
Public Clouds: AWS EC2



Outline

- What is AWS and EC2
- Sign-up EC2 for a free Account
- Creating a instance with a pre-packaged AMI
- Create a custom AMI

What is AWS

- What to do with over-sized Amazon data centers out of holiday season?
 - By the end of 2003 Chris Pinkham and Benjamin Black proposed to provide some sort of Queuing System to use the machines in something-else
- In 2007 AWS start to provide online services to other providers or client-side applications
- Today provides a wide range of services
 - Compute
 - EC2 (Elastic Cloud 2), EMR (Elastic Map Reduce)
 - Networking
 - Route 53 (DNS service), Virtual Private Cloud (VPC) [Isolated EC2], AWS direct connect
 - Storage
 - S3, Amazon Glacier (Backup), AWS Storage Gateway (block level device through iSCSI), EBS (Elastic Block Store == LVM)
 - Data base
 - DynamoDB (NoSQL), ElasticCache (memcached), RelationalDB (Oracle, Mysql...)
 - Many SaaS services

What is EC2?

- IaaS to other AWS services but also available for external customers
 - “virtual” computers that you configure-as-you-want and pay-as-you-go
- Different instances according to node characteristics and on-demand costs
 - m1.small --- 2 GB Mem, 1 vCPU, 160GB HDD, \$0.07 c/hour
 -
 - hs1.8xlarge – 117GB, 16 vCPU, 48TB, 10Gbit net, \$4.6 c/hour
- Class of instances
 - cX (compute), rX (memory), hsX (storage), gX (GPGPU)
 - Prices are data-center dependent
- Persistent storage
 - Uses Elastic Block Storage
- Persistent IP
 - Uses elastic IP
- Provides a free tier to learn!
 - <http://aws.amazon.com/es/free/>

EC2 Virtual Data Center

- Provides the resources to deploy a “complex” data center without spend a “penny” before to start “earning” money: i.e. Pay-as-you-go
- Elements in a data-center ([AWS-Terminology](#))
 - Servers (Instances)
 - Static IP Addresses (Elastic IP Addresses)
 - Firewall (“Security Group”)
 - SAN (“Elastic Block Store”)
 - Monitoring (“CloudWatch”)
 - Load Balancing (“Elastic Load Balancing”)
- Key: auto-scaling
 - **Up:** To meet demands
 - **Down:** To save money
 - The changes are produced in minutes

Sign-in EC2 for a Free Account


■ Caveats

- You need a “valid” visa number
- You need a “valid” phone number to verify your identity

■ Provides

- 750 hours of micro Linux/Windows instances per month
- 30GB in EBS





AWS management console

**Services** ▾ **Edit** ▾





Valentin Puente ▾ Global ▾ Help ▾

Amazon Web Services





Compute & Networking

-  **Direct Connect**
Dedicated Network Connection to AWS
-  **EC2**
Virtual Servers in the Cloud
-  **Route 53**
Scalable Domain Name System
-  **VPC**
Isolated Cloud Resources







Storage & Content Delivery

-  **CloudFront**
Global Content Delivery Network
-  **Glacier**
Archive Storage in the Cloud
-  **S3**
Scalable Storage in the Cloud
-  **Storage Gateway**
Integrates On-Premises IT Environments with Cloud Storage



Database

-  **DynamoDB**
Predictable and Scalable NoSQL Data Store
-  **ElastiCache**
In-Memory Cache
-  **RDS**
Managed Relational Database Service
-  **Redshift**
Managed Petabyte-Scale Data Warehouse Service







Deployment & Management

-  **CloudFormation**
Templated AWS Resource Creation
-  **CloudTrail**
User Activity and Change Tracking
-  **CloudWatch**
Resource and Application Monitoring
-  **Elastic Beanstalk**
AWS Application Container
-  **IAM**
Secure AWS Access Control
-  **OpsWorks**
DevOps Application Management Service

Analytics

-  **Data Pipeline**
Orchestration for Data-Driven Workflows
-  **Elastic MapReduce**
Managed Hadoop Framework

App Services

-  **CloudSearch**
Managed Search Service
-  **Elastic Transcoder**
Easy-to-use Scalable Media Transcoding
-  **SES**
Email Sending Service
-  **SNS**
Push Notification Service
-  **SQS**
Message Queue Service
-  **SWF**
Workflow Service for Coordinating Application Components

Additional Resources


Getting Started

See our documentation to get started and learn more about how to use our services.

