

# Cloud e Datacenter Networking

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Laurea Magistrale in Ingegneria Informatica

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## Introduzione ai servizi Amazon AWS: IAM, EC2 ed S3



- ▶ **Introduzione alla suite di servizi Amazon AWS**
- ▶ **Identity and Access Management (IAM)**
- ▶ **Il servizio Amazon *Elastic Compute Cloud* EC2**
- ▶ **Creazione ed accesso ad un'istanza EC2**

# AWS: Identity and Access Management (IAM)



- ▶ *Identity and Access Management* is the security discipline that enables the right individuals to access the right resources at the right times for the right reasons
- ▶ In cloud computing IAM is crucial to securely control access to cloud resources
- ▶ *AWS Identity and Access Management (IAM)* is a web service that enables Amazon Web Services (AWS) customers to manage users and user permissions
- ▶ The service is targeted at organizations with multiple users or systems that use AWS products such as Amazon EC2, Amazon SimpleDB, and the AWS Management Console
- ▶ With IAM, you can centrally manage users, security credentials such as access keys, and permissions that control which AWS resources users can access
- ▶ In AWS a single person (e.g. a programmer) or a single company (e.g. a software house) can create several different IAM users in the system, with different capabilities
- ▶ Each user is identified in AWS by (User Name, Access Key Id, Secret Access Key)
- ▶ An IAM user may login to the AWS console

# AWS console: IAM

AWS Services

## Amazon Web Services

- Compute**
  - EC2: Virtual Servers in the Cloud
  - EC2 Container Service: Run and Manage Docker Containers
  - Elastic Beanstalk: Run and Manage Web Apps
  - Lambda: Run Code in Response to Events
- Storage & Content Delivery**
  - S3: Scalable Storage in the Cloud
  - CloudFront: Global Content Delivery Network
  - Elastic File System **PREVIEW**: Fully Managed File System for EC2
  - Glacier: Archive Storage in the Cloud
  - Import/Export Snowball: Large Scale Data Transport
  - Storage Gateway: Integrates On-Premises IT Environments with Cloud Storage
- Database**
  - RDS: Managed Relational Database Service
  - DynamoDB: Predictable and Scalable NoSQL Data Store
  - ElastiCache: In-Memory Cache
  - Redshift: Managed Petabyte-Scale Data Warehouse Service
- Networking**
  - VPC: Isolated Cloud Resources
  - Direct Connect: Dedicated Network Connection to AWS
  - Route 53: Scalable DNS and Domain Name Registration
- Developer Tools**
  - CodeCommit: Store Code in Private Git Repositories
  - CodeDeploy: Automate Code Deployments
  - CodePipeline: Release Software using Continuous Delivery
- Management Tools**
  - CloudWatch: Monitor Resources and Applications
  - CloudFormation: Create and Manage Resources with Templates
  - CloudTrail: Track User Activity and API Usage
  - Config: Track Resource Inventory and Changes
  - OpsWorks: Automate Operations with Chef
  - Service Catalog: Create and Use Standardized Products
  - Trusted Advisor: Optimize Performance and Security
- Security & Identity**
  - Identity & Access Management**: Manage User Access and Encryption Keys
  - Directory Service: Host and Manage Active Directory
  - Inspector **PREVIEW**: Analyze Application Security
  - WAF: Filter Malicious Web Traffic
- Analytics**
  - EMR: Managed Hadoop Framework
  - Data Pipeline: Orchestration for Data-Driven Workflows
  - Elasticsearch Service: Run and Scale Elasticsearch Clusters
  - Kinesis: Work with Real-time Streaming data
  - Machine Learning: Build Smart Applications Quickly and Easily
- Internet of Things**
  - AWS IoT **BETA**: Connect Devices to the cloud
- Mobile Services**
  - Mobile Hub **BETA**: Build, Test, and Monitor Mobile apps
  - Cognito: User Identity and App Data Synchronization
  - Device Farm: Test Android, Fire OS, and iOS apps on real devices in the Cloud
  - Mobile Analytics: Collect, View and Export App Analytics
  - SNS: Push Notification Service
- Application Services**
  - API Gateway: Build, Deploy and Manage APIs
  - AppStream: Low Latency Application Streaming
  - CloudSearch: Managed Search Service
  - Elastic Transcoder: Easy-to-use Scalable Media Transcoding
  - SES: Email Sending Service
  - SQS: Message Queue Service
  - SWF: Workflow Service for Coordinating Application Components
- Enterprise Applications**
  - WorkSpaces: Desktops in the Cloud
  - WorkDocs: Secure Enterprise Storage and Sharing Service
  - WorkMail **PREVIEW**: Secure Email and Calendaring Service

# IAM user creation

- ▶ When a new IAM user is created, credentials are provided to let the user access AWS resources
- ▶ Access Key Id is public
- ▶ Secret Access Key is strictly private
- ▶ After a new user has been created, download the .csv key file, which contains:  
User Name, Access Key ID, Secret Access Key
- ▶ Store this key file securely, because this is the last time you'll be able to download the secret access key
- ▶ A user may also be identified by a password (for console login)

The screenshot shows the AWS IAM console interface. On the left, a navigation menu includes Dashboard, Details, Groups, Users (highlighted), Roles, Policies, Identity Providers, Account Settings, Credential Report, and Encryption Keys. The main content area displays a table of users with columns for 'User Name' and 'Groups'. Three users are listed: UtenteAT01, UtenteAT02, and UtenteAT03, each with 0 groups. A red arrow points from the 'User Name' column to a red-bordered box containing a CSV snippet: 'UtenteAT01',AKIAIBCQ42ACDC56RPBQ,..... Below the table, a 'Create Access Key' dialog box is open, showing a success message and a 'Download Key File' button, which is also highlighted with a red box.

<input type="checkbox"/>	User Name ↕	Groups
<input type="checkbox"/>	UtenteAT01	0
<input type="checkbox"/>	UtenteAT02	0
<input type="checkbox"/>	UtenteAT03	0

`User Name,Access Key Id,Secret Access Key  
"UtenteAT01",AKIAIBCQ42ACDC56RPBQ,.....`

**Create Access Key** Cancel

You have successfully created a new Access Key and Secret Key with ID **AKIAJH4QC2MO4BFAJNIQ**.

Please download your key file now, which contains your new access key ID and secret access key. If you do not download the key file now, you will not be able to retrieve your Secret Key later.

For your protection, store your secret access key securely and do not share it.

Download Key File Close

# AM user: console login



- ▶ After you create IAM users and passwords for each, users can sign in to the AWS Management Console for your AWS account with a special URL
- ▶ By default, the sign-in URL for your account includes your account ID
- ▶ You can create a unique sign-in URL for your account so that the URL includes a name instead of an account ID
- ▶ The sign-in endpoint follows this pattern:

```
https://AWS-account-ID-or-alias.signin.aws.amazon.com/console
```

- ▶ You can find the global sign-in URL for an account on the IAM console dashboard



- ▶ IAM users in your account have access only to the AWS resources that you specify in the policy that is attached to the user or to an IAM group that the user belongs to
- ▶ To work in the console, users must have permissions to perform the actions that the console performs, such as listing and creating AWS resources

# IAM user: Access Key ID

Access Key ID and Secret Access Key are needed to access AWS resources within a program

The screenshot shows the AWS IAM console interface. The breadcrumb navigation is IAM > Users > UtenteAT01. The left sidebar contains navigation options: Dashboard, Details, Groups, Users (highlighted), Roles, Policies, Identity Providers, Account Settings, Credential Report, and Encryption Keys. The main content area is divided into three tabs: Groups, Permissions, and Security Credentials (selected). Under the Security Credentials tab, there is an 'Access Keys' section with a 'Create Access Key' button and a table of existing keys. Below that is a 'Sign-In Credentials' section with a 'Manage Password' button.

