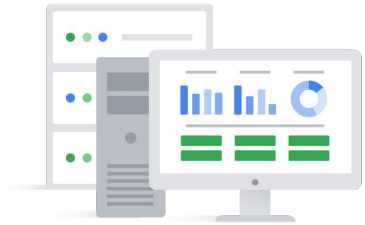
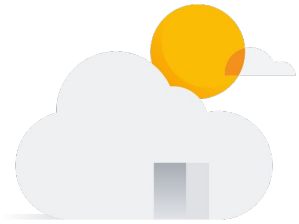
The cloud's impact on resource management



Traditional IT

Organizations are responsible for all of their IT infrastructure when it's completely on-premises.



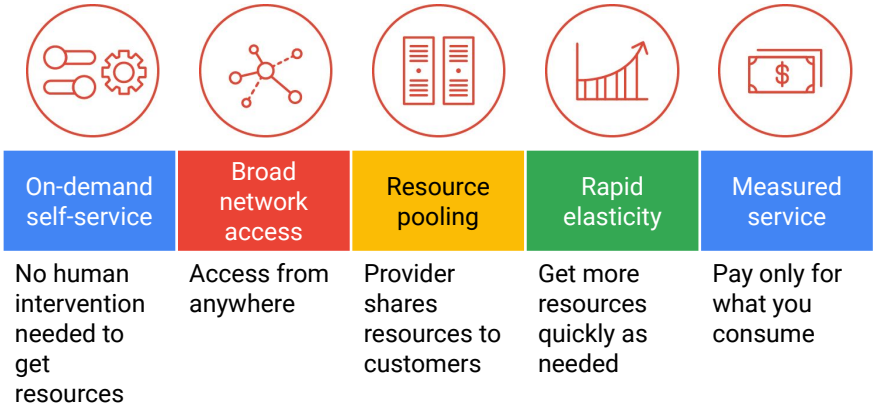
Cloud computing

Allows for a third party to be responsible for some part of the infrastructure.

The world of cloud computing has a diverse set of computing service models to choose from, depending on customer requirements. You might have heard of terms like IaaS, PaaS, and SaaS. These terms represent the different cloud computing models provided “as a service” by cloud providers. As a service” refers to the way IT resources are consumed in these models, and is a key difference between cloud computing and traditional IT.

- In **traditional IT,** an organization consumes resources, such as hardware, software, and development tools, by purchasing, installing, managing, and maintaining them in its own on-premises or self-managed data center. Organizations are responsible for all of their IT infrastructure when it's completely on-premises.
- In **cloud computing**, the cloud service provider owns, manages, and maintains the resources. The customer consumes those resources, which are provided on a subscription or pay-as-you-go basis. All you need is an internet connection. Cloud computing allows for a third party to be responsible for some part of the infrastructure. This means that organizations then have more time to focus on their core business.

What is cloud computing?



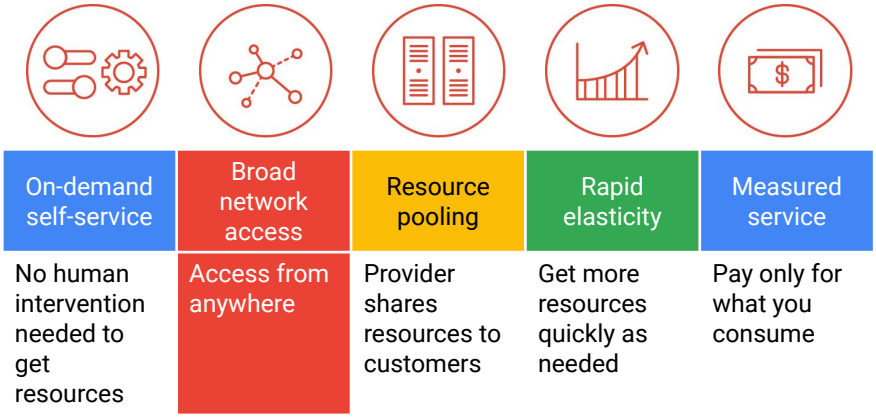
Cloud computing has five fundamental attributes, according to the definition of cloud computing proposed by the United States National Institute of Standards and Technology.

