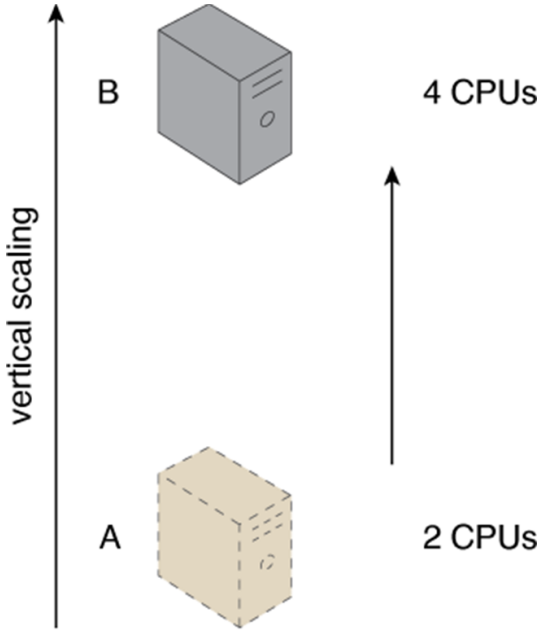
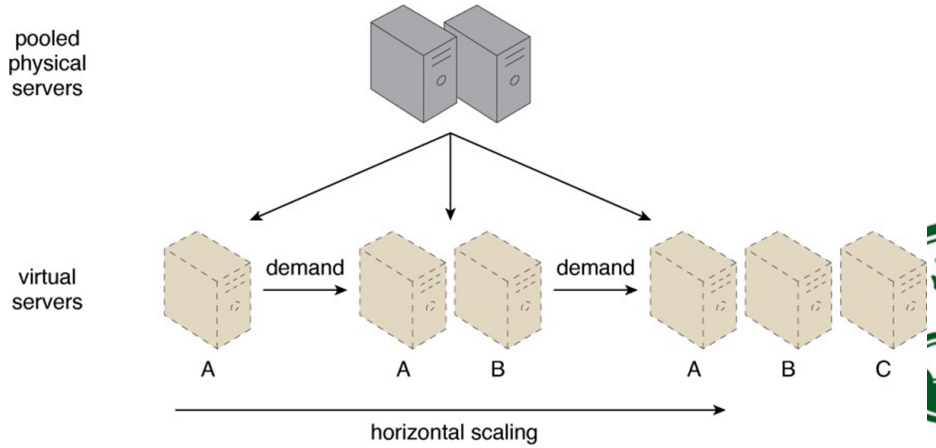
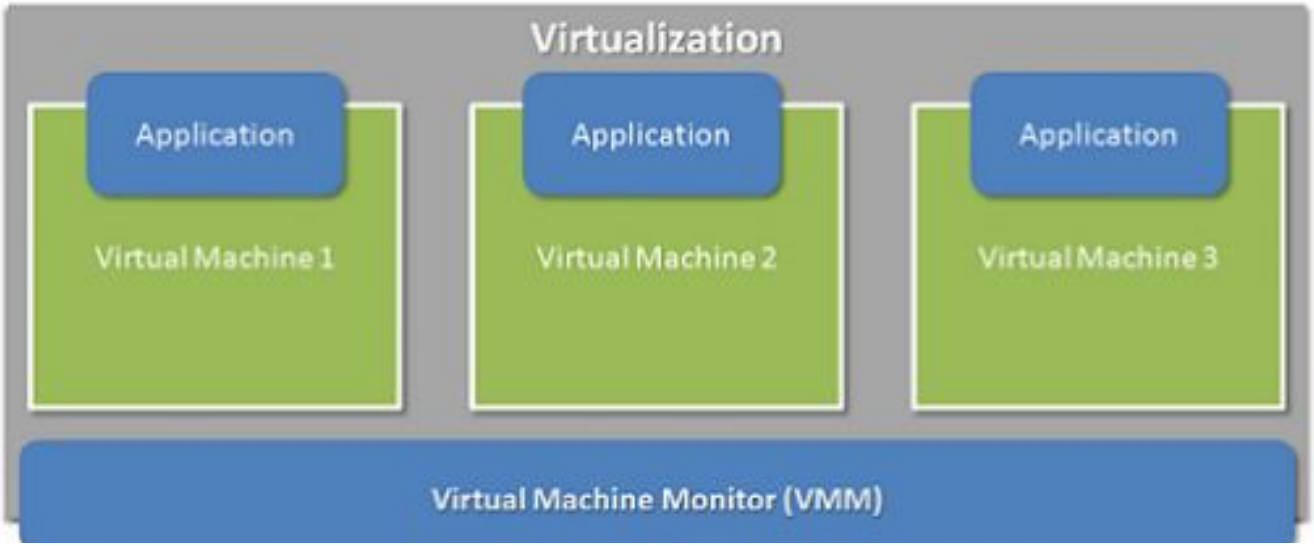
弹性能力提供