**Summary**

**User ARN:** arn:aws:iam::825934055097:user/UtenteAT01  
**Has Password:** No  
**Groups (for this user):** 0  
**Path:** /  
**Creation Time:** 2013-09-19 20:59 UTC+0200

**Security Credentials**

**Access Keys**

Use access keys to make secure REST or Query protocol requests to any AWS service API. For your protection, you should never share your secret keys with anyone. In addition, industry best practice recommends [Access Keys](#)

[Create Access Key](#)

Access Key ID	Created	Last Used	Last Used Service	Last Used Region	Status
AKIAIBCQ42AKVA56RPDQ	2015-11-01 22:55 UTC+0100	2015-11-04 01:24 UTC+0100	s3	N/A	Active

**Sign-In Credentials**





**User Name:** UtenteAT01 [Manage Password](#)  
**Password:** No  
**Last Used:** N/A

# AWS console: EC2



## Amazon Web Services





### Compute

-  **EC2**  
Virtual Servers in the Cloud
-  **EC2 Container Service**  
Run and Manage Docker Containers
-  **Elastic Beanstalk**  
Run and Manage Web Apps
-  **Lambda**  
Run Code in Response to Events




### Storage & Content Delivery

-  **S3**  
Scalable Storage in the Cloud
-  **CloudFront**  
Global Content Delivery Network
-  **Elastic File System** PREVIEW  
Fully Managed File System for EC2
-  **Glacier**  
Archive Storage in the Cloud
-  **Import/Export Snowball**  
Large Scale Data Transport
-  **Storage Gateway**  
Integrates On-Premises IT Environments with Cloud Storage

### Database

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




### Networking

-  **VPC**  
Isolated Cloud Resources
-  **Direct Connect**  
Dedicated Network Connection to AWS
-  **Route 53**  
Scalable DNS and Domain Name Registration


### Developer Tools

-  **CodeCommit**  
Store Code in Private Git Repositories
-  **CodeDeploy**  
Automate Code Deployments
-  **CodePipeline**  
Release Software using Continuous Delivery






### Management Tools

-  **CloudWatch**  
Monitor Resources and Applications
-  **CloudFormation**  
Create and Manage Resources with Templates
-  **CloudTrail**  
Track User Activity and API Usage
-  **Config**  
Track Resource Inventory and Changes
-  **OpsWorks**  
Automate Operations with Chef
-  **Service Catalog**  
Create and Use Standardized Products
-  **Trusted Advisor**  
Optimize Performance and Security

### Security & Identity

-  **Identity & Access Management**  
Manage User Access and Encryption Keys
-  **Directory Service**  
Host and Manage Active Directory
-  **Inspector** PREVIEW  
Analyze Application Security
-  **WAF**  
Filter Malicious Web Traffic






### Analytics

-  **EMR**  
Managed Hadoop Framework
-  **Data Pipeline**  
Orchestration for Data-Driven Workflows
-  **Elasticsearch Service**  
Run and Scale Elasticsearch Clusters
-  **Kinesis**  
Work with Real-time Streaming data
-  **Machine Learning**  
Build Smart Applications Quickly and Easily








### Internet of Things

-  **AWS IoT** BETA  
Connect Devices to the cloud




### Mobile Services

-  **Mobile Hub** BETA  
Build, Test, and Monitor Mobile apps
-  **Cognito**  
User Identity and App Data Synchronization
-  **Device Farm**  
Test Android, Fire OS, and iOS apps on real devices in the Cloud
-  **Mobile Analytics**  
Collect, View and Export App Analytics
-  **SNS**  
Push Notification Service

### Application Services

-  **API Gateway**  
Build, Deploy and Manage APIs
-  **AppStream**  
Low Latency Application Streaming
-  **CloudSearch**  
Managed Search Service
-  **Elastic Transcoder**  
Easy-to-use Scalable Media Transcoding
-  **SES**  
Email Sending Service
-  **SQS**  
Message Queue Service
-  **SWF**  
Workflow Service for Coordinating Application Components

### Enterprise Applications

-  **WorkSpaces**  
Desktops in the Cloud
-  **WorkDocs**  
Secure Enterprise Storage and Sharing Service
-  **WorkMail** PREVIEW  
Secure Email and Calendaring Service





- ▶ Amazon Elastic Compute Cloud (Amazon EC2) è un servizio web che fornisce capacità computazionale nel cloud
- ▶ E' sostanzialmente un servizio di tipo IaaS
- ▶ Progettato per rendere più semplice agli sviluppatori l'accesso e l'utilizzo di risorse computazionali controllabili attraverso una semplice interfaccia web
- ▶ Permette di allocare macchine virtuali nei datacenter di Amazon
- ▶ Non comprende servizi di storage
- ▶ Amazon offre una serie di altri servizi che possono essere abbinati ad EC2:
  - ▶ S3 - servizio di storage
  - ▶ Elastic IP - servizio che assegna uno o più indirizzi IP pubblici che possono essere associati, in maniera statica o dinamica, alle istanze EC2
  - ▶ CloudWatch - servizio per il monitoraggio delle risorse Cloud
  - ▶ Elastic Beanstalk - un servizio di tipo PaaS per costruire applicazioni scalabili
  - ▶ ...



- ▶ Riduce il tempo richiesto per ottenere ed avviare una nuova istanza server
- ▶ Possibilità di scalare velocemente la quantità di risorse impiegate (a crescere o a diminuire) al variare delle esigenze computazionali
  - ▶ Possibilità di ottenere nuove istanze di server in pochi minuti
- ▶ Si pagano solo le risorse utilizzate
- ▶ Non ci sono costi di start-up
- ▶ Non ci sono costi fissi
- ▶ Non ci sono utilizzi minimi mensili richiesti
- ▶ Si paga solo la CPU ad ore ed il trasferimento di dati sulla rete



- ▶ Estratto da: <http://aws.amazon.com/ec2-sla/>
- ▶ Service Commitment
  - ▶ AWS will use commercially reasonable efforts to make Amazon EC2 and Amazon EBS each available with a Monthly Uptime Percentage of at least 99.95%, in each case during any monthly billing cycle.
  - ▶ In the event Amazon EC2 or Amazon EBS does not meet the Service Commitment, you will be eligible to receive a Service Credit.
- ▶ Service Credits
  - ▶ Service Credits are calculated as a percentage of the total charges paid by you ... for either Amazon EC2 or Amazon EBS in the Region affected for the monthly billing cycle in which the Region Unavailability occurred in accordance with the schedule below

<b>Monthly Uptime Percentage</b>	<b>Service Credit Percentage</b>
<b>Less than 99.95%</b>	
<b>but equal to or greater than 99.0%</b>	<b>10%</b>
<b>Less than 99.0%</b>	<b>30%</b>



- ▶ Selezione di un'immagine pre-configurata da far girare immediatamente oppure la creazione di una Amazon Machine Image (AMI) contenente le applicazioni, librerie, dati e configurazione dell'utente.
- ▶ Attivazione dell'istanza
- ▶ Configurazione delle policy di sicurezza e di accesso alla rete (firewalling)
- ▶ Eventuale associazione ad un blocco di storage fisso per le istanze (Elastic Block Store EBS) che persiste indipendentemente dalla vita delle istanze
- ▶ Monitoraggio dell'istanza attraverso le API ed i tool di gestione forniti

# Amazon AWS: console

The screenshot shows the Amazon AWS Management Console for the EC2 service in the US West (Oregon) region. The interface includes a navigation sidebar on the left with categories like EC2 Dashboard, INSTANCES, IMAGES, ELASTIC BLOCK STORE, and NETWORK & SECURITY. The main content area is divided into several sections:

- Resources:** A summary of EC2 resources in the region, including 0 Running Instances, 0 Elastic IPs, 0 Volumes, 0 Snapshots, 0 Key Pairs, 0 Load Balancers, 0 Placement Groups, and 1 Security Group. A callout box for the AWS Trusted Advisor is also present.
- Create Instance:** A section with a 'Launch Instance' button and a note that instances will launch in the US West (Oregon) region.
- Service Health:** A section showing the status of the EC2 service in the US West (Oregon) region, indicating that the service is operating normally across all availability zones (us-west-2a and us-west-2b).
- Account Attributes:** A section providing account-specific information, such as Supported Platforms (VPC) and Default VPC (vpc-f0d4c092).
- Additional Information:** A section with links to various resources, including the Getting Started Guide, Documentation, All EC2 Resources, Forums, Pricing, and Contact Us.
- Popular AMIs on AWS Marketplace:** A section listing popular AMIs, such as CentOS 6.4 (i386) and Couchbase Server - Community Edition.

The footer of the console displays the copyright notice: © 2008 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved. It also includes links for Privacy Policy and Terms of Use, and a Feedback button.

# Amazon AWS: Financial statement

The screenshot displays the Amazon Web Services (AWS) Billing console in a Mozilla Firefox browser. The page title is "Amazon Web Services - Mozilla Firefox" and the URL is "https://portal.aws.amazon.com/gp/aws/developer/account/index.html". The page shows the "Statement Period: September 1 - September 30, 2013" and a dropdown menu to "Select a different statement: September 1 - September 30, 2013".

**Summary**

You have no billable activity for this statement period.

