

DPU-CT519

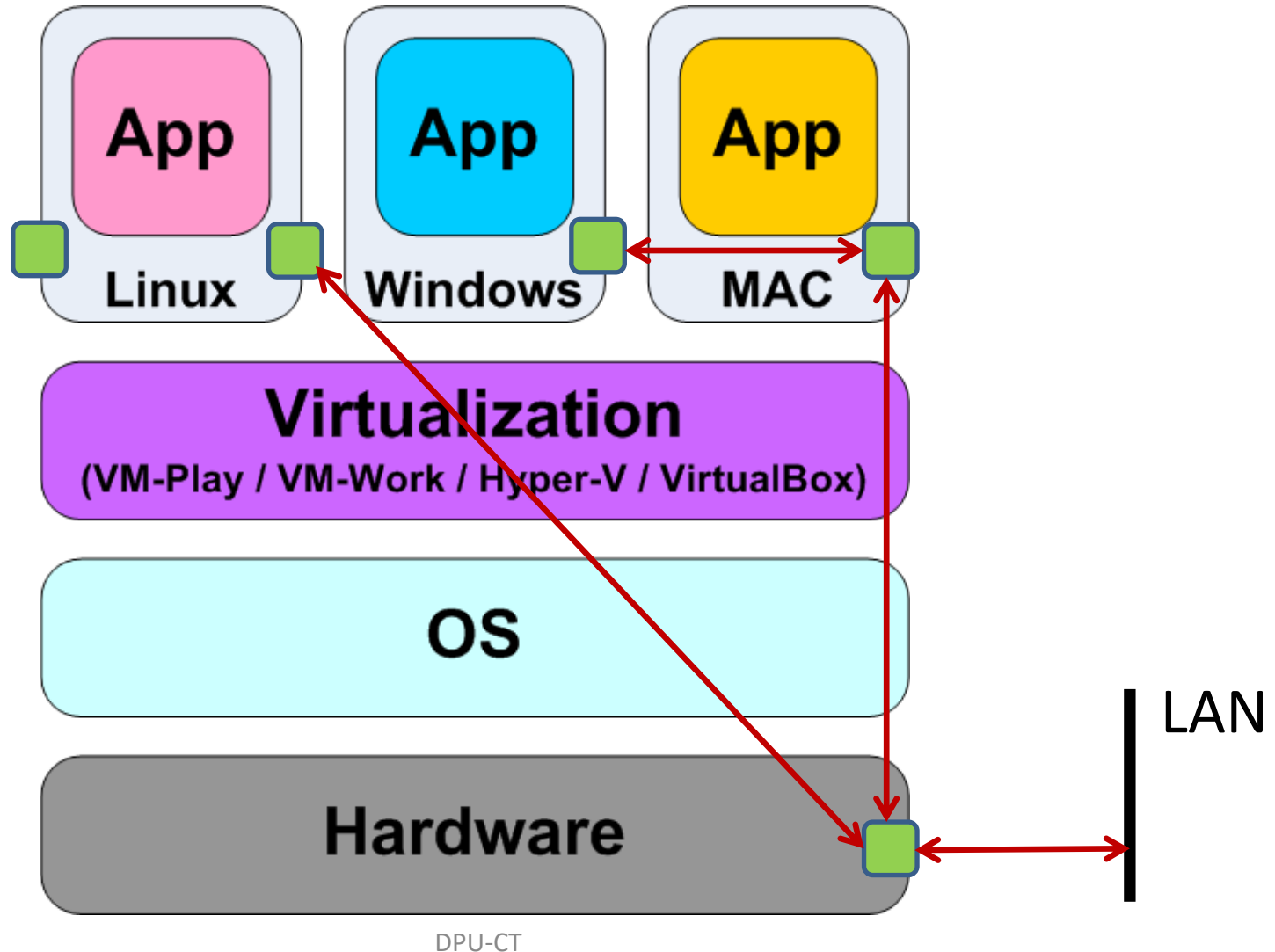
Virtual Networking

Dr.Chaiyaporn Khemapatapan

Learning Objectives

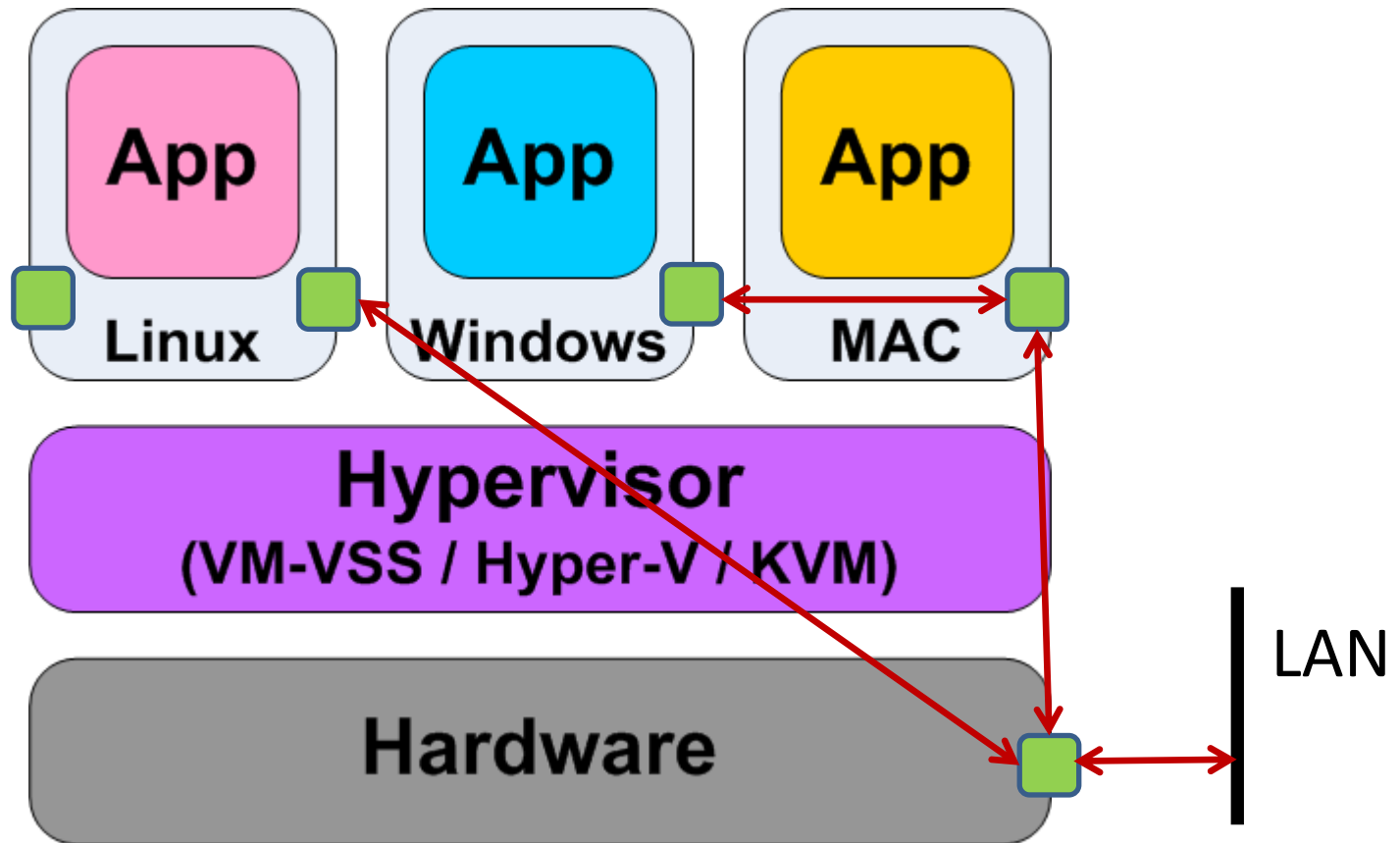
- To learn Virtual Networking
