



# Container World

## **From the Beginning: Hypervisors, VMs, and Containers**

Sarah Christoff

Technical Support Analyst

WP Engine

#ContainerWorld

@ContainerWrld

<https://tmt.knect365.com/container-worl>



WPengine

WP Engine



@schristoff25



[catonacomputer.com](http://catonacomputer.com)



# Containers vs Virtual Machines

...

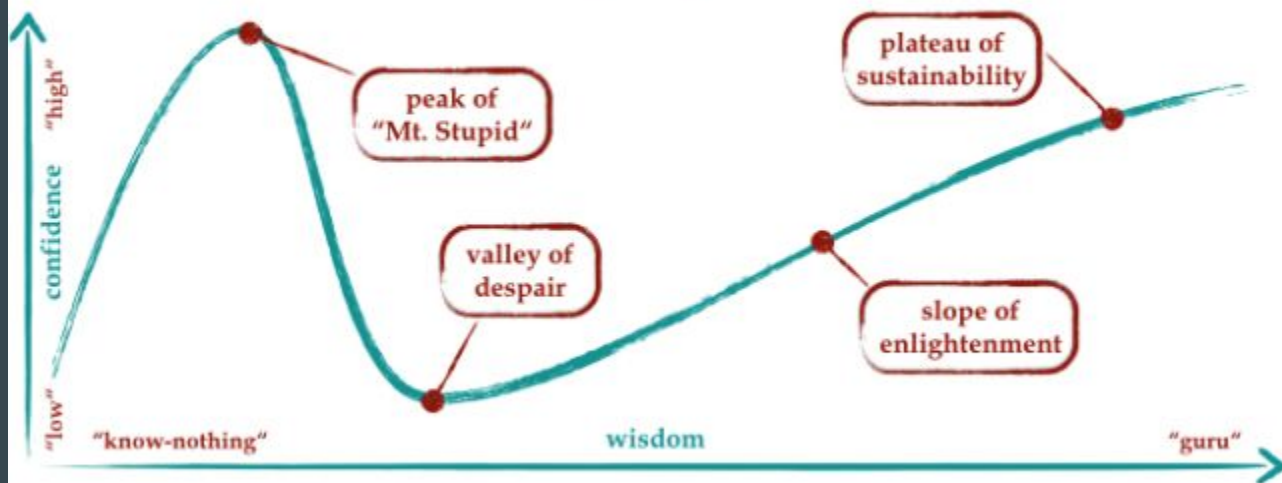
What's best for your application

# Highest Rated Questions on Stack Overflow about Containers and Virtual Machines

...

Let me read out the answers to you!

## Dunning-Kruger effect



Docker Conta

<https://blog.neta>

Mar 16, 2016 - In p

different from con



stackoverflow

Questions

Developer Jobs

Tags

Users

Search...

Containers vs

<https://www.itwc>

Apr 28, 2015 - Yes

physical server tha

runs not just a full copy of an operating system, but a **virtual** copy of all the hardware that the operating

system needs to run.

# How is Docker different from a normal virtual machine?

Containers vs VMs: Which is better for Cloud Deployments?

<https://www.sdxcentral.com> > Cloud Infrastructure > Containers > Containers Resources ▼

**Containers vs VMs: Virtual Machine** Workloads. A VM is a software-based environment geared to simulate a hardware-based environment, for the sake of the applications it will host. ... A hypervisor, such as VMware ESXi, is responsible for executing the **virtual machine** assigned to it and can execute several simultaneously.

Containers vs. virtual machines: A simplified answer to a complex ..

<https://www.techrepublic.com/.../containers-vs-virtual-machines-a-simplified-answer-t>

May 23, 2017 - If you're having trouble deciding between **virtual machines** or **containers**, Jack boils down this choice to two simple bullet points.

Linux Containers vs Virtual Machines - Datamation

<https://www.datamation.com/open-source/linux-containers-vs-virtual-machines.html> ▼

Nov 20, 2017 - Among the many distinctions between **containers** and **virtual machines** is that one is used for applications and the other is designed for entire operating systems.

How is Docker different from a normal virtual machine? - Stack ...

Lightweight Virtual Machines Made  
Simple with Docker or How to Run 100  
Virtual Machines

Stop calling containers  
“lightweight virtual machines”

...

It's offensive

# From the Beginning:

...

What's a virtual machine again?



CP-40 made -  
reimplemented as  
CP-67

1960s

1972

IBM announced System/370  
would have virtual memory -  
and announced VM 370

VMWare Workstation  
is born!