<b>Total new charges for this statement</b>	<b>\$0.00</b>
No payments received to date.	
<b>Outstanding balance for this statement</b>	<b>\$0.00</b>

**Details**

Expand All Services | Collapse All Services Printer Friendly Version

<b>AWS Service Charges</b>	<b>\$0.00</b>
<b>Amazon Elastic Compute Cloud</b>	<b>\$0.00</b>
Download Usage Report >>	
<b>US East (Northern Virginia) Region</b>	
<b>Amazon EC2 running Linux/UNIX</b>	
\$0.00 per Linux/RHEL Micro Instance (t1.micro) instance-hour (or partial hour) under monthly free tier	3 Hrs 0.00
<b>Amazon EC2 EBS</b>	
\$0.00 per GB-month of provisioned storage under monthly free tier.	2.511 GB-Mo 0.00
\$0.00 for the first 2 million I/O requests under monthly free tier	18,045 IOs 0.00
<b>Amazon CloudWatch</b>	
\$0.00 per alarm-month - first 10 alarms	0.315 Alarms 0.00
<b>Amazon SimpleDB</b>	<b>\$0.00</b>
Download Usage Report >>	
<b>Amazon Simple Notification Service</b>	<b>\$0.00</b>
Download Usage Report >>	



# Amazon EC2: instance creation (1)

EC2 Management Console - Mozilla Firefox

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EC2 Management Console

https://console.aws.amazon.com/ec2/v2/home?region=us-west-2#LaunchInstanceWizard:

Services Edit Roberto Canonico Oregon Help





1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Tag Instance 6. Configure Security Group 7. Review

## 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 ⓘ

 <b>Amazon Linux</b> Free tier eligible	<b>Amazon Linux AMI 2013.09.1</b> - ami-be1c848e (64-bit) / ami-4c1c847c (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	<input type="button" value="Select"/> <input checked="" type="radio"/> 64-bit <input type="radio"/> 32-bit
 <b>Red Hat</b> Free tier eligible	<b>Red Hat Enterprise Linux 6.4</b> - ami-b8a63b88 (64-bit) / ami-baa63b8a (32-bit) Red Hat Enterprise Linux version 6.4, EBS-boot. Root device type: ebs Virtualization type: paravirtual	<input type="button" value="Select"/> <input checked="" type="radio"/> 64-bit <input type="radio"/> 32-bit
 <b>SUSE Linux</b> Free tier eligible	<b>SUSE Linux Enterprise Server 11</b> - ami-d8b429e8 (64-bit) / ami-9eb429ae (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	<input type="button" value="Select"/> <input checked="" type="radio"/> 64-bit <input type="radio"/> 32-bit
 <b>Ubuntu</b> Free tier eligible	<b>Ubuntu Server 12.04.3 LTS</b> - ami-6aad335a (64-bit) / ami-68ad3358 (32-bit) Ubuntu Server 12.04.3 LTS, with support available from Canonical ( <a href="http://www.ubuntu.com/cloud/services">http://www.ubuntu.com/cloud/services</a> ). Root device type: ebs Virtualization type: paravirtual	<input type="button" value="Select"/> <input checked="" type="radio"/> 64-bit <input type="radio"/> 32-bit

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# Amazon EC2: instance creation (2)

EC2 Management Console - Mozilla Firefox

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EC2 Management Console

https://console.aws.amazon.com/ec2/v2/home?region=us-west-2#LaunchInstanceWizard:

Services Edit Roberto Canonico Oregon Help

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Tag Instance 6. Configure Security Group 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.

**Currently selected:** t1.micro (up to 2 ECUs, 1 vCPUs, 0.613 GiB memory, EBS only)

All instance types

**Micro instances**  
Free tier eligible

General purpose

Memory optimized

Storage optimized

Compute optimized

### Micro instances

Micro instances are a low-cost instance option, providing a small amount of CPU resources. They are suited for lower throughput applications, and websites that require additional compute cycles periodically, but are not appropriate for applications that require sustained CPU performance. Popular uses for micro instances include low traffic websites or blogs, small administrative applications, bastion hosts, and free trials to explore EC2 functionality.

Size	ECUs ⓘ	vCPUs ⓘ	Memory (GiB)	Instance Storage (GiB) ⓘ	EBS-Optimized Available ⓘ	Network Performance ⓘ
t1.micro	up to 2	1	0.613	EBS only	-	Very Low

Micro instances are eligible for the AWS free usage tier. For the first 12 months following your AWS sign-up date, you get up to 750 hours of micro instances each month. When your free usage tier expires or if your usage exceeds the free tier restrictions, you pay standard, pay-as-you-go service rates. [Learn more](#) about free usage tier eligibility and restrictions

Cancel Previous **Review and Launch** Next: Configure Instance Details

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# Amazon EC2: instance creation (3)

The screenshot displays the Amazon EC2 Management Console in a Mozilla Firefox browser window. The page title is "EC2 Management Console - Mozilla Firefox" and the URL is "https://console.aws.amazon.com/ec2/v2/home?region=us-west-2#LaunchInstanceWizard:". The console shows the "Step 3: Configure Instance Details" wizard, which is part of a 7-step process: 1. Choose AMI, 2. Choose Instance Type, 3. Configure Instance Details, 4. Add Storage, 5. Tag Instance, 6. Configure Security Group, and 7. Review. The current step is "Step 3: Configure Instance Details", which includes instructions: "Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot Instances to take advantage of the lower pricing, assign an access management role to the instance, and more." The configuration options are as follows:

- Number of instances:** 1
- Purchasing option:**  Request Spot Instances
- Network:** vpc-f0d4c092 (172.31.0.0/16) (default) [Create new VPC](#)
- Subnet:** No preference (default subnet in any Availability Zone) [Create new subnet](#)
- Public IP:**  Automatically assign a public IP address to your instances
- IAM role:** None
- Shutdown behavior:** Stop
- Enable termination protection:**  Protect against accidental termination
- Monitoring:**  Enable CloudWatch detailed monitoring  
[Additional charges apply.](#)
- Tenancy:** Shared tenancy (multi-tenant hardware)  
[Additional charges will apply for dedicated tenancy.](#)

At the bottom of the page, there is a "Advanced Details" section and navigation buttons: "Cancel", "Previous", "Review and Launch" (highlighted in blue), and "Next: Add Storage". The footer contains the copyright notice "© 2008 - 2013, Amazon Web Services, Inc. or its affiliates. All rights reserved.", links for "Privacy Policy" and "Terms of Use", and a "Feedback" button.

# Amazon EC2: instance creation (4)

The screenshot shows the Amazon EC2 Management Console in Mozilla Firefox. The browser address bar displays the URL: `https://console.aws.amazon.com/ec2/v2/home?region=us-west-2#LaunchInstanceWizard:`. The console header shows the user 'Roberto Canonico' and the region 'Oregon'. The progress bar indicates the current step is '4. Add Storage'.

### Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. [Learn more](#) about storage options in Amazon EC2.

Type	Device	Snapshot	Size (GB)	Volume Type	IOPS	Delete on Termination
Root	/dev/sda1	snap-911898ad	8	Standard	N/A	<input checked="" type="checkbox"/>

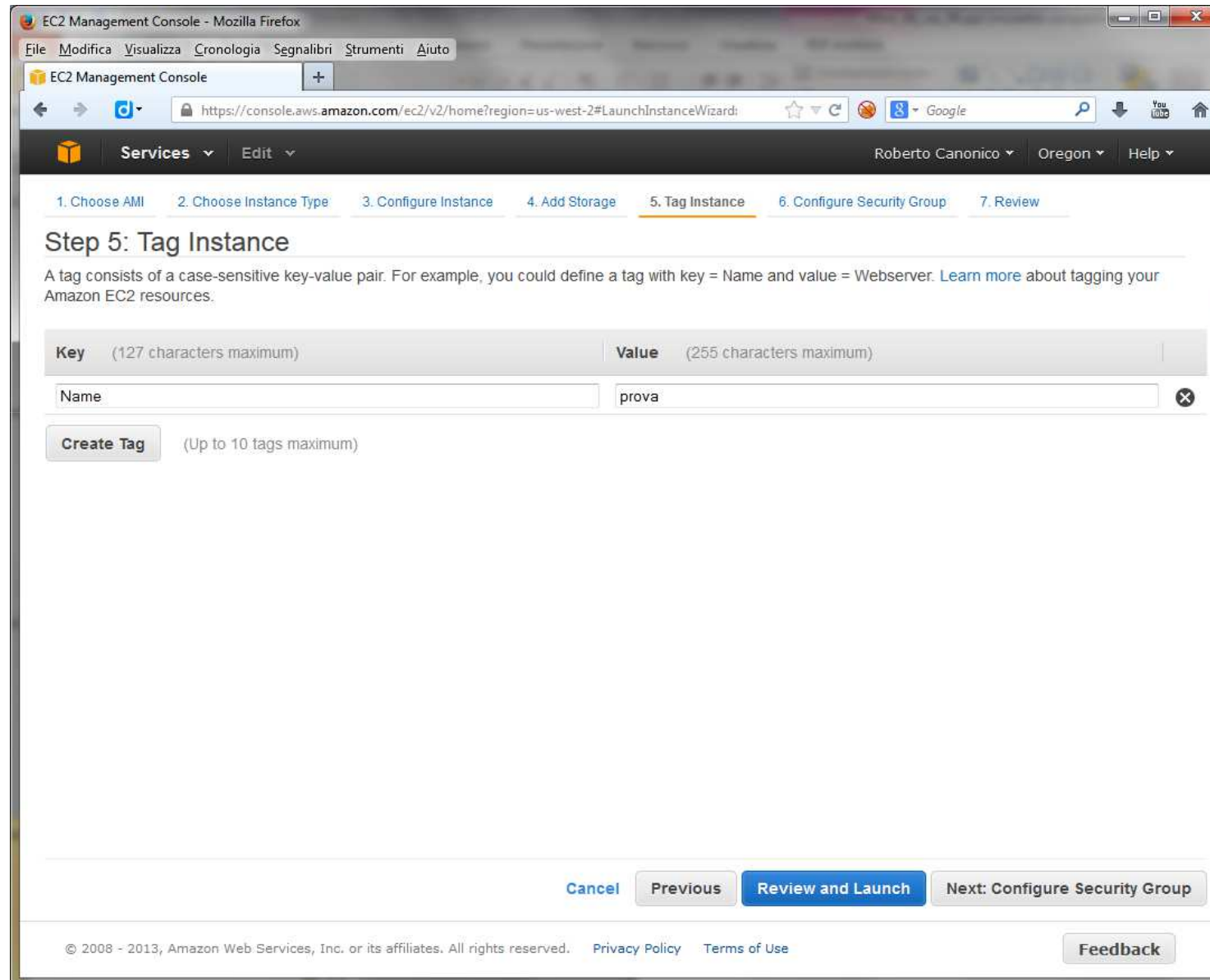
[Add New Volume](#)

