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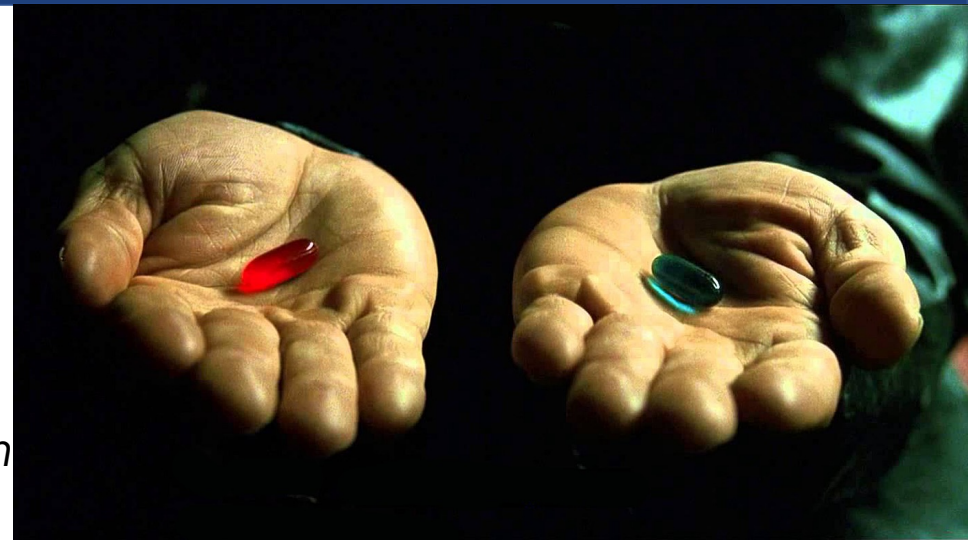
# CMPSC 311 - Introduction to Systems Programming

## Virtual Machine Setup

Professors:

Sencun Zhu and Suman Saha

(Slides are mostly by *Professor Patrick McDaniel*  
*Professor Abutalib Aghayev*)

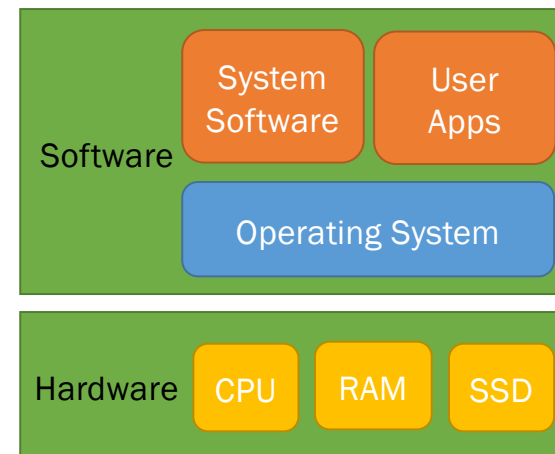


# Operating Systems... 10,000-foot view



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- What is an operating system (OS)?
  - **Software** that manages machine **hardware** and provides interface and abstractions atop which user applications and systems software is built
- Types of machines/hardware
  - Desktops, laptops, servers, mobile devices
- Examples of OSs
  - Windows, macOS, Linux, FreeBSD, Android, iOS
- OS dominance by sector
  - Desktop/laptops: Windows > macOS > Linux
  - Server: no reliable source, probably Linux
  - Mobile: Android > iOS

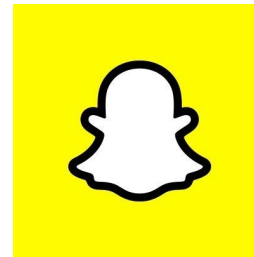


# Why learn systems programming on Linux?



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- It is free. It is ubiquitous. You want to run your tech company on Linux...