1999

2005

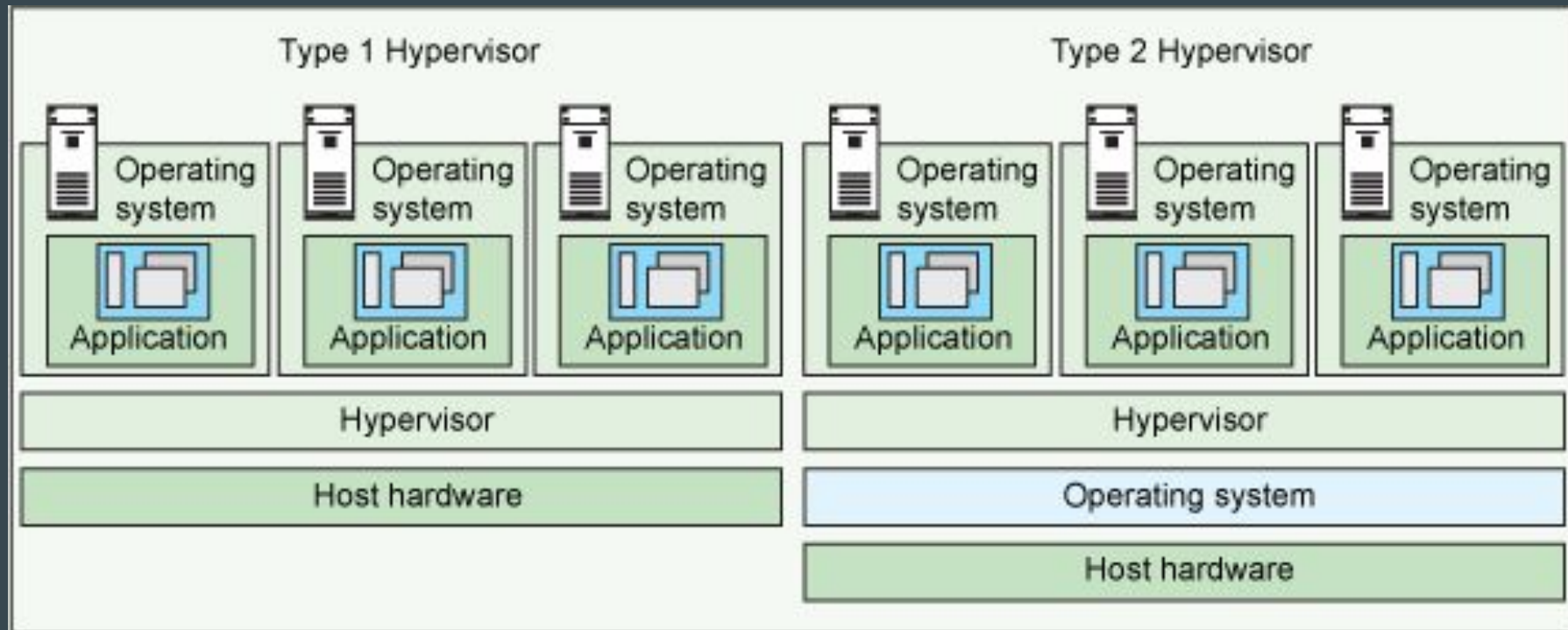
VMWare offers free high  
quality virtualization  
technology



2018

# Hypervisors

- Used to be Control Program - now Hypervisor or Virtual Machine Monitor (VMM)
- Emulated computer system



Source: <http://vapour-apps.com/wp-content/uploads/2016/05/figure2.gif>

# Type 1 Hypervisors

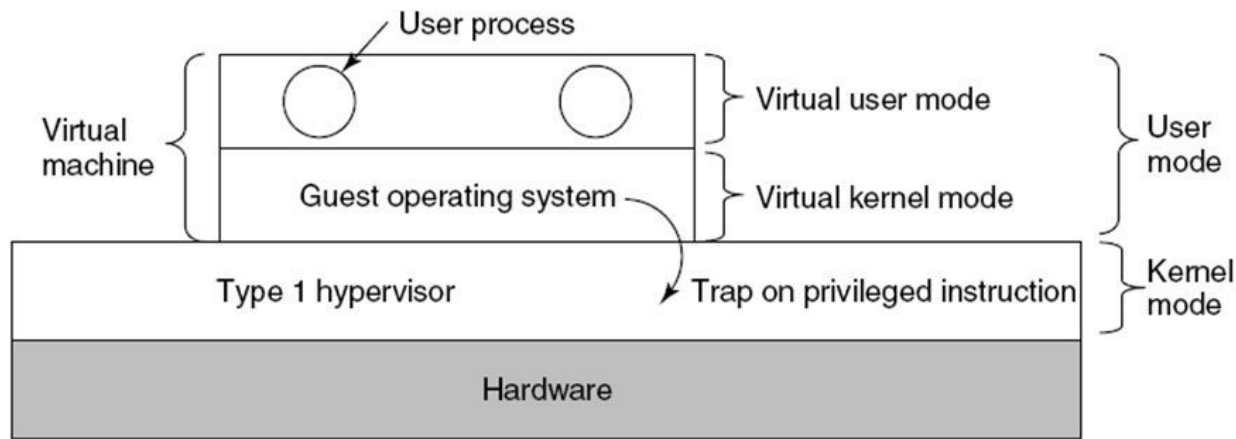
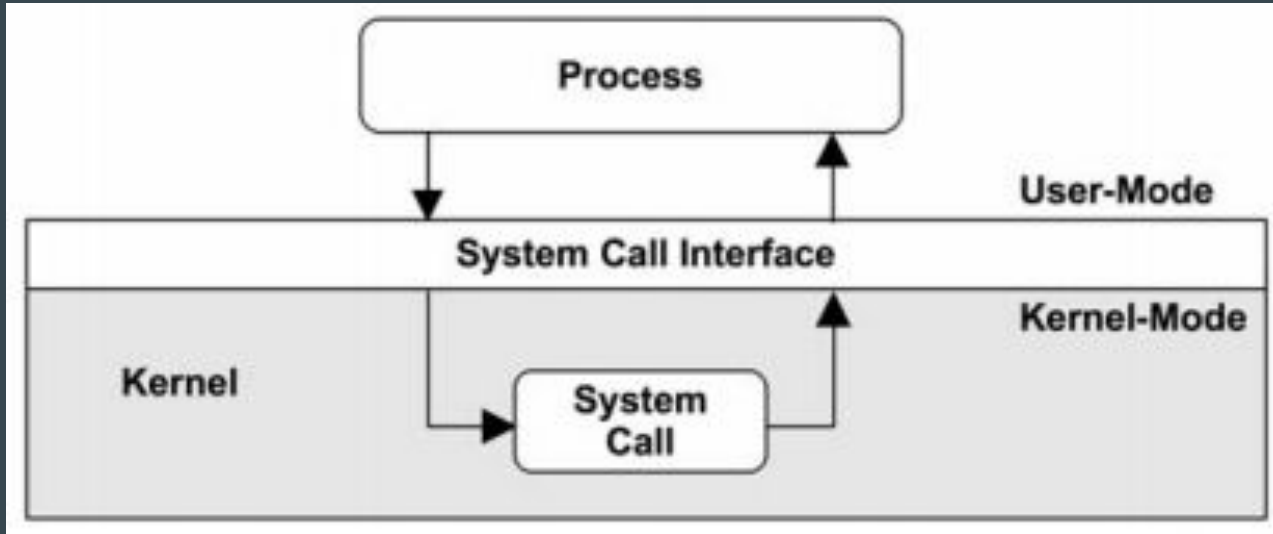


