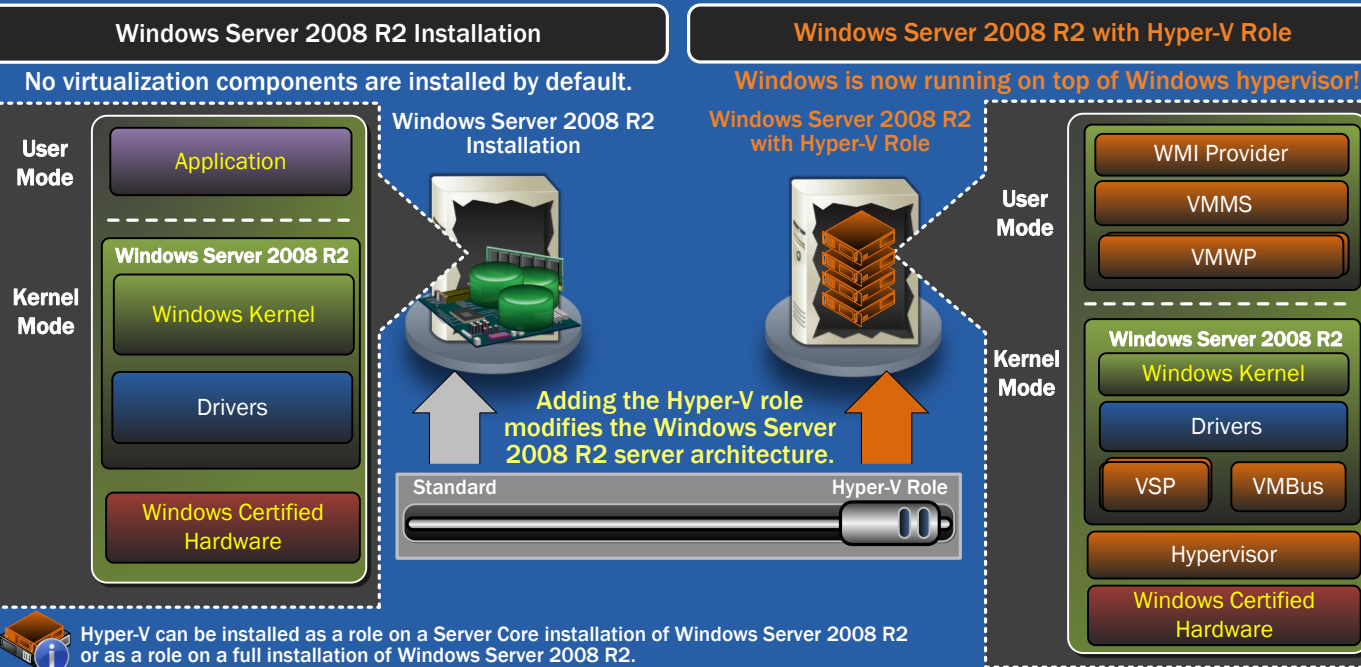


# Windows Server 2008 R2: Hyper-V Component Architecture

## Architecture

### How Installing the Hyper-V Role Changes Architecture

You can install Hyper-V as a role in Windows Server 2008 R2. It installs all the components of the Hyper-V technology, including the remote management tools. Hyper-V introduces architectural changes to Windows Server 2008 R2.



Hyper-V can be installed as a role on a Server Core installation of Windows Server 2008 R2 or as a role on a full installation of Windows Server 2008 R2.

Windows Server 2008 R2 Hyper-V Product Classification

Windows Server 2008 R2 includes a hypervisor-based server virtualization technology that can be installed as a role in Windows Server 2008 R2.

Microsoft Hyper-V Server 2008 R2 is a stand-alone server virtualization product. It includes the Windows hypervisor, the Windows Server driver model, and virtualization components.

When the Hyper-V role is added to Windows Server 2008 R2, Windows hypervisor takes control of the physical computer and creates partitions. The parent partition becomes a special virtual machine that runs the management operating system (Windows Server 2008 R2), which you use to manage virtual machines. You can create virtual machines that run guest operating systems in the child partitions.