- 向上/下扩展（Scale Up/Down）
  - 根据负载高低调整资源分配
  - 多用于小型系统
- 向内/外扩展（Scale In/Out）
  - 根据负载升降增加或减少虚拟机数量
  - 负载均衡是关键
  - 多用于大型系统

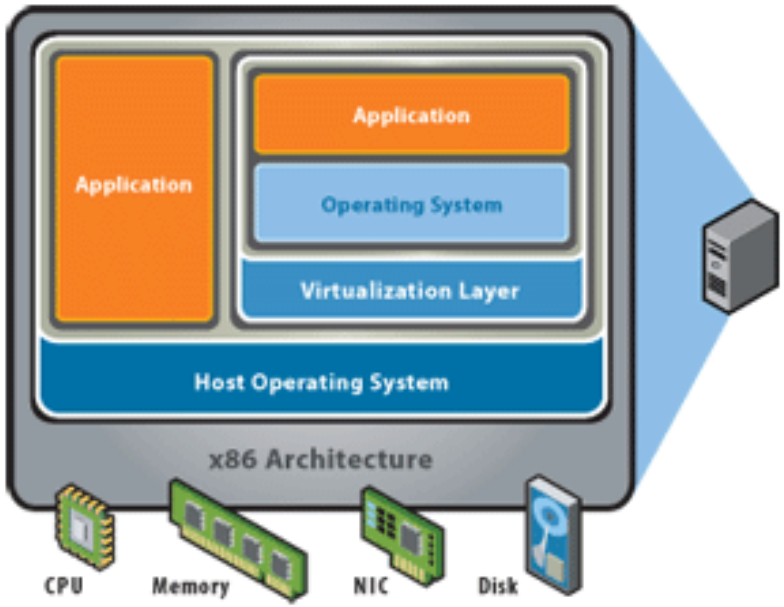




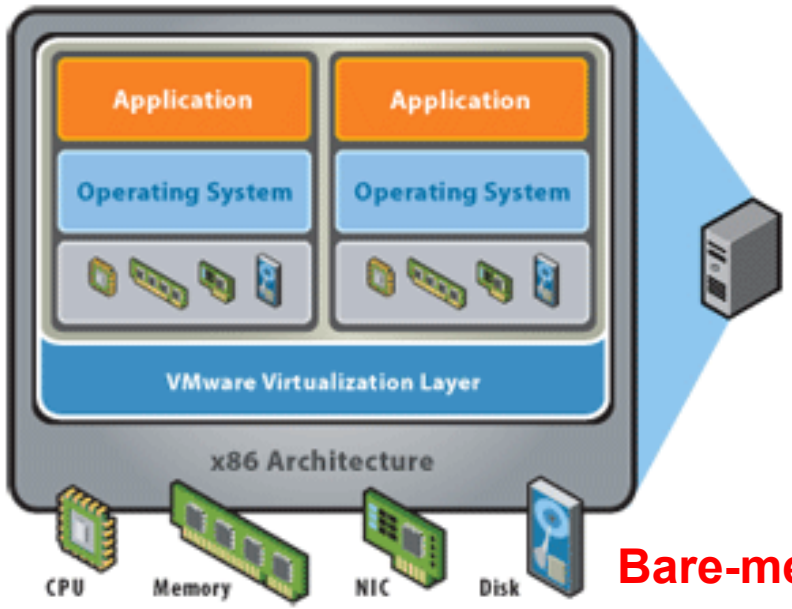
虚拟机架构-两种



基本架构



Hosted



Bare-metal

基于操作系统的虚拟化--寄生架构（Hosted）

Definition

Operating system-based virtualization is the installation of virtualization software in a pre-existing operating system, which is called the host operating system.

