

Virtualization

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chapter 3

virtualization: technology to run multiple OSs on a single system which are completely isolated from each other.

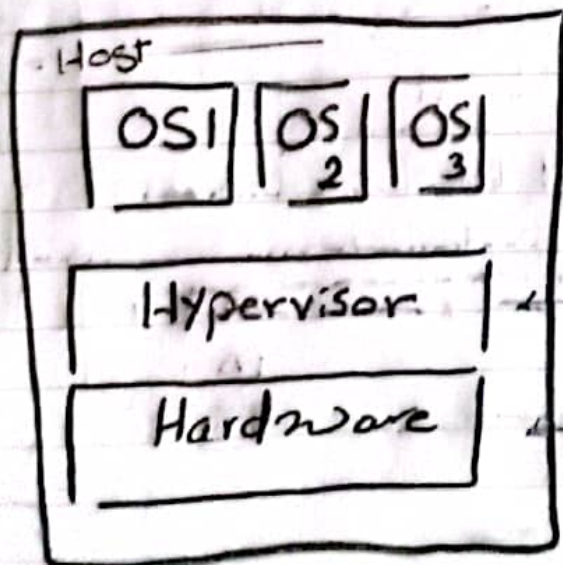
- 1] abstraction over computing resources
- 2] process of a computer behaves as many computers
- 3] Using the physical resources as a pool from which the virtual resources can be allocated.

1] Dual Boot	2] Emulation	3] virtualization
↓	↓	↓
2 OSs installed on the same hard drive	system pretends to be another	system pretends to be 2 or more

→ virtual machine = guest OS = isolated runtime environment

■ Single physical machine can run multiple OS concurrently

VIM = virtual Infrastructure Management



• VM can run both Host OS and guest OS

• Hypervisor = VMM

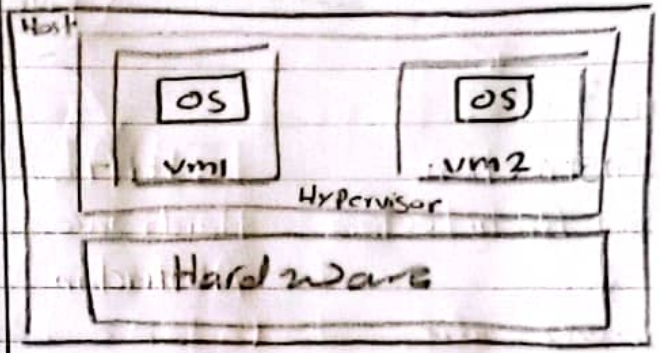
Server without virtualization

- Single OS
- SW and HW tightly Coupled
- Multiple Apps create conflict



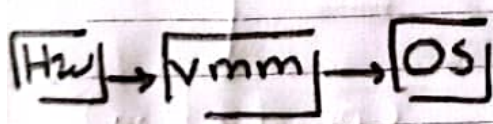
Server with virtualization

- HW independence
- Multiple OSs with different configuration.
- each VM can be provisioned any time.



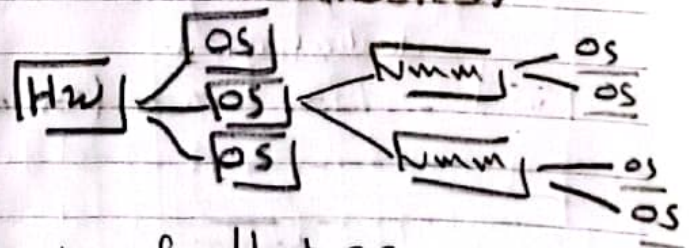
Hypervisor type

1] Full virtualization (native)

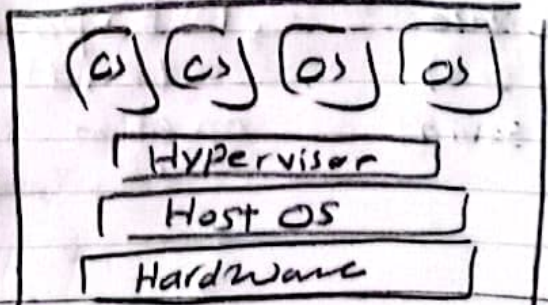


- on top of bare HW device
- Multi guest OSs
- No Host OS is used
- Single machine \Rightarrow vertical virtualization
- Complete simulation.
- Encapsulation.

