

Cloud Architecture and Applications

Chapter 2

Outline

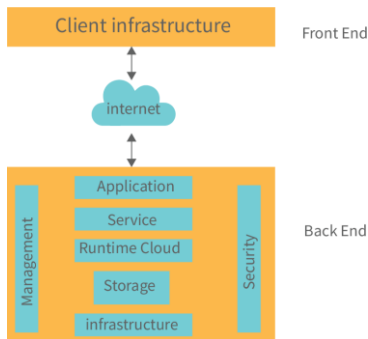
- 1 Cloud Computing Architecture
 - Infrastructural Constraints
- 2 Applications of cloud computing

Cloud Computing Architecture

Cloud Computing Architecture is divided into two parts

- Front-end Platform → User Interface
- Back-end Platform → Cloud Service Provider

Front-end and back-end communicate via a network (internet).



Cloud computing architecture

Frontend

Consists of client's side applications, which communicate with Backend via internet

Users or clients can access all networked services through the front end which can be any web-enabled interface

For example: to access email, open the web browser and go to your mail account

Backend architecture

Managed by the host or cloud service provider

Consists of huge data storage, virtual machines, security mechanisms, deployment models, service models, and servers

delivers the backend data from the database to the front end

Responsible for managing traffic and protecting data

Users: no information about the backend **acts as a blind box**

Backend architecture

Vital components included in the backend

- 1 Application
- 2 Services
- 3 Cloud runtime
- 4 Storage
- 5 Infrastructure
- 6 Security
- 7 Management

Component of Backend Architecture

Application:

Refers to the software or app that the client or user wants to access
Users can interact with applications with the help of a web browser or mobile app

Services

Refer to any IT services delivered by the cloud service provider on the demand of the client

Three types of services:

- SaaS: Provides application services

 - e.g: Gmail, Netflix, Zoom

- PaaS: Provides platform services

 - e.g: Facebook, Twitter

- IaaS: Provides infrastructure services

 - e.g: create and test software

Component of Backend Architecture

Cloud runtime:

This is the place where the service runs.

provides execution and runtime environment for the virtual machines
consider as the operating system of the cloud

It includes a technology like virtualization which allows multiple
servers to exist on the same server

PaaS and IaaS include cloud runtime

Storage:

Storage is the place where the data of the client resides in the cloud
system

Cloud service providers provide their own segments for storing data

Component of Backend Architecture

Infrastructure:

Infrastructure actually describes the set of components that frame the cloud system

It is the vital component of the cloud system architecture which consists of components like

- Hypervisor
- Management software
- Deployment software
- Network
- Server
- Storage

Component of Backend Architecture: Infrastructure

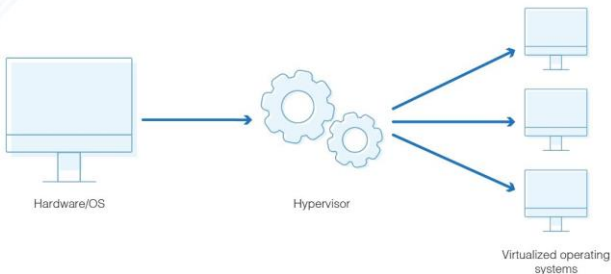
Hypervisor

- Hypervisor: also known as Virtual Machine Monitor or VMM
- It is defined as a specialized firmware or software, or a combination of both that creates and runs virtual machines
- It gives the facility to run numerous virtual operating systems on a single computer system
 - Physical hardware like memory, processor, and storage can also be shared among various virtual machines
- Hypervisor enabling a single physical server to independently run multiple guest VMs each with their own operating systems (OSs)
 - logically separate from each other
- **Problems or crashes** in one guest VM have no effect on the other guest VMs, OSs, or the applications running on them

Component of Backend Architecture: Infrastructure

Hypervisor

What Is a Hypervisor?



Component of Backend Architecture: Infrastructure

Management software

helps to maintain and configure the infrastructure

Deployment Software

Refers to a set of all steps, processes, and actions that are required to make a software available for use

It is used to deploy and integrate applications on the cloud

It enables SaaS, PaaS, and IaaS solutions that may be accessed by clients or end users on demand

Network

Vital components of infrastructure that enables users to connect to the cloud

Users can access cloud services with the help of network (internet)

The speed of data transfer depends on the [network quality](#)

Component of Backend Architecture: Infrastructure

Server

Handles, allocates, de-allocates and computes cloud resources to the organization

Also responsible for sharing and monitoring the cloud resources

Cloud servers prevent us from all the problems that are encountered with physical servers

Storage

Place where the data is stored on the cloud

Multiple copies of your data are stored on the storage system so that if one system fails, you can access your data from anywhere

Component of Backend Architecture:

Management

Management is responsible for the effective and smooth functioning of the cloud system

It manages the communication between the front end and backend

Security

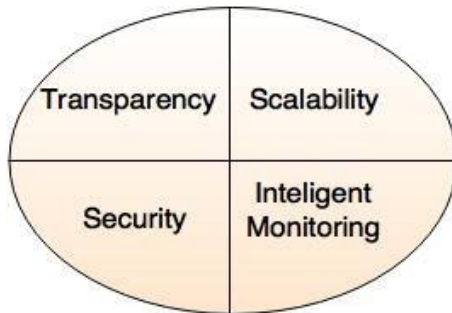
Security of data is the primary concern for every organization, business, or personal users

Everyone wants to keep their information safe and secure

to keep cloud data secure, a lot of emphasis is laid on the security tools, policies, mechanisms, and technologies

It is the responsibility of the backend to secure the cloud system with firewall, redundancy concept, and preventing data loss

Infrastructural Constraints



Infrastructural Constraints:

Transparency

In a Cloud environment, virtualization is the key to share the resources.

It is impossible to satisfy the demand with single resource or server there should be transparency in resources, load balancing and application, so that we can scale the resources on demand

Scalability

Scaling up an application delivery solution is not that easy as scaling up an application

because it involves configuration overhead or even re-architecting the network

Application delivery solution is need to be scalable which will require the virtual infrastructure such that resource can be provisioned and de-provisioned easily

Infrastructural Constraints:

Intelligent Monitoring

To achieve transparency and scalability, application solution delivery will need to be capable of intelligent monitoring

Security

In security, the mega data center in the cloud must be securely architected

The control node, an entry point in a mega data center also requires to be secure

Applications of Cloud computing

- Healthcare
- Energy Systems
- Transportation systems
- Data storage and backup service applications
- Management applications
- Social applications
- Entertainment applications
- Education applications
- E-commerce applications