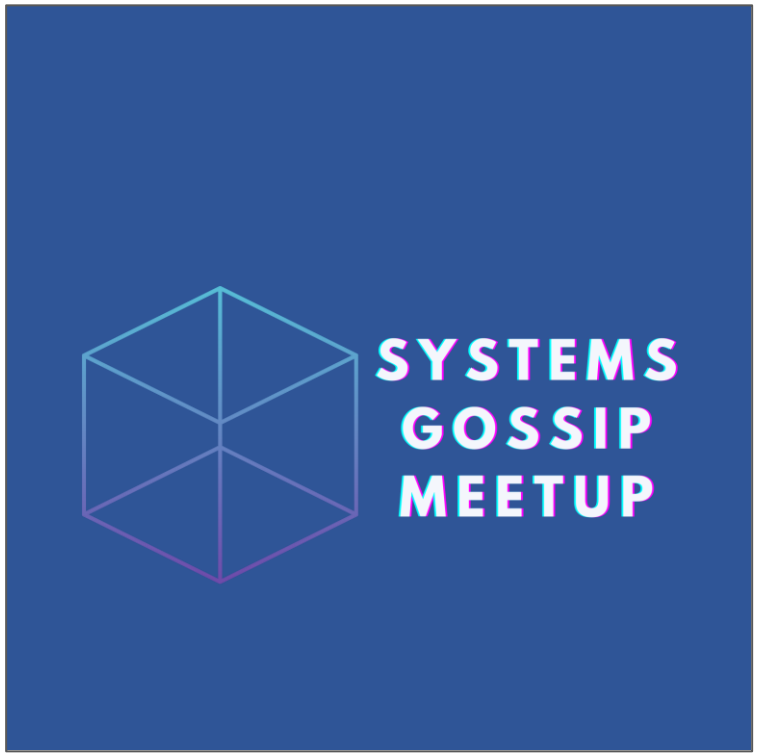


Learning large systems using peer-to-peer gossip

Policy Against Harassment at ACM Activities

OS Meetup wants to encourage and preserve this open exchange of ideas, which requires an environment that enables all to participate without fear of personal harassment. We define harassment to include specific unacceptable factors and behaviors listed in the ACM's policy against harassment. Unacceptable behavior will not be tolerated.
https://www.acm.org/about-acm/policy-against-harassment

Virtual Memory Primitives for User Programs

- Recall
  - User / Kernel Separation
- Why Virtual Machine
- Virtual Machine Overview
  - Hypervisor
  - Hardware Virtualization
- Dune Overview
- Namespace and Control Group in Linux

Recall

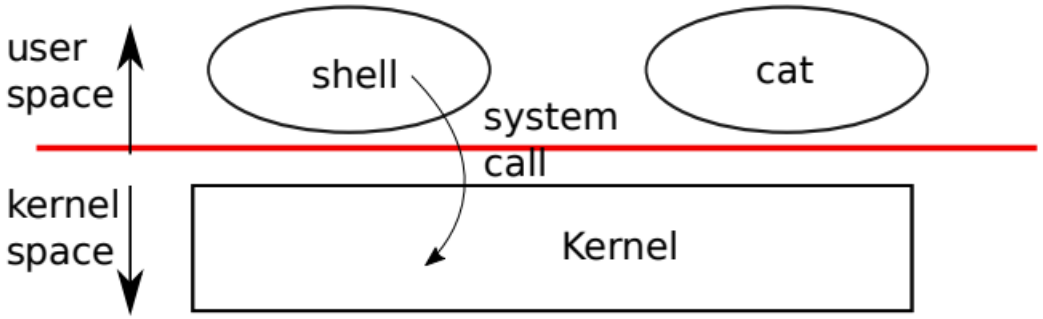
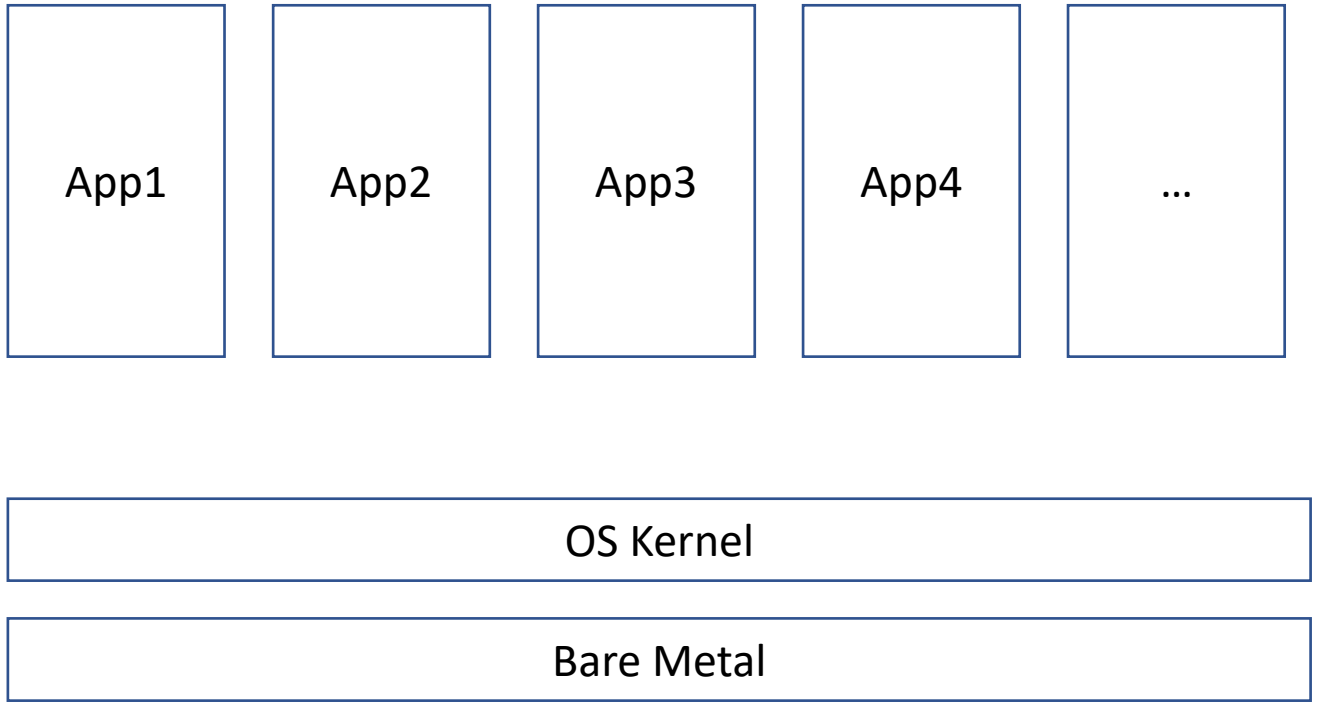
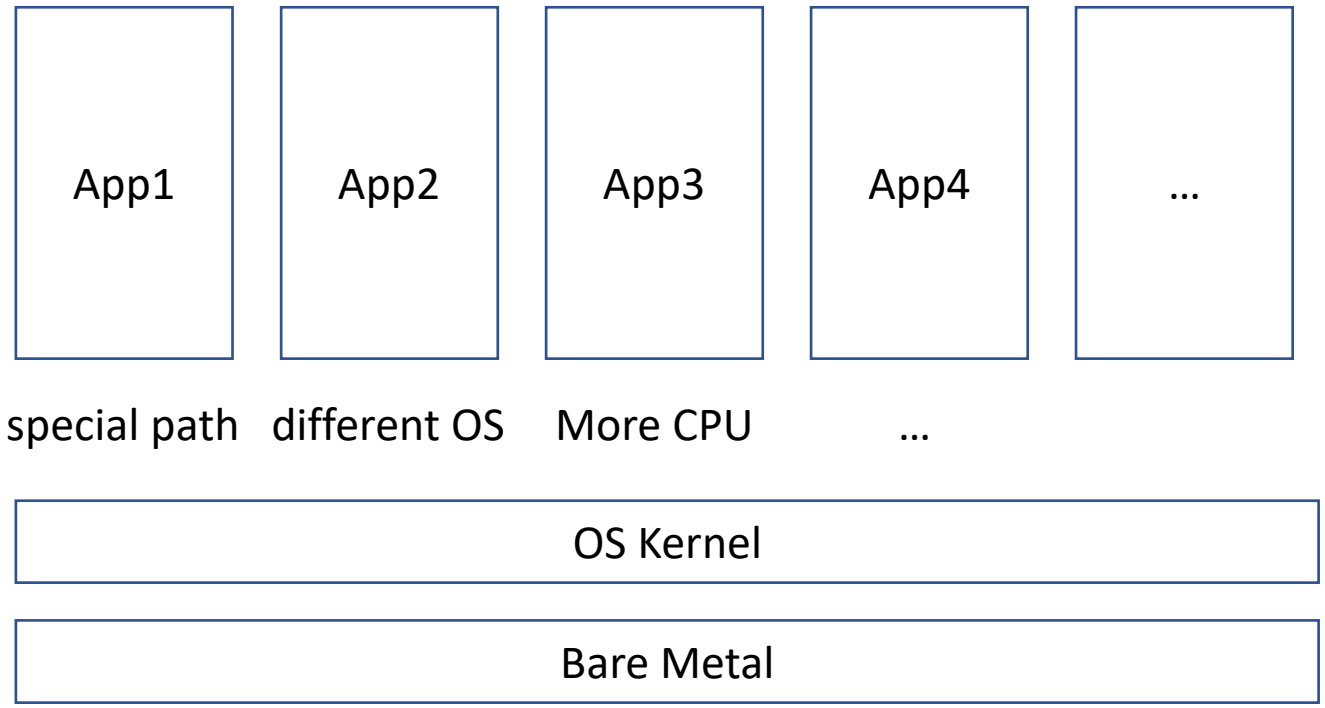


