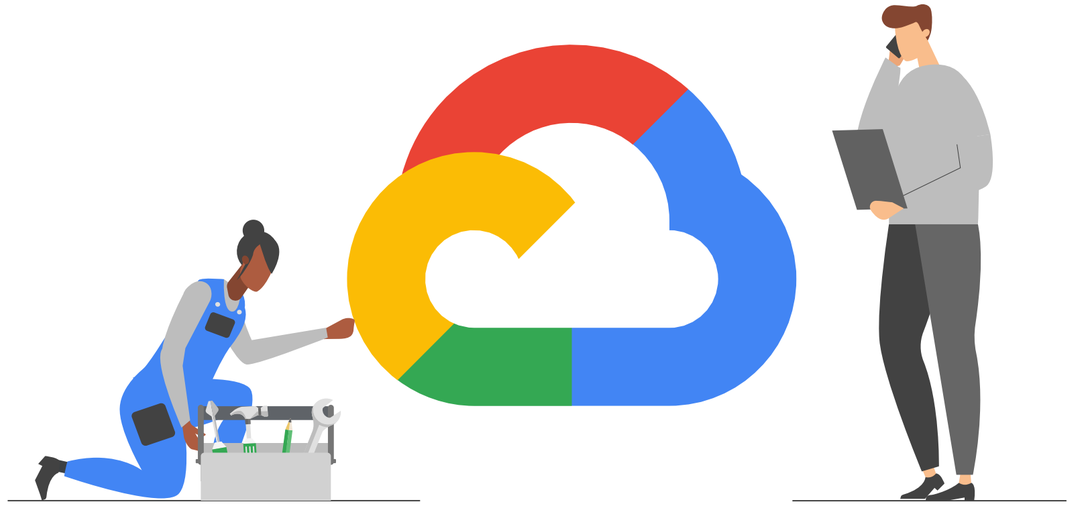


Many companies are now outsourcing their infrastructure entirely. They are growing to deliver their products and services to customers regionally and globally, and need to scale quickly and securely. Setting up and maintaining data centers and network connections that are optimal for their needs is expensive.

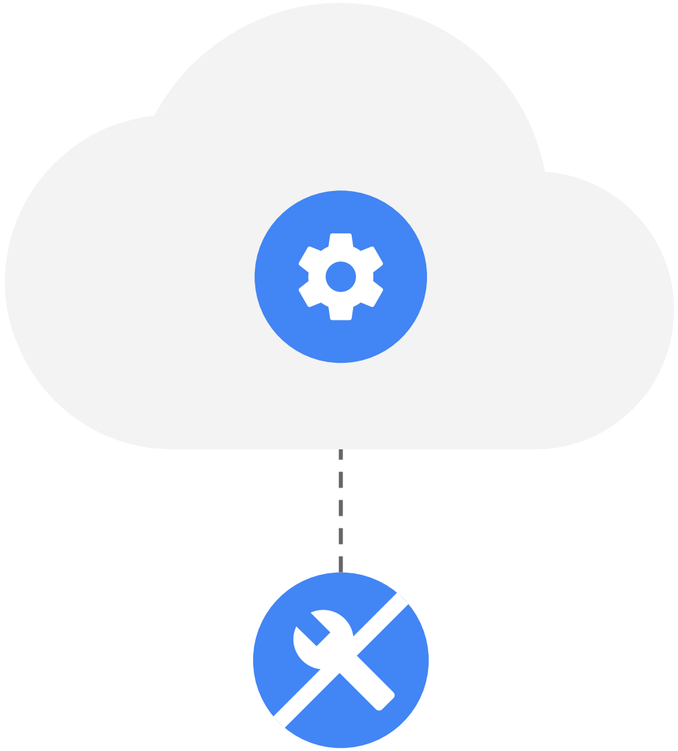


What is infrastructure as a service?

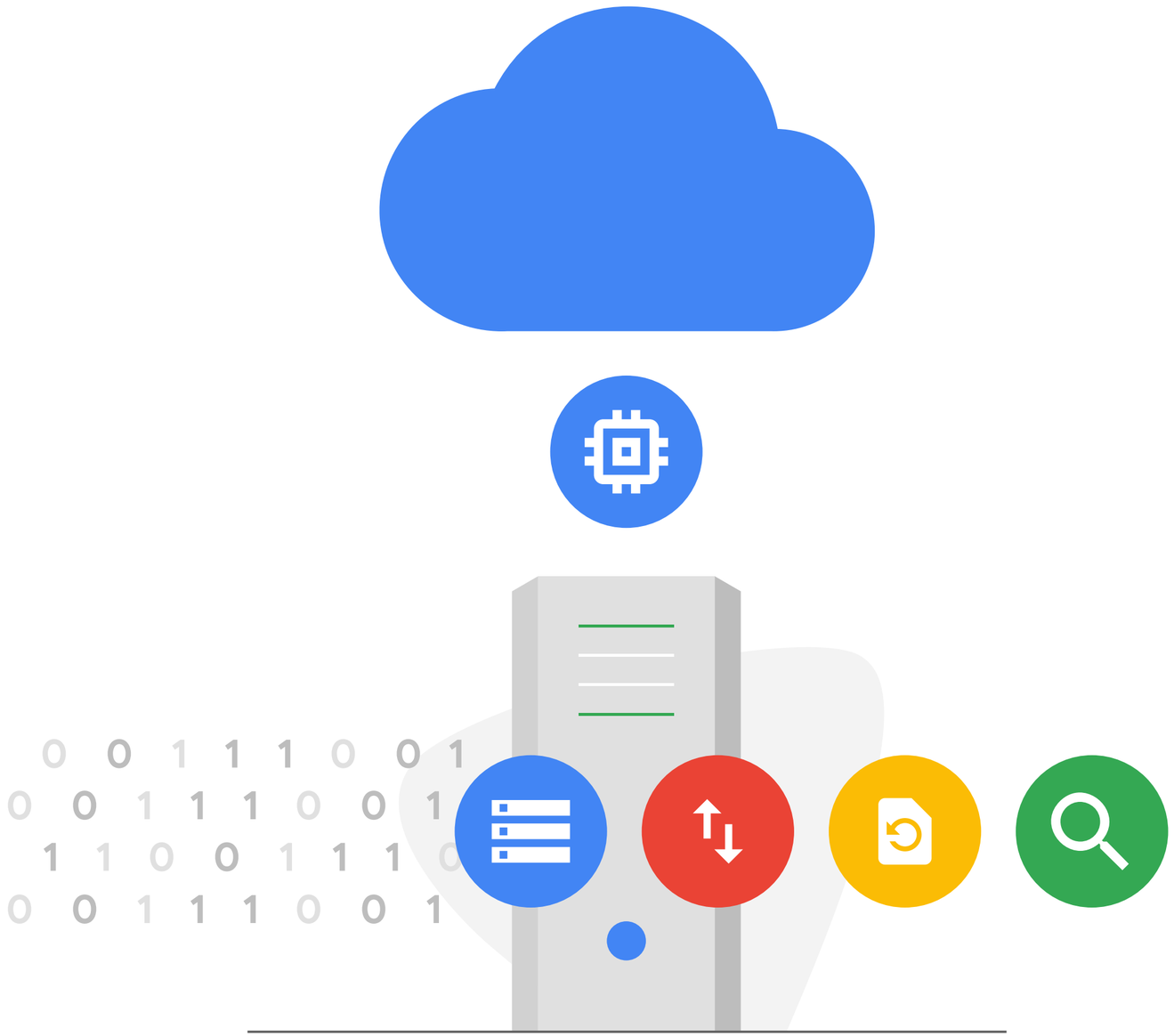
Outsourcing your IT needs at the infrastructure level is called **infrastructure as a service.** If your organization chooses to, it can move some or all of its infrastructure away from physical data centers to virtualized data centers in the cloud.



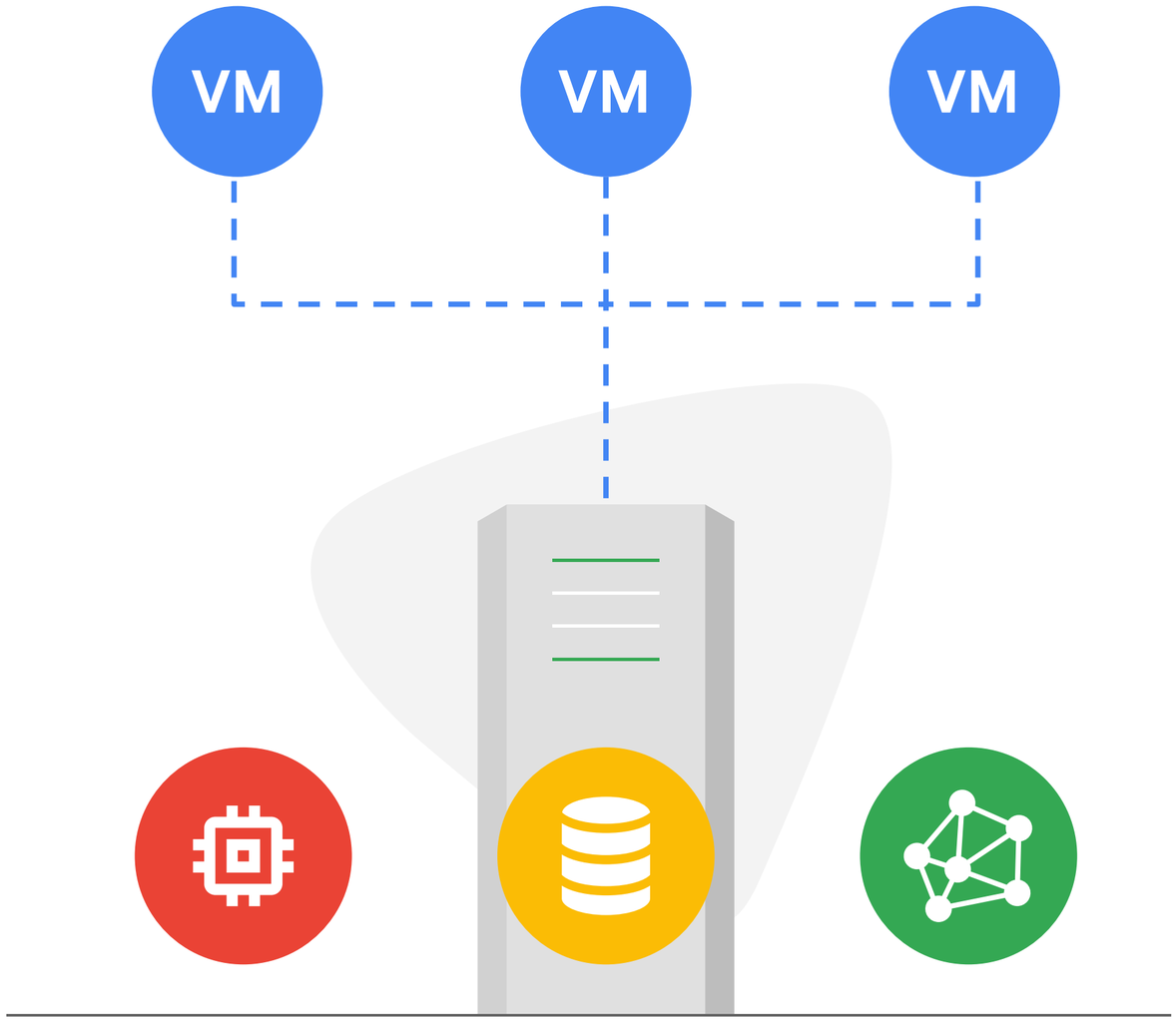
The maintenance work is outsourced to the public cloud provider so it’s easier to shift a larger proportion of company expertise to build processes and applications that move the business forward.



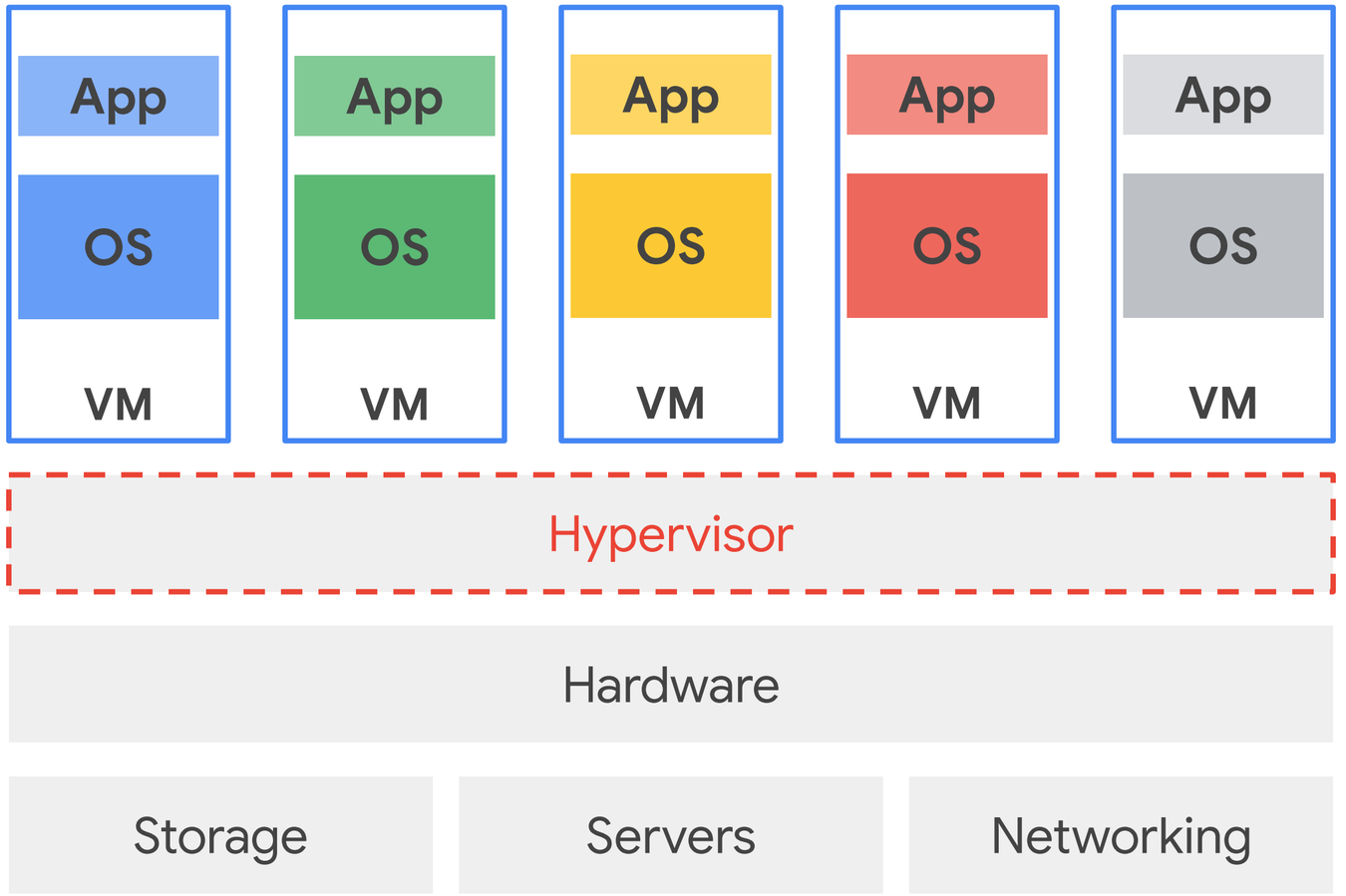
If you want a more managed service, cloud service providers offer something called: **platform as a service.** In this case, you don't have to manage the infrastructure and for some services you only pay for what you use.



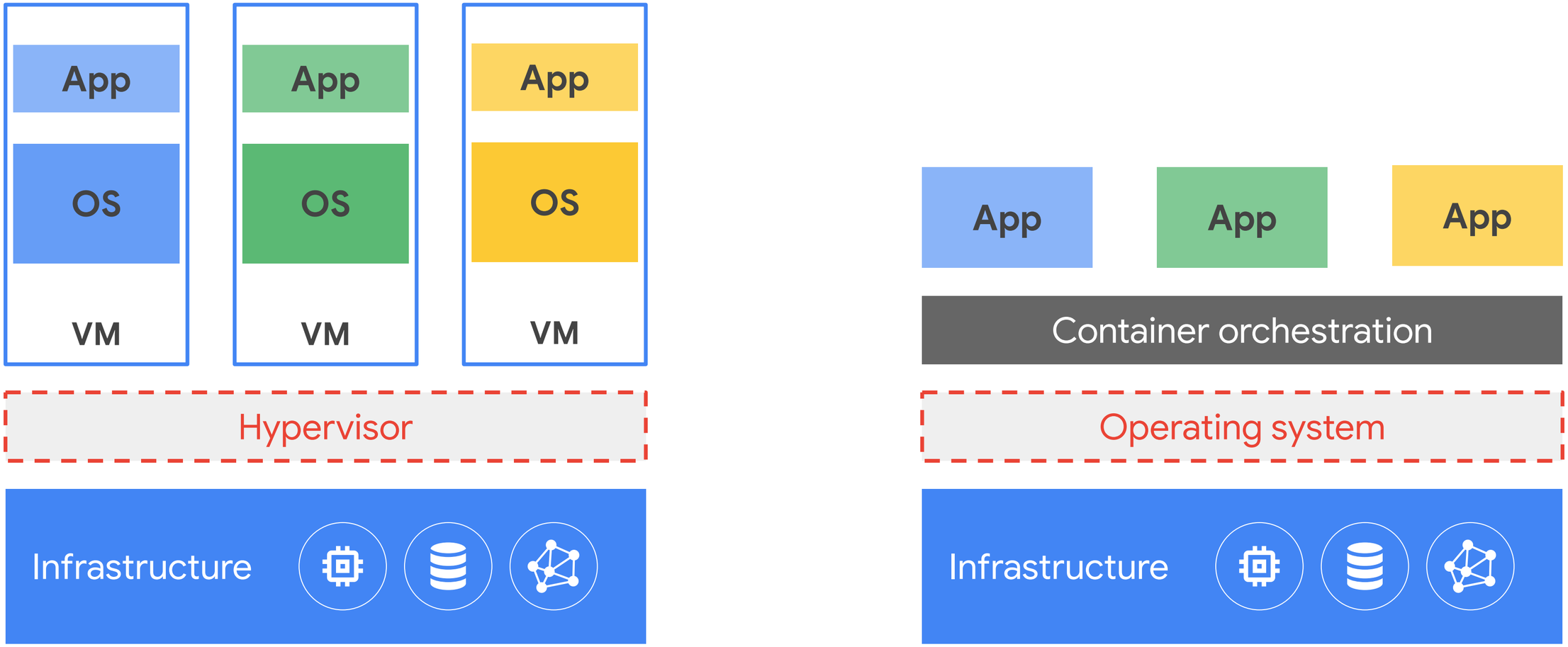
Compute or computing refers to a machine's ability to process information—to store, retrieve, compare, and analyze it—and automate tasks often done by computer programs, otherwise known as software or applications.



Traditionally, the hardware available for computing could only run a limited amount of software and applications. But with virtual machines or ‘VMs’, multiple systems can now run on the same hardware. VMs share the same pool of computer processing, storage, and networking resources.