Free tier eligible customers can get up to 30 GB of EBS storage. [Learn more](#) about free usage tier eligibility and usage restrictions.

[Cancel](#) [Previous](#) [Review and Launch](#) [Next: Tag Instance](#)

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# Amazon EC2: instance creation (5)



# Amazon EC2: instance creation (6)

EC2 Management Console - Mozilla Firefox

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EC2 Management Console

https://console.aws.amazon.com/ec2/v2/home?region=us-west-2#LaunchInstanceWizard

Services Edit Roberto Canonico Oregon Help

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Tag Instance 6. Configure Security Group 7. Review

## Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

**Assign a security group:**  Create a new security group  
 Select an existing security group

**Security group name:**

**Description:**

Protocol	Type	Port Range (Code)	Source
SSH	TCP	22	Anywhere 0.0.0.0/0

Add Rule

**Warning**

Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

Cancel Previous **Review and Launch**

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# Amazon EC2: instance creation (7)

EC2 Management Console - Mozilla Firefox

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EC2 Management Console

https://console.aws.amazon.com/ec2/v2/home?region=us-west-2#LaunchInstanceWizard

Services Edit Roberto Canonico Oregon Help

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Tag Instance 6. Configure Security Group 7. Review

## Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

**Improve your instance's security. Your security group, launch-wizard-1, is open to the world.**

Your instance may be accessible from any IP address. We recommend that you update your security group rules to allow access from known IP addresses only.

You can also open additional ports in your security group to facilitate access to the application or service you're running, e.g., HTTP (80) for web servers. [Edit security groups](#)

AMI Details [Edit AMI](#)

**Ubuntu Server 12.04.3 LTS - ami-6aad335a**

Free tier eligible

Ubuntu Server 12.04.3 LTS, with support available from Canonical (<http://www.ubuntu.com/cloud/services>).

Root Device Type: ebs Virtualization type: paravirtual

Instance Type [Edit instance type](#)

Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GiB)	EBS-Optimized Available	Network Performance
t1.micro	up to 2	1	0.613	EBS only	-	Very Low

Security Groups [Edit security groups](#)

Security group name: launch-wizard-1

Description: launch-wizard-1 created on Saturday, December 7, 2013 6:50:44 PM UTC+1

[Cancel](#) [Previous](#) [Launch](#)

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# Amazon EC2: instance creation (8)

EC2 Management Console - Mozilla Firefox

https://console.aws.amazon.com/ec2/v2/home?region=us-west-2#LaunchInstanceWizard:

Services Edit Roberto Canonico Oregon Help

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Tag Instance 6. Configure Security Group 7. Review

### Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

**Improve your instance's security. Your security group, launch-wizard-1, is open to the world.**

Your instance may be accessible from known IP addresses only. You can also open ports for other servers. [Edit security groups](#)

**AMI Details**

Ubuntu S  
Free tier eligible  
Ubuntu Se  
Root Device

**Instance Type**

Instance Type  
t1.micro

**Security Groups**

Security group nam  
Description

#### 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.

Create a new key pair

**Key pair name**  
myawskey1

Download Key Pair

You have to download the **private key file** (\*.pem file) before you can continue. **Store it in a secure and accessible location.** You will not be able to download the file again after it's created.

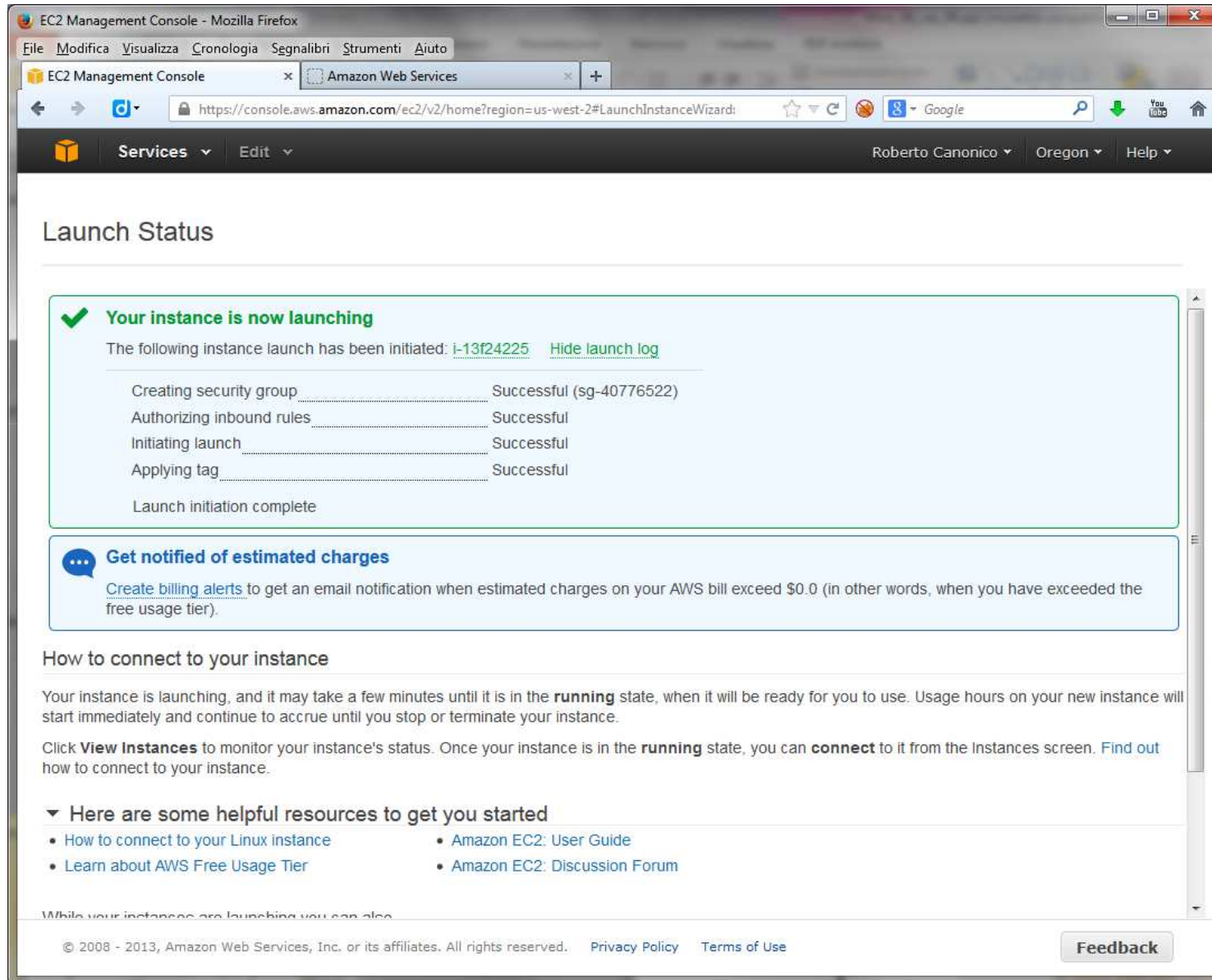
Cancel Launch Instances

Cancel Previous Launch

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Feedback

# Amazon EC2: instance creation (9)




EC2 Management Console - Mozilla Firefox

EC2 Management Console Amazon Web Services

https://console.aws.amazon.com/ec2/v2/home?region=us-west-2#LaunchInstanceWizard


Services Edit Roberto Canonico Oregon Help

## Launch Status

 **Your instance is now launching**

The following instance launch has been initiated: [i-13f24225](#) [Hide launch log](#)

Creating security group	Successful (sg-40776522)
Authorizing inbound rules	Successful
Initiating launch	Successful
Applying tag	Successful
Launch initiation complete	

 **Get notified of estimated charges**

[Create billing alerts](#) to get an email notification when estimated charges on your AWS bill exceed \$0.0 (in other words, when you have exceeded the free usage tier).