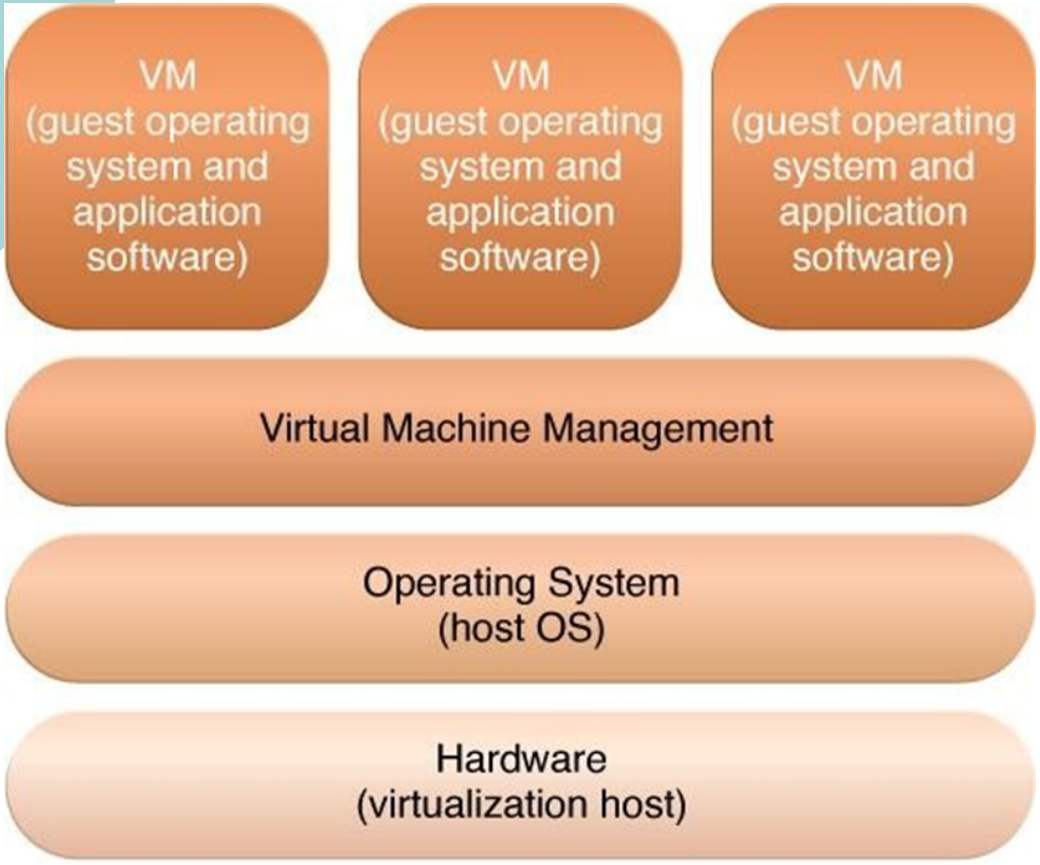


Figure 5.8 – 基于操作系统虚拟化的逻辑分层。其中，VMM首先被安装在完整的宿主操作系统上，然后被用于产生虚拟机

基于硬件的虚拟化--裸金属架构（Bare-metal）

Definition

Hardware-based virtualization represents the installation of virtualization software directly on the physical host hardware so as to bypass the host operating system, which is presumably engaged with operating system-based virtualization.