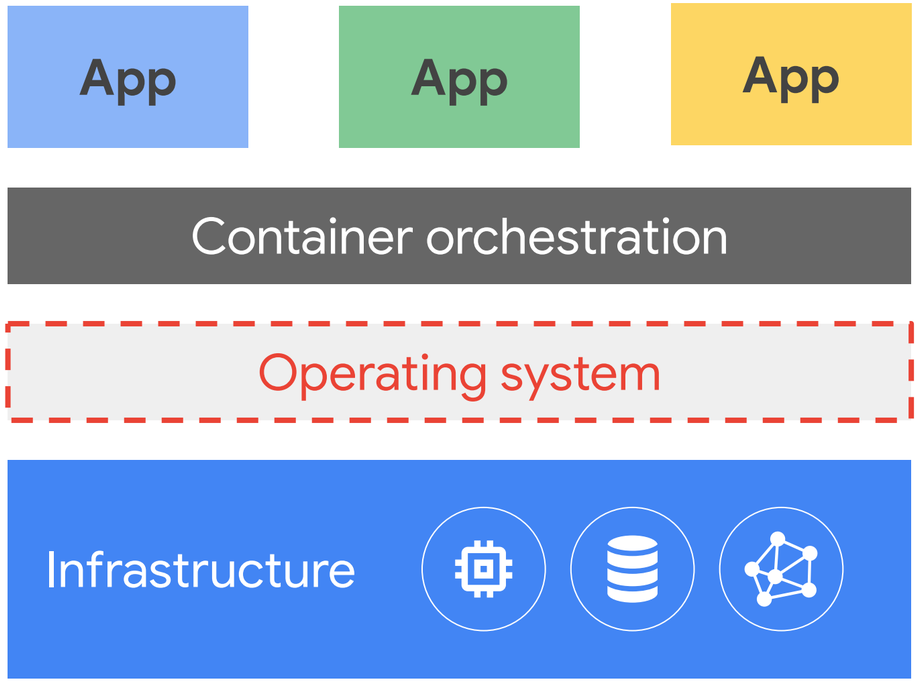


The software layer that enables this is called a hypervisor. A hypervisor sits on top of physical hardware, and multiple VMs are built on top of it. It's like having multiple computers that only use one piece of hardware.

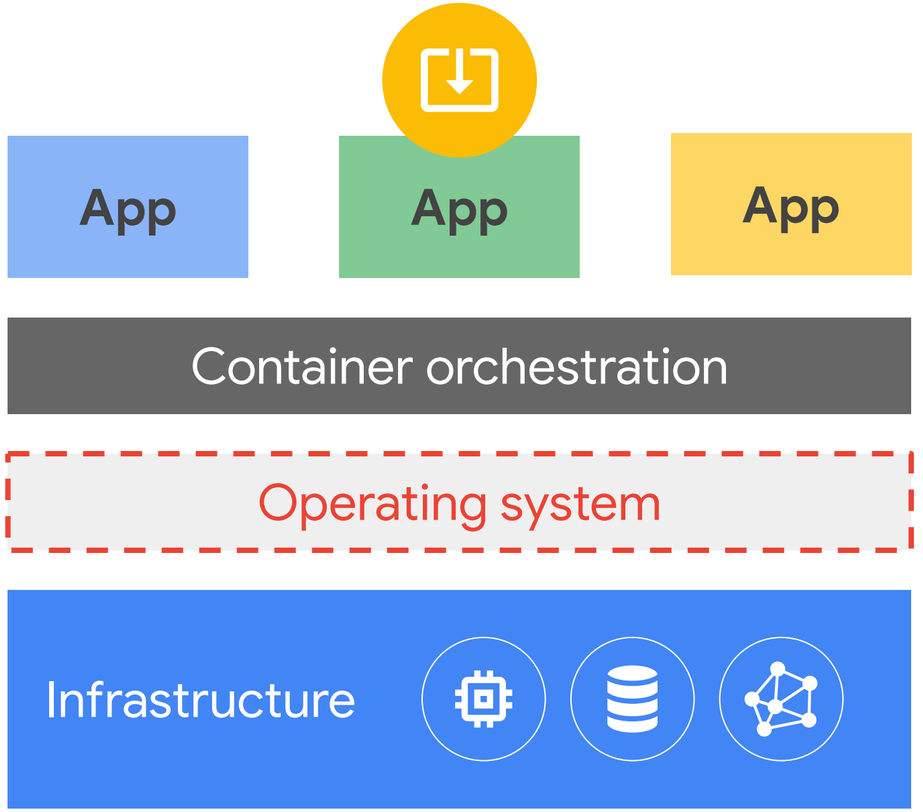


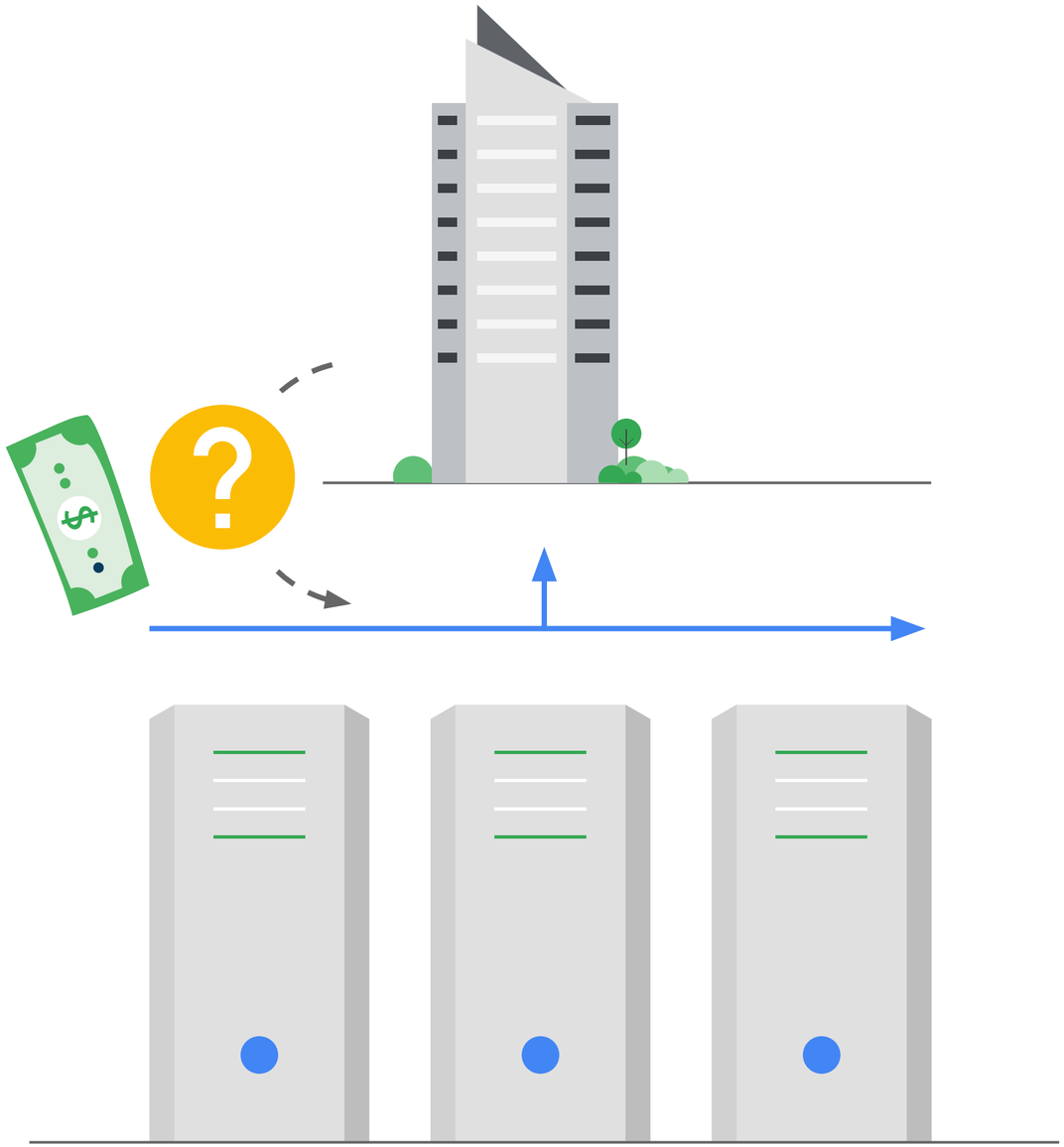
Virtual machines recreate a full representation of the hardware.
Containers only recreate, or virtualize, the operating systems.

Containers only hold exactly what's needed for the particular application that they support. They start faster, use less memory, and allow developers to create predictable environments.

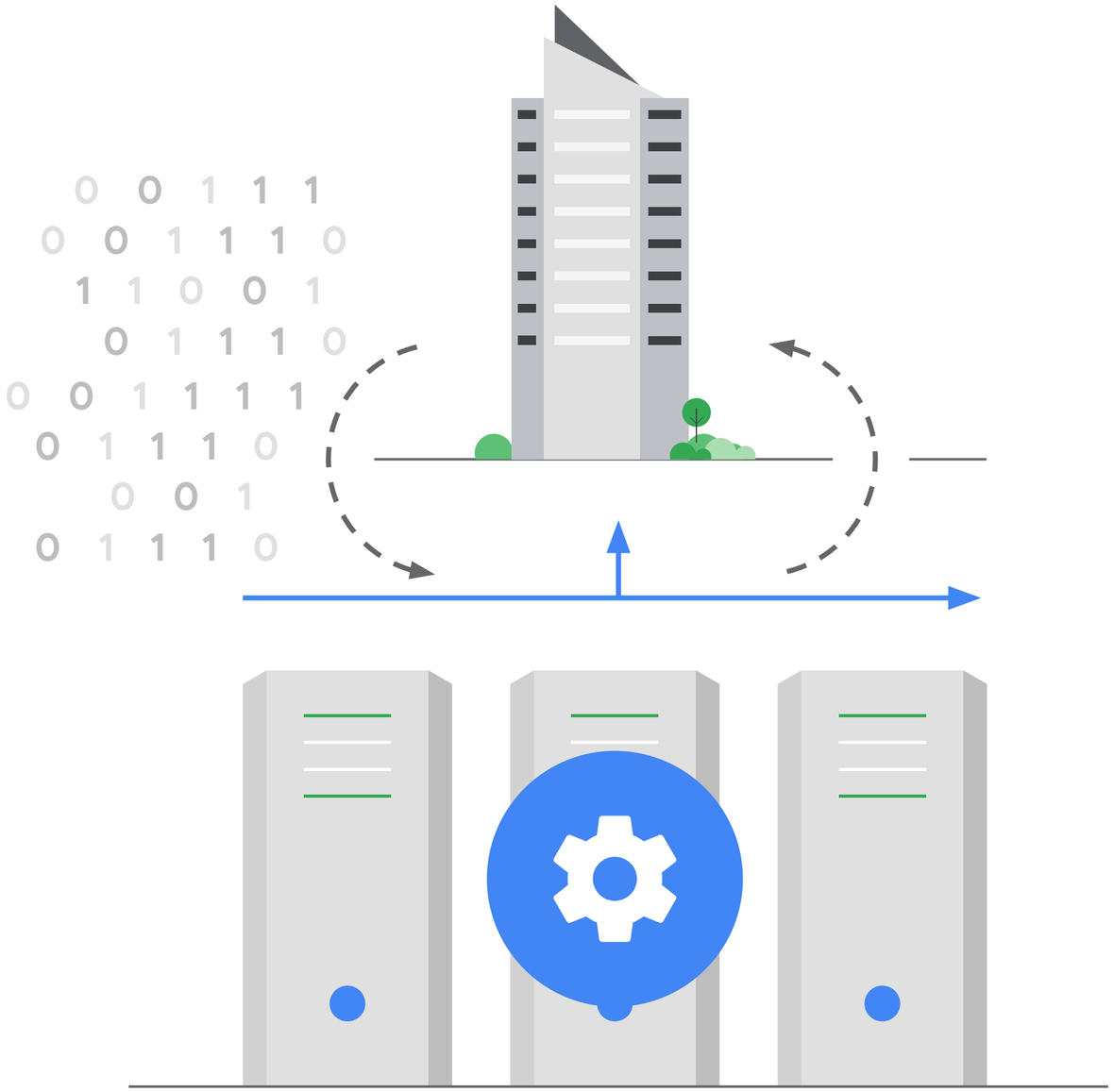


Containers are like prefabricated units placed on top of each other. This means that any problem that arises is easier to isolate and fix.





Serverless computing means that resources, such as compute power, are automatically provisioned behind-the-scenes as needed. Businesses do not pay for compute power unless they are actually running a query or application.

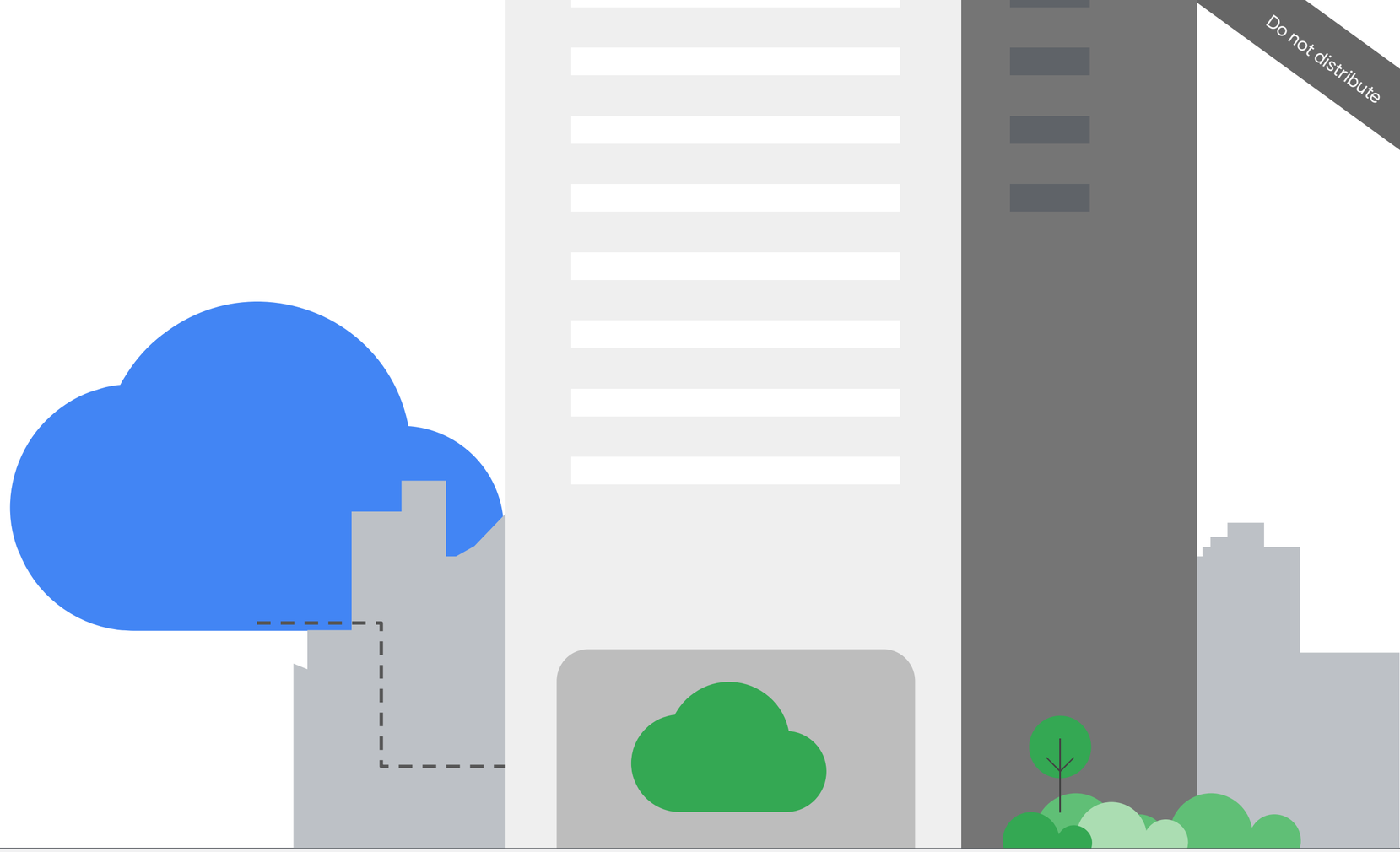


Serverless computing solutions are often called ‘Function-as-a-service.’ Businesses provide the code for whatever function they want and the public cloud provider does everything else.

Private cloud

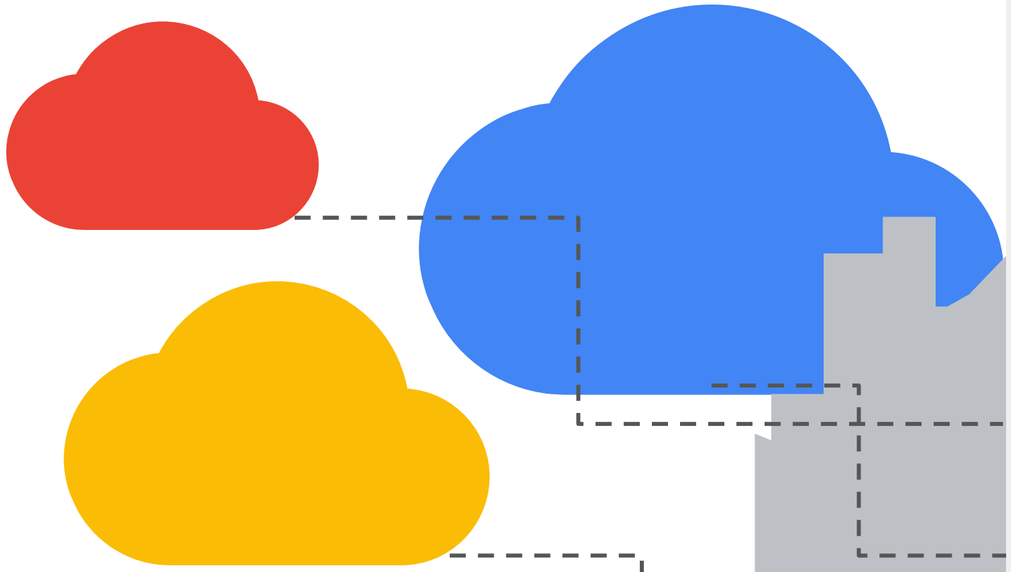
Private cloud is where an organization has virtualized servers in its own data centers to create its own private on-premises environment. This might be done when an organization has already made significant investments in its own infrastructure, or if, for regulatory reasons, data needs to be kept on-premises.

Hybrid cloud

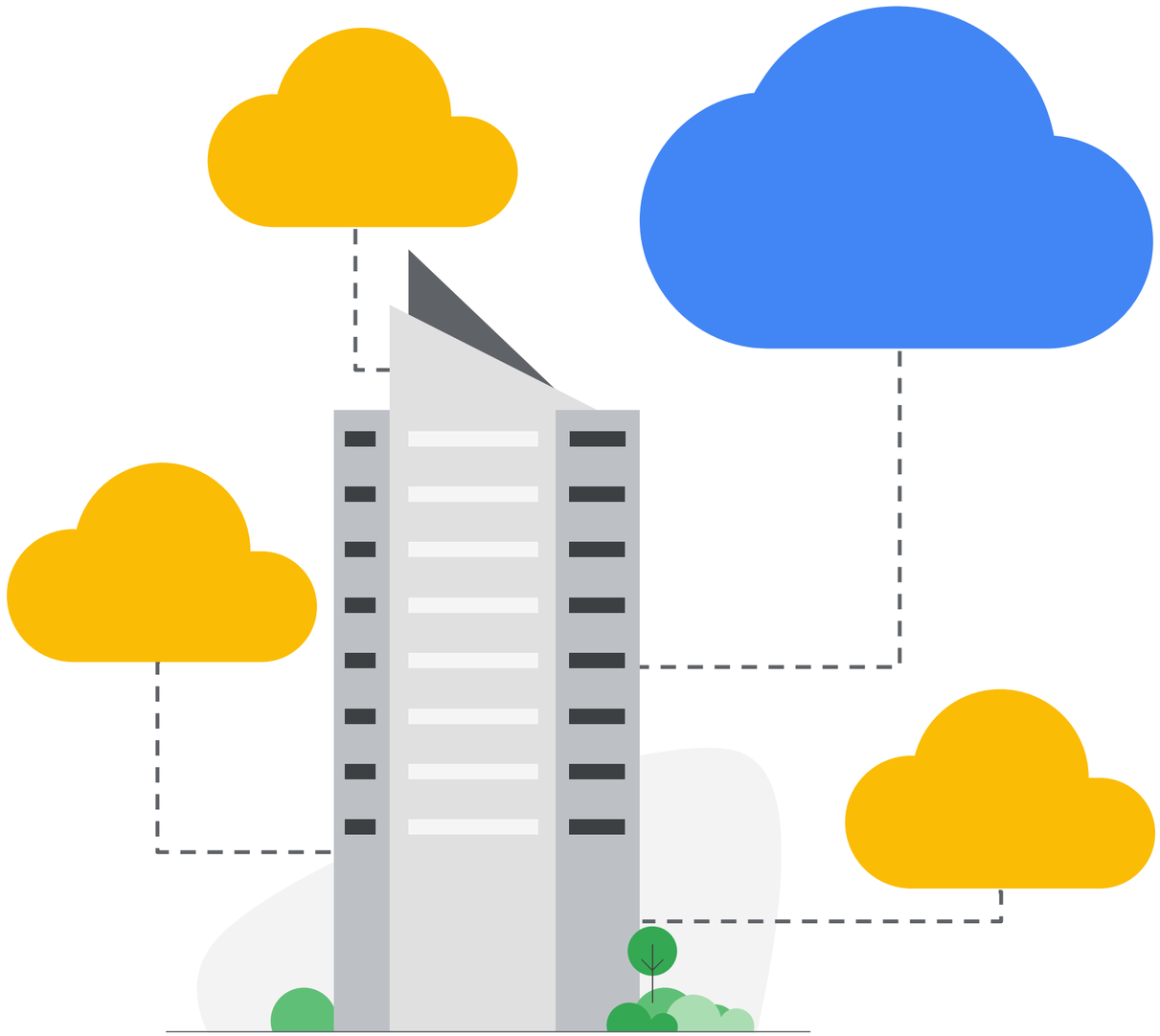


Hybrid cloud is where an organization is using a combination of on-premises or private cloud infrastructure and public cloud services. Some data and applications have been migrated to the cloud and others remain on premises.