Trusted Advisor

Best practice recommendations to save money, improve fault tolerance, increase performance, and close security gaps.

Service Health


 All services operating normally.

Updated: Nov 25 2013 13:09:00 GMT+0100

Service Health Dashboard

Set Start Page

[Console Home](#) ▾

 **AWS Marketplace**
Find & buy software, launch with 1-Click and pay by the hour.

EC2 management Console

Tags

INSTANCES

Instances
Spot Requests
Reserved Instances

IMAGES

AMIs
Bundle Tasks

ELASTIC BLOCK STORE

Volumes
Snapshots

NETWORK & SECURITY

Security Groups
Elastic IPs
Placement Groups
Load Balancers
Key Pairs
Network Interfaces

You are using the following Amazon EC2 resources in the EU West (Ireland) region.

0 Running Instances
0 Volumes
0 Key Pairs
0 Placement Groups

0 Elastic IPs
0 Snapshots
0 Load Balancers
1 Security Group



Optimize your resources' cost, performance and security with [AWS Trusted Advisor](#)

[Hide](#)

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 EU West (Ireland) region

Service Health

Service Status:



EU West (Ireland):
This service is operating normally

Availability Zone Status:



eu-west-1a:
Availability zone is operating normally



eu-west-1b:
Availability zone is operating normally



eu-west-1c:
Availability zone is operating normally

[Service Health Dashboard](#)



Scheduled Events

EU West (Ireland):

No events

Supported Platforms

VPC

Default VPC

vpc-821d16e0

Additional Information

[Getting Started Guide](#)

[Documentation](#)

[All EC2 Resources](#)

[Forums](#)

[Pricing](#)

[Contact Us](#)

Popular AMIs on AWS Marketplace

[CentOS 6.4 \(i386\) - Release Media](#)

Provided by CentOS.org
Rating ★★★★★
Free Software, pay only for AWS usage
[View all Operating Systems](#)

[Couchbase Server - Community Edition](#)

Provided by Couchbase
Rating ★★★★★
Free Software, pay only for AWS usage
[View all Databases](#)

[LAMP Stack powered by BitNami](#)

Provided by BitNami
Rating ★★★★★

Create a new server (using preset-AMI)












Step 1: Choose an Amazon Machine Image (AMI)

[Cancel and Exit](#)