- To practice Virtual Network Labs

Virtual Networks (Hosted Architecture)

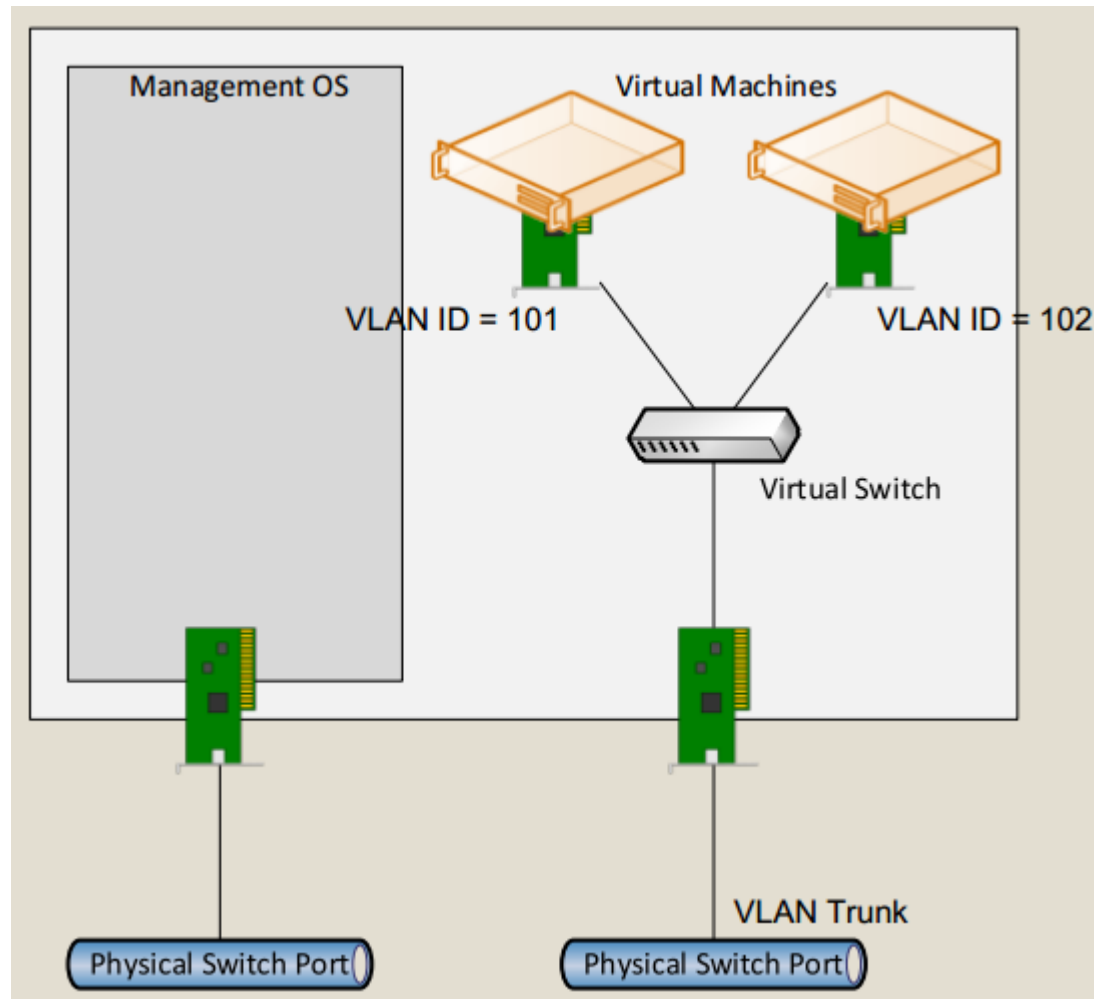


Virtual Networks

(Bare-Metal or Hypervisor Architecture)



