



Cloud Computing

Introduction to virtualization

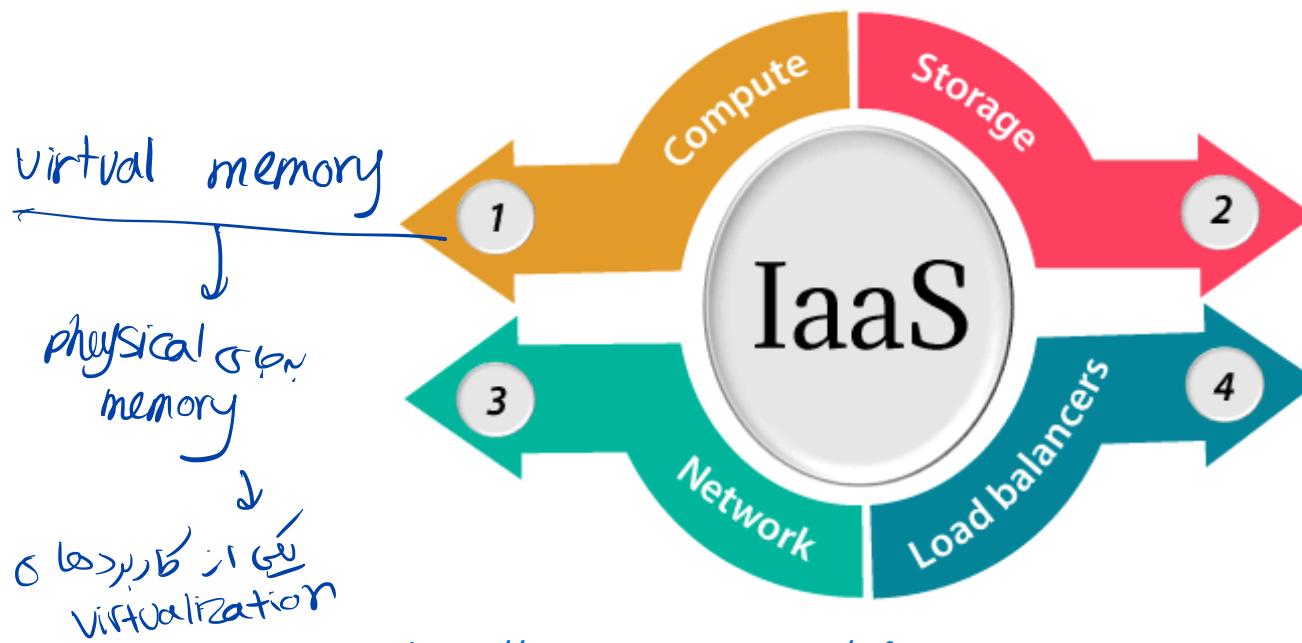
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Introduction (cont.)

- **Virtualization** is often *synonymous* with *hardware virtualization*.
- Plays a fundamental role in efficiently delivering ***Infrastructure-as-a-Service (IaaS)*** solutions for cloud computing.



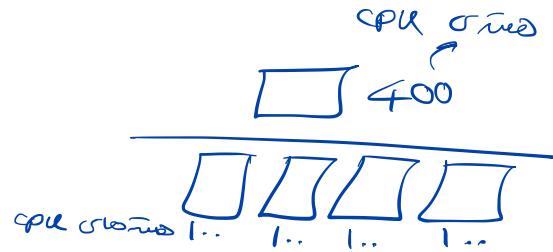
<https://www.javatpoint.com/infrastructure-as-a-service>

Introduction (cont.)

➤ Virtualization techs have a long trail in the history of computer science.

➤ In many flavors by providing **Virtual Environments (VE)** at the:

- Operating system level
- Programming language level
- Application level



سیستم مداری مجازی که ۱۶ گردهمایی را در ۴۰۰ میلی ثانیه پایان دارد. (پنل کی ایجاد مجازی سازی شد)

➤ Virtualization technologies provide a VE for not only **executing applications** but also for **storage, memory, and networking**.

که نظری فناوری وین که هاب اینترنال نام دارد ← Software define network

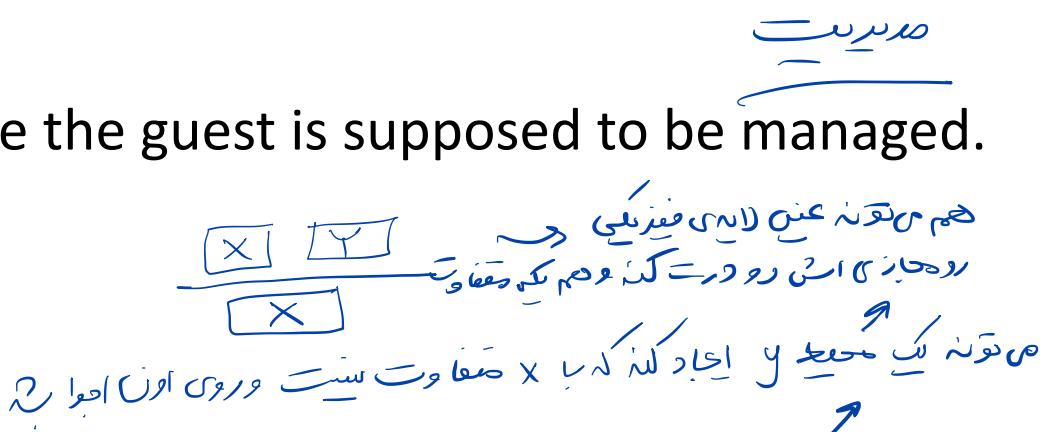
Major components of a virtualized environment

➤ Guest

- The system component that interacts with the virtualization layer rather than with the host, as would normally happen.