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

[My AMIs](#)[AWS Marketplace](#)[Community AMIs](#)☐ Free tier only ⓘ

 Amazon Linux Free tier eligible	Amazon Linux AMI 2013.09.1 - ami-c7ec0eb0 (64-bit) / ami-efec0e98 (32-bit) The Amazon Linux AMI is an EBS-backed, PV-GRUB image. It includes Linux 3.4, AWS tools, and repository access to multiple versions of MySQL, PostgreSQL, Python, Ruby, and Tomcat. Root device type: ebs Virtualization type: paravirtual	Select <input checked="" type="radio"/> 64-bit <input type="radio"/> 32-bit
 Red Hat Free tier eligible	Red Hat Enterprise Linux 6.4 - ami-75342c01 (64-bit) / ami-8b332bff (32-bit) Red Hat Enterprise Linux version 6.4, EBS-boot. Root device type: ebs Virtualization type: paravirtual	Select <input checked="" type="radio"/> 64-bit <input type="radio"/> 32-bit
 SUSE Linux Free tier eligible	SUSE Linux Enterprise Server 11 - ami-8d1109f9 (64-bit) / ami-fd110989 (32-bit) SUSE Linux Enterprise Server 11 Service Pack 3 basic install, EBS boot with Amazon EC2 AMI Tools preinstalled; Apache 2.2, MySQL 5.5, PHP 5.3, and Ruby 1.8.7 available Root device type: ebs Virtualization type: paravirtual	Select <input checked="" type="radio"/> 64-bit <input type="radio"/> 32-bit
 Ubuntu Free tier eligible	Ubuntu Server 12.04.3 LTS - ami-8e987ef9 (64-bit) / ami-80987ef7 (32-bit) Ubuntu Server 12.04.3 LTS with support available from Canonical (http://www.ubuntu.com/cloud/services). Root device type: ebs Virtualization type: paravirtual	Select <input checked="" type="radio"/> 64-bit <input type="radio"/> 32-bit
 Ubuntu Free tier eligible	Ubuntu Server 13.10 - ami-480bea3f (64-bit) / ami-4a0bea3d (32-bit) Ubuntu Server 13.10, with support available from Canonical (http://www.ubuntu.com/cloud/services). Root device type: ebs Virtualization type: paravirtual	Select <input checked="" type="radio"/> 64-bit <input type="radio"/> 32-bit
 Amazon Linux	Amazon Linux AMI (HVM) 2013.09.1 - ami-2b09eb5c The Amazon Linux AMI is an EBS-backed, HVM image. It includes Linux 3.4, AWS tools, and repository access to multiple versions of MySQL, PostgreSQL, Python, Ruby, and Tomcat. Root device type: ebs Virtualization type: hvm	Select 64-bit
 Red Hat	Red Hat Enterprise Linux 6.4 for Cluster Instances - ami-f72b3383 Red Hat Enterprise Linux version 6.4 is an EBS-backed, HVM image for use with Amazon EC2 Cluster Instances. Root device type: ebs Virtualization type: hvm	Select 64-bit
 Ubuntu	Ubuntu Server 12.04.3 LTS for HVM instances - ami-8c987efb Ubuntu Server 12.04.3 LTS with support available from Canonical (http://www.ubuntu.com/cloud/services) for Cluster and other HVM instances Root device type: ebs Virtualization type: hvm	Select 64-bit
 SUSE Linux	Cluster Instances HVM SUSE Linux Enterprise 11 - ami-011b1975 SUSE Linux Enterprise Server 11 Service Pack 2, 64-bit architecture, and HVM based virtualization for use with Amazon EC2 Cluster Compute and Cluster GPU instances. Nvidia driver installs automatically during startup. Root device type: ebs Virtualization type: hvm	Select 64-bit
 Ubuntu	Ubuntu Server 13.10 for HVM Instances - ami-360bea41 Ubuntu Server 13.10, with support available from Canonical (http://www.ubuntu.com/cloud/services). Valid for Cluster and other HVM instances Root device type: ebs Virtualization type: hvm	Select 64-bit
 Microsoft Windows	Microsoft Windows Server 2012 Base - ami-3937da4e	Select

Community AMIs (Debian) Use Micro!!!

ces

Edit

Valentin Puente

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2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Tag Instance

6. Configure Security Group

7. Review

Choose an Amazon Machine Image (AMI)











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 use your own AMIs.