Figure 8-26. When the operating system in a virtual machine executes a kernel-only instruction, it traps to the hypervisor if virtualization technology is present.



Source: <https://notes.shichao.io/spec/ch3/>

# Type 1 Hypervisors

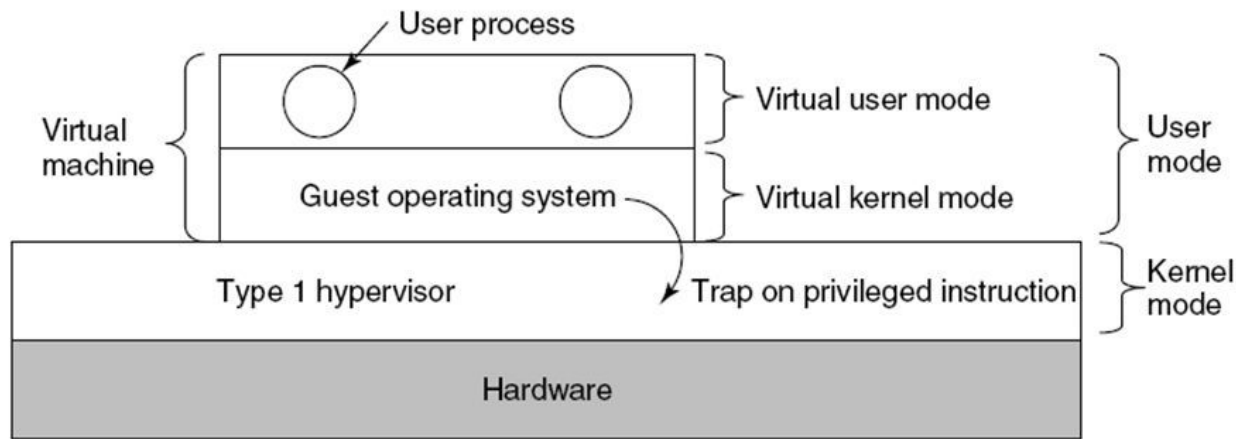
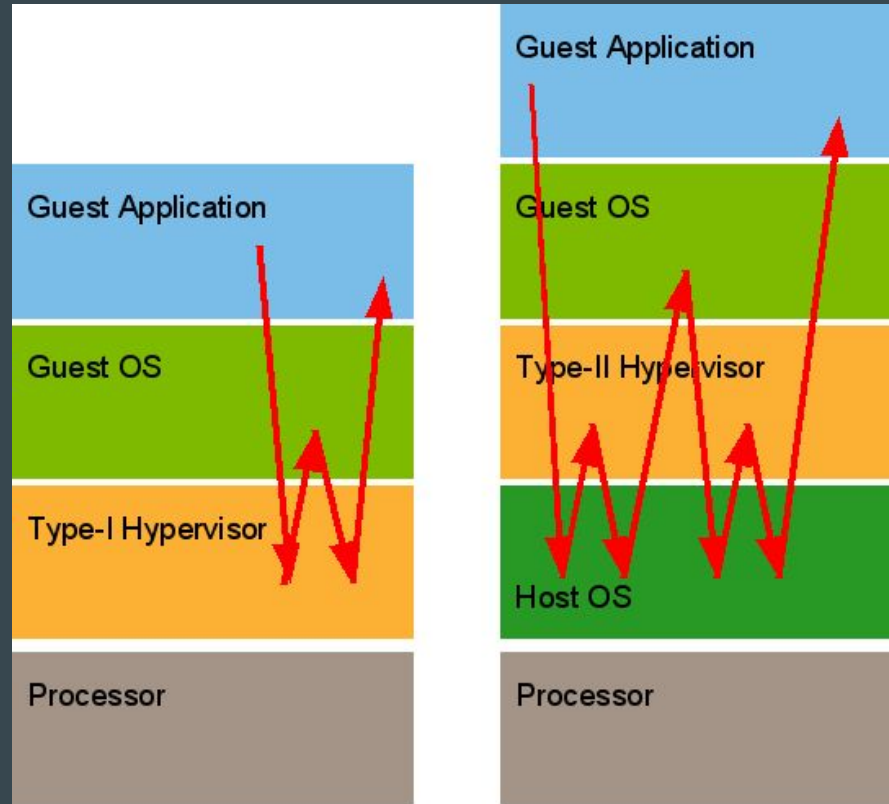
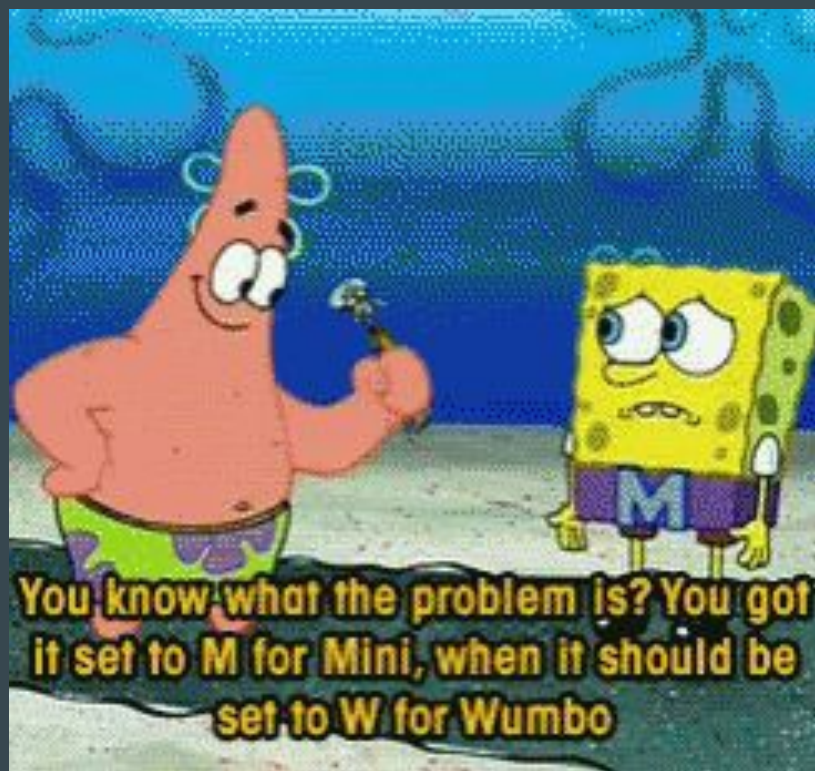


