Cloud Computing Assignment 2

Container Practice

2017/04/14

Outline

- OS-level Virtualization

- Namespaces

- Runc: A lightweight universal container runtime

- Assignment Requirements

A Survey on Virtualization Technologies

Susanta Nanda   Tzi-cker Chiueh
{susanta,chiueh}@cs.sunysb.edu
Department of Computer Science
SUNY at Stony Brook
Stony Brook, NY 11794-4400

Quote 1

Virtuality differs from **reality** only in the **formal** world, while possessing a similar essence or effect. In the computer world, a virtual environment is perceived the **same** as that of a real environment by application programs and the rest of the world, though the underlying mechanisms are **formally different**.

Quote 2

Virtualization is a technology that **combines** or **divides** computing **resources** to present one or many operating environments using methodologies like hardware and software partitioning or aggregation, partial or complete machine simulation, emulation, time-sharing, and many others.

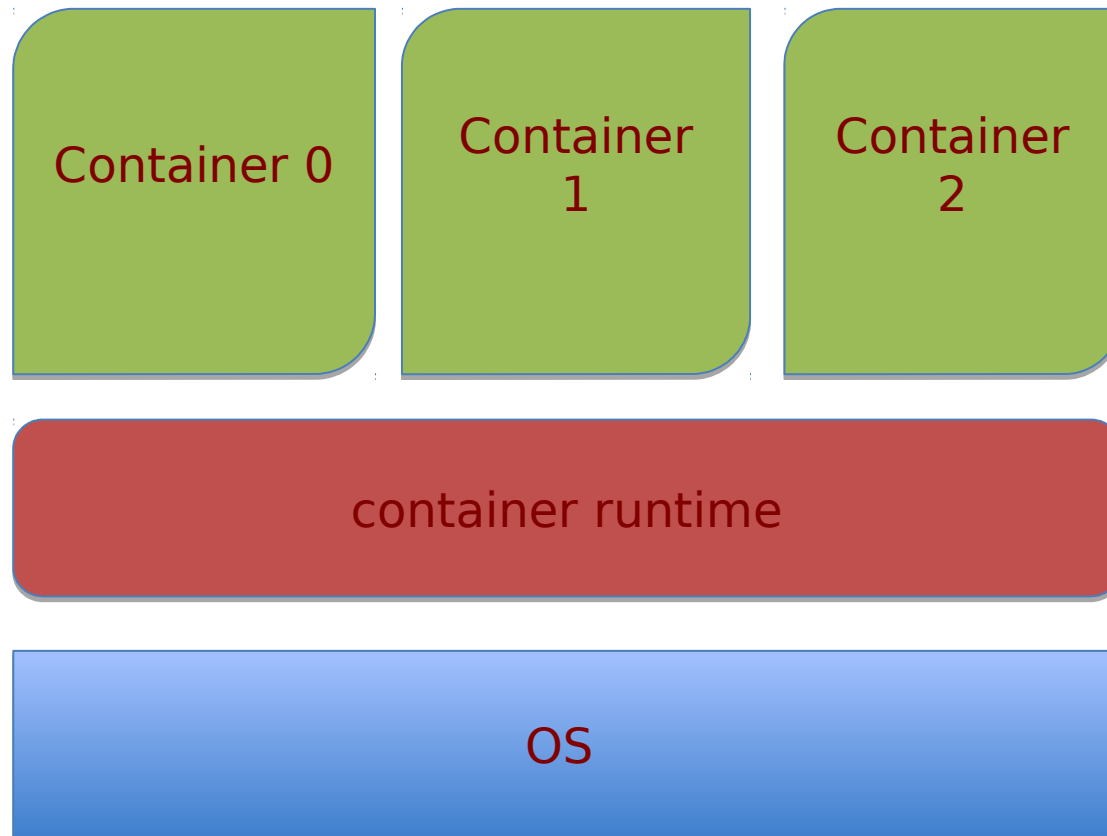# Virtualization (the one you know)
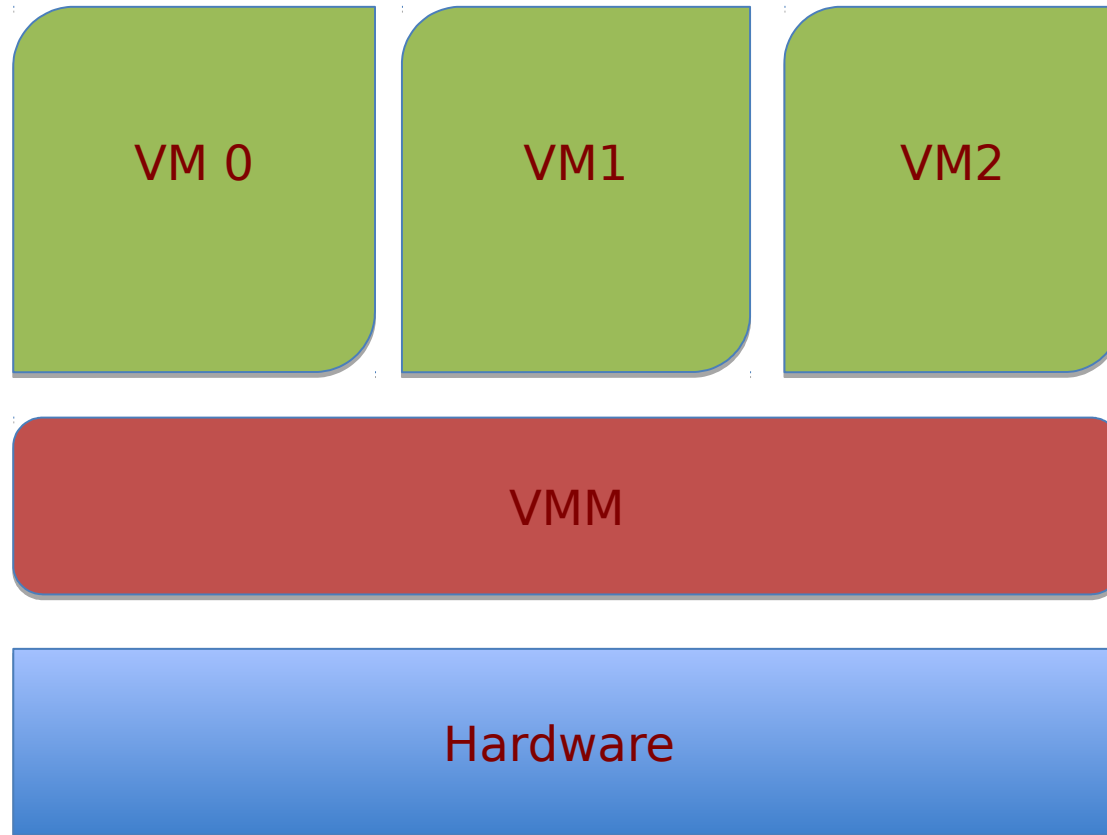
Virtualization?
(the one you familiar with)
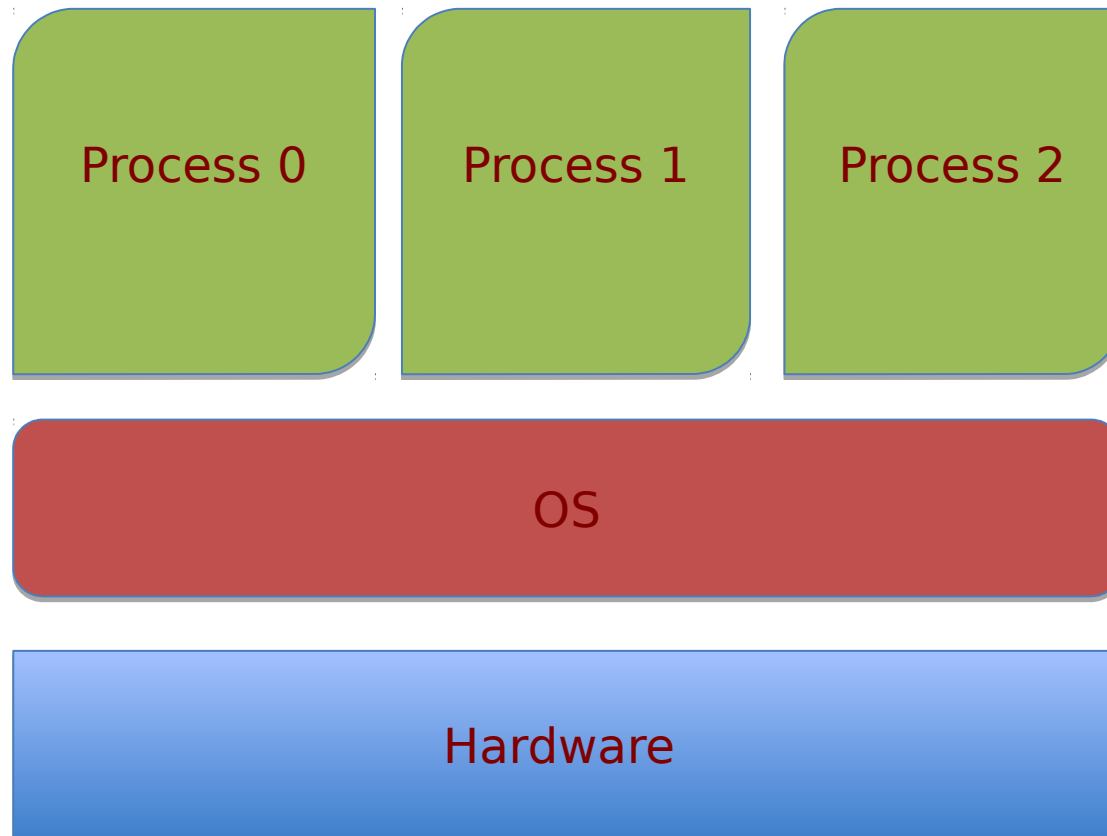
OS-level Virtualization (Containerization)