### How to connect to your instance

Your instance is launching, and it may take a few minutes until it is in the **running** state, when it will be ready for you to use. Usage hours on your new instance will start immediately and continue to accrue until you stop or terminate your instance.

Click **View Instances** to monitor your instance's status. Once your instance is in the **running** state, you can **connect** to it from the Instances screen. [Find out how to connect to your instance.](#)

▼ **Here are some helpful resources to get you started**

- [How to connect to your Linux instance](#)
- [Learn about AWS Free Usage Tier](#)
- [Amazon EC2: User Guide](#)
- [Amazon EC2: Discussion Forum](#)

While your instances are launching you can also

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# Amazon EC2: instance creation (10)

The screenshot displays the Amazon EC2 Management Console interface. The top navigation bar includes the AWS logo, 'Services', 'Edit', and user information for 'Roberto Canonico' in the 'Oregon' region. The left sidebar lists various EC2 services such as 'Instances', 'Spot Requests', 'Reserved Instances', 'Images', 'Elastic Block Store', and 'Network & Security'. The main content area shows a list of instances with a filter set to 'All instances' and a search for 'i-13f24225'. A single instance named 'prova' is listed with ID 'i-13f24225', type 't1.micro', and state 'running'. Below the list, the details for instance 'i-13f24225 (prova)' are shown, including its public DNS, IP addresses, and other configuration details.

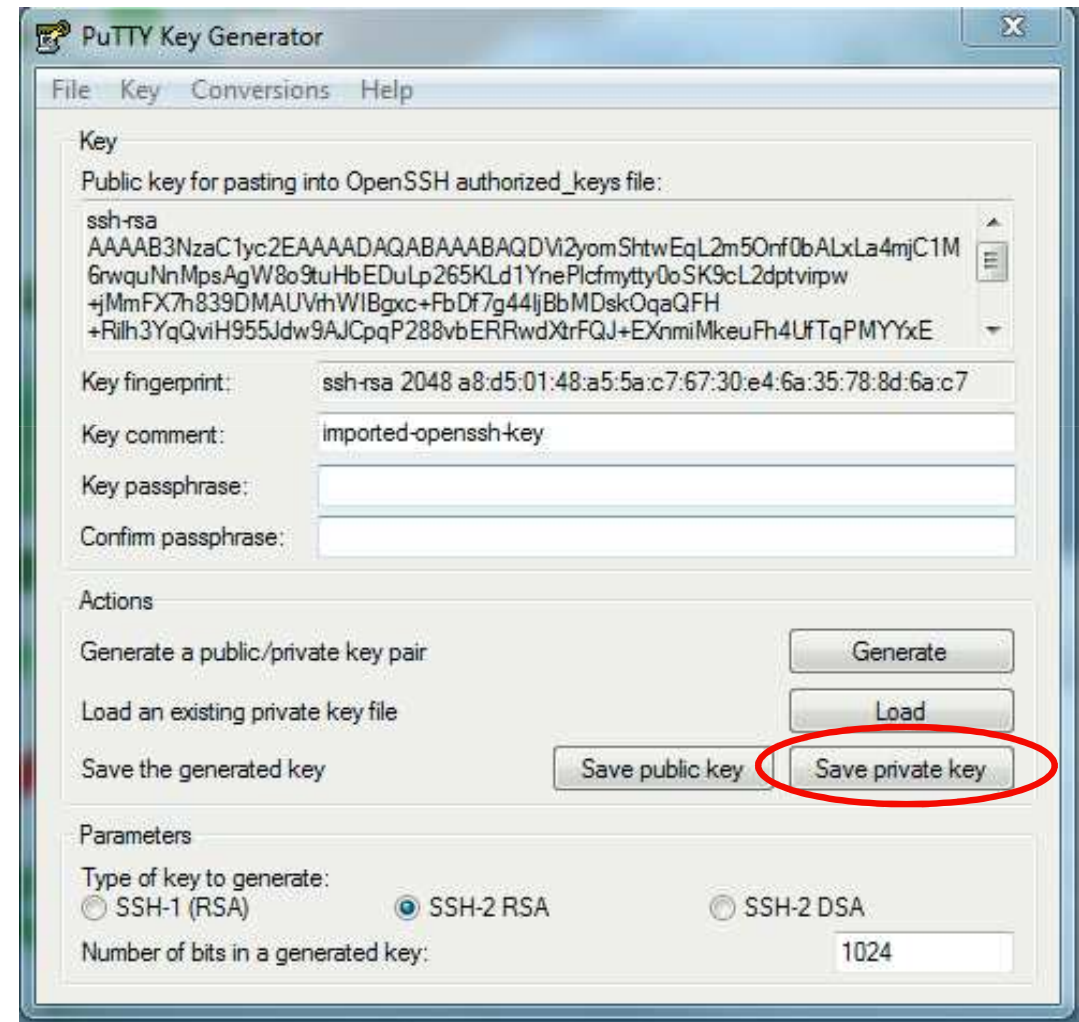
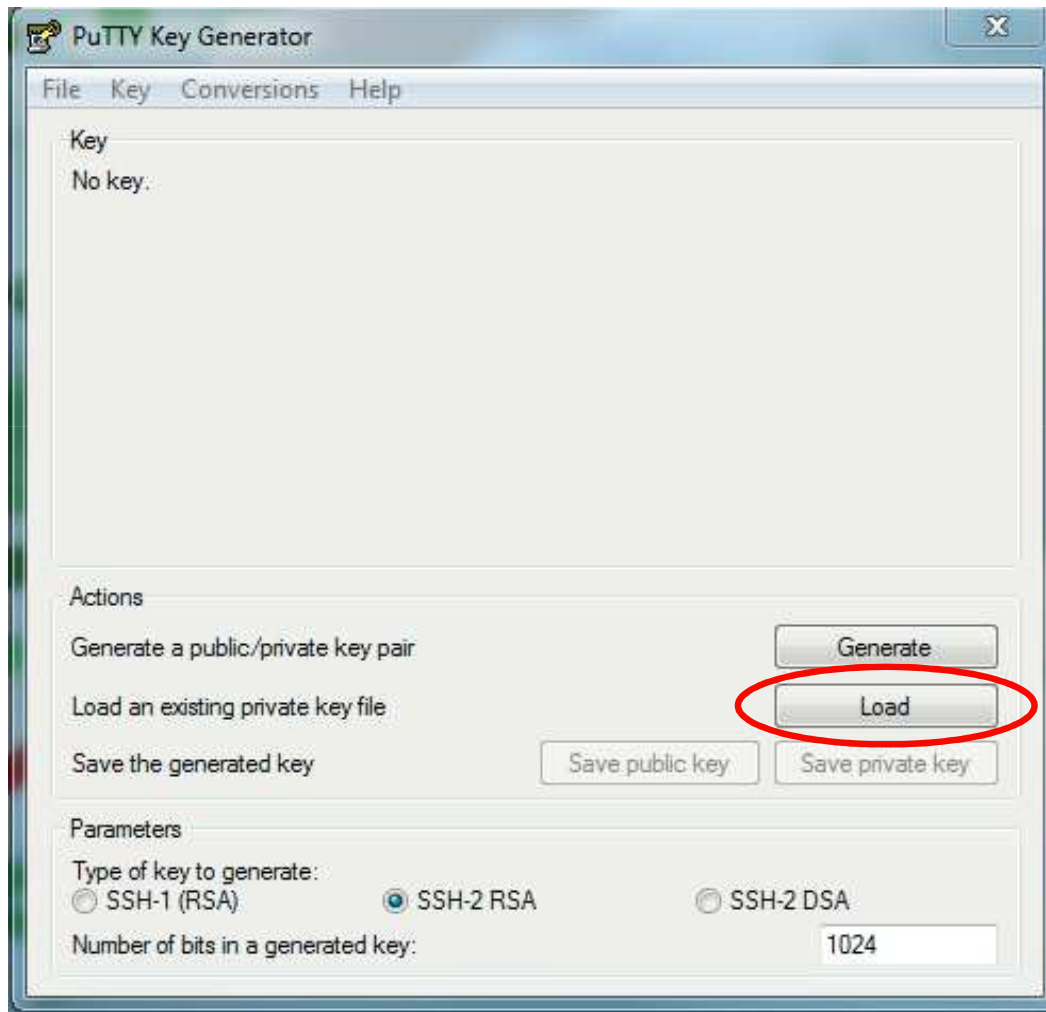
Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status
prova	i-13f24225	t1.micro	us-west-2b	running	2/2 check...	None

