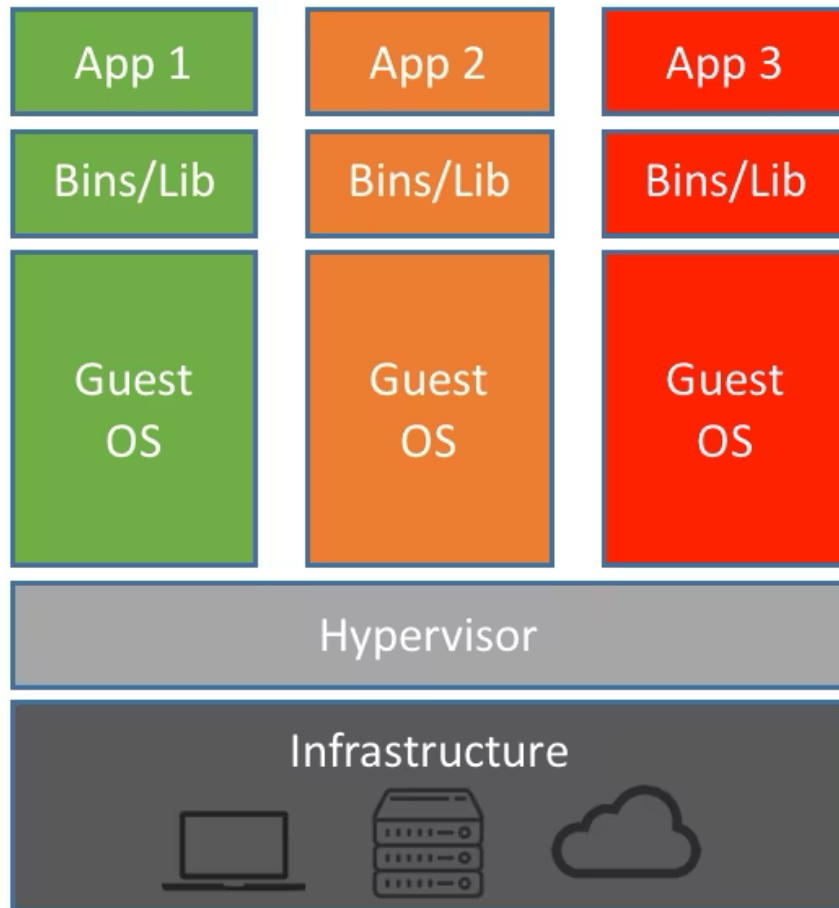


VIRTUALISATION

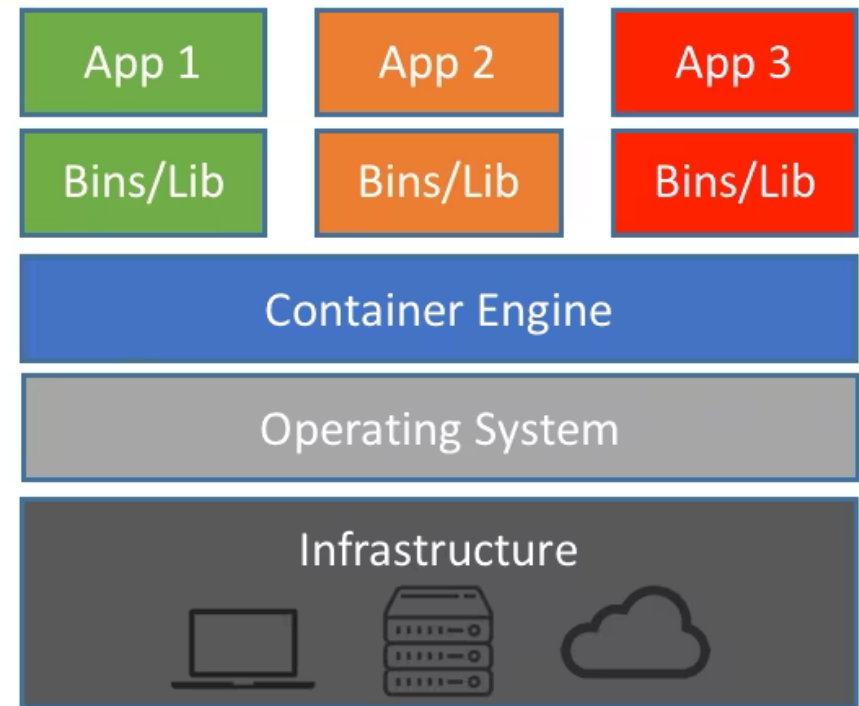
HYPERVISOR

- Virtualisation is a process whereby software is used to create an abstraction layer over computer hardware that allows the hardware elements of a single computer to be divided into multiple virtual computers
- Allows multiple (guest) OS running on top of a “physical” (host) OS
- Share physical resources with multiple systems
- Can create an image of a system and easily copy it onto another system
- Create snapshots (saved points) of a system (even running)
- Restore a snapshot as a new Virtual Machine (VM)
- Better High Availability (HA) design
- Para-virtualise (share hardware directly with the host)