OS-level Virtualization

- In Unix: chroot

- In *BSD: jails

  - why do you"JB"your iphone?

- In Linux: container

  - Namespaces

  - Cgroups

  - Layered File System (optional)

Namespaces

- UTS: Unix Time-sharing System

- PID: Process Identifier

- MNT: Mount

- NET: Networking

- IPC: Inter-Process Communication

- USER

- CGROUP

RunC: The Tutorial

- https://katacoda.com/lalyos/scenarios/runc

- We will provide you

  - the **rootfs directory** (in step 2), and

  - the **config.json** (in step 3)

  for this assignment

Objective: Bridging Two Containers

- Container A and B

- A **simple client** runs on container A, in which user can types arbitary messages

- An **echo server** runs on container B

- A **bridge** program

- Three programs in this assignment

The Bridge Program

- Shares the **X** namespace with container A, and

- Shares the **Y** namespace with container B

- X and Y are **different ones** of the three namespaces: NET, MNT, IPC

  - network interfaces of different subdomain

  - different root directory

- You may choose **any** of the combinations of X,Y

Environment

- You may use the VM you created in the assignment 1, or

- You may setup a Linux VM on your own machine, and setup runc on it

- For Ubuntu users, `apt-get install runc` should work

Scoring

- Connection between the programs (60%)
  - X namespace connection (20%)
  - Y namespace connection (20%)
  - The echo service work (20%)
- Report (40%)

- Deadline: 5/19 (flexible)

Appendix -- network connection

- Socket

- Bind

- Listen

- Connect

- Accept

- Send, Recv

Appendix -- IPC (msg only) connection

- Msgget

- Msgsnd

- Msgrcv

- Msgctl

Appendix -- file system monitoring

- inotify_init
- inotify_add_watch