➤ Host

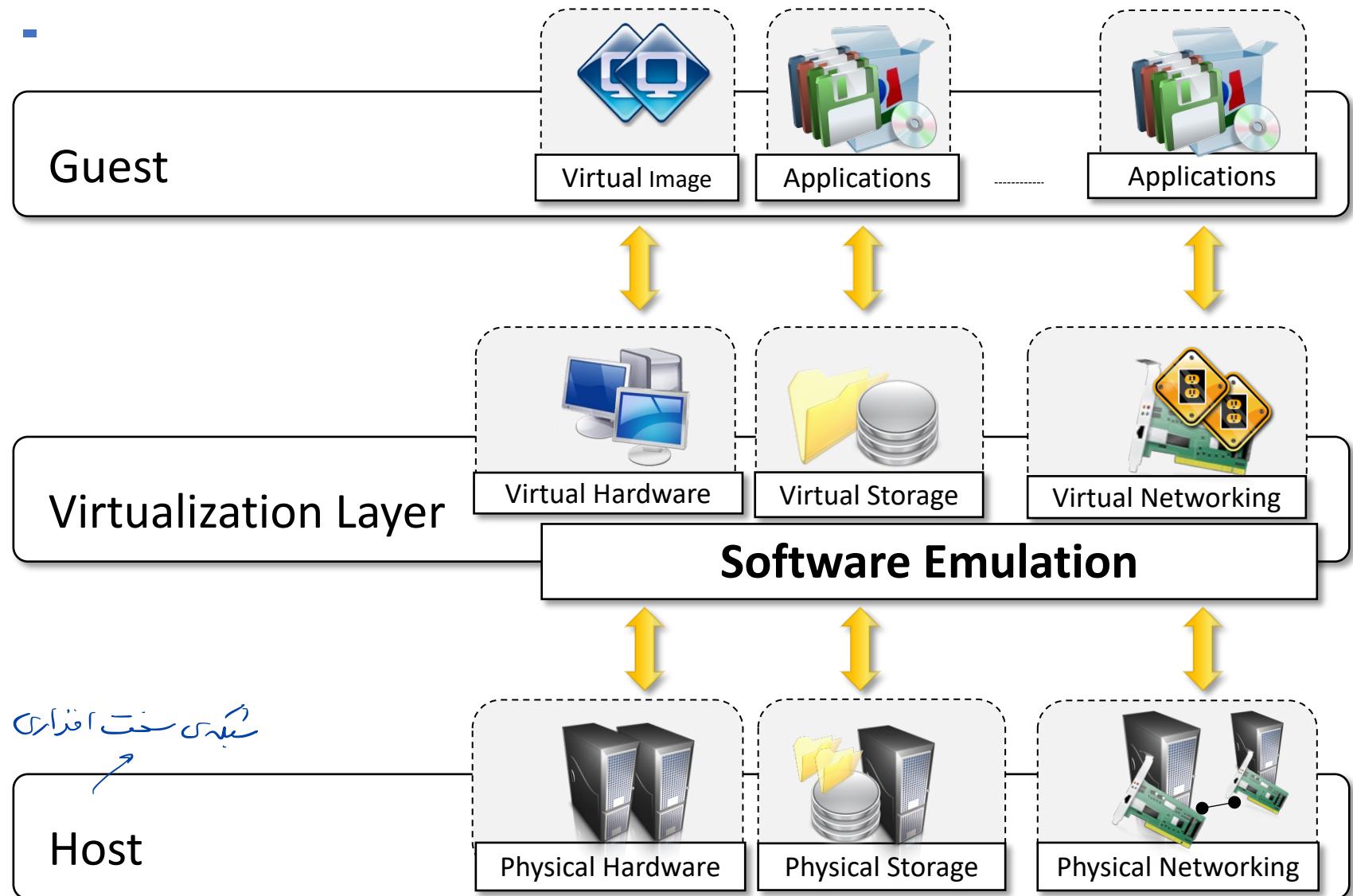
- The original env. where the guest is supposed to be managed.



- Recreate the same or a different env. where the guest will operate.



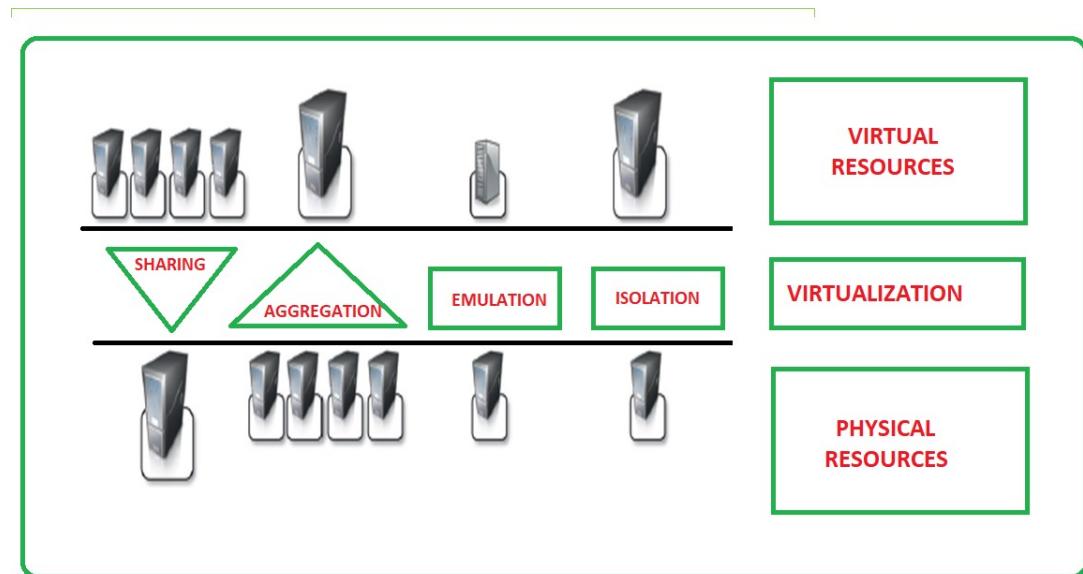
Major components of a virtualized environment (cont.)



