



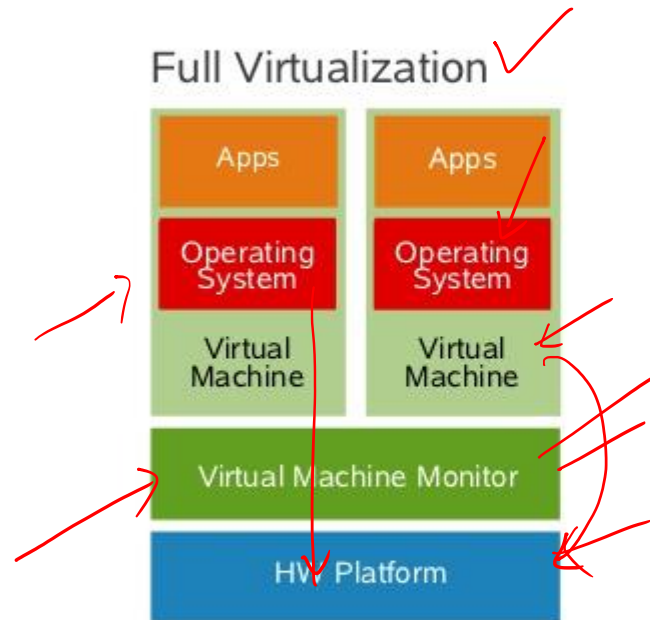
# Cloud Computing

SEWP ZG527

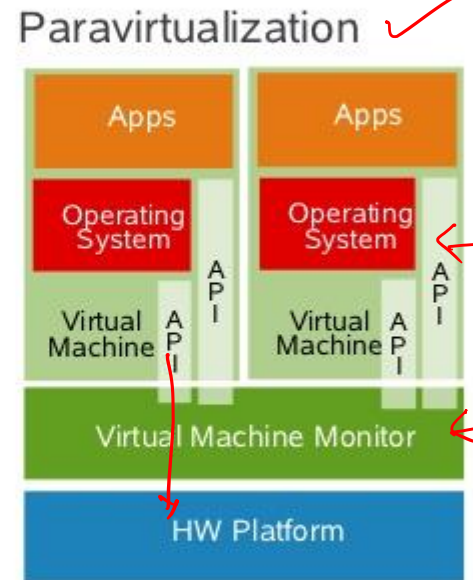
**BITS Pilani**

# Approaches for Virtualization

## Full & Paravirtualization Overview



Runtime modification of Guest OS:  
VMM manages the conflict, then  
returns to OS



Static modification of Guest OS prior to runtime: Privileged instruction calls are exchanged with API functions provided by the VMM

- Almost no performance degradation
- Significant scalability

# Full Virtualization


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## ❑ Full virtualization

- In its basic form known as “full virtualization” the hypervisor provides a fully emulated machine in which an operating system can run. VMWare is a good example.
- The biggest advantage to this approach is its flexibility: one could run a RISC-based OS as a guest on an Intel-based host.
- While this is an obvious approach, there are significant performance problems in trying to emulate a complete set of hardware in software.

# ParaVirtualization

## ❑ Paravirtualization

- “Paravirtualization,” found in the XenSource, open source Xen product, attempts to reconcile these two approaches. Instead of emulating hardware, paravirtualization uses slightly altered versions of the operating system which allows access to the hardware resources directly as managed by the hypervisor.
- This is known as hardware-assisted virtualization, and improves performance significantly 
- In order to retain flexibility, the guest OS is not tied to its host OS. Drastically different operating systems can be running in a hypervisor at the same time, just as they can under full virtualization.
- In this way, paravirtualization can be thought of as a low-overhead full virtualization