Figure 8-26. When the operating system in a virtual machine executes a kernel-only instruction, it traps to the hypervisor if virtualization technology is present.

# Type 2 Hypervisors

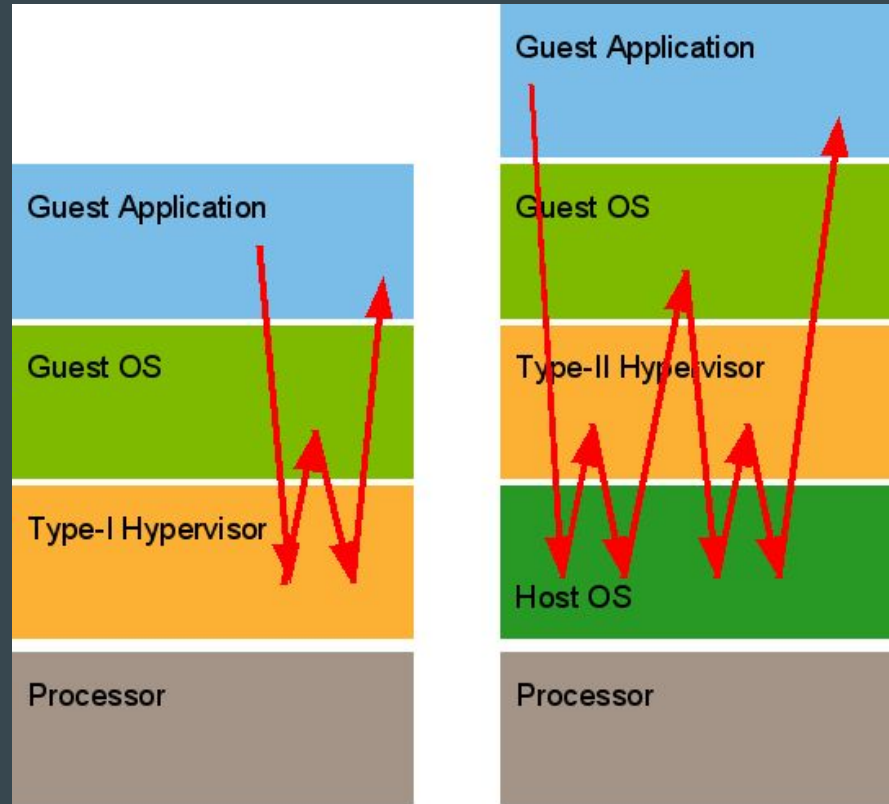


Source: <https://microkerneldude.wordpress.com/2009/03/23/virtualization-some-get-it-some-dont/>