HYPERVISORS vs CONTAINERS



Machine Virtualization



Containers

OPTIONS

- Free Server
 - Proxmox
 - XCP-ng (Open Source)
 - VMware ESXi
 - KVM (Open Source – Linux Libvirt)
 - QEMU
- Free desktop editions
 - Oracle VirtualBox (Open Source)
 - VMware Workstation Player



VMWARE

- Commercial versions
 - vSphere – Server Hypervisor (Pay per socket)
 - Workstation Pro – on PC
 - University discount ~~\$199~~ → \$119
 - Fusion – Mac
- “Free” version
 - Workstation Player
 - vSphere hypervisor technology
 - ESXi (vSphere Hypervisor 8)
 - Limited to 8 vCPUs per VM
 - No Migration between hosts
 - 60 Day full featured



XCP-ng



- XCP-ng
 - User-friendly, high-performance virtualisation
 - Unrestricted features and open-source
- Open Source & Paid Support
- Based on Xen – used by Citrix

- Use Xen Orchestra (XOA) to manage
 - Built in version (very limited in features)
 - <https://github.com/vatesfr/xen-orchestra>
 - Can build XOA from source
 - Most “Pro Support” features
 - Easy install:
 - <https://github.com/ronivay/XenOrchestraInstallerUpdater>

CLOUD INFRASTRUCTURE

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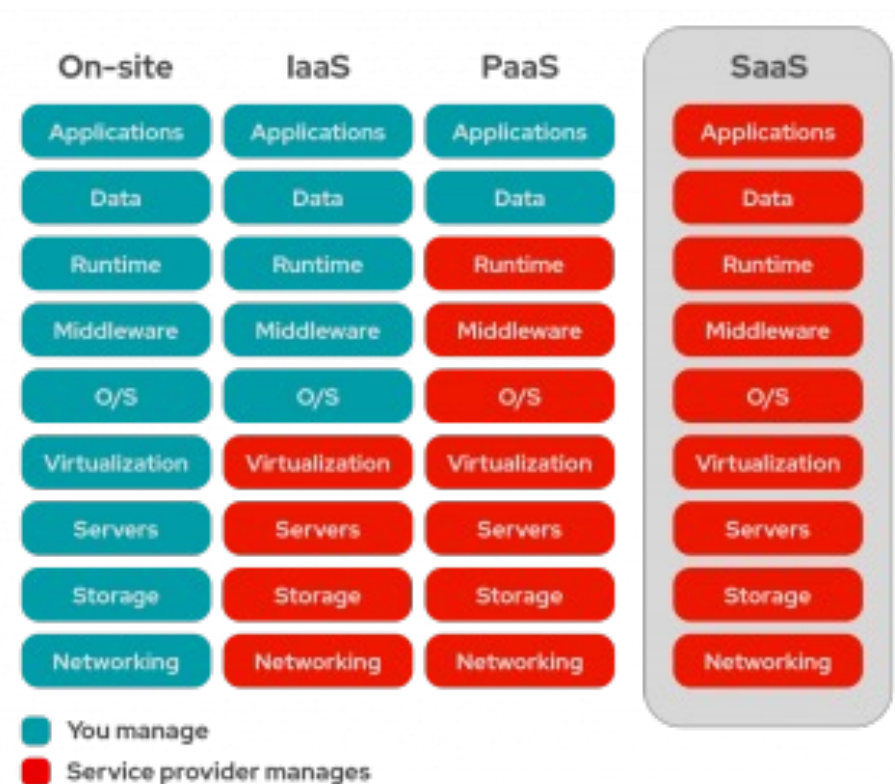
CLOUD INFRASTRUCTURE

- Cloud infrastructure is based on virtualisation
- Interface focused on user experience instead of backend
- Customers/tenants choose the number of:
 - vCPUs, RAM, Storage, and vGPUs
- The cost model is usually a pay-while-running model
- Pay for additional services:
 - Data uploads
 - Increased upload speed
 - Replication of data
 - Specifying where data should be hosted (country)
 - Support

\$

CLOUD AS A...

