
Virtualization “a cloud computing context”

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- International Telecommunications Union Expert



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Agenda

What is Virtualization?
Cloud and Virtualization
Virtualization Fit
Security Considerations
Performance Considerations
Summary

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More Virtualized
Machines created
than babies each
day in the USA



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Virtualization

Alternative
Reality



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Virtualization

- Allows the splitting of a single physical piece of hardware into independent, self-governed environments, which can be extended in terms of CPU, RAM, Disk, I/O and other elements. - ITU
- Is the simulation of the software and/ or hardware upon which other software runs. - NIST

Virtualization Benefits

- Increasing load on existing hardware (Computing, Storage, Network)
- Consolidation
- Provisioning speeds
- Desktop Virtualization (multiple OS one physical machine)
- Reduce Costs

General Model – Before Virtualization

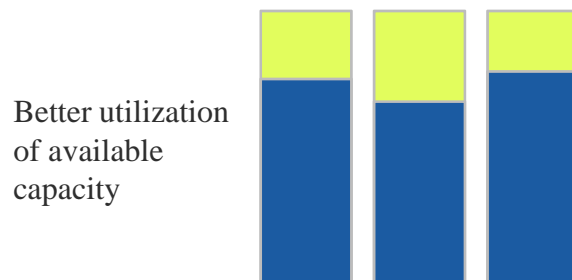


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General Model – after Virtual Consolidation



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Virtualization = Cloud Computing ?



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Virtualization Provides

- Technology that helps enable Cloud Computing
- Technology to help meet the NIST Cloud Computing essential characteristics
 - On demand self-service
 - Broad network access
 - Resource pooling
 - Rapid elasticity
 - Measured service

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Main Types of Virtualization

- Desktop Virtualization
- Hardware/ Platform Virtualization
- Server Virtualization
- CPU Virtualization
- Software Virtualization
- Memory Virtualization
- Storage Virtualization
- Data Virtualization
- Network Virtualization

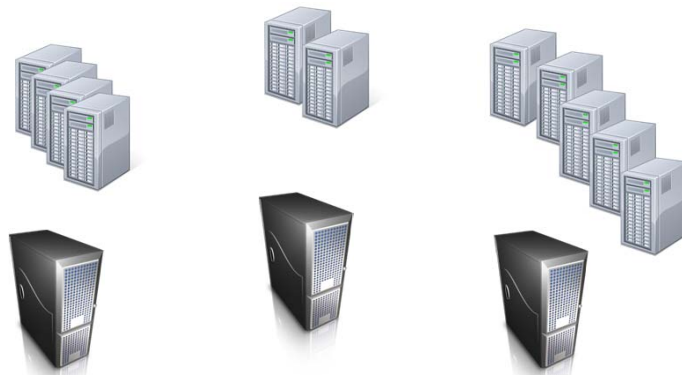


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Virtualized Instances



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Physical Cluster



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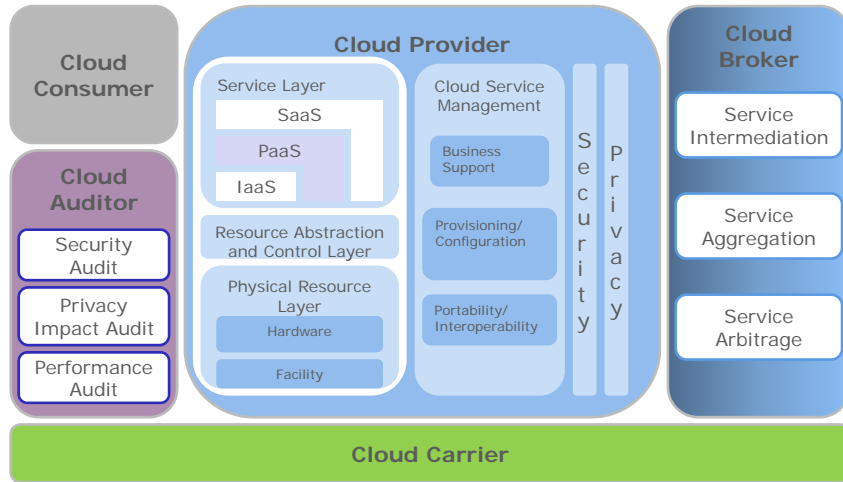
Virtual Cluster



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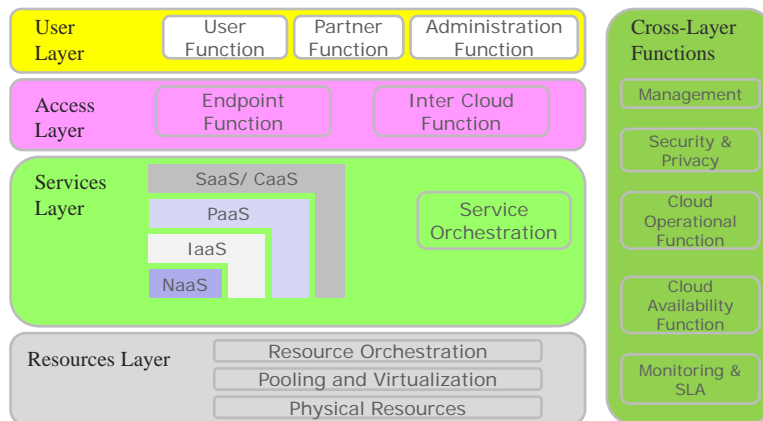
NIST Reference Architecture