Advantages

- Increased Security
- Managed Execution

- Sharing
- Aggregation
- Emulation
- Isolation
- Performance tuning
- Virtual machine migration



<https://www.geeksforgeeks.org/characteristics-of-virtualization/>

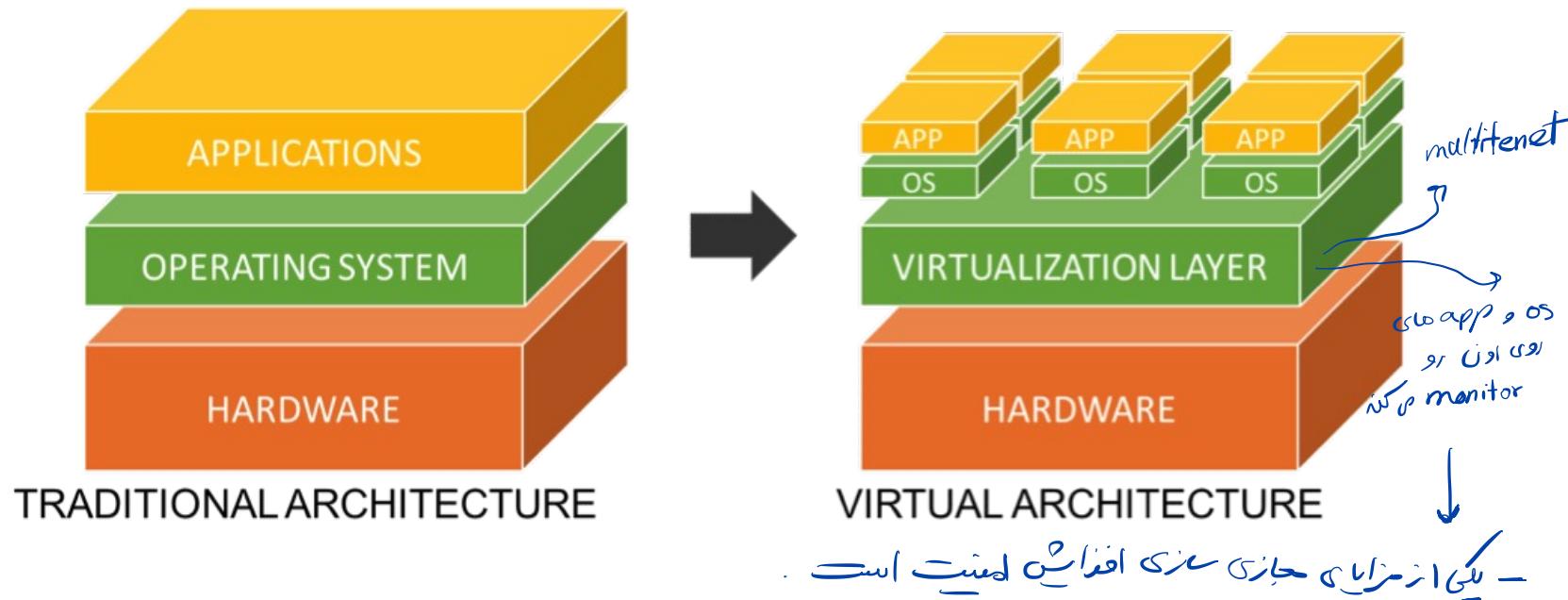
- Portability



Advantages

Increased Security

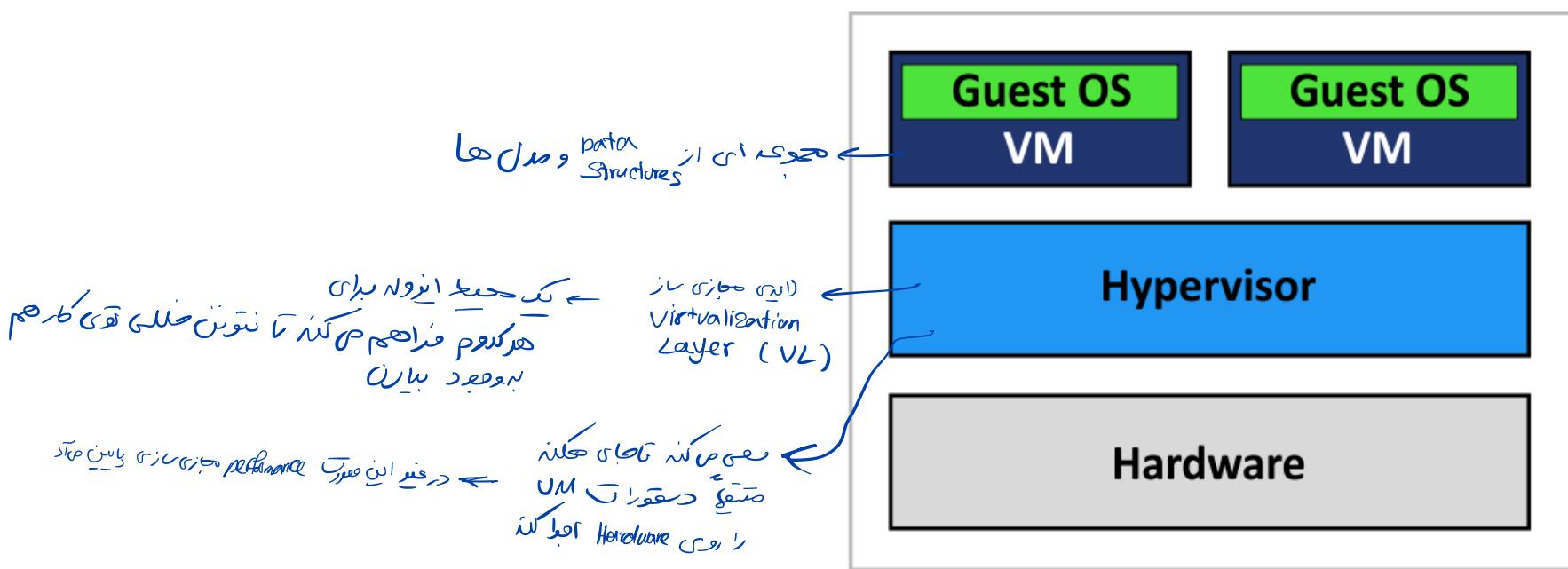
- The ability to control the execution of a guest in a ***completely transparent manner*** opens new possibilities for delivering a secure, controlled execution environment.