Search

debian

X

1 to 25 of 113 AMIs

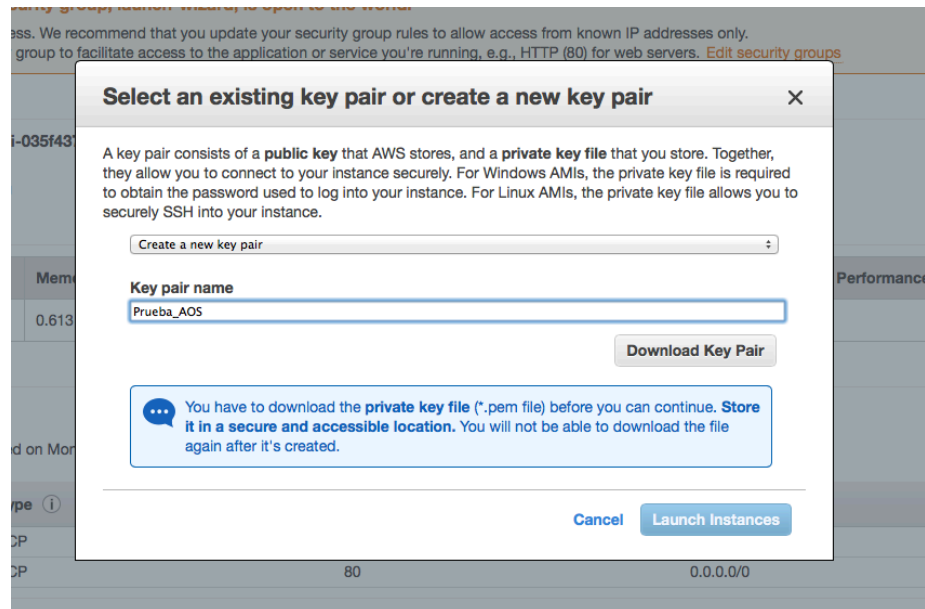
	debian-wheezy-amd64-20130705 - ami-035f4377 Debian 7.1a (Wheezy) Base Root device type: ebs Virtualization type: paravirtual	
	debian-wheezy-amd64-20130711 - ami-05f3ef71 Debian 7.1 (Wheezy) Base Root device type: ebs Virtualization type: paravirtual	
	rightimage_debian_6.0.1_amd64_20110405.1_ebs - ami-0f01367b Debian GNU/Linux 6.0.1 (squeeze). Created with Debian Machine Image Builder v0.1 on Tue, 05 Apr 2011 22:00:41 +0000. EBS Root device type: ebs Virtualization type: paravirtual	
	debian-6-x32-ree - ami-15f7c961 Vanilla 6.0 Squeeze 32bit, updated, with REE in /opt Root device type: ebs Virtualization type: paravirtual	
	debian-6-x64-ree - ami-27013f53 Vanilla 6.0 Squeeze 64bit, updated, with REE in /opt Root device type: ebs Virtualization type: paravirtual	

Configure instance

- 2 Instance type
 - Use a micro instance (otherwise you will pay)
- 3 Configure instance
 - Spot Instances
 - Like stock options buy: limit your maximum price
 - Assign a public IP to the instance
 - Multi-tenancy
 - Book a “private” hw or not (and pay more)
 - Kernels and ramdisk boot
 - Only change if you know what you need: LVM, iSCSI, etc...?
- 4 Storage
 - 8GB is enough
- 6 Security options
 - Firewall
 - How its accessible the machine and from where?
 - SSH config available!!!
 - Otherwise, you will be not able to access to it!

Security Keys

- Ssh access is done by key pair



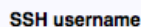
- Download the key and keep it safe!
 - `# mv Downloads/prueba_AOS.pem $HOME/.ssh/aws.pem`
 - `# chmod go-rwx $HOME/.ssh/aws.pem`

Accessing your instance

- Check in console when is up and running

<div> <div>Launch Instance</div> <div>Connect</div> <div>Actions</div> </div> <div> <div>Filter: All Instance types</div> <div>Search Instances</div> <div>1 to 1 of 1 Instances</div> </div>											
	Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS	Public IP	Key Name	Launch Time
		i-15217c59	t1.micro	eu-west-1c	running	Initializing	None	ec2-54-194-78-180.eu...	54.194.78.180	Prueba_AOS	2013-11-15 12:00:00

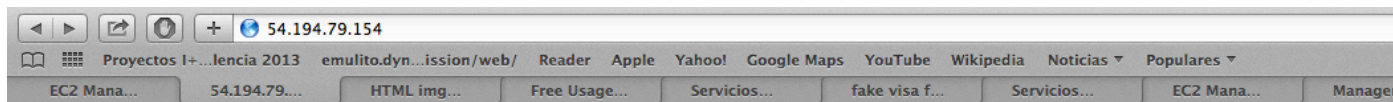
- Log-in your brand new machine and install apache
 - `# ssh -i $HOME/.ssh/aws.pem admin@IP_public`
- Never connect as root
 - In this case we are using a “official” EC2 Image/AMI
 - <https://wiki.debian.org/Cloud/AmazonEC2Image/Wheezy>



In line with the security of most Linux distributions on *Amazon Web Services*, remote *root* SSH is disabled (as is password authentication). You will need to connect to instances from this AMI as the user **admin** using your SSH key, and then **sudo -i** to gain root access.

