



Operating System Concepts

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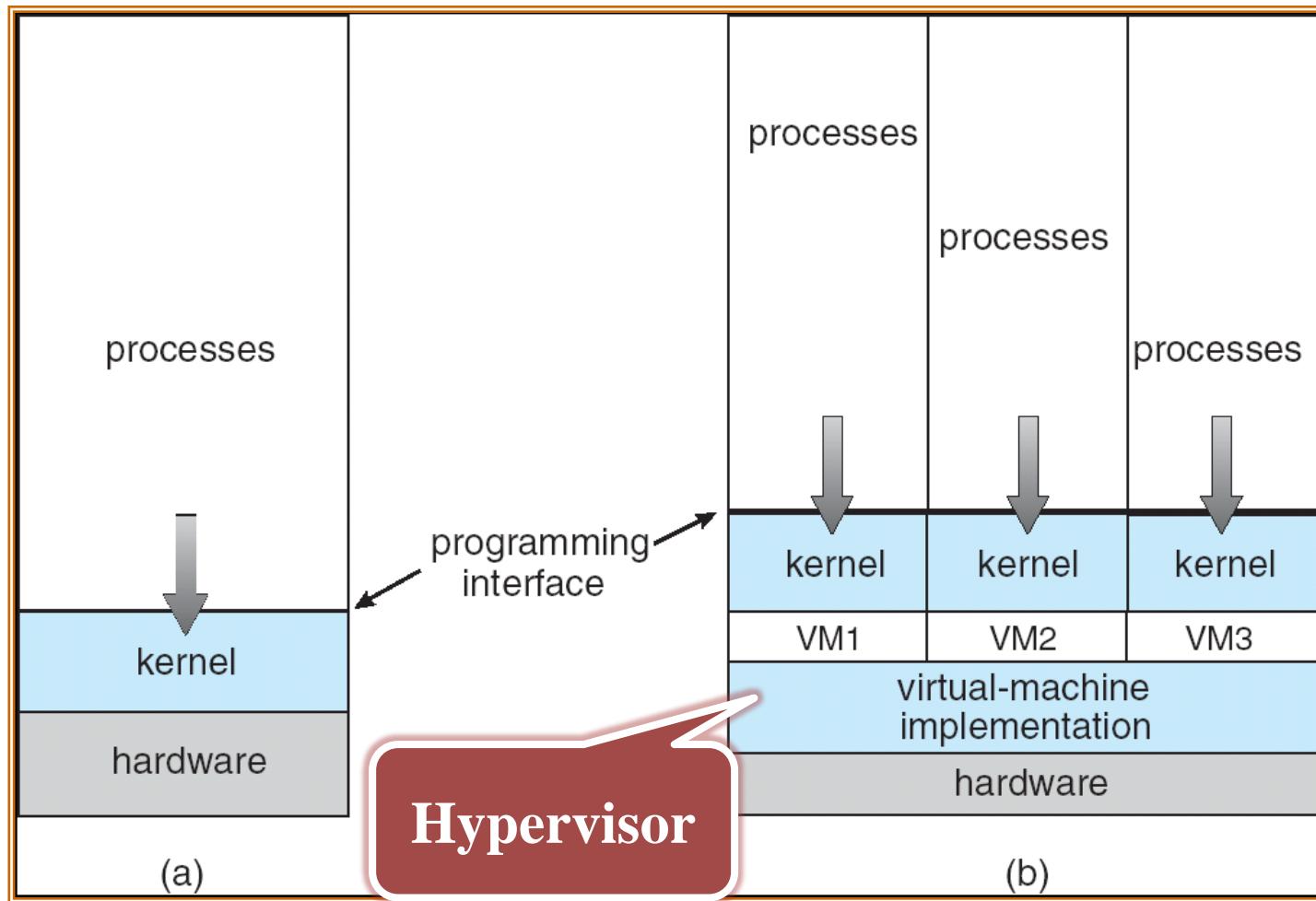
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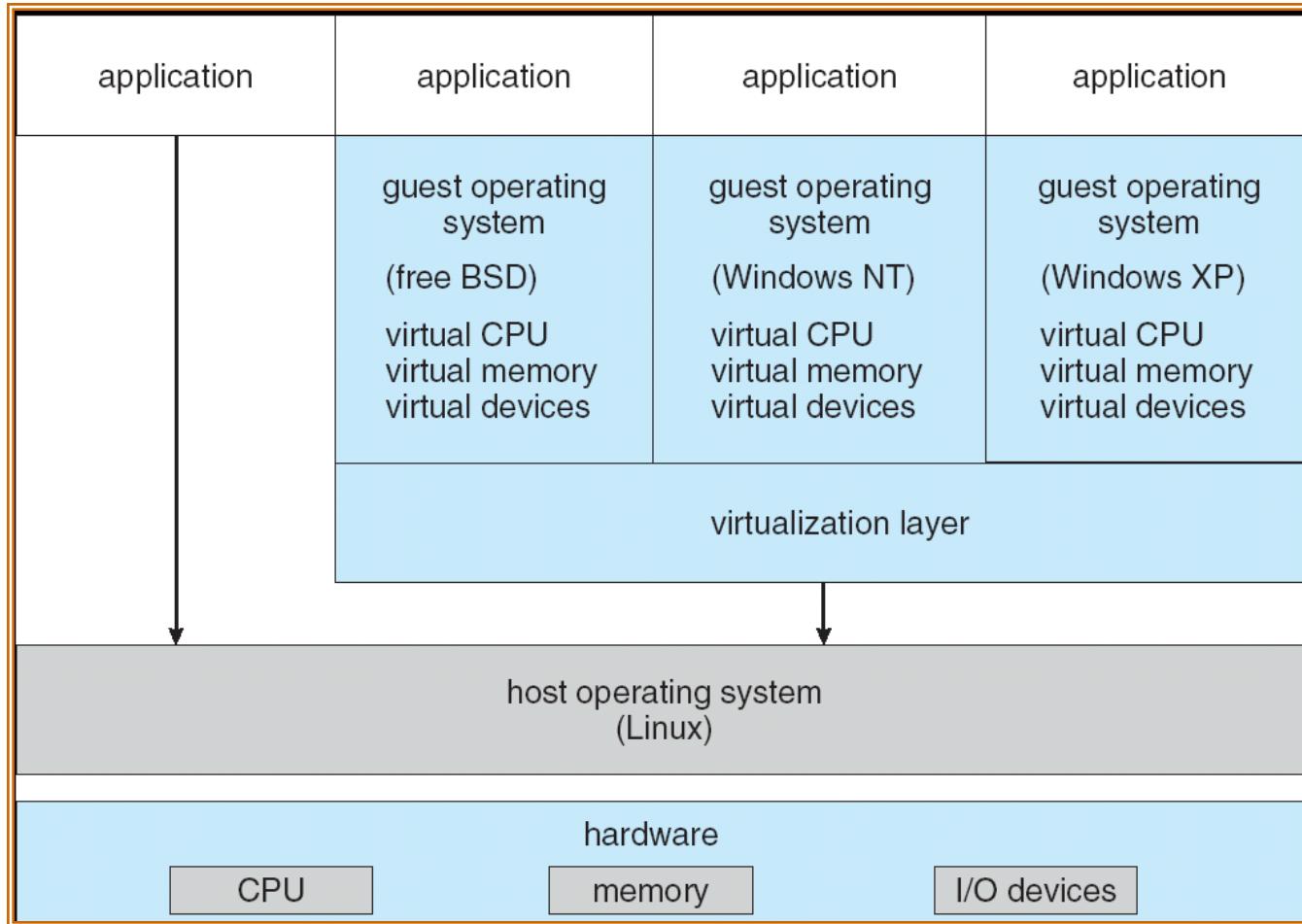


