

CS 4924: Emerging and Disruptive Cyber Technologies
US Naval Postgraduate School

Journey to a Cloud: Migrating an app

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What is a Cloud?

Cloud Definition

Cloud computing is a model for enabling ubiquitous, convenient, *on-demand network access* to a *shared pool of configurable computing resources* (e.g., networks, servers, storage, applications, and services) that can be *rapidly provisioned and released* with minimal management effort or service provider interaction.

Source: <https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf>

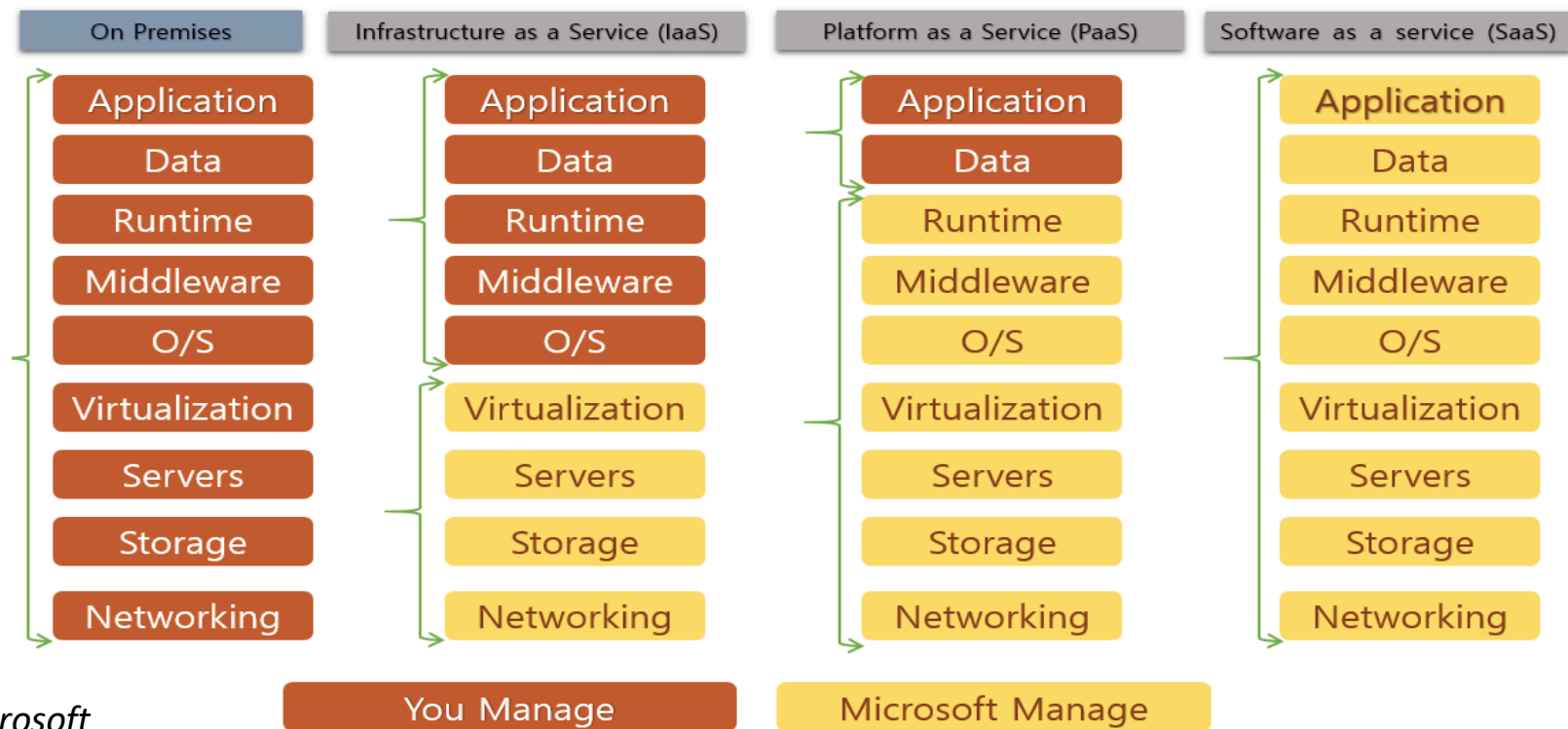
What is a Cloud?