2] para virtualization (hosted)



- on top of a Host OS
- guest OS runs as a process
- Better performance and lower overhead



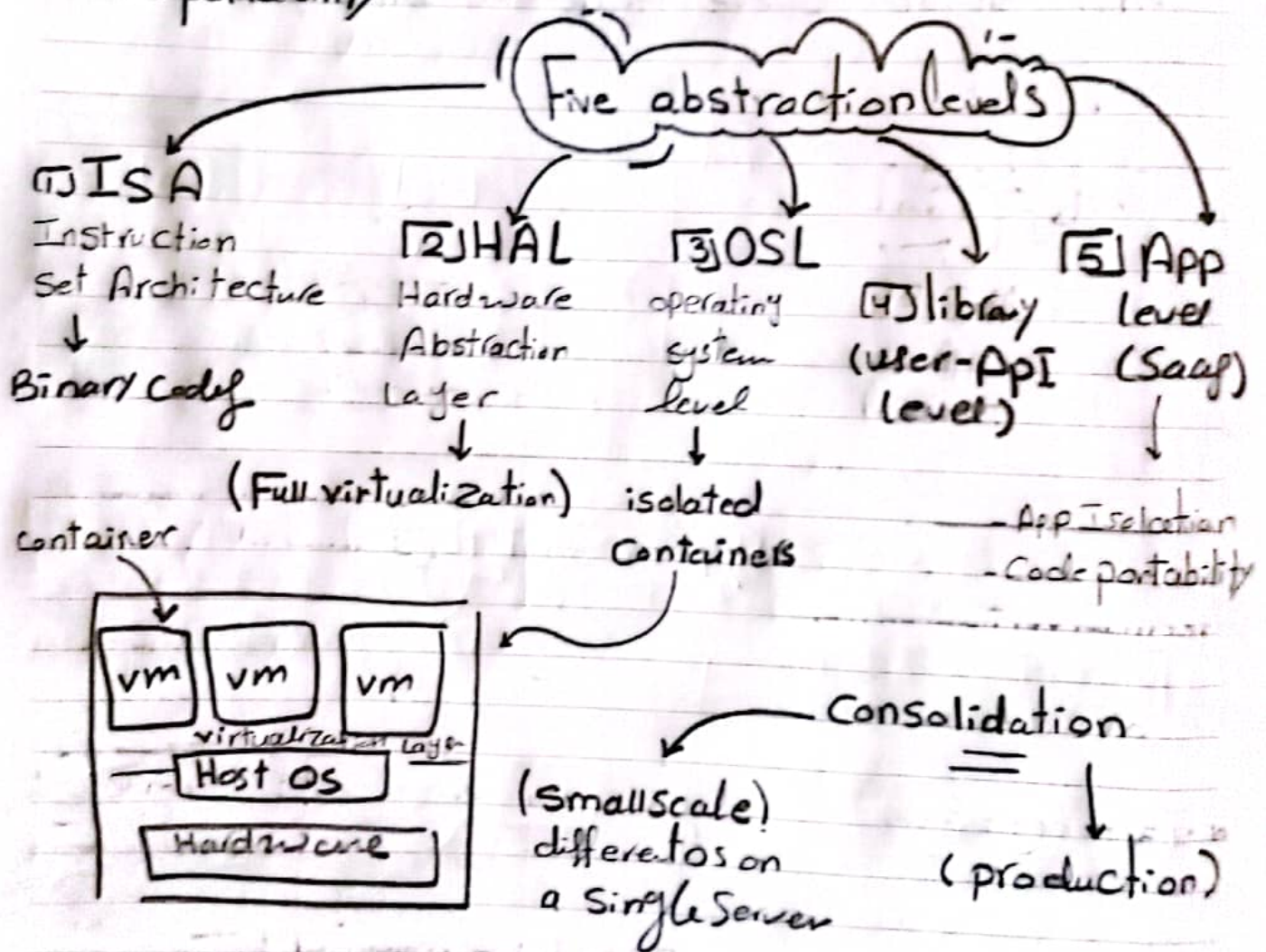
Host machine

Hi . Star

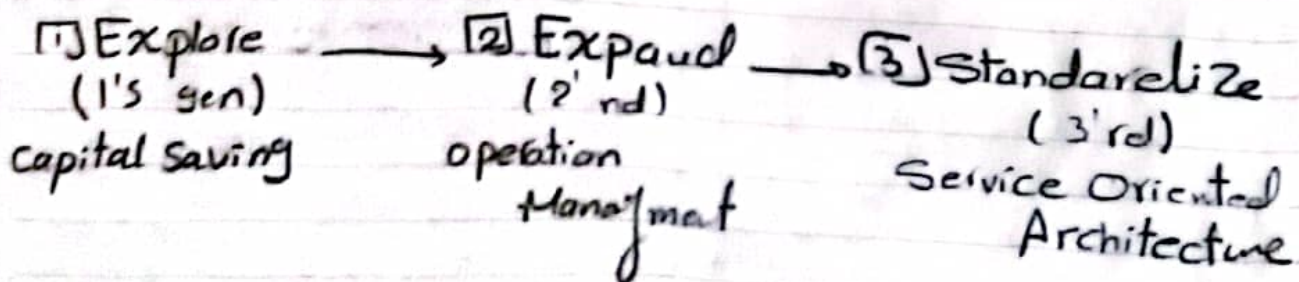
[Virtualization Benefits]

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- 1] Consolidation
- 2] resource sharing → cost reduction
- 3] Isolation
- 4] Encapsulation
- 5] Hardware Independence
- 6] portability



virtualization Evolution:

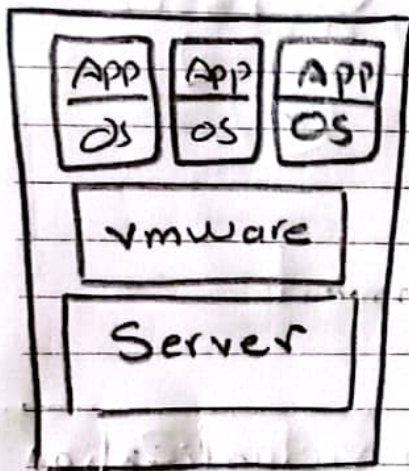


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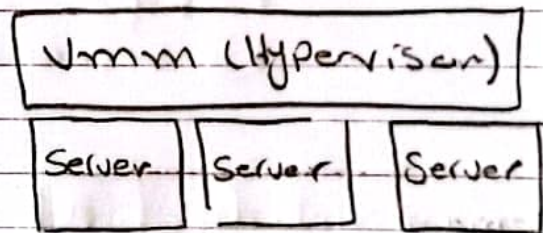
virtualization in Cloud Computing

- resources are rented as needed from a cloud.
- reduce CapEx and OpEx
- reduce physical space needed in data centers.

OS- virtualization = vertical virtualization
(Multiple Vertical Servers)



! virtual machines can run on a Shared Infrastructure



vertical virtualization.

■ A single software can span different HW components

■ Migrations: Moving Apps without service Interruption.

provisioning

Advantages

- 1) No downtime maintenance
- 2) Instant provisioning
- 3) pooling HW resources
- 4) Dynamic resource sharing
- 5) Backups and automated restoration.

→ Virtualization is the solution of green ICT
→ Cloud computing offer IT as a Service Model

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Core Services of Iaaf:

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- 1] Vm provisioning
- 2] Migration Service

⚠️ the virtualization layer will partition the physical resource of the underlying physical Server into multiple vm with different workload.