Advantages

Increased Security (cont.)

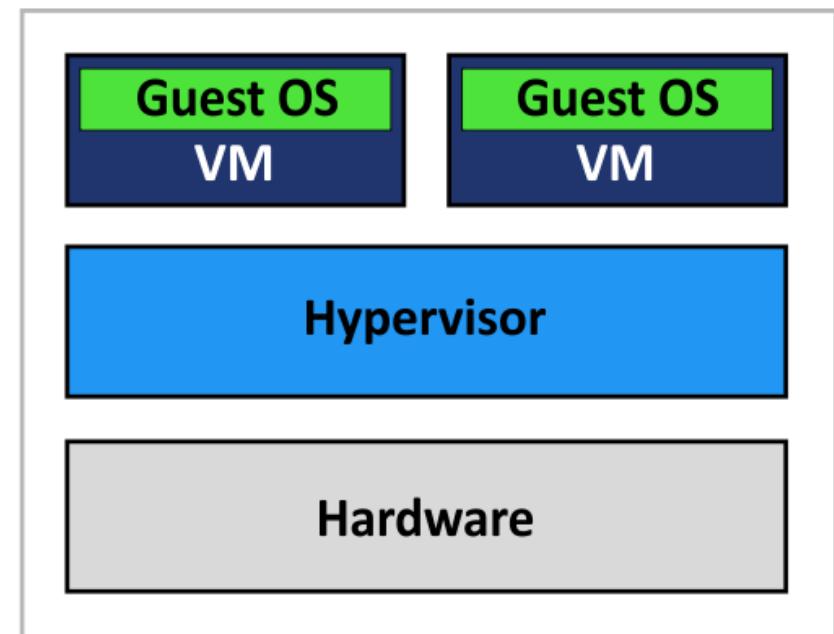
- All the operations of the guest are generally ***performed against the Virtual Machine (VM)***, which then translates and applies them to the host.



Advantages

Increased Security (cont.)

- This level of ***indirection*** allows the hypervisor (VM manager) to **control and filter the activity of the guest**, thus preventing **some harmful operations** from being performed.



