

# Kernel based Virtual Machines

## A short introduction

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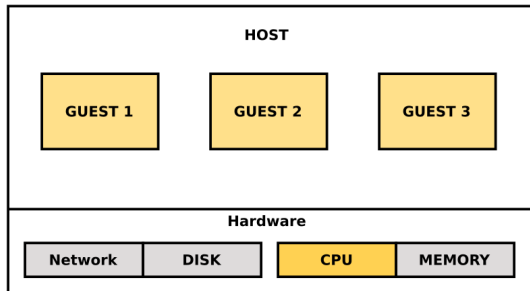
# Virtualization

- Virtualization is a form of hardware abstraction with the aim of sharing resources.
- Components sharing an underlying hardware resource may be isolated/independent from each other.
- CPU Core Virtualization: *INTEL VT-x, AMD-V*

# Hypervisor

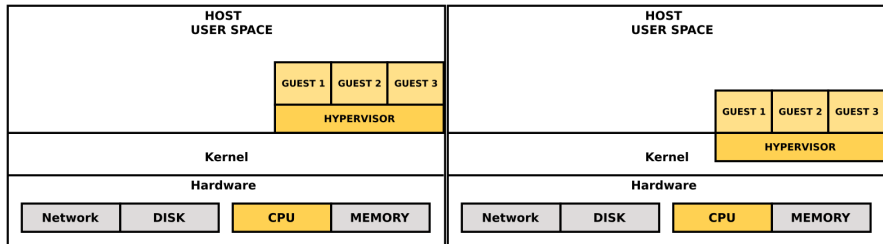
- The Hypervisor is an abstraction layer between the real hardware components and any form of operating system on higher levels.
- It forms an virtual environment which can be modified and used as a basis for virtual machines regardless of the real underlying hardware components.

# Concept of Host & Guest System



A host system may contain several independent guests.

# Kernel & User Space



# Kernel Based Virtualization

- Infrastructure for virtualization implemented in the Linux Kernel
- Since Kernel 2.6.20 (now at 4.9)
- Under OpenSource Software Licenses

## Kernel Modules:

**kvm.ko** - KVM Core module

**kvm-intel.ko** - Intel VT-x specific module

**kvm-amd.ko** - AMD-V specific module

**Location:** `/lib/modules/4.8.0-1-amd64/kernel/arch/x86/kvm/`

## Example & Demonstration:

### **Host:**

**CPU:** *Intel Core i5(64bit Dual Core CPU at maximum of 2 x 2.4GHz)*

**KVM Support:** *Intel VT-x*

**Operating System:** *Debian Linux with Kernel 4.8*

**Guest(1):** *Android 7.1 with Kernel 3.10*

**Guest(2):** *Debian Linux with Kernel 3.16*

```

root@virtu01:~# uname -a
Linux virtu01 3.16.0-4-amd64 #1 SMP Debian 3.16.36-1+deb8u2 (2016-10-19) x86_64
GNU/Linux
root@virtu01:~# cat /proc/cpuinfo
processor       : 0
vendor_id     : GenuineIntel
cpu family    : 6
model         : 6
model name    : QEMU Virtual CPU version 2.5+
stepping     : 3
microcode    : 0x1
cpu MHz      : 2394.560
cache size   : 4096 KB
physical id  : 0
siblings     : 1
core id      : 0
cpu cores    : 1
apicid       : 0
initial apicid : 0
fpu          : yes
fpu_exception : yes
root@virtu01:~# uname -a
Linux laptop 4.8.0-1-amd64 #1 SMP Debian 4.8.7-1 (2016-11-13) x86_64 GNU/Linux

```



The screenshot shows an Android phone status screen with the following information:

Phone status	
<b>Model</b>	Android SDK built for x86_64
<b>Android version</b>	7.1
<b>Android security patch level</b>	November 5, 2016
<b>Baseband version</b>	Unknown
<b>Kernel version</b>	3.10.0+ lfy@lfy0.mtv.corp.google.com #1 Tue Oct 4 07:47:21 PDT 2016
<b>Build number</b>	sdk_google_phone_x86_64-userdebug 7.1 NPF26K 3479480 test-keys