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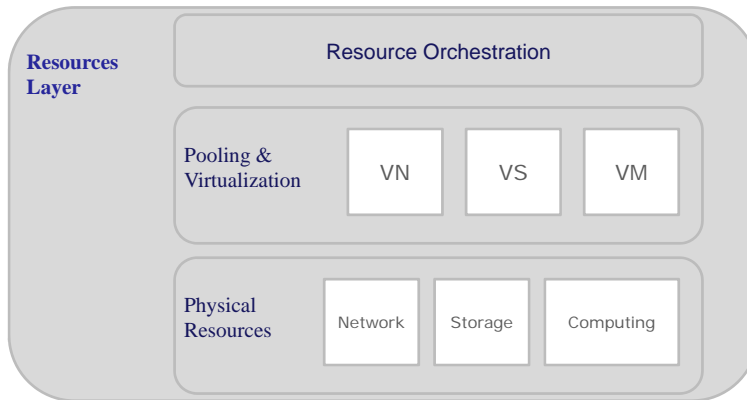
ITU Cloud Computing Functional Reference Architecture



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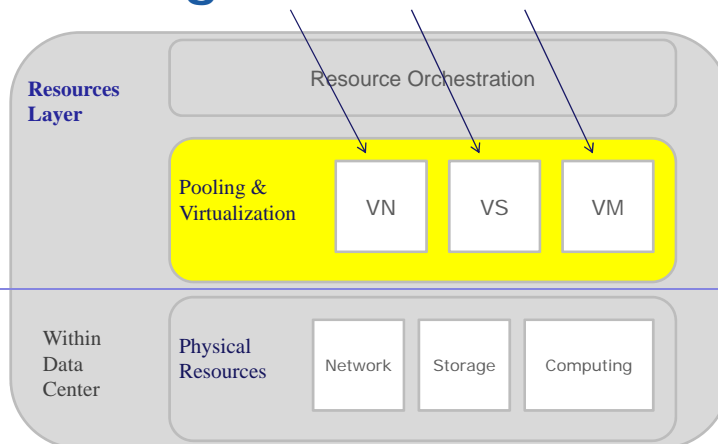
ITU Virtualization "Resources Layer"



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Pooling and Virtualization



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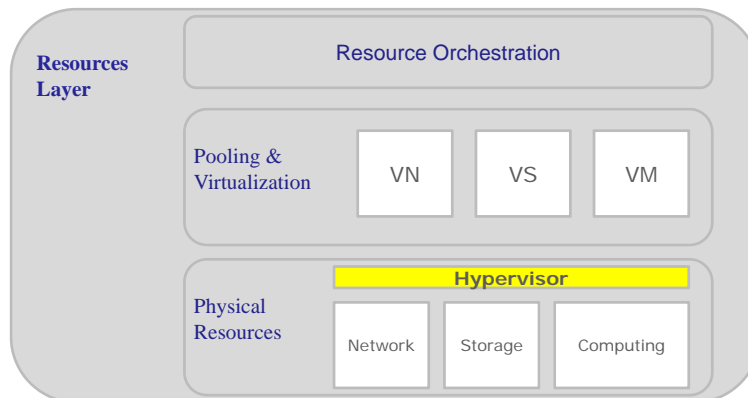


Pooling and Virtualization

- Requests to pooling are managed and controlled by Resource Orchestration based on user demand
- Physical Resources are turned into virtual machines, virtual networks and virtual storage

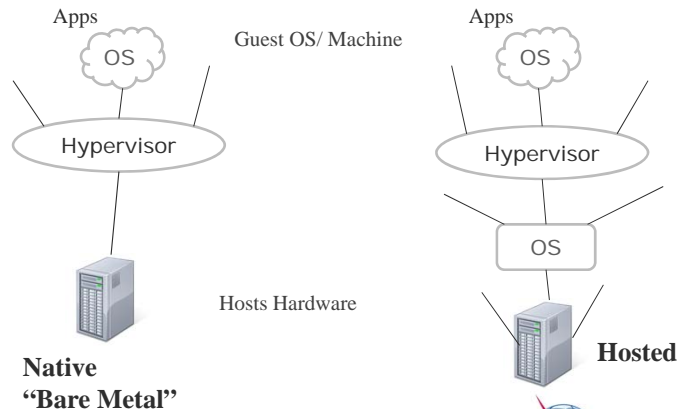
Typical Hypervisor "Fit"

New term?



