Cloud Computing

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Cloud Computing

Definition:

Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. Large clouds often have functions distributed over multiple locations, each location being a data center.

Examples:

Dropbox, Salesforce, Cisco WebEx

History:

Cloud Computing was invented in the early 1960s by J.C.R Licklider (Joseph Carl Robnett Licklider), an American Psychologist and Computer Scientist.

Why Cloud Computing?

With increase in computer and Mobile user's, data storage has become a priority in all fields. Large and small scale businesses today thrive on their data & they spent a huge amount of money to maintain this data. It requires a strong IT support and a storage hub. Not all businesses can afford high cost of in-house IT infrastructure and back up support services. For them Cloud Computing is a cheaper solution. Perhaps its efficiency in storing data, computation and less maintenance cost has succeeded to attract even bigger businesses as well.

Properties

- ## Resources Pooling

It means that the Cloud provider pulled the computing resources to provide services to multiple customers with the help of a multi-tenant model. There are different physical and virtual resources assigned and reassigned which depends on the demand of the customer.

- ## On-Demand Self-Service

It is one of the important and valuable features of Cloud Computing as the user can continuously monitor the server uptime, capabilities, and allotted network storage. With this feature, the user can also monitor the computing capabilities.

Advantages

- **Back-up and restore data**

Once the data is stored in the cloud, it is easier to get back-up and restore that data using the cloud.

- **Improved collaboration**

Cloud applications improve collaboration by allowing groups of people to quickly and easily share information in the cloud via shared storage

- **Excellent accessibility**

Cloud allows us to quickly and easily access store information anywhere, anytime in the whole world, using an internet connection. An internet cloud infrastructure increases organization productivity and efficiency by ensuring that our data is always accessible.

- **Low maintenance cost**

Cloud computing reduces both hardware and software maintenance costs for organizations.

- **Mobility**

Cloud computing allows us to easily access all cloud data via mobile.

- **Services in the pay-per-use model**

Cloud computing offers Application Programming Interfaces (APIs) to the users for access services on the cloud and pays the charges as per the usage of service.

- **Unlimited storage capacity**

Cloud offers us a huge amount of storing capacity for storing our important data such as documents, images, audio, video, etc. in one place.

- **Data security**

Data security is one of the biggest advantages of cloud computing. Cloud offers many advanced features related to security and ensures that data is securely stored and handled.

Disadvantages

- **Internet Connectivity**

As you know, in cloud computing, every data (image, audio, video, etc.) is stored on the cloud, and we access these data through the cloud by using the internet connection. If you do not have good internet connectivity, you cannot access these data. However, we have no any other way to access data from the cloud.

- **Vendor lock-in**

Vendor lock-in is the biggest disadvantage of cloud computing. Organizations may face problems when transferring their services from one vendor to another. As different vendors provide different platforms, that can cause difficulty moving from one cloud to another.

- **Limited Control**

As we know, cloud infrastructure is completely owned, managed, and monitored by the service provider, so the cloud users have less control over the function and execution of services within a cloud infrastructure.

- **Security**

Although cloud service providers implement the best security standards to store important information. But, before adopting cloud technology, you should be aware that you will be sending all your organization's sensitive information to a third party, i.e., a cloud computing service provider. While sending the data on the cloud, there may be a chance that your organization's information is hacked by Hackers.

Types of Computing

- **Distributed Computing**

Distributed computing (or distributed processing) is the technique of linking together multiple computer servers over a network into a cluster, to share data and to coordinate processing power.