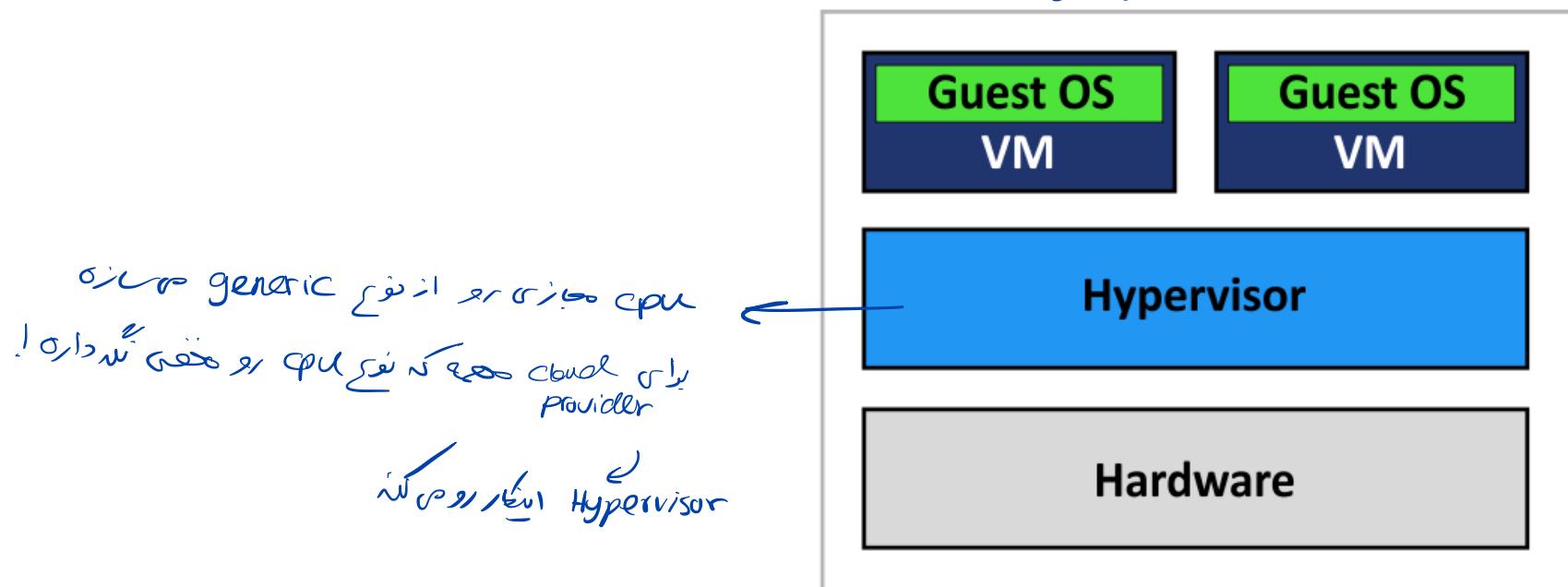
Advantages

Increased Security (cont.)

در دسترس قرار نهادن

- Resources exposed by the **host** can then be **hidden or simply protected from the guest.**

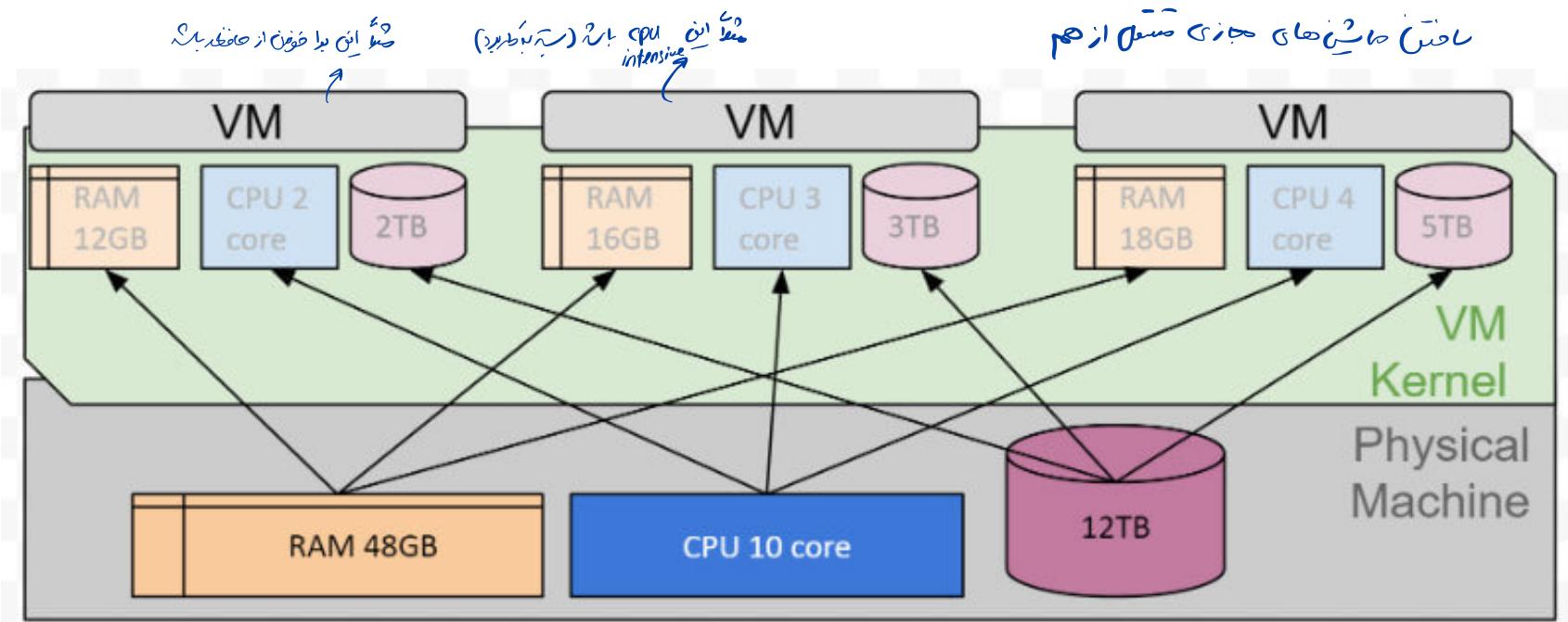
→ مواردی که در دسترس قرار داشتند
باشد که غیرمورد توجه را اختیار
نمایند قرار نهادن Guest



Advantages

Managed Execution: Sharing

- Virtualization allows the creation of a ***separate computing environments*** within the same host.