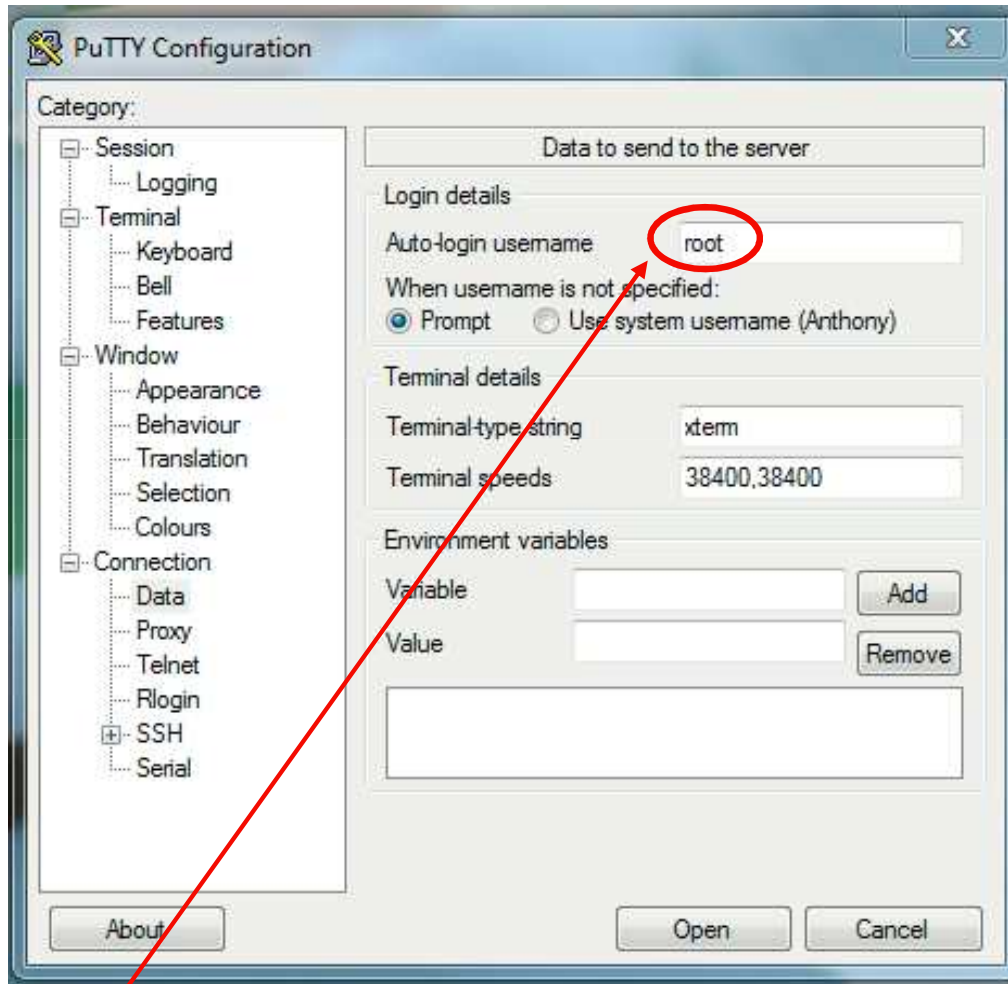
Instance: i-13f24225 (prova)		Public DNS: ec2-54-200-175-229.us-west-2.compute.amazonaws.com	
<b>Description</b>	<b>Status Checks</b>	<b>Monitoring</b>	<b>Tags</b>
Instance ID	i-13f24225	Public DNS	ec2-54-200-175-229.us-west-2.compute.amazonaws.com
Instance state	running	Public IP	54.200.175.229
Instance type	t1.micro	Elastic IP	-
Private DNS	ip-172-31-30-178.us-west-2.compute.internal	Availability zone	us-west-2b
Private IPs	172.31.30.178	Security groups	launch-wizard-1. <a href="#">view rules</a>
Secondary private IPs		Scheduled events	No scheduled events
VPC ID	vpc-f0d4c092	AMI ID	ubuntu-precise-12.04-amd64-server-20131003 (ami-6aad335a)
Subnet ID	subnet-e12e1a95	Platform	-
Network interfaces	eth0	IAM role	-
Source/dest. check	True	Key pair name	myawskey1
		Owner	825931055097



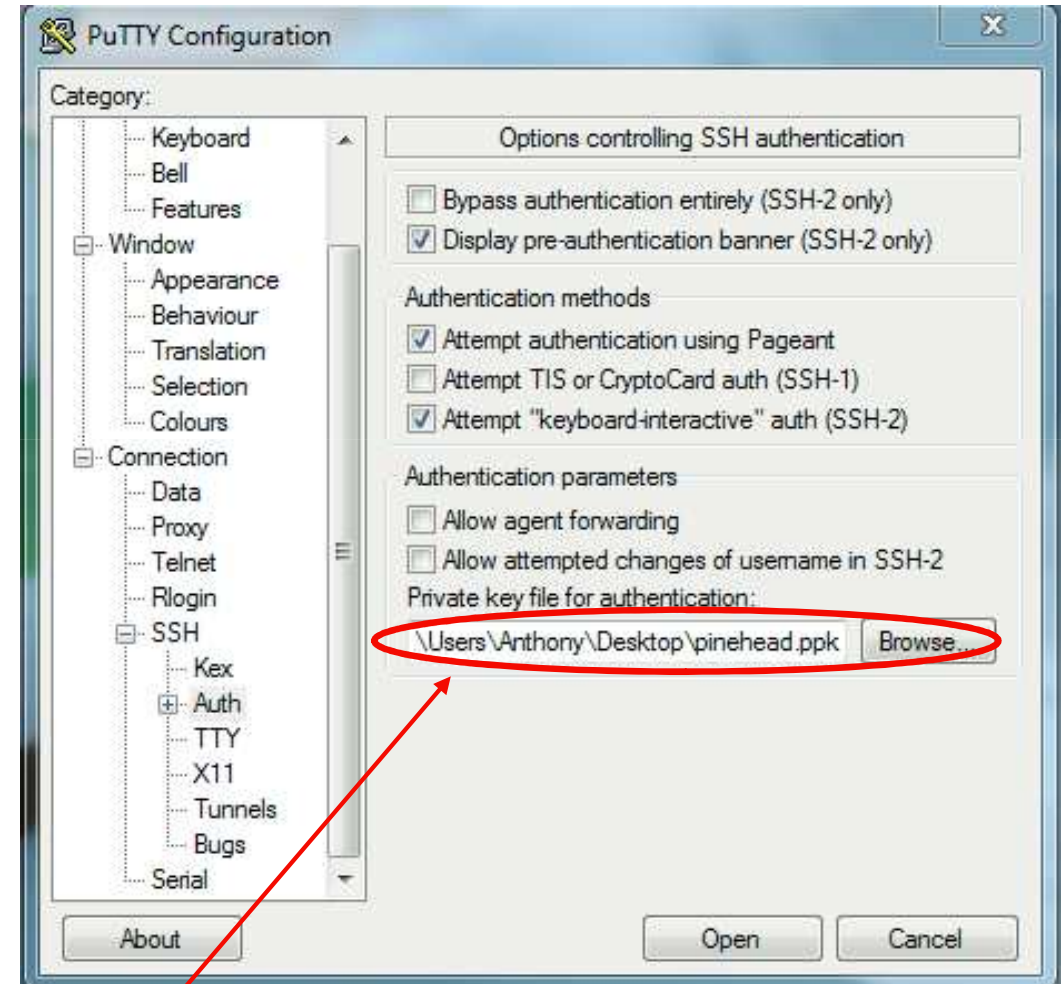
# Puttygen to transform .pem private key in .ppk format