Alibaba Group

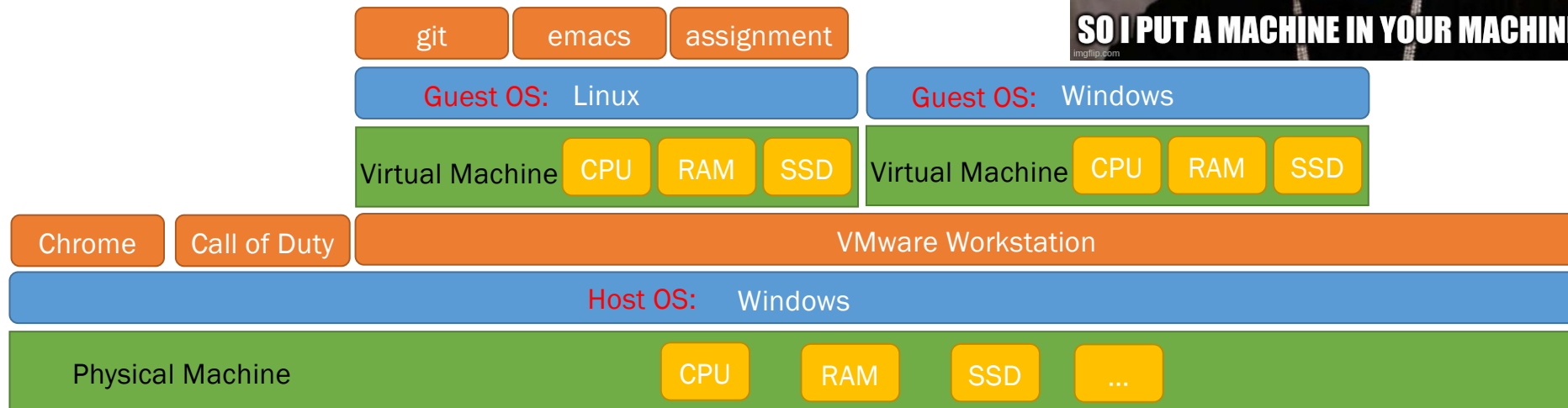
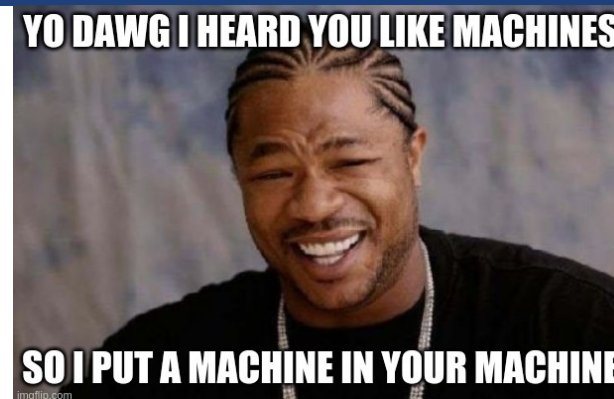


# How to run Linux on your machines?



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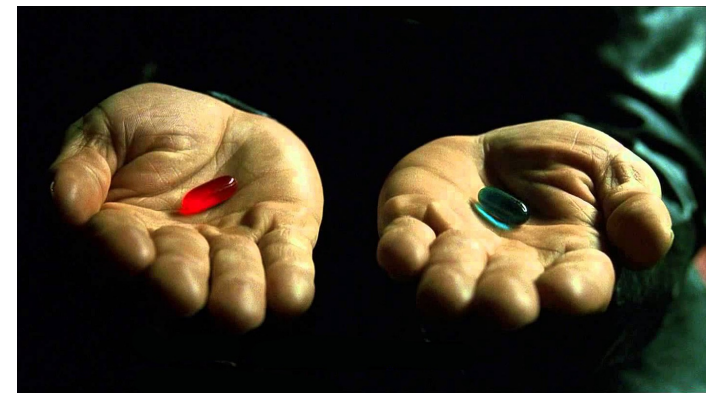
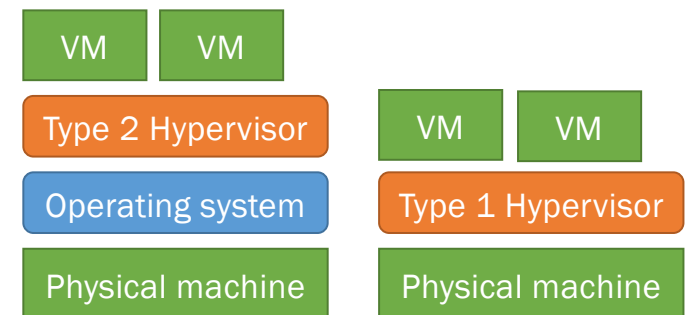
- Most of you probably run Windows or macOS
- That's where VMware comes into play
- VMware is a **hypervisor (or virtual machine monitor)**
  - A software that creates virtual machine (VM)



# More on hypervisors



- There are two types of hypervisors
  - **Type 1:** runs on bare physical machine
  - **Type 2:** runs on an operating system
- Examples of type 2 hypervisors
  - VMware Workstation (Fusion)
  - QEMU
  - VirtualBox
  - Parallels Desktop for Mac
  - UTM
- Examples of type 1 hypervisors
  - VMware ESXi
  - Xen



# We Will Use



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- Virtualbox
  - Download Virtualbox 6.1.30 from: <https://www.virtualbox.org/>
- Guest OS
  - Ubuntu 20.04.3: <https://ubuntu.com/download/desktop>
  - Installation video demo: <https://youtu.be/x5MhydijWmc>
- For students using Mac with a M1 chip (MacBoook air/pro/mini from 2020 onwards or iMac from 2021 onwards)
  - Download UTM from <https://mac.getutm.app/>
  - Download Ubuntu 20.04.02 for arm <https://ubuntu.com/download/server/arm>
  - Detailed instructions: <https://mac.getutm.app/gallery/ubuntu-20-04>
  - Installation video demo: <https://youtu.be/hnwK-nkXolc>