Figure 1.1: A kernel and two user processes.

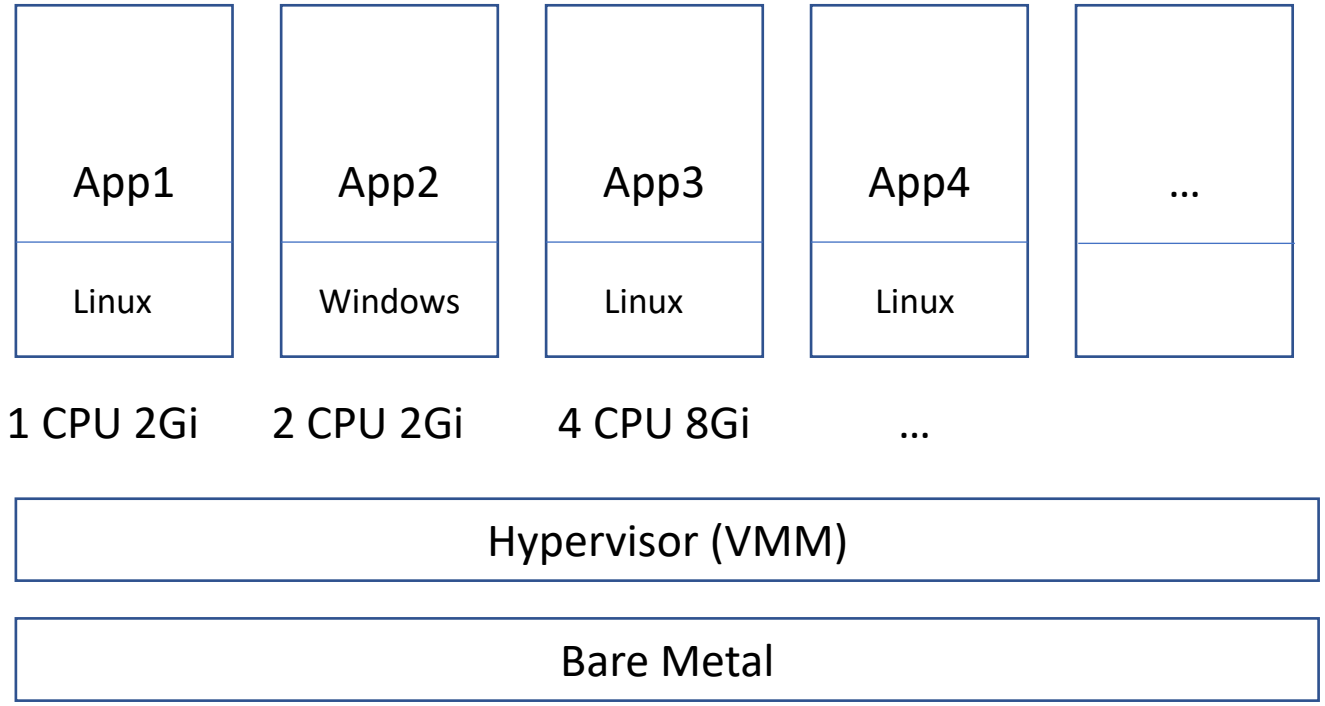
Why Virtual Machine



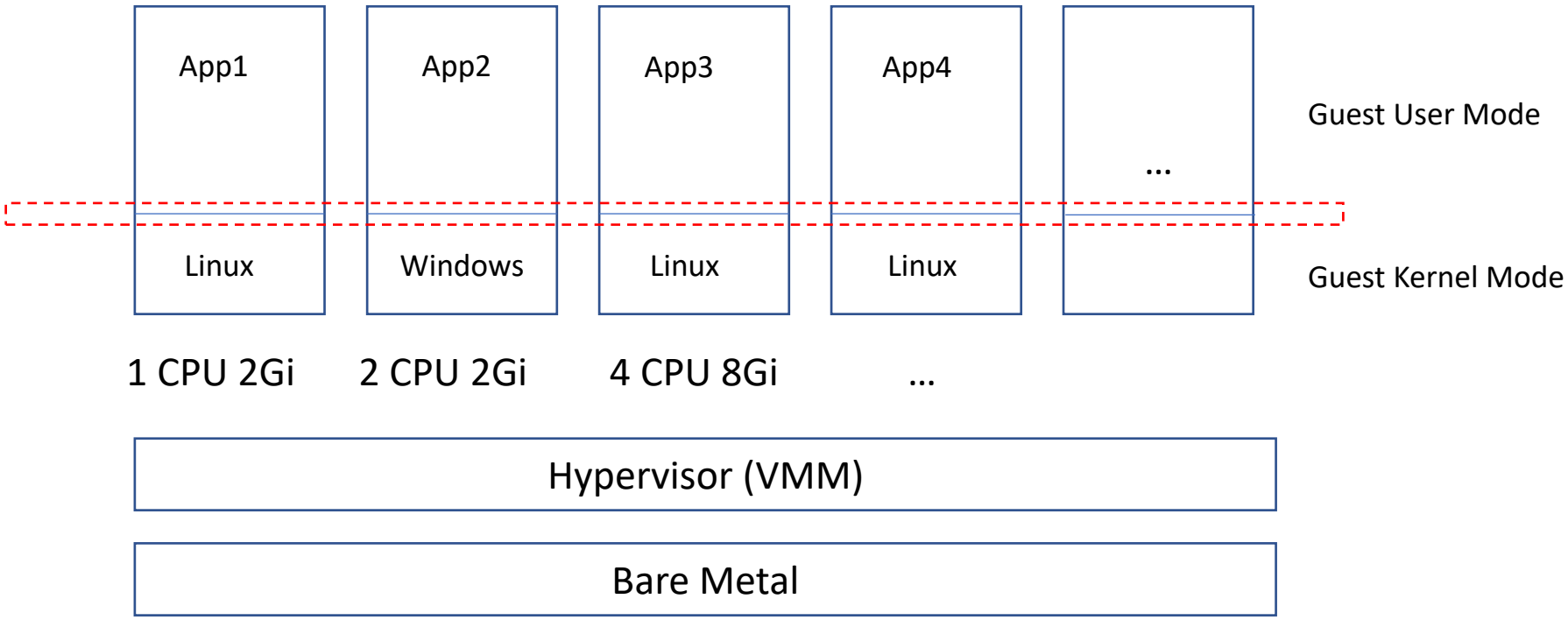
Why Virtual Machine



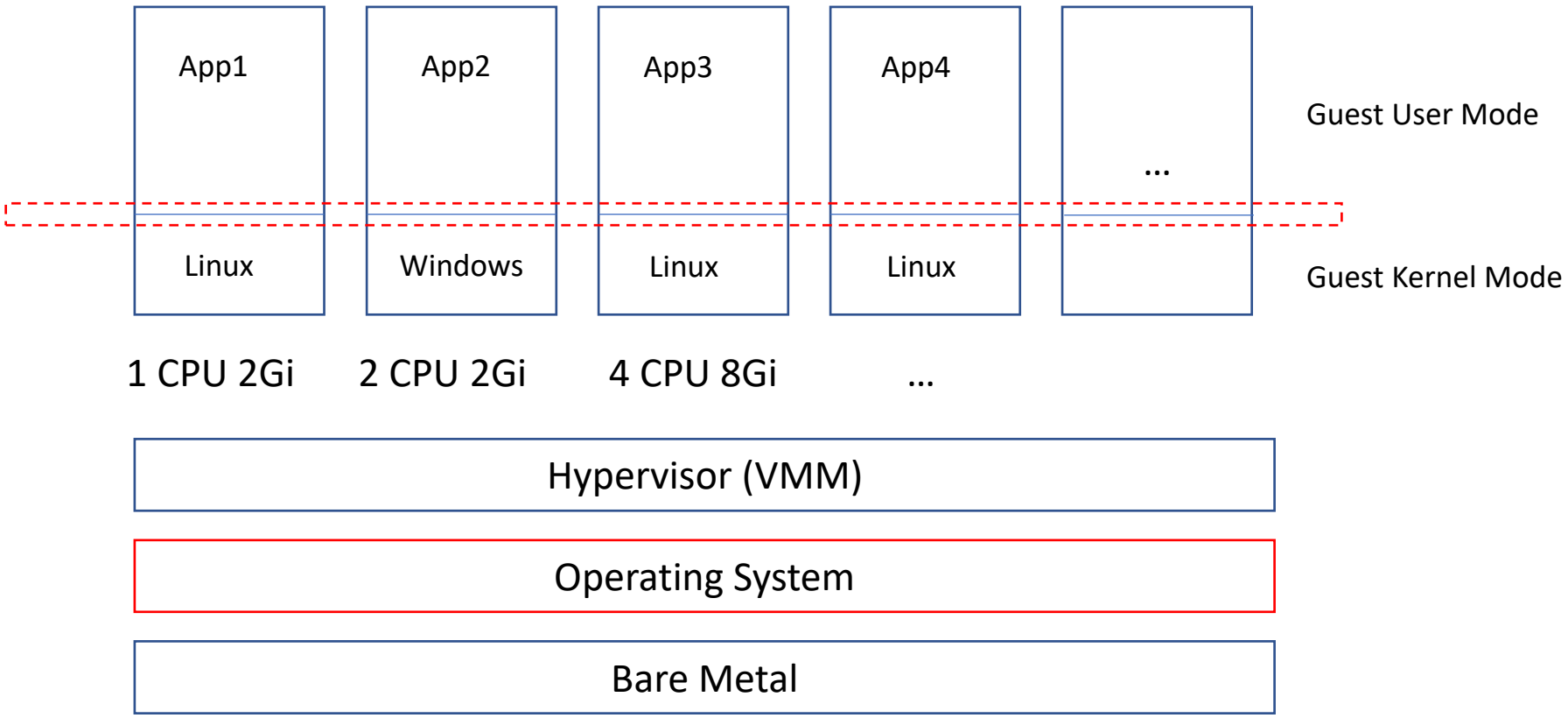
