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.

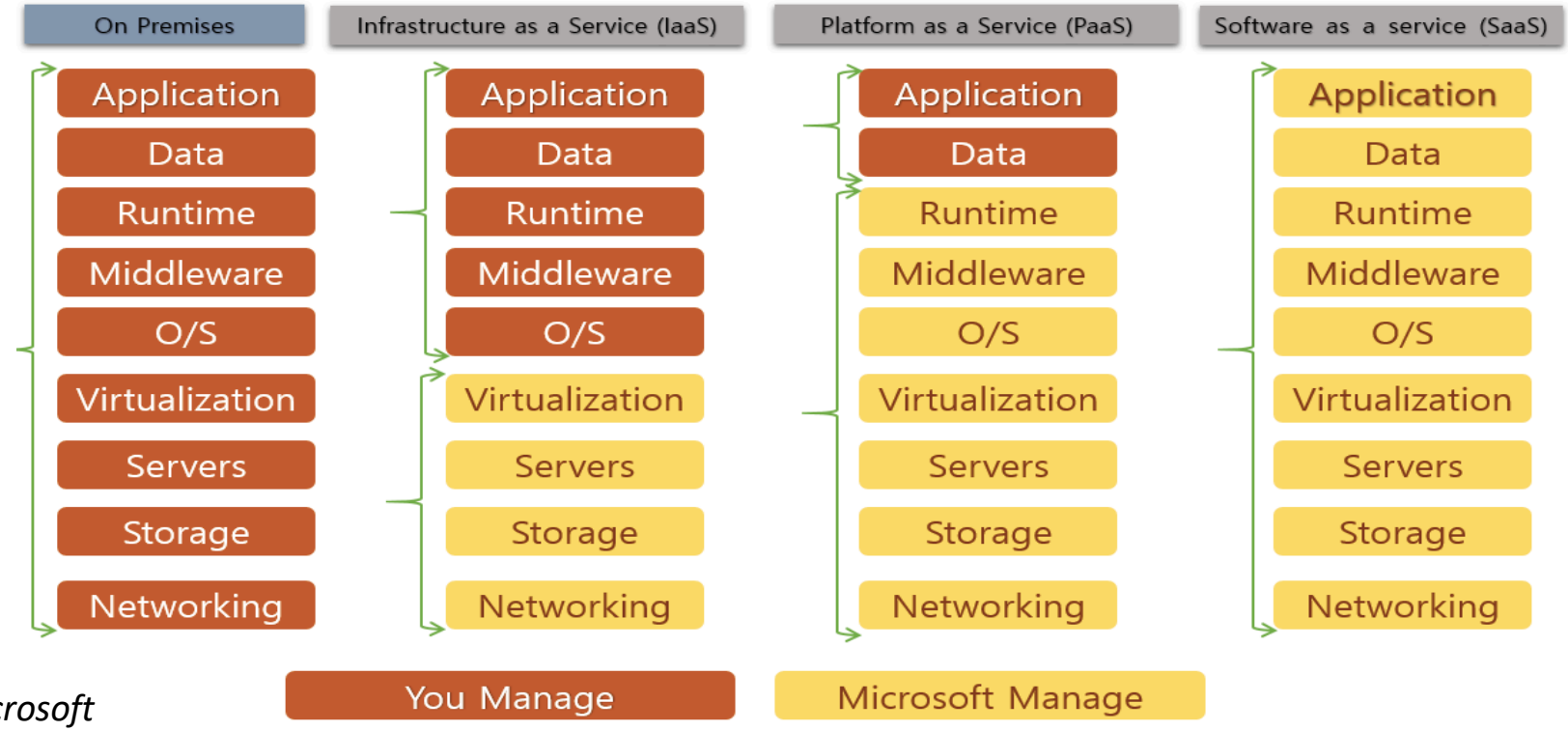
*Source: https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf*

# 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*

# IaaS.

- 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.

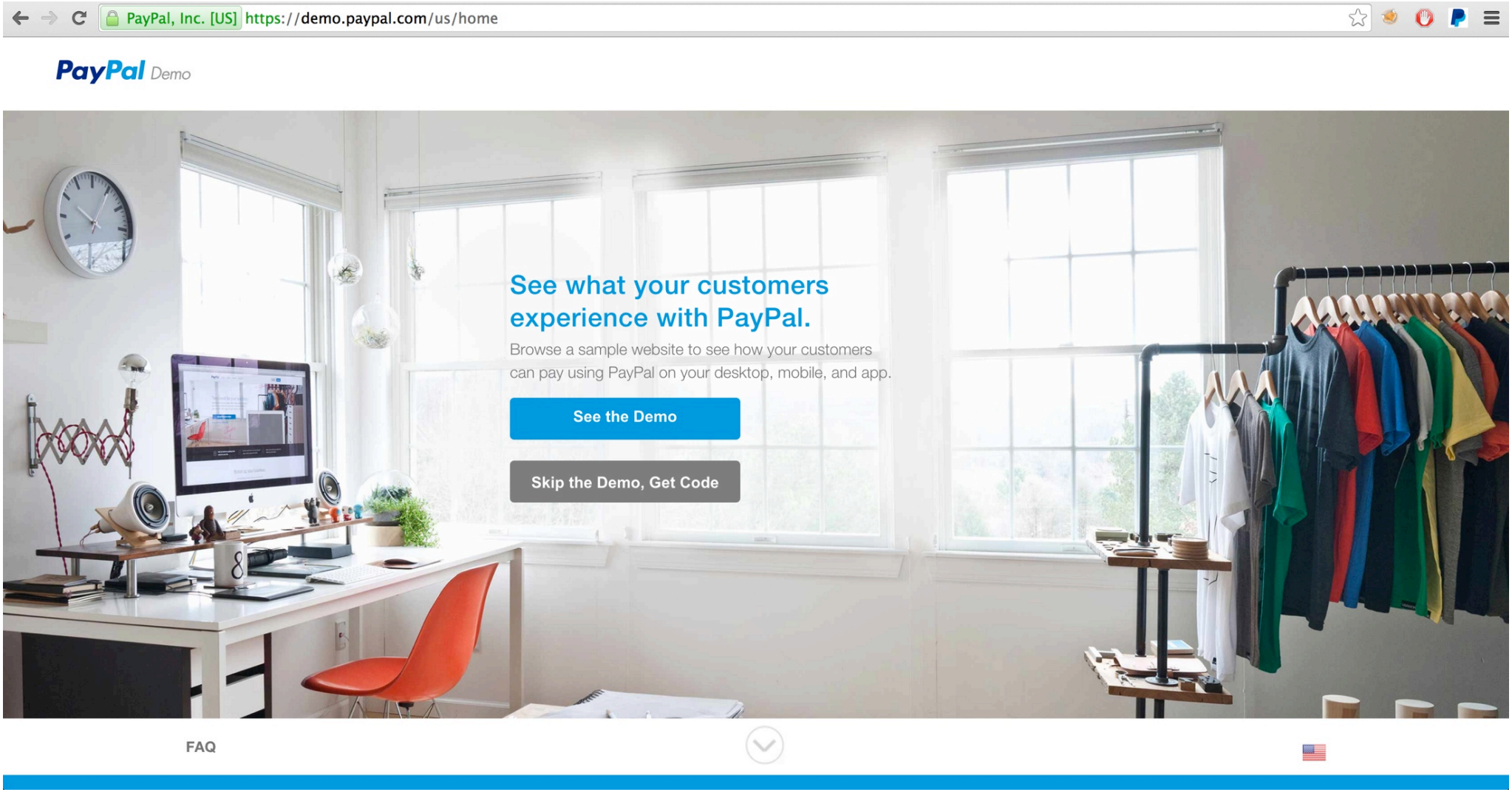
Migrate an on-premises application to a public cloud to optimize

- 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


PayPal, Inc. [US] https://demo.paypal.com/us/home
PayPal Demo
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
FAQ

PayPal, Inc. [US] https://demo.paypal.com/us/home

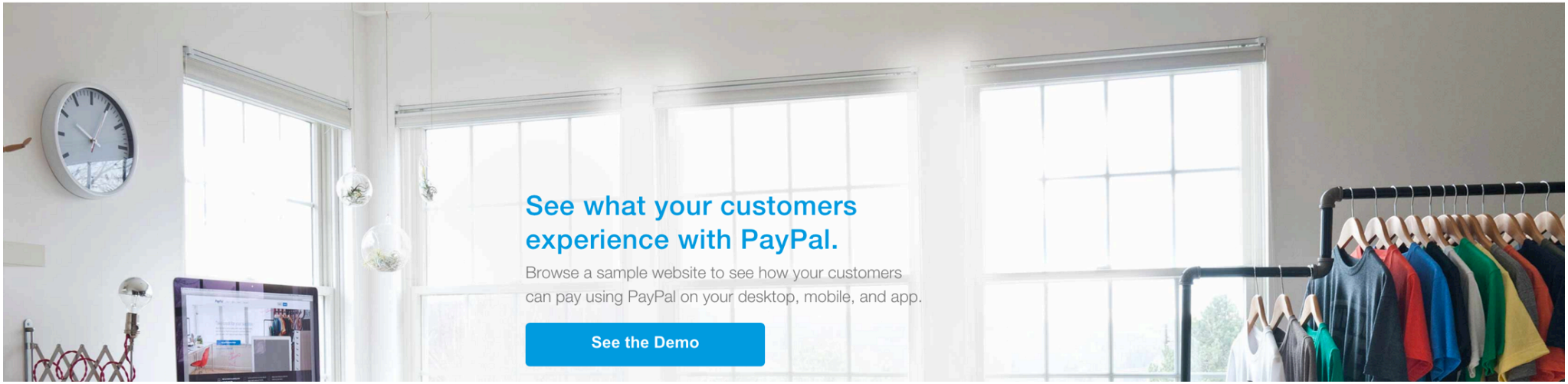
PayPal Optimizer Beta

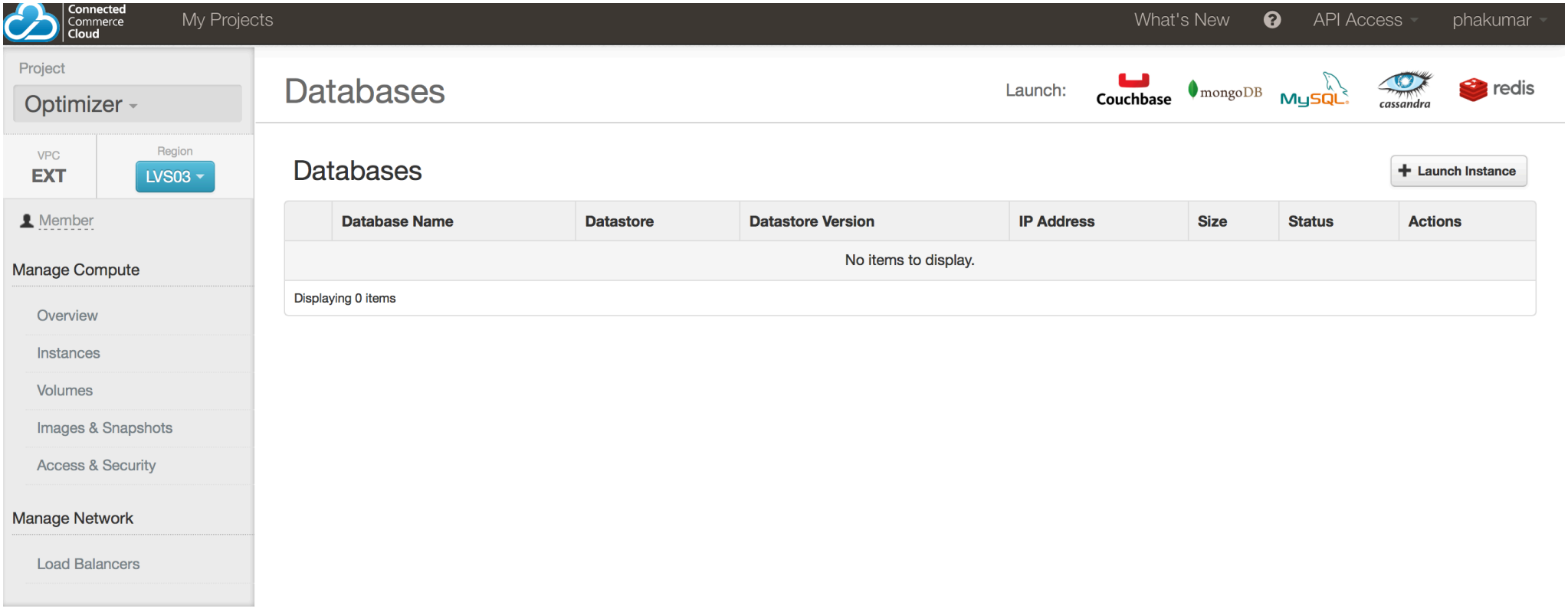
PayPal Optimizer tool helps you analyze and fine-tune your website. It recommends improvements, helps you enhance customer experience, increase customer conversions and maximize your profits.

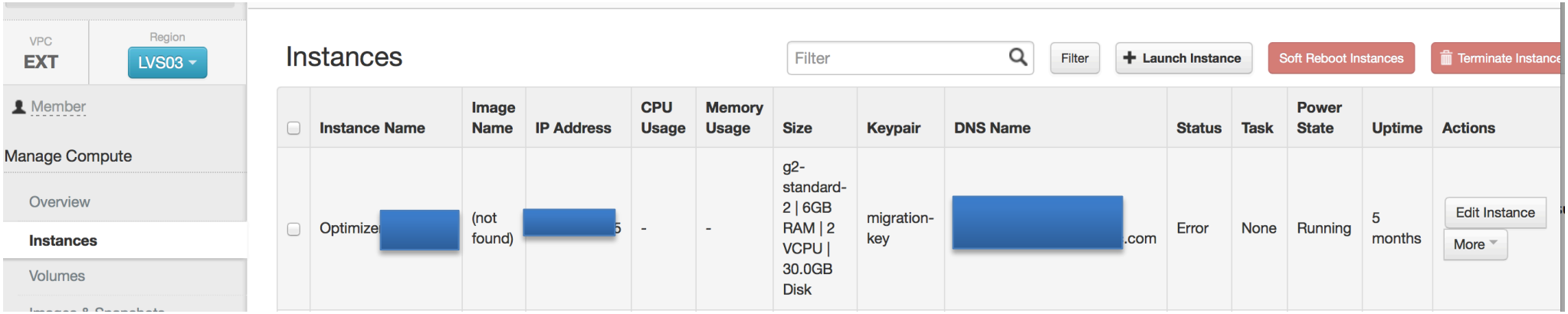
PayPal Optimizer scans the following pages from your website in the next steps. Please select the appropriate page as per the instructions in every page.

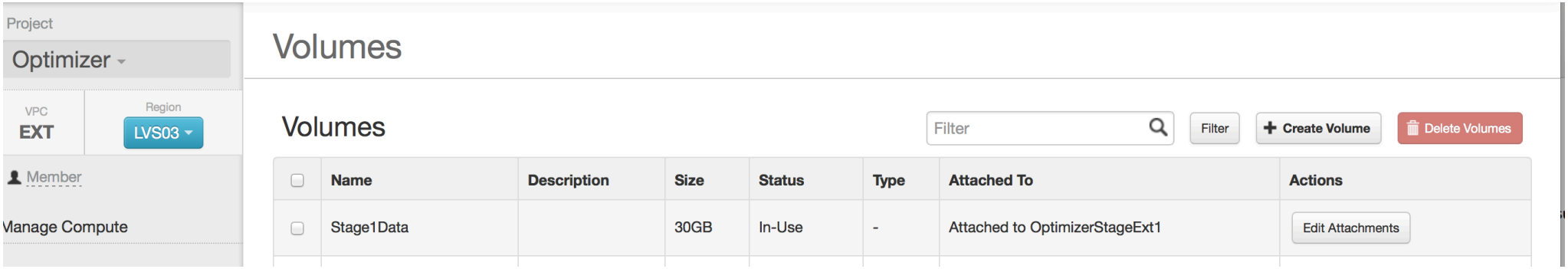
1. Home Page
2. Product Page
3. Shopping cart page
4. Payments Methods Page
5. Checkout Page

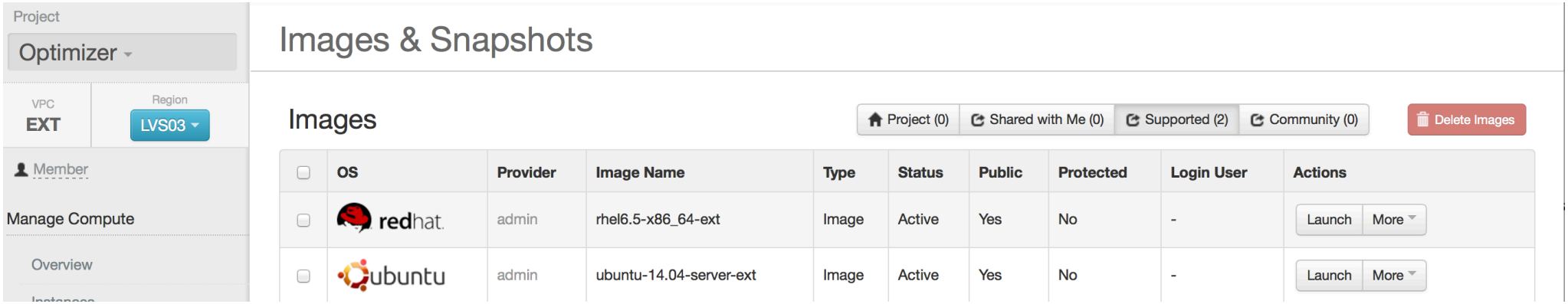
GET STARTED

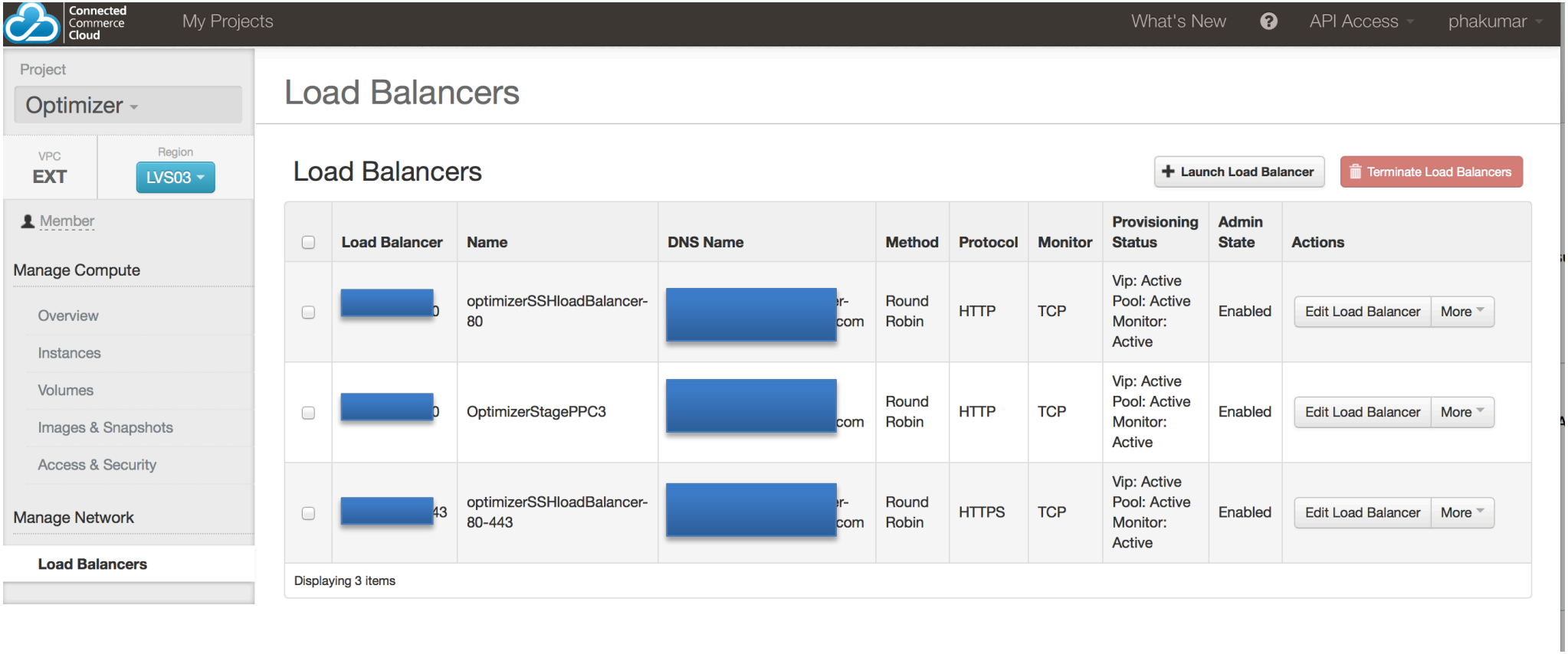



Connected Commerce Cloud
My Projects
What's New
API Access
phakumar
Project
Optimizer
VPC
EXT
Region
LVS03
Member
Manage Compute
Overview
Instances
Volumes
Images & Snapshots
Access & Security
Manage Network
Load Balancers
Databases
Launch:
Couchbase
mongoDB
MySQL
cassandra
redis
Databases
Launch Instance
Database Name
Datastore
Datastore Version
IP Address
Size
Status
Actions
No items to display.
Displaying 0 items


VPC
EXT
Region
LVS03
Member
Manage Compute
Overview
Instances
Volumes
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
Optimize
(not found)
-
-
g2-standard-2 | 6GB RAM | 2 VCPU | 30.0GB Disk
migration-key
.com
Error
None
Running
5 months
Edit Instance
More


Project
Optimizer
VPC
EXT
Region
LVS03
Member
Manage Compute
Volumes
Volumes
Filter
Filter
Create Volume
Delete Volumes
Name
Description
Size
Status
Type
Attached To
Actions
Stage1Data
30GB
In-Use
-
Attached to OptimizerStageExt1
Edit Attachments


Project
Optimizer
VPC
EXT
Region
LVS03
Member
Manage Compute
Overview
Images & Snapshots
Images
Project (0)
Shared with Me (0)
Supported (2)
Community (0)
Delete Images
OS
Provider
Image Name
Type
Status
Public
Protected
Login User
Actions
redhat
admin
rhel6.5-x86_64-ext
Image
Active
Yes
No
-
Launch
More
ubuntu
admin
ubuntu-14.04-server-ext
Image
Active
Yes
No
-
Launch
More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What's New
API Access
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Optimizer
VPC
EXT
Region
LVS03
Member
Manage Compute
Overview
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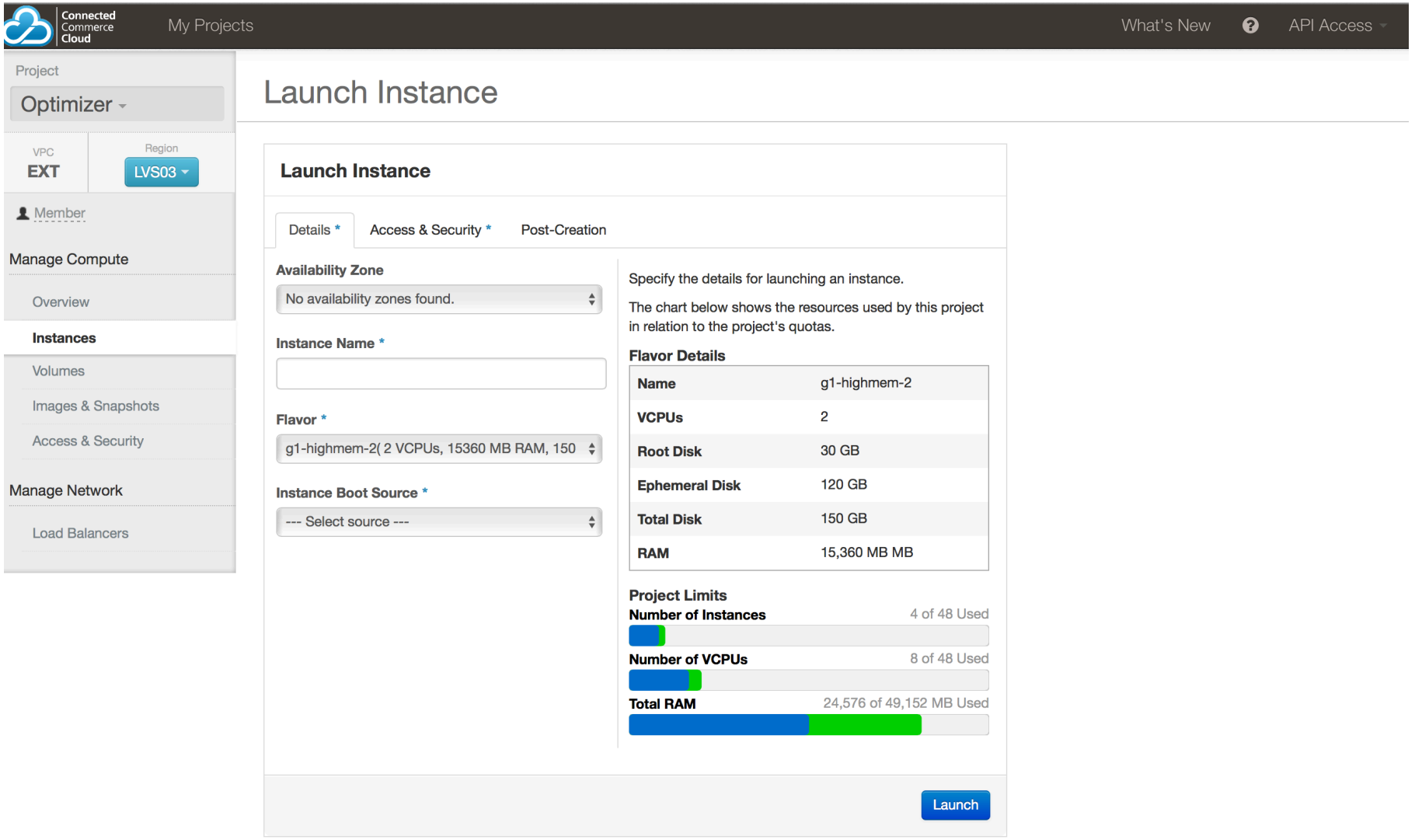
Volumes
Images & Snapshots
Access & Security
Manage Network
Load Balancers
Load Balancers
Load Balancers
Launch Load Balancer
Terminate Load Balancers
Load Balancer
Name
DNS Name
Method
Protocol
Monitor
Provisioning Status
Admin State
Actions
optimizerSSHloadBalancer-80
Round Robin
HTTP
TCP
Vip: Active Pool: Active Monitor: Active
Enabled
Edit Load Balancer
More
OptimizerStagePPC3
optimizerSSHloadBalancer-80-443
HTTPS
Displaying 3 items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EXT
Region
LVS03
Member
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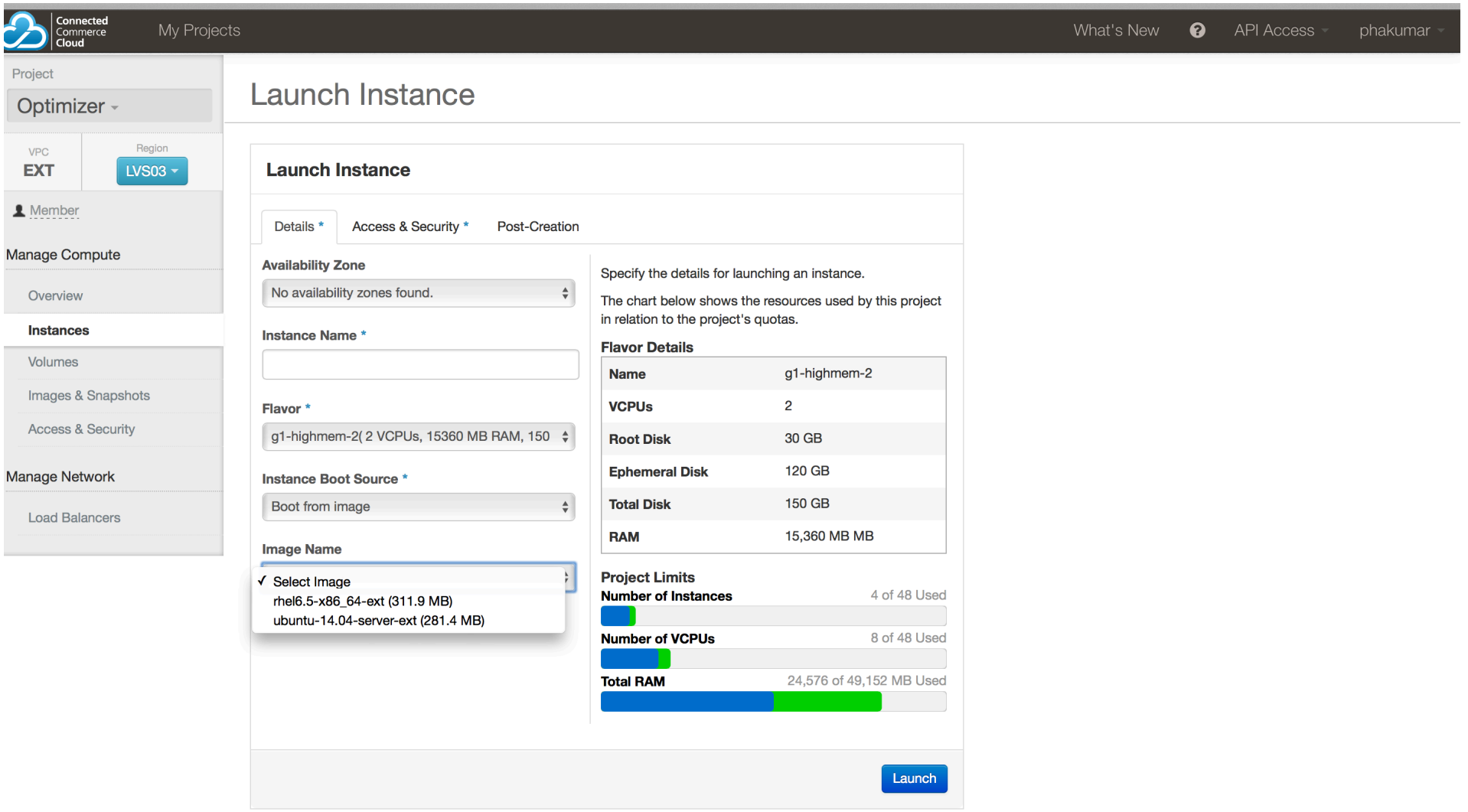
Manage Network
Load Balancers
Launch Instance
Launch Instance
Details *
Access & Security *
Post-Creation
Availability Zone
No availability zones found.
Instance Name *
Flavor *
g1-highmem-2( 2 VCPUs, 15360 MB RAM, 150
Instance Boot Source *
--- Select source ---
Specify the details for launching an 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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VPC
EXT
Region
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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 *
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.
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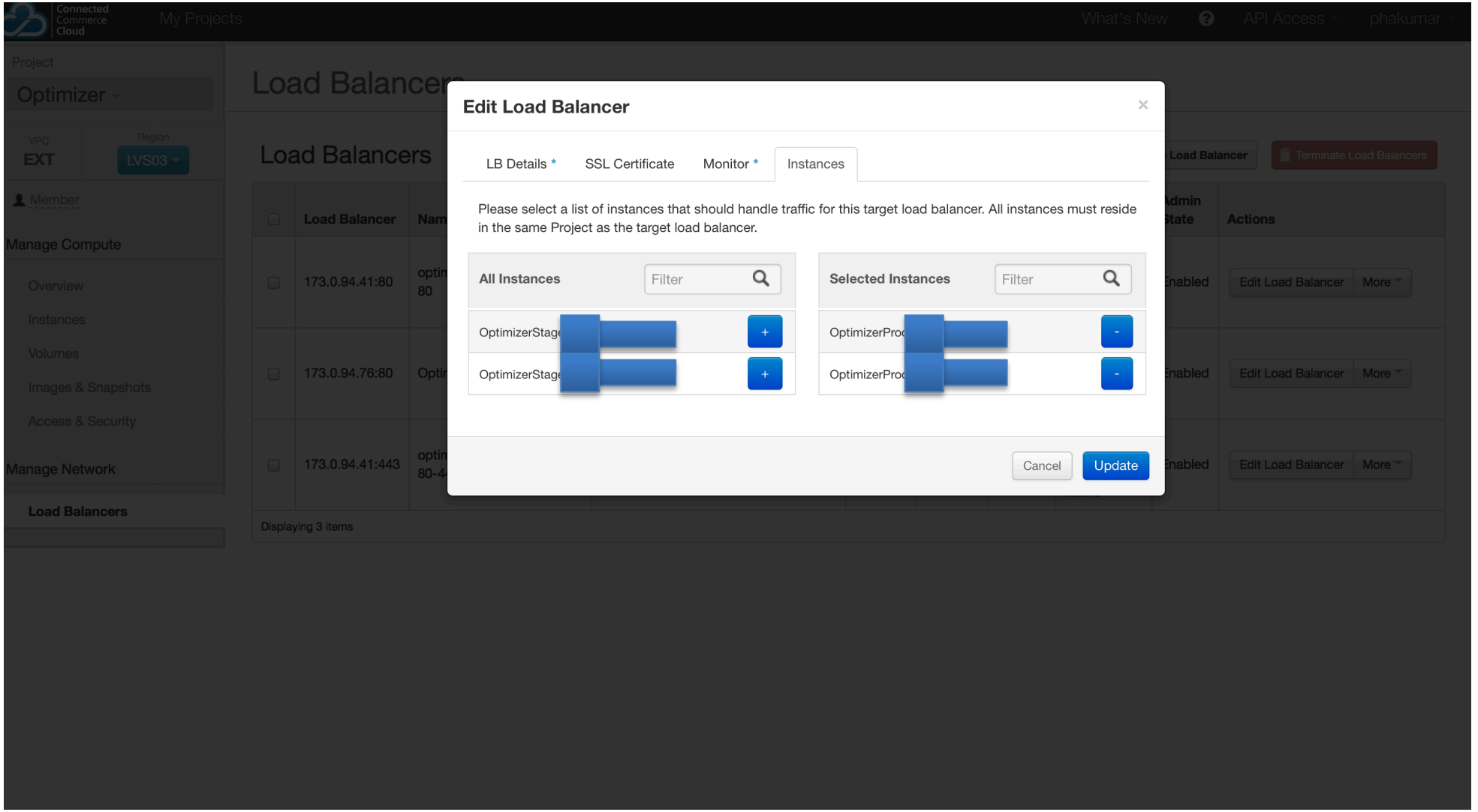
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Region
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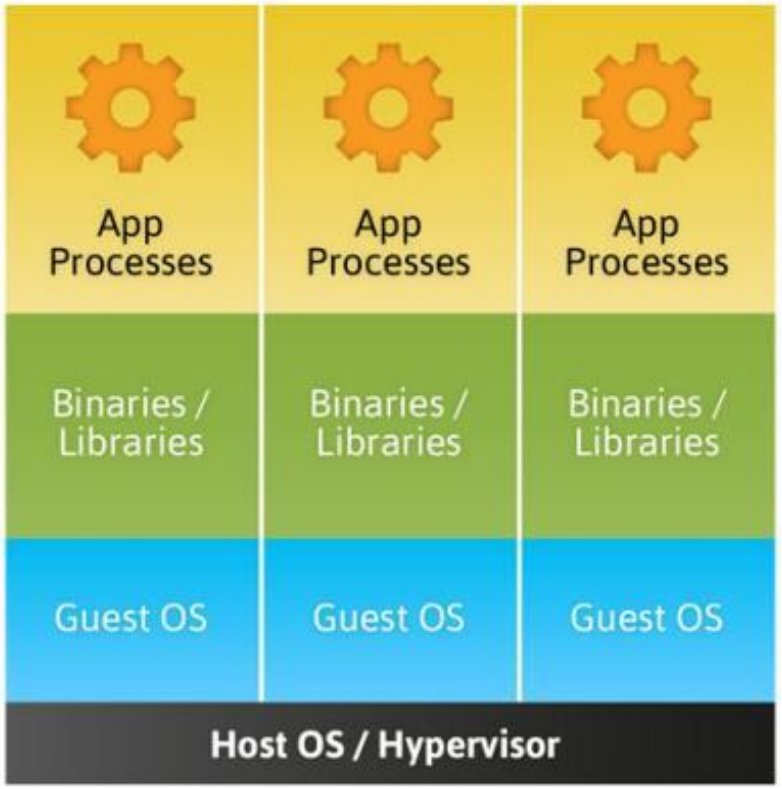
Load Balancers
Load Balancer
Terminate Load Balancers
Load Balancer
Actions
173.0.94.41:80
173.0.94.76:80
173.0.94.41:443
Edit Load Balancer
More
Displaying 3 items
Edit Load Balancer
LB Details *
SSL Certificate
Monitor *
Instances
Please select a list of instances that should handle traffic for this target load balancer. All instances must reside in the same Project as the target load balancer.
All Instances
Filter
Selected Instances
Filter
Cancel
Update

Current Cloud: Full OS for each VM




Source: http://www.linuxjournal.com

**The Problem with VMs**

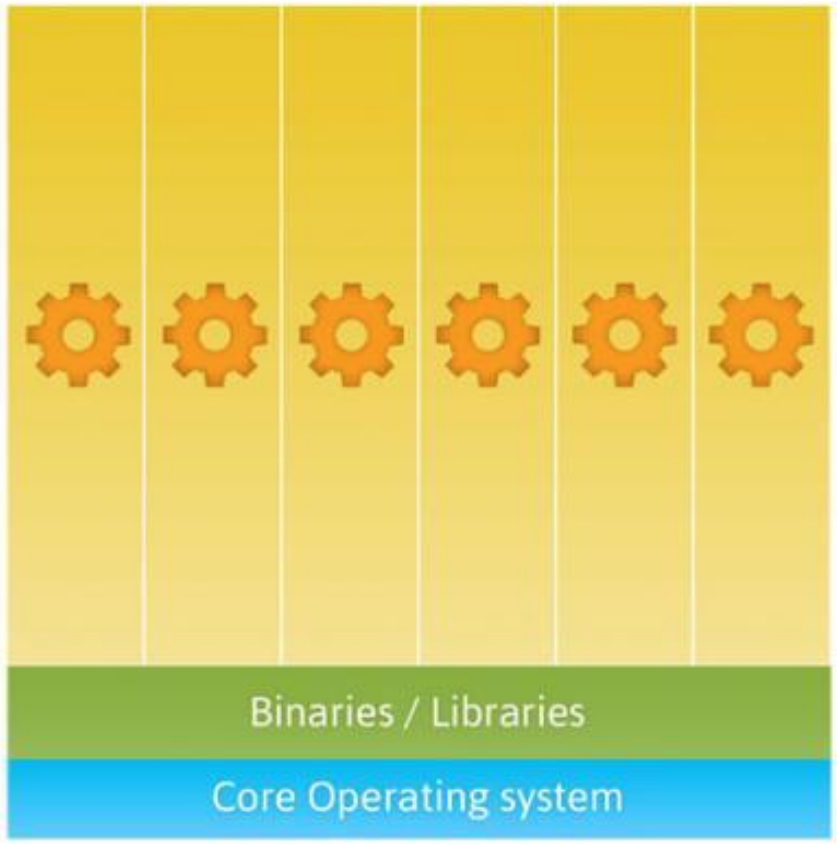
Penalties:

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 & Kubernates are the open-source leaders for containerization and orchestration

Demo of Docker Image creation
https://www.youtube.com/watch?v=NmUdaJOu5L4

# Thank You