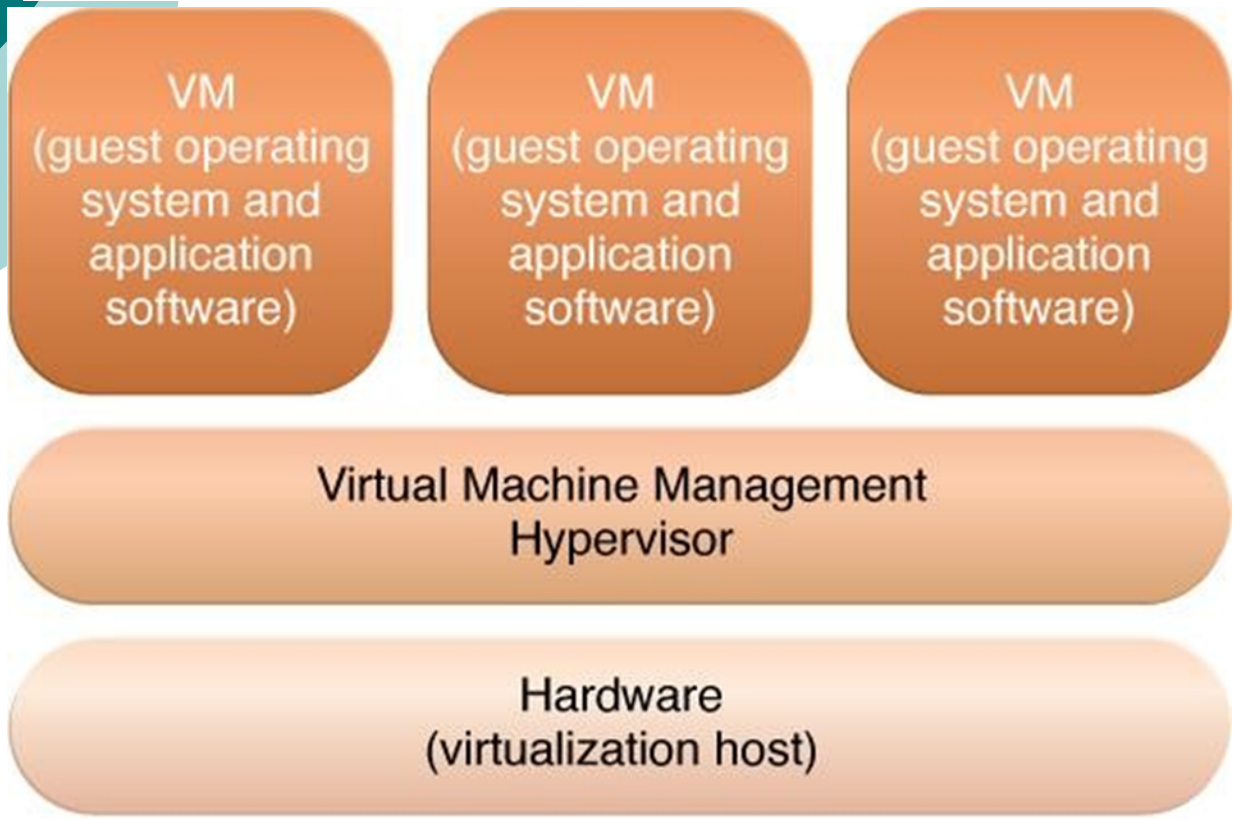
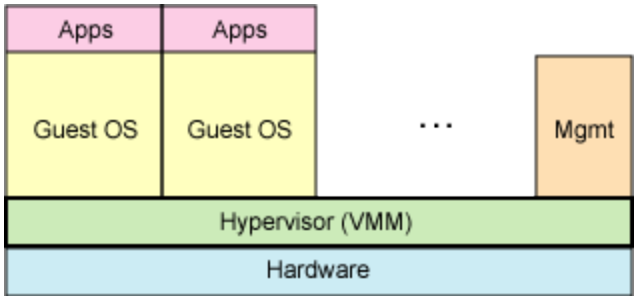