- **Mainframe Computing**

A mainframe computer, informally called a mainframe or big iron, is a computer used primarily by large organizations for critical applications like bulk data processing for tasks such as censuses, industry and consumer statistics, enterprise resource planning, and large-scale transaction processing

- **Cluster Computing**

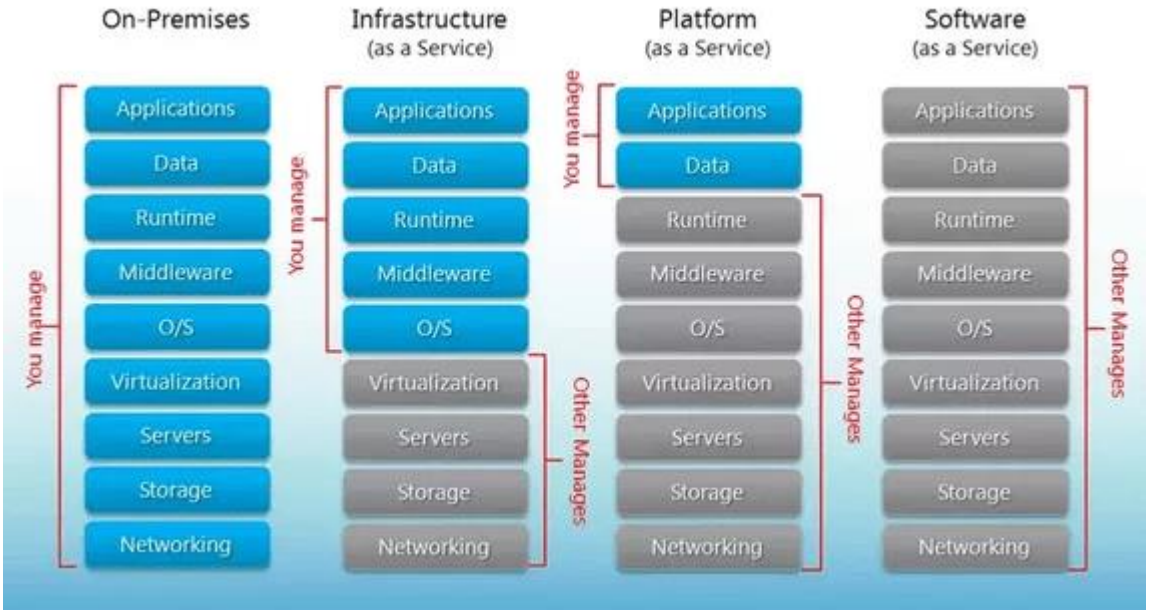
Cluster computing defines several computers linked on a network and implemented like an individual entity. Each computer that is linked to the network is known as a node. Cluster computing provides solutions to solve difficult problems by providing faster computational speed, and enhanced data integrity.

- **Grid Computing**

Grid Computing is a process where computers and devices from various locations work on a single problem. Further, in this system clusters jointly execute given tasks. As a result, it applies resources from multiple computers and nodes.

Therefore, it is a type of computing environment that utilizes several and scattered resources. Hence, these resources provide a functioning environment for executing a single task.