Why Virtual Machine



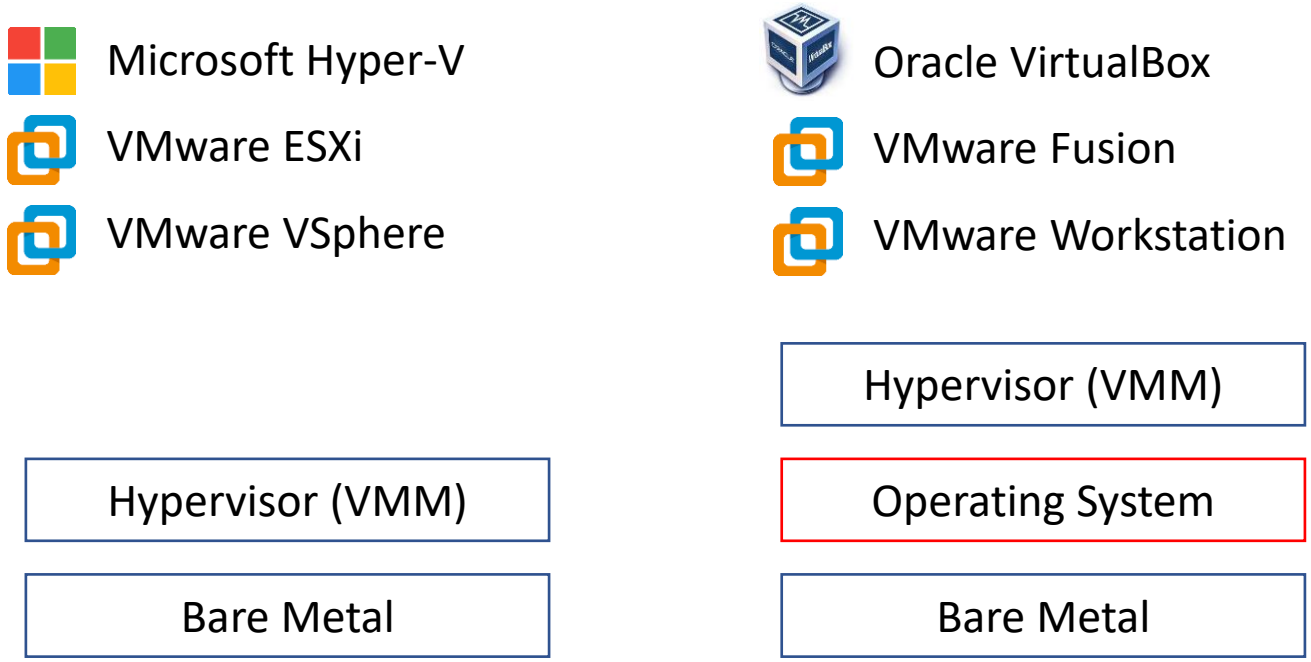
Virtual Machine Overview



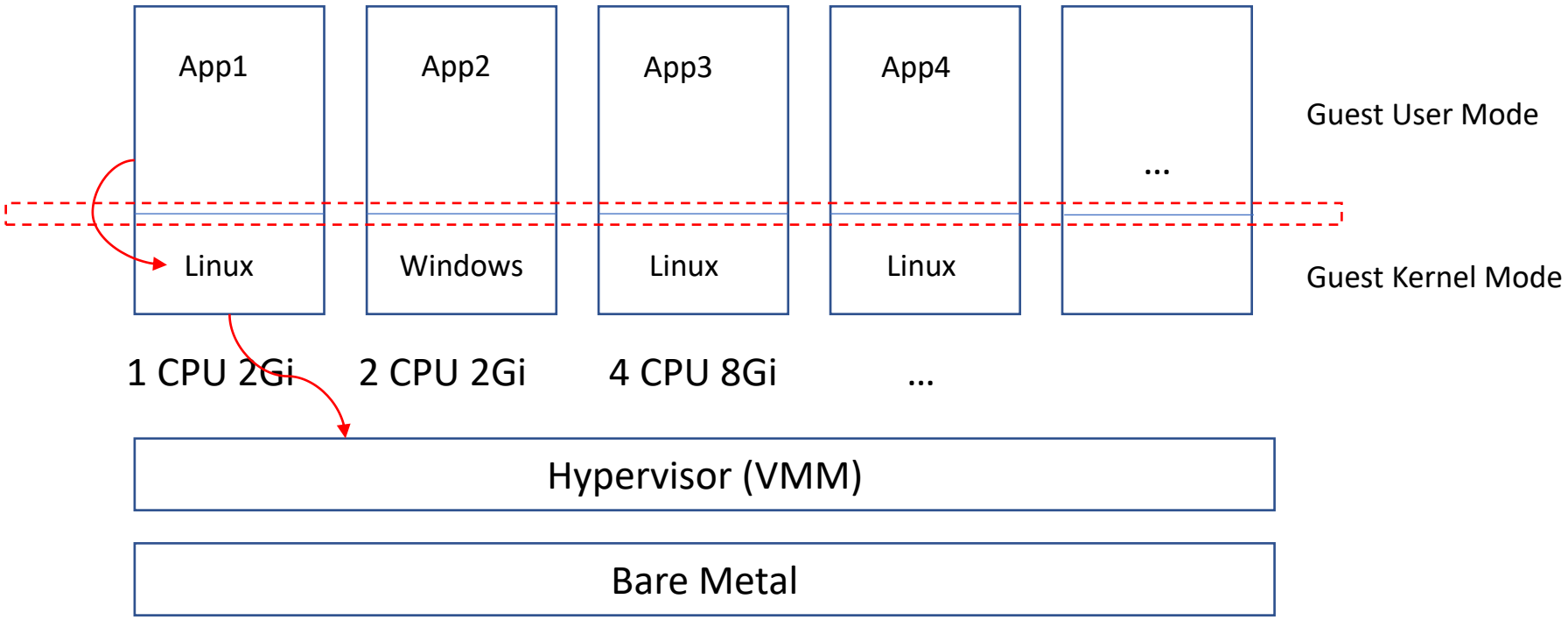
Virtual Machine Overview



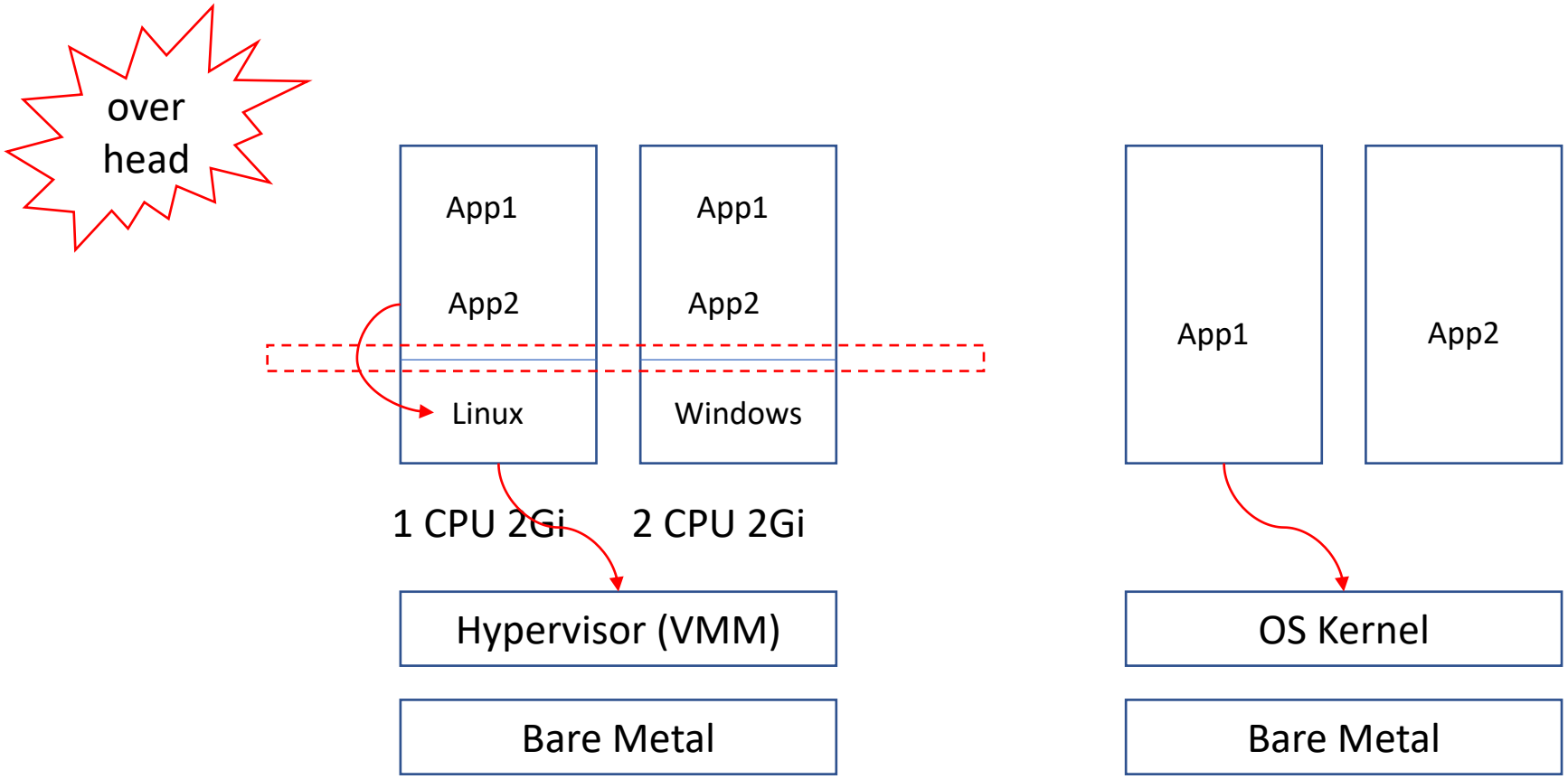