What is cloud computing?

On-demand self-service	Broad network access	Resource pooling	Rapid elasticity	Measured service
No human intervention needed to get resources	Access from anywhere	Provider shares resources to customers	Get more resources quickly as needed	Pay only for what you consume

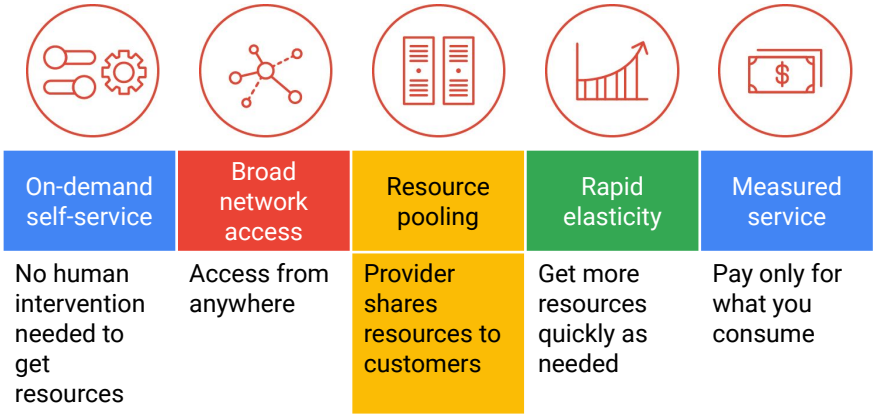
First, customers get computing resources on-demand and self-service. Cloud-computing customers use an automated interface and get the processing power, storage, and network they need, with no need for human intervention.

What is cloud computing?



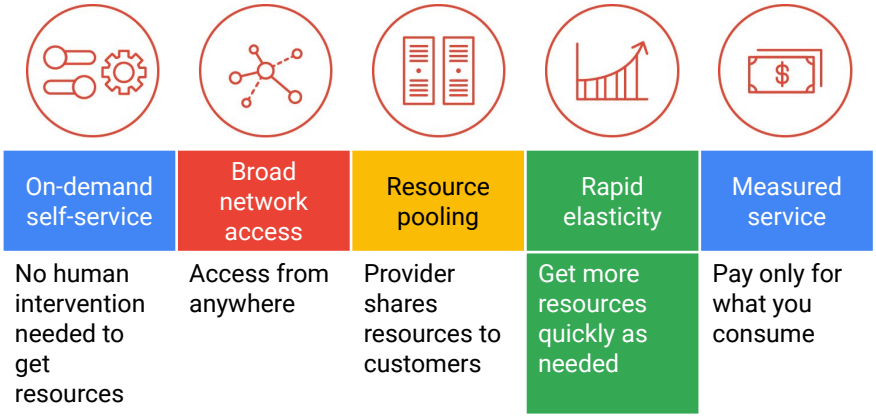
Second, they can access these resources over the network.

What is cloud computing?



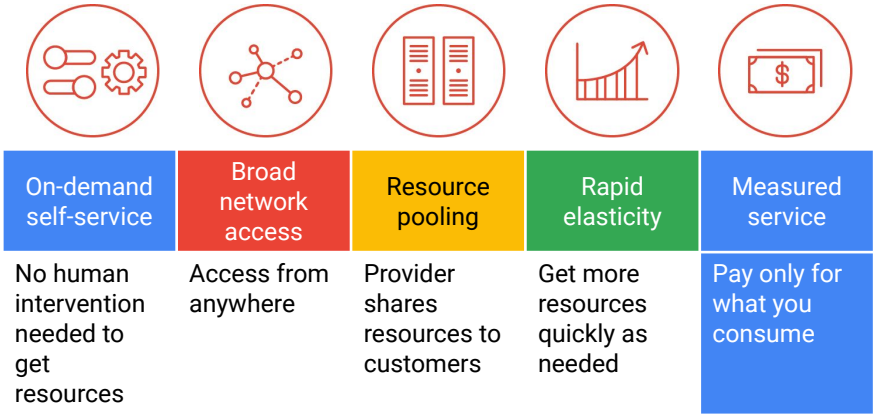
Third, the provider of those resources has a big pool of them, and allocates them to customers out of the pool. That allows the provider to get economies of scale by buying in bulk. Customers don't have to know or care about the exact physical location of those resources.

