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Virtualization in Cloud Computing

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Virtualization → creation of virtual (rather than actual) version of something, such as a server, a desktop, a storage device, an operating system or network resources.

→ technique that allows to share a single physical instance of a resource or an application among multiple customers & organizations.

Virtualization is an abstraction technique where the finer details of hardware layout are hidden from upper layers of computing such as operating system or application.

(artificial computer system created by host)

- Virtual Machine → computer of a defined virtual type that operates beneath a hypervisor

• Hypervisor

- operating system that runs on actual hardware
- virtual counterpart of OS → executes or emulates
- defined as Domain 0 or virtual process.

Dom 0.

software that runs the virtual machines & serves as bridge b/w virtual machines & physical hardware.

Container - virtual machines of lightweight nature that are a subset of same as instance or hypervisors.

Virtual Network - network being separated logically & is present inside servers.

Virtualization software -

Advantages / Needs / Goals of Virtualization.

- 1) Server consolidation & resource optimisation.
- 2) Improved productivity & operational efficiency.
- 3) Cost Savings
- 4) Improve Security
- 5) Improved Resiliency.

Challenges / Limitations of Virtualization.

- 1) Could be a single point of failure
- 2) Not everything can be virtualized
- 3) Required skilled staff
- 4) Virtual Machine Sprawl
- 5) Capacity planning is Hard
- 6) Managing licenses.

Requirements of server virtualization -

- consolidation
- Redundancy
- Legacy Hardware
- Migration.

Benefits of Virtualization

- Lower costs
- Consolidation
- Practice of redundancy

Disadvantages of server virtualization.

- Increase complexity of IT environment
- Physical failures become serious bleed over.

* Full Virtualization

- relies upon binary translⁿ to trap & to virtualize certain sensitive instructions.
eg - VMware
- doesn't need to modify host OS.
- normal instrⁿ → directly on host OS
- using binary translⁿ & direct execution.
- performance is good.
- guest software → don't require any modification since underlying hardware is full simulated.

* Para Virtualization

- refers to communication b/w guest OS & hypervisor to improve performance & eff.

eg → Xen architecture
• modify OS kernel

- won't run on native hardware

- user hyper-calls

- performance is better in certain cases.

- Hardware → not simulated, guest software run their own isolated domains

storage virtualization -

abstraction of storage systems from applications or
computers.

Characteristics

- availability of logical volume operate from physical disk constraint.
- capability of abstracting of abstracting multivendor storage devices.
- capability of having automated storage optimization & management.

Methods of virtualization

- server based virtualization
- fabric-based virtualisation
- storage array-based virtualization.

Benefits of storage virtualization

- data is stored in more convenient locations away.
- storage devices → perform advanced functions.
- abstracting storage level, IT operations can become more flexible.
- improve physical resource utilization.
- lower total cost of ownership.

- p Virtual Clustering -
a computer cluster is set of connected computer (nodes) that work
together as if they are single machine.
→ processor machines share resources such as a common home directory.

- characteristics o
 - VM or physical machine → virtual cluster nodes
 - runs with guest operating system
 - replicated in multiple servers if it supports distributed partition
 - number of nodes of virtual cluster → change accordingly
 - VM fails → not affect host machine
- virtual cluster → managed by four ways.
 - guest based manager
 - host based manager
 - cluster manager (independent)
 - integrated cluster (manager)

A Anatomy of Cloud Infrastructure

Application → applⁿ are executed.

Platform → b/w infrastructure & the application

Infrastructure → resources over which other components work.

Virtualization → making logical components of resources over existing physical resources

Server/storage / datacenters → provided by server & storage units!

	Virtualization	Cloud Computing
1) what it is?	Technology	Methodology & Principles
2) Purpose	get most from hardware	deliver compute resources on demand.
3) Lifespan	Years	short-lived & on demand.
4) Expenditure	High	Low
5) Investment	Capital as well as opex	Opex n' Investment only
6) Scalability	Up to hardware limit only	Nearly infinite
7) Ownership	Owned by one	Shared tenancy.
8) Innovation & changes	Slow	Rapid
9) Adapted by	Large enterprises only	Individuals, small to large enterprises.
10) Skills required to operate	High	Low & specific to consumed service.
11) Shifting to another vendor	Complex & costly	Comparatively easier & cheap.
12) Governance	Self-owned	Shared b/w cloud provider & tenant
13) Primary consumption method	Direct interaction.	Programmatic via APIs