Install a new Apache2 Server

- As usual
 - `#sudo su -`
 - `#apt-get update`
 - `#apt-get install apache2`
- We have a “real” web server listening in the `public_IP`



EC2 Apache Server: It works!

This is the default web page for this server.

The web server software is running but no content has been added, yet.



Amazon Machine Images

- It's a boot disk
 - Pre-bundled OS+Tools installed
 - Should not contain “data”
- You can use
 - AMIs from Amazon
 - AMIs with 3rd parties software
 - AMIs from the community...
 - Your own AMIs
- Public AMIs
 - **Ups:** Support, Community, maintenance, etc...
 - **Downs:** Security, Documentation, Software setup, etc..

Previous: concepts

- Bucket
 - possibly public, globally unique name; contains multiple images
- Prefix
 - possibly public, globally unique name; contains multiple images
- Image ID (AMI ID)
 - **Unique** identifier for an individual image; assigned by EC2
 - Required to create a new instance

Previous

Create a Bucket in S3

The screenshot shows the AWS Management Console interface. In the left-hand navigation pane, under the 'Storage' section, the 'S3' service is listed. The 'Create Bucket' button is highlighted with a red circle. The main content area shows the 'Create Bucket' wizard for a bucket named 'aos.uc'. The wizard includes fields for 'Bucket Name', 'Region' (Ireland), 'Creation Date' (Mon Nov 25 16:56:48 GMT+100 2013), and 'Owner' (Me). Below these fields, there are expandable sections for 'Permissions', 'Static Website Hosting', 'Logging', 'Notifications', 'Lifecycle', 'Tags', 'Requester Pays', and 'Versioning'.

Get your credentials (IAM) AWS_ACCESS_KEY and AWS_SECRET_ACCESS_KEY

The screenshot shows the AWS IAM console. The top navigation bar includes the user's name 'Valentin Puente'. A dropdown menu is open, showing options: 'My Account', 'Billing & Cost Management', 'Security Credentials', and 'Sign Out'. Below this, the 'Access Keys' page is displayed. It contains a table of access keys with columns: 'Created', 'Access Key ID', 'Secret Access Key', and 'Status'. Two keys are listed: one created on August 23, 2012, and another on May 15, 2013. The 'Access Key ID' for the May 15, 2013 key is highlighted with a red box and labeled 'Your Access Key IDs'. The 'Secret Access Key' for the same key is also visible. Below the table, there is a section for 'View Your Deleted Access Keys' with a warning about key rotation.

Created	Access Key ID	Secret Access Key	Status
August 23, 2012		Show	Inactive (Make Active Delete)
May 15, 2013	Your Access Key IDs	Show	Active (Make Inactive)

Task1: Custom AMI from a pre-bundled Instance

■ Steps

- 1 Configure a prebuilt instance
 - Installing additional software, configurations, etc...
- 2 Rebundle and upload to S3
- 3 Register as a new AMI

■ Tools required

- EC2 AMI tools: <http://aws.amazon.com/developertools/368>
 - Use alien to convert rpm into deb
- AWS CLI python frontend
 - Installed with pip

Rebundle a running AMI and upload it to S3

#Create a X.509 certificate/private key in Security Credentials (IAM)

#Upload both to the EC2 instance

scp -i \$HOME/aws.pem Downloads/*.pem admin@<EC2_pubIP>:/tmp/

#Connect

ssh -i \$HOME/aws.pem admin@<EC2_pubIP>

#Install EC2 AMI tools and install other tools

wget rpm from http://aws.amazon.com/developertools/368

apt-get install alien ruby curl && alien ec2-ami-tools.noarch.rpm && alien ec2-ami-tools.noarch.rpm

#Prepare Ruby

export RUBYLIB=\$RUBYLIB:/usr/lib/ruby/site_ruby

#Bundle the image (You can get user ID from IAM in “Account identification”

ec2-bundle-vol --prefix myDebian --user xxxx-xxxx-xxxx --destination /mnt --privatekey /tmp/pk-*.pem --cert /tmp/cert-*.pem --exclude /mnt/,/tmp --arch x86_64