V Networking



V VNICs

- Generation 1 VMs can have:
 - (Synthetic) network adapter
 - Requires drivers (Hyper-V integration components/services)
 - Does not do PXE boot
 - Best performance
 - Legacy network adapter
 - Emulated - does not require Hyper-V drivers
 - Does offer PXE
 - Bad performance
- Generation 2 VMs have synthetic network adapters with PXE

Virtual Network Types

- External:
 - Allow VMs to talk to each other physical network and host
 - Normally used
- Internal
 - Allow VMs to talk to each other and host
 - VMs cannot communicate to VMs on another host
 - Normally only ever seen in a lab
- Private Or Host Only
 - Allow VMs to talk to each other
 - VMs cannot communicate to VMs on another host
 - Sometimes seen but replaced by Hyper-V network virtualization or VLANs

External Type Connection

- NAT
 - Connect to outside host using NAT
 - Use private IP address for guest
- Bridge
 - Connect to outside host directly via host's NIC
 - Use IP address in the same subnet of host

Enterprise Cloud Architecture



Virtual Technology Infrastructure

Hypervisor
(Linux KVM / Microsoft HyperV / VMWare SS,ESX / Citrix XEN)

Physical Infrastructure



Computer Node

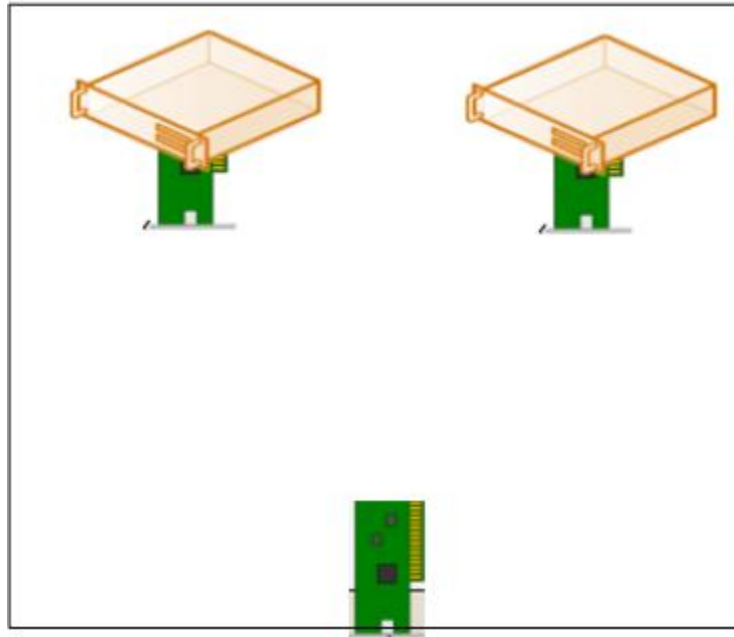


Storage

Network

Host / VM / NIC / VNIC

Host 1



VMware Network Mode

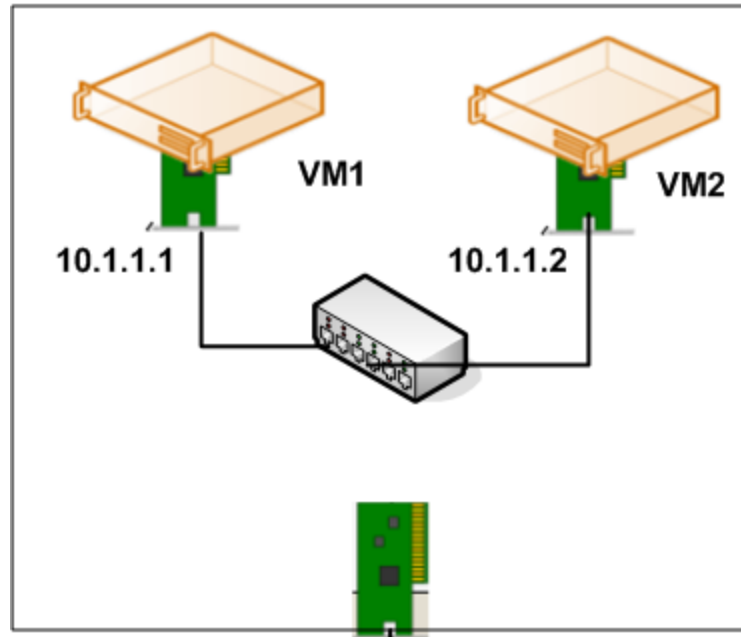
- Host-only
- Bridge
- NAT

VMware creates Vmnet as a virtual network for VMs connect through VMnet.