Components of Cloud Computing

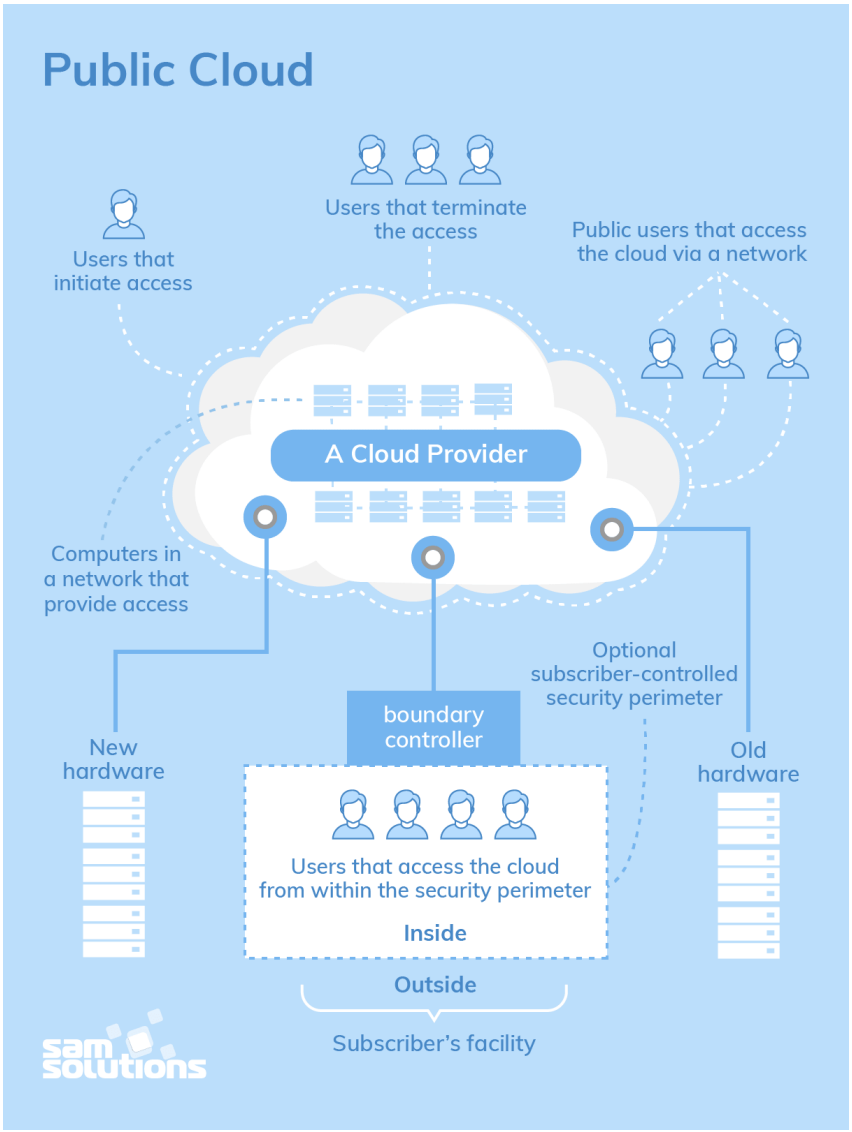


- **Public Cloud**

The name speaks for itself: public clouds are available to the general public, and data are created and stored on third-party servers.

Server infrastructure belongs to service providers that manage it and administer pool resources, which is why there is no need for user companies to buy and maintain their own hardware. Provider companies offer resources as a service both free of charge or on a pay-per-use basis via the Internet. Users can scale resources as required.

The public cloud deployment model is the first choice for businesses with low privacy concerns. When it comes to popular public cloud deployment models, examples are Amazon Elastic Compute Cloud (Amazon EC2 — the top service provider according to ZDNet), Microsoft Azure, Google App Engine, IBM Cloud, Salesforce Heroku and others.



The Advantages of a Public Cloud

- **Hassle-free infrastructure management.** Having a third party running your cloud infrastructure is convenient: you do not need to develop and maintain your software because the service provider does it for you. In addition, the infrastructure setup and use are uncomplicated.
- **High scalability.** You can easily extend the cloud's capacity as your company requirements increase.
- **Reduced costs.** You pay only for the service you use, so there's no need to invest in hardware or software.
- **24/7 uptime.** The extensive network of your provider's servers ensures your infrastructure is constantly available and has improved operation time.

The Disadvantages of a Public Cloud

- **Compromised reliability.** That same server network is also meant to ensure against failure But often enough, public clouds experience outages and malfunction, as in the case of the 2016 Salesforce CRM disruption that caused a storage collapse.
- **Data security and privacy issues give rise to concern.** Although access to data is easy, a public deployment model deprives users of knowing where their information is kept and who has access to it.
- **The lack of a bespoke service.** Service providers have only standardized service options, which is why they often fail to satisfy more complex requirements.

• Private Cloud

There is little to no difference between a public and a private model from the technical point of view, as their architectures are very similar. However, as opposed to a public cloud that is available to the general public, only one specific company owns a private cloud. That is why it is also called an internal or corporate model.

The server can be hosted externally or on the premises of the owner company. Regardless of their physical location, these infrastructures are maintained on a designated private network and use software and hardware that are intended for use only by the owner company.