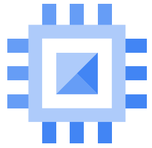
Multi-cloud



Multi-cloud is where an organization is using multiple public cloud providers as part of its architecture. The organization needs flexibility and secure connectivity between the different networks involved.



Open source in the cloud preserves an organization's control over where they deploy their IT investments.



Compute Engine

VMWare Engine

Bare Metal

Google Kubernetes Engine

Cloud Run

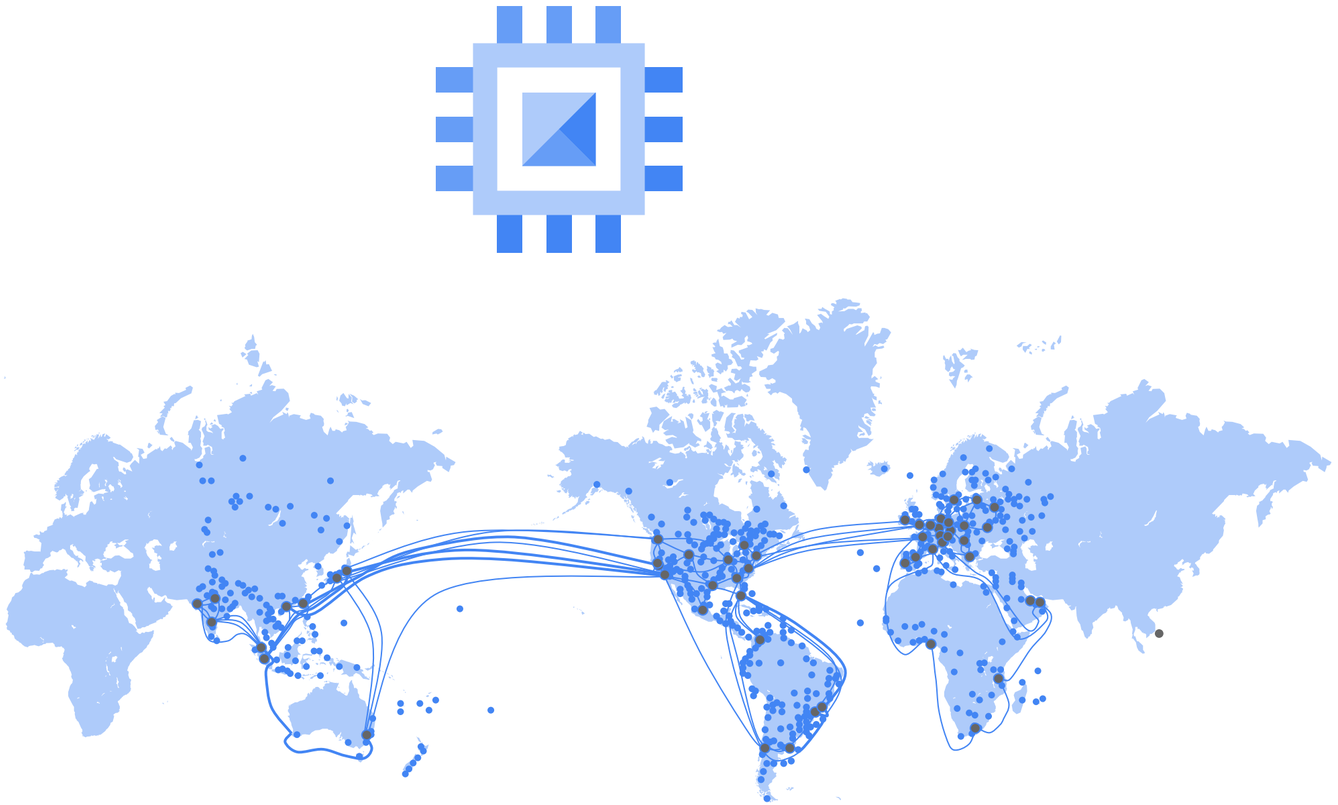
Cloud Functions

App Engine

Virtual machine

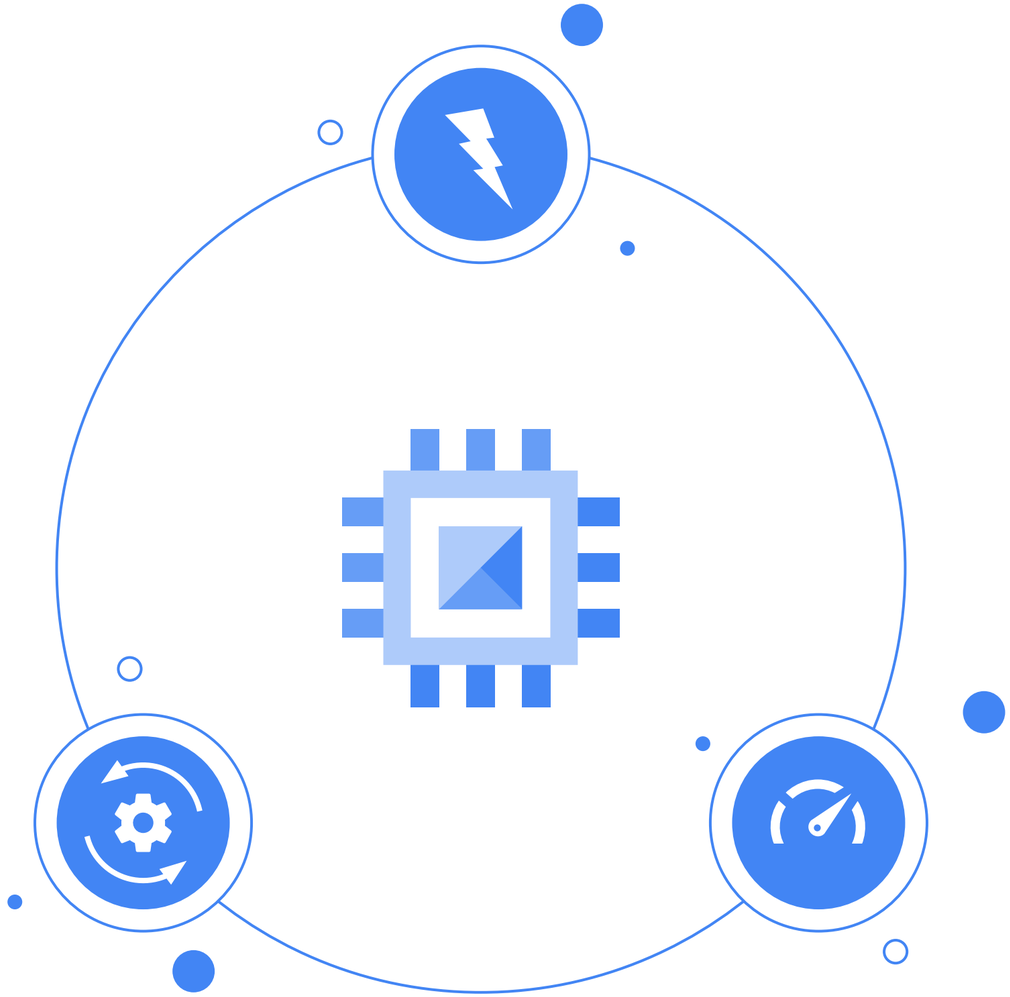
Container

Serverless computing

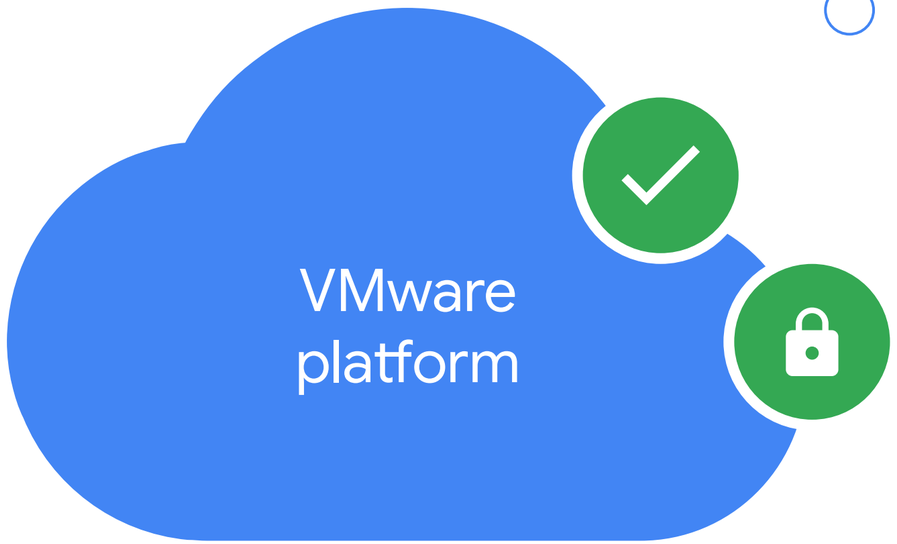


What is Compute Engine?

Compute Engine is a computing and hosting service that lets you create and run virtual machines on Google infrastructure.



Compute Engine VMs boot quickly, come with persistent disk storage, and deliver consistent performance.



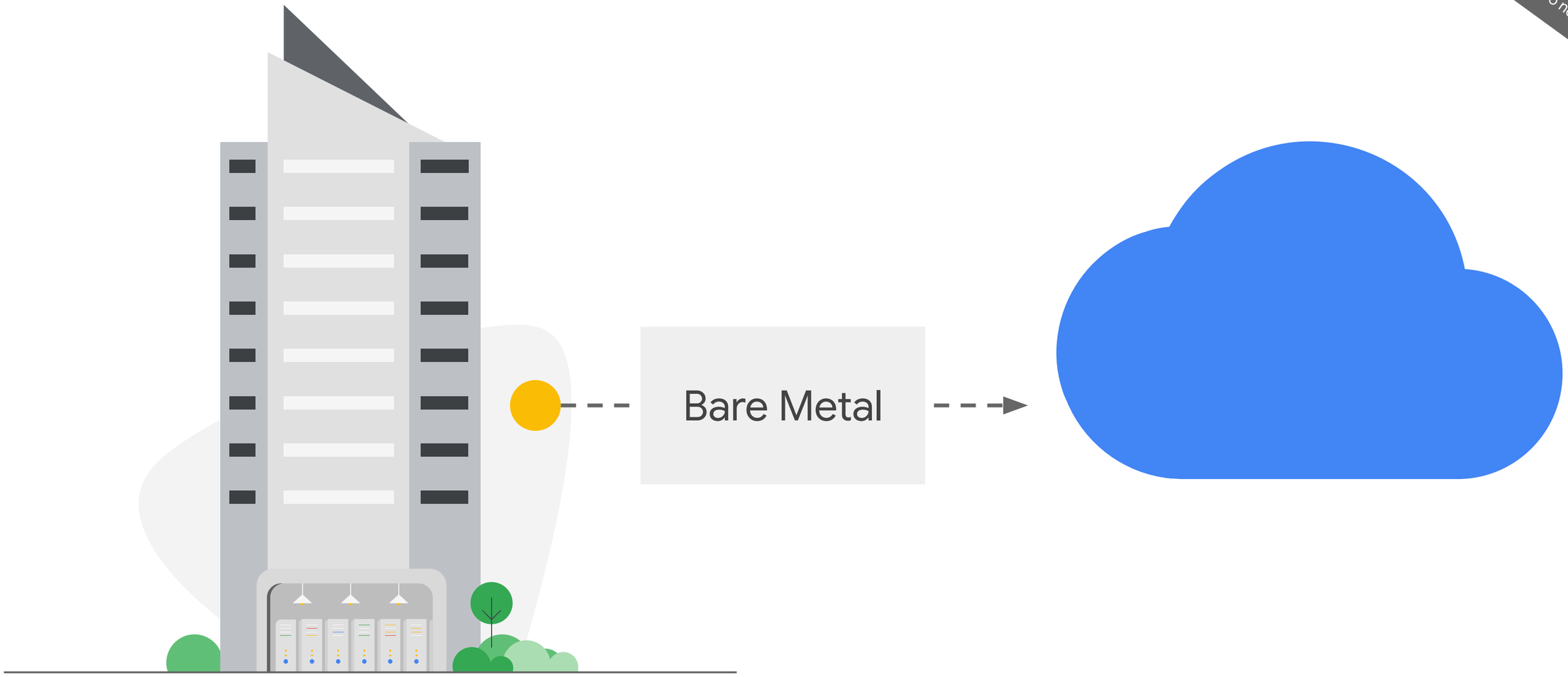
Infrastructure

Networking

Management services

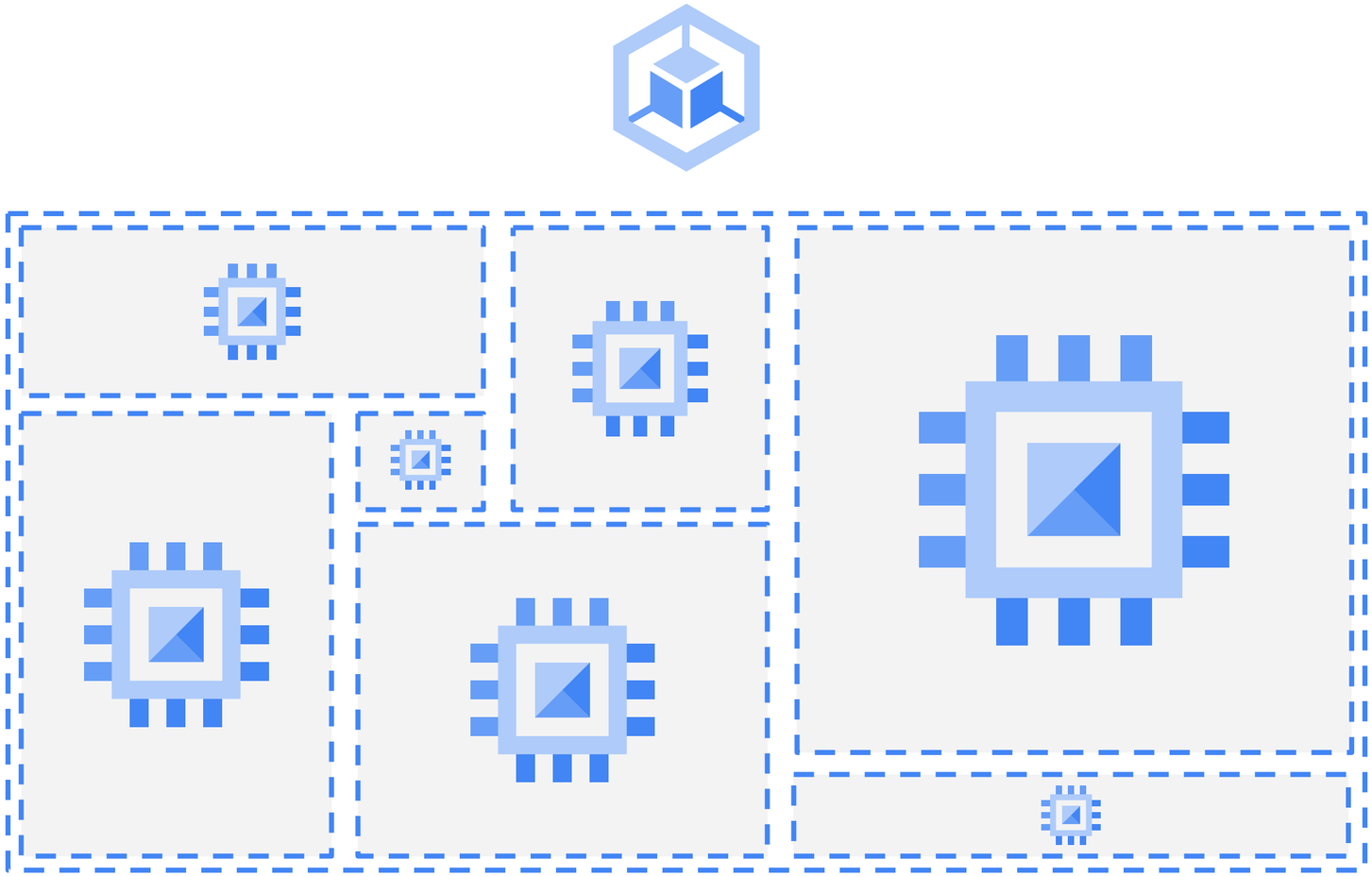
What is Google Cloud VMware Engine?

Google Cloud VMware Engine is a fully managed service that lets you run the VMware platform in Google Cloud. Google manages the infrastructure, networking and management services.



What is Bare Metal?

Bare Metal enables you to migrate specialized workloads to the cloud, while maintaining your existing investments and architecture. This allows you access and integration with Google Cloud services with minimal latency.



What is Google Kubernetes?

Google Kubernetes Engine or GKE provides a managed environment for deploying, managing, and scaling your containerized applications using Google infrastructure. The GKE environment consists of multiple machines grouped together to form a cluster.

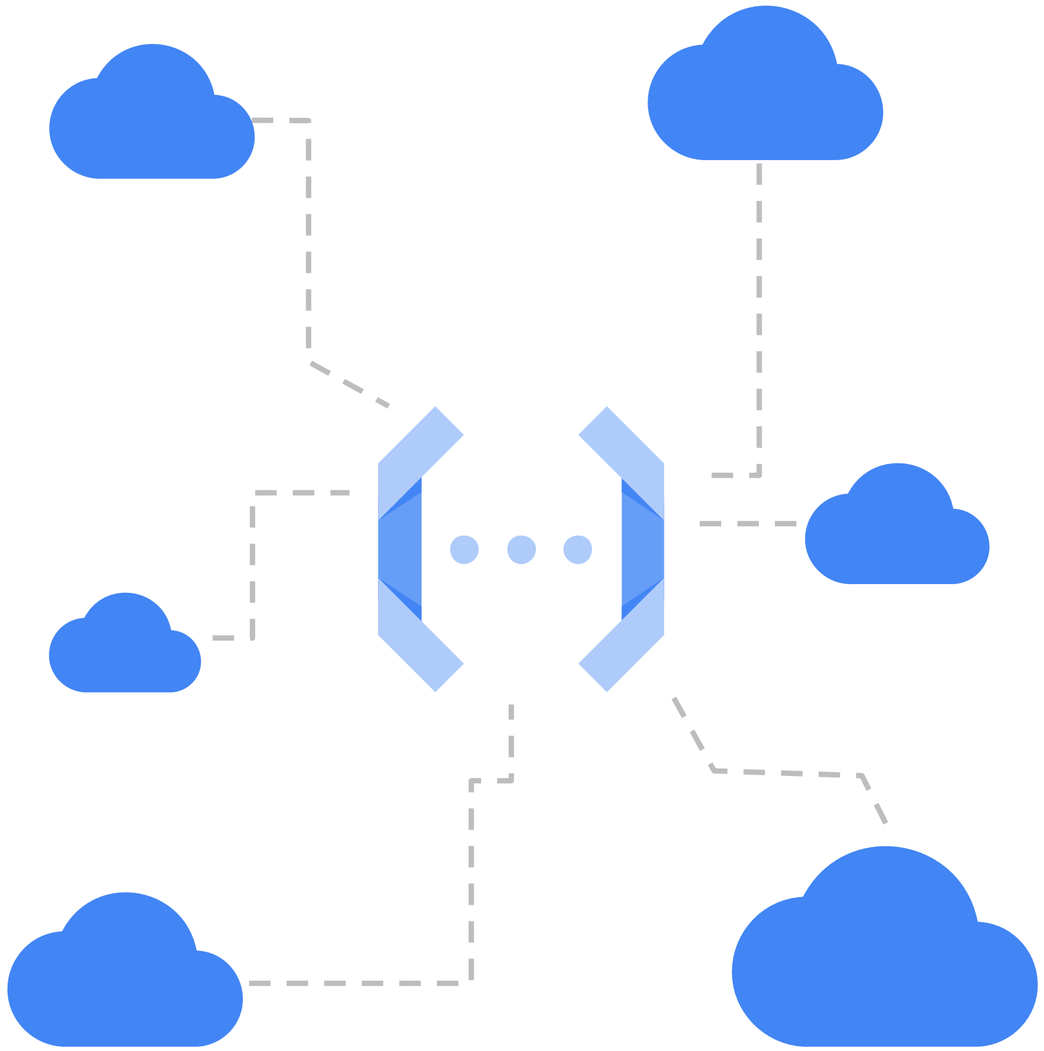
GKE allows you to securely speed up app development, streamline operations, and manage infrastructure.