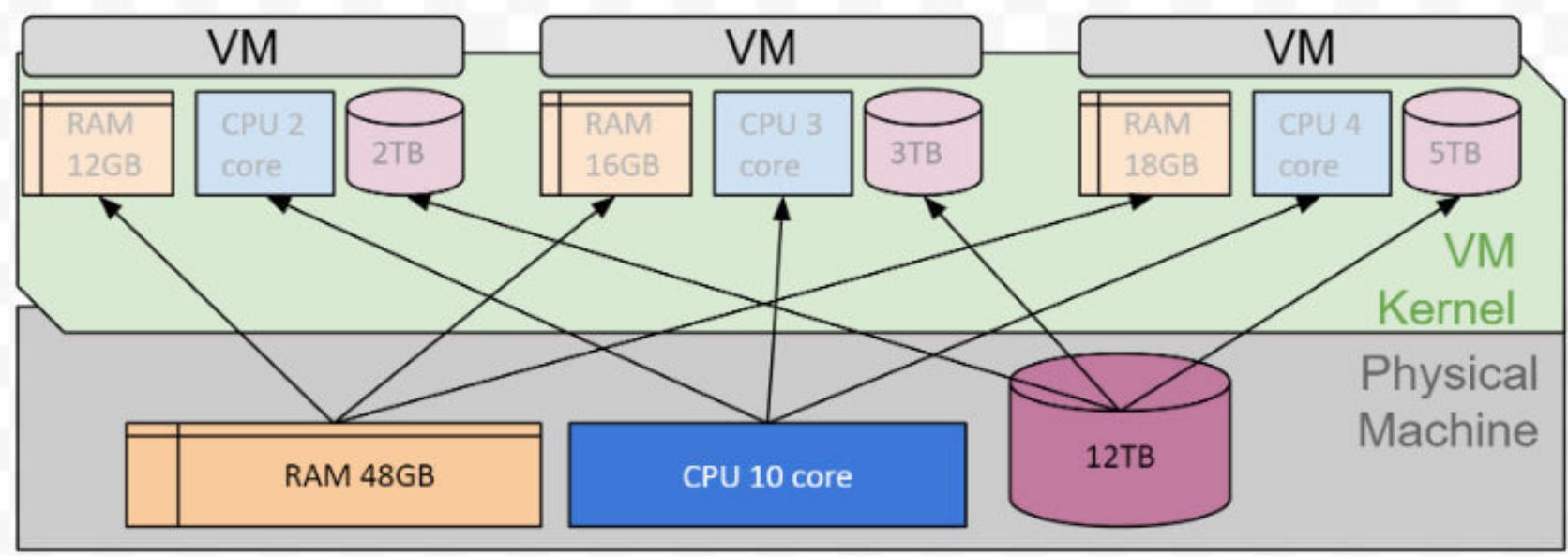
<https://actusdigital.com/2018/01/08/virtual-machine-or-physical-server/>

Advantages

Managed Execution: Sharing

- In this way it is possible to ***fully exploit the capabilities*** of a ***powerful host, which would otherwise be underutilized.***

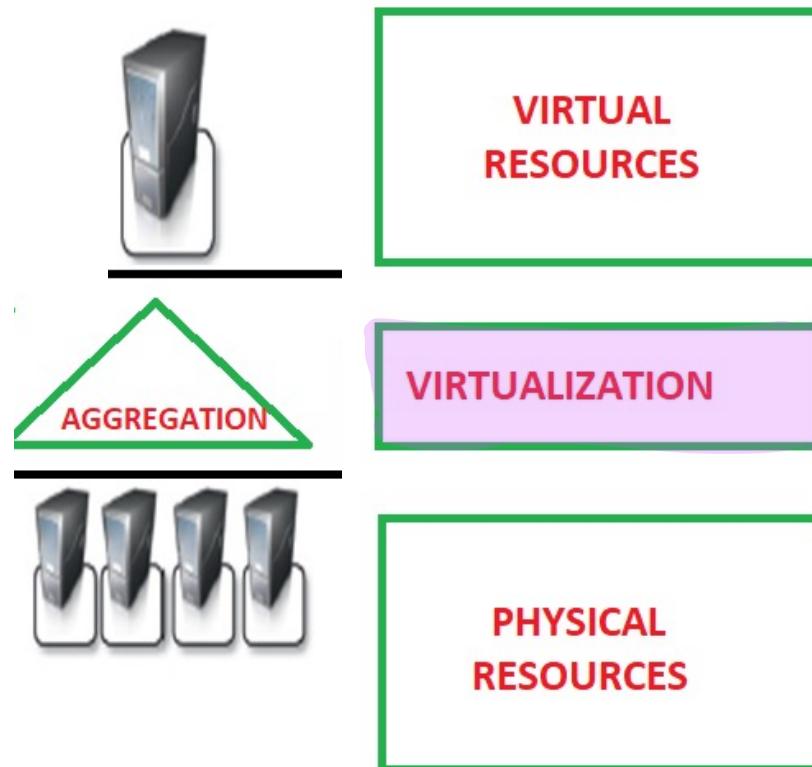
($\approx 75\% \text{ of } 25\%$) $\approx 18\% \text{ average} < 20\% \text{ utilize}$



<https://actusdigital.com/2018/01/08/virtual-machine-or-physical-server/>

Managed Execution: Aggregation

➤ A **group of separate hosts** can be tied together and represented to guests as a single virtual host.