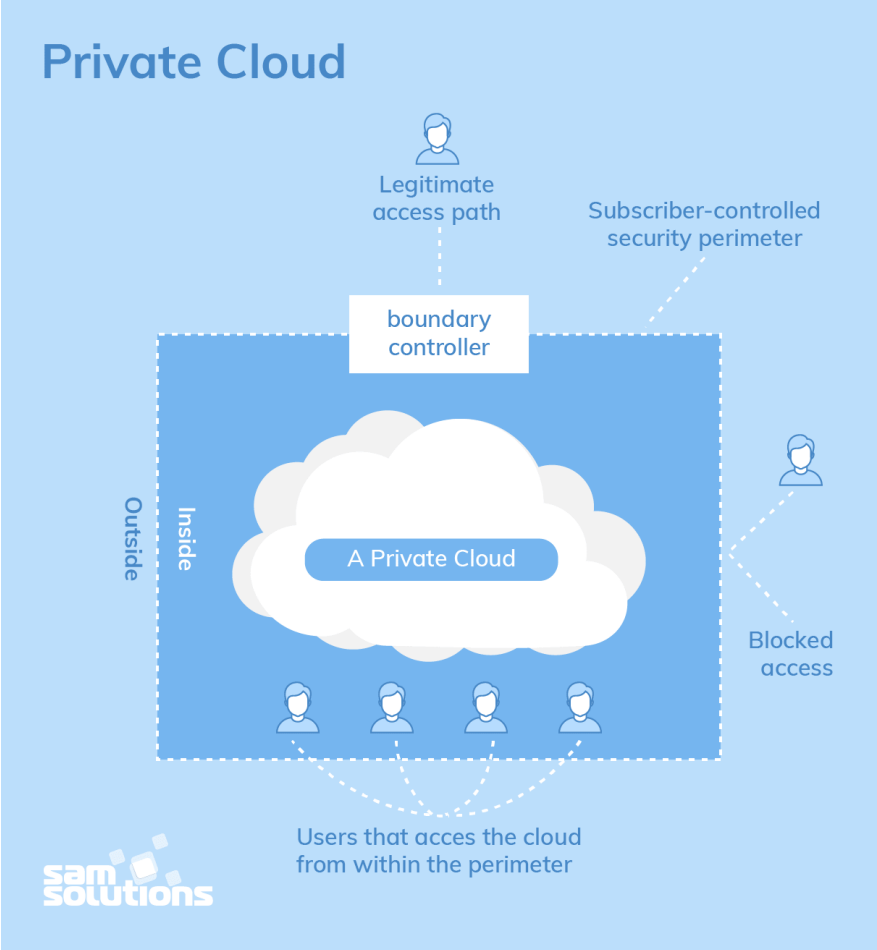
The Benefits of a Private Cloud

All the benefits of this deployment model result from its autonomy. They are the following:

- Bespoke and flexible development and high scalability, which allows companies to customize their infrastructures in accordance with their requirements
- High security, privacy and reliability, as only authorized persons can access resources