What is Google App Engine?

Google App Engine is a Platform as a Service and cloud computing platform for developing and hosting web applications. It lets app developers build scalable web and mobile back ends in any programming language on a fully managed serverless platform.

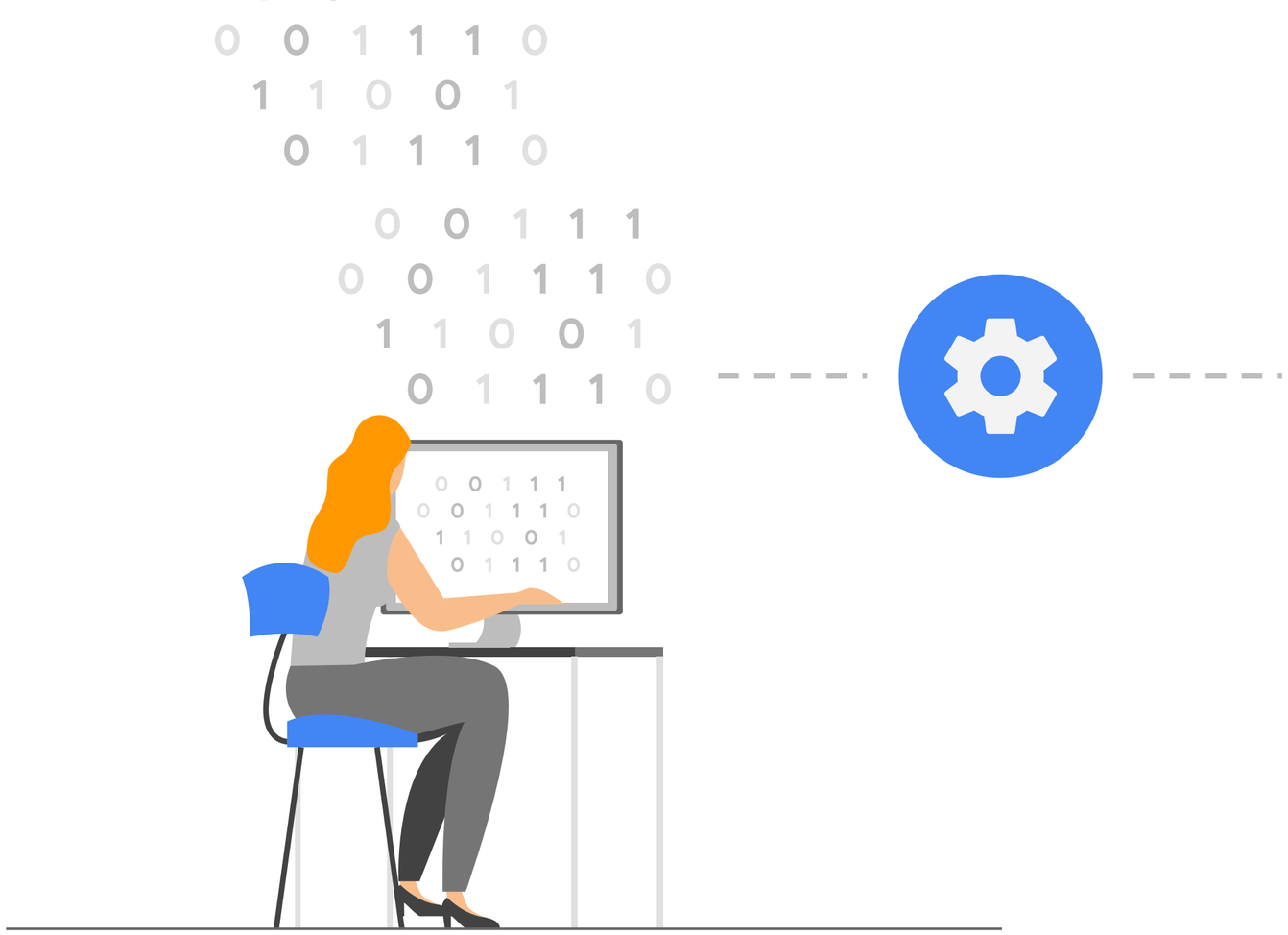
What is Cloud Run?

Cloud Run allows you to build applications in your favorite programming language, with your favorite dependencies and tools, and deploy them in seconds. It abstracts away all infrastructure management by automatically scaling up and down from zero almost instantaneously—depending on traffic.



What is Cloud Functions?

Cloud Functions is a serverless execution environment for building and connecting cloud services. It offers scalable, pay-as-you-go functions as a service to run your code with zero server management.



Developers can simply write their code and let Google Cloud handle the operational infrastructure. They can also write and run small code snippets that respond to events.

Google Cloud

Module 2: Student Slides

Modernizing Applications with Google Cloud

Topics covered

- Five common change patterns to modernize applications
- Application development challenges
- Google Kubernetes Engine and App Engine

On-premises application development often slows businesses down. Deploying an application on-premises can be time-consuming and require specialized IT teams.

Cloud technology enables businesses to develop and manage applications in new ways so they are more agile and responsive to user needs.

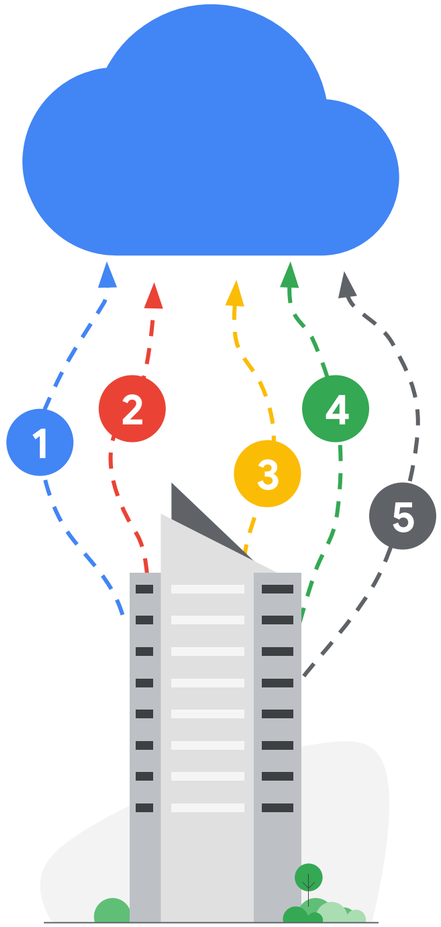
Move applications first and then change them

Change applications before they move

Invent in greenfield

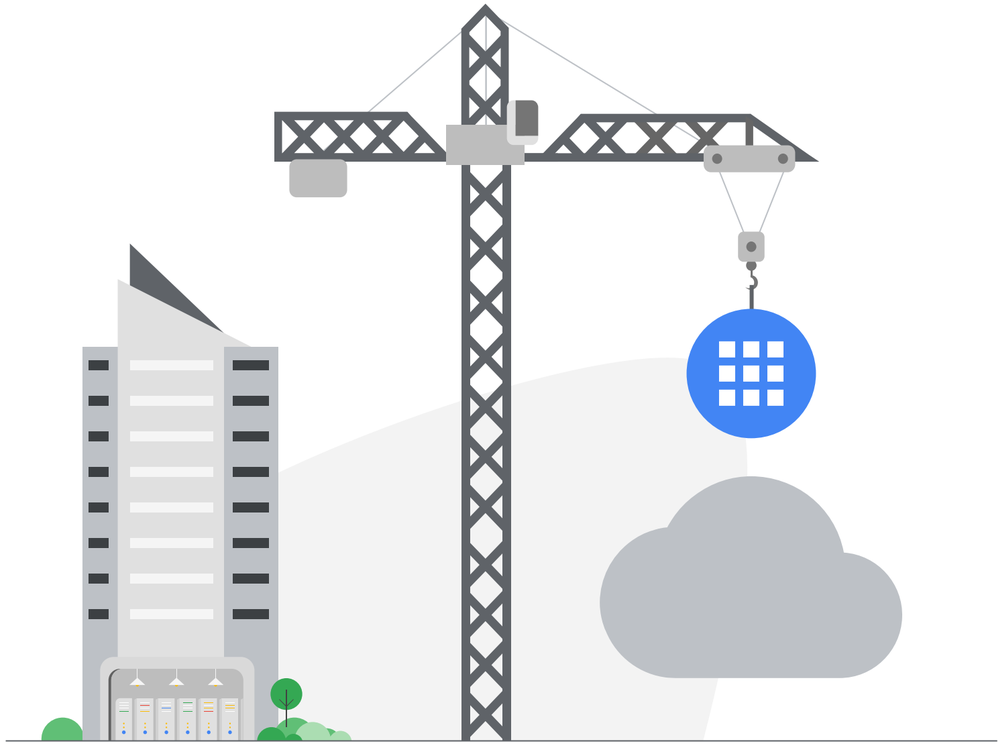
Invent in brownfield

Move applications without any changes



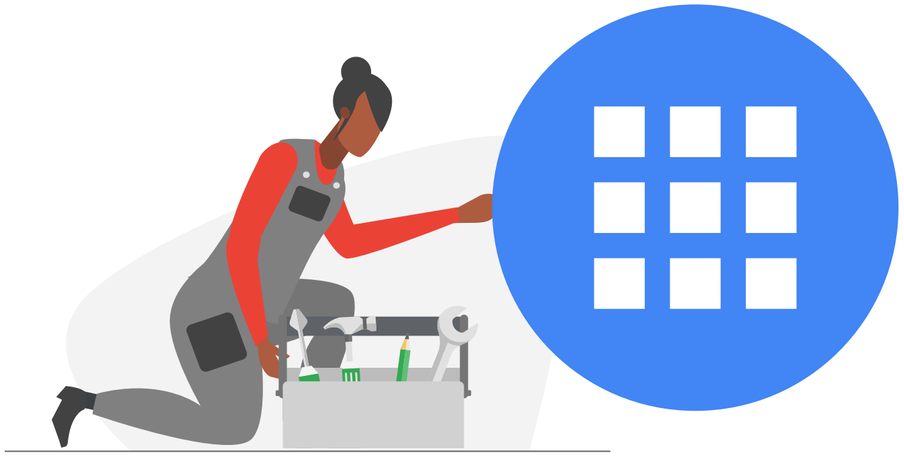
Google Cloud has identified five common patterns that businesses can adopt when they want to modernize their applications.

Move applications first and then change them



The “move first and then change” approach typically starts with a “lift and shift” program for selected applications. The migration typically brings minimal changes to ways of working within the organization, but once the applications are running in the cloud, they are then ready to be updated more easily than when they were running on-premises.

Change applications before they move

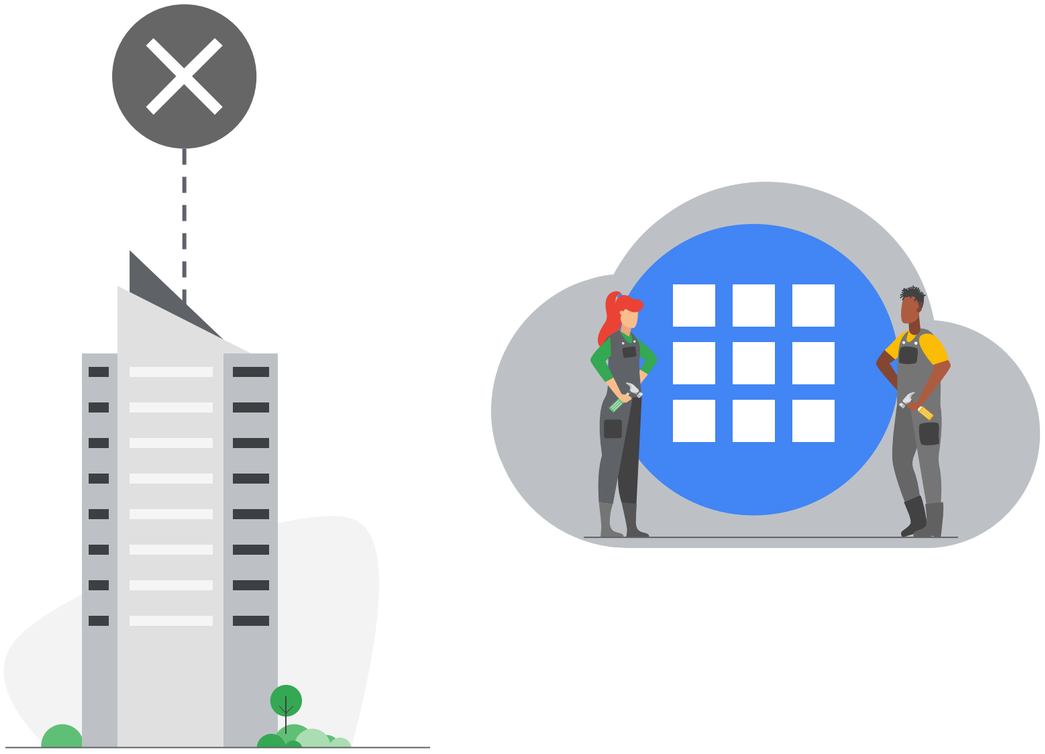


If an organization wants to take a more aggressive approach to modernizing its applications, they can re-architect applications first, to make them more cloud-ready, before migrating them.

Invent in greenfield

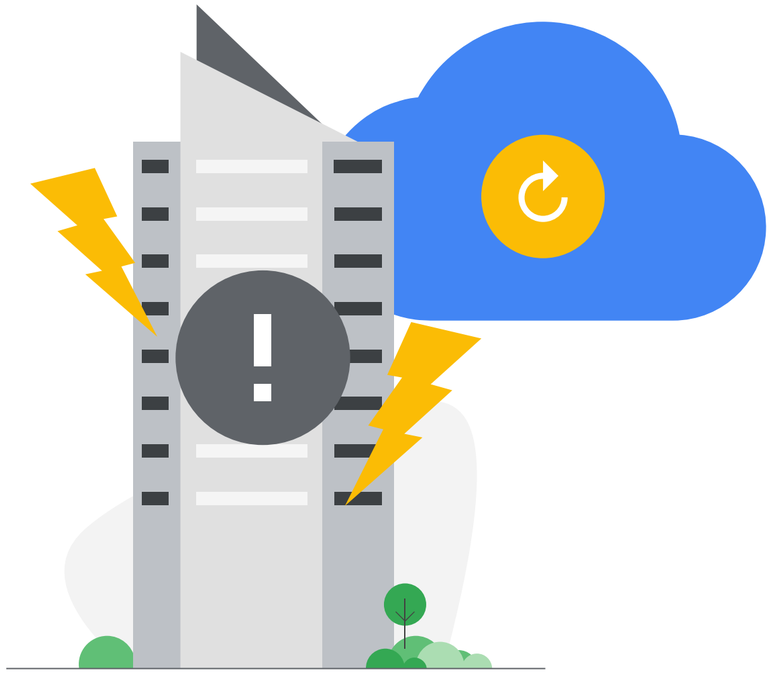
Inventing in greenfield allows you to build innovative applications that will help drive the business forward, but it does require agility, access to a diverse development skill set, and strong support from leadership.

Invent in brownfield

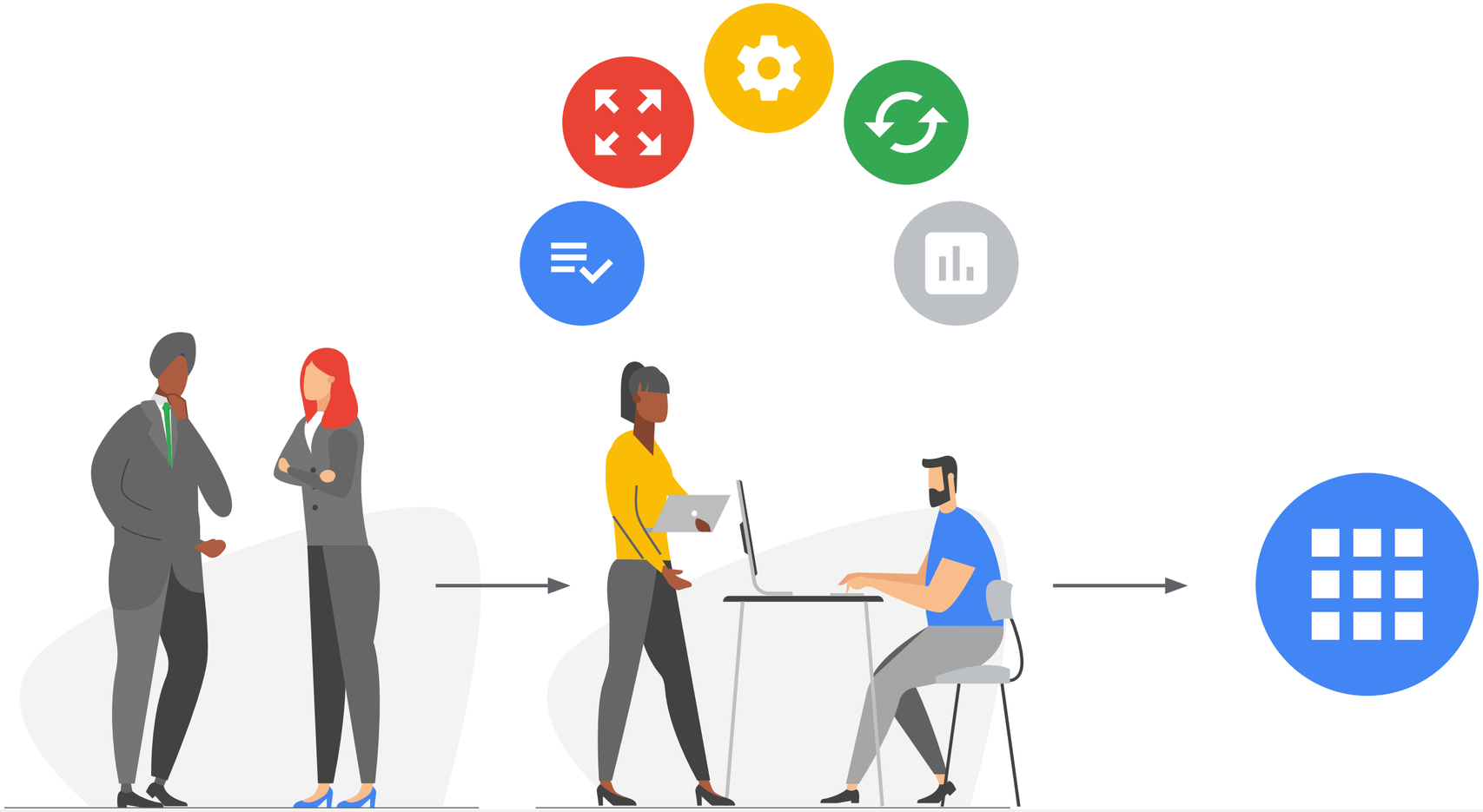


A brownfield strategy is to invent a new application in the cloud environment that will replace an existing legacy application that remains on-premises. The legacy application is only retired after the new application is built.