Virtual Machine Overview: Hypervisor



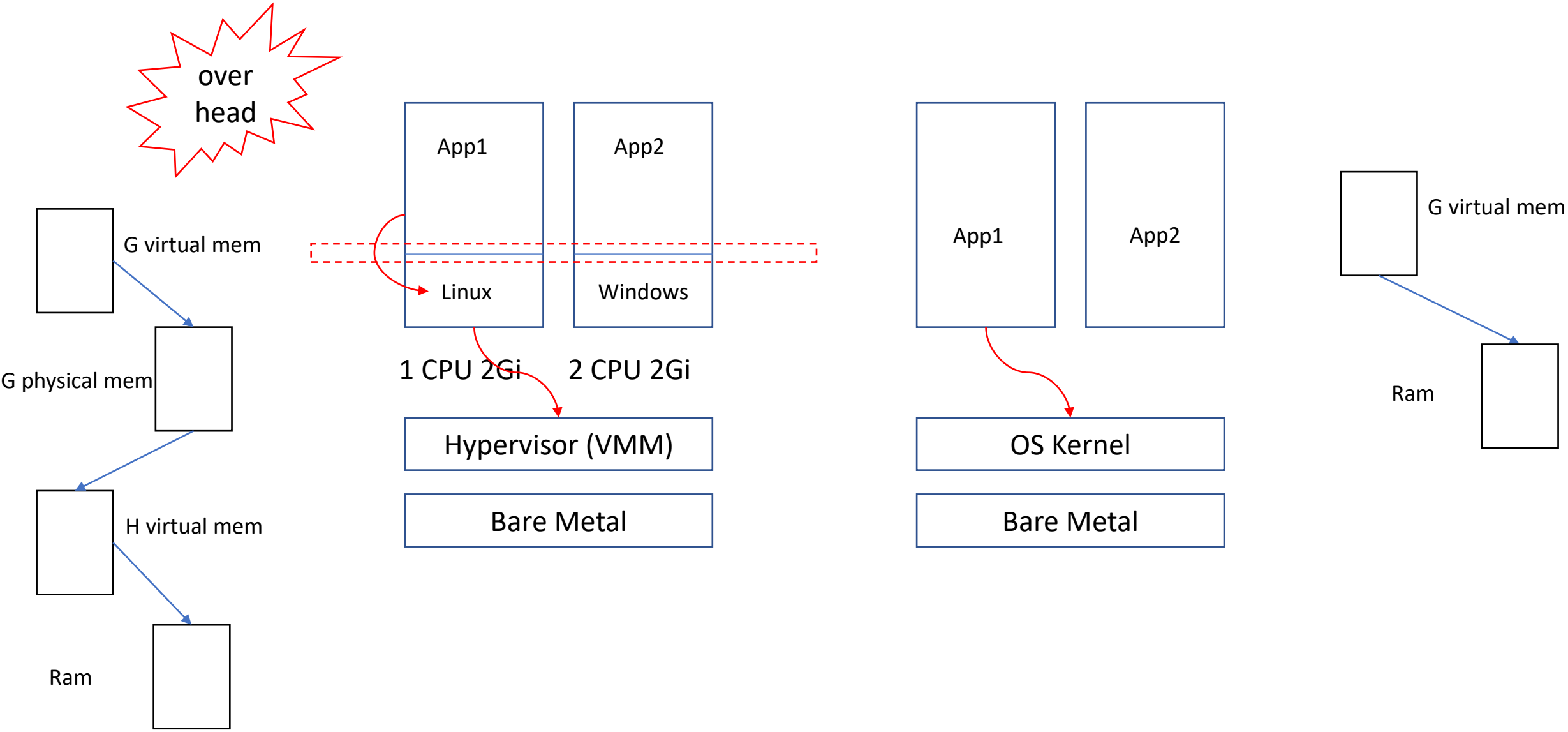
Virtual Machine Overview



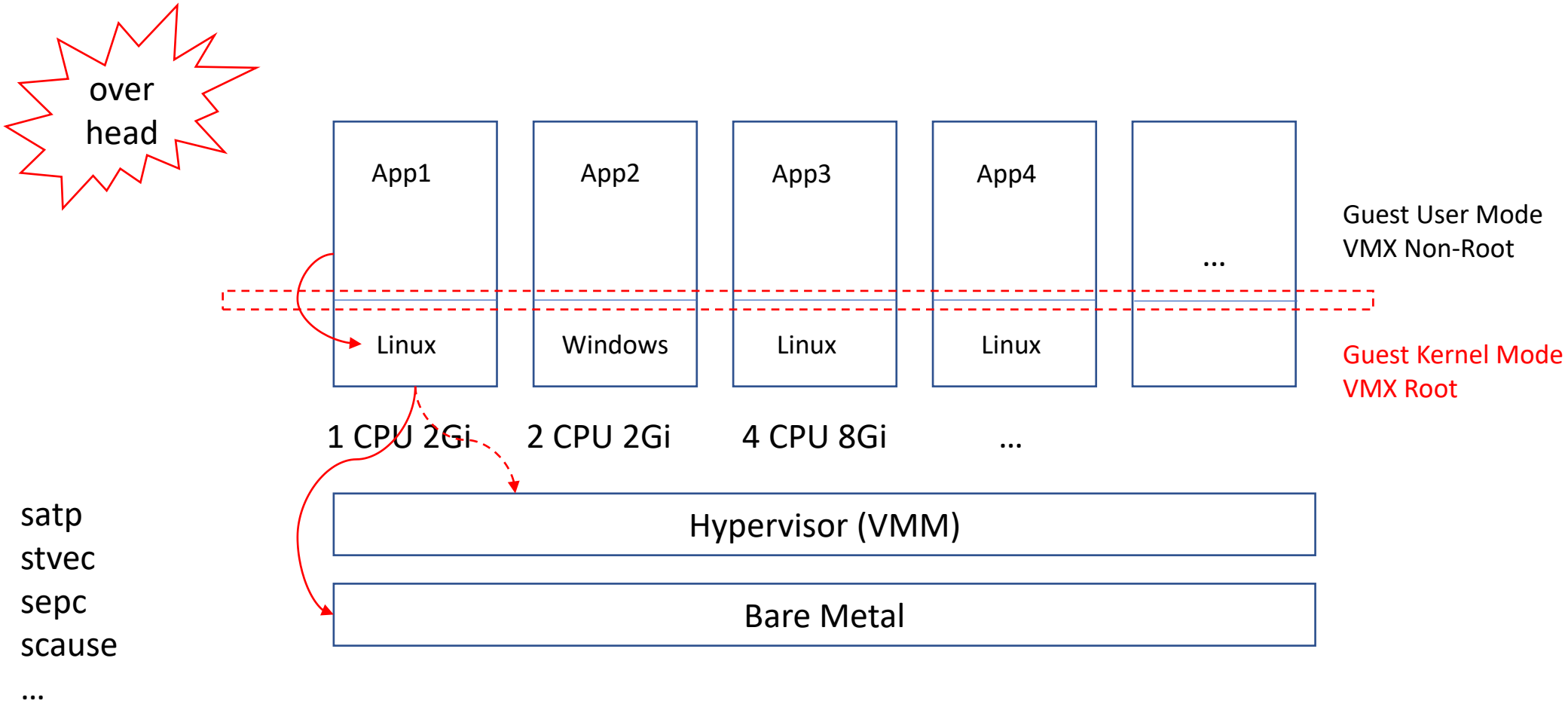
Virtual Machine Overview