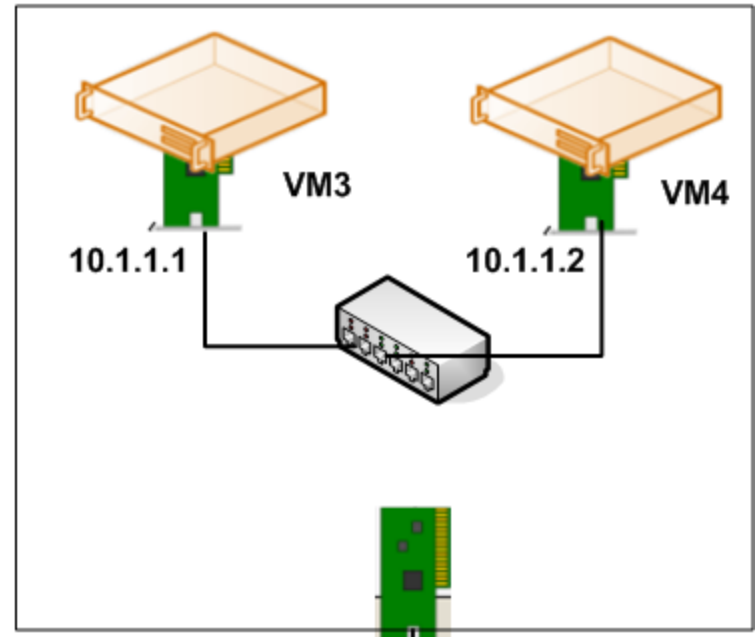
Host automatically connects to all VMnets.

Host-only

Host 1

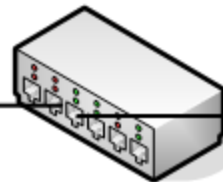


Host 2



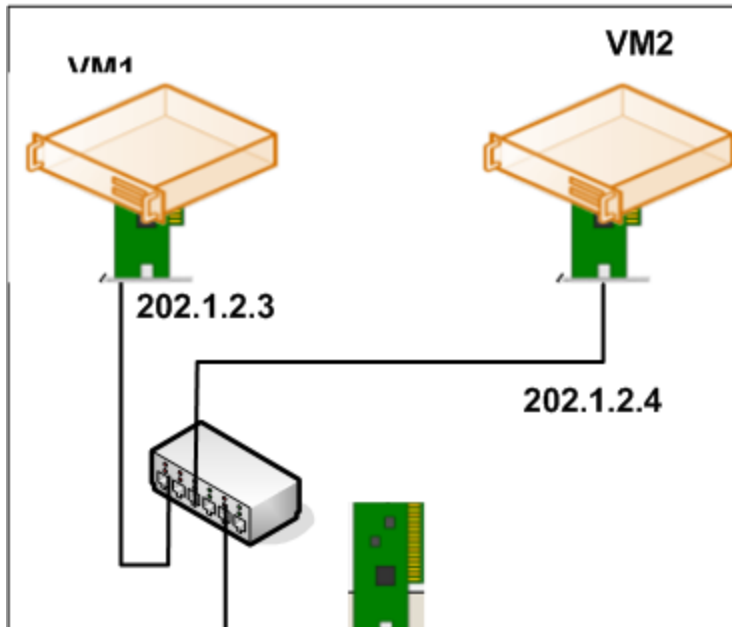
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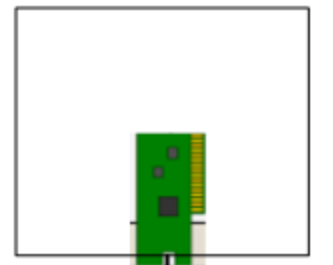
Bridge

Host 1



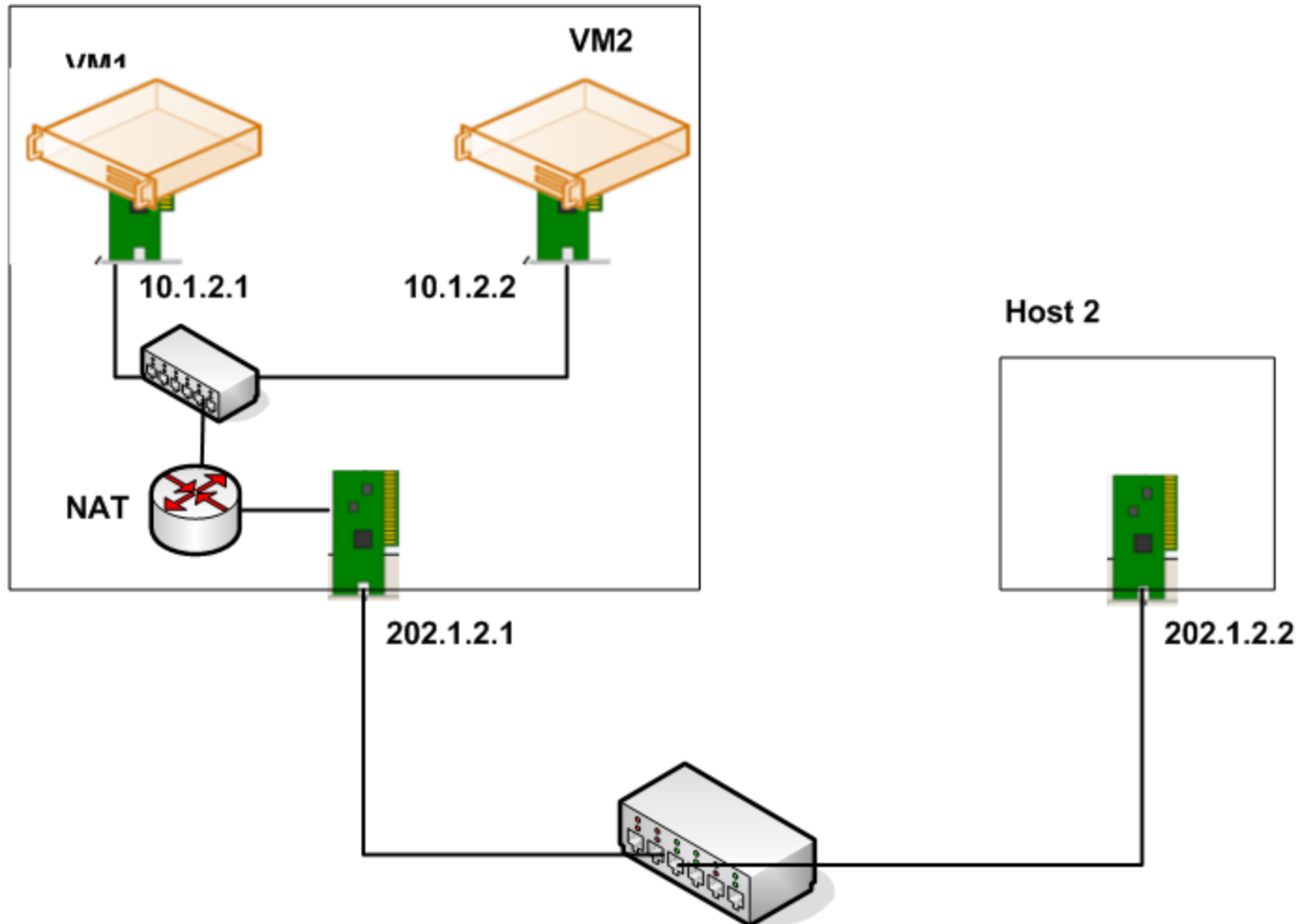
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Host 2