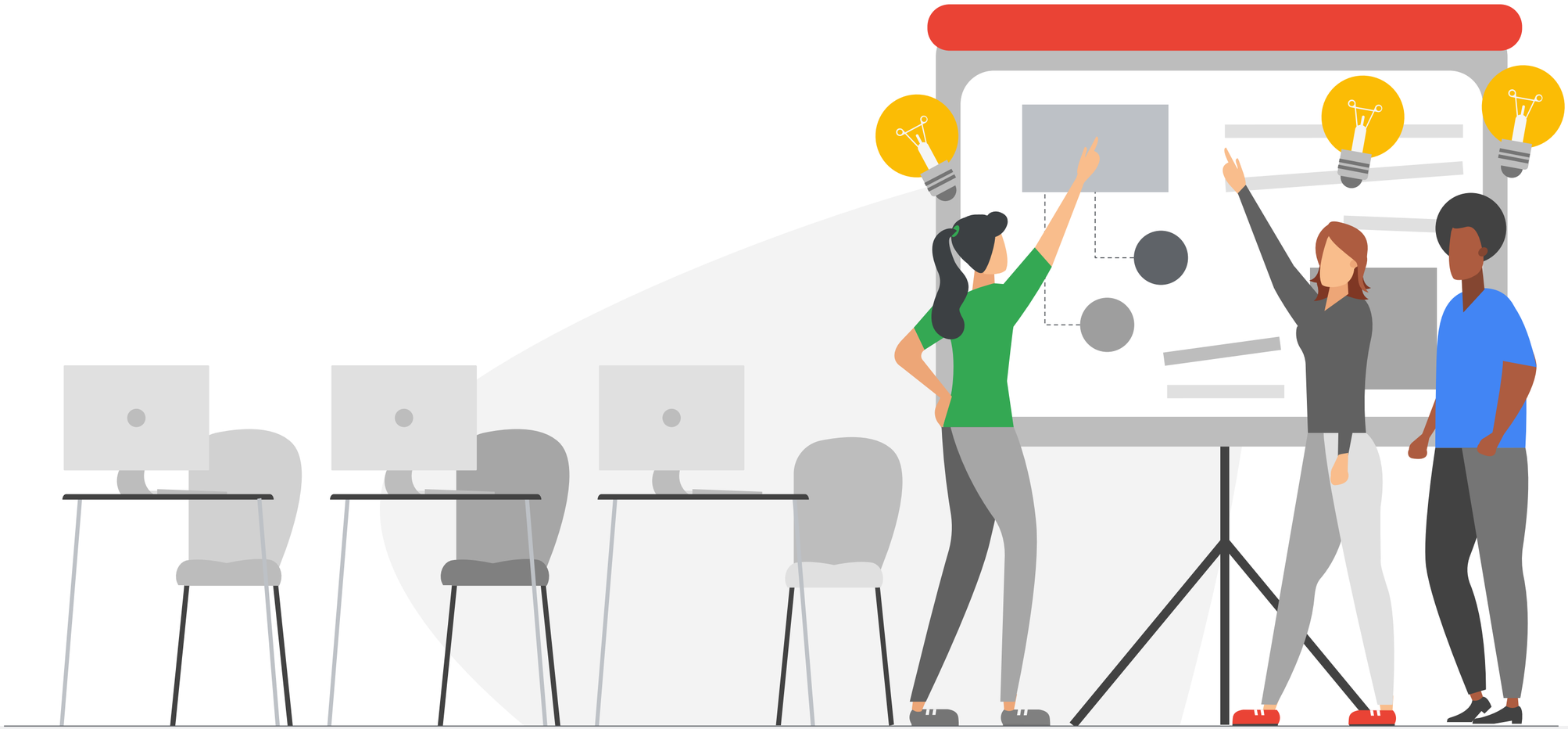
Move applications without any changes



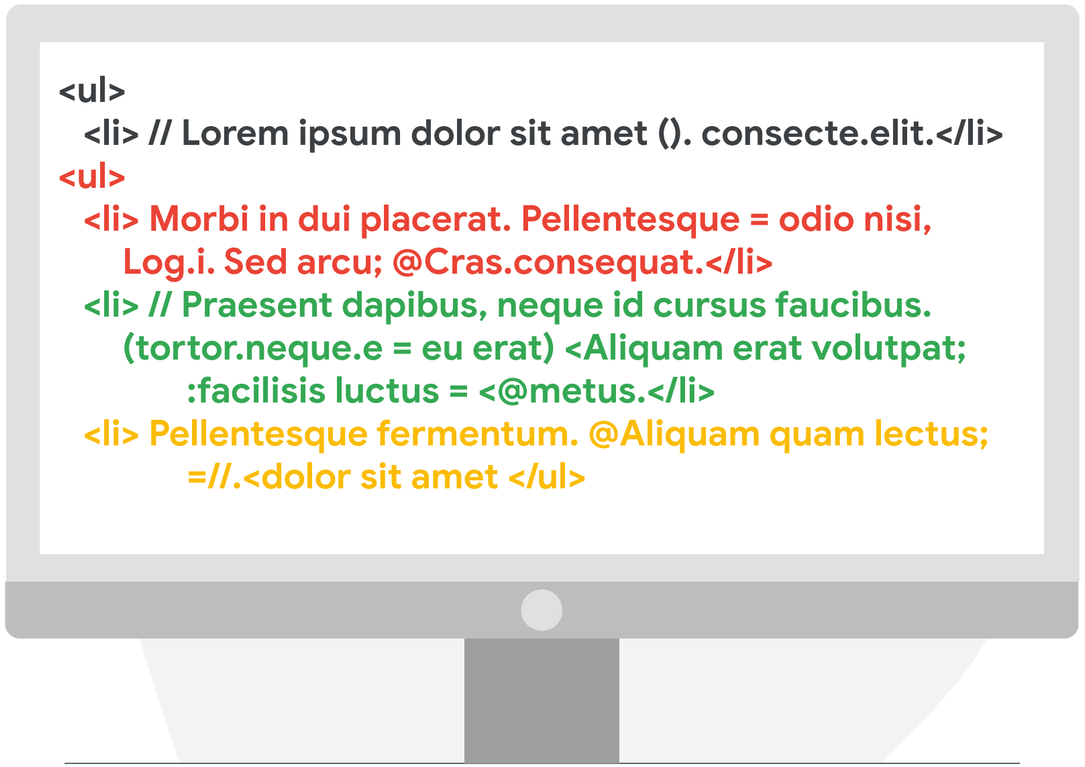
For some use cases, it’s sufficient to leverage the cloud just to modernize the infrastructure layer. Use cases include switching to cloud storage to decommission on-premises data centers, or creating virtualized environments for disaster recovery.

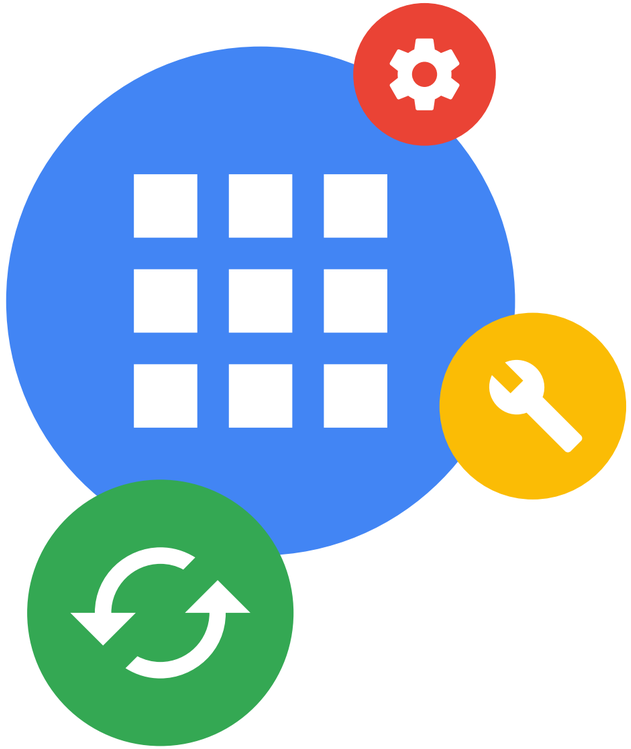


New applications often have to be designed, built, tested, integrated, and deployed.
But new needs often compete with existing projects for time and resources.

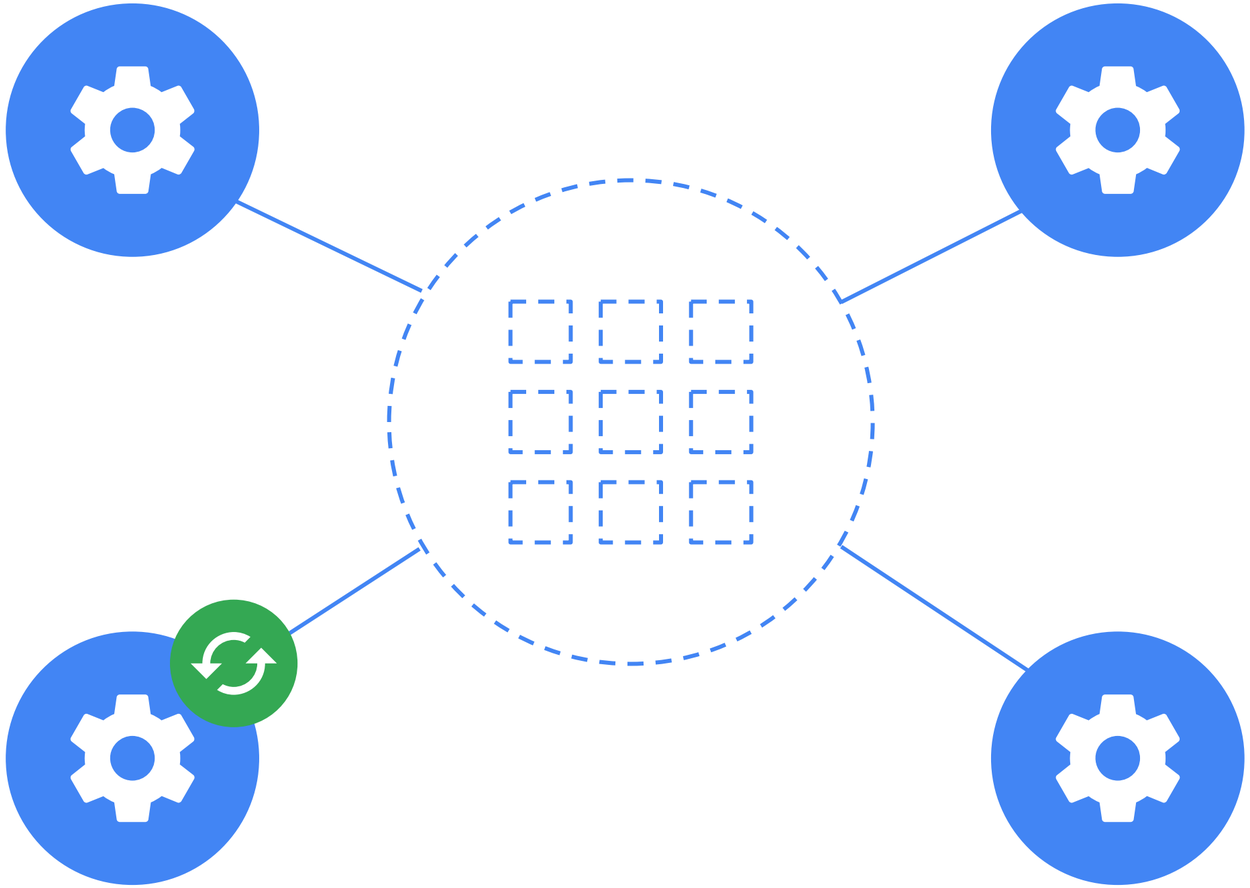


Developing cloud-native applications avoids the hassle of trying to create something that is constrained by legacy systems and out-dated processes. Building a new application in the cloud frees teams up from worrying about environments so that they can focus on creating features instead.



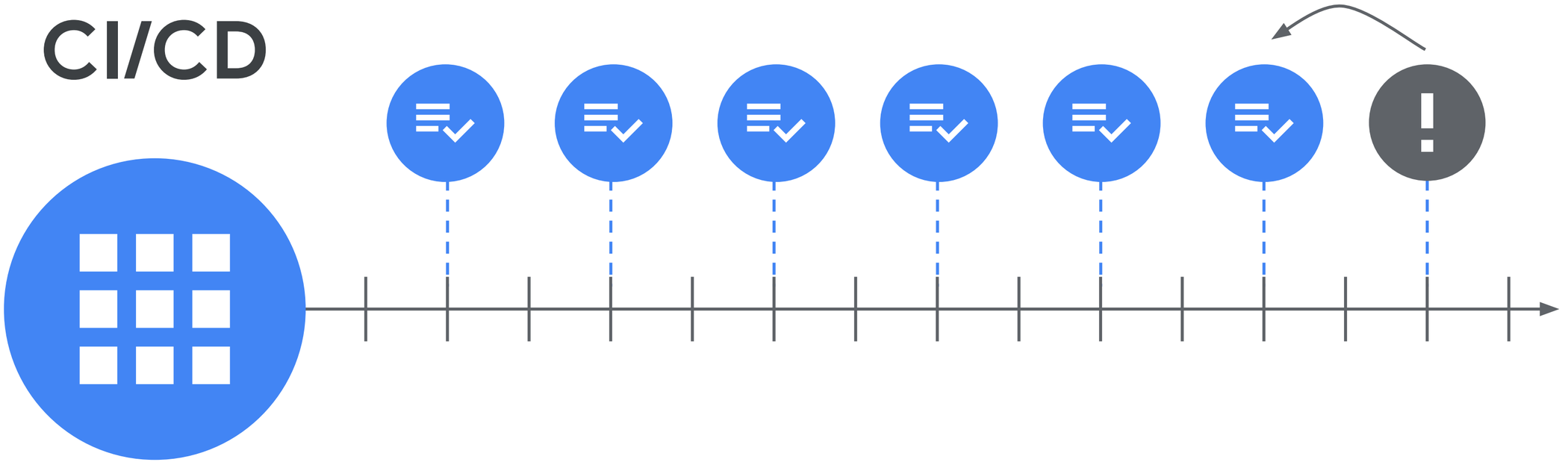


Updating existing applications that have been built on-premises with a monolithic architecture can be difficult. When an application is updated, the entire application needs to be deployed and tested, even if the change is only small.



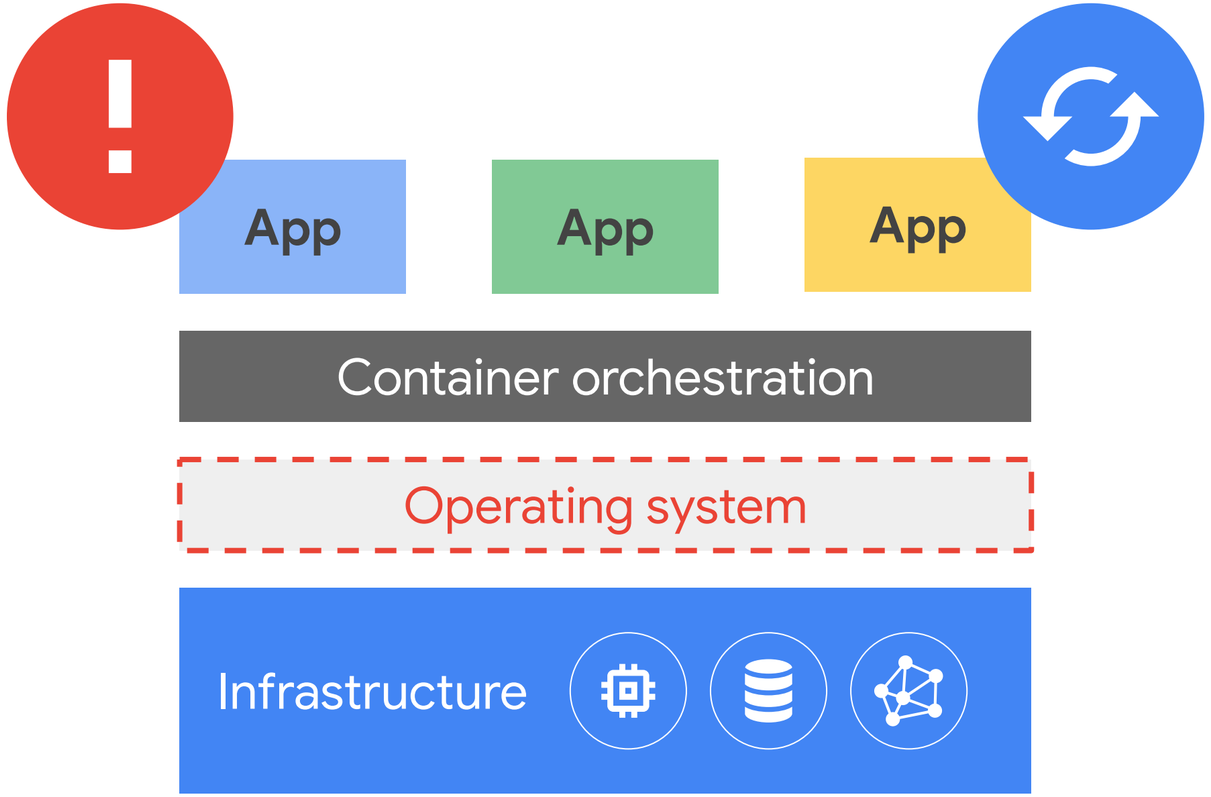
A microservice architecture reduces these problems by separating a large application into small, loosely coupled services. This means it's easy to determine where code needs to be changed and the service can be updated, deployed, and scaled independently.

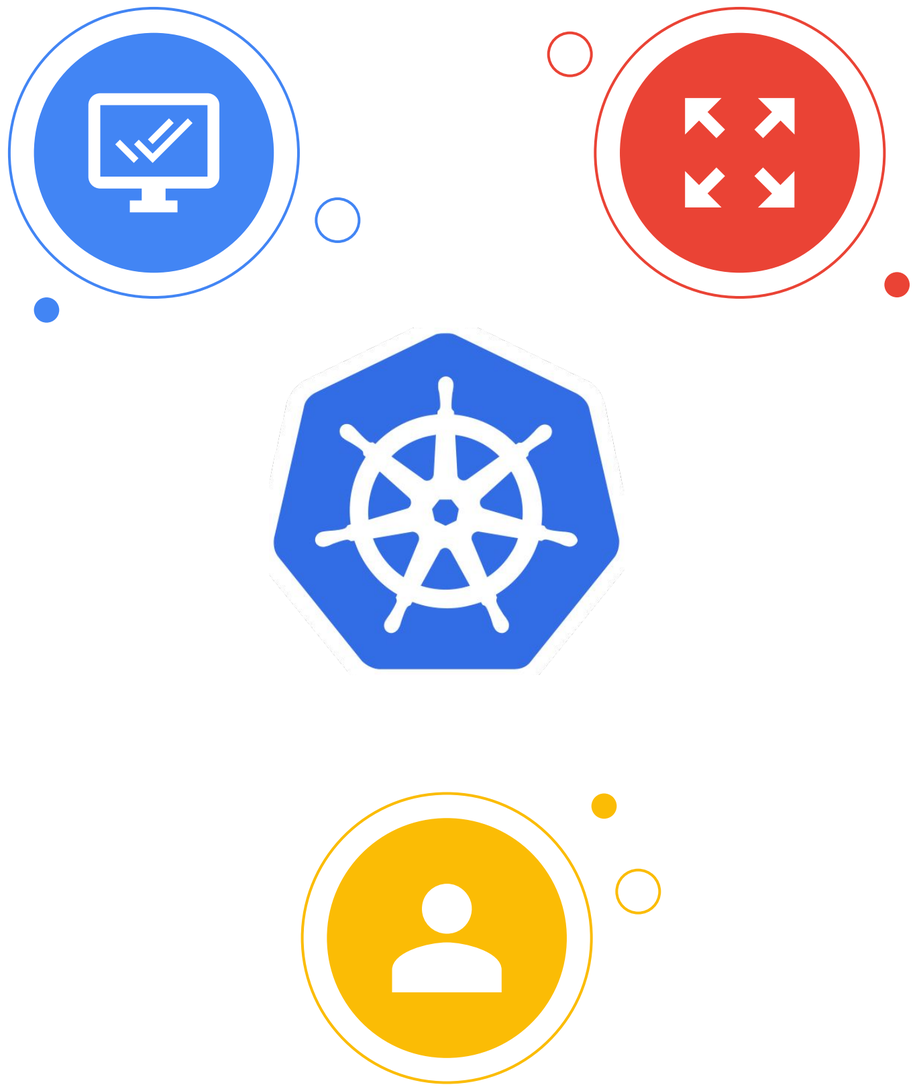
CI/CD



Adopting an automated continuous integration or ‘CI/CD’ can help you increase your application release velocity and reliability. You can test and roll out changes incrementally. This approach enables you to lower the risk of regressions, debug issues quickly, and roll back to the last stable build if necessary-- all without interrupting service for your users.