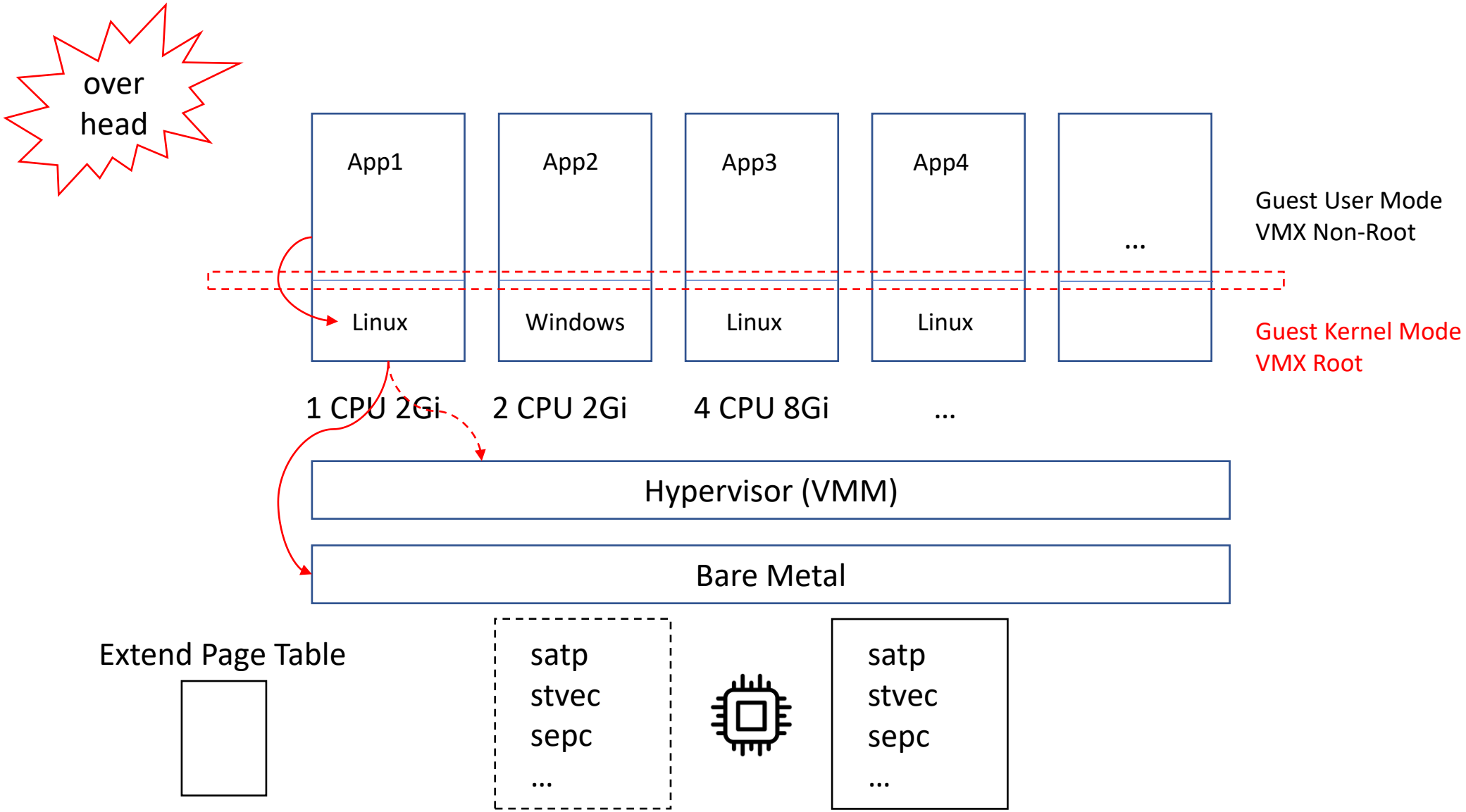
Virtual Machine Overview



Hardware Virtualization: VT-x



Hardware Virtualization: VT-x



Dune

Mechanism	Privileged Instructions
Exceptions	LIDT, LTR, IRET, STI, CLI
Virtual Memory	MOV CRn, INVLPG, INVPCID
Privilege Modes	SYSRET, SYSEXIT, IRET
Segmentation	LGDT, LLDT

Table 1: Hardware features exposed by Dune and their corresponding privileged x86 instructions.