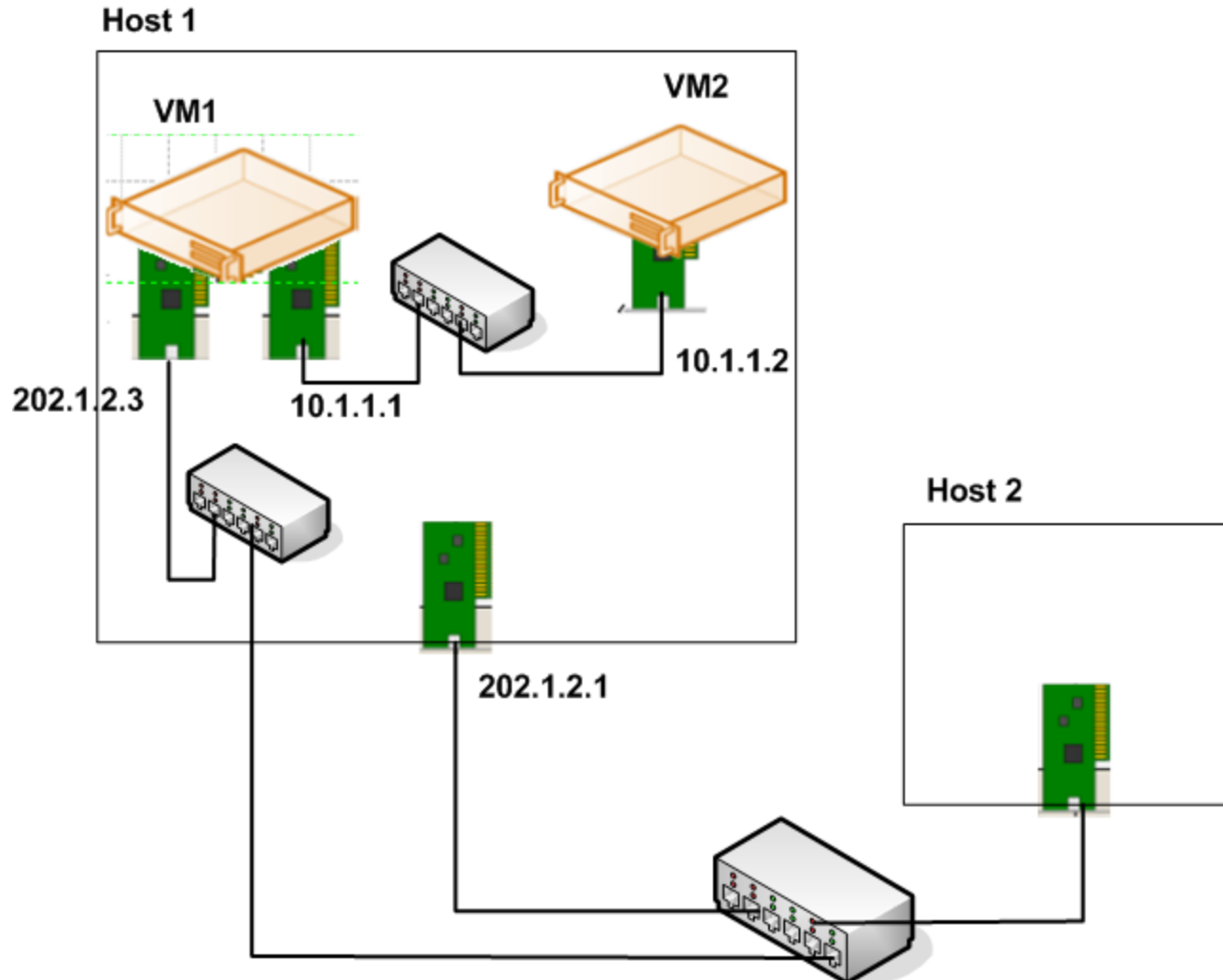


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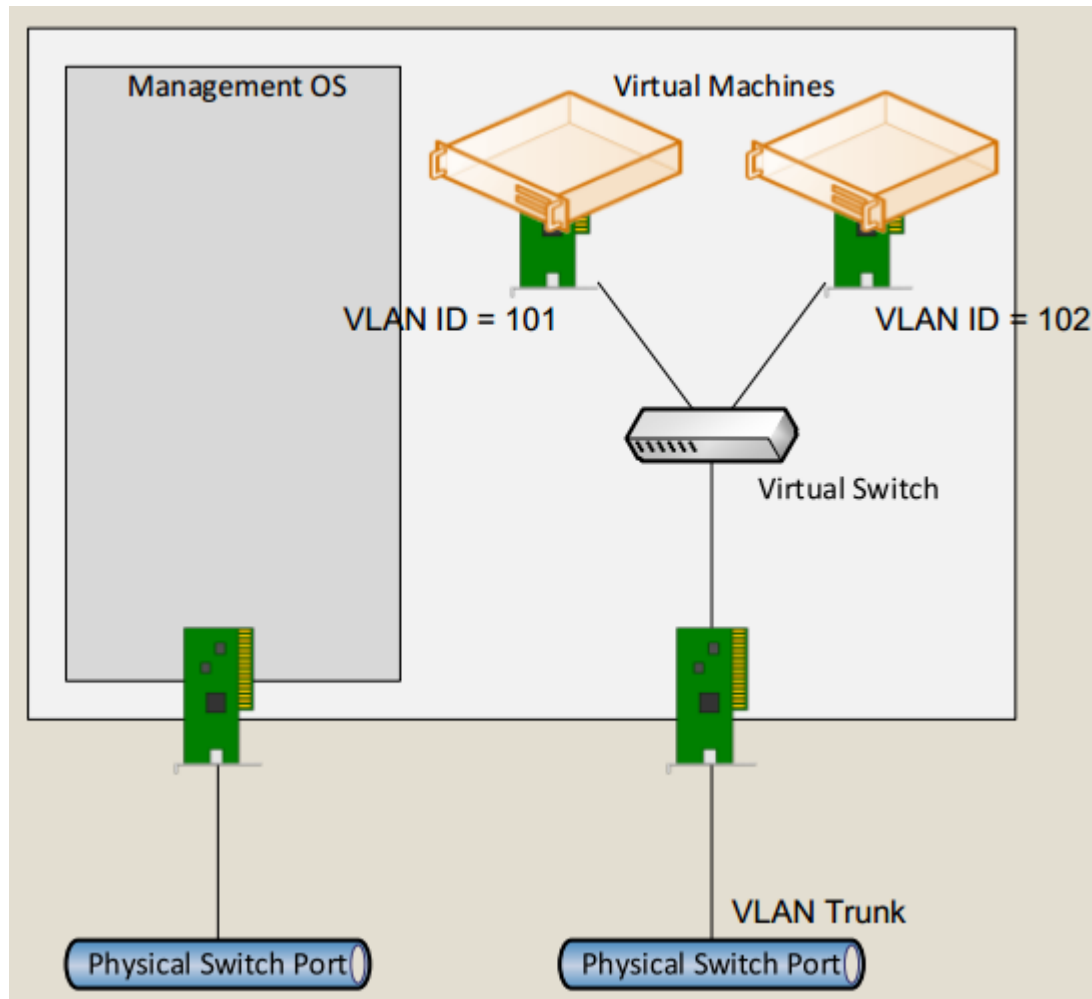
NAT