Homework 1– Exercise on Virtual Machines

Virtual Machines on Hypervisor



Virtual Machines on Host OS



VM Managers

- ▶ Oracle VirtualBox
- ▶ VMWare Player
- ▶ Parallels Desktop for Mac
- ▶ QEMU (Quick EMULATOR)



Homework Details– Build a Linux Kernel Module

Commands to Download Tools

► On Ubuntu12.04

- *sudo apt-get update*
- *sudo apt-get install make*
- *sudo apt-get install build-essential*
- *sudo apt-get install vim*
- *sudo apt-get install linux-headers-\$(uname -r)*

Makefile

```
obj-m = hello.o
```

```
KVERSION = $(shell uname -r)
```

```
all:
```

```
    make -C /lib/modules/$(KVERSION)/build M=$(PWD) modules
```

```
clean:
```

```
    make -C /lib/modules/$(KVERSION)/build M=$(PWD) clean
```

Note: You have to use “tab” instead of “space” in the Makefile

hello.c

```
#include <linux/init.h>
#include <linux/module.h>
#include <linux/sched.h>
MODULE_LICENSE("Dual BSD/GPL");
static int hello_init(void)
{
    return 0;
}
static void hello_exit(void)
{
    printk(KERN_ALERT "Goodbye, cruel world\n");
}
module_init(hello_init);
module_exit(hello_exit);
```

Compile and Use It

- ▶ *make*
- ▶ *sudo insmod hello.ko*
- ▶ *sudo modprobe hello.ko*
 - try to also load other modules for undefined symbols
- ▶ *sudo rmmod hello*
- ▶ *dmesg*

Requirements

- ▶ Install a virtual machine on your computer
- ▶ Install Linux and Windows 11 (or any other OS) on the virtual machine
- ▶ Implement a device driver
 - Print “Hi, I am Student-ID, 2025” to the kernel buffer when inserting the module
 - Print “Bye!” to the kernel buffer when removing the module
 - Hint: you can use the command *dmesg* to read the buffer

Report

1. The steps for your implementation
 2. The problem you met, and how you solved it
 3. **The reference of this homework**
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- ▶ The report is limited within 4 pages in or PDF

Grading

- ▶ Implementation
 - The VM: 20%
 - The OS: 20% (10% for each)
 - The kernel module: 20%
- ▶ Report
 - 20%
- ▶ Demo Q&A
 - 20%

Submission

- ▶ Homework 1 deadline: at 23:00 on 2025-11-04
→NO DELAY!
- ▶ Upload to e-learning system
→Not the source files
- ▶ The file name: OSHomework1StudentID.zip
 - Including the report and the kernel module
- ▶ The title of the report: OS_StudentID_Name
- ▶ The title of the module: Module_StudentID.ko
- ▶ **Point deduction for wrong format: 10%**

→DEMO will be arranged!