What is cloud computing?

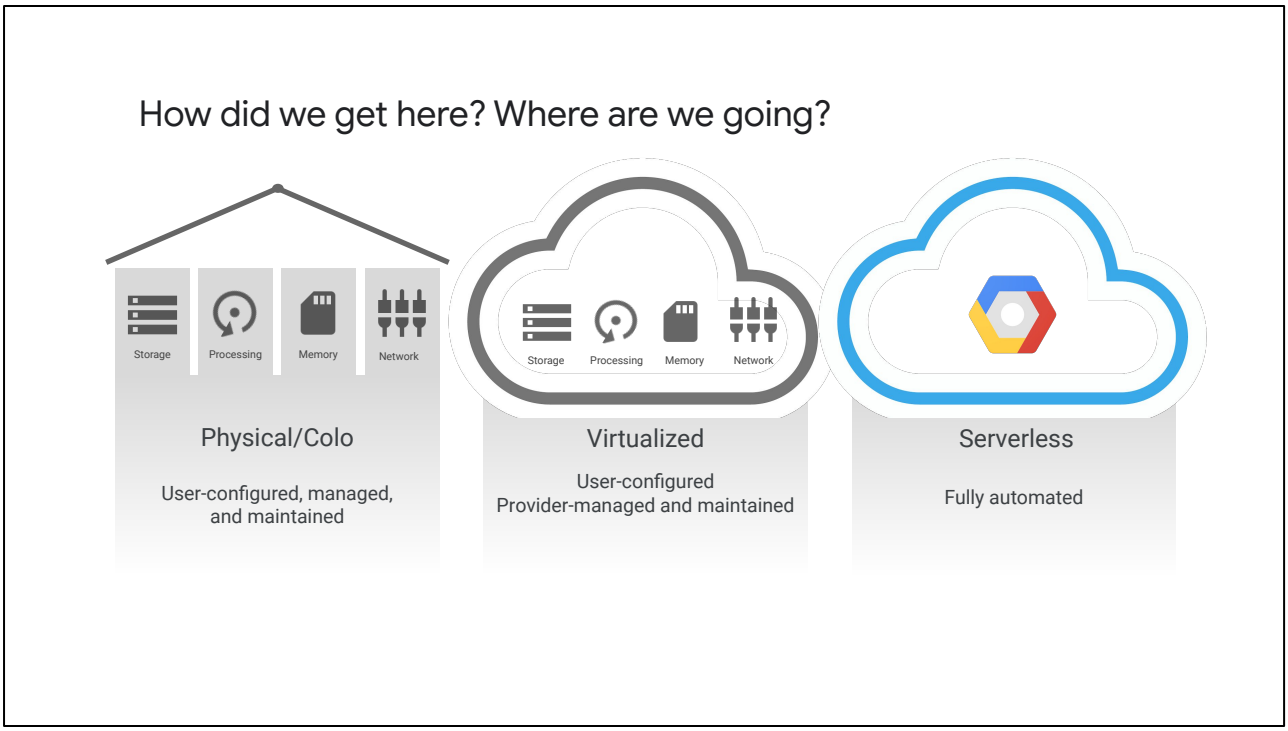


Fourth, the resources are elastic. Customers who need more resources can get more rapidly. When they need less, they can scale back.

What is cloud computing?



And last, the customers pay only for what they use or reserve, as they go. If they stop using resources, they stop paying.