Essential characteristics

- On Demand Self Service
- Broad Network Access
- Resource Pooling
- Rapid Elasticity
- Measured Service

Source: <https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf>

Service Models.



Source: Microsoft

laaS.

- Infrastructure as a Service
- OS: Windows/Linux (no patching, AV, backups etc.)
- Virtualization: OS is virtualized away from hardware (Vmware etc.)
- Servers: Big boxes
- Storage: Hard Disks
- Network: Connection to servers/storage and outside world

Undifferentiated Heavy lifting

Problem Statement.

Migrate an on-premises application to a public cloud to optimize

- Cost
- Location (country)
- Security
- Minimal disruption to production apps
- Better performance

So how does a cloud look to a user and developer?

Not that different

Let's take a look

See what your customers experience with PayPal.

Browse a sample website to see how your customers can pay using PayPal on your desktop, mobile, and app.

See the Demo

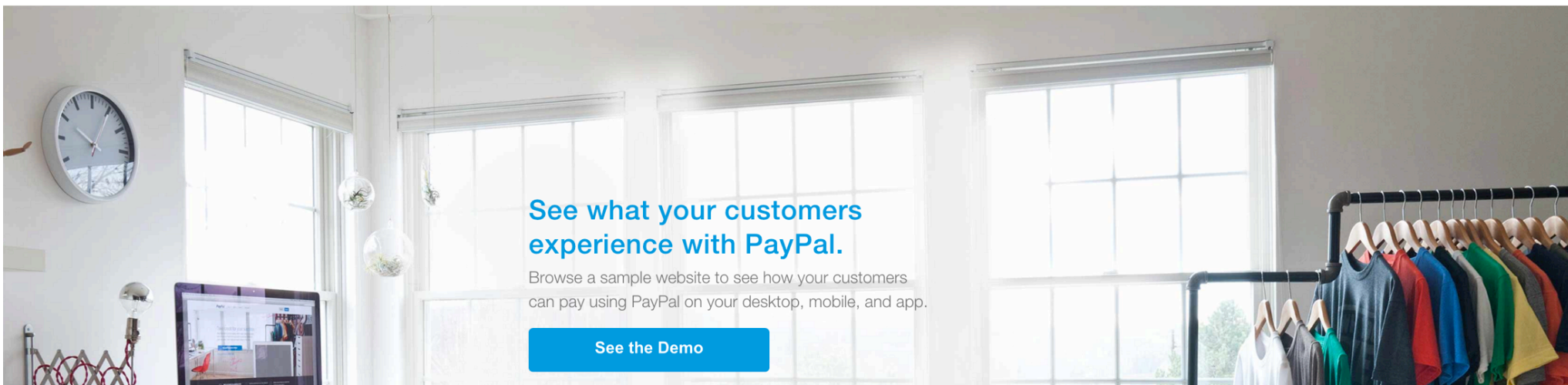
Skip the Demo, Get Code

PayPal Optimizer tool helps you analyze and fine-tune your website. It recommends improvements, helps you enhance customer experience, increase customer conversions and maximize your profits.

PayPal Optimizer scans the following pages from your website in the next steps. Please select the appropriate page as per the instructions in every page.

1. Home Page
2. Product Page
3. Shopping cart page
4. Payments Methods Page
5. Checkout Page

GET STARTED



Project

Optimizer ▾

VPC

EXT

Region

LVS03 ▾

 Member

Manage Compute

Overview

Instances

Volumes

Images & Snapshots

Access & Security

Manage Network

Load Balancers

Databases

Launch:



Databases

+ Launch Instance

	Database Name	Datastore	Datastore Version	IP Address	Size	Status	Actions
No items to display.							
Displaying 0 items							

VPC
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LVS03

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Instances

Filter

Filter

+ Launch Instance

Soft Reboot Instances

Terminate Instance

	Instance Name	Image Name	IP Address	CPU Usage	Memory Usage	Size	Keypair	DNS Name	Status	Task	Power State	Uptime	Actions
<input type="checkbox"/>	Optimize	(not found)		-	-	g2-standard-2 6GB RAM 2 VCPU 30.0GB Disk	migration-key		Error	None	Running	5 months	<div>Edit Instance</div> <div>More</div>

