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Cloud Computing



- Cloud computing is a general term for anything that involves delivering hosted services over the Internet.
- These services are broadly divided into three categories:
 - i. Infrastructure-as-a-Service (IaaS),
 - ii. Platform-as-a-Service (PaaS) and
 - iii. Software-as-a-Service (SaaS).
- The name cloud computing was inspired by the cloud symbol that's often used to represent the Internet in flowcharts and diagrams

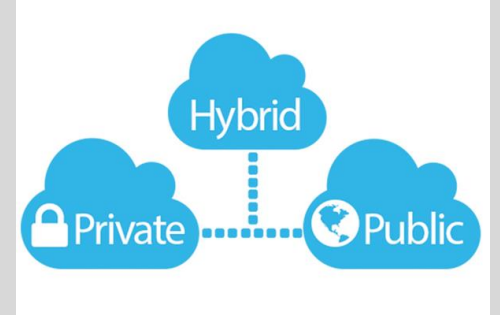
Cloud Computing Deployment Models

- ❑ Private cloud services are delivered from a business's data center to internal users. This model offers the versatility and convenience of the cloud, while preserving the management, control and security common to local data centers. Internal users may or may not be billed for services through IT chargeback. Common private cloud technologies and vendors include VMware and OpenStack
- ❑ In the public cloud model, a third-party cloud service provider delivers the cloud service over the internet. Public cloud services are sold on demand, typically by the minute or hour, though long-term commitments are available for many services. Customers only pay for the CPU cycles, storage or bandwidth they consume. Leading public cloud service providers include Amazon Web Services (AWS), Microsoft Azure, IBM and Google Cloud Platform.

Cloud Computing Deployment Models Cont.

- ❑ A hybrid cloud is a combination of public cloud services and an on-premises private cloud, with orchestration and automation between the two. Companies can run mission-critical workloads or sensitive applications on the private cloud and use the public cloud to handle workload bursts or spikes in demand. The goal of a hybrid cloud is to create a unified, automated, scalable environment that takes advantage of all that a public cloud infrastructure can provide, while still maintaining control over mission-critical data.
- ❑ Multi Cloud - Main cloud deployment models In addition, organizations are increasingly embracing a multicloud model, or the use of multiple infrastructure-as-a-service providers. This enables applications to migrate between different cloud providers or to even operate concurrently across two or more cloud providers. Organizations adopt multicloud for various reasons. For example, they could do so to minimize the risk of a cloud service outage or to take advantage of more competitive pricing from a particular provider. Multicloud implementation and application development can be a challenge because of the differences between cloud providers' services and application program interfaces (APIs). Multicloud deployments should become easier, however, as providers' services and APIs converge and become more homogeneous through industry initiatives such as the Open Cloud Computing Interface.

Public vs. Private vs. Hybrid vs. Multi Cloud



Private cloud – What are the advantages of a private cloud? Well, you can start small, maybe just some ephemeral services and then go further and start moving more important services to it. Everything is contained in-house, both apps and data, and you're in total control – sometimes it is required that you keep sensitive data away, under a key.

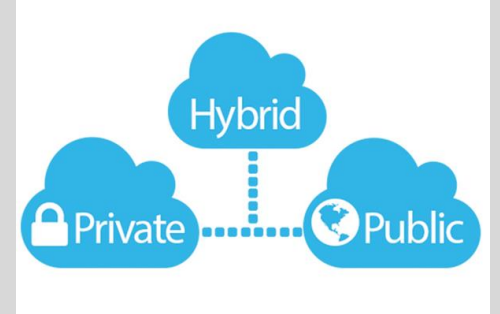
However, there are disadvantages as well: you need to provide for the hardware resources; you need to provide for installation, configuration and management of cloud infrastructure itself, aside from apps and data. Usually, you don't have enough hardware resources to provide for geo-diversification and redundancy of locations, and thus prevent major outage of your services if there's a problem with your primary location. You are in total control – ergo, you are the only one responsible for everything that happens to your apps and data.

Public vs. Private vs. Hybrid vs. Multi Cloud

Public cloud-

The pros of using the public cloud are numerous:

- You don't need to provide for hardware resources, as you'll be using the ones provided by your cloud provider
- You'll have a large choice of services offered by your provider, so you don't need to install and configure these
- You pay only what you use and how much you use it.
- The responsibility for securing your services and data is shared between the provider and you – you're responsible only for your app and data, and the provider is responsible for everything else. And you can use services for protecting your sensitive data offered by your provider.



There are some cons:

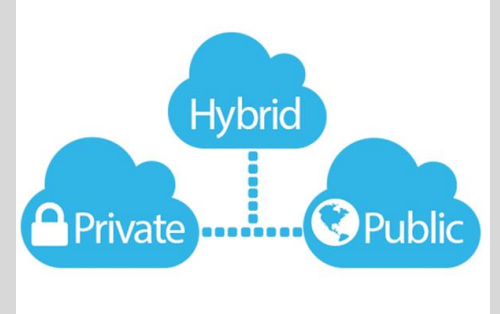
- Your data is located somewhere else, and often you don't even know where exactly it is.
- Cloud infrastructure services differ from one provider to another. This means you have a vendor lock-in.