Hybrid / Complicated Cloud



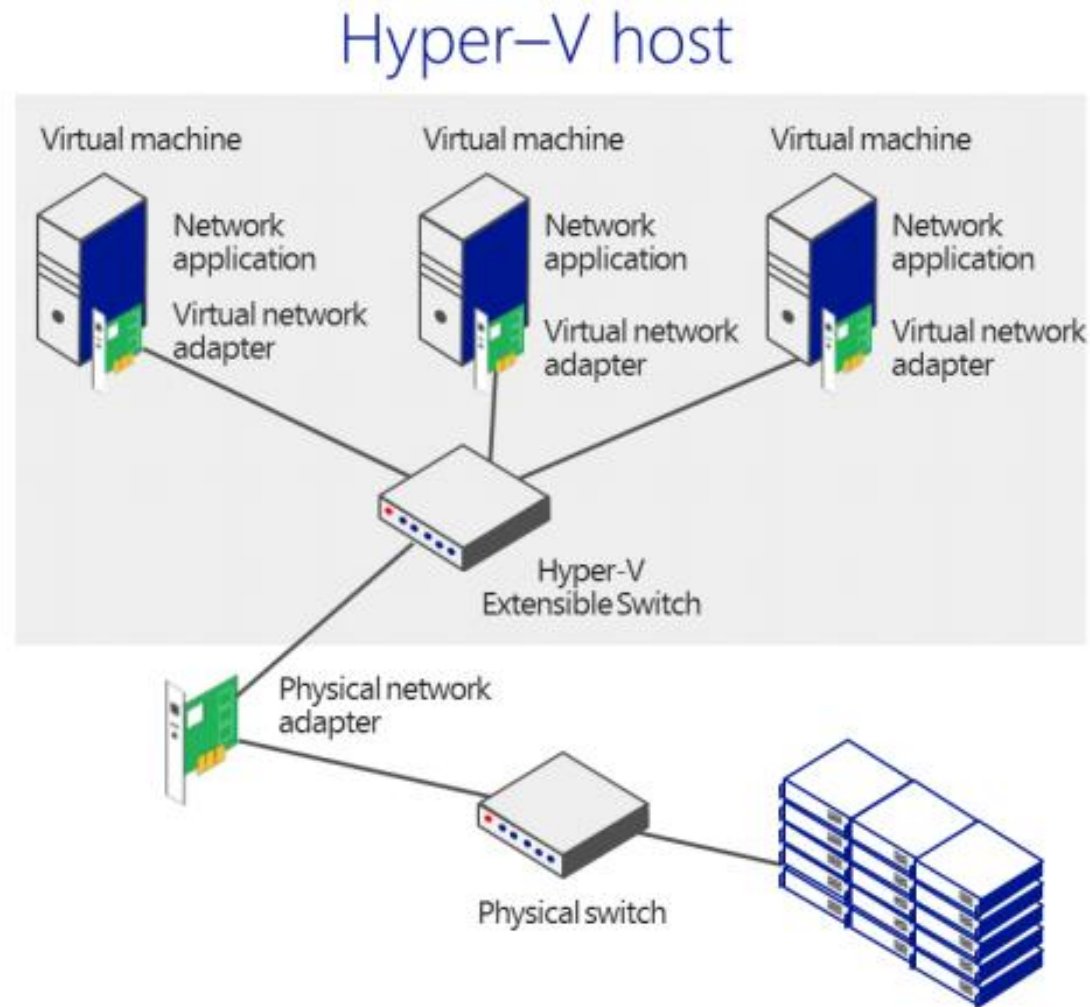
Hyper-V Networking



Hyper-V Virtual SW Types

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Hyper-V Extensible Switch



Features of Hyper-V Extensible Switch

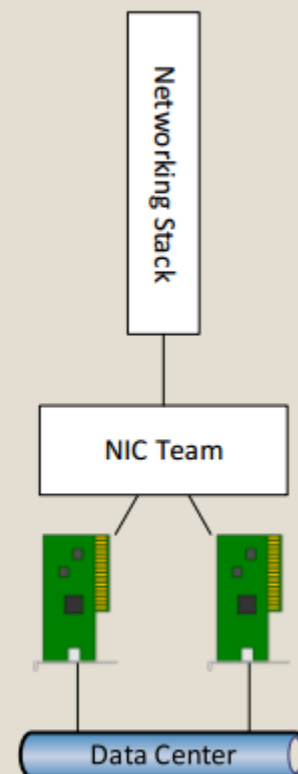
- **Private VLANs (PVLANS)** - Provide isolation between two virtual machines on the same VLAN
- **ARP/ND Poisoning/Spoofing** - Protection against a malicious virtual machine stealing IP addresses from other virtual machines
- **DHCP Snooping/DHCP Guard** - Protects against rogue DHCP servers attempting to provide IP addresses that would cause traffic to be rerouted
- **Virtual Port ACLs** - Isolate networks and metering network traffic for a virtual port
- **Trunk Mode to Virtual Machines** - Traffic from multiple VLANs can now be directed to a single network adapter in a virtual machine
- **Monitoring & Port Mirroring** - Monitor the traffic from specific ports flowing through specific virtual machines on the switch and mirror traffic which can then be delivered to another virtual port for further processing