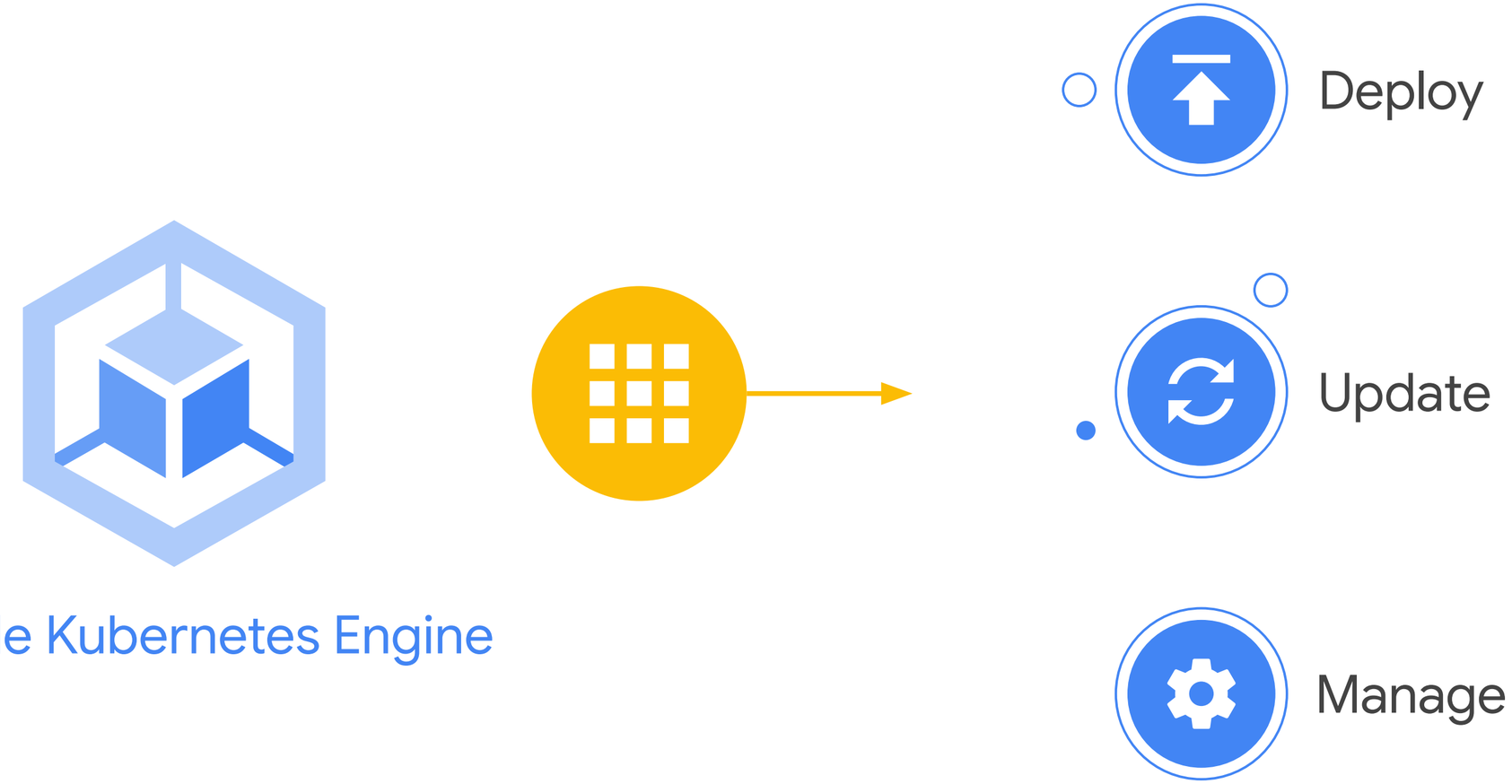
Containerization allows developers to divide an application design into individual compartments. Parts of the code can be updated without affecting the whole application. This builds resilience, because one error doesn't impact the whole application.



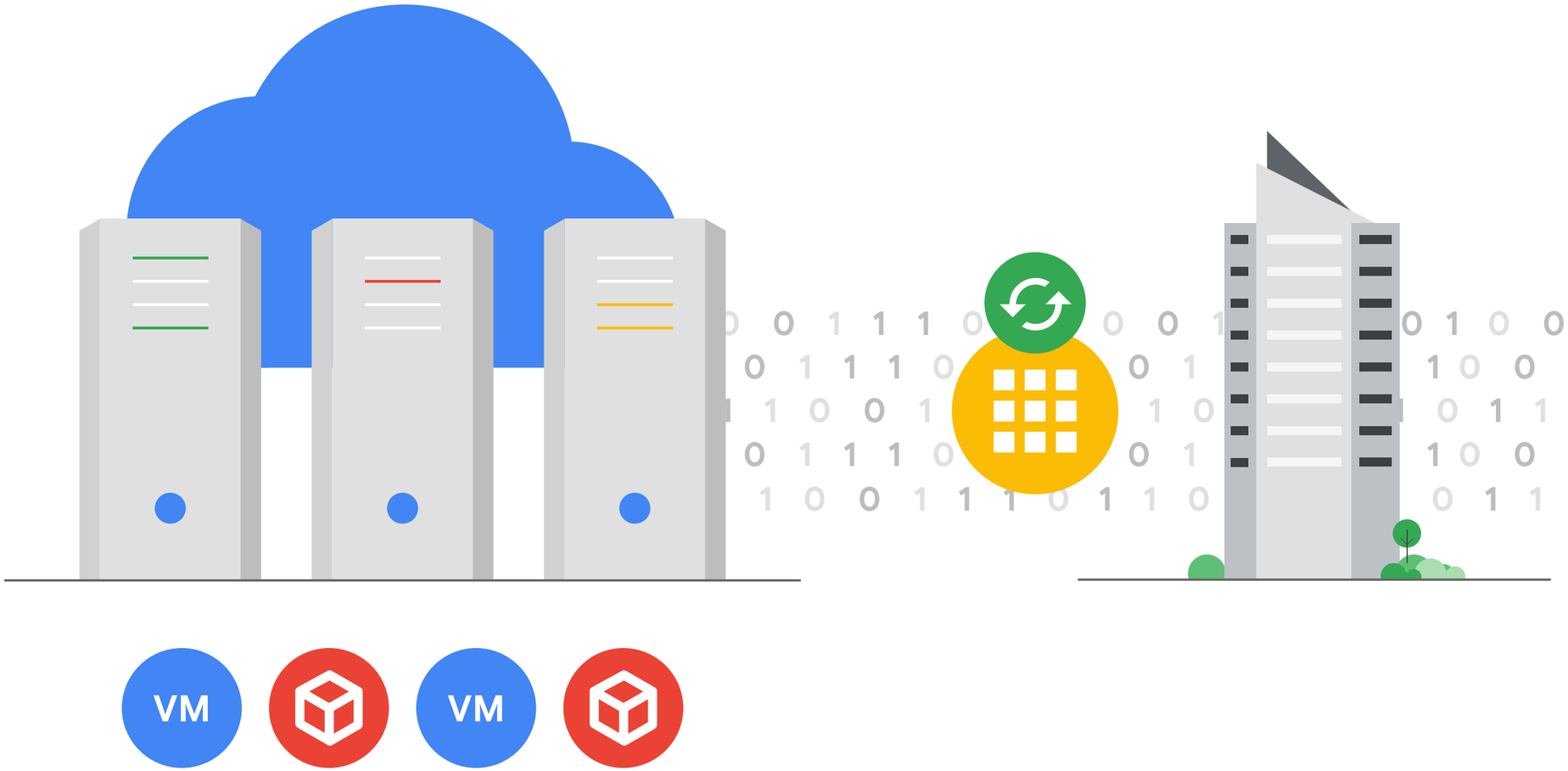


What is Kubernetes?

Kubernetes is an open-source container-orchestration system for automating computer application deployment, scaling, and management.

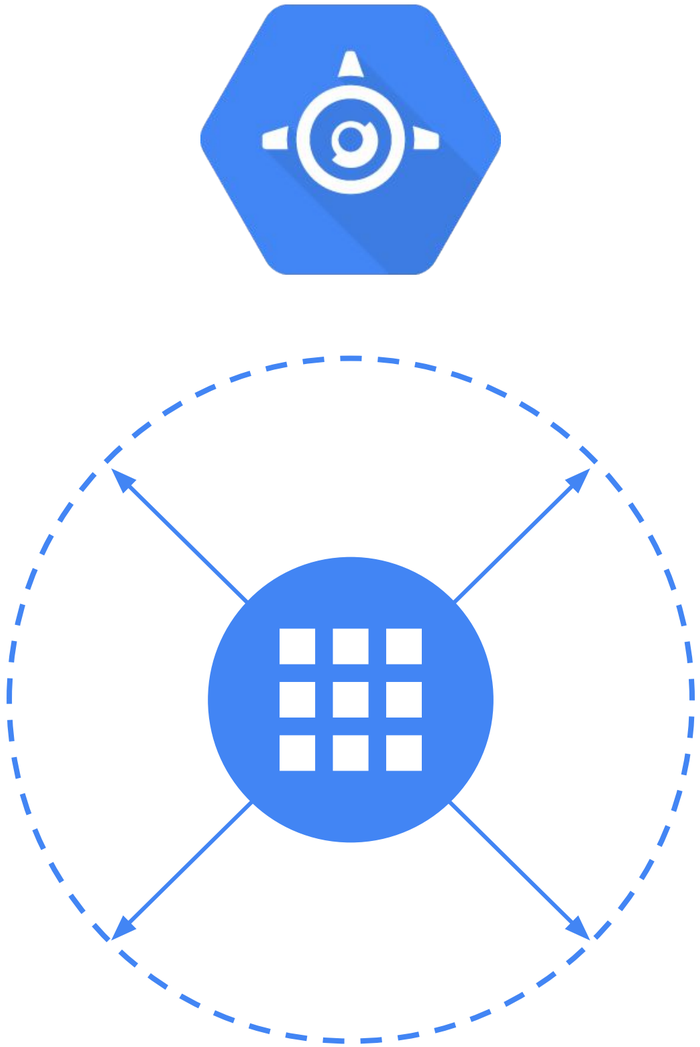


Google Kubernetes Engine or GKE, is the Google Cloud managed service for container orchestration. GKE enables rapid application development and iteration by making it easy to deploy, update, and manage your applications and services.



Serverless computing can be used for application development. You write the code for the functions you want, and the cloud provider updates and adapts the containers or VMs as needed.

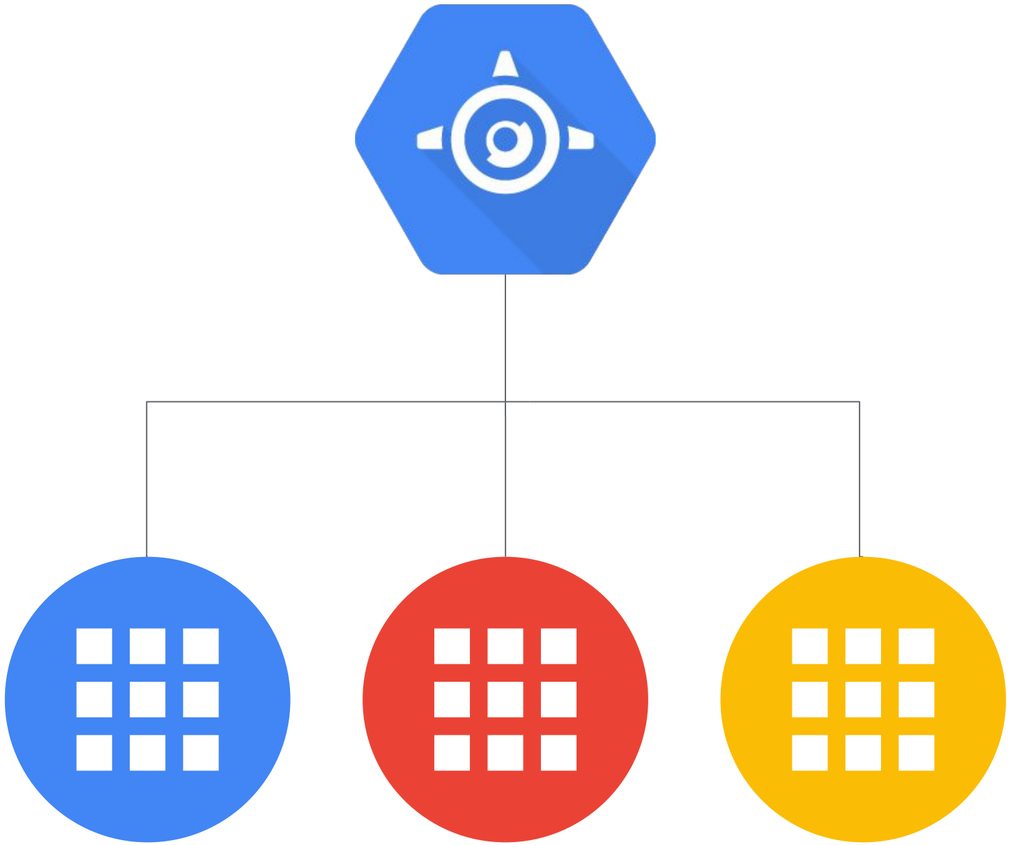
App Engine



High traffic

What is App Engine?

App Engine is a platform for building scalable web applications and mobile backends. App Engine will scale your application automatically in response to the amount of traffic it receives, so you only pay for the resources you use.



You can easily run multiple versions of your app to test new features or designs with end users. Because there are no servers for you to provision or maintain, the monitoring and maintenance processes are easier too.

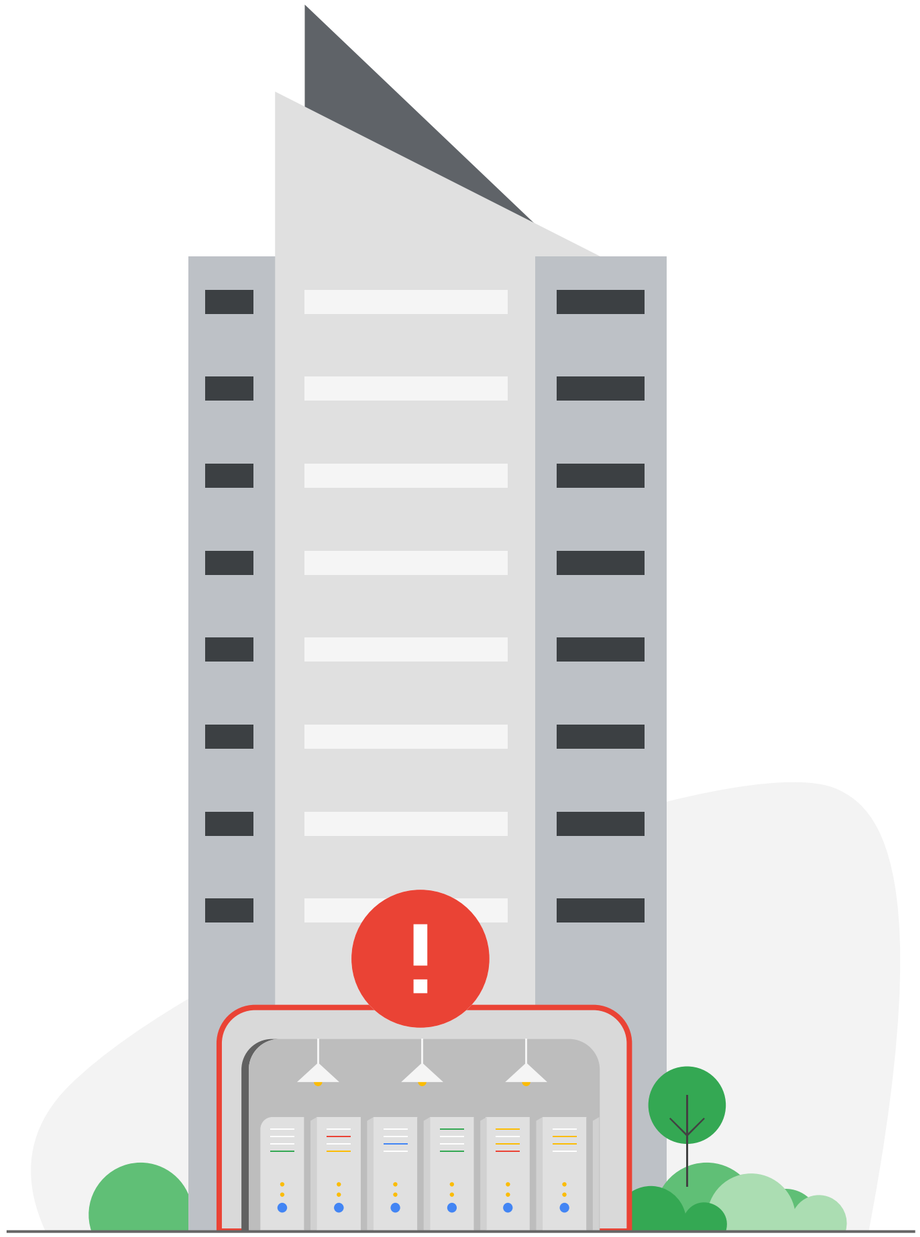
Google Cloud

Module 3: Student Slides

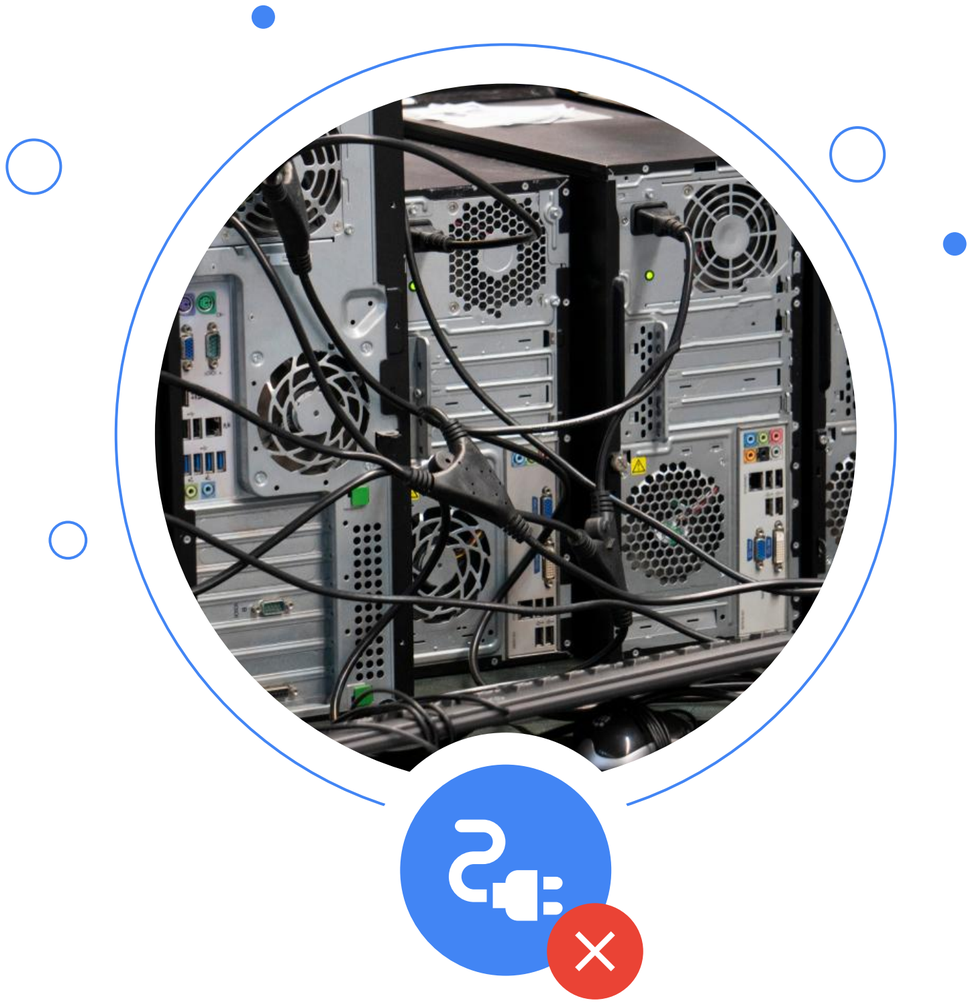
The Value of APIs

Topics covered

- Legacy systems challenges
- APIs to modernize legacy systems
- APIs to create new business value
- Apigee