Public vs. Private vs. Hybrid vs. Multi Cloud

Hybrid cloud

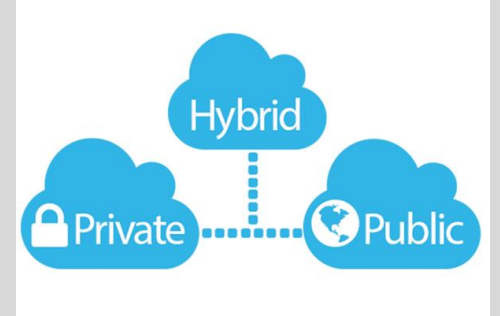
There are two main reasons why you would need a hybrid cloud strategy. One is that you already have the private cloud infrastructure that you want to migrate to public cloud in part or in whole. The best way to do this migration, while minimizing the downtime of your services is to connect your private cloud infrastructure to the public cloud setup and then migrate services one by one. Many public cloud providers offer services to ease the migration and movement of services, as well as the integration of services that remain on the private side to those on the public cloud.

The other main reason is the need to keep some (usually the most sensitive) data in-house exclusively, while still utilizing all the good things that public cloud provider offers. That way you get the best of both worlds.



The main problem with hybrid clouds is the need for management, monitoring and configuration services that can integrate private and public cloud. Some public cloud providers offer some management services that can span both your private and their own cloud infrastructure.

Public vs. Private vs. Hybrid vs. Multi Cloud



Multi-cloud

Why would you even want that? Well, there can be several reasons for that:

You already use services from one public cloud provider but somebody else offers a service that your current provider does not offer, or their service level is not on the same level with the same service from the other provider. However, for some reasons, you don't want to migrate services already on your current public cloud.

You don't want to keep all your eggs in one basket – diversification of infrastructure offerings can be more efficient and cost-effective.

A multi-cloud strategy is mostly used by big companies, but even smaller enterprises can utilize the benefits of multi-cloud.

The biggest obstacle for spreading from single/public cloud to multi-cloud is again vendor lock-in. You need to connect different virtual data centers, each with their own management, configuration and monitoring services. This mostly means that you'll need some apps that will integrate monitoring, configuration and management services for these diverse public clouds into one easy to maintain the system. You don't want to stress out your ops team by forcing them to use native tools for maintaining public cloud infrastructure that your provider offers. You want to have one set of tools that can work with either provider and integrate them into one big setup. The other problem is to provide identity and authentication services that can span multiple clouds so that your users do not need to have a separate set of credentials for accessing services on different clouds.

Cloud Computing Characteristics and Benefits

- ❑ Cloud computing boasts several attractive benefits for businesses and end users. Five of the main benefits of cloud computing are:
 - ✓ Self-service provisioning: End users can spin up compute resources for almost any type of workload on demand. This eliminates the traditional need for IT administrators to provision and manage compute resources.
 - ✓ Elasticity: Companies can scale up as computing needs increase and scale down again as demands decrease. This eliminates the need for massive investments in local infrastructure, which may or may not remain active.
 - ✓ Pay per use: Compute resources are measured at a granular level, enabling users to pay only for the resources and workloads they use.

Cloud Computing Characteristics and Benefits Cont.

- ✓ Workload resilience: Cloud service providers often implement redundant resources to ensure resilient storage and to keep users' important workloads running -- often across multiple global regions.
- ✓ Migration flexibility: Organizations can move certain workloads to or from the cloud -- or to different cloud platforms -- as desired or automatically for better cost savings or to use new services as they emerge.



Types of cloud computing services

- ❑ Although cloud computing has changed over time, it has been divided into three broad service categories: infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS).
- IaaS providers, such as AWS, supply a virtual server instance and storage, as well as APIs that enable users to migrate workloads to a VM. Users have an allocated storage capacity and can start, stop, access and configure the VM and storage as desired. IaaS providers offer small, medium, large, extra-large and memory- or compute-optimized instances, in addition to customized instances, for various workload needs.
- In the PaaS model, cloud providers host development tools on their infrastructures. Users access these tools over the internet using APIs, web portals or gateway software. PaaS is used for general software development, and many PaaS providers host the software after it's developed. Common PaaS providers include Salesforce's Force.com, AWS Elastic Beanstalk and Google App Engine.

Types of cloud computing services Cont.

- SaaS is a distribution model that delivers software applications over the internet; these applications are often called web services. Users can access SaaS applications and services from any location using a computer or mobile device that has internet access. One common example of a SaaS application is Microsoft Office 365 for productivity and email services.

Why is cloud computing important?

- Before cloud computing, companies had to store all their data and software on their own hard drives and servers. The bigger the company, the more storage they needed. This way of treating data is not scalable at speed. For example, if word started spreading about your business and you suddenly had a lot of online orders, your servers would probably crash. Good business meant hard work for the IT department.
- It's not just businesses that benefit from cloud computing. The cloud has transformed our lives as individuals as well. Many of us use cloud services every day. When we update our status on social media, binge a new streaming series, or check our bank accounts we're most likely using applications that are hosted by cloud services. These apps are accessed through an internet connection rather than installed on our hard drives or devices.
- Today, cloud technology means that companies can scale and adapt at speed and scale, accelerate innovation, drive business agility, streamline operations, and reduce costs. Not only can this help propel companies through the current crisis, it can lead to increased, sustainable growth. According to our future system research, companies that are more strategic in their approach to technology are doing better financially. They're achieving more than twice the average revenue growth of companies slow to implement and use their tech. In fact, 95 percent of leaders have adopted sophisticated cloud services.