# Configure PuTTY for automatic login with private key



Lo username dipende dall'immagine attivata  
Per Ubuntu Linux è *ubuntu*

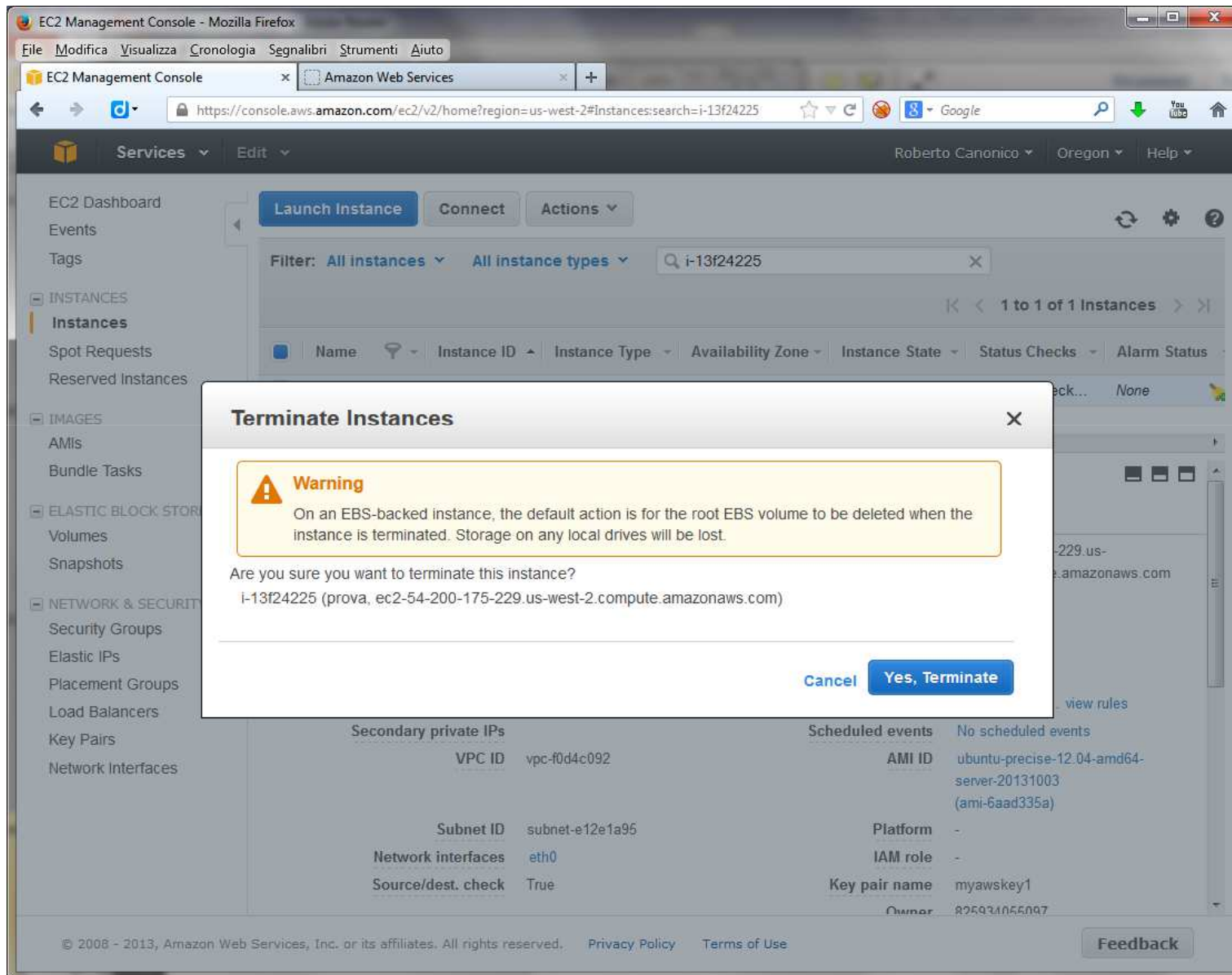


Selezionare il file .ppk prodotto precedentemente

# SSH session created with PuTTY

```
ubuntu@ip-172-31-30-178: ~  
Using username "ubuntu".  
Authenticating with public key "imported-openssh-key"  
Welcome to Ubuntu 12.04.3 LTS (GNU/Linux 3.2.0-54-virtual x86_64)  
  
* Documentation:  https://help.ubuntu.com/  
  
System information as of Sat Dec  7 18:11:15 UTC 2013  
  
System load:  0.01          Processes:          58  
Usage of /:   11.1% of 7.87GB Users logged in:    0  
Memory usage: 7%           IP address for eth0: 172.31.30.178  
Swap usage:   0%  
  
Graph this data and manage this system at https://landscape.canonical.com/  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
  http://www.ubuntu.com/business/services/cloud  
  
Use Juju to deploy your cloud instances and workloads:  
  https://juju.ubuntu.com/#cloud-precise  
  
0 packages can be updated.  
0 updates are security updates.  
  
The programs included with the Ubuntu system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*/copyright.  
  
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.  
  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
ubuntu@ip-172-31-30-178:~$
```

# Amazon EC2: instance termination (1)





# Amazon EC2: terminazione dell'istanza (2)

The screenshot displays the Amazon EC2 Management Console interface. The browser address bar shows the URL: `https://console.aws.amazon.com/ec2/v2/home?region=us-west-2#Instances:search=i-13f24225`. The console header includes the user name 'Roberto Canonico', the region 'Oregon', and a 'Help' link. The left-hand navigation pane lists various services such as 'EC2 Dashboard', 'Events', 'Tags', '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', and 'Network Interfaces'. The main content area features a 'Launch Instance' button, a 'Connect' button, and an 'Actions' dropdown menu. Below these is a search filter for 'i-13f24225' and a table of instances. The table shows one instance with the name 'prova', ID 'i-13f24225', type 't1.micro', availability zone 'us-west-2b', and state 'terminated'. Below the table, the details for the selected instance 'i-13f24225 (prova)' are shown, including a 'Public DNS' field and a detailed description table.

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status
prova	i-13f24225	t1.micro	us-west-2b	terminated		None

Instance: i-13f24225 (prova)		Public DNS: -	
Description	Status Checks	Monitoring	Tags
Instance ID	i-13f24225	Public DNS	-
Instance state	terminated	Public IP	-
Instance type	t1.micro	Elastic IP	-
Private DNS	-	Availability zone	us-west-2b
Private IPs	-	Security groups	-
Secondary private IPs	-	Scheduled events	-
VPC ID	-	AMI ID	ubuntu-precise-12.04-amd64-server-20131003 (ami-6aad335a)
Subnet ID	-	Platform	-
Network interfaces	-	IAM role	-
Source/dest. check	False	Key pair name	myawskey1
EBS-optimized	False	Owner	825934055097
		Launch time	2013-12-07T17:57:20.000Z

# AWS console: S3

## Amazon Web Services

### Compute

- EC2**  
Virtual Servers in the Cloud
- EC2 Container Service**  
Run and Manage Docker Containers
- Elastic Beanstalk**  
Run and Manage Web Apps
- Lambda**  
Run Code in Response to Events

### Storage & Content Delivery

- S3**  
Scalable Storage in the Cloud
- CloudFront**  
Global Content Delivery Network
- Elastic File System** PREVIEW  
Fully Managed File System for EC2
- Glacier**  
Archive Storage in the Cloud
- Import/Export Snowball**  
Large Scale Data Transport
- Storage Gateway**  
Integrates On-Premises IT Environments with Cloud Storage

### Database

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

### Networking

- VPC**  
Isolated Cloud Resources
- Direct Connect**  
Dedicated Network Connection to AWS
- Route 53**  
Scalable DNS and Domain Name Registration

### Developer Tools

- CodeCommit**  
Store Code in Private Git Repositories
- CodeDeploy**  
Automate Code Deployments
- CodePipeline**  
Release Software using Continuous Delivery

### Management Tools

- CloudWatch**  
Monitor Resources and Applications
- CloudFormation**  
Create and Manage Resources with Templates
- CloudTrail**  
Track User Activity and API Usage
- Config**  
Track Resource Inventory and Changes
- OpsWorks**  
Automate Operations with Chef
- Service Catalog**  
Create and Use Standardized Products
- Trusted Advisor**  
Optimize Performance and Security

### Security & Identity

- Identity & Access Management**  
Manage User Access and Encryption Keys
- Directory Service**  
Host and Manage Active Directory
- Inspector** PREVIEW  
Analyze Application Security
- WAF**  
Filter Malicious Web Traffic

### Analytics

- EMR**  
Managed Hadoop Framework
- Data Pipeline**  
Orchestration for Data-Driven Workflows
- Elasticsearch Service**  
Run and Scale Elasticsearch Clusters
- Kinesis**  
Work with Real-time Streaming data
- Machine Learning**  
Build Smart Applications Quickly and Easily

### Internet of Things

- AWS IoT** BETA  
Connect Devices to the cloud

### Mobile Services

- Mobile Hub** BETA  
Build, Test, and Monitor Mobile apps
- Cognito**  
User Identity and App Data Synchronization
- Device Farm**  
Test Android, Fire OS, and iOS apps on real devices in the Cloud
- Mobile Analytics**  
Collect, View and Export App Analytics
- SNS**  
Push Notification Service