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Volumes

Volumes

Filter

Q

Filter

+ Create Volume

Delete Volumes

<input type="checkbox"/>	Name	Description	Size	Status	Type	Attached To	Actions
<input type="checkbox"/>	Stage1Data		30GB	In-Use	-	Attached to OptimizerStageExt1	<div>Edit Attachments</div>

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Images

Project (0)

Shared with Me (0)

Supported (2)

Community (0)

Delete Images

<input type="checkbox"/>	OS	Provider	Image Name	Type	Status	Public	Protected	Login User	Actions
<input type="checkbox"/>	redhat.	admin	rhel6.5-x86_64-ext	Image	Active	Yes	No	-	<div>LaunchMore ▾</div>
<input type="checkbox"/>	ubuntu	admin	ubuntu-14.04-server-ext	Image	Active	Yes	No	-	<div>LaunchMore ▾</div>



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Load Balancers

Load Balancers

Load Balancers

+ Launch Load Balancer

Terminate Load Balancers

<input type="checkbox"/>	Load Balancer	Name	DNS Name	Method	Protocol	Monitor	Provisioning Status	Admin State	Actions
<input type="checkbox"/>		optimizerSSHloadBalancer-80		Round Robin	HTTP	TCP	Vip: Active Pool: Active Monitor: Active	Enabled	Edit Load Balancer More
<input type="checkbox"/>		OptimizerStagePPC3		Round Robin	HTTP	TCP	Vip: Active Pool: Active Monitor: Active	Enabled	Edit Load Balancer More
<input type="checkbox"/>		optimizerSSHloadBalancer-80-443		Round Robin	HTTPS	TCP	Vip: Active Pool: Active Monitor: Active	Enabled	Edit Load Balancer More

Displaying 3 items



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Launch Instance

Launch Instance

Details *

Access & Security *

Post-Creation

Availability Zone

No availability zones found.

Instance Name *

Flavor *

g1-highmem-2(2 VCPUs, 15360 MB RAM, 150 ▾

Instance Boot Source *

--- Select source --- ▾

Specify the details for launching an instance.

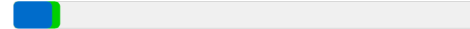
The chart below shows the resources used by this project in relation to the project's quotas.

Flavor Details

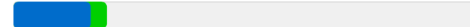
Name	g1-highmem-2
VCPUs	2
Root Disk	30 GB
Ephemeral Disk	120 GB
Total Disk	150 GB
RAM	15,360 MB MB

Project Limits

Number of Instances 4 of 48 Used



Number of VCPUs 8 of 48 Used



Total RAM 24,576 of 49,152 MB Used



Launch



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Availability Zone

No availability zones found.

Instance Name

Flavor

g1-highmem-2(2 VCPUs, 15360 MB RAM, 150

Instance Boot Source

Boot from image

Image Name

- ✓ Select Image
- rhel6.5-x86_64-ext (311.9 MB)
- ubuntu-14.04-server-ext (281.4 MB)

Specify the details for launching an instance.

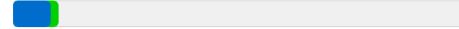
The chart below shows the resources used by this project in relation to the project's quotas.

Flavor Details

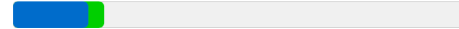
Name	g1-highmem-2
VCPUs	2
Root Disk	30 GB
Ephemeral Disk	120 GB
Total Disk	150 GB
RAM	15,360 MB MB

