1.5) Architecture of Cloud computing
Draw Architecture of Cloud computing.
Explain Architecture of Cloud computing.
Ans.: Architecture of Cloud computing:

1. It is possible to organize all the concrete realizations of cloud computing into a layered view covering the entire stack from hardware appliances to software systems. Cloud resources are harnessed to offer "computing horsepower" required for providing services.

2. Often, this layer is implemented using a datacenter in which hundreds and thousands of nodes are stacked together. Cloud infrastructure can be heterogeneous in nature because a variety of resources, such as clusters and even networked PCs, can be used to build it. Moreover, database systems and other storage services can also be part of the infrastructure.

3. The physical infrastructure is managed by the core middleware, the objectives of which are to provide an appropriate runtime environment for applications and to best utilize resources. At the bottom of the stack, virtualization technologies are used to guarantee runtime environment customization, application isolation, sandboxing, and quality of service. Hardware virtualization is most commonly used at this level.

4. Hypervisors manage the pool of resources and expose the distributed infrastructure as a collection of virtual machines. By using virtual machine technology it is possible to finely partition the hardware resources such as CPU and memory and to virtualize specific devices, thus meeting the requirements of users and applications.

5. This solution is generally paired with storage and network virtualization strategies, which allow the infrastructure to be completely virtualized and controlled. According to the specific service offered to end users, other virtualization techniques can be used; for example, programming-level virtualization helps in creating a portable runtime environment where applications can be run and controlled.

6. This scenario generally implies that applications hosted in the cloud be developed with a specific technology or a programming language, such as Java, .NET, or Python. In this case, the user does not have to build its system from bare metal. Infrastructure management is the key function of core middleware, which supports capabilities such as negotiation of the quality of service, admission control, execution management and monitoring, accounting, and billing.
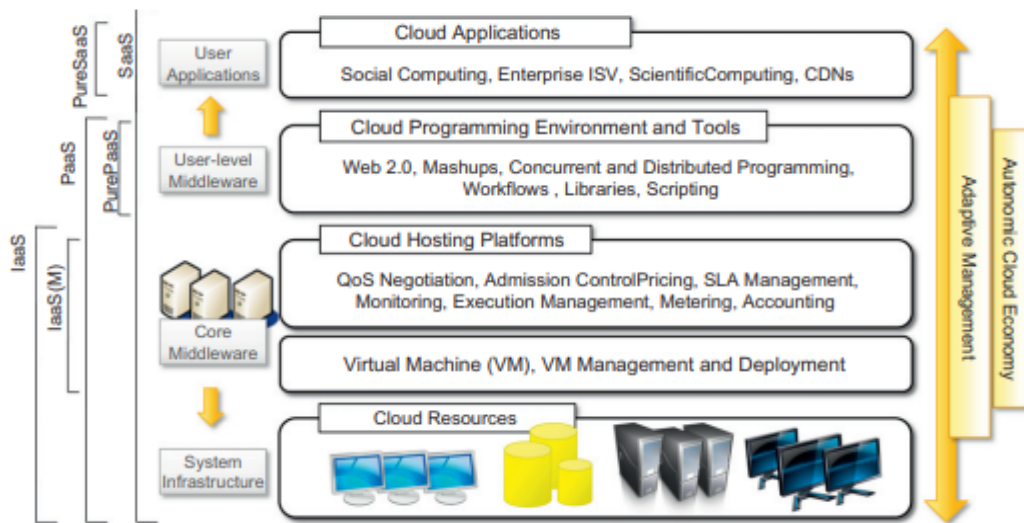
7. Figure:

Figure: The cloud computing architecture.