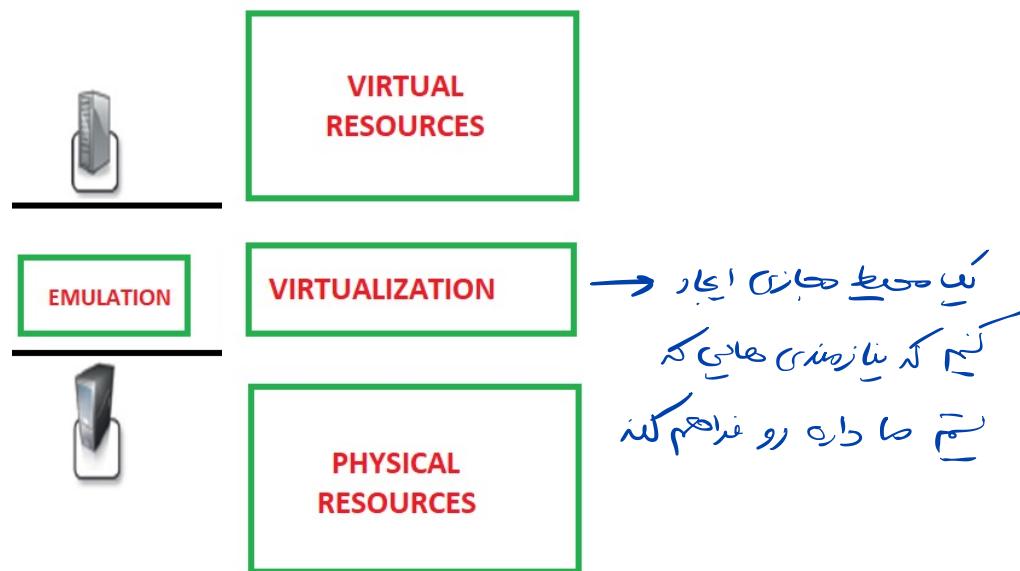
Managed Execution: Emulation

- A completely ***different environment with respect to the host***

can be emulated.

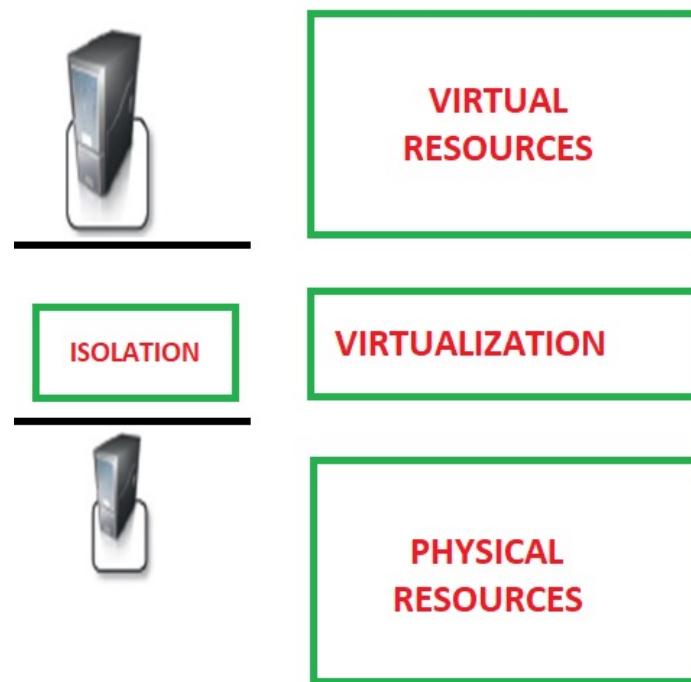
البيئة المُحاكاة
real host
simulation

- Allowing the execution of guest programs ***requiring specific characteristics*** that are ***not present*** in the physical host.



Managed Execution: Isolation

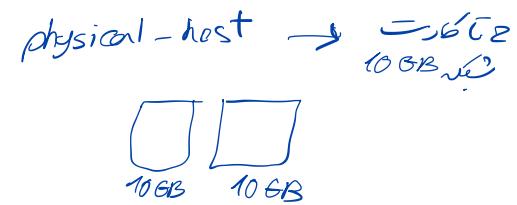
- Virtualization allows providing guests—whether they are operating systems, applications, or other entities—with a **completely separate environment**, in which **they are executed**.



Managed Execution: Performance tuning



- It becomes easier to control the performance of the guest by
تغییل کردن
finely tuning the properties of the **resources exposed** through the virtual environment.



۲۸GB را در میان دو خود distribute نمایند که بین این دو کامپیوتر و یا سایر کامپیوترها می شوند