Project Limits

Number of Instances 4 of 48 Used



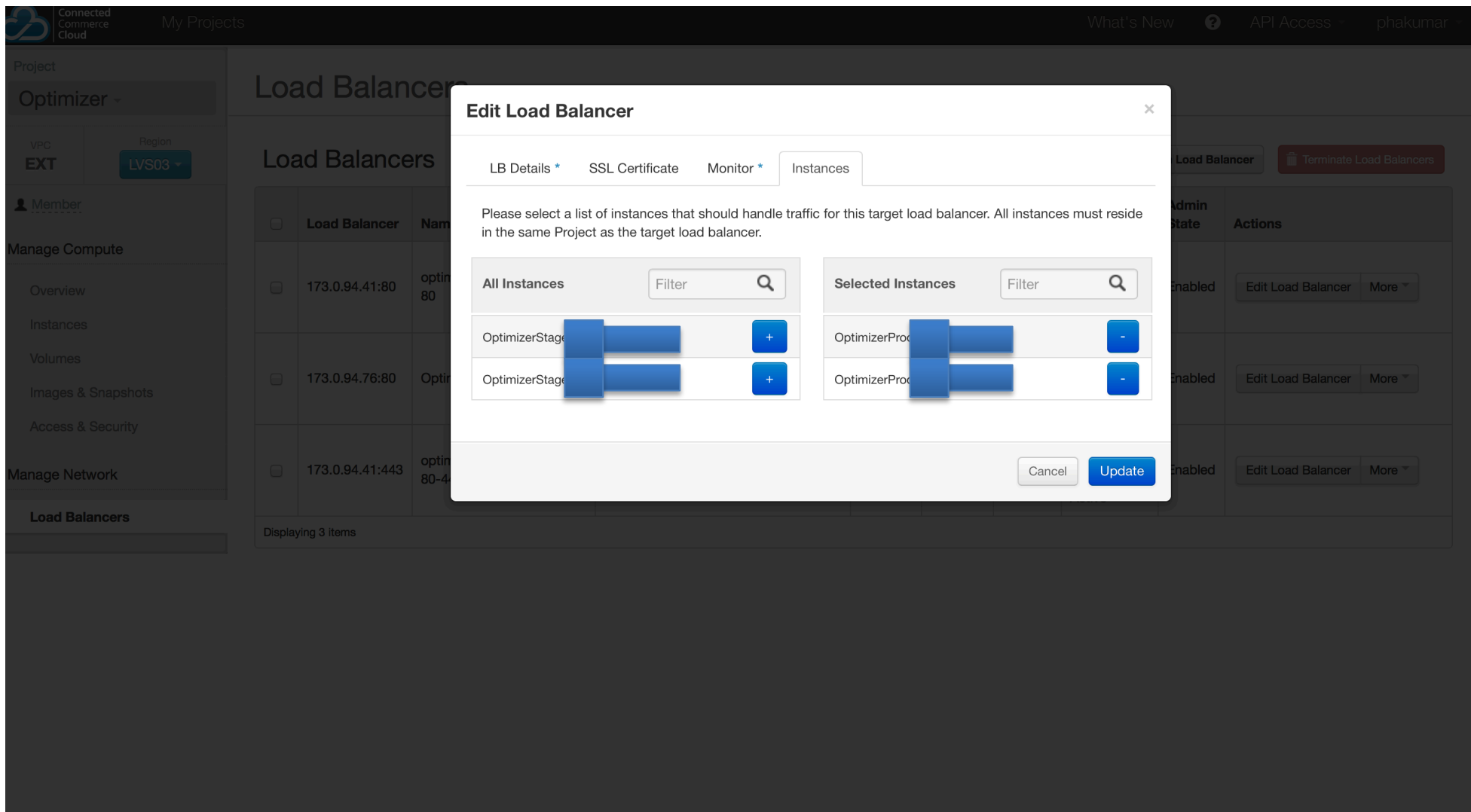
Number of VCPUs 8 of 48 Used



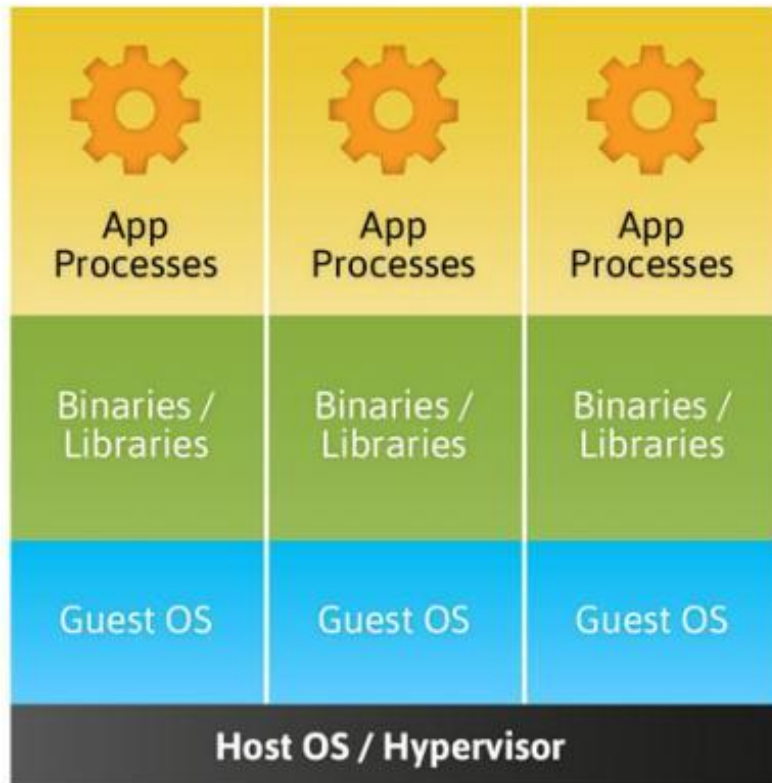
Total RAM 24,576 of 49,152 MB Used



Launch



Current Cloud: Full OS for each VM



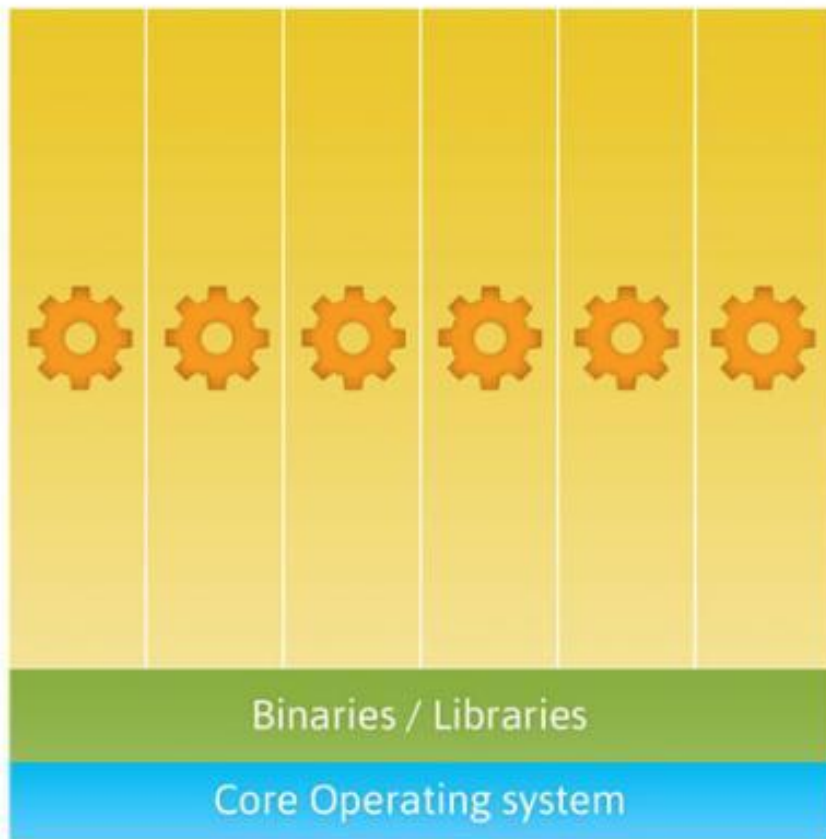
Source: <http://www.linuxjournal.com>

The Problem with VMs

Penalties:

- 1) Running a whole separate operating system to get a resource and security isolation.
- 2) Slow startup time while waiting for the OS to boot.
- 3) The OS often consumes more memory and more disk than the actual application it hosts. The Rackspace Cloud recently discontinued 256MB instances because it didn't see them as practical. Yet, 256MB is a very practical size for an application if it doesn't need to share that memory with a full operating system.

Future Cloud: Containers (One OS for all VMs)



Source: <http://www.linuxjournal.com>

Compared to VM:

- 1) Overhead of a container is disruptively low.
- 2) They start so fast that many configurations can launch on-demand as requests come in, resulting in zero idle memory and CPU overhead.
- 3) A container running systemd or Upstart to manage its services has less than 5MB of system memory overhead and nearly zero CPU consumption.
- 4) With copy-on-write for disk, provisioning new containers can happen in seconds.
- 5) Docker & Kubernetes are the open-source leaders for containerization and orchestration

Demo of Docker Image creation

<https://www.youtube.com/watch?v=NmUdaJOu5L4>



Thank You