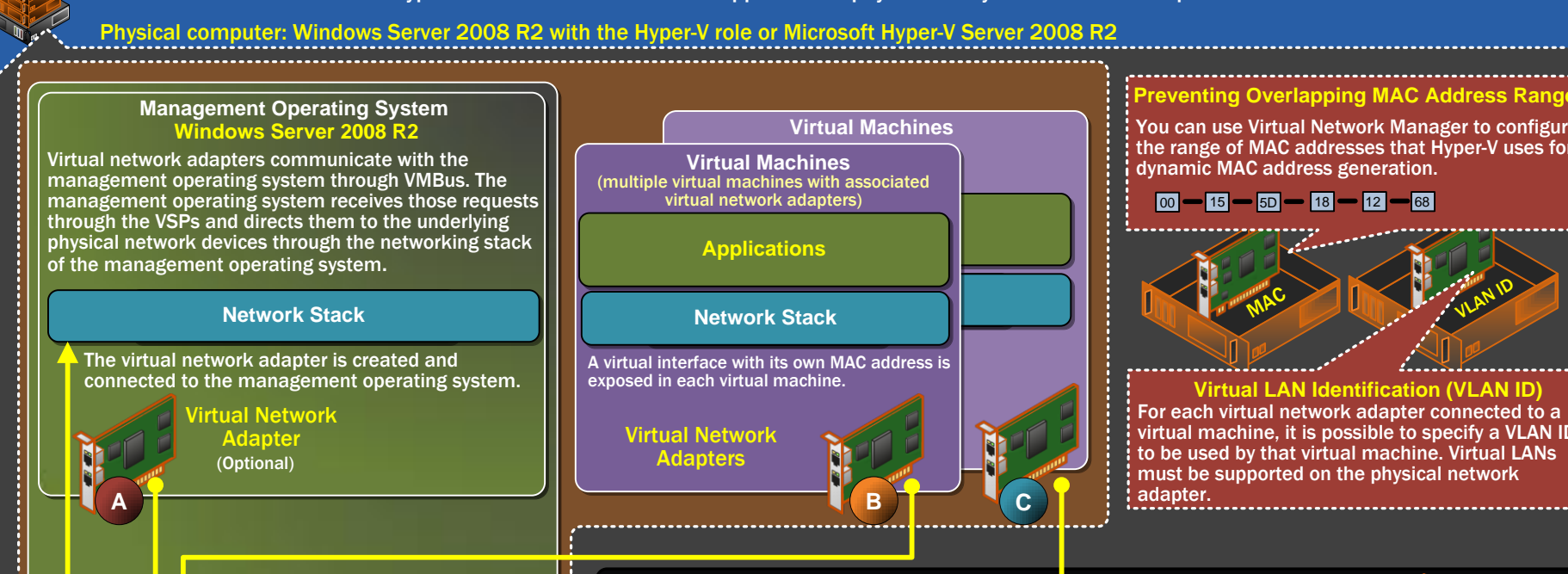
### Windows Server 2008 R2 Detailed Hyper-V Architecture



## Virtual Networking

### Virtual Network Architecture

Hyper-V supports three types of virtual networks: private virtual networks, internal virtual networks, and external virtual networks. The virtual network switch forms the center of all Hyper-V virtual networks. It never appears as a physical entity—it is a software representation.



Physical computer: Windows Server 2008 R2 with the Hyper-V role or Microsoft Hyper-V Server 2008 R2

Virtual Network Switch

Virtual Machines

Virtual Network Adapter

Virtual Network Adapter

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### Virtual Network Interfaces in Hyper-V

In Hyper-V, the virtual machine queue (VMQ) feature enables physical network adapters to place the contents of data packets directly into virtual machine memory, which increases I/O performance.