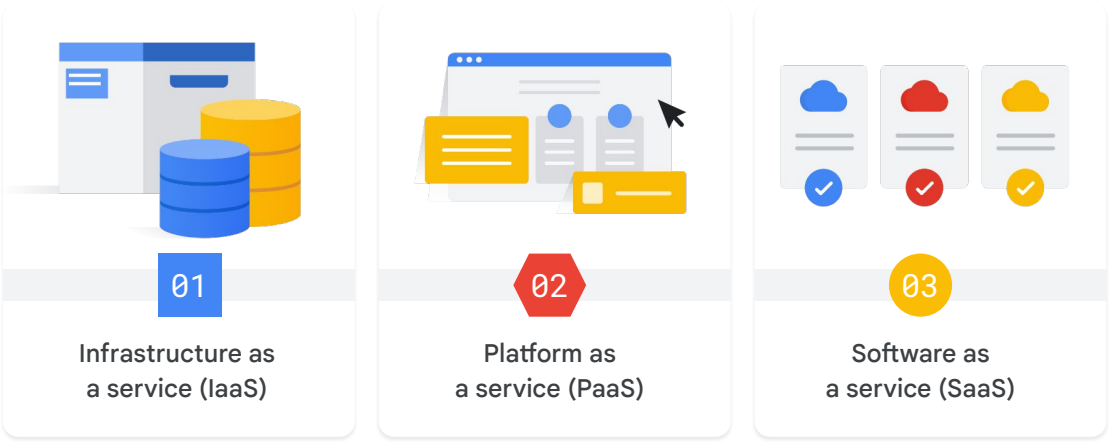
The first wave of the trend towards cloud computing was colocation. Colocation gave users the financial efficiency of renting physical space, instead of investing in data center real estate.

Virtualized data centers of today, the second wave, share similarities with the private data centers and colocation facilities of decades past. The components of virtualized data centers match the physical building blocks of hosted computing—servers, CPUs, disks, load balancers, and so on—but now they are virtual devices. Virtualization does provide a number of benefits: your development teams can move faster, and you can turn capital expenses into operating expenses. With virtualization you still maintain the infrastructure; it is still a user-controlled/user-configured environment.

About 10 years ago, Google realized that its business couldn't move fast enough within the confines of the virtualization model. So Google switched to a container-based architecture—a fully automated, elastic third-wave cloud that consists of a combination of automated services and scalable data. Services automatically provision and configure the infrastructure used to run applications.

Today Google Cloud makes this third-wave cloud available to Google customers.

Cloud computing service models



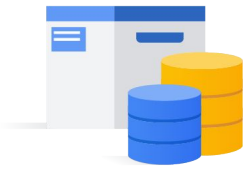
Coming up, we're going to explore three different cloud computing service models:

- **Infrastructure as a service**, or IaaS, which offers infrastructure resources such as compute and storage.
- **Platform as a service**, or PaaS, which offers a develop-and-deploy environment to build cloud apps.
- And **software as a service**, or SaaS, which delivers complete applications as services.

Each model offers distinct features and functionalities, and knowing the differences between them helps organizations choose one to best fit their business' needs.

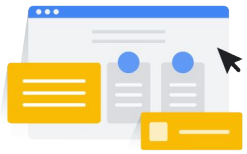
It's important to remember that most organizations that use cloud often use a combination of cloud computing models to solve for different needs.

Choosing the best cloud computing option



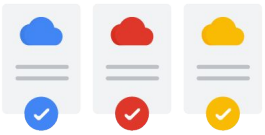
IaaS

A highly flexible, scalable service, while maintaining control of infrastructure.



PaaS

A platform designed for building software products.



SaaS

Ready to use features, without the hassle of installations.

So, how does an organization decide which cloud computing model is the best option for them? The answer depends on their business needs, required functionality, and available expertise.