1.6) Cloud Computing Infrastructure

Explain Cloud Computing Infrastructure.
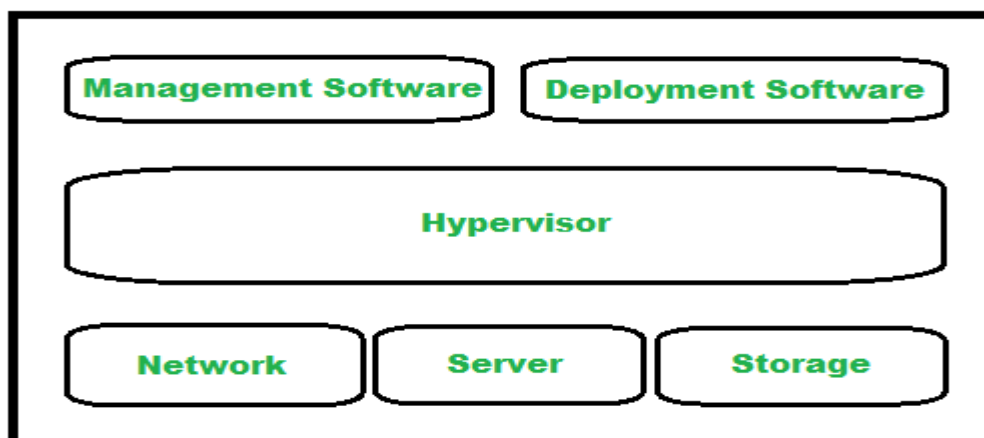
Ans.: Cloud Computing Infrastructure:

1. Cloud computing infrastructure is the collection of hardware and software elements needed to enable cloud computing.
2. It includes computing power, networking, and storage, as well as an interface for users to access their virtualized resources.
3. The virtual resources mirror a physical infrastructure, with components like servers, network switches, memory and storage clusters.
4. Cloud Infrastructure which comes under the backend part of cloud architecture represents the hardware and software components such as server, storage, networking, management software, deployment software and virtualization software etc. In the backend, cloud infrastructure enables the complete cloud computing system.

Why Cloud Computing Infrastructure?

1. Cloud infrastructure offers the same capabilities as physical infrastructure but can provide additional benefits like a lower cost of ownership, greater flexibility, and scalability.
2. Cloud computing infrastructure is available for private cloud, public cloud, and hybrid cloud systems. It's also possible to rent cloud infrastructure components from a cloud.
3. Cloud infrastructure has more capabilities of providing the same services as the physical infrastructure to the customers.
4. It is available for private cloud, public cloud, and hybrid cloud systems with low cost, greater flexibility and scalability.

Cloud infrastructure components :

1. Different components of cloud infrastructure supports the computing requirements of a cloud computing model.
2. Cloud infrastructure has number of key components but not limited to only server, software, network and storage devices. Still cloud infrastructure is categorized into three parts in general i.e.
   a. Computing
   b. Networking
   c. Storage
3. The most important point is that cloud infrastructure should have some basic infrastructural constraints like transparency, scalability, security and intelligent monitoring etc.
4. The below figure represents components of cloud infrastructure:

Figure: Cloud Computing Infrastructure

1. Hypervisor :

- Hypervisor is a firmware or a low level program which is a key to enable virtualization. It is used to divide and allocate cloud resources between several customers.
- As it monitors and manages cloud services/resources that's why hypervisor is called as VMM (Virtual Machine Monitor) or (Virtual Machine Manager).

2. Management Software :

- Management software helps in maintaining and configuring the infrastructure.
- Cloud management software monitors and optimizes resources, data, applications and services.

3. Deployment Software :

- Deployment software helps in deploying and integrating the application on the cloud.
- So, typically it helps in building a virtual computing environment.

4. Network :

- It is one of the key components of cloud infrastructure which is responsible for connecting cloud services over the internet.
- For the transmission of data and resources externally and internally, a network is required.
- It is also possible to deliver network as a utility over the Internet, which means, the customer can customize the network route and protocol.

5. Server :

- Server which represents the computing portion of the cloud infrastructure is responsible for managing and delivering cloud services for various services and partners, maintaining security etc.
- The server helps to compute the resource sharing and offers other services such as resource allocation and de-allocation, monitoring the resources, providing security etc.

6. Storage :

- Storage represents the storage facility which is provided to different organizations for storing and managing data. It provides a facility of extracting another resource if one of the resources fails as it keeps many copies of storage.
- Cloud keeps multiple replicas of storage. If one of the storage resources fails, then it can be extracted from another one, which makes cloud computing more reliable.