Virtualization
and
Computer Architecture

Agenda

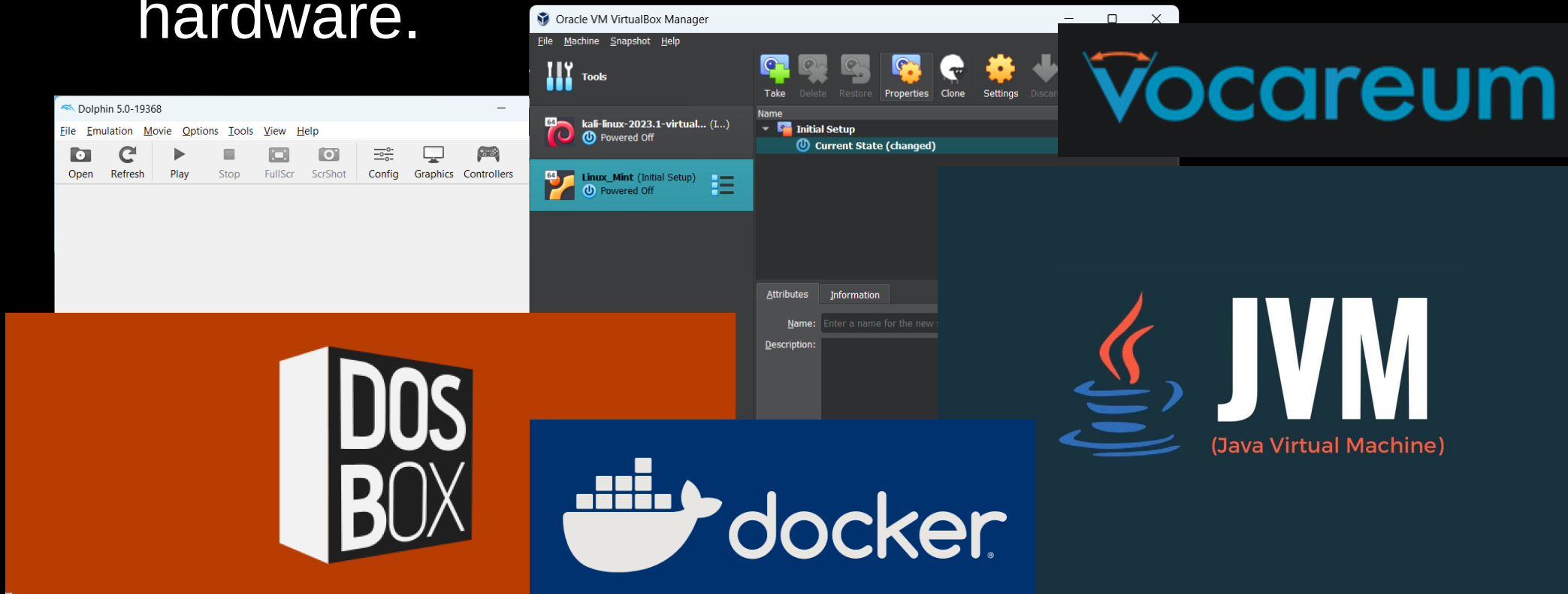
- What is Virtualization?
- Platforms
- VERY brief overview of Computer Architecture

What is Virtualization?

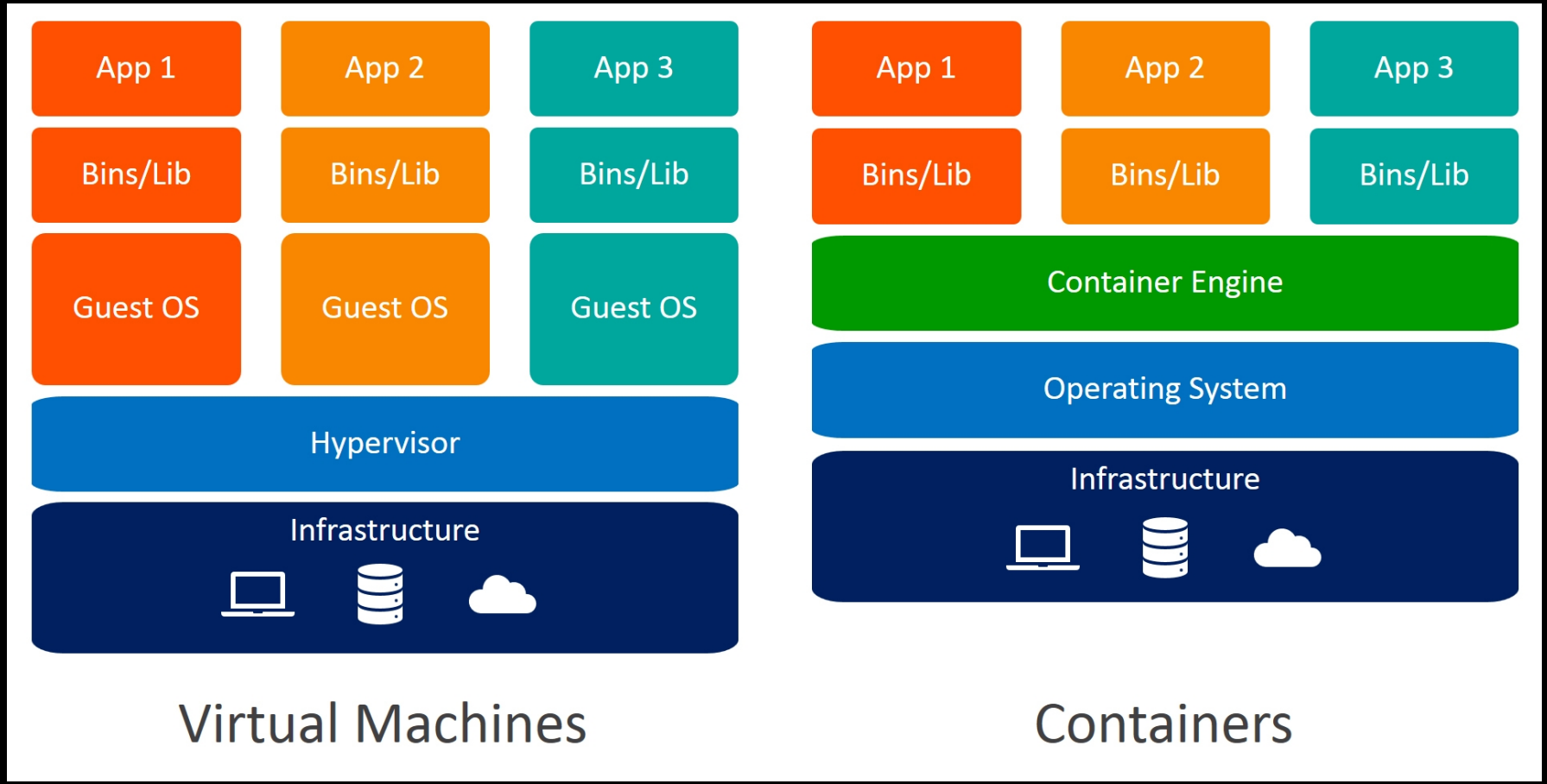
- What do you think it is?