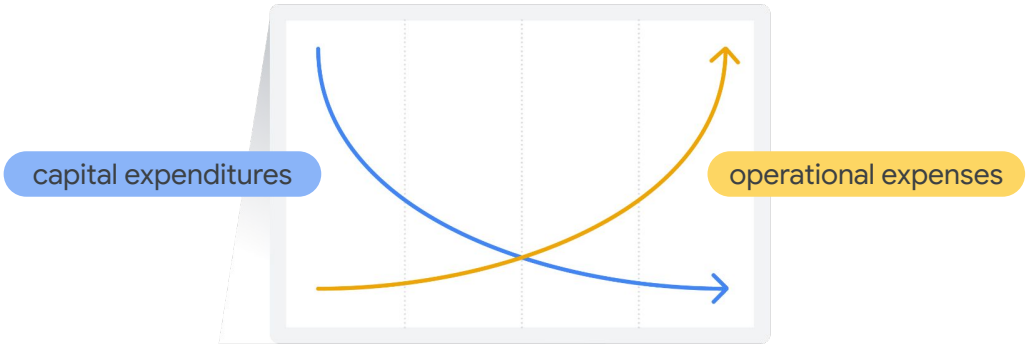
If they are looking for a highly flexible, scalable service— while maintaining control of their infrastructure— then **IaaS** is the right choice. This model offers the most control and customization, but also requires the most management responsibilities and technical expertise.

If they need a platform designed for building software products, then **PaaS** would help their business immediately. This provides a cost-effective way to build applications, but still requires some technical expertise and less management.

If they want features that are ready to use, without the hassle of installations, then **SaaS** might be the best option. This represents the least management responsibilities and technical expertise, but also offers the least control and customization.

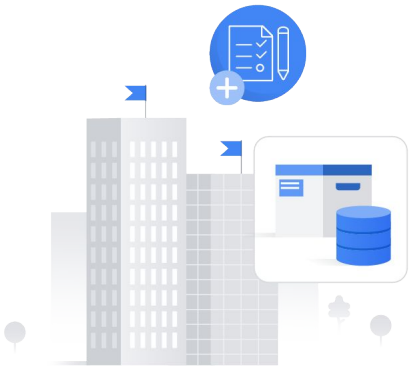
These computing models are not mutually exclusive, though. Depending on the use case, most organizations will use combinations of all three to solve for different business needs.

IaaS transforms CapEx into OpEx



One of the main reasons businesses choose IaaS is to reduce their capital expenditures and transform them into operational expenses. As we previously discussed earlier today

Scenario: IaaS



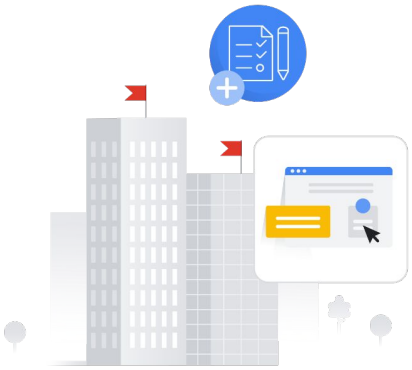
Imagine a large organization needs to implement a new inventory management system.

- Use in-house expertise to develop the system and manage the infrastructure
- IT team has complete control over server configurations
- IT team has to manage and maintain servers

For example, imagine a large organization needs to implement a new inventory management system.

If they had the in-house expertise to develop it and the willingness to manage the infrastructure, they could build this with IaaS resources. The organization's IT team would have complete control over server configurations, but also bear the burden of managing and maintaining them.

Scenario: PaaS

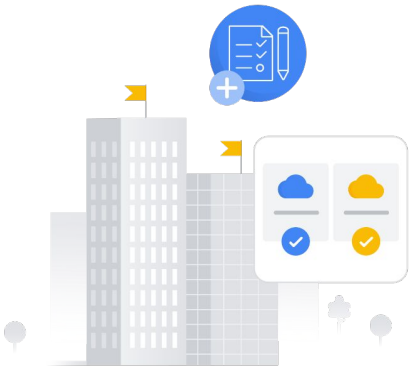


Imagine a large organization needs to implement a new inventory management system.

- Build a custom CRM application while offloading management of infrastructure
- Retain complete control over application features
- Reduce management load

They could choose a PaaS solution and build a custom CRM application while offloading management of infrastructure to the cloud service provider; retaining complete control over application features, but reducing the management load.