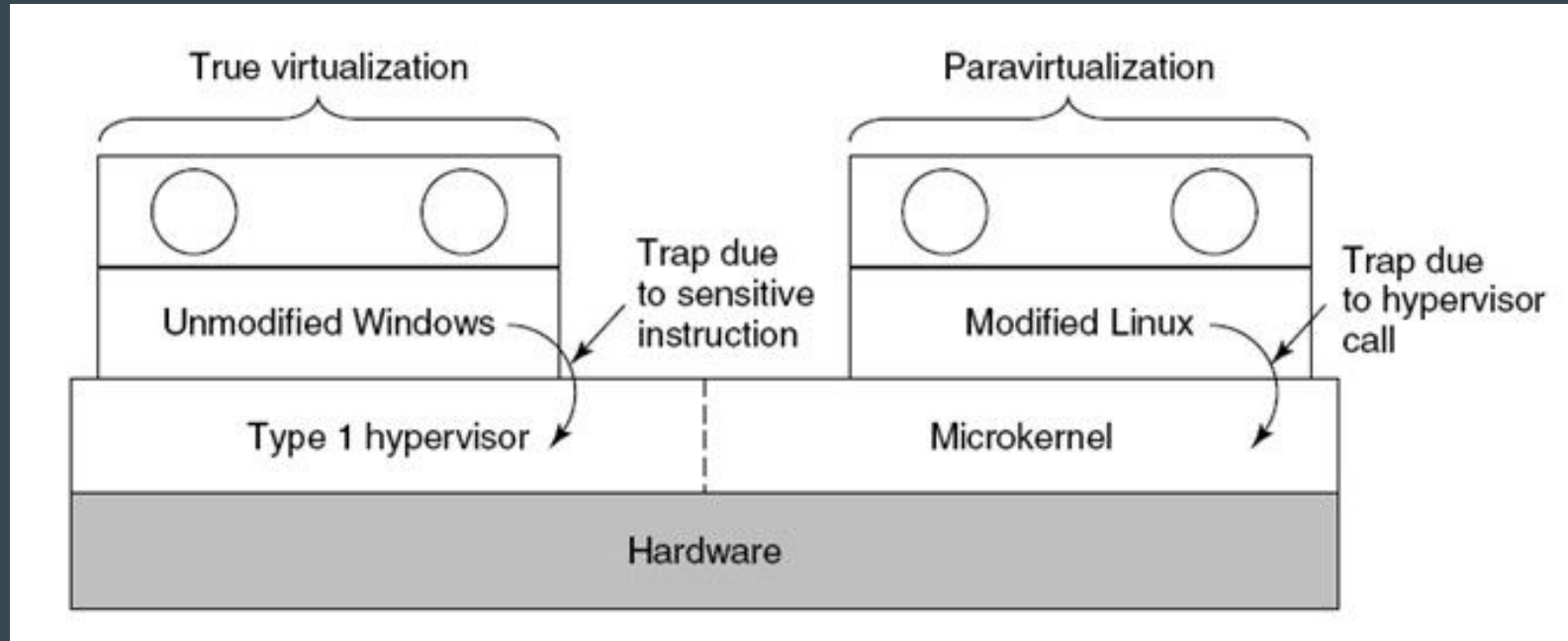


# Type 2 Hypervisors



Source: <https://microkerneldude.wordpress.com/2009/03/23/virtualization-some-get-it-some-dont/>

# Paravirtualization





stack**overflow**

Questions

Developer Jobs

Tags

Users

Search...

Can someone explain what virtual machines are and why they're useful?

# From the Beginning:

...