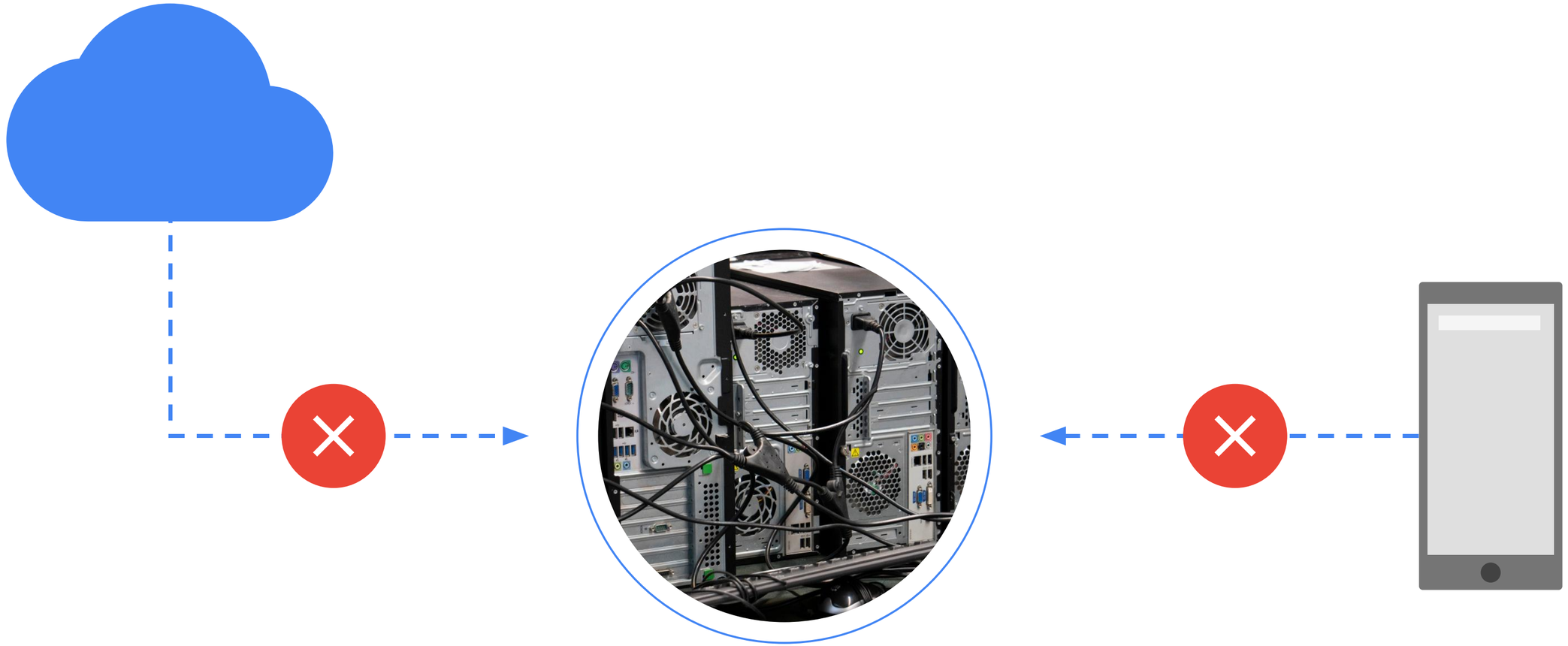


Legacy systems and applications are complex, expensive to maintain, and do not provide the speed and scale required to deliver seamless, digital experiences that consumers now expect.

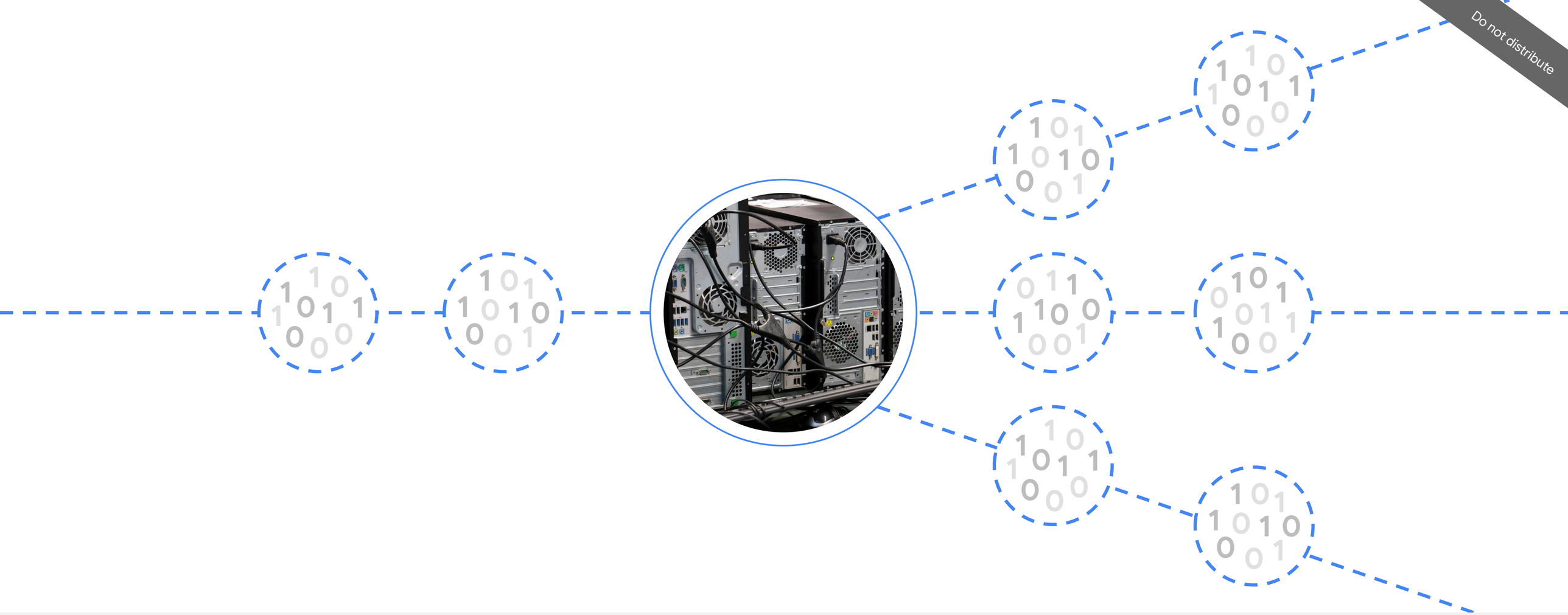


What is a legacy system?

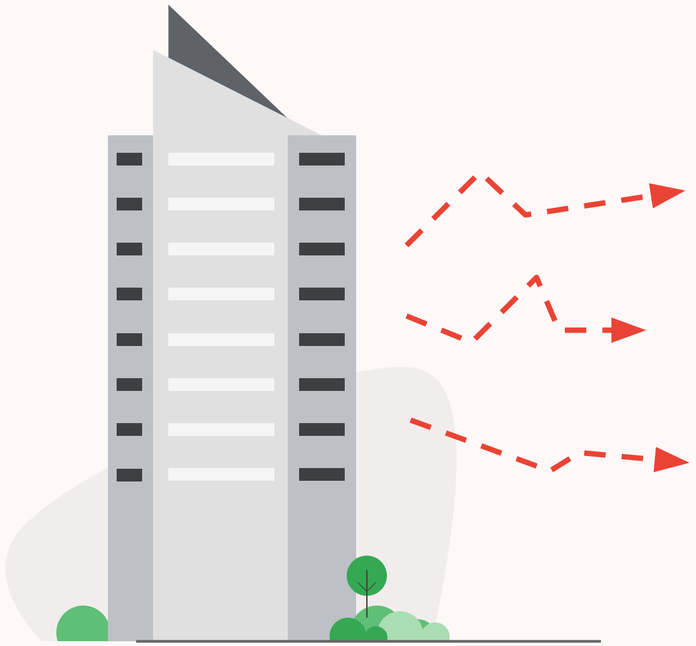
A legacy system is outdated computing software and/or hardware that is still in use. The legacy system is mission critical but often not equipped to deliver new services or upgrades at the speed and scale that users expect. A legacy system often can't connect to newer systems.



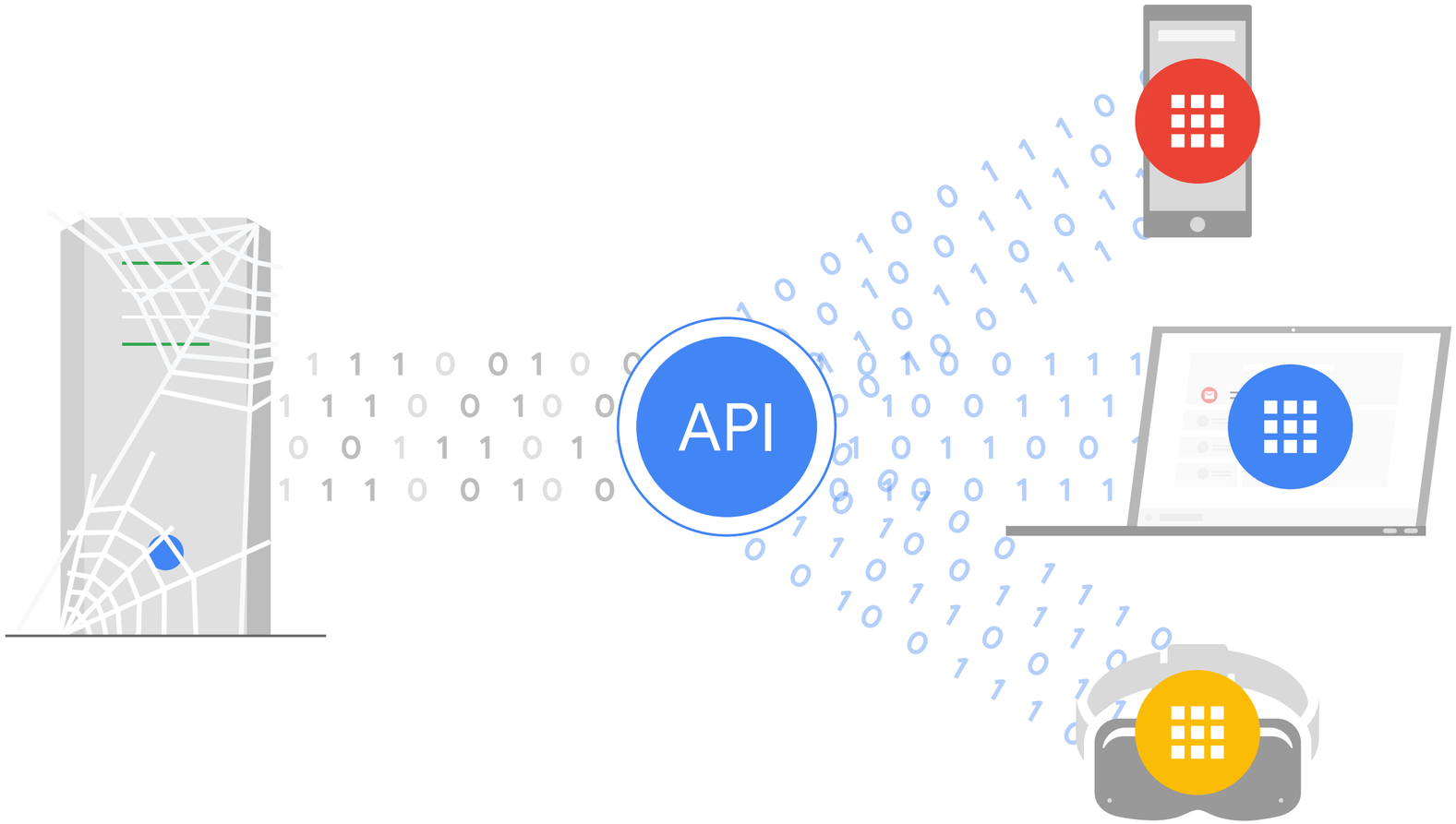
Legacy systems weren’t developed to support the implementation and adoption of modern technologies, such as the cloud, or the internet of things, or mobile applications.



They were also developed for a time when data was shared in batches or at specific time intervals.

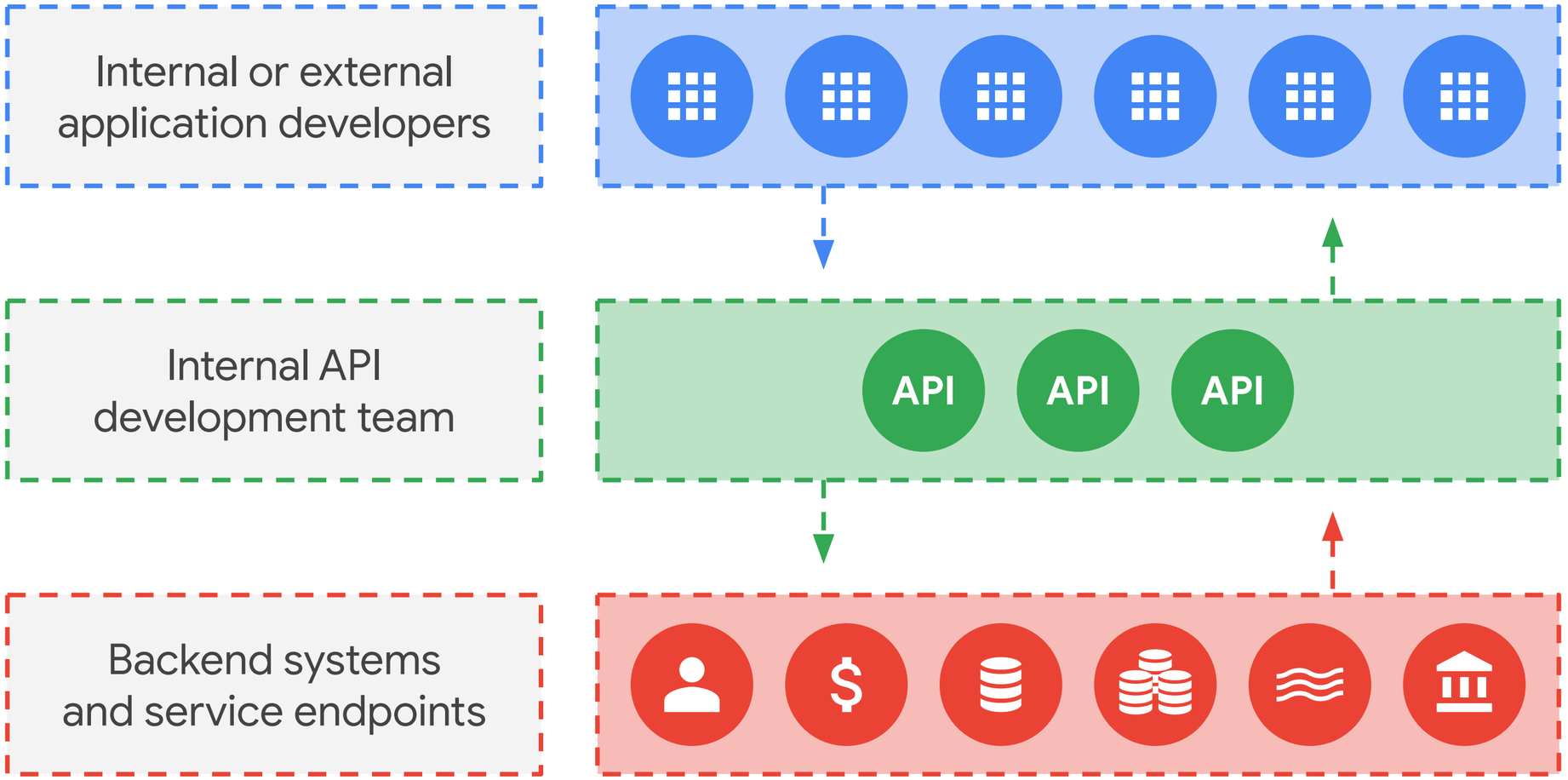


Legacy systems are not designed to serve real-time data as is expected in today's digital world. As a result, legacy systems tend to hold organizations back from using digital technologies to innovate or improve IT efficiency.

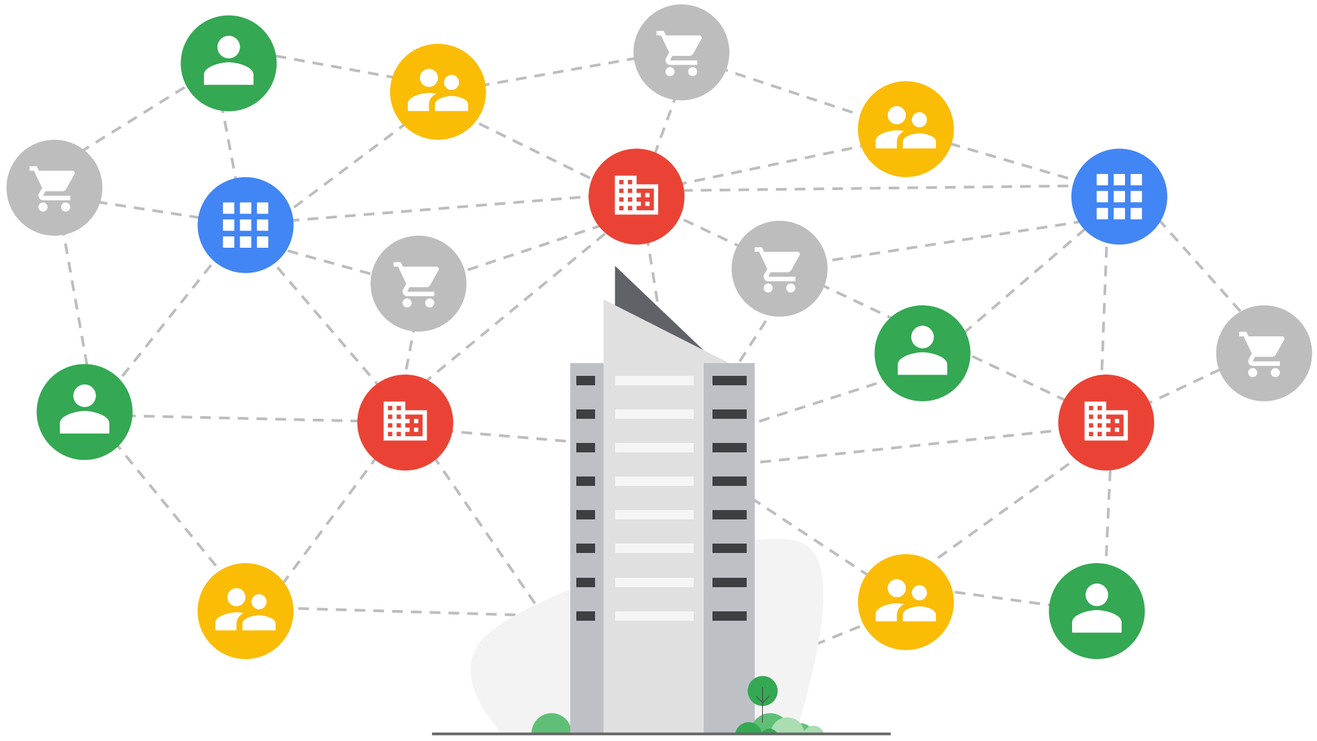


What is an API?