# SKI Virtualization

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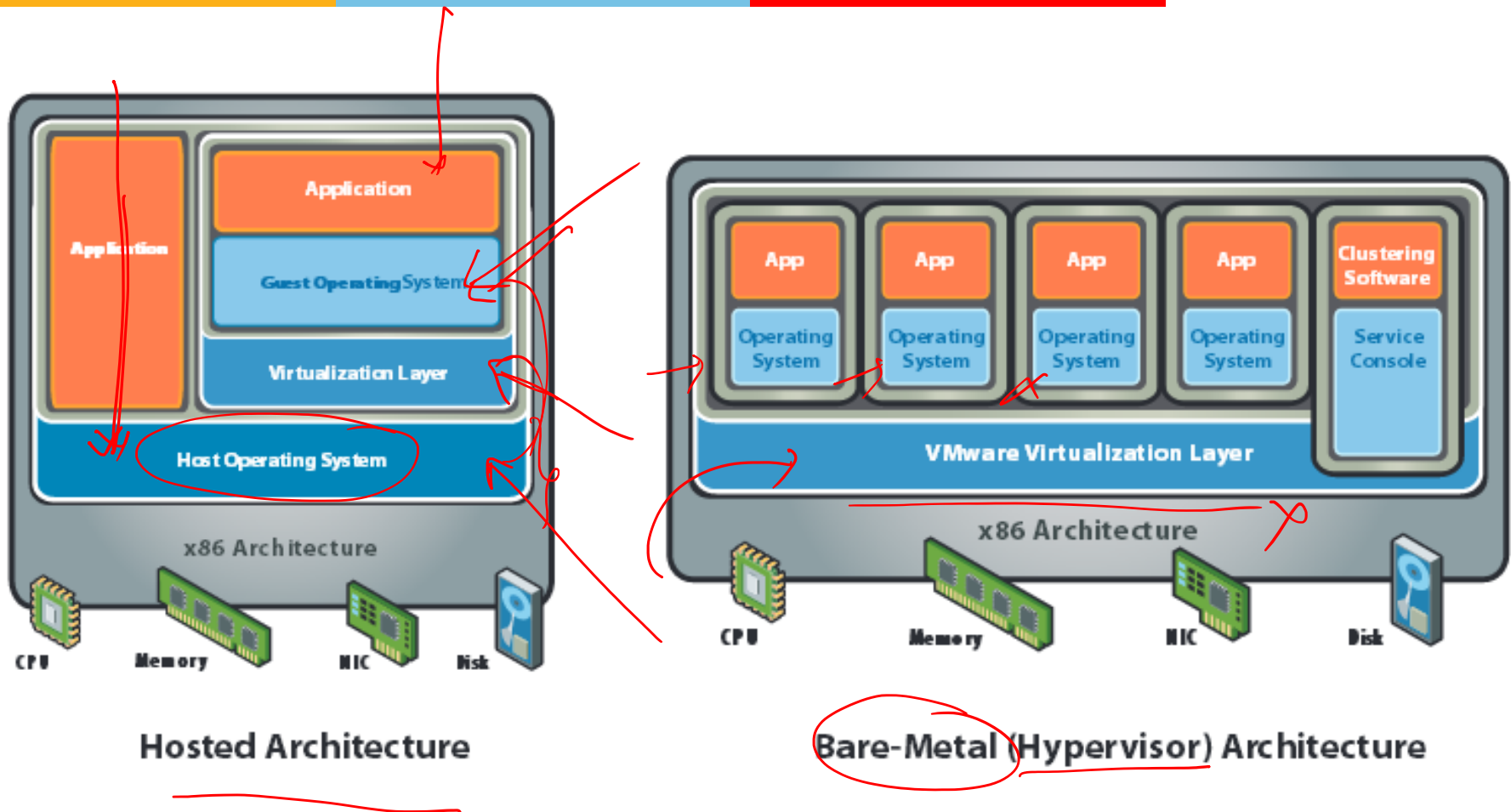
- ❑ Single Kernel Image (SKI),
  - Single Kernel Image (SKI), in which the host OS spawns additional copies of itself. This kind of virtualization can be found in Swsoft Virtuozzo and Sun Solaris, Zones. SKI can be thought of as “lightweight” virtualization.
  - While this approach avoids the performance problems with pure emulation, it does so at the expense of flexibility.
  - It is not possible, for instance, to run different versions or even different patch levels of a particular operating system on the same machine.
  - Whatever versions exist in the host, that same software will be provided in the guest. SKI also sacrifices the security and reliability provided by other virtualization methods.

# x86 Hardware Virtualization

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- For Industry-standard x86 systems, the two approaches typically used with software-based partitioning are
  - hosted and
  - hypervisor architectures
- A hosted approach provides partitioning services on top of a standard operating system and supports the broadest range of hardware configurations.
- In contrast, a hypervisor architecture is the layer of software installed on a clean x86-based system (hence it is often referred to as a “bare metal” approach). Since it has direct access to the hardware resources, a hypervisor is more efficient than hosted architectures, enabling greater scalability, robustness and performance

# x86 Hardware Virtualization



# Advantages of Virtualization

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- Instant provisioning - fast scalability
- Live Migration is possible
- Load balancing and consolidation in a Data Center is possible.
- Low downtime for maintenance ✓
- Virtual hardware supports legacy operating systems efficiently
- Security and fault isolation ✓



# Issues to be aware of

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- **Software licensing**

One of the most significant virtualization-related issues to be aware of is software licensing. Virtualization makes it easy to create new servers, but each VM requires its own separate software license. Organizations using expensive licensed applications could end up paying large amounts in license fees if they do not control their server sprawl.

- **IT training**

IT staff used to dealing with physical systems will need a certain amount of training in virtualization. Such training is essential to enable the staff to debug and troubleshoot issues in the virtual environment, to secure and manage VMs, and to effectively plan for capacity.

- **Hardware investment**

Server virtualization is most effective when powerful physical machines are used to host several VMs. This means that organizations that have existing not-so-powerful hardware might still need to make upfront investments in acquiring new physical servers to harvest the benefits of virtualization

# Issues to be aware of

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- Performance can be a concern, especially for in-band deployments, where the virtualization controller or appliance can become a bandwidth bottleneck.
- Interoperability among vendor products is still evolving.
- Failure of the virtualization device, leading to loss of the mapping table.

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Thanks!!!  
Queries?