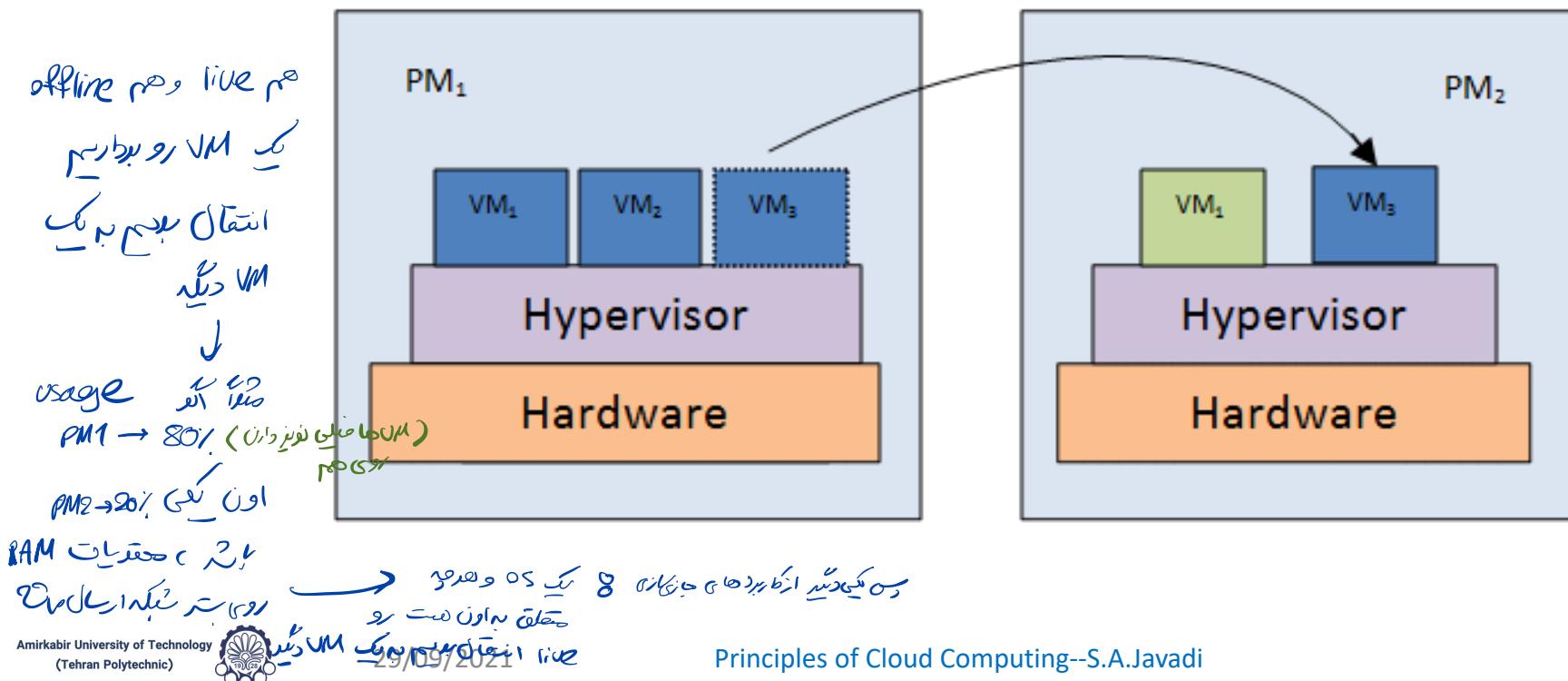
- This capability provides a means to **effectively implement a quality-of-service (QoS) infrastructure** that more easily fulfills the service-level agreement (SLA) established for the guest.



Advantages

Managed Execution: Virtual machine migration

- Managed execution allows VM managers to **stop** the execution of a guest operating system, move its virtual image into another VM, and **resume** its execution in **a completely transparent manner.**



Managed Execution: Virtual machine migration

- Managed execution allows easy capturing of the state of the guest program, persisting it, and resuming its execution.

- This allows VM managers to stop the execution of a guest operating system, move its virtual image into another VM, and resume its execution in a **completely transparent manner**.

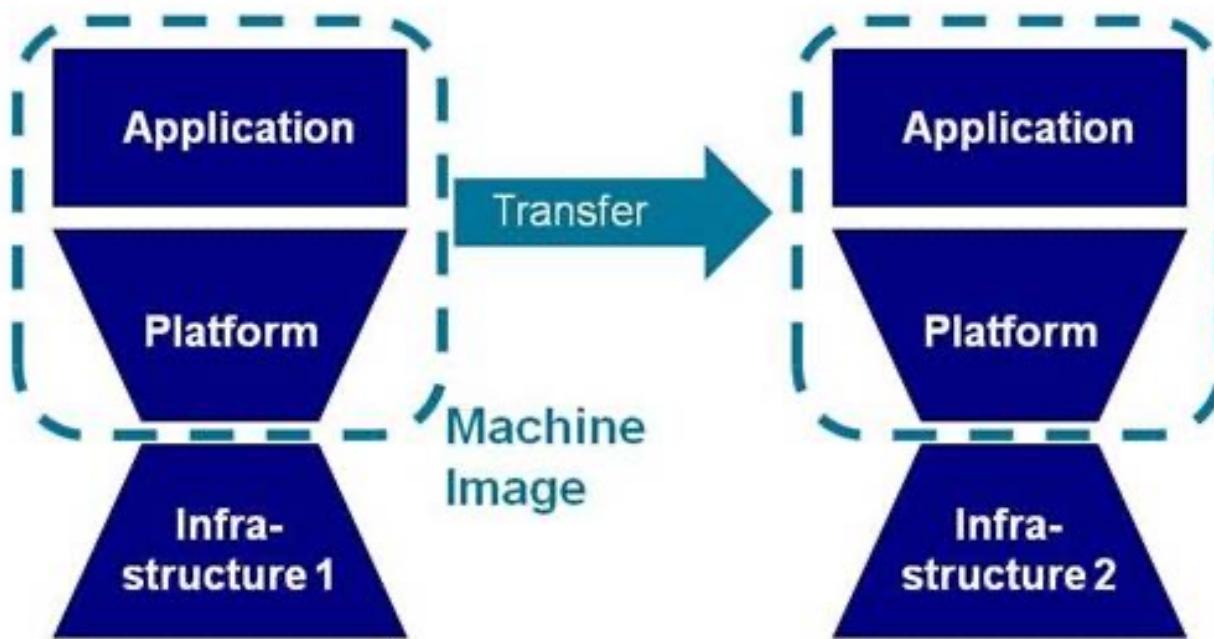
- **This is an important feature in virtualized data centers for optimizing their efficiency in serving application demands.**

Advantages

Portability of a hardware virtualization solution

- Guest is packaged into a **virtual image** that, in most cases, can be safely moved and executed on top of different **virtual machines**.

برای نصب نرم افزار می توان سیستم عامل را بسازید



http://www.opengroup.org/cloud/cloud_iop/p4.htm

Advantages

Portability of programming-level virtualization

- The binary code representing application components (jars or assemblies) can be run *without any recompilation on any implementation of the corresponding virtual machine.*