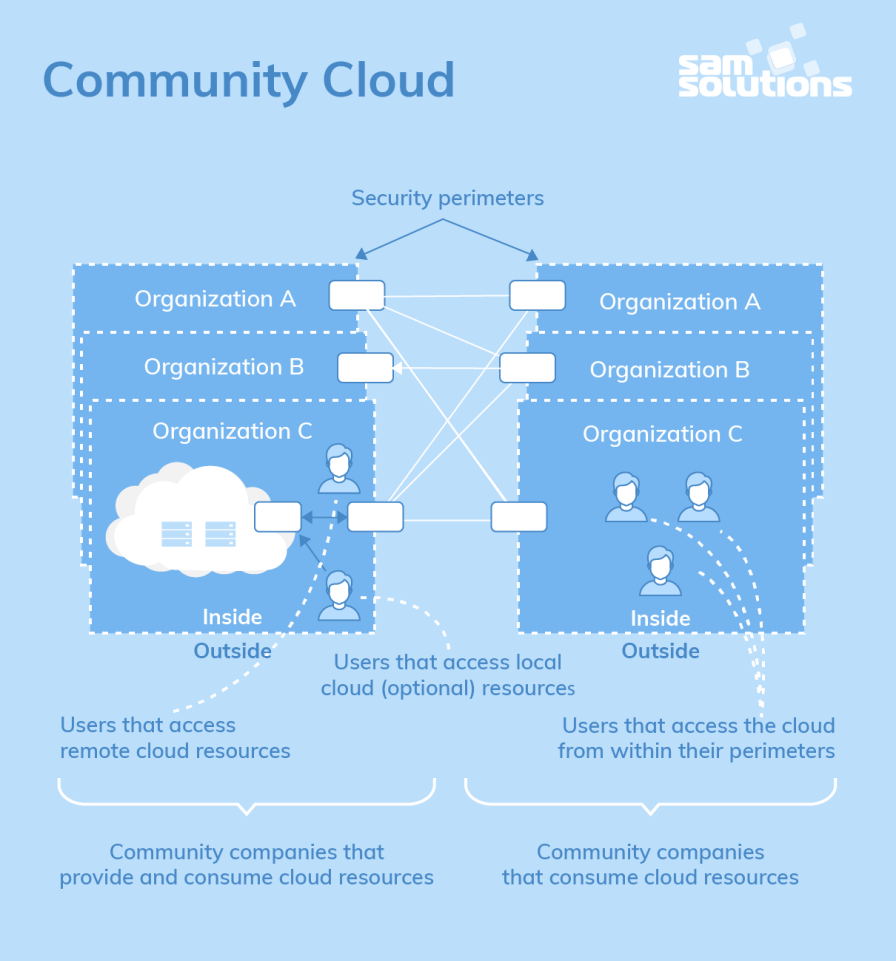
The Drawbacks of a Private Cloud

The major disadvantage of the private cloud deployment model is its cost, as it requires considerable expense on hardware, software and staff training. That is why this secure and flexible computing deployment model is not the right choice for small companies.



- ### Community Cloud

A community deployment model largely resembles the private one; the only difference is the set of users. Whereas only one company owns the private cloud server, several organizations with similar backgrounds share the infrastructure and related resources of a community cloud.



The Strengths of a Community Cloud

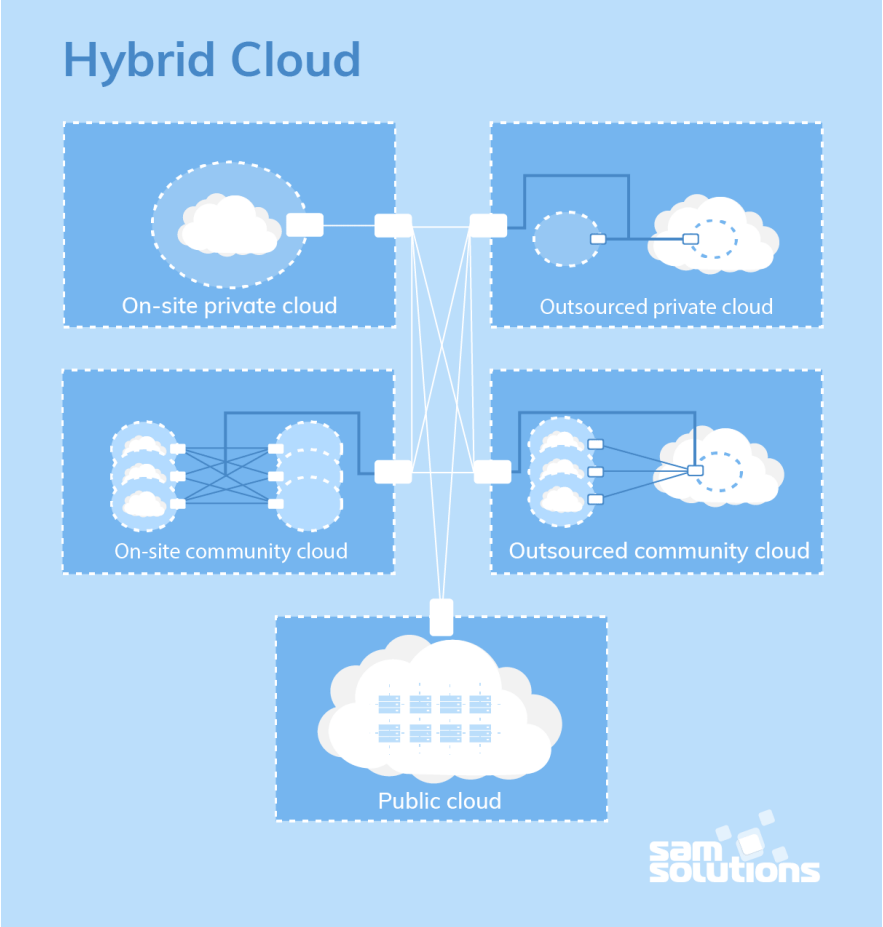
- Cost reduction
- Improved security, privacy and reliability
- Ease of data sharing and collaboration