Containers

Unix Version 7,  
Chroot added

1979

2000

FreeBSD Jails

Process  
Containers

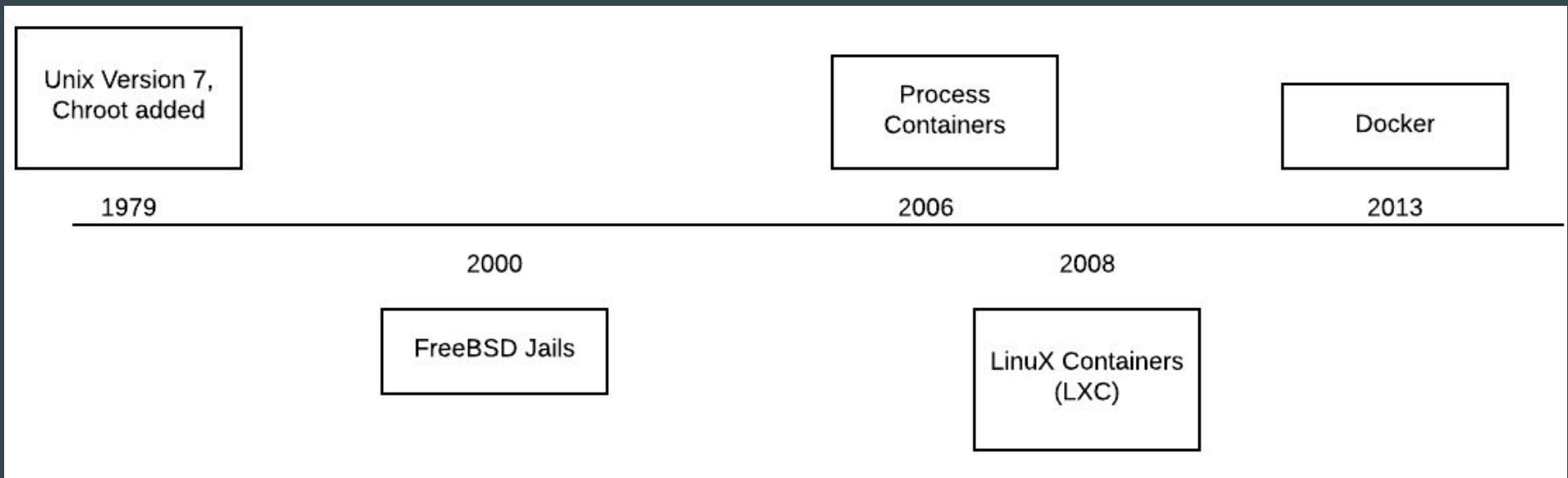
2006

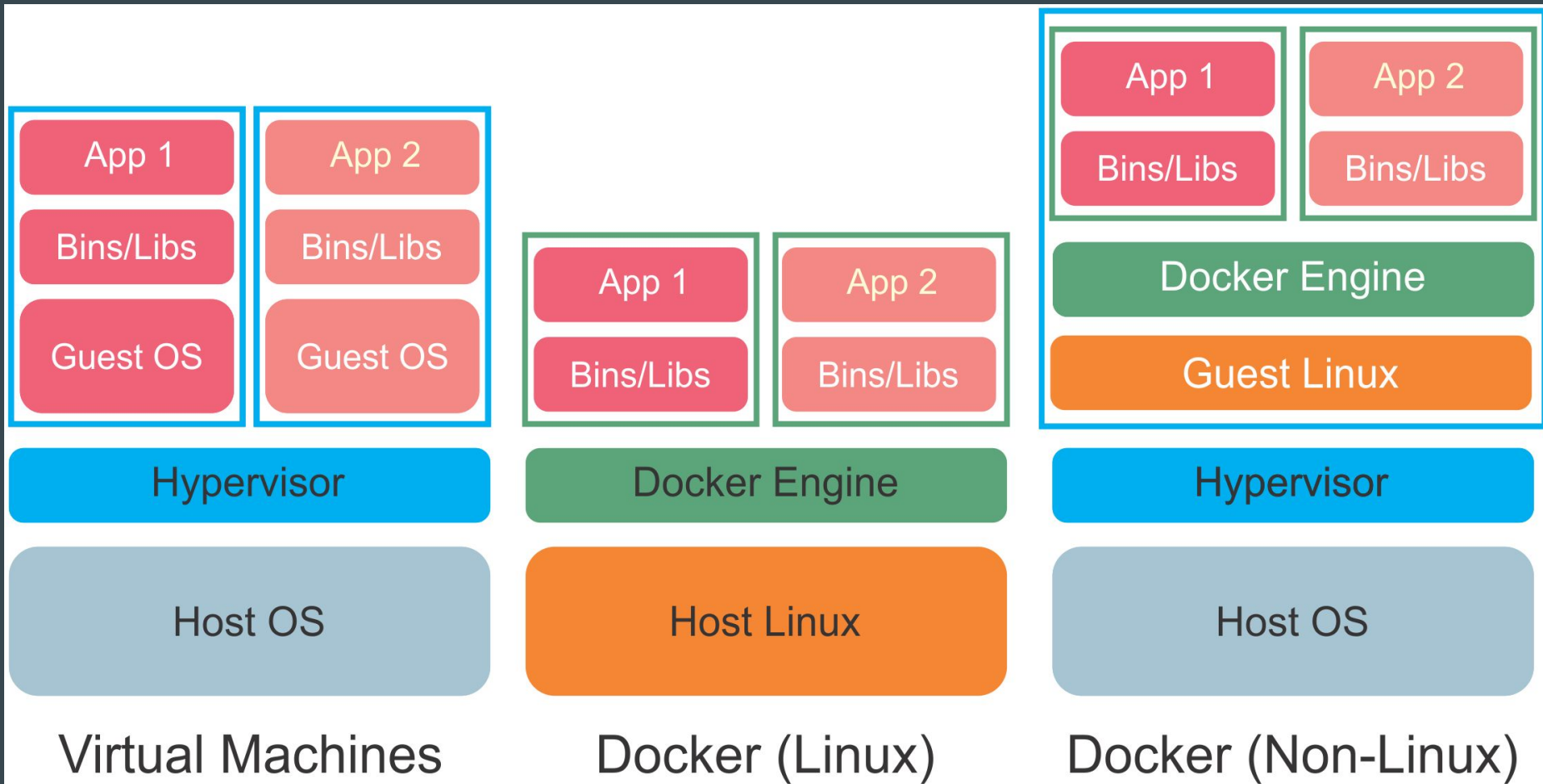
2008

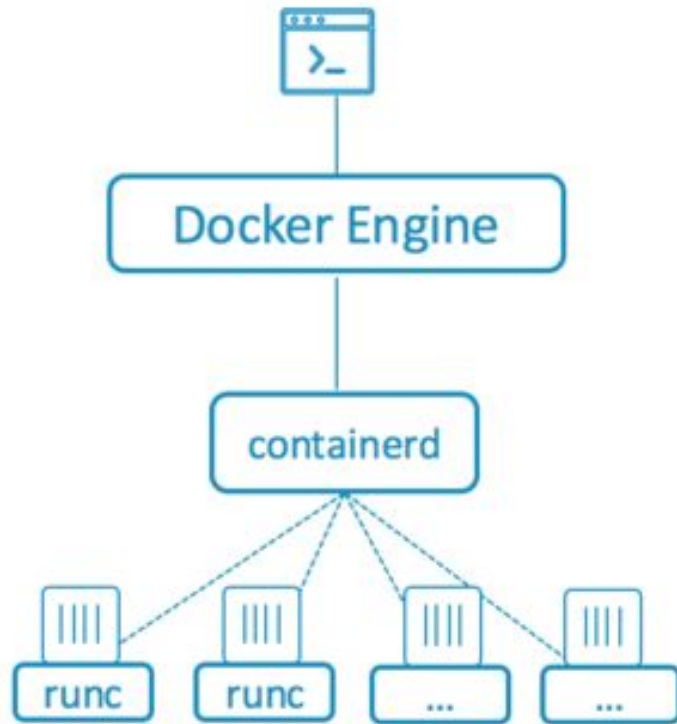
Linux Containers  
(LXC)

Docker

2013





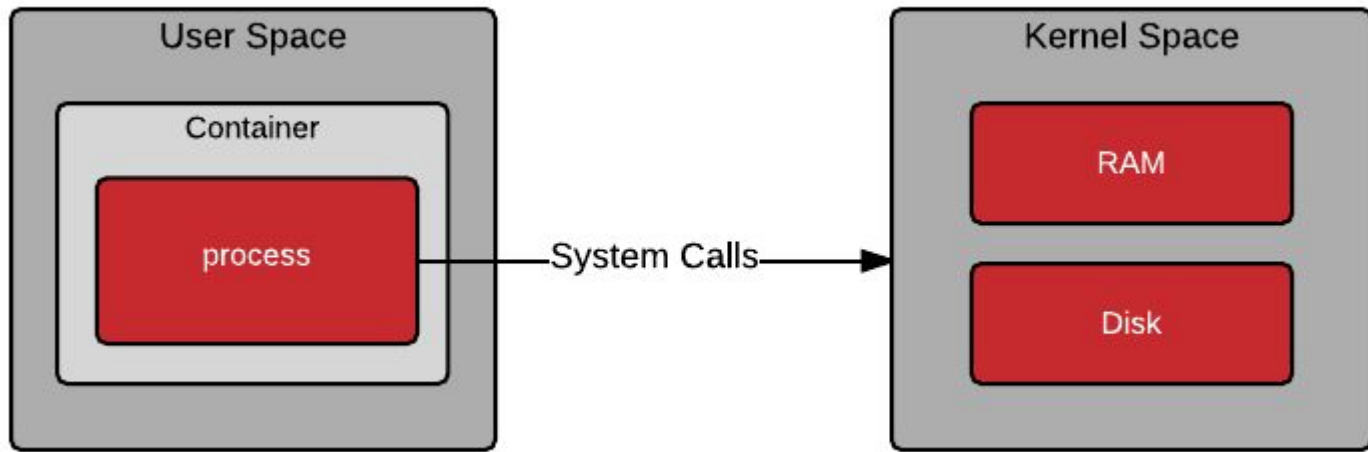


Same Docker UI and commands

User interacts with the Docker Engine

Engine communicates with containerd

containerd spins up runc or other OCI compliant runtime to run containers



Source: <https://developers.redhat.com/blog/2018/02/22/container-terminology-practical-introduction/>





# difference between cgroups and namespaces

Namespaces: isolate and virtualize system resources as a collection of processes

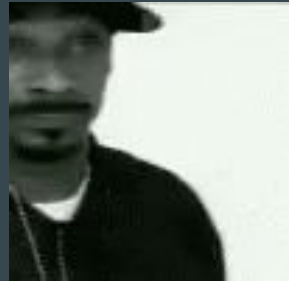
- Mount
- PID
- Network
- IPC ( InterProcess Communication - SysV)
- UTS
- UID (User ID)