Hypervisor Implementations

- Hypervisor “Virtual Machine Manager/ Monitor”



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Considerations Native vs Hosted

- Hosted is less secure and vulnerable
- Hosted is more complex (more layers)
- Hosted has more availability

- Native/ Bare Metal is more secure
- Native/ Bare Metal is less complex
- Native/ Bare Metal is more limited

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Do You Need a Hypervisor to be Virtual?

No, some don't have something named "hypervisor", others you can turn off the hypervisor

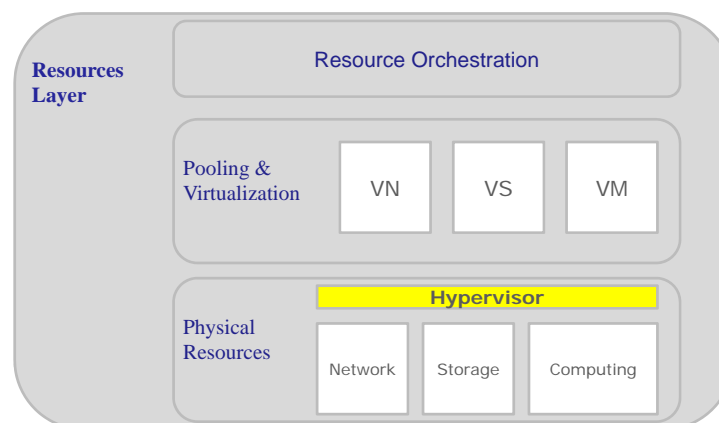


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Network Security



NIST 800-125 Virtualization & Security

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Hypervisor Good Security Practices

- Install vendor updates
- Restrict access
- Trusted synchronization of virtualized infrastructure
- Disconnect unused physical hardware from host
- Disable unneeded hypervisor services between guest OS and host OS
- Disable clipboards

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Hypervisor Good Security Practices (continued)

- Use introspection capabilities to monitor each guest OS
- Use introspection capabilities to monitor activity between guest OSs (was previously by Network security such as "firewalls")
- Monitor hypervisor itself for signs in compromise
- Good physical access controls

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Some Guest OS Security Considerations

- Same security concerns as OS running on real hardware
- Sharing information between host OS and guest OS
 - If one guest is impacted by malware, it quickly spreads
 - Establish shared network policies
- Clipboard constraints and policies

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Security Reality

- Technology is pretty good
- People and Processes
- Access of administrators to virtualized environments
- Physical Access
 - Room
 - Cabinets



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More Processors

- More processors inherently increase performance?



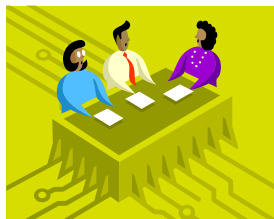
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Processor Considerations

- Designing appropriate applications to leverage multiple processors
- Appropriate sizing of processors based upon usage



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Myth or Reality?

- Migrating an already virtualized solution to a different virtualized solution is easy
- Interconnectivity between various clouds and virtual environments are standardized
- Will you build your own internally hosted virtual environment?
- Your cloud providers will offer the best solutions for you

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Our Cloudy Crystal Ball

- OS/2 is destined to be the most important operating system, and possibly program, of all time
- ...when the Internet came along, we had it as a fifth or sixth priority
- Bill Gates



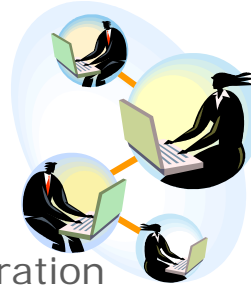
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Summary

- Many options
- Many considerations
- Many products
- Many initiatives
- Security is a major consideration
- Satisfy your objectives
- Establish goals and expectations
- Flexibility is needed

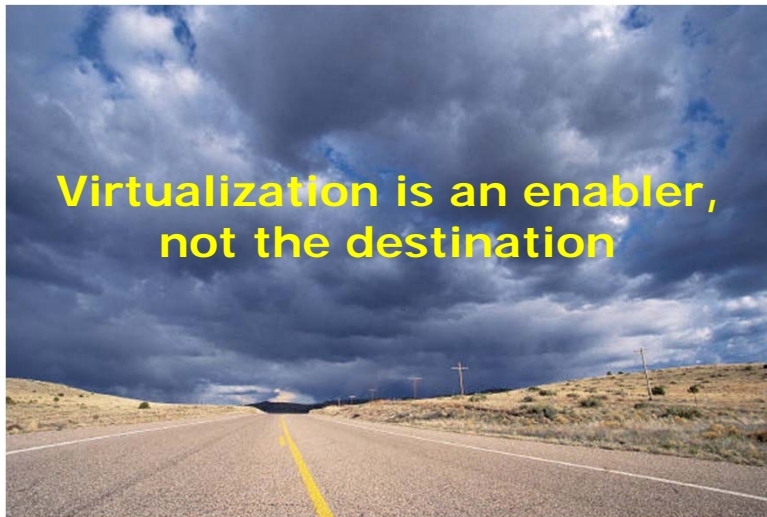


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**Virtualization is an enabler,
not the destination**



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