Data Path Without Virtual Machine Queue

Data Path With Virtual Machine Queue

Data Path With Virtual Machine Queue

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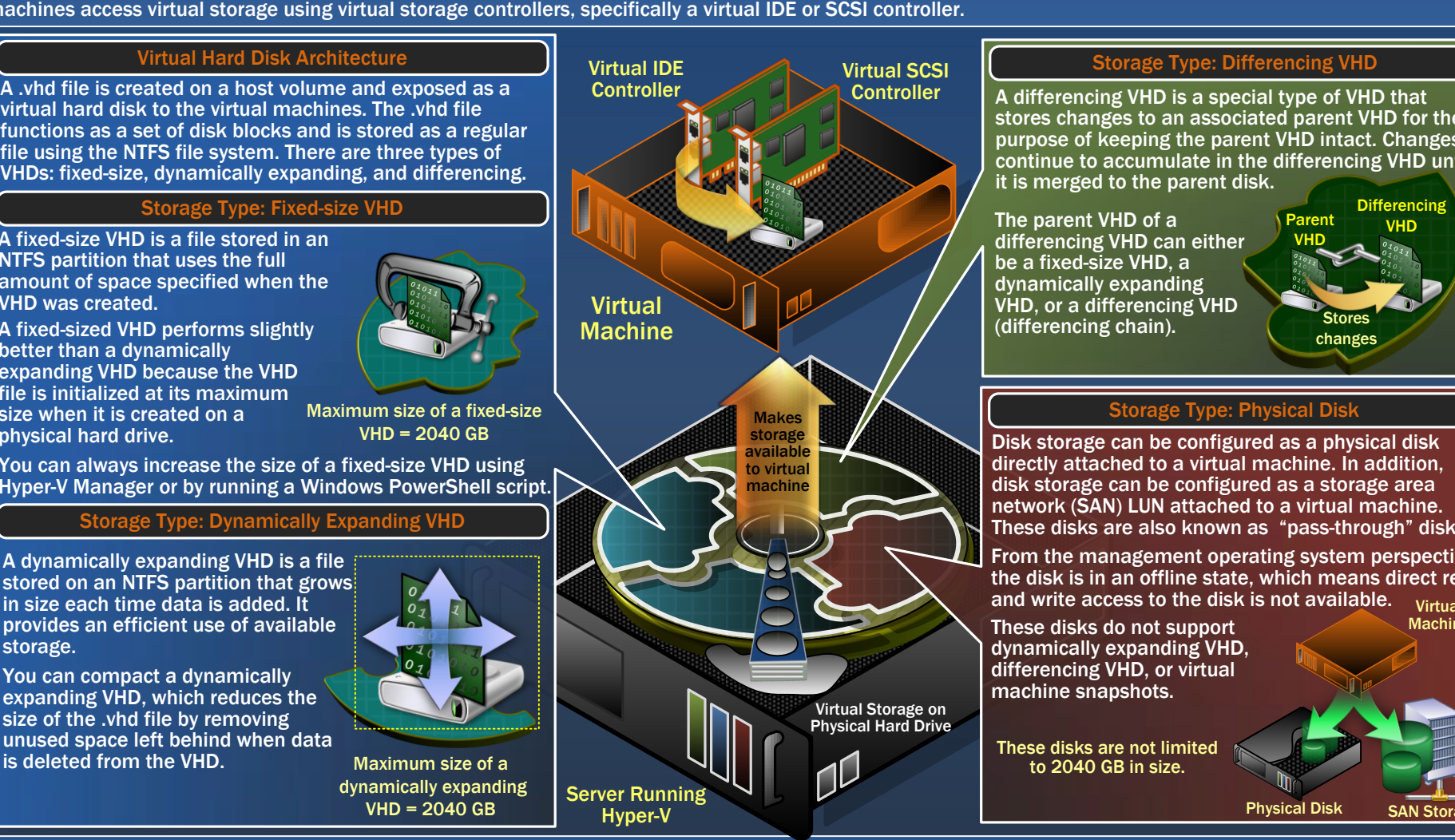
Data Path With Virtual Machine Queue

Data Path With Virtual Machine Queue

## Storage Types

### Hyper-V Disk Storage Types

For data storage, virtual machines use either a virtual hard disk (VHD) or a physical disk that is directly attached to a virtual machine (also known as a "pass-through" disk). You can easily configure virtual machines to use either a fixed-size VHD or a dynamically expanding VHD, or to directly access a physical disk. All virtual machines access virtual storage using virtual storage controllers, specifically a virtual IDE or SCSI controller.



### Storage Type: Differencing VHD

A differencing VHD is a special type of VHD that stores changes to a base VHD. The base VHD is the parent VHD. The differencing VHD stores only the changes made to the base VHD. This allows for efficient storage of multiple virtual machines that share a common base VHD.

Storage Type: Fixed-size VHD

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Storage Type: Fixed-size VHD

### Storage Type: Physical Disk

Disk storage can be configured as a physical disk directly attached to a virtual machine. In addition, disk storage can be configured as a storage area network (SAN) LUN attached to a virtual machine. These disks are also known as "pass-through" disks. From the management operating system perspective, the disk is in an offline state, which means direct read and write access to the disk is not available. These disks do not support dynamically expanding VHD, differencing VHD, or virtual machine snapshots.