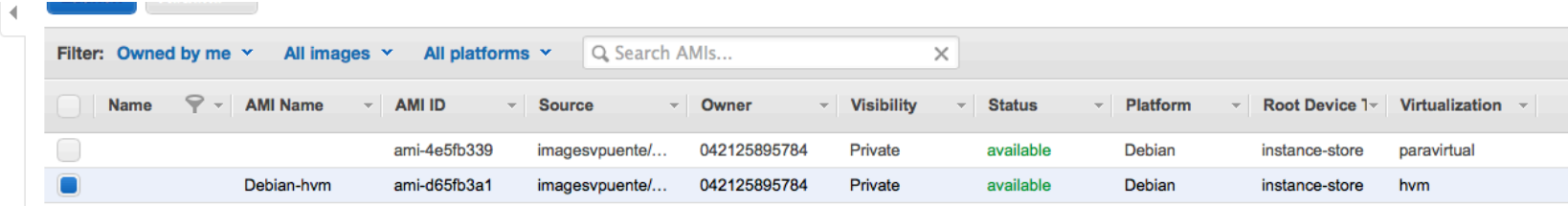
#Upload the bundle to S3 (Need AWS_ACCESS_KEY and AWS_SECRET_KEY from IM)

Beware bucketnames (aos.uc gives a SSL error uses something without “.”)

ec2-upload-bundle --bucket imagesVpuente -m /mnt/myDebian.manifest.xml --access-key XXXXXX --secret-key xxxxxxxxxx

Register the new AMI

- More powerful than old EC2 CLI
 - Install aws cli tools (<http://aws.amazon.com/es/cli/>)
 - apt-get install -y python-pip
 - pip install awscli
 - Edit \$HOME/.aws-config or “aws configure”
[default]
aws_access_key_id = XXXXXXXXX
aws_secret_access_key = xxxxxxxx region = eu-west-1
export AWS_CONFIG_FILE=\$HOME/.aws-config
- Register the AMI (you can change a lot of properties, such as VM type)
 - aws ec2 register-image --image-location imagesvpuente/myDebian.manifest.xml
 - aws ec2 register-image --image-location imagesvpuente/myDebian.manifest.xml --virtualization-type hvm --name Debian-hvm
- Now Available in my personal AMIs (free tier is not available!)



Filter: Owned by me All images All platforms Search AMIs...										
<input type="checkbox"/>	Name	AMI Name	AMI ID	Source	Owner	Visibility	Status	Platform	Root Device 1	Virtualization
<input type="checkbox"/>			ami-4e5fb339	imagesvpuente/...	042125895784	Private	available	Debian	instance-store	paravirtual
<input checked="" type="checkbox"/>		Debian-hvm	ami-d65fb3a1	imagesvpuente/...	042125895784	Private	available	Debian	instance-store	hvm

Uploading your own VM I (Windows on Xen)

- EC2 Supports Import/Export from Vmware, Hyper-V, Xen, etc... through EC2-api-tools
- Recipe
 - 1 Install API tools
 - wget
http://launchpadlibrarian.net/111617788/ec2-api-tools_1.6.1.1-0ubuntu1_all.deb
 - dpkg -i ec2-api-tools_1.6.1.1-0ubuntu1_all.deb
 - Get your AWS_ACCESS_KEY and AWS_SECRET_KEY from top EC2 console, User Name → Security Credentials)
 - #export AWS_ACCESS_KEY=XXXXXXXXXXXXXXXXXXXXXXXXXXXX
 - #export AWS_SECRET_KEY=XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Uploading your own VM 2

- Create EC2 using RAW Xen disk in a prebuilt S3 bucket (aos.uc) (Note: Sync clocks with ntpdate)
 - `ec2-import-instance /vms/images/image.img -f RAW -t t1.micro -a x86_64 -b aos.uc -o $AWS_ACCESS_KEY -w $AWS_SECRET_KEY --region eu-west-1`
- Check the progress
 - `ec2-describe-conversion-tasks import-i-ffm2nty0 -O $AWS_ACCESS_KEY -W $AWS_SECRET_KEY --region eu-west-1`
- Only valid for Windows Images (No Linux support at this time)