Dune: Linux System Call Filter

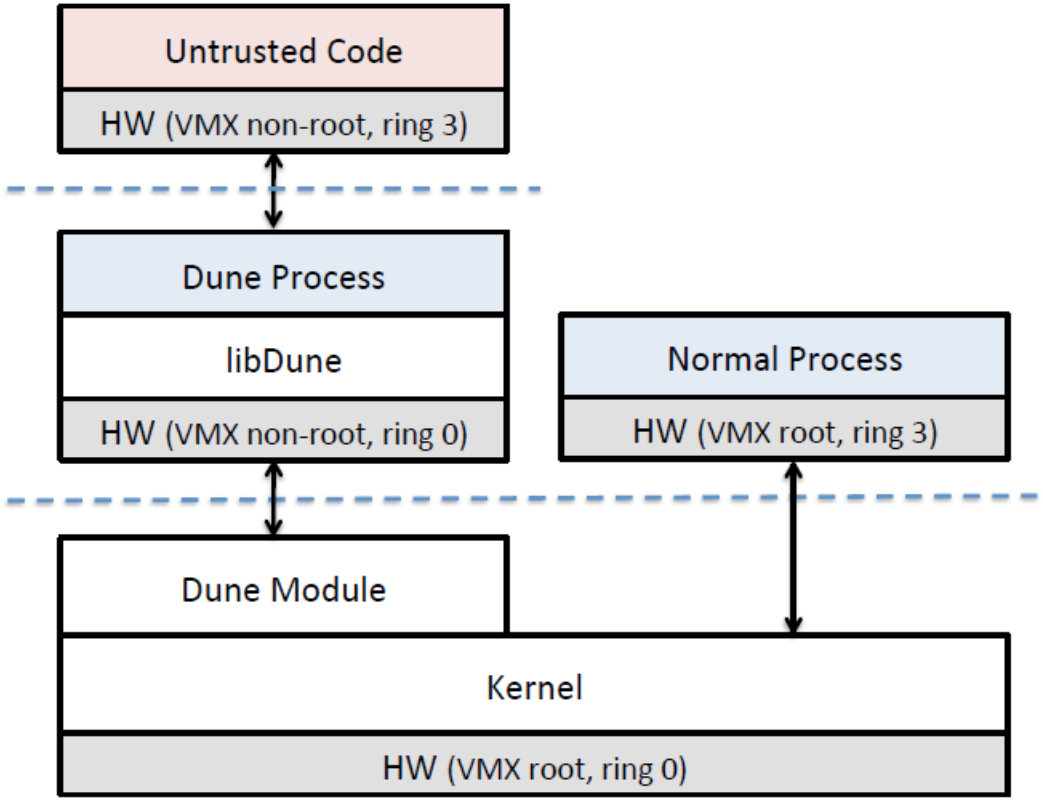


Figure 1: The Dune system architecture.

Dune: Linux System Call Filter

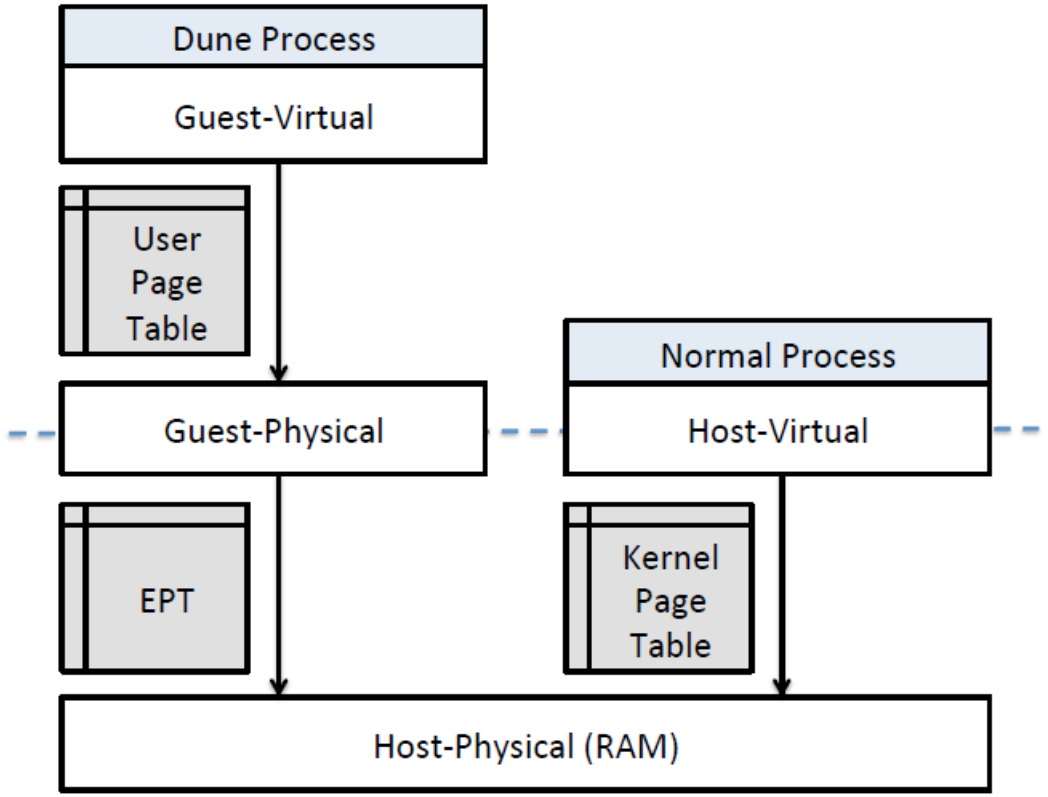
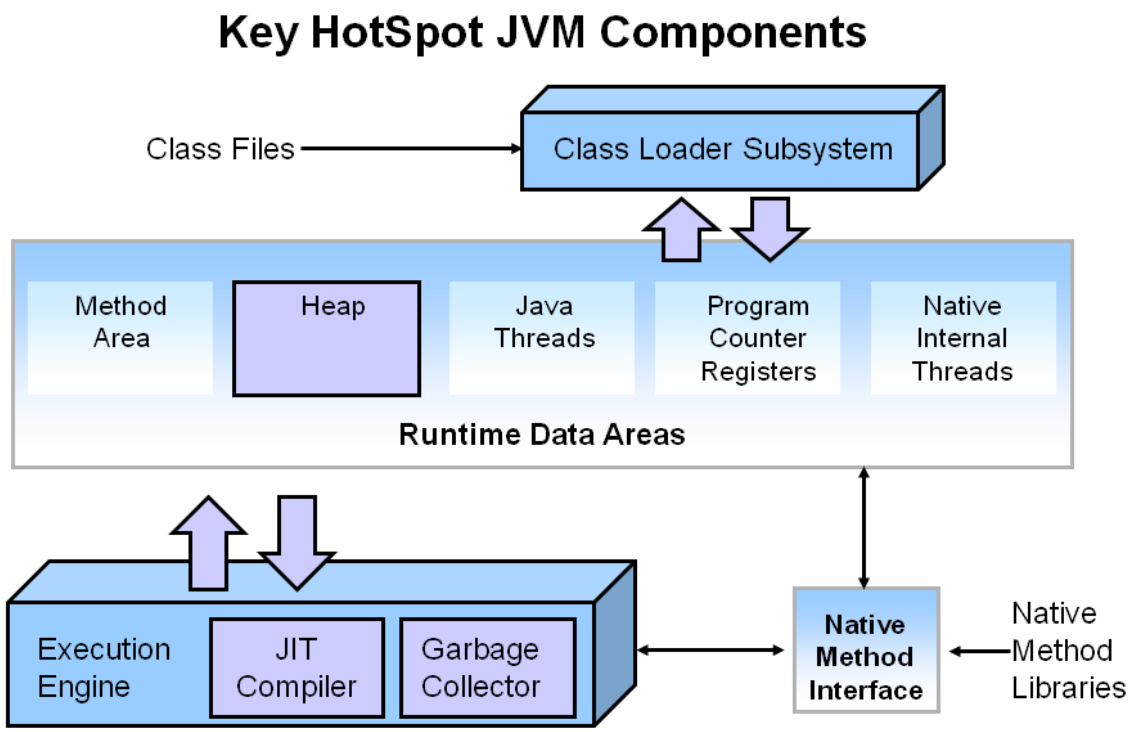


Figure 2: Virtual memory in Dune.