The Shortcomings of a Community Cloud

- High cost compared to the public deployment model
- Sharing of fixed storage and bandwidth capacity
- Not commonly used yet

Hybrid Cloud

As is usually the case with any hybrid phenomenon, a hybrid cloud encompasses the best features of the abovementioned deployment models (public, private and community). It allows companies to mix and match the facets of the three types that best suit their requirements.



The Benefits of a Hybrid Cloud

- Improved security and privacy
- Enhanced scalability and flexibility
- Reasonable price

Virtualization

Virtualization is the process of running a virtual instance of a computer system in a layer abstracted from the actual hardware. Most commonly, it refers to running multiple operating systems on a computer system simultaneously.

To the applications running on top of the virtualized machine, it can appear as if they are on their own dedicated machine, where the operating system, libraries, and other programs are unique to the guest virtualized system and unconnected to the host operating system which sits below it.

What is Hypervisor?

A hypervisor is a program for creating and running virtual machines. Hypervisors have traditionally been split into two classes: type one, or "bare metal" hypervisors that run guest virtual machines directly on a system's hardware, essentially behaving as an operating system. Type two, or "hosted" hypervisors behave more like traditional applications that can be started and stopped like a normal program. In modern systems, this split is less prevalent, particularly with systems like KVM. KVM, short for kernel-based virtual machine, is a part of the Linux kernel that can run virtual machines directly, although you can still use a system running KVM virtual machines as a normal computer itself.

Types of Hypervisors

- ### Type 1 hypervisors

A Type 1 hypervisor runs directly on the host machine's physical hardware, and it's referred to as a bare-metal hypervisor. The Type 1 hypervisor doesn't have to load an underlying OS. With direct access to the underlying hardware and no other software -- such as OSes and device drivers -- to contend with for virtualization.

Hypervisors that run directly on physical hardware are also highly secure. Virtualization mitigates the risk of attacks that target security flaws and vulnerabilities in OSes because each guest has its own OS. This ensures an attack on a guest VM is logically isolated to that VM and can't spread to others running on the same hardware.

- ### Type 2 Hypervisors

A Type 2 hypervisor is typically installed on top of an existing OS. It is sometimes called a hosted hypervisor because it relies on the host machine's preexisting OS to manage calls to CPU, memory, storage and network resources.

Type 2 hypervisors trace their roots back to the early days of x86 virtualization when the hypervisor was added above the existing systems' OSes. Although the purpose and goals of Type 1 and Type 2 hypervisors are identical, the presence of an underlying OS with Type 2 hypervisors introduces unavoidable latency; all of the

hypervisor's activities and the work of every VM has to pass through the host OS. Also, any security flaws or vulnerabilities in the host OS could potentially compromise all of the VMs running above it.