Process Abstraction

Instruction Set

Registers

Physical Memory

MMU

I/O Devices

Hardware

Virtual Memory

Operating System

System Calls

CS 111 Lecture Notes: Virtual Machines
Process Abstraction

- Instruction Set
- Registers
- Physical Memory
- MMU
- I/O Devices

Virtual Memory
System Calls

Operating System

Hardware

Process
Process Abstraction

Virtual Machine

- Instruction Set
- Registers
- Physical Memory
- MMU
- I/O Devices

Hardware

Virtual Memory

Operating System

System Calls

Process
Virtualizing Virtual Memory

- Guest Virtual AS
- Guest MMU (Virtual)
- Guest Page Maps
- Virtual Machine

- Guest "Physical" AS

- Host "Machine" AS
- Machine MMU
- Machine Page Maps
- Hardware
Shadow Page Maps

Guest
Virtual AS

Guest Page Maps

Guest
“Physical” AS

Machine Page Maps

Host
“Machine” AS

Actual MMU hardware, managed by hypervisor