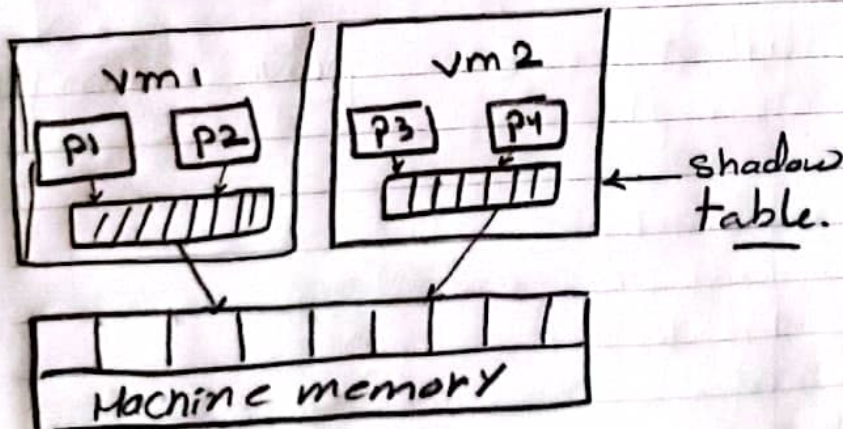
Security needs:

Scheduling ^{issue}

- 1] TLS
- 2] NFS
- 3] Secure runtime environment

Memory virtualization

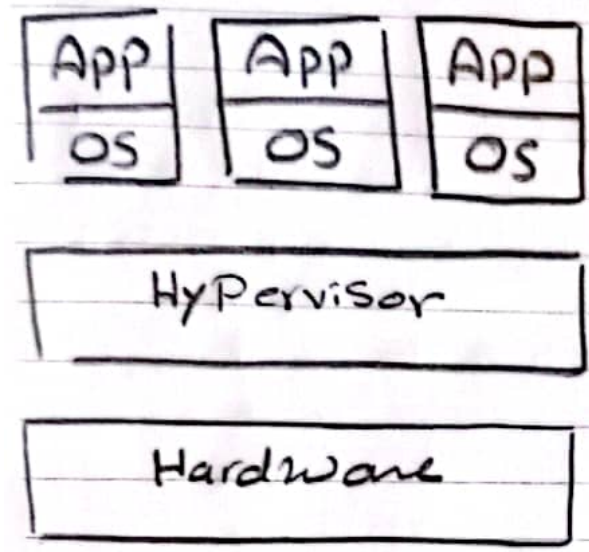
mapping → Shadow page table.



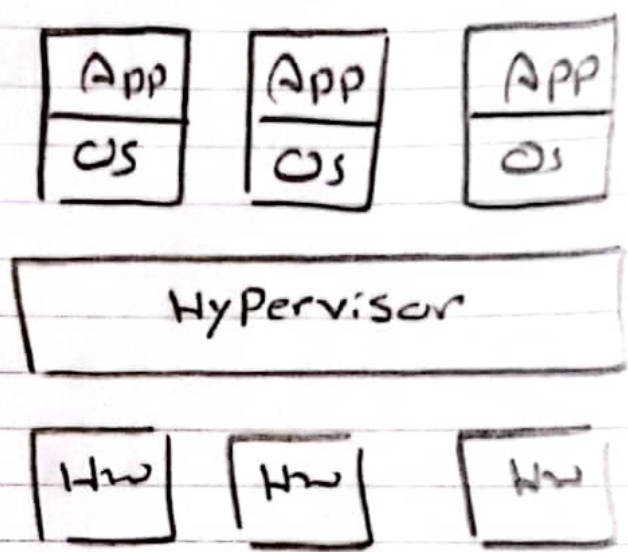
I/O virtualization

→ vm should support all devices I/O physically or virtually existed.

vertical virtualization



Horizontal virtualization



provisioning life cycle:

