

# Cloud Computing Intro

Les 6 20191024 - 20191107

M.DIMA



# Cloud Computing Is...

*On demand computing resources, delivered to you over  
the Internet*

*A computing service you traditionally did local (on-premises), now performed remotely, across the Internet (off-premises)*

# According to VMware...

*Cloud computing is an approach to computing that leverages the efficient pooling of an on-demand, self-managed, virtual infrastructure.”*

# Traits of a Cloud

## Elastic

Scales up or down quickly

## Metered

Pay only for what you use

## Self-Service

No (or reduced) need for IT Experts

# Benefits of Cloud Computing

Fast access to resources or applications you or your company needs

Only pay for what you use

No capital expenditure to get started

Potential to eliminate the need for local IT staff to maintain infrastructure and applications

Potential to lower costs

Deploy what you need, yourself, with self-service

Allow IT staff to instead focus on the business

# Risks of Cloud Computing

- Placing your trust in the cloud provider**
- Potential for data loss**
- Potential for slow access to your data**
- Potential questions related to legal/regulatory**
- Potential for loss of customization**
- Potential for unknown costs**

# Cloud Computing Comes in Many Forms...

# Software as a Service



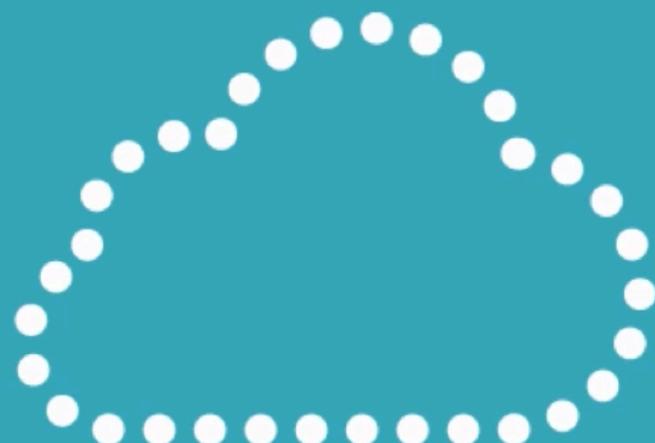
# Infrastructure as a Service



# Platform as a Service



# (everything) as a Service (?aaS)



# What Has Cloud Been Called in the Past?

**Centralized computing**

**Grid computing**

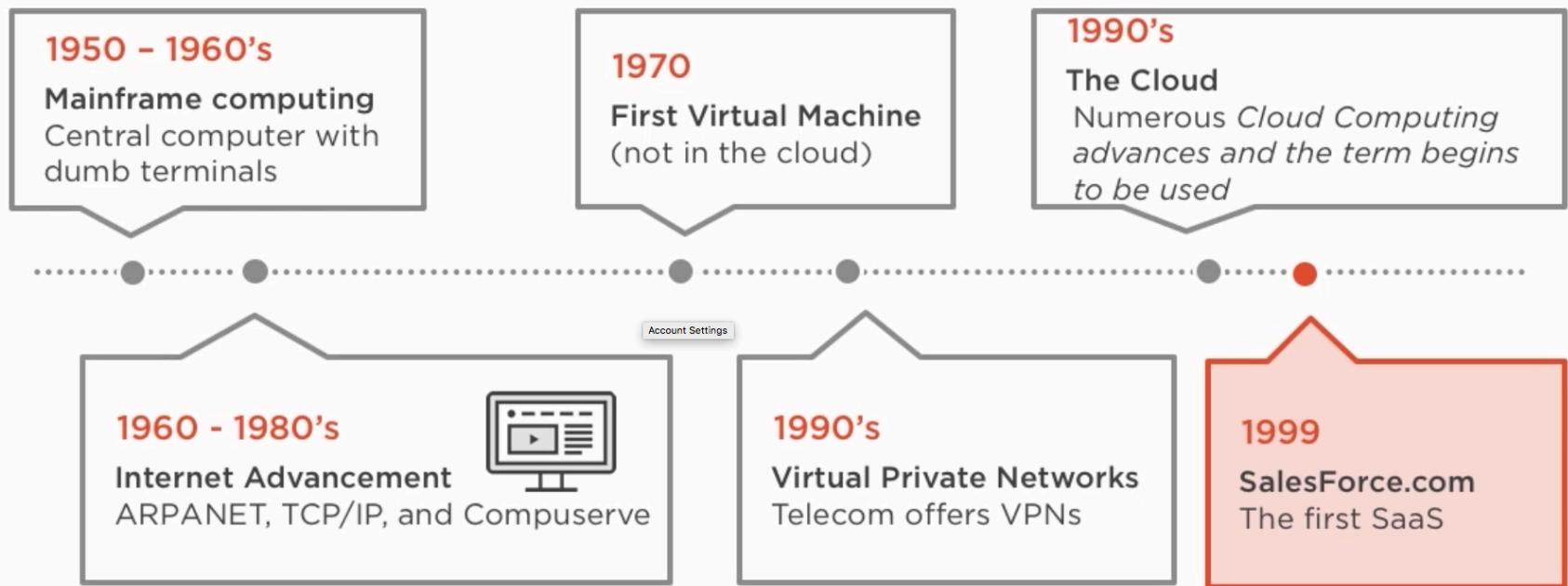
**Distributed computing**

**On-demand computing**

**Hosting**

**Application service provider (ASP)**

# History of Cloud Computing



# History of Cloud Computing

**2006**

**Amazon.com**

Amazon launched their EC2 IaaS as a beta

**2008**

**Microsoft Azure**

Azure IaaS were announced

**2016**

**AWS EC2 Revenue**

As of 2016, Revenue now \$12.22 Billion

**2006**

**Google Docs**

Google Docs was launched



**2013**

**Google Compute Engine**

GCE IaaS released to GA

**2017**

**SalesForce Revenue**

As of 2016, Revenue now estimated to be over \$8 Billion

Demo



## Cloud Computing in Action....



## Home

Search users, groups, settings or tasks



Go to the old admin center

## Users &gt;

- + Add a user
- Delete a user
- Edit a user
- Reset a password

## Billing &gt;

- Total balance: \$0.00
- Update payment details
- View my bill

## Office software

- Install my software
- Share the download link
- Software download settings
- Troubleshoot installation

## Domains &gt;

- + Add a domain
- Delete a domain
- Edit a domain
- Check health

## Message center &gt;

- New feature: Office 365 Groups retention polici... Apr 6 X
  - Updated feature: Planner task assignments Apr 3 X
  - Updated feature: Manage Permissions in OneDr... Mar 31 X
- 31 unread messages

## Service health &gt;

## Active users &gt;

Need help?

Feedback

# Cloudcomputing leveranciers

- Amazon <https://eu-central-1.console.aws.amazon.com/console/home?region=eu-central-1#>
- Google <https://console.cloud.google.com/compute/>
- Azure <https://portal.azure.com/>
- Digital Ocean <https://cloud.digitalocean.com/>
- MVPS/Time4VPS/Vultr/Kamatera/TransIP/....



## History

Console Home

Search services

Group A-Z

## Compute

- EC2
- EC2 Container Service
- Lightsail
- Elastic Beanstalk
- Lambda
- Batch

## Developer Tools

- CodeCommit
- CodeBuild
- CodeDeploy
- CodePipeline
- X-Ray

## Analytics

- Athena
- EMR
- CloudSearch
- Elasticsearch Service
- Kinesis
- Data Pipeline
- QuickSight

## Application Services

- Step Functions
- SWF
- API Gateway
- Elastic Transcoder

## Storage

- S3
- EFS
- Glacier
- Storage Gateway

## Management Tools

- CloudWatch
- CloudFormation
- CloudTrail
- Config
- OpsWorks
- Service Catalog
- Trusted Advisor
- Managed Services

## Artificial Intelligence

- Lex
- Polly
- Rekognition
- Machine Learning

## Business Productivity

- WorkDocs
- WorkMail
- Amazon Chime

## Database

- RDS
- DynamoDB
- ElastiCache
- Redshift**

## Security, Identity &amp; Complia...

- IAM
- Inspector
- Certificate Manager
- Directory Service
- WAF & Shield
- Compliance Reports

## Internet Of Things

- AWS IoT

## Desktop &amp; App Streaming

- WorkSpaces
- AppStream 2.0

## Networking &amp; Content Deliv...

- VPC

## Contact Center

- Amazon Connect

## Game Development



Services

Resource Groups



David M. Davis

N. Virginia

Support

## EC2 Dashboard

Events

Tags

Reports

Limits

### INSTANCES

Instances

Spot Requests

Reserved Instances

Scheduled Instances

Dedicated Hosts

### IMAGES

AMIs

Bundle Tasks

### ELASTIC BLOCK STORE

Volumes

Snapshots

### NETWORK & SECURITY

Security Groups

Elastic IPs

Placement Groups

Key Pairs

Network Interfaces

### LOAD BALANCING

## Resources

You are using the following Amazon EC2 resources in the US East (N. Virginia) region:

0 Running Instances

0 Dedicated Hosts

0 Volumes

1 Key Pairs

0 Placement Groups

0 Elastic IPs

0 Snapshots

0 Load Balancers

3 Security Groups

## Account Attributes

Supported Platforms

VPC

Default VPC

vpc-52017336

Resource ID length management

## Additional Information

[Getting Started Guide](#)[Documentation](#)[All EC2 Resources](#)[Forums](#)[Pricing](#)[Contact Us](#)

## AWS Marketplace

Find free software trial products in the AWS Marketplace from the [EC2 Launch Wizard](#). Or try these popular AMIs:

[Barracuda NextGen Firewall F-Series - PAYG](#)

Provided by Barracuda Networks, Inc.

Rating ★★★★☆

Starting from \$0.50/hr or from \$1,500/hr

## Create Instance

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

[Launch Instance](#)

Note: Your instances will launch in the US East (N. Virginia) region

## Service Health

### Service Status:

US East (N. Virginia):  
This service is operating normally

### Availability Zone Status:

— us-east-1a —

## Scheduled Events

### US East (N. Virginia):

No events



1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Add Tags

6. Configure Security Group

7. Review

[Cancel and Exit](#)

## Step 1: Choose an Amazon Machine Image (AMI)

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace; or you can select one of your own AMIs.

### Quick Start

◀ ⏪ 1 to 31 of 31 AMIs ⏩ ▶

My AMIs

AWS Marketplace

Community AMIs

 Free tier only (i)**Amazon Linux AMI 2017.03.0 (HVM), SSD Volume Type - ami-22ce4934**[Select](#)

Amazon Linux

Free tier eligible

The Amazon Linux AMI is an EBS-backed, AWS-supported image. The default image includes AWS command line tools, Python, Ruby, Perl, and Java. The repositories include Docker, PHP, MySQL, PostgreSQL, and other packages.

64-bit

Root device type: ebs Virtualization type: hvm

**Red Hat Enterprise Linux 7.3 (HVM), SSD Volume Type - ami-b63769a1**[Select](#)

Red Hat

Free tier eligible

Red Hat Enterprise Linux version 7.3 (HVM), EBS General Purpose (SSD) Volume Type

64-bit

Root device type: ebs Virtualization type: hvm

**SUSE Linux Enterprise Server 12 SP2 (HVM), SSD Volume Type - ami-fde4ebea**[Select](#)

SUSE Linux

Free tier eligible

SUSE Linux Enterprise Server 12 Service Pack 2 (HVM), EBS General Purpose (SSD) Volume Type. Public Cloud, Advanced Systems Management, Web and Scripting, and Legacy modules enabled.

64-bit

Root device type: ebs Virtualization type: hvm

**Ubuntu Server 16.04 LTS (HVM), SSD Volume Type - ami-f4cc1de2**[Select](#)

Ubuntu Server 16.04 LTS (HVM).EBS General Purpose (SSD) Volume Type. Support available from Canonical





1. Choose AMI

2. Choose Instance Type

3. Configure Instance

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7. Review

## Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your applications. [Learn more](#) about instance types and how they can meet your computing needs.

Filter by: All instance types

Current generation

Show/Hide Columns

Currently selected: t2.micro (Variable ECUs, 1 vCPUs, 2.5 GHz, Intel Xeon Family, 1 GiB memory, EBS only)

	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Support
<input type="checkbox"/>	General purpose	t2.nano	1	0.5	EBS only	-	Low to Moderate	Yes
<input checked="" type="checkbox"/>	General purpose	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.small	1	2	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.medium	2	4	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.large	2	8	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.xlarge	4	16	EBS only	-	Moderate	Yes

Cancel

Previous

Review and Launch

Next: Configure Instance Details

Feedback

English

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1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Add Tags

6. Configure Security Group

7. Review

## Step 7: Review Instance Launch

Root Device Type: ebs

Virtualization:

### Instance Type

Instance Type	ECUs
t2.micro	Variable

### Security Groups

Security group name	Launch
Description	Launch

Type (i)  
SSH

### Instance Details

### Storage

### Tags

### Select an existing key pair or create a new key pair



A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about [removing existing key pairs from a public AMI](#).

Choose an existing key pair

Create a new key pair

Proceed without a key pair

I acknowledge that I have access to the selected private key file (david.pem), and that without this file, I won't be able to log into my instance.

Cancel

Launch Instances

Edit instance type

Network Performance

Low to Moderate

Edit security groups

Cancel (i)

/0

Edit instance details

Edit storage

Edit tags

Cancel

Previous

Launch

Feedback

English

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associatie KU Leuven





Services ▾

Resource Groups ▾



David M. Davis ▾

N. Virginia ▾

Support ▾

EC2 Dashboard

Events

Tags

Reports

Limits

INSTANCES

**Instances**

Spot Requests

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ELASTIC BLOCK STORE

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NETWORK &amp; SECURITY

Security Groups

Elastic IPs

Placement Groups

Key Pairs

**Launch Instance**

Connect

Actions ▾



search : i-08471502cb9ca884b Add filter



K &lt; 1 to 1 of 1 &gt; |

Name Instance ID Instance Type Availability Zone Instance State Status Checks Alarm Status Public DNS (IPv4)

i-08471502cb9ca884b t2.micro us-east-1c running 2/2 checks ... None ec2-52-3-230-251.co

Instance: **i-08471502cb9ca884b** Public DNS: ec2-52-3-230-251.compute-1.amazonaws.com**Description**

Status Checks

Monitoring

Tags

Instance ID i-08471502cb9ca884b

Public DNS (IPv4) ec2-52-3-230-251.compute-1.amazonaws.com

Instance state running

IPv4 Public IP 52.3.230.251

Feedback

English

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daviddavissecuritykey.pem

Show All



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## Connect To Your Instance



I would like to connect with  A standalone SSH client

A Java SSH Client directly from my browser (Java required)

### To access your instance:

1. Open an SSH client. (find out how to [connect using PuTTY](#))
2. Locate your private key file (david davis security key pair.pem). The wizard automatically detects the key you used to launch the instance.
3. Your key must not be publicly viewable for SSH to work. Use this command if needed:

```
chmod 400 david davis security key pair.pem
```

4. Connect to your instance using its Public DNS:

`ec2-52-3-230-251.compute-1.amazonaws.com`

### Example:

```
ssh -i "david davis security key pair.pem" ec2-user@ec2-52-3-230-251.compute-1.amazonaws.com
```

Please note that in most cases the username above will be correct, however please ensure that you read your AMI usage instructions to ensure that the AMI owner has not changed the default AMI username.

If you need any assistance connecting to your instance, please see our [connection documentation](#).

[Close](#)

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[Show All](#)

daviddavissecuritykey....pem



1. ec2-user@ip-172-31-66-55:~ (ssh)

David-iMac-5K:~ david\$ ssh -i "daviddavissecuritykeypair.pem" ec2-user@ec2-52-3-230-251.compute-1.amazonaws.com

Last login: Fri Apr 7 17:25:57 2017 from 216.16.219.247.dyn-cm-pool47.pool.hargray.net

\_\_| \_\_|\_ )  
\_| ( \_ / Amazon Linux AMI  
\_\_|\\_\|\_||

<https://aws.amazon.com/amazon-linux-ami/2017.03-release-notes/>

2 package(s) needed for security, out of 2 available

Run "sudo yum update" to apply all updates.

[ec2-user@ip-172-31-66-55 ~]\$

[ec2-user@ip-172-31-66-55 ~]\$

[ec2-user@ip-172-31-66-55 ~]\$

[ec2-user@ip-172-31-66-55 ~]\$



```
iTerm2 Shell Edit View Profiles Toolbelt Window Help 1. ec2-user@ip-172-31-66-55:~ (ssh)
root      2386  1  0 17:22 ?          00:00:00 /usr/sbin/acpid
root      2526  1  0 17:22 ?          00:00:00 /usr/sbin/sshd
ntp       2536  1  0 17:22 ?          00:00:00 ntpd -u ntp:ntp -p /var/run/ntp.pid -g
root      2556  1  0 17:22 ?          00:00:00 sendmail: accepting connections
smmsp    2565  1  0 17:22 ?          00:00:00 sendmail: Queue runner@01:00:00 for /var/
root      2577  1  0 17:22 ?          00:00:00 crond
root      2591  1  0 17:22 ?          00:00:00 /usr/sbin/atd
root      2626  1  0 17:22 ttys0   00:00:00 /sbin/agetty ttys0 9600 vt100-nav
root      2628  1  0 17:22 tty1    00:00:00 /sbin/mingetty /dev/tty1
root      2631  1  0 17:22 tty2    00:00:00 /sbin/mingetty /dev/tty2
root      2633  1  0 17:22 tty3    00:00:00 /sbin/mingetty /dev/tty3
root      2635  1  0 17:22 tty4    00:00:00 /sbin/mingetty /dev/tty4
root      2637  1  0 17:22 tty5    00:00:00 /sbin/mingetty /dev/tty5
root      2639  1530 0 17:22 ?        00:00:00 /sbin/udevd -d
root      2640  1  0 17:22 ttys6   00:00:00 /sbin/mingetty /dev/ttys6
root      2681  2526 0 17:28 ?        00:00:00 sshd: ec2-user [priv]
ec2-user  2683  2681 0 17:28 ?        00:00:00 sshd: ec2-user@pts/0
ec2-user  2684  2683 0 17:28 pts/0   00:00:00 -bash
ec2-user  2706  2684 0 17:29 pts/0   00:00:00 ps -ef
[ec2-user@ip-172-31-66-55 ~]$
```

# Summary



**What is it?**

**Traits of a Cloud**

**Benefits of Cloud Computing**

**Risks of Cloud Computing**

**Many Forms of Cloud Computing**

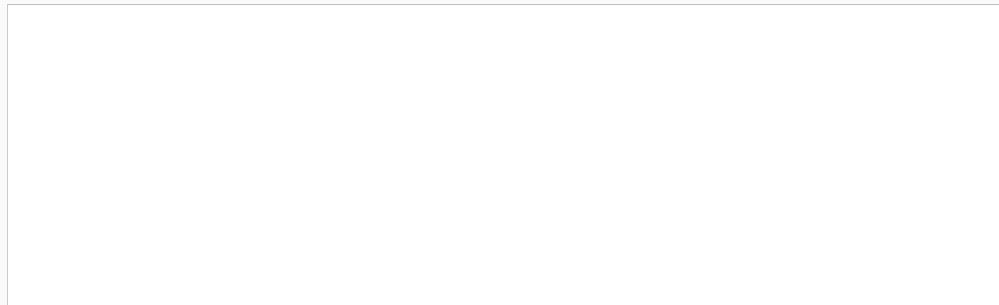
**History of Cloud Computing**

**Demo - Cloud Computing in Action**



# Infrastructure as a Service (IaaS)

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# Overview



**What is Virtualization?**

**What is a Virtual Machine?**

**What is a Container?**

**Private Cloud, Hybrid Cloud, and Public Cloud**

**Virtualization vs Private Cloud**

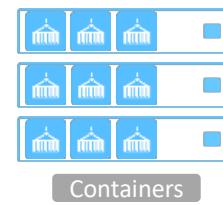
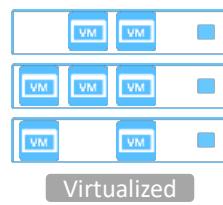
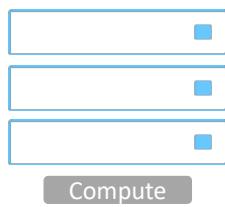
**IaaS Pricing Models**

**Service Level Agreements (SLA)**

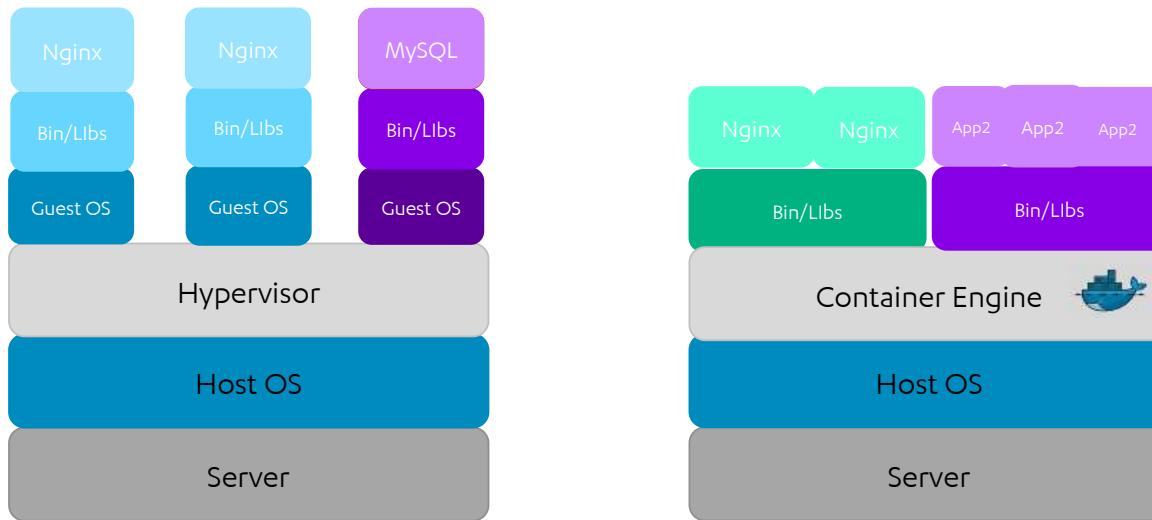
**Migrating to the Cloud**



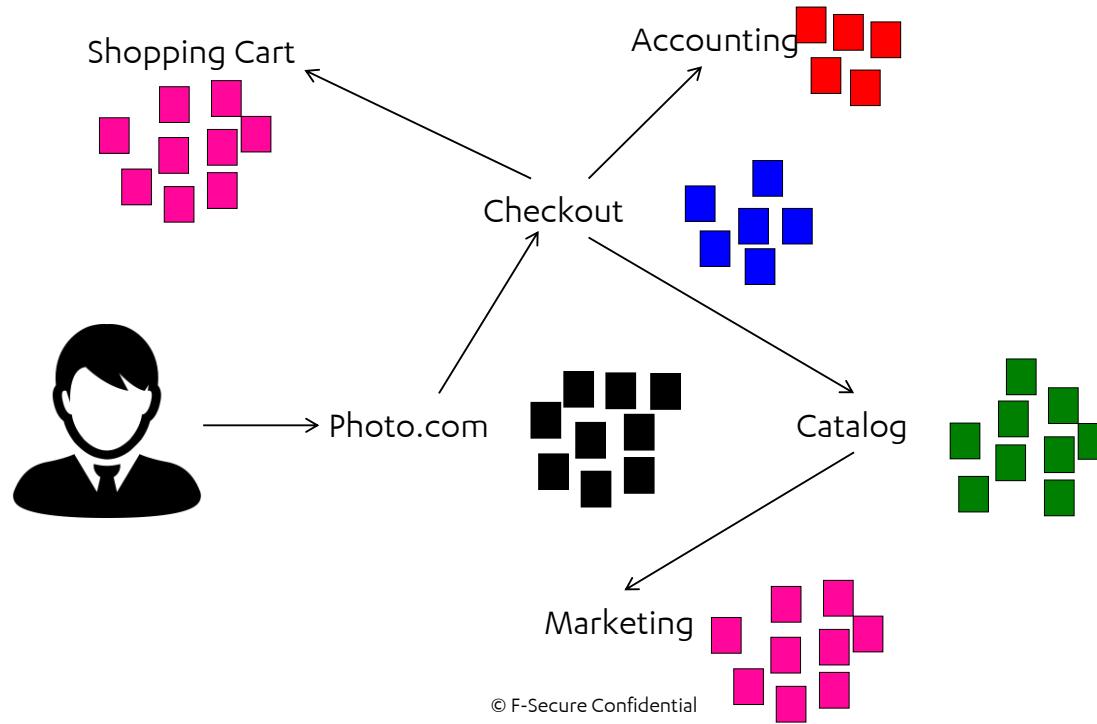
# VIRTUALIZATION TECHNOLOGY



# DOCKER AT A GLANCE

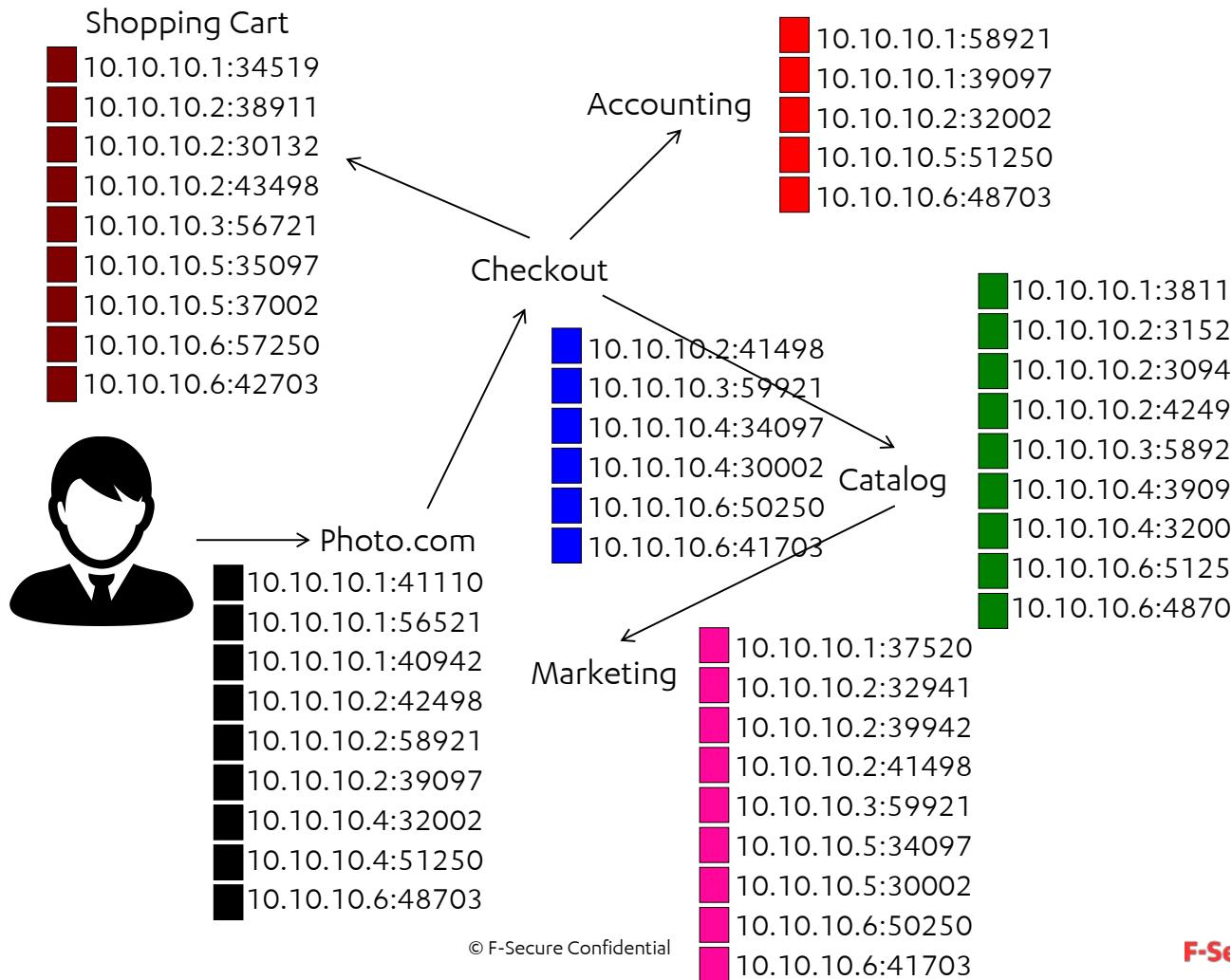


# MICRO SERVICES



20

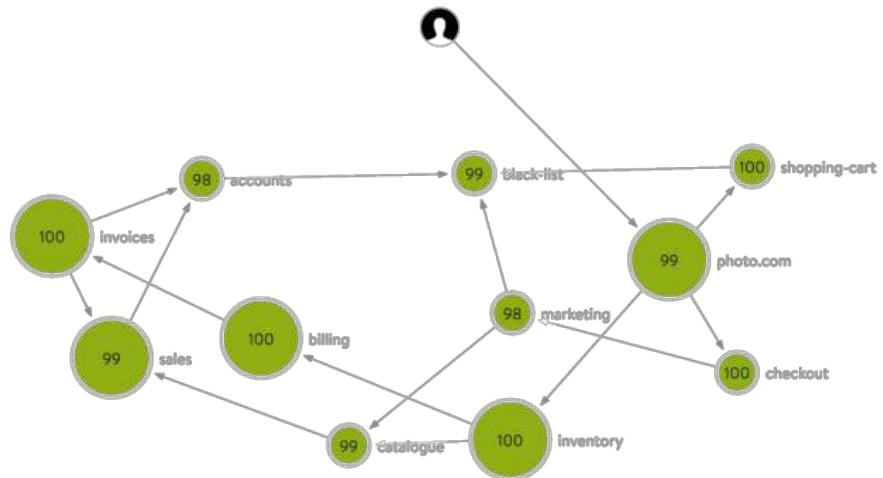




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F-S

# MICRO SERVICES



Source: <https://www.avinetworks.com>

Virtualization is the logical  
division of physical  
computing resources

# Virtualization

Started in the 1960's as a way to slice up mainframe resources

There are many resources that can be virtualized – server (compute), storage, and network

There are many forms of virtualization – including server and desktop

Virtualization was popularized in the enterprise datacenter with VMware ESX Server, launched in 2001



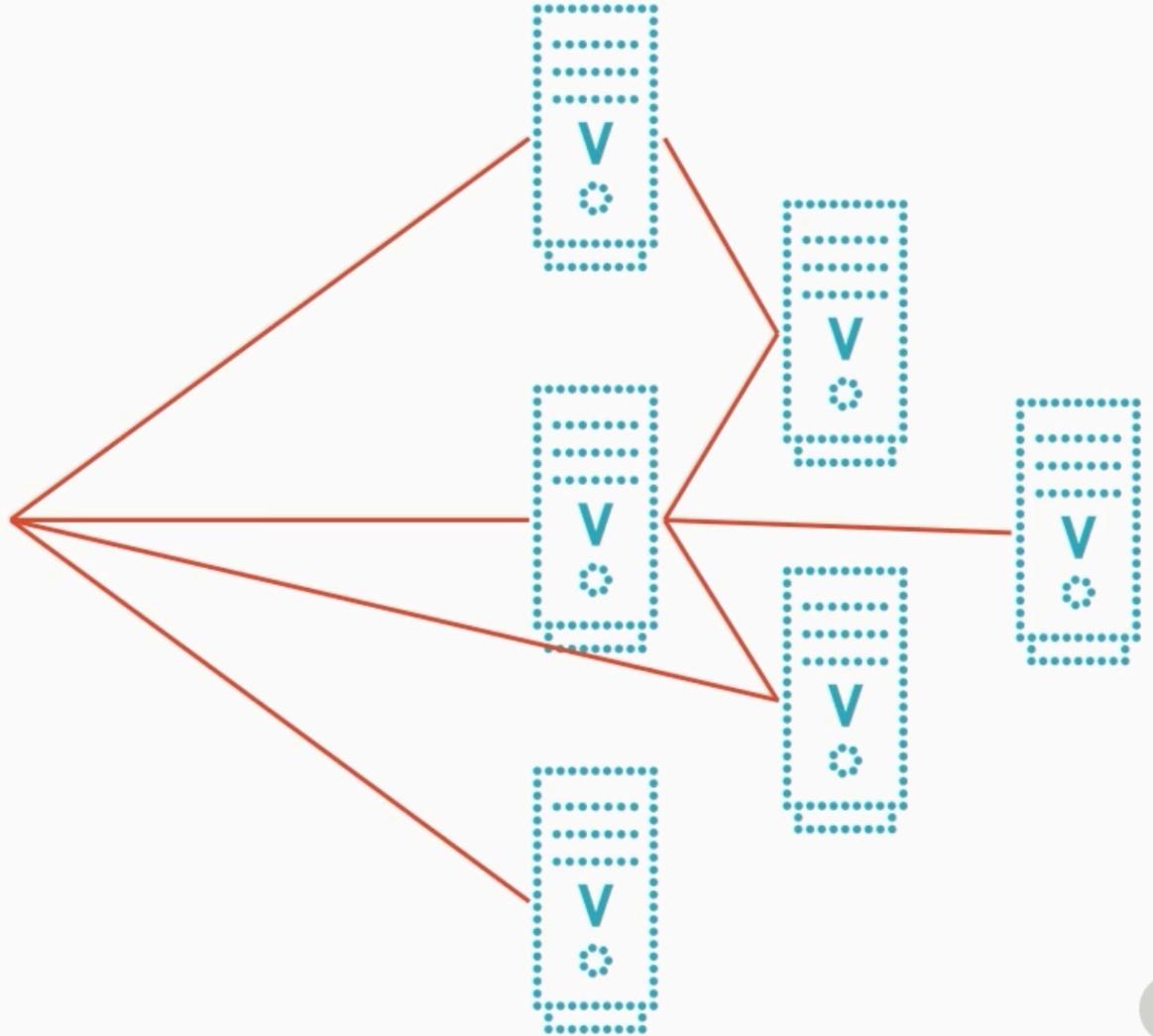
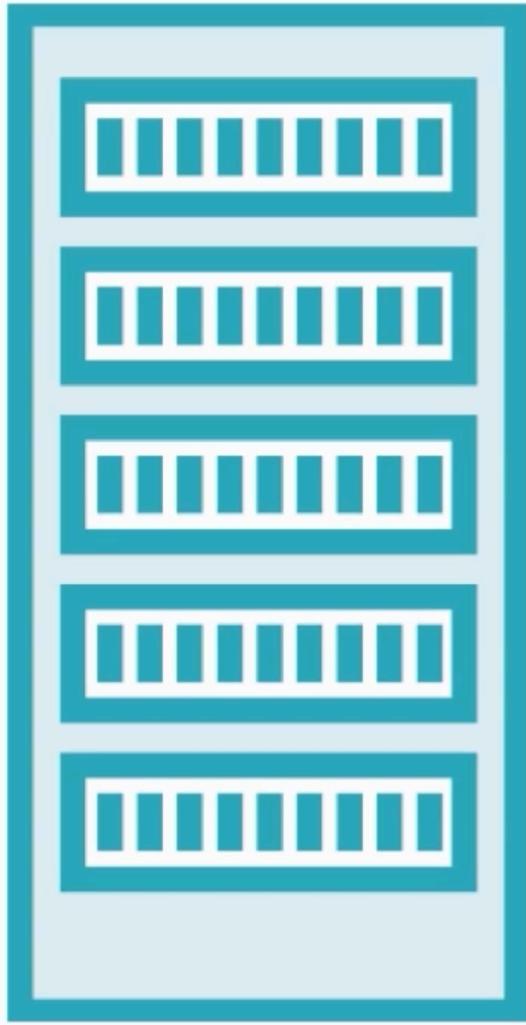
Running on a hypervisor, a virtual machine is software-based instance of physical server where a guest operating system has access to emulated virtual hardware.

# Virtual Machine

A hypervisor is loaded on the virtual host to run virtual machines

Virtual guests run on a virtual host, which provides the physical resources

An operating system and applications are loaded in the guest



A container is operating-system level virtualization where the OS kernel provides isolated user spaces to run specific applications.

# Containers

Have been around for a long time  
Could run inside a virtual machine  
Have less overhead and faster startup time than virtual machines  
Have been popularized with the excitement around Docker containers

Mac OS X Dock icons

Apple Kitematic (Beta) File Edit View Window Help

Containers + NEW

Search for Docker Images from Docker Hub

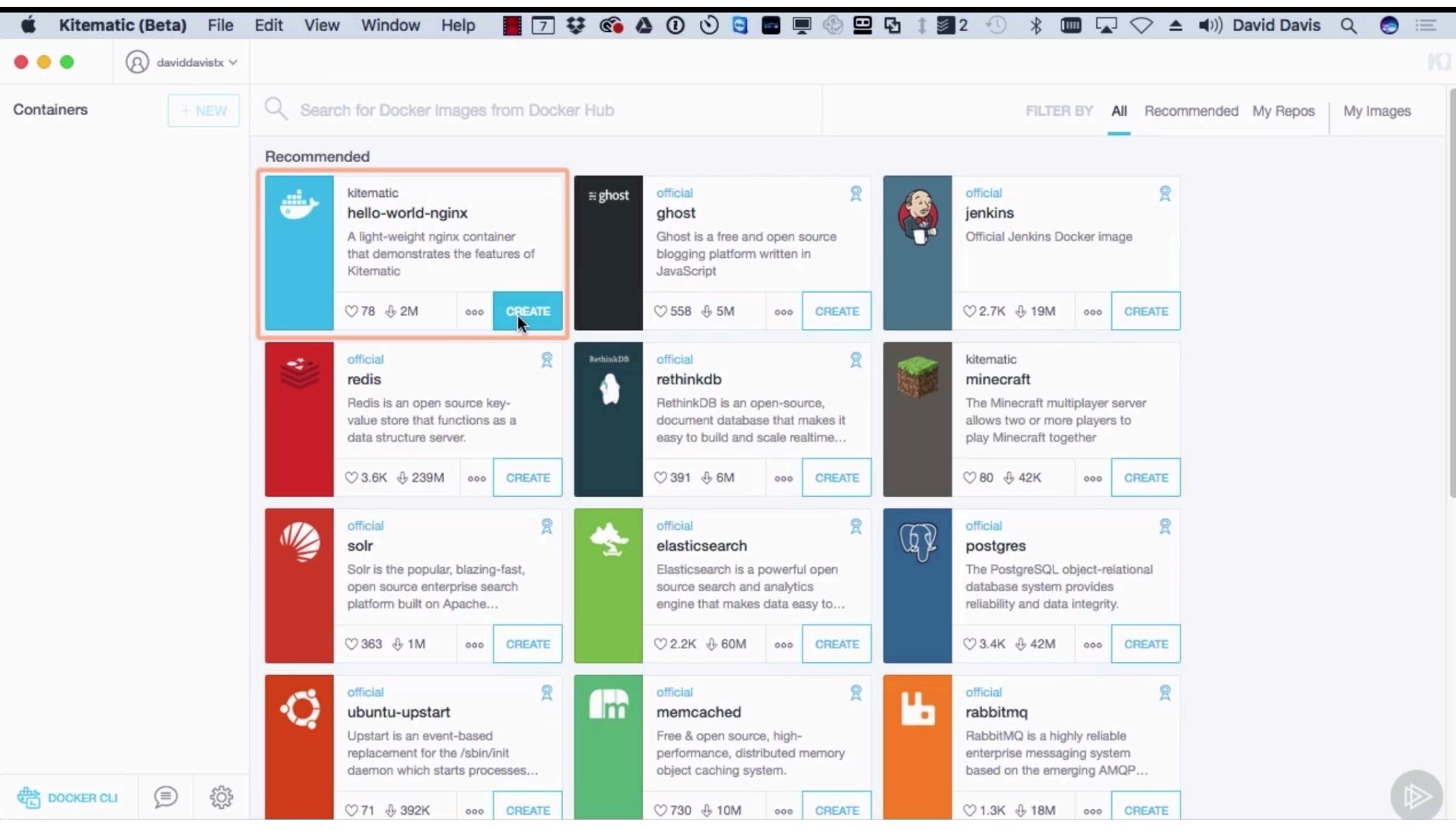
FILTER BY All Recommended My Repos My Images

### Recommended

 kitematic <b>hello-world-nginx</b> A light-weight nginx container that demonstrates the features of Kitematic	 official <b>ghost</b> Ghost is a free and open source blogging platform written in JavaScript	 official <b>jenkins</b> Official Jenkins Docker image
 official <b>redis</b> Redis is an open source key-value store that functions as a data structure server.	 official <b>rethinkdb</b> RethinkDB is an open-source, document database that makes it easy to build and scale realtime...	 kitematic <b>minecraft</b> The Minecraft multiplayer server allows two or more players to play Minecraft together
 official <b>solr</b> Solr is the popular, blazing-fast, open source enterprise search platform built on Apache...	 official <b>elasticsearch</b> Elasticsearch is a powerful open source search and analytics engine that makes data easy to...	 official <b>postgres</b> The PostgreSQL object-relational database system provides reliability and data integrity.
 official <b>ubuntu-upstart</b> Upstart is an event-based replacement for the /sbin/init daemon which starts processes...	 official <b>memcached</b> Free & open source, high-performance, distributed memory object caching system.	 official <b>rabbitmq</b> RabbitMQ is a highly reliable enterprise messaging system based on the emerging AMQP...

Docker CLI

David Davis



Apple Kitematic (Beta) File Edit View Window Help

Containers + NEW

hello-world-nginx RUNNING

STOP RESTART EXEC DOCS

Home Settings

CONTAINER LOGS

```
/website_files/index.html not found.  
Copying default index.html...  
nginx: [alert] could not open error log file: open() "/var/log/nginx/error.log" failed (2: No such file or directory)  
2017/04/07 19:09:03 [notice] 8#0: using the "epoll" event method  
2017/04/07 19:09:03 [notice] 8#0: nginx/1.4.7  
2017/04/07 19:09:03 [notice] 8#0: built by gcc 4.8.3 (OpenWrt/Linaro GCC 4.8-2014.04 r45973)  
2017/04/07 19:09:03 [notice] 8#0: OS: Linux 4.9.13-moby  
2017/04/07 19:09:03 [notice] 8#0: getrlimit(RLIMIT_NOFILE): 1048576:1048576  
2017/04/07 19:09:03 [notice] 8#0: start worker processes  
2017/04/07 19:09:03 [notice] 8#0: start worker process 9  
172.17.0.1 - - [07/Apr/2017:19:09:04 +0000] "GET / HTTP/1.1" 200 361 "-" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_12_3) AppleWebKit/537.36 (KHTML, like Gecko) Kitematic/0.17.0 Chrome/45.0.2454.85 Electron/0.35.4 Safari/537.36"
```

WEB PREVIEW

Kitematic logo

Voilà! Your nginx container is running!

To edit files, double click the website\_files folder in Kitematic and edit the index.html file.

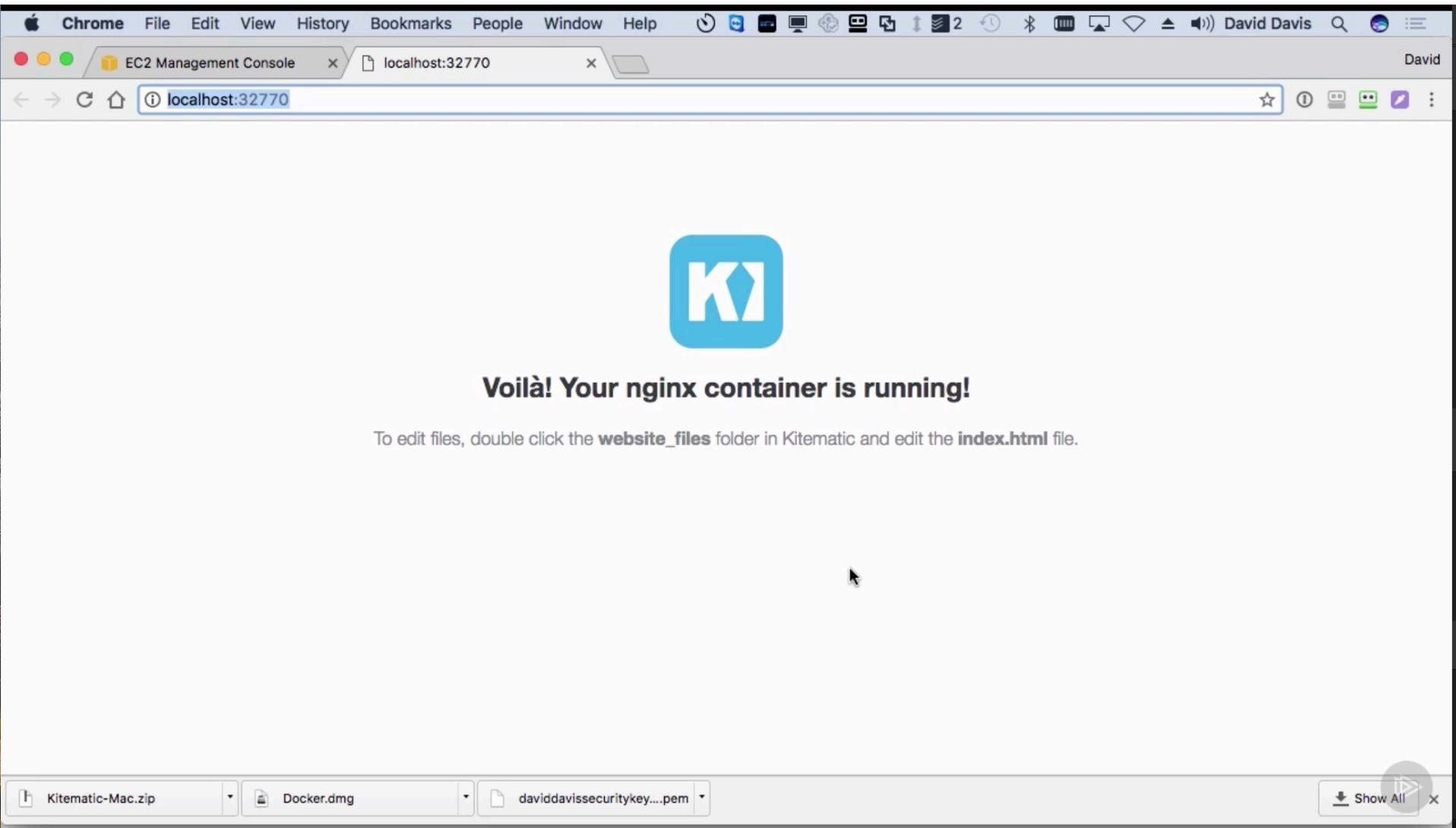
VOLUMES

/website\_files

Docker CLI

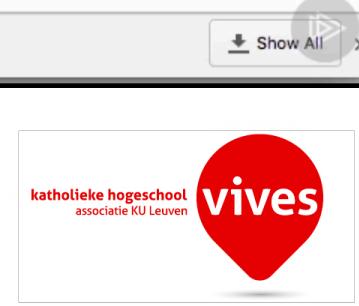
44





<https://hub.docker.com/>

<https://docs.docker.com/toolbox/>



# Different Types of Infrastructure as a Service Cloud Offerings

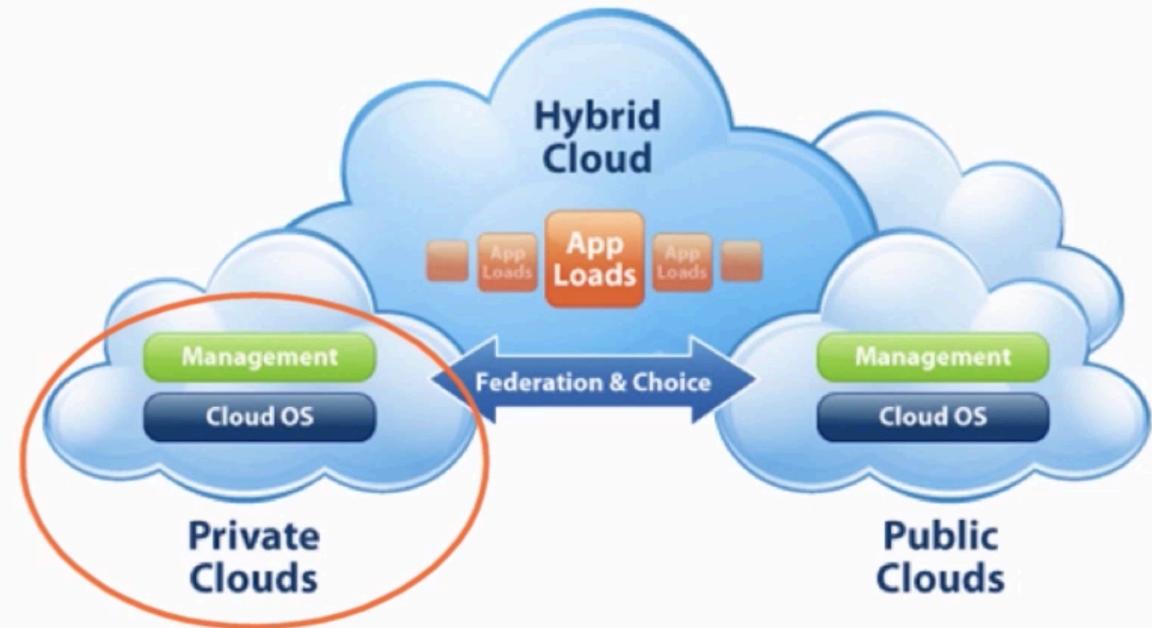


Diagram thanks to VMware.com



# Virtualization vs. Private Cloud

## Virtualization

Required for cloud computing

Virtualization provides:

Scalability / elastic computing

Resource sharing & pooling

Load balancing

High availability

Portability

Cloning

## Private Cloud

On top of virtualization, private cloud provides:

Abstraction of underlying infrastructure layer

Secure multi-tenancy

Self-service portal

Catalog of applications

Chargeback / showback

Potential to burst to a hybrid cloud



Infrastructure as a Service (IaaS)  
pricing is, ideally, utility /  
consumption / subscription-based  
where you pay for what you use

# IaaS Pricing Models Can Get Complex...

On-Demand

Spot-Instances

Reserved Instances

Dedicated Hosts



# Service Level Agreement (SLA)

**Defines what level of performance and availability the IaaS provider will provide you**

**And what they will do if they are unable to provide you that level of service**

**Amazon's SLA is located here-  
<https://aws.amazon.com/ec2/sla/>**



## PRODUCTS &amp; SERVICES

- Amazon EC2 >
- Product Details >
- Instances >
- Developer Resources >
- FAQs >
- Getting Started >
- Amazon EC2 Run Command >
- Pricing >

## RELATED LINKS

- Amazon EC2 Spot Instances
- Amazon EC2 Reserved Instances
- Amazon EC2 Dedicated Hosts
- Amazon EC2 Dedicated Instances
- Windows Instances
- VMware Cloud on AWS
- Systems Manager
- Server Migration Services

# Amazon EC2 Service Level Agreement

Last Updated June 1, 2013

This Amazon EC2 Service Level Agreement ("SLA") is a policy governing the use of Amazon Elastic Compute Cloud ("Amazon EC2") and Amazon Elastic Block Store ("Amazon EBS") under the terms of the Amazon Web Services Customer Agreement (the "AWS Agreement") between Amazon Web Services, Inc. and its affiliates ("AWS", "us" or "we") and users of AWS' services ("you"). This SLA applies separately to each account using Amazon EC2 or Amazon EBS. Unless otherwise provided herein, this SLA is subject to the terms of the AWS Agreement and capitalized terms will have the meaning specified in the AWS Agreement. We reserve the right to change the terms of this SLA in accordance with the AWS Agreement.

## Service Commitment

AWS will use commercially reasonable efforts to make Amazon EC2 and Amazon EBS each available with a [Monthly Uptime Percentage](#) (defined below) of at least 99.95%, in each case during any monthly billing cycle (the "Service Commitment"). In the event Amazon EC2 or Amazon EBS does not meet the Service Commitment, you will be eligible to receive a Service Credit as described below.

## Definitions

T

- "Monthly Uptime Percentage" is calculated by subtracting from 100% the percentage of minutes during the month in which Amazon EC2 or Amazon EBS, as applicable, was in the state of "Region Unavailable." Monthly Uptime Percentage measurements exclude downtime resulting directly or indirectly from any Amazon EC2 SLA Exclusion (defined below).
- "Region Unavailable" and "Region Unavailability" mean that more than one Availability Zone in which you are running an instance, within the same Region, is "Unavailable" to you.
- "Unavailable" and "Unavailability" mean:
  - For Amazon EC2, when all of your running instances have no external connectivity.



## PRODUCTS &amp; SERVICES

[Amazon EC2](#)[Product Details](#)[Instances](#)[Developer Resources](#)[FAQs](#)[Getting Started](#)[Amazon EC2 Run Command](#)[Pricing](#)

## RELATED LINKS

[Amazon EC2 Spot Instances](#)[Amazon EC2 Reserved Instances](#)[Amazon EC2 Dedicated Hosts](#)[Amazon EC2 Dedicated Instances](#)[Windows Instances](#)[VMware Cloud on AWS](#)[Systems Manager](#)[Server Migration Services](#)

within the same Region, is "Unavailable" to you.

- "Unavailable" and "Unavailability" mean:
  - For Amazon EC2, when all of your running instances have no external connectivity.
  - For Amazon EBS, when all of your attached volumes perform zero read write IO, with pending IO in the queue.
- A "Service Credit" is a dollar credit, calculated as set forth below, that we may credit back to an eligible account.

## Service Commitments and Service Credits

Service Credits are calculated as a percentage of the total charges paid by you (excluding one-time payments such as upfront payments made for Reserved Instances) for either Amazon EC2 or Amazon EBS (whichever was Unavailable, or both if both were Unavailable) in the Region affected for the monthly billing cycle in which the Region Unavailability occurred in accordance with the schedule below.

### Monthly Uptime Percentage

### Service Credit Percentage

Less than 99.95% but equal to or greater than 99.0%	10%
Less than 99.0%	30%

We will apply any Service Credits only against future Amazon EC2 or Amazon EBS payments otherwise due from you. At our discretion, we may issue the Service Credit to the credit card you used to pay for the billing cycle in which the Unavailability occurred. Service Credits will not entitle you to any refund or other payment from AWS. A Service Credit will be applicable and issued only if the credit amount for the applicable monthly billing cycle is greater than one dollar (\$1 USD). Service Credits may not be transferred or applied to any other account. Unless otherwise provided in the AWS Agreement, your sole and exclusive remedy for any unavailability, non-performance, or other failure by us to provide Amazon EC2 or Amazon EBS is the receipt of a Service Credit (if eligible) in accordance with the terms of this SLA.

### Credit Request and Document Procedures

katholieke hogeschool  
associatie KU Leuven



# How Do You Get to the Cloud?

Some companies have “greenfield deployments”, but that’s not common

Here’s what you should consider before you migrate to the cloud:

- Costs associated with using the cloud?
- Security, availability, and performance?
- Migrate vs rebuild?
- Enterprise-grade functionality?
- Tools that can help?



## Summary



**What is Virtualization?**

**What is a Virtual Machine?**

**What is a Container?**

**Private Cloud, Hybrid Cloud, and Public Cloud**

**Virtualization vs Private Cloud**

**IaaS Pricing Models**

**Service Level Agreements (SLA)**

**Migrating to the Cloud**



# Overview



## IaaS Networking Options

**Virtual Private Cloud (VPC) Networking**

**Connecting to the Cloud with a Virtual Private Network (VPN)**



# How do servers in the IaaS cloud connect to the network?

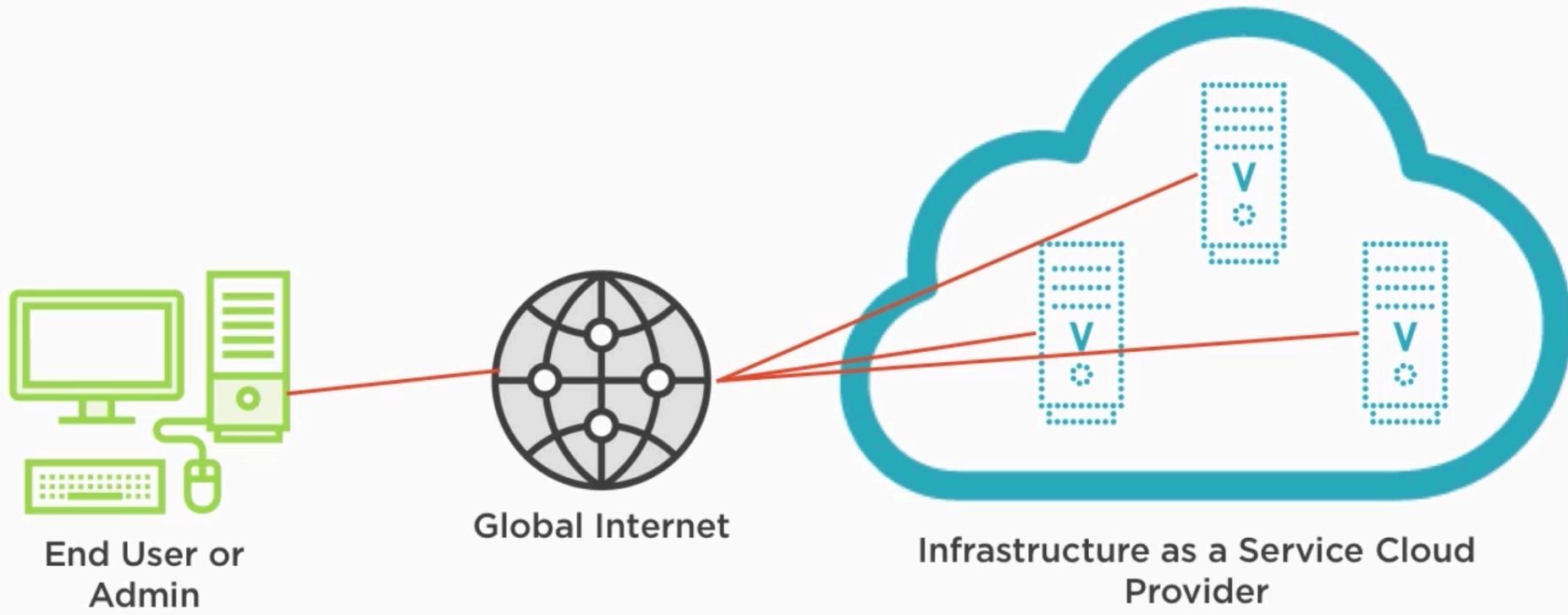
# IaaS Networking Options

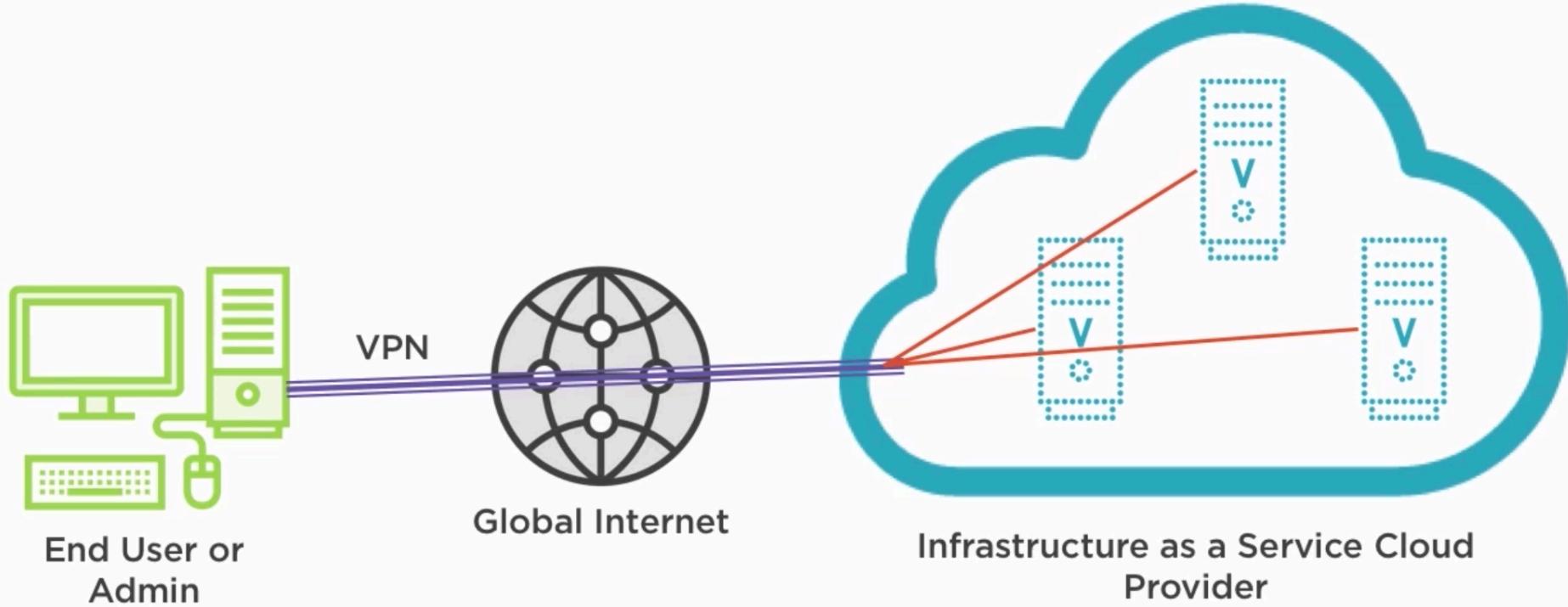
## Public Networking

Using public IP addresses

## Private Networking

via VPN or, in some cases,  
dedicated connections





# Virtual Private Cloud (VPC) Networking

**Amazon VPC is NOT a private cloud, but a private network that can be connected to your network**

**You have control over-**

- Private IP address networking
- Routing
- Network access lists
- And VPN connectivity back to your on-premises infrastructure

Demo



## Connecting to the Cloud with a Virtual Private Network



## History

## EC2

## Console Home

Search services

Group A-Z



## Compute

- EC2
- EC2 Container Service
- Lightsail
- Elastic Beanstalk
- Lambda
- Batch



## Developer Tools

- CodeCommit
- CodeBuild
- CodeDeploy
- CodePipeline
- X-Ray



## Analytics

- Athena
- EMR
- CloudSearch
- Elasticsearch Service
- Kinesis
- Data Pipeline
- QuickSight



## Application Services

- Step Functions
- SWF
- API Gateway
- Elastic Transcoder



## Messaging

- Simple Queue Service
- Simple Notification Service
- SES



## Storage

- S3
- EFS
- Glacier
- Storage Gateway



## Management Tools

- CloudWatch
- CloudFormation
- CloudTrail
- Config
- OpsWorks
- Service Catalog
- Trusted Advisor
- Managed Services



## Artificial Intelligence

- Lex
- Polly
- Rekognition
- Machine Learning



## Business Productivity

- WorkDocs
- WorkMail
- Amazon Chime



## Database

- RDS
- DynamoDB
- ElastiCache
- Redshift



## Security, Identity &amp; Complia...

- IAM
- Inspector
- Certificate Manager
- Directory Service
- WAF & Shield



## Internet Of Things

- AWS IoT



## Desktop &amp; App Streaming

- WorkSpaces
- AppStream 2.0



## Networking &amp; Content Deliv...

- VPC



## Contact Center

- Amazon Connect



## Game Development

<https://console.aws.amazon.com/ec2/v2/home?region=us-east-1#>

 Compute EC2 EC2 Container Service Lightsail  Elastic Beanstalk Lambda Batch	 Developer Tools CodeCommit CodeBuild CodeDeploy CodePipeline X-Ray	 Analytics Athena EMR CloudSearch Elasticsearch Service Kinesis Data Pipeline QuickSight 	 Application Services Step Functions SWF API Gateway Elastic Transcoder
 Storage S3 EFS Glacier Storage Gateway	 Management Tools CloudWatch CloudFormation CloudTrail Config OpsWorks Service Catalog Trusted Advisor Managed Services	 Artificial Intelligence Lex Polly Rekognition Machine Learning	 Messaging Simple Queue Service Simple Notification Service SES
 Database RDS DynamoDB ElastiCache Redshift	 Security, Identity & Complia... IAM Inspector Certificate Manager Directory Service WAF & Shield Compliance Reports	 Internet Of Things AWS IoT	 Business Productivity WorkDocs WorkMail Amazon Chime 
 Networking & Content Deliv...  VPC CloudFront Direct Connect Route 53	 Contact Center Amazon Connect	 Game Development Amazon GameLift	 Desktop & App Streaming WorkSpaces AppStream 2.0
 Migration	 Mobile Services Mobile Hub Cognito		



<https://console.aws.amazon.com/vpc/home?region=us-east-1>



Services

Resource Groups



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N. Virginia

Support

## VPC Dashboard

Filter by VPC:

None

Virtual Private Cloud

Your VPCs

Subnets

Route Tables

Internet Gateways

Egress Only Internet Gateways

DHCP Options Sets

Elastic IPs

Endpoints

NAT Gateways

Peering Connections

Security

Network ACLs

Security Groups

VPN Connections

[Feedback](#)[English](#)

## Resources

[Start VPC Wizard](#)[Launch EC2 Instances](#)

Note: Your Instances will launch in the US East (N. Virginia) region.

You are using the following Amazon VPC resources in the US East (N. Virginia) region:

2 VPCs	2 Internet Gateways
0 Egress-only Internet Gateways	6 Subnets
3 Route Tables	2 Network ACLs
0 Elastic IPs	0 VPC Peering Connections
0 Endpoints	0 Nat Gateways
4 Security Groups	0 Running Instances
0 VPN Connections	0 Virtual Private Gateways
0 Customer Gateways	

## VPN Connections

Amazon VPC enables you to use your own isolated resources within the AWS cloud, and then connect those resources directly to your own datacenter using industry-standard encrypted IPsec VPN connections.

[Create VPN Connection](#)

## Service Health

### Current Status

### Details

✓ Amazon VPC - US East (N. Virginia)

Service is operating normally

✓ Amazon EC2 - US East (N. Virginia)

Service is operating normally

[View complete service health details](#)

## Additional Information

[VPC Documentation](#)[All VPC Resources](#)[Forums](#)[Report an Issue](#)



## Step 1: Select a VPC Configuration

### VPC with a Single Public Subnet

VPC with Public and Private Subnets

VPC with Public and Private Subnets and Hardware VPN Access

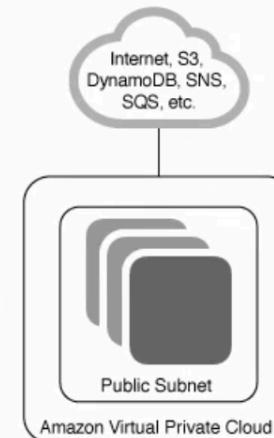
VPC with a Private Subnet Only and Hardware VPN Access

Your instances run in a private, isolated section of the AWS cloud with direct access to the Internet. Network access control lists and security groups can be used to provide strict control over inbound and outbound network traffic to your instances.

Creates:

A /16 network with a /24 subnet. Public subnet instances use Elastic IPs or Public IPs to access the Internet.

Select



[Cancel and Exit](#)





Services

Resource Groups



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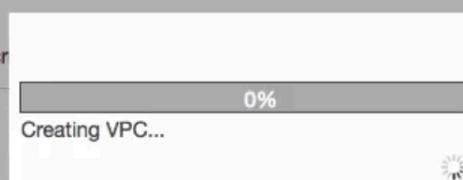
Support

## Step 2: VPC with a Single Public Subnet

IPv4 CIDR block: (65531 IP addresses available)IPv6 CIDR block:  
 No IPv6 CIDR Block  
 Amazon provided IPv6 CIDR blockVPC name:Public subnet's IPv4 CIDR: (251 IP addresses available)Availability Zone:Subnet name:

You can add more subnets after AWS cr

Service endpoints

Enable DNS hostnames: Yes  NoHardware tenancy:

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Services

Resource Groups



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Support

## VPC Dashboard

Filter by VPC:

None

Virtual Private  
Cloud

Your VPCs

Subnets

Route Tables

Internet Gateways

Egress Only Internet  
Gateways

DHCP Options Sets

Elastic IPs

Endpoints

NAT Gateways

Peering Connections

Security

Network ACLs

Security Groups

VPN Connections

Feedback

English

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## VPC Successfully Created

Your VPC has been successfully created.

You can launch instances into the subnets of your VPC. For more information, see [Launching an Instance into Your Subnet](#).

OK



## VPC Dashboard

Create VPC

Actions

Filter by VPC:  
None

&lt;&lt; 1 to 3 of 3 VPCs &gt;&gt;

	Name	VPC ID	State	IPv4 CIDR	IPv6 CIDR	DHCP options set	Route table	Network ACL
	vpc-beddaeda	vpc-52017336	available	10.0.0.0/16		dopt-20ad5045	rtb-c66454a2	acl-db8fcfbf
	vpc-c5c1fea3		available	172.31.0.0/16		dopt-20ad5045	rtb-6e18280a	acl-26de9e42
			available	10.0.0.0/16		dopt-20ad5045	rtb-28da9051	acl-bb8e5ac2

Virtual Private Cloud

Your VPCs

Subnets

Route Tables

Internet Gateways

Egress Only Internet Gateways

DHCP Options Sets

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Select a VPC above



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Support

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Your VPCs

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Security Groups

VPN Connections

Customer Gateways

Virtual Private Gateways

VPN Connections

Create VPN Connection

Delete

Download Configuration



Search VPN Connections

 Name

## Create VPN Connection



You currently have no virtual private gateways, you need to create a gateway in order to create a VPN.

[Cancel](#)

Select a VPN Connection above

[Feedback](#)[English](#)

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Services

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Support

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Your VPCs

Subnets

Route Tables

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Virtual Private  
Gateways

VPN Connections

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Create VPN Connection

Delete

Download Configuration



Search VPN Connection

 Name

## Create VPN Connection



You currently have no virtual private gateways, you need to create a gateway in order to create a VPN.

Cancel

Select a VPN Connection above



Services

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VPN Connections

Customer Gateways

Virtual Private Gateways

VPN Connections

Create Virtual Private Gateway

Delete Virtual Private Gateway

Attach to VPC

Detach from VPC



Search Virtual Private Gateway

Name

david

## Attach to VPC



Select the VPC to attach to the virtual private gateway

VPC vpc-beddaeda

Cancel

Yes, Attach

vgw-6bc72f02 | david



Summary

Tags

ID: vgw-6bc72f02 | david

State: detached

Type: ipsec.1

VPC:

Feedback

English

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Services ▾

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Cloud

Your VPCs

Subnets

Route Tables

Internet Gateways

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DHCP Options Sets

Elastic IPs

Endpoints

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Security

Network ACLs

Security Groups

VPN Connections

Customer Gateways

Virtual Private Gateways

VPN Connections

[Create Virtual Private Gateway](#)[Delete Virtual Private Gateway](#)[Attach to VPC](#)[Detach from VPC](#) Search Virtual Private Gateway X

&lt;&lt; 1 to 1 of 1 Virtual Private Gateway &gt;&gt;

Name	ID	State	Type	VPC
david	vgw-6bc72f02	attaching	ipsec.1	vpc-beddaeda

vgw-6bc72f02 | david

[Summary](#)[Tags](#)

ID: vgw-6bc72f02 | david

State: attaching

Type: ipsec.1

VPC: vpc-beddaeda



Services

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Support

Cloud

Your VPCs

Subnets

Route Tables

Internet Gateways

Egress Only Internet Gateways

DHCP Options Sets

Elastic IPs

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Customer Gateways

Virtual Private Gateways

VPN Connections

Feedback

English

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Create Customer Gateway

Delete Customer Gateway



Search Customer Gateways

Name

&lt;&lt; No Customer Gateways &gt;&gt;

## Create Customer Gateway



Specify the Internet-routable IP address for your gateway's external interface; the address must be static and may be behind a device performing network address translation (NAT). For dynamic routing, also specify your gateway's Border Gateway Protocol (BGP) Autonomous System Number (ASN); this can be either a public or private ASN (such as those in the 64512-65534 range).

Name tag

Routing

Static

IP address

Cancel

Yes, Create

Select a customer gateway above



# Summary



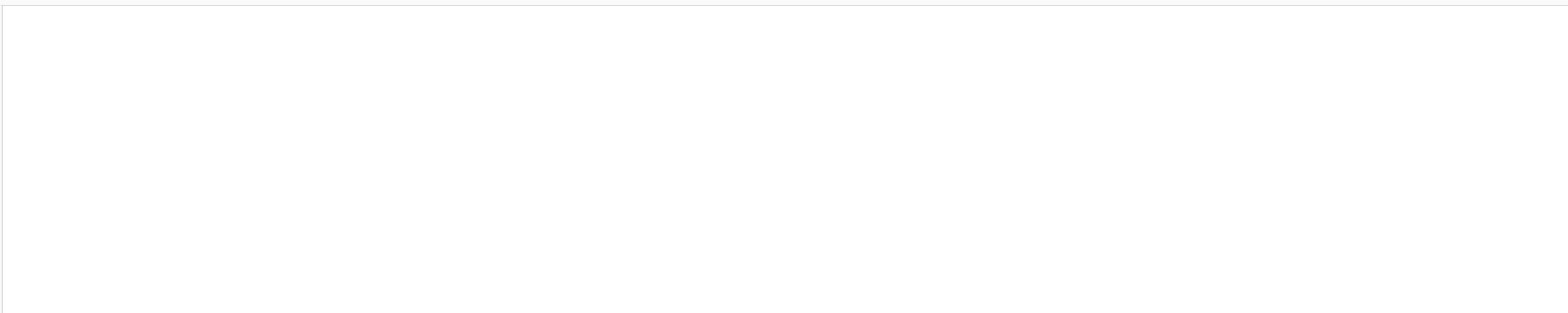
## IaaS Networking Options

**Virtual Private Cloud (VPC) Networking**

**Connecting to the Cloud with a Virtual Private Network (VPN)**

# Storage in the Cloud

---



# Overview



**Understanding IaaS Storage**

**Cloud File Storage**

**Object Storage**

**Data Protection in the Cloud**

# With IaaS where are my files stored?

# Understanding IaaS Storage

**Inside the Virtual Machine**  
Each VM has storage of its own

**Outside the Virtual Machine**  
Each VM can access external storage like block or object storage

# Cloud File Storage

Dropbox

Microsoft  
OneDrive

Google Drive



## Files

Paper

Sharing

Recents

File requests

Deleted files

## Personal

Only you

Name	Modified	Members	
!VMware Workstation for the IT A...	--	Only you	...
!VMware_vSphere_Troubleshooting	--	Only you	...
!vSphere 5	--	Only you	...
!vSphere 5.1 New Features	--	Only you	...
A+ Video	--	Only you	...
CCNA Security Banners	--	Only you	...
CompTIA Cloud Essentials	--	Only you	...
Hyper-V and Virtualizaiton slides	--	Only you	...
ISA	--	Only you	...
Linux	--	Only you	...

Share folder

Only you have access

Upload files

New folder

Show deleted files

Help Privacy ...





Name	Date Modified	Size	Kind
► !VMware Workstation for the IT Admin	Apr 1, 2016, 12:15 PM	--	Folder
► !VMware_vSphere_Troubleshooting	Apr 1, 2016, 8:30 AM	--	Folder
► !vSphere 5	Mar 30, 2016, 12:59 AM	--	Folder
► !vSphere 5.1 New Features	Apr 1, 2016, 11:17 AM	--	Folder
► A+ Video	Apr 1, 2016, 9:25 AM	--	Folder
► CCNA Security Banners	Mar 31, 2016, 8:31 AM	--	Folder
► CompTIA Cloud Essentials	Apr 1, 2016, 11:09 AM	--	Folder
► Hyper-V and Virtualization slides	Apr 1, 2016, 11:24 AM	--	Folder
► ISA	Apr 1, 2016, 11:02 AM	--	Folder
► Linux	Apr 1, 2016, 2:40 PM	--	Folder
► MS Virtual Server	Apr 1, 2016, 11:04 AM	--	Folder
► SHARED-Joan-at-Pearson	Mar 29, 2016, 2:31 PM	--	Folder
► Videos	Mar 30, 2016, 9:21 AM	--	Folder
► Virtual-Labs	Apr 1, 2016, 2:40 PM	--	Folder
► VMware ESX banners	Mar 31, 2016, 9:42 AM	--	Folder
► VMware ESX Server	Apr 1, 2016, 9:06 AM	--	Folder
► VMware Server & Workstation	Apr 1, 2016, 9:26 AM	--	Folder
► VMware Tech Resource Center - TRC	Apr 1, 2016, 1:50 PM	--	Folder
► VMware Technical Resources	Apr 1, 2016, 2:21 AM	--	Folder
► VMware vCloud Director Essentials	Apr 1, 2016, 3:25 PM	--	Folder
► vSphere Advanced Features for VCP5 Preparation	Apr 1, 2016, 1:10 PM	--	Folder
► vSphere Banners	Mar 31, 2016, 11:27 AM	--	Folder
► vSphere Package - May 2010	Mar 31, 2016, 12:53 PM	--	Folder
► vSphere Pro Vol 1	Apr 1, 2016, 11:04 AM	--	Folder
► Windows XP	Mar 31, 2016, 9:21 AM	--	Folder

SCULLY &gt; Dropbox (Personal) &gt; ! Pluralsight - TrainSignal COURSES &gt; Virtual-Labs

1 of 25 selected, 2.81 TB available

Virtual-Labs

Search

WORKFOLDER - VMware vRealize Operations Manager

VMware Assignments

Services and Selling Tools

evaluating-vsphere-environment-security

Raw client video

Dropbox (Personal)

Dropbox (ActualTech)

Clients

!Desktop - Temp Files

Desktop

Documents

Downloads

Movies

david

Searching "SSD-500GB"

Applications

iCloud Drive

All My Files

AirDrop

Logins

Sync

Devices

David iMac 5K

Name

Date Modified

Size

Kind

Configuring Your New Virtual Infrastructure-formatted lab book.pdf Mar 23, 2012, 10:54 AM 2.4 MB PDF Document

David D - NEW Apr 1, 2016, 2:40 PM -- Folder

DD IN PROG Apr 1, 2016, 11:06 AM -- Folder

lab-template-matrix.xlsx Apr 4, 2012, 6:58 PM 12 KB Microsoft Office Document

Lesson 1 Apr 30, 2016, 8:03 AM -- Folder

Lesson 2 Mar 31, 2016, 7:36 AM -- Folder

Lesson 3 Apr 1, 2016, 11:02 AM -- Folder

lesson14.docx Mar 24, 2012, 10:14 PM 24 KB Microsoft Word Document

lesson14.pdf Mar 26, 2012, 6:05 PM 18 KB Microsoft PDF Document

lesson14.docx Mar 26, 2012, 6:12 PM 20 KB Microsoft Word Document

Lesson 4 Mar 29, 2016, 2:24 PM -- Folder

Lesson 5 Apr 1, 2016, 1:50 PM -- Folder

Lesson 6 Mar 29, 2016, 2:24 PM -- Folder

Lesson 7 Mar 29, 2016, 2:24 PM -- Folder

Lesson 8 Mar 30, 2016, 8:03 AM -- Folder

Lesson 9 Mar 31, 2016, 1:45 AM -- Folder

Lesson 10 Mar 31, 2016, 1:45 AM -- Folder

Lesson 11 Mar 31, 2016, 1:45 AM -- Folder

Lesson 12 Mar 31, 2016, 5:36 AM -- Folder

Lesson 13 Oct 26, 2011, 5:05 PM 717 KB PDF Document

Lesson 14 Feb 2, 2012, 12:46 AM 22 KB Microsoft Word Document

Lesson 15 Oct 7, 2011, 10:05 AM 17 KB Microsoft Word Document

Lesson 16 INCOMPLETE.docx Jan 3, 2012, 6:06 AM 62 KB Microsoft Word Document

Lesson 17 vSphere Client 5.docx Jan 4, 2012, 8:36 AM 1.8 MB Microsoft Word Document

Lesson 18 vSphere Client (vCSA).docx Apr 4, 2012, 9:12 AM 1.7 MB Microsoft Word Document

Lesson 19 vSphere Client (vSphere Client).docx Nov 14, 2011, 11:50 AM 603 KB Microsoft Word Document

Lesson 20 vSphere Infrastructure.docx Nov 14, 2011, 11:50 AM 603 KB Microsoft Word Document

Lesson 21 vSphere with vMotion.docx Apr 1, 2012, 5:35 PM 606 KB Microsoft Word Document

TrainSignal COURSES > Virtual-Labs > lesson14.docx

Services

View on Dropbox.com

Open

Open With

Move to Trash

Share...

Manage Access...

Copy Dropbox Link

Get Info

Rename

Compress "lesson14.docx"

Duplicate

Make Alias

Quick Look "lesson14.docx"

Share

Copy "lesson14.docx"

Show View Options

Tags...

Red

Orange

Yellow

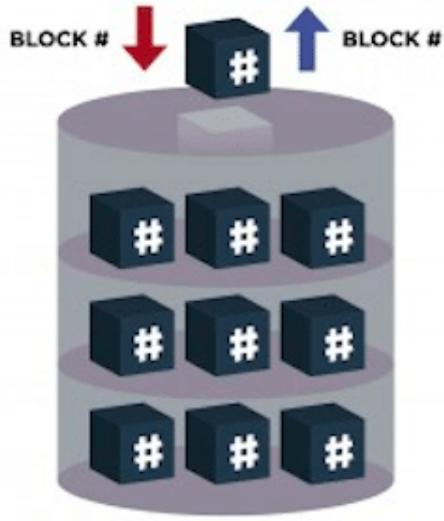
Green

Blue

Purple

Grey

## BLOCK STORAGE



vs.

## OBJECT STORAGE



# Object Storage

Storage for unstructured data

Usually used for pictures, videos, and archival data



S3 Simple Storage Service

Microsoft Azure  
Blob Storage





Services ▾

Resource Groups ▾



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Support ▾

History

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A-Z



## Compute

- EC2
- EC2 Container Service
- Lightsail
- Elastic Beanstalk
- Lambda
- Batch



## Developer Tools

- CodeCommit
- CodeBuild
- CodeDeploy
- CodePipeline
- X-Ray



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- EMR
- CloudSearch
- Elasticsearch Service
- Kinesis
- Data Pipeline
- QuickSight



## Application Services

- Step Functions
- SWF
- API Gateway
- Elastic Transcoder



## Storage



## EFS

- Glacier
- Storage Gateway



## Management Tools

- CloudWatch
- CloudFormation
- CloudTrail
- Config
- OpsWorks
- Service Catalog
- Trusted Advisor
- Managed Services



## Artificial Intelligence

- Lex
- Polly
- Rekognition
- Machine Learning



## Business Productivity

- WorkDocs
- WorkMail
- Amazon Chime



## Database

- RDS
- DynamoDB
- ElastiCache
- Redshift



## Security, Identity &amp; Complia...

- IAM
- Inspector
- Certificate Manager
- Directory Service
- WAF & Shield



## Internet Of Things

- AWS IoT



## Desktop &amp; App Streaming

- WorkSpaces
- AppStream 2.0



## Networking &amp; Content Deliv...

## VPC



## Contact Center

- Amazon Connect



## Game Development

<https://console.aws.amazon.com/s3/home?region=us-east-1>



Services ▾

## Resource Groups ▾



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Support ▾

**Want to manage your data based on what it is instead of where it's stored? Try S3 Object Tagging**



Amazon S3



## Switch to the old console



Discover the new console



## Quick tips



Bucket name	Region	Date created
elasticbeanstalk-us-east-1-811736816661	US East (N. Virginia)	Sep 20, 2016 4:20:53 AM
elasticbeanstalk-us-west-2-811736816661	US West (Oregon)	Oct 15, 2014 1:38:10 AM





Services

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Want to manage your data based on what you do?



Amazon S3

Search for buckets

+ Create bucket

Delete bucket

Bucket name

elasticbeanstalk-us-east-1-811736816

elasticbeanstalk-us-west-2-811736816

## Create bucket

1 Name and region    2 Set properties    3 Set permissions    4 Review

### Name and region

Bucket name

Enter DNS-compliant bucket name

Region

Select a region

Copy settings from an existing bucket

Select bucket (optional)

2 Buckets

Create    Cancel    Next

Quick tips

Regions



# Data Protection in the Cloud

Virtual Machines

Disaster Recovery to the Cloud

**Zerto**

**VEEAM**

**Infrascale™**  
Total Data Protection



# Data Protection in the Cloud

## Files

File Backup to the Cloud



## Summary



**Understanding IaaS Storage**

**Cloud File Storage**

**Object Storage**

**Data Protection in the Cloud**

# Infrastructure as a Service: Security

---

## Overview



Cloud Security Concerns

Encryption

Compliance

**Vulnerabilities and Mitigation**

# Are you concerned about Cloud Security?

# Cloud Security Concerns

- Is my data safe?**
- Who can see my data?**
- Can my data be modified?**
- Who is responsible for securing my data?**

Unless you have managed security,  
the security of your data in the  
cloud is under *shared responsibility*.



# AWS Cloud Security

Protect your data with cloud-powered security.

[I'd like information about Security in the Cloud »](#)

[Cloud Security](#)

[Penetration Testing](#)

[Security Bulletins](#)

[Resources](#)

[Compliance](#)

[Partners](#)

Cloud security at AWS is the highest priority. As an AWS customer, you will benefit from a data center and network architecture built to meet the requirements of the most security-sensitive organizations.



An advantage of the AWS cloud is that it allows customers to scale and innovate, while maintaining a secure environment. Customers pay only for the services they use, meaning that you can have the security you need, but without the upfront expenses, and at a lower cost than in an on-premises environment.

“

We worked closely with the Amazon team to develop a security model, which we believe enables us to operate more securely in the public cloud than we can even in our data centers.

Rob Alexander  
CIO, Capital One

**Capital One**

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# Encryption

The process of converting information or data into ciphertext, which cannot be easily understood by anymore except those who have the key.

Compliance

Laws  
Requirements  
Policies  
Rules  
Standards  
Governance  
**Regulations**

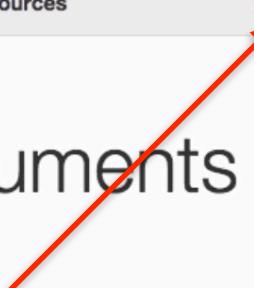
# Cloud Security Resources

I'd like information about Security in the Cloud

[Cloud Security](#)[Penetration Testing](#)[Security Bulletins](#)[Resources](#)[Compliance](#)[Partners](#)

## Developer Documents

- [AWS Security Credentials](#)
- [Using Encryption in S3](#)
- [List of Secure Endpoints](#)
- [Configuring EC2 Security Groups](#)
- [Server Access Logging in S3](#)
- [Signing AWS API Requests](#)



<https://aws.amazon.com/compliance/>



# Assurance Programs

From San Francisco to Singapore - We've got you covered



## Certifications / Attestations

- C5 [Germany]
- Cyber Essentials Plus [UK]
- DoD SRG
- FedRAMP
- FIPS
- IRAP [Australia]
- ISO 9001
- ISO 27001
- ISO 27017
- ISO 27018
- MLPS Level 3 [China]
- MTCS [Singapore]



## Laws, Regulations, and Privacy

- CISPE
- DNB [Netherlands]
- EU Model Clauses
- FERPA
- GLBA
- HIPAA
- HITECH
- IRS 1075
- ITAR
- My Number Act [Japan]
- U.K. DPA - 1988
- VPAT / Section 508



## Alignments / Frameworks

- CIS
- CGI
- CSA
- ENS [Spain]
- EU-US Privacy Shield
- FISC
- FISMA
- G-Cloud [UK]
- GxP (FDA CFR 21 Part 11)
- ICREA
- IT Grundschutz [Germany]
- MITA 3.0



# Vulnerabilities and Mitigation

- Who keeps my operating systems and applications up to date?
- Who performs backups of the data, should something happen? Have they been tested?
- Who performs security scans of my virtual machines?

# Summary



**Cloud Security Concerns**

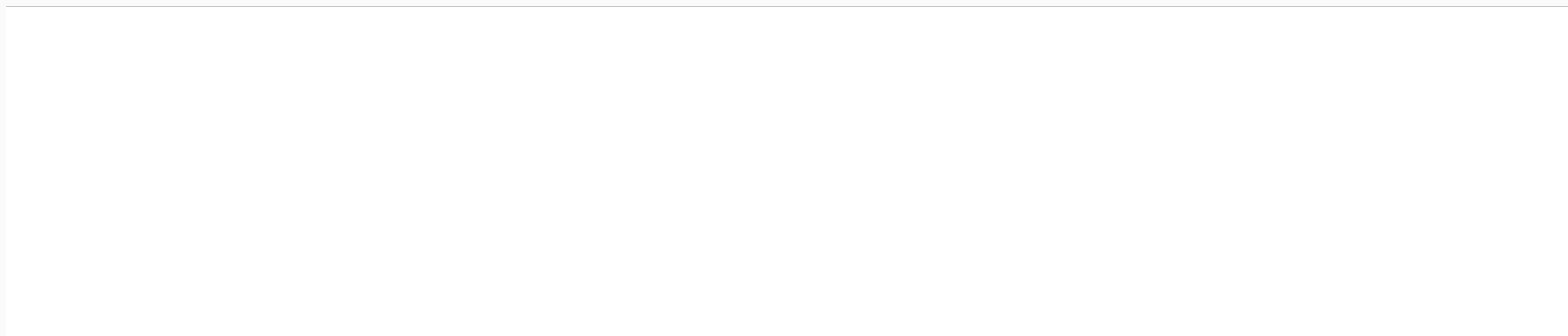
**Encryption**

**Compliance**

**Vulnerabilities and Mitigation**

# Comparing Infrastructure as a Service (IaaS) and Platform as a Service (PaaS)

---



# Overview



**What is Platform as a Service?**  
**How do IaaS and PaaS Compare?**  
**Demo AWS Elastic Beanstalk**

# Platform as a Service is for Developers

# Platform as a Service (PaaS)

**A cloud service for developers who want to develop, run, and manage applications**

**No servers, storage, network, OS, middleware, or databases are needed**

**Examples of PaaS are:**

- AWS Elastic Beanstalk
- Microsoft Azure App Service
- Google App Engine
- Cloud Foundry
- Heroku

# IaaS vs PaaS

## IaaS

All servers, storage, and networking are provided

Developers must install their own software such as web servers, database servers, etc.

## PaaS

PaaS runs on top of infrastructure as a service

Developers have access to already installed web servers, database servers, and development libraries

# Pizza as a Service

Published on July 30, 2014



Albert Barron | [Follow](#)

Sr. Software Client Architect at IBM



746



113



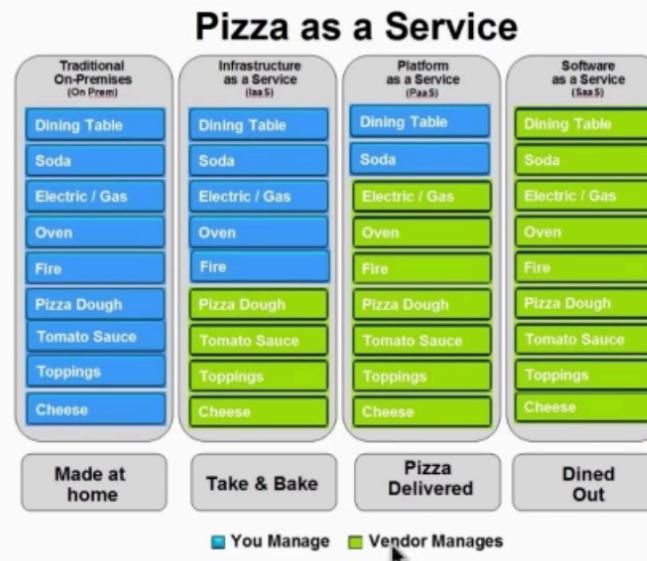
29

As technologists, we tend to live in a world of acronyms and terms quite common to those of us in the industry. But this abbreviated language can seem like a foreign language to those outside of it. Recently, while on a bicycle ride, a friend and I were talking technology. In our conversation, I mentioned SOA and the not so recent shift from WS to REST and JSON. I brought up some of the most current cloud announcements and how easily we can now dynamically scale applications or spin up environments. However, five minutes into my rambling ~~the conversation~~ he asked, “What’s SOA?” Without missing a beat I replied, “It’s a TLA”.

I then stopped, not literally of course, as I would’ve caused a crash in our weekend makeshift peloton! I stopped when I quickly realized I had just committed a cardinal sin. I assumed he knew the terminology and the technology, though he isn’t in the field. And admittedly, since I am passionate about technology, I’m sometimes blissfully



Discover how companies like the world's leading technology companies use LinkedIn every day.

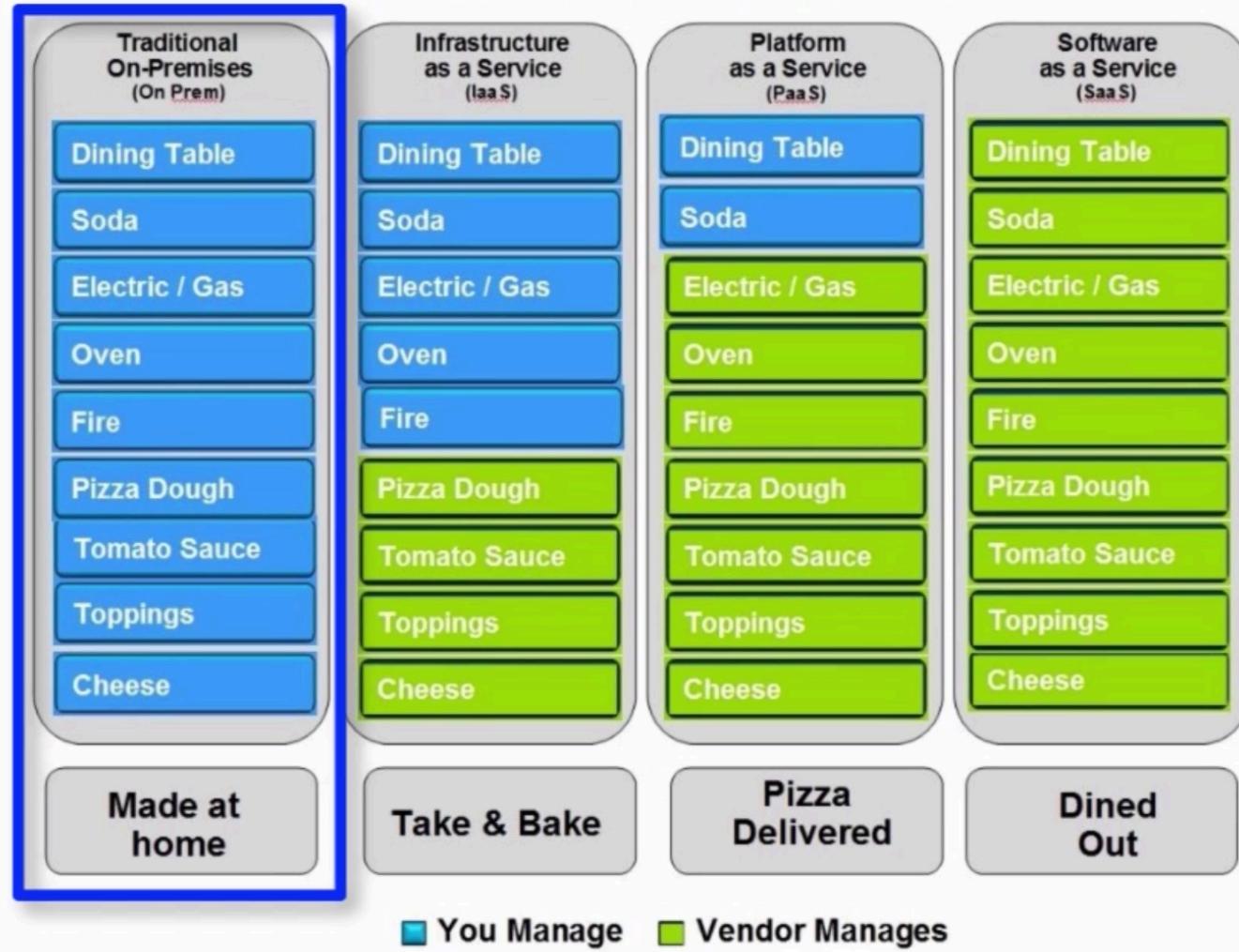


Time for lunch..pizza anyone?

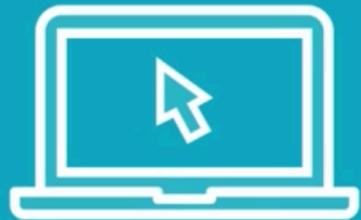


As it turns out, the pizza example was something he could relate to and it reaffirmed that sometimes we simply have to take a step back and keep things simple. It's not a new concept, but it's something a techie easily forgets! Thanks to Professor Gilson for helping me to remember that sometimes keeping it simple is the best way to deliver a message.

# Pizza as a Service



Demo



## Amazon's PaaS: Elastic Beanstalk



## History

Console Home

S3

VPC

EC2

Search services

Group A-Z

Compute

EC2

EC2 Container Service

Lightsail ↗

Elastic Beanstalk

Lambda

Batch

Storage

S3

EFS

Glacier

Storage Gateway

Database

RDS

DynamoDB

ElastiCache

Redshift

Networking &amp; Content Deliv...

VPC

Developer Tools

CodeCommit

CodeBuild

CodeDeploy

CodePipeline

X-Ray

Management Tools

CloudWatch

CloudFormation

CloudTrail

Config

OpsWorks

Service Catalog

Trusted Advisor

Managed Services

Security, Identity &amp; Complia...

IAM

Inspector

Certificate Manager

Directory Service

WAF &amp; Shield

Analytics

Athena

EMR

CloudSearch

Elasticsearch Service

Kinesis

Data Pipeline

QuickSight ↗

Application Services

Step Functions

SWF

API Gateway

Elastic Transcoder

Messaging

Simple Queue Service

Simple Notification Service

SES

Business Productivity

WorkDocs

WorkMail

Amazon Chime ↗

Artificial Intelligence

Lex

Polly

Rekognition

Machine Learning

Internet Of Things

AWS IoT

Contact Center

Amazon Connect

Game Development

<https://console.aws.amazon.com/plasticbeanstalk/home?region=us-east-1>



## Learn More

[Get Started using Elastic Beanstalk](#)[What Is AWS Elastic Beanstalk?](#)[How Does AWS Elastic Beanstalk Work?](#)

## Featured

[Create your own custom platform](#)

## Command Line Interface (v3)

[Installing the AWS EB CLI](#)[EB CLI Command Reference](#)

If you want to use a command line to create, manage, and scale your Elastic Beanstalk applications, please use the Elastic Beanstalk Command Line Interface (EB CLI).

## Get Started

```
$ mkdir HelloWorld  
$ cd HelloWorld  
$ eb init -p PHP  
$ echo "Hello World" > index.html  
$ eb create dev-env  
$ eb open
```

To deploy updates to your applications, use

## All Applications

Filter by Application Name:

test

Actions ▾

No environments currently exist for this application. [Create one now.](#)



## AWS Elastic Beanstalk

Developer Guide (API Version 2010-12-01)

Documentation - This Guide

Search

What Is AWS Elastic Beanstalk?

Getting Started

How Elastic Beanstalk Works

Elastic Beanstalk Platforms

Tutorials and Samples

Managing Applications

Managing Environments

Environment Configuration

Monitoring an Environment

Integrating AWS Services

Your Local Development Environment

The EB CLI

Working with Docker

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Have a question? Try the Forums.

Did this page help you?

Yes

No

Feedback 

The following tasks will help you get started with Elastic Beanstalk to create, view, deploy, and update your application as well as edit and terminate your environment. You'll use the AWS Management Console, a point-and-click web-based interface, to complete these tasks.

### Sections

- Step 1: Sign up for the Service
- Step 2: Create an Application
- Step 3: View Information About Your Environment
- Step 4: Deploy a New Application Version
- Step 5: Change Configuration
- Step 6: Clean Up
- Where to Go Next



### Step 1: Sign up for the Service

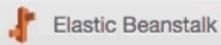
If you're not already an AWS customer, you'll need to sign up. Signing up allows you to access Elastic Beanstalk and other AWS services that you will need, such as Amazon Elastic Compute Cloud (Amazon EC2), Amazon Simple Storage Service (Amazon S3), and Amazon Simple Notification Service (Amazon SNS).

#### To sign up for an AWS account

1. Open the [Elastic Beanstalk console](#).
2. Follow the instructions shown.

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## Learn More

[Get Started using Elastic Beanstalk](#)[What Is AWS Elastic Beanstalk?](#)[How Does AWS Elastic Beanstalk Work?](#)

## Featured

[Create your own custom platform](#)

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$ eb open
```

To deploy updates to your applications, use

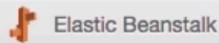
## All Applications

Filter by Application Name:

test

Actions ▾

No environments currently exist for this application. [Create one now.](#)



## Try the new design

We're testing a new design for the environment creation wizard. [Opt in now](#) to try it and let us know what you think!



## New Environment

Environment Type

Application Version

Environment Info

Additional Resources

Configuration Details

Environment Tags

Permissions

Review Information

## New Environment

AWS Elastic Beanstalk has two types of environment tiers to support different types of web applications. Web servers are standard applications that listen for and then process HTTP requests, typically over port 80. Workers are specialized applications that have a background processing task that listens for messages on an Amazon SQS queue. Worker applications post those messages to your application by using HTTP.

## Web Server Environment

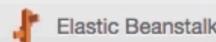
Provides resources for an AWS Elastic Beanstalk web server in either a single instance or load-balancing, auto scaling environment. [Learn more](#).

[Create web server](#)

## Worker Environment\*

Provides resources for an AWS Elastic Beanstalk worker application in either a single instance or load-balancing, auto scaling environment. [Learn more](#).

[Create worker](#)[Cancel](#)



## Try the new design

We're testing a new design for the environment creation wizard. [Opt in now](#) to try it and let us know what you think!



New Environment

## Environment Type

Environment Type

Application Version

Environment Info

Additional Resources

Configuration Details

Environment Tags

Permissions

Review Information

Choose the platform and type of environment to launch.

Predefined configuration:

- ✓ Select a platform
- Preconfigured
  - .NET (Windows/IIS)
  - Java
  - Node.js
  - PHP
  - Python
  - Ruby
  - Tomcat
  - Go
  - Packer
- Preconfigured – Docker
  - GlassFish
  - Go
  - Python
  - Generic
  - Docker
  - Multi-container Docker

Looking for a different platform? Let us know.

[Learn more](#)[Cancel](#)[Previous](#)[Next](#)[Feedback](#)[English](#)

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## Try the new design

We're testing a new design for the environment creation wizard. [Opt in now](#) to try it and let us know what you think!

New Environment

Environment Type

Application Version

Environment Info

Additional Resources

Configuration Details

Environment Tags

Permissions

Review Information

## Environment Type

Choose the platform and type of environment to launch.

Predefined configuration:

Docker

Looking for a different platform? Let us know.

AWS Elastic Beanstalk will create an environment running Docker 1.12.6 on 64bit Amazon Linux 2016.09 v2.5.2.

Environment type:

Single instance

[Learn more](#)

Retrieving values for configuration source...

[Cancel](#)[Previous](#)[Next](#)



## Try the new design

We're testing a new design for the environment creation wizard. [Opt in now](#) to try it and let us know what you think!

New Environment

Environment Type

## Application Version

Application Version

Environment Info

Select a source for your application version.

Additional Resources

Source:  Sample application

Configuration Details

Upload your own ([Learn more](#))

No file chosen

Environment Tags

S3 URL

(e.g. <https://s3.amazonaws.com/s3Bucket/s3Key>)

Permissions

Review Information

## Deployment Preferences

Elastic Beanstalk will update your application in batches so as to avoid downtime when deploying.

Deployment policy:  [Learn more](#)

Healthy threshold:

Ignore health check:

Batch size:  Percentage

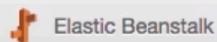
% of the fleet at a time

Fixed



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## Try the new design

We're testing a new design for the environment creation wizard. [Opt in now](#) to try it and let us know what you think!



New Environment

Environment Type

Application Version

**Environment Info**

Additional Resources

Configuration Details

Environment Tags

Permissions

Review Information

## Environment Information

Enter your environment information.

Environment name:

test-env

Environment URL:

test-env-dmd .us-east-1.elasticbeanstalk.com

[Check availability](#)

Description:

Optional: 200 character maximum

[Cancel](#)[Previous](#)[Next](#)



Services ▾

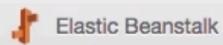
Resource Groups ▾



David M. Davis ▾

N. Virginia ▾

Support ▾



test ▾

Create New Environment

All Applications &gt; test &gt; test-env (Environment ID: e-76u2j6qk2x, URL: test-env-dmd.us-east-1.elasticbeanstalk.com)

Actions ▾

Dashboard

Configuration

Logs

Health

Monitoring

Alarms

Managed Updates

Events

Tags

Overview

⟳ Refresh



Health

Ok

Causes

Running Version

Sample Application

Upload and Deploy



Configuration

64bit Amazon Linux 2016.09  
v2.5.2 running Docker 1.12.6

Change

Recent Events

Show All

Time	Type	Details
2017-04-08 01:25:55 UTC-0400	INFO	Successfully launched environment: test-env
2017-04-08 01:25:09 UTC-0400	INFO	Environment health has transitioned from Pending to Ok. Initialization completed 15 seconds ago and took 5 minutes.



All Applications > test > test-env (Environment ID: e-76u2j6qk2x, URL: [test-env-dmd.us-east-1.elasticbeanstalk.com](#))

Actions ▾

Overview

⟳ Refresh

Dashboard

Configuration

Logs

Health

Monitoring

Alarms

Managed Updates

Events

Tags



Health

OK

Causes

Running Version

Sample Application

Upload and Deploy



docker

Configuration

64bit Amazon Linux 2016.09  
v2.5.2 running Docker 1.12.6

Change

Recent Events

Show All

Time	Type	Details
2017-04-08 01:25:55 UTC-0400	INFO	Successfully launched environment: test-env
2017-04-08 01:25:09 UTC-0400	INFO	Environment health has transitioned from Pending to Ok. Initialization completed 15 seconds ago and took 5 minutes.

test-env-dmd.us-east-1.elasticbeanstalk.com



# Congratulations!

Your Docker Container is now running in Elastic Beanstalk on your own dedicated environment in the AWS Cloud.

## Video Tutorials

- YouTube: [Run a Docker Container from the Docker Registry](#)
- YouTube: [Use Private Docker Repositories](#)

## Sample Apps

- GitHub: [PHP and Amazon RDS](#)
- GitHub: [Python, DynamoDB, and SNS](#)

## Documentation

- [Deploying Docker with AWS Elastic Beanstalk](#)
- [AWS Elastic Beanstalk overview](#)
- [AWS Elastic Beanstalk concepts](#)



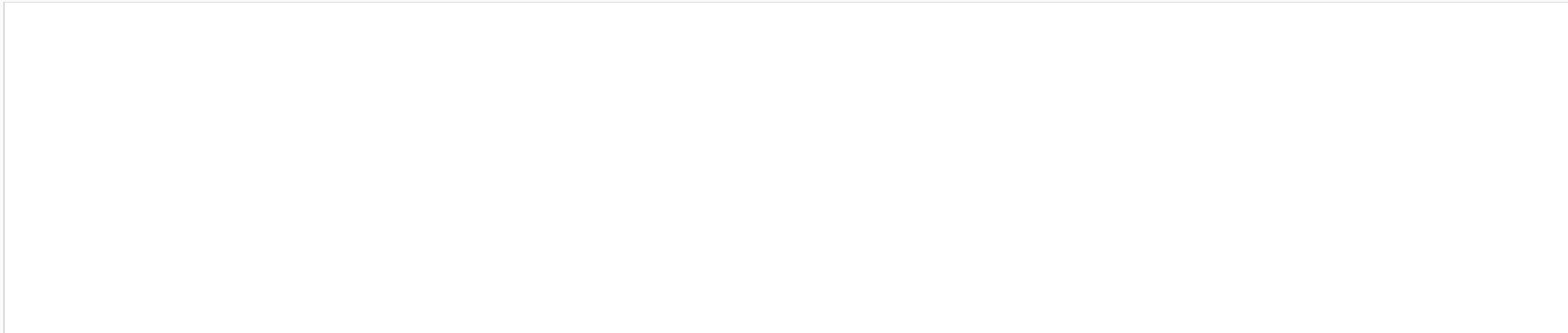
# Summary



- What is Platform as a Service?
- How do IaaS and PaaS Compare?
- Demo AWS Elastic Beanstalk

# Software as a Service (SaaS) Cloud Solutions

---



# Overview



**Benefits of SaaS Cloud Solutions**

**Demo Office 365**

**Demo Google G Suite**

**Demo Salesforce.com**



# Benefits of Software as a Service Solutions

- No hardware to buy or install**
- No software to buy or install**
- No software to maintain or upgrade**
- You only pay for what you use**
- New features are included**
- Most everyone can afford and use applications that used to be only for large corporations**



Demo



Demo of Office 365

# DEMO

## G-Suite

[https://p.cygnus.cc.kuleuven.be/bbcswebdav/pid-26686075-dt-content-rid-243870814\\_2/xid-243870814\\_2](https://p.cygnus.cc.kuleuven.be/bbcswebdav/pid-26686075-dt-content-rid-243870814_2/xid-243870814_2)

## Office 365

[https://p.cygnus.cc.kuleuven.be/bbcswebdav/pid-26686077-dt-content-rid-243870815\\_2/xid-243870815\\_2](https://p.cygnus.cc.kuleuven.be/bbcswebdav/pid-26686077-dt-content-rid-243870815_2/xid-243870815_2)

## Salesforce

[https://p.cygnus.cc.kuleuven.be/bbcswebdav/pid-26686081-dt-content-rid-243870834\\_2/xid-243870834\\_2](https://p.cygnus.cc.kuleuven.be/bbcswebdav/pid-26686081-dt-content-rid-243870834_2/xid-243870834_2)



# Summary



**Benefits of SaaS Cloud Solutions**

**Demo Office 365**

**Demo Google G Suite**

**Demo Salesforce.com**

# Free Student Cloud Accounts

- Microsoft Azure: <https://azure.microsoft.com/nl-nl/free/students/>
- Google cloud: <https://cloud.google.com/free/> OR  
[https://edu.google.com/programs/credits/?modal\\_active=sign-up](https://edu.google.com/programs/credits/?modal_active=sign-up)
- Amazon AWS: <https://www.awseducate.com/registration#INFO-Student>
- Registreer en maak een account aan

## Oefeningen:

Maak onderstaande oefeningen en documenteer alle stappen met screenshots.  
Gebruik hiervoor de voorziene template en sla die op als Naam\_voornaam.docx/pdf...  
Voorzie behalve de screenshots ook beperkt uitleg per stap indien nodig.  
Dien het in in de voorziene uploadzone vóór de deadline.

### 1. IAAS

- A. Creeer 1 Windows VM op een platform naar keuze
- B. Zorg dat je die van op afstand met RDP kan overnemen
- C. Creeer 1 Linux VM op een platform naar keuze
- D. Zorg dat je toegang hebt via SSH
- E. BONUS (niet verplicht) zorg dat je die kan overnemen met RDP

### 2. PAAS

- A. Zet 1 SQL Database op in de cloud op een platform naar keuze
- B. Zorg dat je daarmee kan verbinden met een SQL client op je computer

Permanente evaluatie, deadline: zie Toledo