- On-site
 - You manage **network, storage, servers, virtualization, OS,**
 - middleware, runtime, database, and applications
- Infrastructure as a Service (IaaS)
 - You manage OS, middleware, runtime, database, applications
- Platform as a Service (PaaS)
 - You manage own databases and applications
- Software as a Service (SaaS)
 - Everything is managed, you simply use applications



CLOUD INFRASTRUCTURE

- Public or private
- Public Cloud Service providers
 - Amazon AWS/EC2
 - Microsoft Azure
 - Google Cloud
 - Oracle
 - "Free" instances: <https://www.oracle.com/za/cloud/free/>
 - Others: Linode, DigitalOcean, Vultr, GoDaddy, + 1000's
- Private Cloud
 - Nutanix
 - vScaler (Not to be confused with vSphere)
 - OpenStack ([Many components to config](#))
 - Cloudstack



CLOUDSTACK

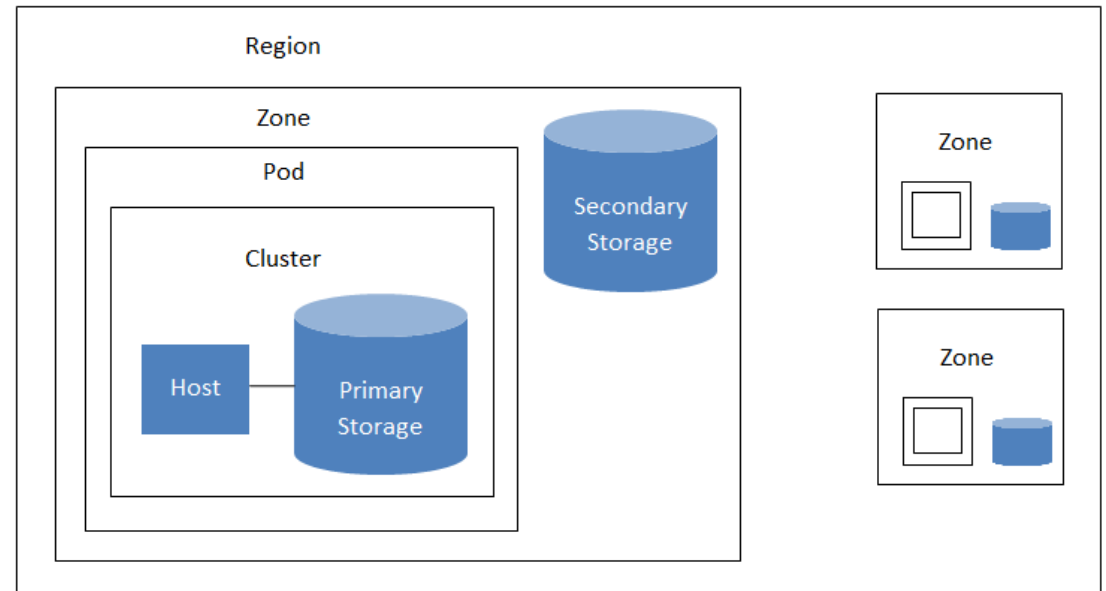


- Open Source
- Top-level project of the Apache Software Foundation
 - Started in 2008
- Largest contributor: ShapeBlue
- Supports
 - XenServer/XCP, KVM, Hyper-V, and/or VMware ESXi with vSphere
- Multi-Tenant: used by many cloud providers
- Scale well
 - One site has over 200k servers



CLOUDSTACK TERMINOLOGY

- A cluster provides a way to group hosts
- A pod often represents a single rack
- A zone is the second-largest organisational unit
- A region is the largest available organisational unit



A region with multiple zones

- By grouping zones into regions, the cloud can achieve higher availability and scalability
- Each region is controlled by its own cluster of Management Servers

PREPARE TO INSTALL CLOUDSTACK



- <https://vm.examplesdomain.com>
- Username: usr**xx**
- Password: As on <https://events.ufs.ac.za/event/3500/>

- **Don't modify the hn**

- Modify **cn01**
 - Network MAC Address
 - VIF #0 5e:d3:4c:01:**xx**:01

- Modify **cn02**
 - Network MAC Address
 - VIF #0 5e:d3:4c:01:**xx**:02



- Login to the jump host:

```
ssh usrxx@cloud.examplesdomain.com -p 2200
```

Password: As specified on events page

- Ping the IPs to see if they respond:

```
ping -c1 10.200.0.1xx || echo "Failed"
```

```
ping -c1 10.200.1.1xx || echo "Failed"
```

```
ping -c1 10.200.2.1xx || echo "Failed"
```

PREPARE TO INSTALL CLOUDSTACK



- Change hostnames of **ALL** nodes:
- Login to the machines:

```
ssh ern_admin@10.200.0.1xx  
sudo hostnamectl set-hostname usrxx-hn.examplesdomain.com
```

```
ssh ern_admin@10.200.1.1xx  
sudo hostnamectl set-hostname usrxx-cn01.examplesdomain.com
```

```
ssh ern_admin@10.200.2.1xx  
sudo hostnamectl set-hostname usrxx-cn02.examplesdomain.com
```