Garbage Collection: JVM

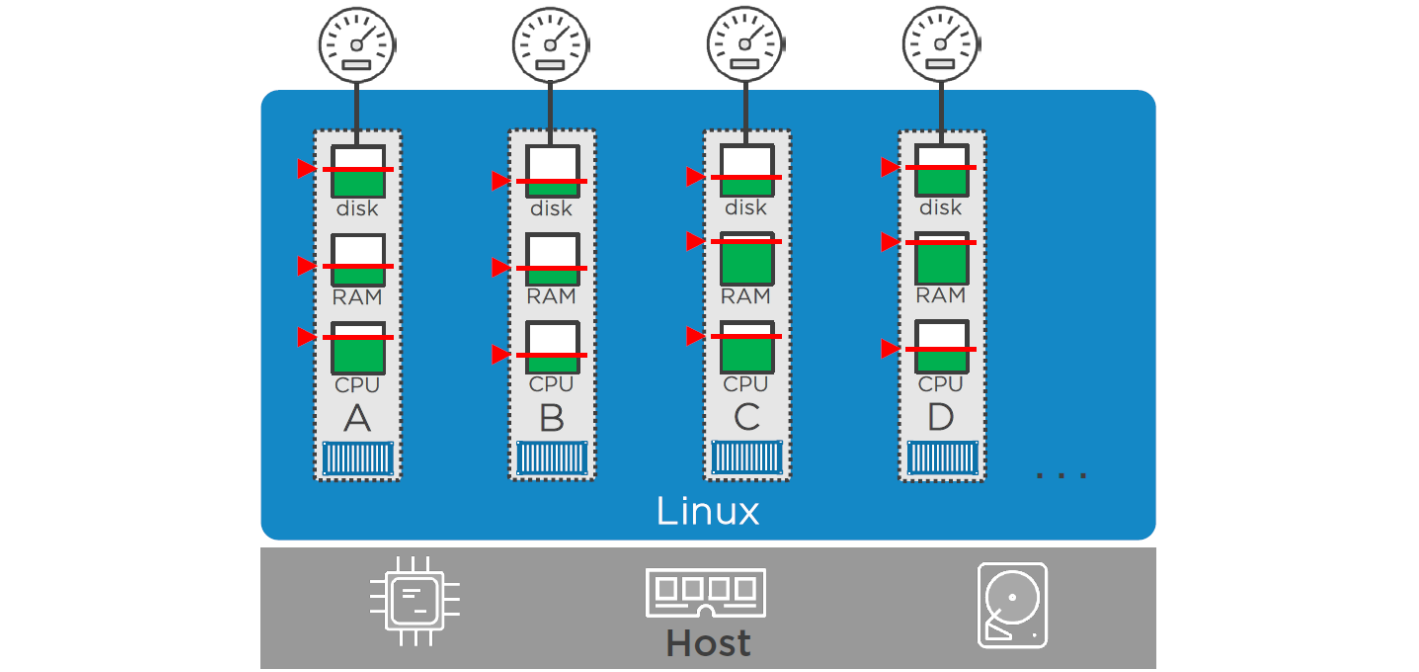


Credit to: [Java Garbage Collection Basics (oracle.com)]

Linux Namespace and Control Group

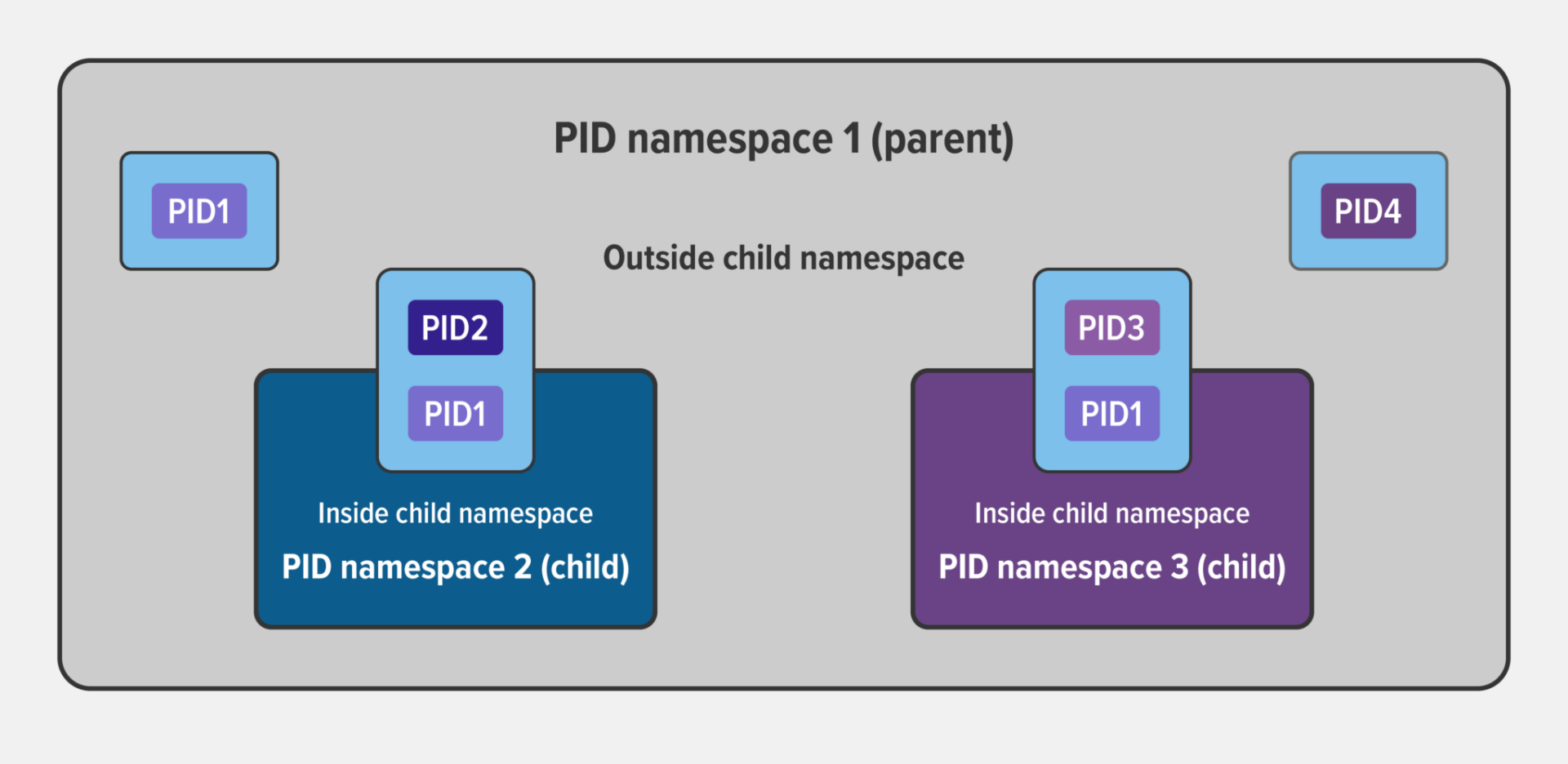
Namespaces are a feature of the Linux Kernel that partitions kernel resources such that one set of processes sees one set of resources while another set of processes sees a different set of resources.

Linux Namespace and Control Group



Credit to: Nigel Poulton (Docker Deep Dive)

Linux Namespace and Control Group



Source: [What Are Namespaces and cgroups, and How Do They Work? - NGINX]

Summary

- OS Isolation (User / Kernel)
- Virtual Machine Overview
- Hypervisor
- Hardware Virtualization
- Dune
- Linux Namespace and CGroups
- Next
  - Michael Qiu on Kernels and High Level Languages