Virtualization

- Simulating hardware using software on other hardware.



Traditional VMs and Containers

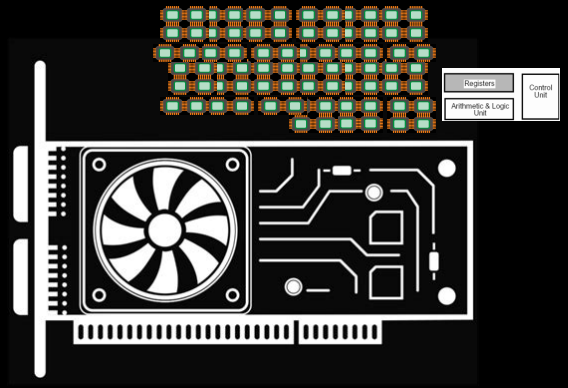


https://raw.githubusercontent.com/dazzyddos/dazzyddos.github.io/master/Images/DockerBuildSec/vmvsdocker.jpg

Platforms

- VMWare
- VirtualBox
- Windows Subsystem for Linux (WSL)
- Amazon Web Services (AWS)
  - Vocareum
- Azure (Microsoft)
- Docker

Computer Architecture



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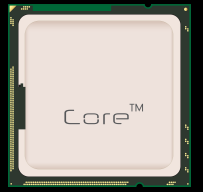

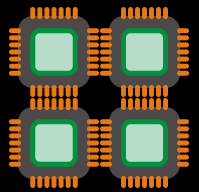

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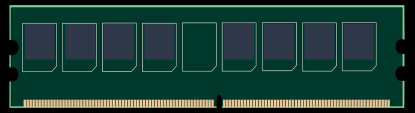

Computer Architecture

Medium	Typical Size (bytes)	Approx. Access Time
CPU Register	64 bits = 8	one cycle < 1 ns
L1 Cache	64 000	4–5 cycles ≈ 2 ns
L2 Cache	256 000	~12 cycles ≈ 5 ns
RAM	8 000 000 000	70 ns
Solid State Drive	256 000 000 000	25 000 ns
Hard Disk Drive	1 000 000 000 000	12 000 000 ns
Optical Drive	650 000 000	150 000 000 ns
Tape Drive	8 000 000 000 000	60 000 000 000 ns
Network	a big truck?	1000 – 1e8 – inf∞ ns

"Memory" primary storage ("non-blocking") volatile

"Storage" secondary storage ("blocking") non-volatile

x86/x64 Vs ARM

- Apple’s M1 and M2 chips run ARM
- x86 – 32bit Intel Architecture
  - Named for the 8086 CPU
- X64 – 64bit Intel Architecture
  - Named for the size of the CPU registers… Actually makes sense.

x86/x64 Vs ARM

- ARM
  - Newer
  - Smaller instruction set
  - Primarily used in mobile devices
- x86/x64
  - Legacy
  - Instruction set designed to be backwards compatible
  - The goto CPU architecture for decades

x86/x64/ARM and Virtualization

- The key is the instruction sets
- The language of the CPU
- Since x86/x64 has a larger dictionary than ARM you cannot translate 1 to 1 between the two
- Efforts have/are being made to visualize x86/x64 software on ARM architecture
- Sera’s recommendation is to use a x64 machine for virtualization generally.

x86 Vs x64

- x86 architecture finished its run with 32bit registers. The 8086 itself had 16 bit registers.
- x64 architecture uses… [pause for dramatic effect] 64bit registers!
- X64 platforms can run in x86 mode
- X86 platforms can NOT run in x64 mode; they simply do not have registers big enough

N64

- The Nintendo 64 was called that because it featured a 64 bit processor!
- Most games did not actually utilize this fact ¯_(ツ)_/¯
- This “N” logo has 64 faces; a reference to the 64 bit architecture