An API is a piece of software that connects different applications and enables information to flow between systems, so businesses can unlock value and create new services. They expose data in a way that protects the integrity of the legacy systems and enables secure and governed access to the underlying data.



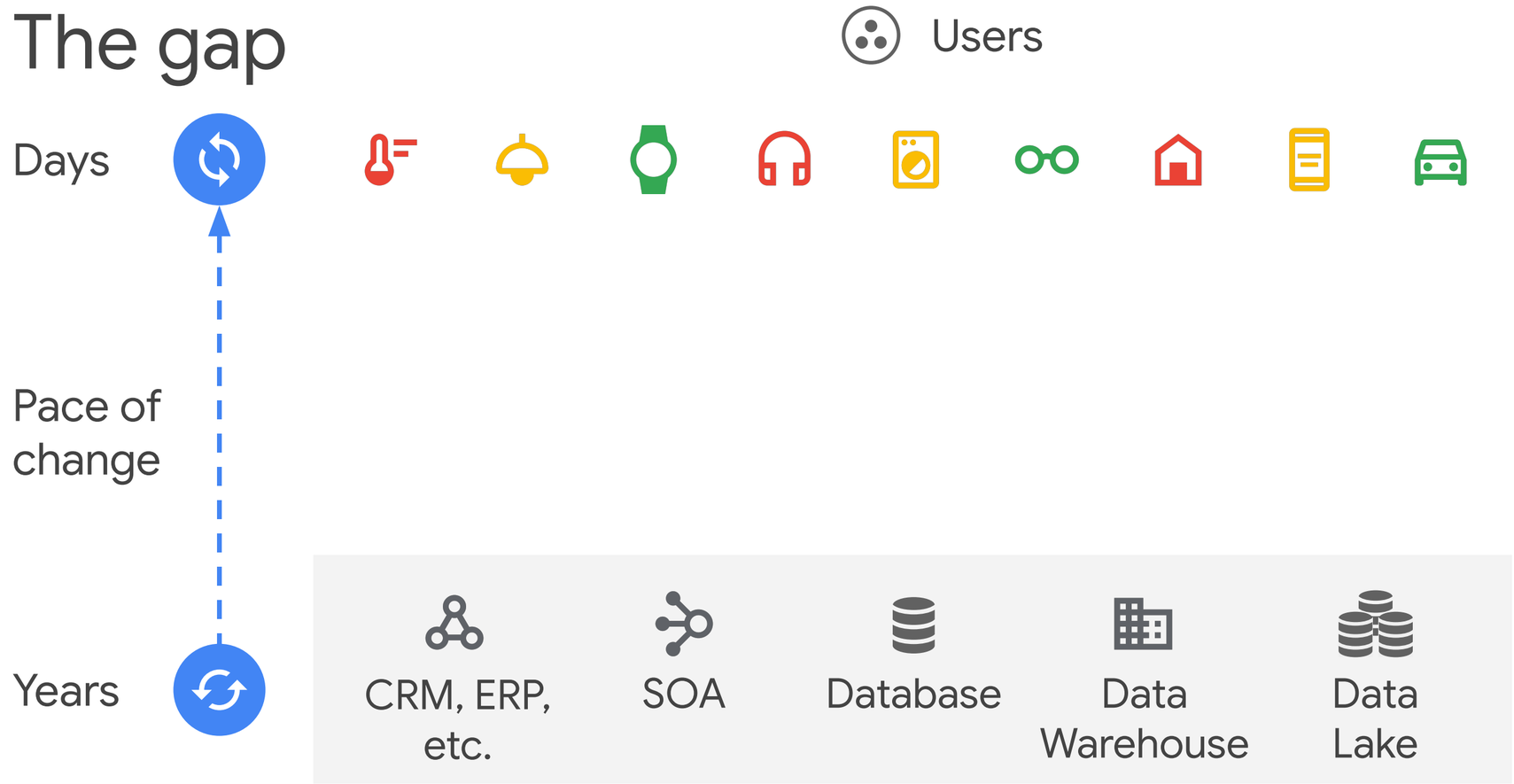
Web or mobile apps are built by internal enterprise developers or by external third-party companies. APIs are built and managed by the API Team within the enterprise. App developers leverage those APIs to integrate with backend services and other service endpoints.



A digital ecosystem is a group of interconnected companies and products. This includes vendors, third party suppliers, customers, and applications. A robust, well connected, and multi faceted digital ecosystem enables businesses to create and monetize new digital experiences.

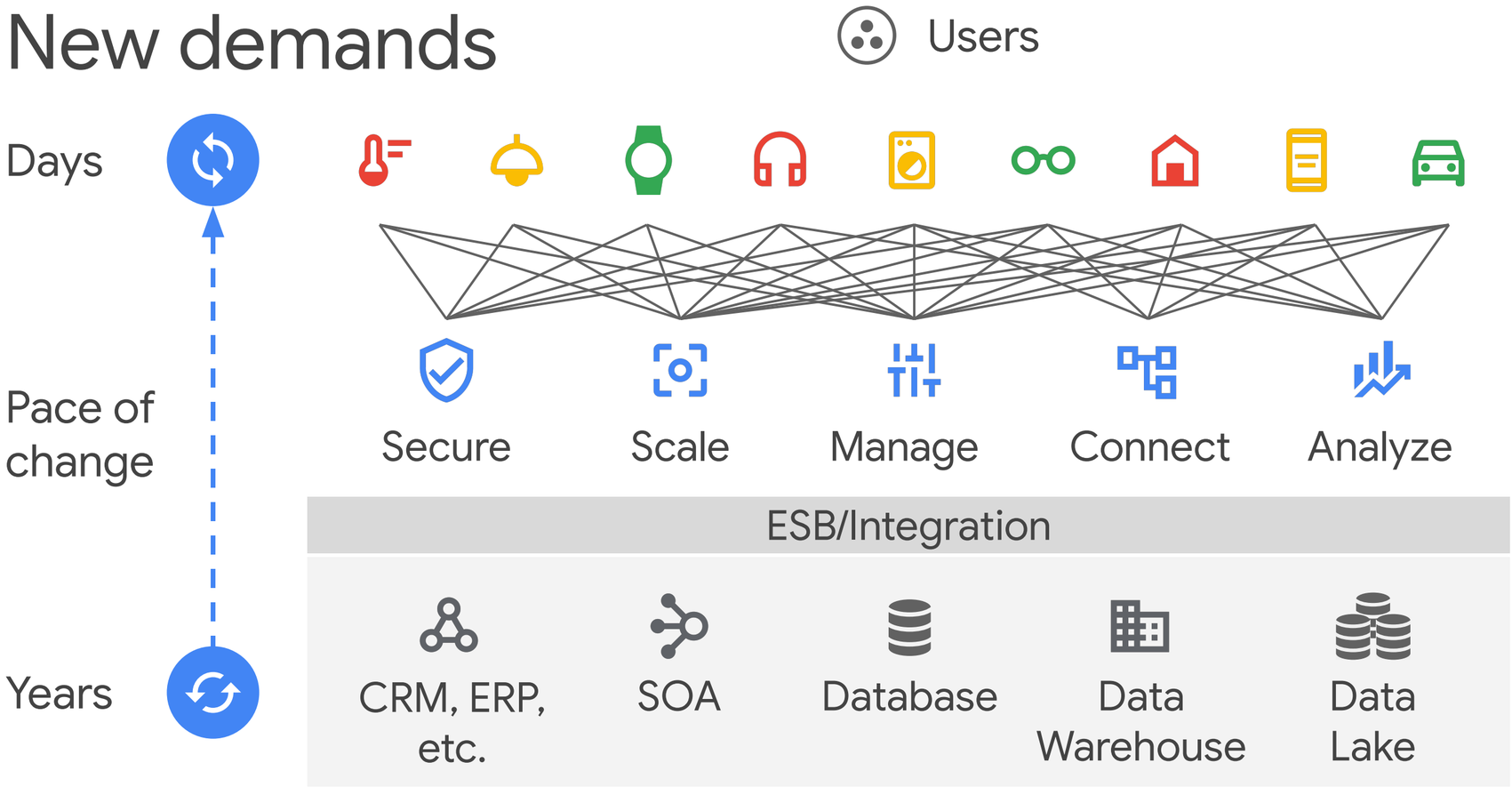
The more you know about your customers, the better able you are to offer a truly integrated, end-to-end digital experience.

The gap



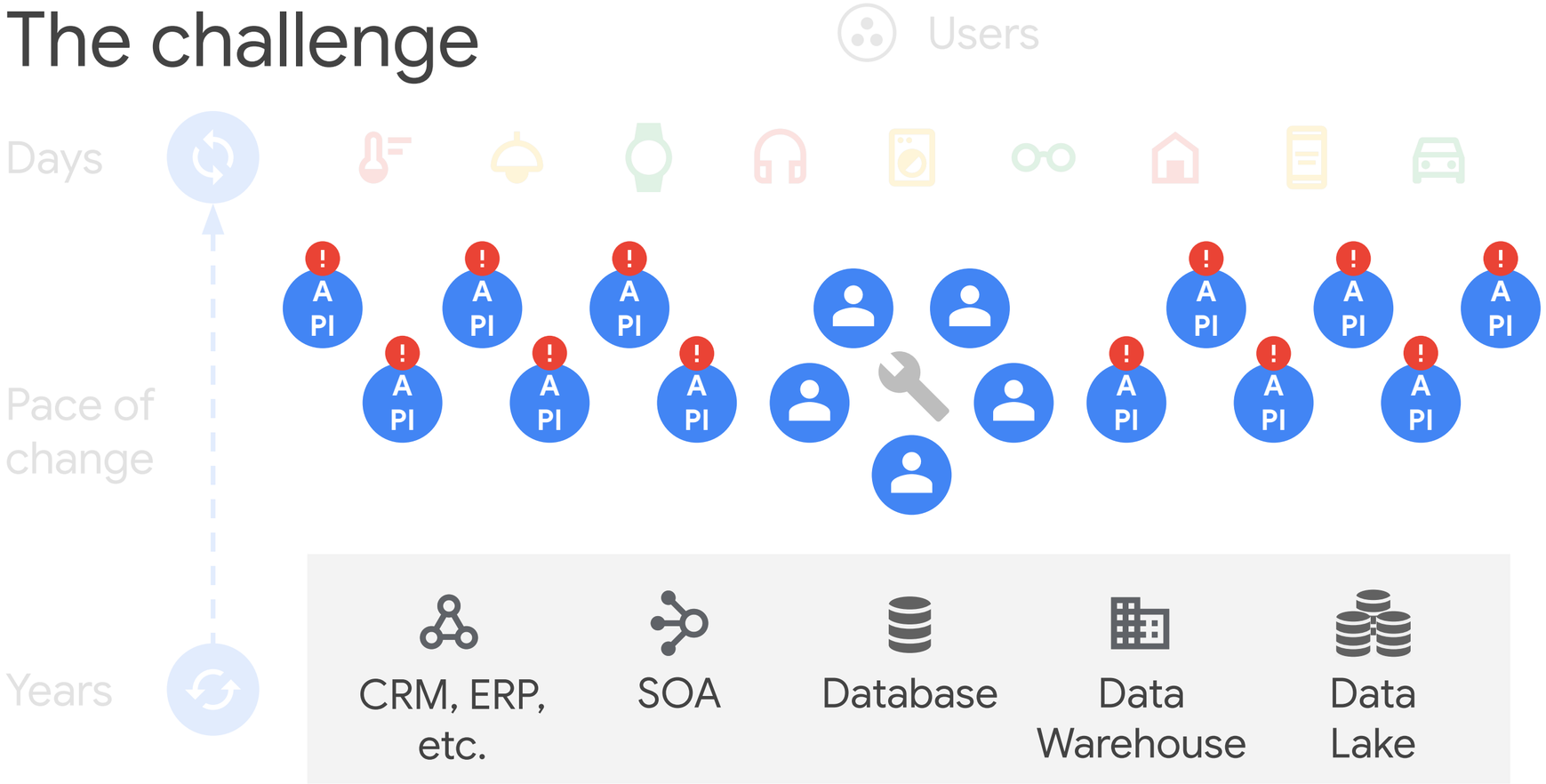
Legacy systems provide business data but don’t provide features and capabilities at the rate of change demanded by today’s users. Modern applications provide connected experiences and can be rapidly updated to meet user demands.

New demands



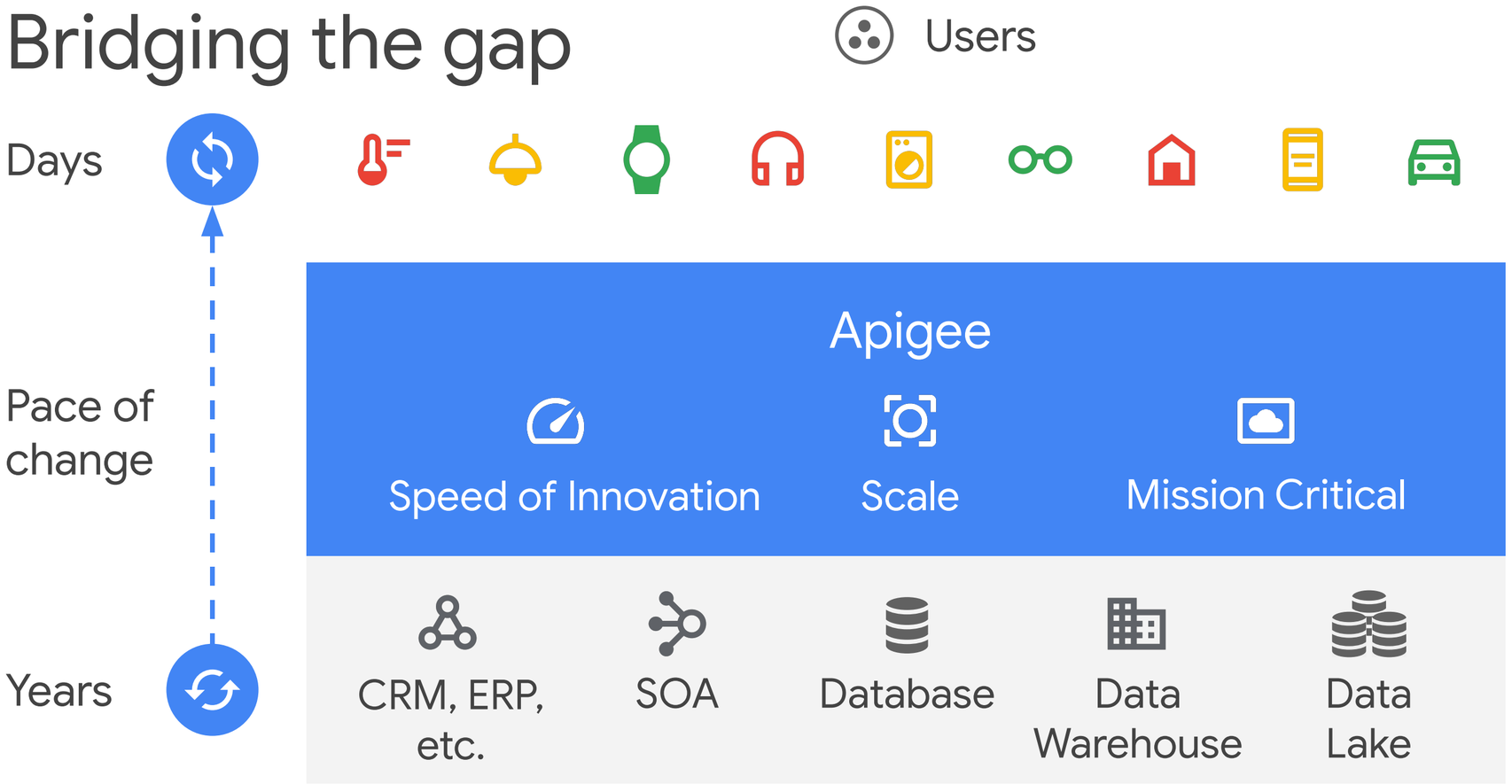
Developers need to manage the entire application lifecycle, connect to different backend systems—including legacy ones—and be able to track and analyze the interactions between consumers and data and service producers.

The challenge



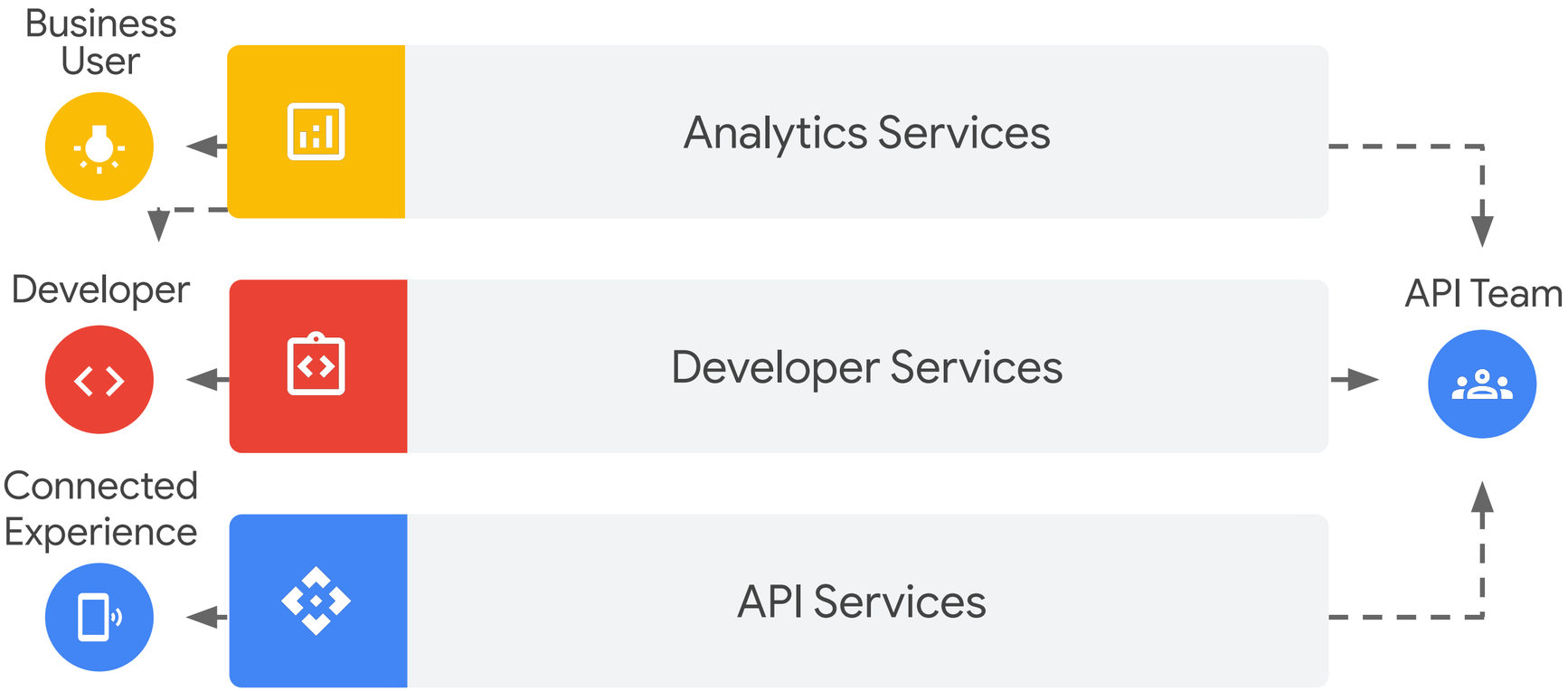
As a company's digital ecosystem becomes more complex, the required time and effort to manage 100s of APIs securely and at scale becomes costly.

Bridging the gap



Apigee is a fully featured API management platform that enables application developers and API providers to create connected digital experiences for end users. Apigee bridges the gap between legacy systems.

Apigee services



The Apigee platform includes API services that provide the runtime API gateway functionality, Developer Services that allow developers to utilize their APIs, and Analytics Services that enable enterprises to report on APIs.