**Hardware virtualization**

Hardware virtualization is accomplished by abstracting the physical hardware layer by use of a hypervisor or VMM (Virtual Machine Monitor). When the virtual machine software or virtual machine manager (VMM) or hypervisor software is directly installed on the hardware system is known as hardware virtualization. Virtual Hardware Overview A virtual machine is a software computer that, like a physical computer, runs an operating system and applications.

The virtual machine consists of a set of specification and configuration files and is backed by the physical resources of a host. Every virtual machine has virtual devices that provide the same functionality as physical hardware, while being more portable, more secure, and easier to manage.

Virtual machines have a guest operating system on which you can install and run any software supported by that operating system. A guest operating system is an operating system that runs inside a virtual machine. You can install a guest operating system in a virtual machine and control guest operating system customization for virtual machines created from templates. Virtualization of CPU A VM is a duplicate of an existing computer system in which a majority of the VM instructions are executed on the host processor in native mode. Thus, unprivileged instructions of VMs run directly on the host machine for higher efficiency. The critical instructions are divided into three 9 categories.

sensitive instructions Behavior sensitive instructions Privileged instructions execute in a privileged mode and will be trapped if executes outside this mode. Control sensitive instructions attempt to change the configuration of resources used. Behavior sensitive instructions have different behaviors depending on the configuration of resources, including the load and store operations over the virtual memory. CPU's user mode while the VMM run in supervisor mode.

When the privileged instructions including control and behavior sensitive instructions of a VM are executed they are trapped in the VMM. RISC CPU architectures can be naturally virtualized because all control and behavior sensitive instructions are privileged instruction.

**Hardware Assisted CPU virtualization**

There are two modes to run under virtualization: root operation and non-root operation. Usually only the virtualization controlling software, called Virtual Machine Monitor (VMM), runs under root operation, while operating systems running on top of the virtual machines run under non-root operation. Software running on top of virtual machines is also called 'guest software,. To enter virtualization mode, the software should execute the VMXON instruction and then call the VMM software. Then VMM software can enter each virtual machine using the VMLAUNCH instruction, and exit it by using the VMRESUME. If VMM wants to shut down and exit virtualization mode, it executes the VMXOFF instruction.