- **Windows PowerShell/Windows Management Instrumentation (WMI)** - Provides Windows PowerShell cmdlets for the Hyper-V Extensible Switch that lets customers and partners build command-line tools or automated scripts for setup, configuration, monitoring, and troubleshooting.

NIC Teaming

- Provides load balancing and failover (LBFO)
- Load balancing:
 - Spread traffic across multiple physical NICs.
 - This provides link aggregation – not necessarily a single virtual “pipe”.
- Failover:
 - If one physical path (NIC or top-of-rack switch) fails then traffic automatically moved to another NIC in the team.
- Built-in and fully supported for Hyper-V and Failover Clustering since WS2012
- Up to:
 - 32 NICs *at same speed* in physical machines
 - 2 virtual NICs *at same speed* in a VM
- Configure teams to meet server needs
- Team management is easy!
 - Server Manager, LBFOADMIN.EXE, VMM, or PowerShell

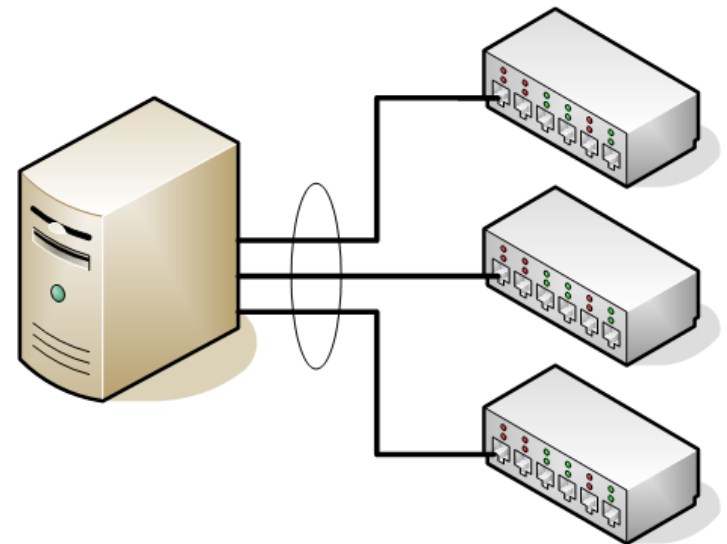
NIC Teaming with Physical NICs

- Choose the team connection mode that is required by your switches
- Choose either Address Hash or Dynamic load distribution
 - Address Hash will isolate a single stream of traffic on one physical NIC.
 - Dynamic enables a since virtual NIC to spread traffic across multiple team members at once.