Storage Type: Dynamically Expanding VHD

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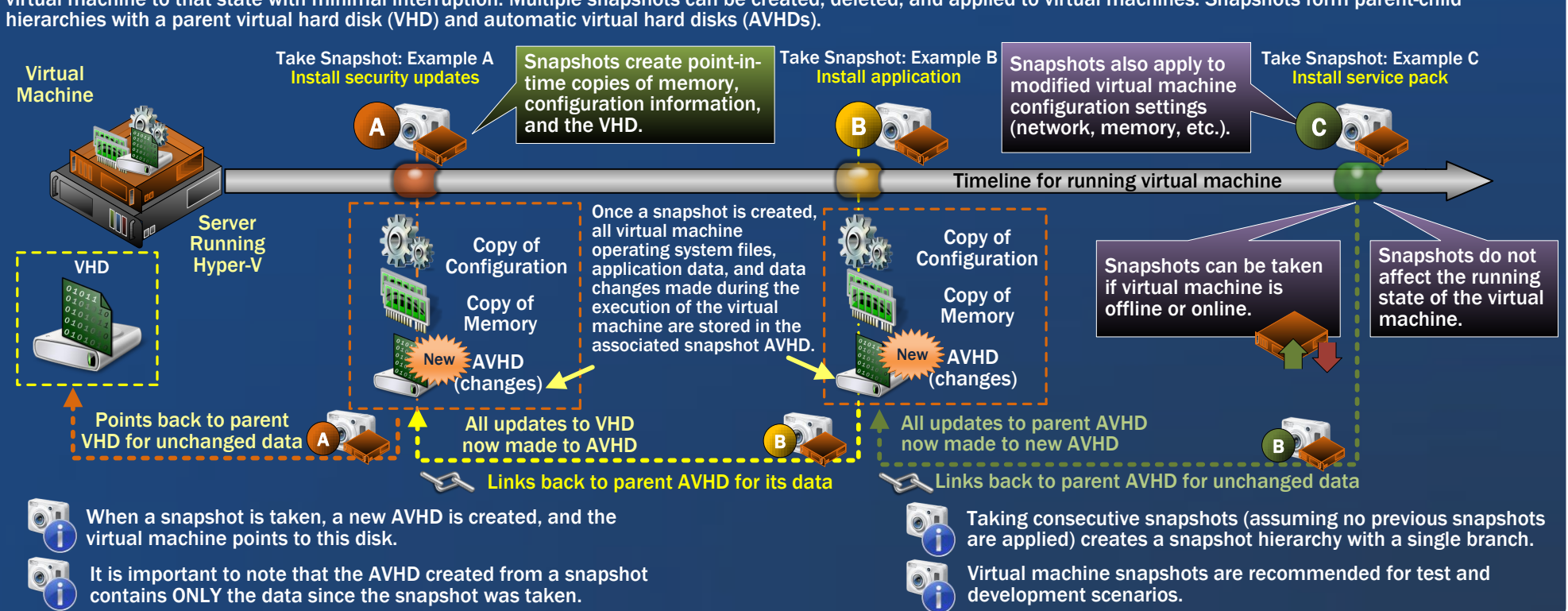
Storage Type: Dynamically Expanding VHD

Storage Type: Dynamically Expanding VHD

## Virtual Machine Snapshots

### Virtual Machine Snapshots

Snapshots are read-only, "point-in-time" images of a virtual machine. You can capture the configuration and state of a virtual machine at any point in time, and return the virtual machine to that state with minimal interruption. Multiple snapshots can be created, deleted, and applied to virtual machines. Snapshots form parent-child hierarchies with a parent virtual hard disk (VHD) and automatic virtual hard disks (AVHDs).



When a snapshot is taken, a new AVHD is created, and the virtual machine points to this disk.

It is important to note that the AVHD created from a snapshot contains ONLY the data since the snapshot was taken.

Snapshot Creation

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### Snapshot Deletion

Deleting a snapshot deletes all the saved state files (.bin and .vdi files). Hyper-V takes different actions on AVHDs, depending on the location of deleted snapshots relative to the running state of the virtual machine.

When you delete a snapshot, the following occurs:

The copy of the virtual machine configuration taken during the snapshot process is removed.

The copy of virtual machine memory taken during the snapshot process is removed.

When the virtual machine is powered down, the contents of any "deleted" AVHDs are merged with its parent.

Deleting a snapshot subtree deletes the selected snapshot and any snapshots listed hierarchically underneath it.

Deleting a snapshot does not cause the virtual machine's memory to be saved to disk.

If a guest operating system attempts to modify memory that has not yet been copied, the write attempt is intercepted and copied to the original memory contents.

When the snapshot is completed, the virtual machine configuration file, the virtual machine saved state files, and the snapshot (AVHD) are stored in a folder under the virtual machine's snapshot directory.

For a virtual machine without snapshots, all changes made to the guest operating system files, application files, and data are applied to the VHDs associated with the virtual machine.

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## Storage Location and Paths

### Hyper-V Disk Storage Locations

Hyper-V storage can be internal storage, known as direct-attached storage, or external storage in a storage area network (SAN).