Figure 5.9 – 基于硬件虚拟化的逻辑分层，不再需要另一个宿主操作系统,而是将VMM直接安装在硬件上。

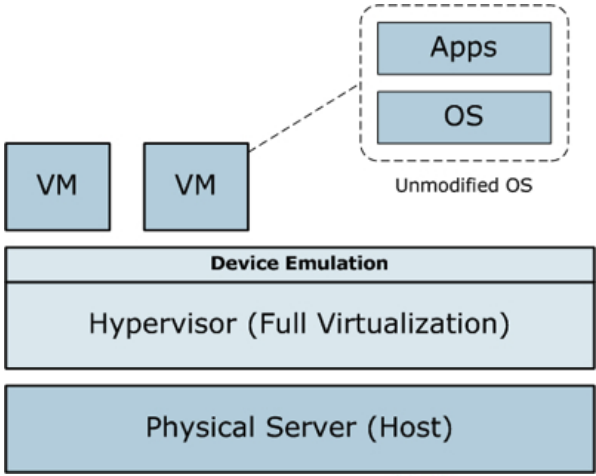
全虚拟化（Full Virtualization）

Definition

Full virtualization is a virtualization technique used to provide a complete simulation of the underlying hardware.



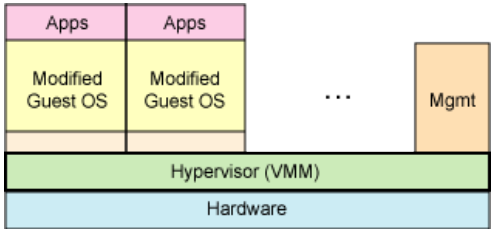
- 最常见、最成熟的虚拟化技术
- Hosted 和 Bare-metal都有
- 技术要点：
  - 在客户操作系统和硬件之间捕捉和处理那些对虚拟化敏感的特权指令，使客户操作系统无需修改就能运行
- 知名产品
  - IBM CP/CMS
  - Oracle VirtualBox
  - KVM
  - VMware ESX



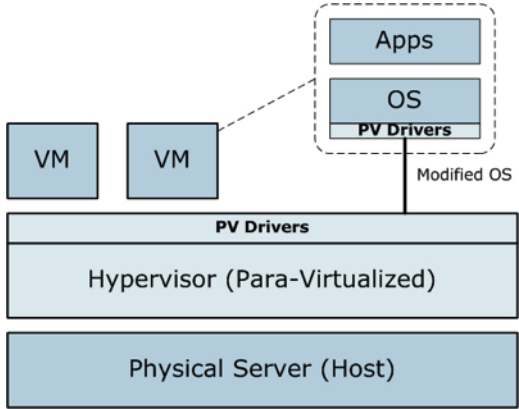
半虚拟化（Para-virtualization）

Definition

In computing, para-virtualization is a virtualization technique that presents a software interface to virtual machines that is similar, but not identical to that of the underlying hardware.



- Bare-metal模式
- 技术要点：
  - 与全虚拟化类似,利用VMM实现对底层硬件的访问
  - Guest OS集成与半虚拟化有关的代码，以配合VMM
  - 无需重新编译或捕获特权指令，性能非常接近物理机
- 知名产品
  - Xen
  - Microsoft Hyper-V



成熟度及分类

- I型：特定/定制 Ad-hoc / custom
  - 即传统的“软件运营”
  - 用户都有定制的程序版本，运行自己的实例
  - 传统软件少量改变即可移植
  - 通过合并服务器、系统维护降低成本
- II型：可配置 Configurable
  - 详细的配置选项对元数据进行配置
  - 不同用户使用同一程序的不同实例
- III型：多租户 Multi-tenancy
  - 不同用户使用同一程序的单一实例
  - 隔离用户的操作界面和应用数据
- IV型：可扩展性 Scalable
  - 通过多层架构对服务器进行动态调整适应可变负载