NIC Teaming: Switch independent mode

- Doesn't require any configuration on a switch, Basic Switch can be used
- Protects against adjacent switch failures
- Standby NIC



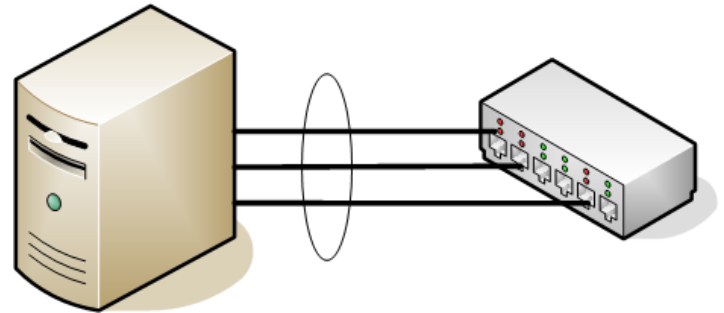
NIC Teaming: Switch dependent modes

Static Teaming

- Configured on a switch

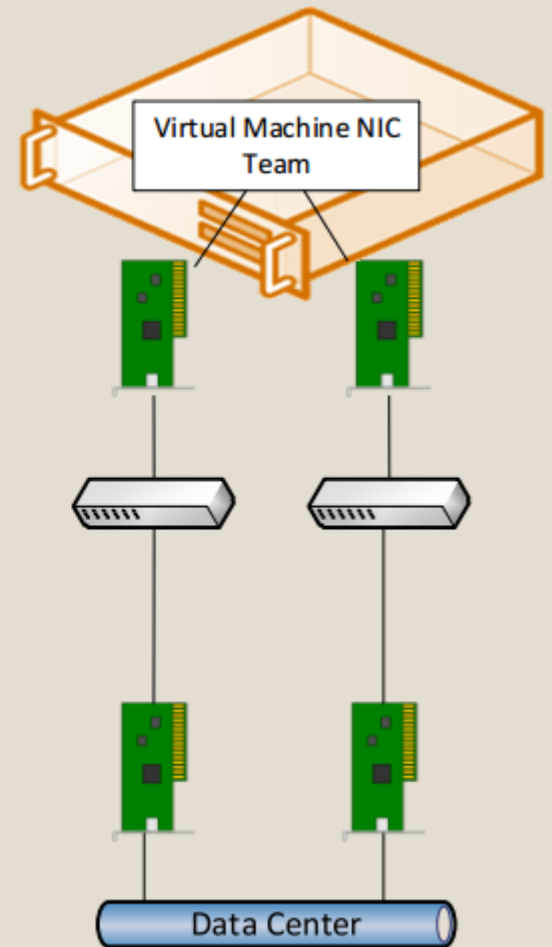
LACP Teaming

- Switch supports IEEE802.1ax or IEEE802.3ad



NIC Teaming with VM NIC Teaming

- Can be configured in guest OS of a WS2012 or later VM.
- Teams the VM's virtual NICs.
- Configuration is locked.
- You must allow NIC teaming in the advanced properties of the virtual NIC in the VM settings.
- `Set-VMNetworkAdapter VM01 -AllowTeaming On/Off`

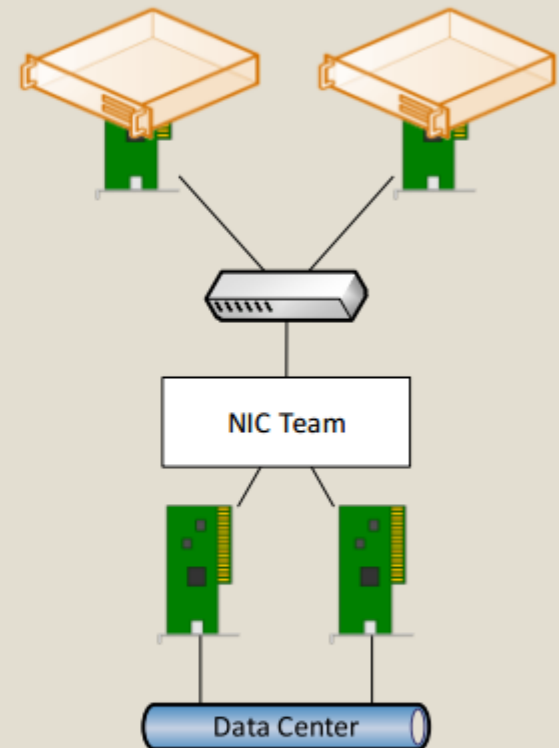


Hyper-V NIC Teaming

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NIC Teaming with Hyper-V Virtual Switch

- Choose the team connection mode that is required by your switches
- Choose either Hyper-V Port or Dynamic (WS2012 R2) load distribution
 - Hyper-V Port provides predictable incoming paths and DVMQ acceleration.
 - Dynamic enables a single virtual NIC to spread traffic across multiple team members at once.



LAB

- Implement 3 VMs on VMWare
 - Web Server: Ubuntu Server with LAMP and webmin
 - DB Server: Ubuntu Server with LAMP and phpMyadmin
 - Client: MS Windows 7
- Implement Virtual Network on All VMs