### Application Services

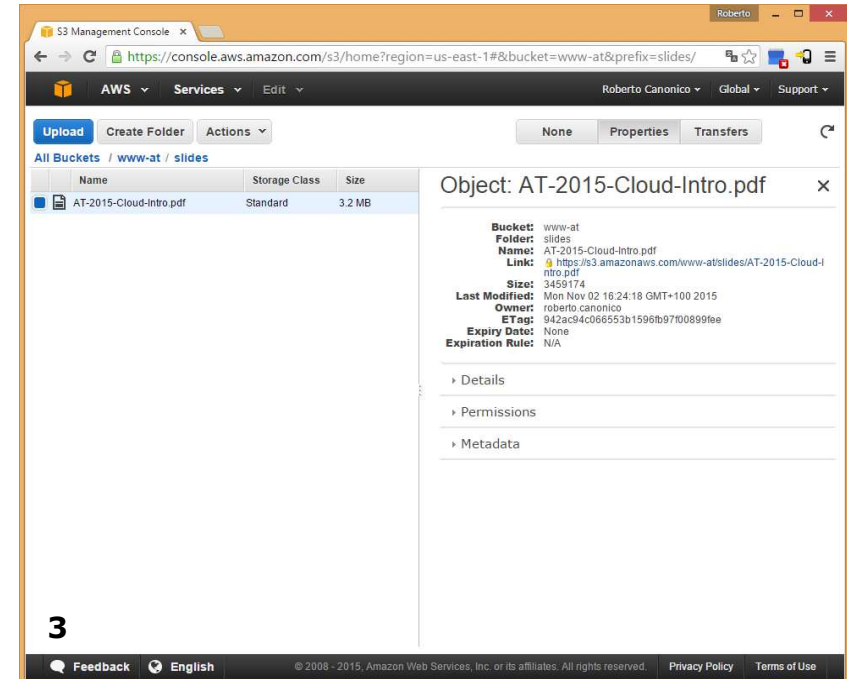
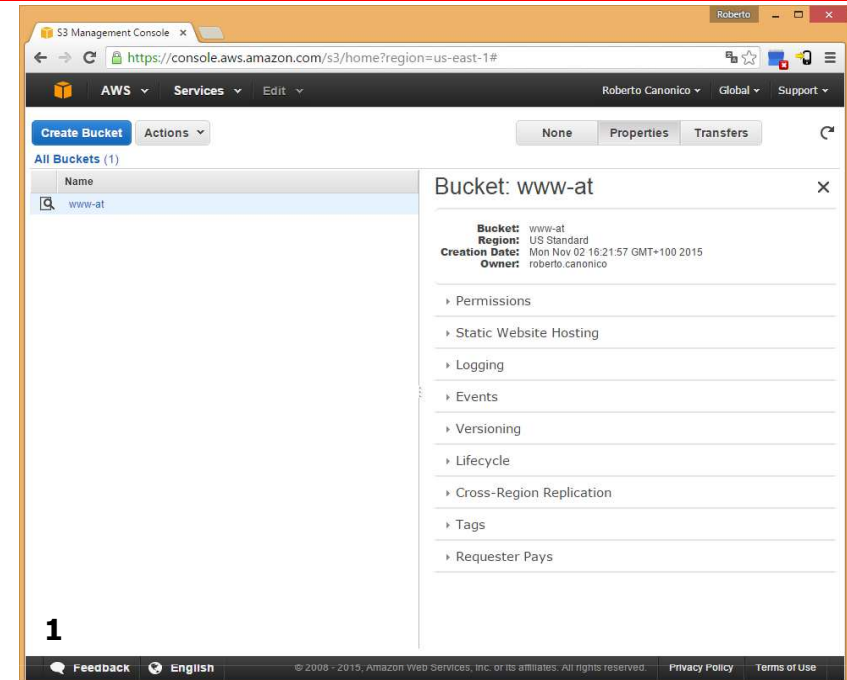
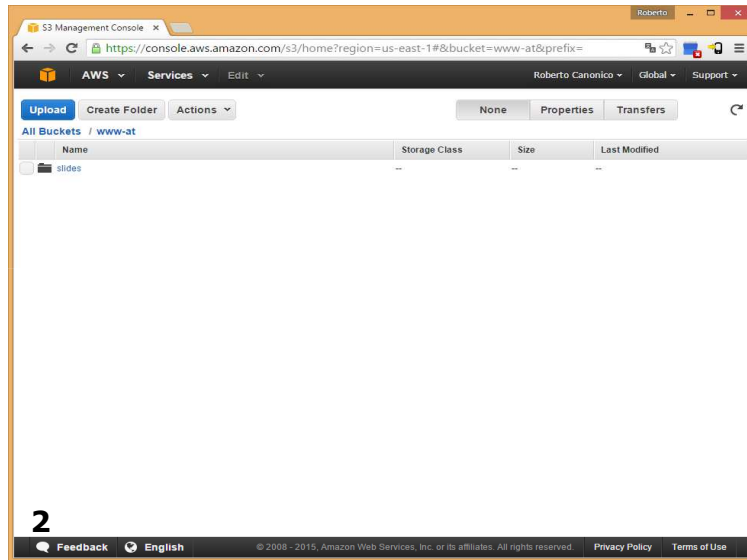
- API Gateway**  
Build, Deploy and Manage APIs
- AppStream**  
Low Latency Application Streaming
- CloudSearch**  
Managed Search Service
- Elastic Transcoder**  
Easy-to-use Scalable Media Transcoding
- SES**  
Email Sending Service
- SQS**  
Message Queue Service
- SWF**  
Workflow Service for Coordinating Application Components

### Enterprise Applications

- WorkSpaces**  
Desktops in the Cloud
- WorkDocs**  
Secure Enterprise Storage and Sharing Service
- WorkMail** PREVIEW  
Secure Email and Calendaring Service

# S3: buckets, folders and objects

1. Creation of a bucket in Amazon's AWS console
2. Creation of a folder in a bucket
3. Upload of a file in a folder
4. Retrieve file through URL → Access denied !



# S3: object permissions



- ▶ To make an object publicly accessible
  - ▶ grant permission to Open/Download to Everyone
- ▶ Permissions can be set for the whole bucket as well

## Permissions

You can control access to the bucket and its contents using access policies. [Learn more.](#)

Grantee:   Open/Download  X

View Permissions  Edit Permissions

Grantee: Everyone   Open/Download X

View Permissions  Edit Permissions

Add more permissions

Save

Cancel

The screenshot shows a web browser window displaying a PDF document. The document is titled "Introduzione al Cloud Computing ed ai servizi Amazon AWS" and is authored by Prof. Simon Pietro Romano and Prof. Roberto Canonico. The document is divided into four sections:

- Utility Computing**
  - "Computing may someday be organized as a public utility"
  - John McCarthy, MIT Centennial in 1961.
  - "As of now, computer networks are still in their infancy. But as they grow up and become more sophisticated, we will probably see the spread of 'computer utilities' which, like present electric and telephone utilities, will service individual homes and offices across the country."
  - Leonard Kleinrock, 1960
  - Huge computational and storage capabilities available from utilities
  - Metered billing (pay for what you use)
  - Simple to use interface to access the capability (e.g., plugging into an outlet)
- Computing as the fifth utility**
  - After
    - Water
    - Gas
    - Electricity
    - Telephone
- NIST definition of Cloud Computing**
  - E' un modello che abilita l'accesso via rete, in modo ubiquitario, conveniente e su richiesta, ad un insieme gestito di risorse computazionali configurabili (reti, server, sistemi di memorizzazione, applicazioni e servizi) che possono essere rapidamente acquisite e rilasciate con minimo sforzo o minima interazione con il fornitore del servizio
  - 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
  - <http://www.nist.gov/ni/cloud/>
  - <http://csrc.nist.gov/publications/nistpub/800-145/SP800-145.pdf>





# Amazon S3: RESTful API



- ▶ The S3 service exposes a RESTful API
- ▶ Different URLs are used for 3 types of resources:
  - ▶ The list of your buckets (<https://s3.amazonaws.com/>)  
There's only one resource of this type
  - ▶ A particular bucket (<https://s3.amazonaws.com/{name-of-bucket}/>)  
There can be up to 100 resources of this type
  - ▶ A particular S3 object inside a bucket  
(<https://s3.amazonaws.com/{name-of-bucket}/{name-of-object}>)  
There can be infinitely many resources of this type.
- ▶ Fundamental operations on buckets corresponding to HTTP actions:
  - ▶ GET an existing object from a bucket
  - ▶ PUT a new object or update an existing object
  - ▶ DELETE an object from the bucket
  - ▶ HEAD to retrieve an object's metadata
- ▶ See Chapter 3 in [http://www.crummy.com/writing/RESTful-Web-Services/RESTful\\_Web\\_Services.pdf](http://www.crummy.com/writing/RESTful-Web-Services/RESTful_Web_Services.pdf)