Scenario: SaaS

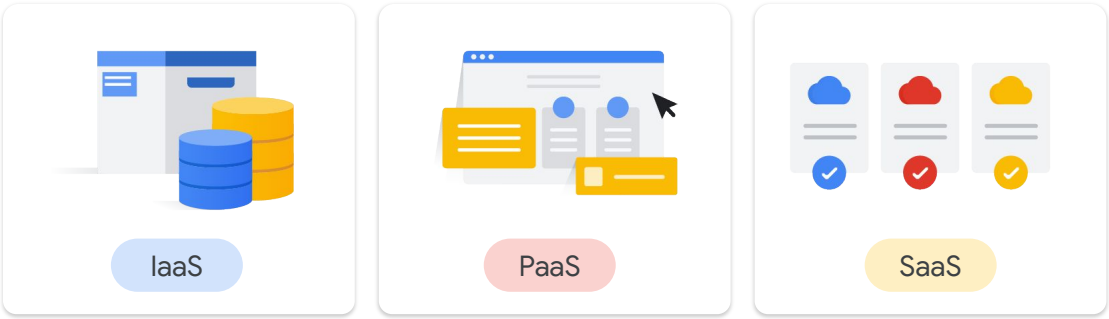


Imagine a large organization needs to implement a new inventory management system.

- Buy a ready-made solution
- No daily management of infrastructure
- Give up all control over software features and functionality

Finally they could choose to buy a ready-made SaaS solution; having no daily management of infrastructure, but also giving up all control over features and functionality in the software.

Compare the benefits and tradeoffs for each use case



Each of these options is a viable solution, so organizations must compare the benefits and tradeoffs for each use case. These cloud computing service models give organizations choices, flexibility, and options that on-premises hosting simply can't provide.

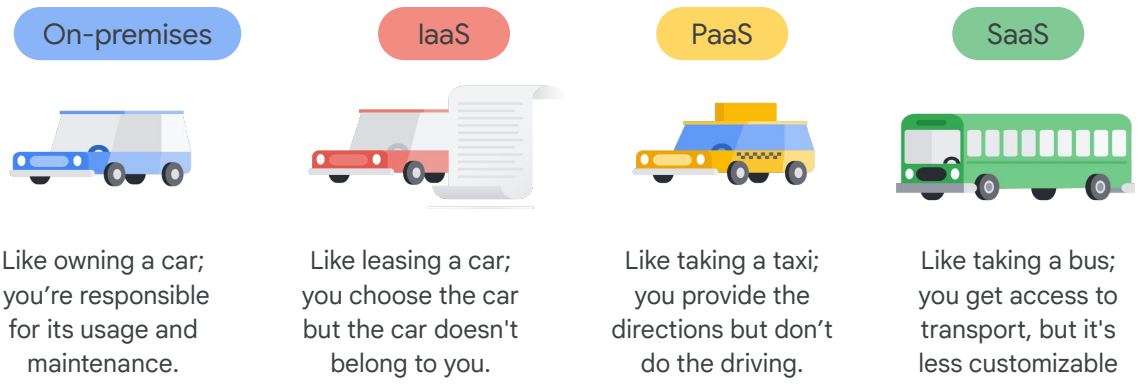
When driving, you don't think about how the engine is operating under the hood

- Ignition
- Brake
- Gear
- Accelerate
- ~~Engine~~

Think about **abstraction** in the way that you operate a car. When you turn on the ignition, press the brake, put the car into gear, and accelerate, you're not thinking about how the engine is physically operating under the hood, right?

That complexity is abstracted away from you, so you can focus on driving safely to your destination. Abstraction is one of the core features of cloud computing.

Organizations must decide the level of control and management they require



When choosing between cloud computing service models, organizations must decide the level of control and management they'll require, or how much they want to hide technical details and focus on business needs.

Let's use a transportation analogy to see how on-premises, IaaS, PaaS, and SaaS compare with each other.

- **On-premises** IT infrastructure is like owning a car. When you buy a car, you're responsible for its usage and maintenance. Upgrading means buying a new car, which takes time and can be costly.
- **IaaS** is like leasing a car. When you lease a car, you choose a car and drive it wherever you want, but the car isn't yours. Upgrading is easier though, as you can just lease a new car.
- **PaaS** is like taking a taxi. You provide specific directions, like the code, but the driver does the actual driving.
- And **SaaS** is like going by bus. You still get access to transport, but it's less customizable. Buses have designated routes, and you share the space with other passengers.