Control Groups: limits and isolates the resource usage as a collection of processes

- CPU
- Memory
- Disk I/O
- Network

**BSD Jails, Solaris Zones, and Containers are  
all the same thing**

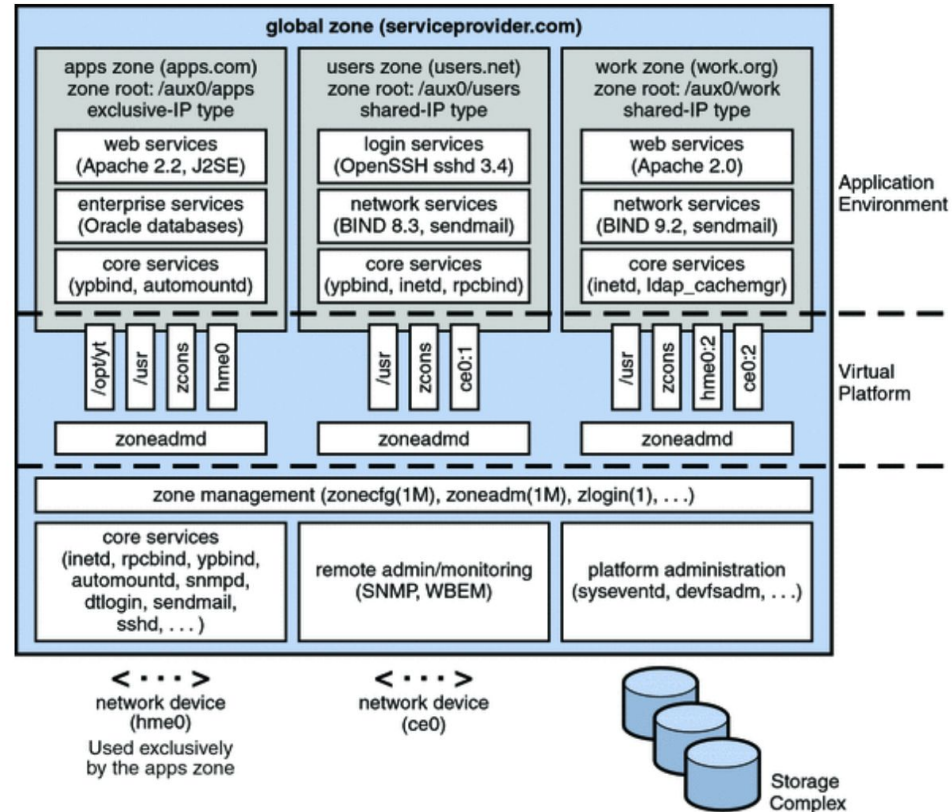
**BSD Jails, Solaris Zones, and Containers are  
all the same thing**





Jails, Zones, and Containers are just “super  
chroot”

Figure 16-1 Zones Server Consolidation Example



# FreeBSD Jails



There is no Escape

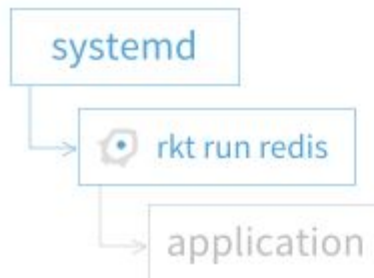
# Docker vs rkt



## Container Engine Process Models

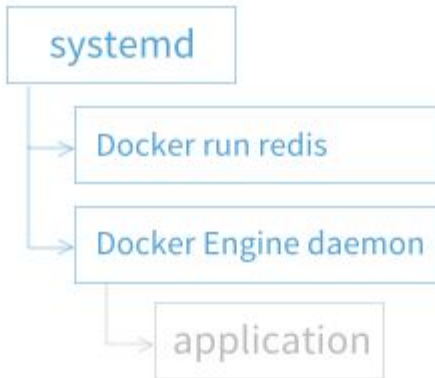
rkt

1.0+



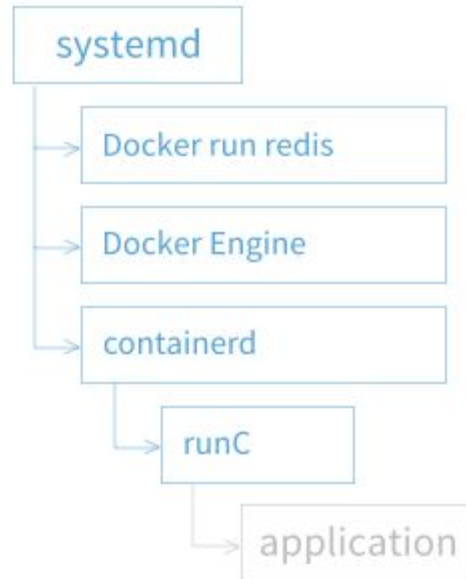
Docker

< 1.11.0



Docker

1.11.0+





# Containers are easy to use wrappers around cgroups and namespaces



**Contain Applications**

**Virtualize Systems**



# Container World

**Thank You!**

#ContainerWorld

@ContainerWrld

<https://tmt.knect365.com/container-worl>