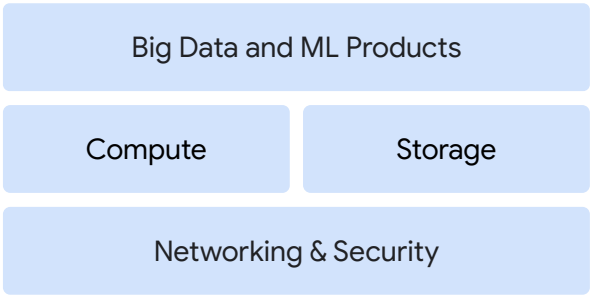
Other Cloud Computing Service Models

1. Infrastructure as a service (IaaS)
2. Hybrid between IaaS and PaaS, as GKE
3. Platform as a service (PaaS)
4. Container as a service (CaaS)
5. Function as a service (FaaS)
6. Software as a service (SaaS)
7. Others, such as
    - Database as a service (DaaS)
    - Anything as a Service (XaaS)

Google believes that, in the future, every company—regardless of size or industry—will differentiate itself from its competitors through technology. Largely, that technology will be in the form of software. Great software is centered on data. Thus, every company is or will become a data company.

Google Cloud provides a wide variety of services for managing and getting value from data at scale.

The Google Cloud infrastructure

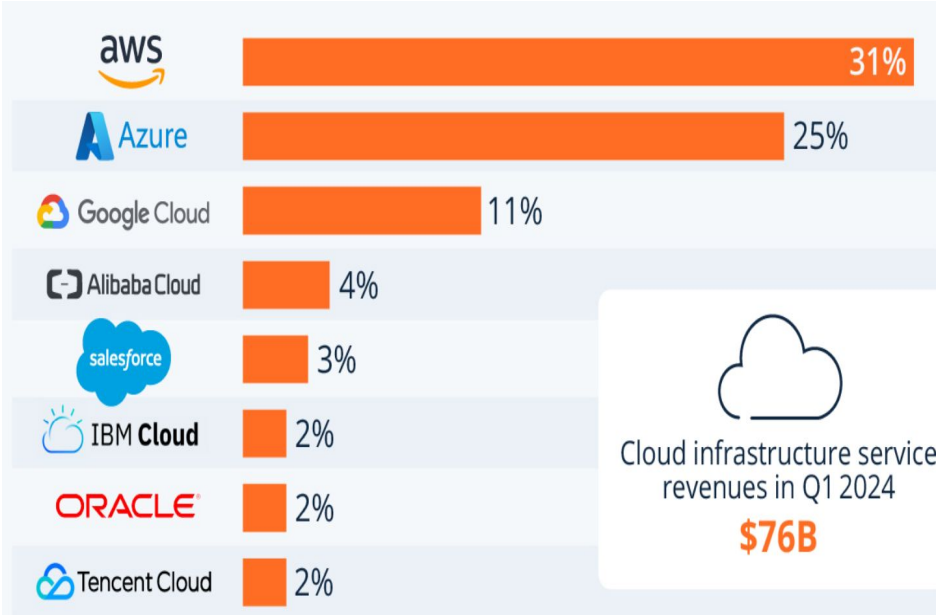


You can think of the Google Cloud infrastructure in terms of three layers.

- At the base layer is **networking and security**, which lays the foundation to support all of Google's infrastructure and applications.
- On the next layer sit **compute** and **storage**. Google Cloud separates, or decouples, as it's technically called, compute and storage so they can scale independently based on need.
- And on the top layer sit the **big data and machine learning products**, which enable you to perform tasks to ingest, store, process, and deliver business insights, data pipelines, and ML models.

And thanks to Google Cloud, these tasks can be accomplished without needing to manage and scale the underlying infrastructure.

Cloud Providers Market Share 2024 Q1



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