Amazon AWS Tutorial II: Windows and Linux on EC2

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Amazon EC2 Getting Started

• Official Website: http://aws.amazon.com/ec2
• Sign up (credit card information required).
• Launch Instance
  – http://aws.amazon.com/console/
  – Username: compmed@cs.unm.edu
  – Password:
Overview

• Understanding AMI (Amazon Machine Image)
• Launching, using and shutting down a Windows instance.
• Launching, using and shutting down a Linux instance.
What is an AMI

- A computer cannot run without first loading software but must be running before any software can be loaded, which seems as impossible as to "pull yourself up by your own bootstraps."
IBM PC Bootstrapping

- Upon starting, an x86 CPU runs the instruction located at the memory location CS:IP F000:FFF0 of the BIOS, which is located at the 0xFFFFF0 linear address.
- This memory location typically contains a jump instruction that transfers execution to the location of the BIOS start-up program.
IBM PC Bootstrapping (cont.)

• The BIOS program runs a power-on self test (POST) to check and initialize required devices and then goes through a list of non-volatile storage devices until it finds one that is bootable.

• A bootable device is defined as one that can be read from, and the last two bytes of the first sector contain the word 0xAA55 (also known as the boot signature).
IBM PC Bootstrapping (cont.)

• Once the BIOS has found a bootable device it loads the boot sector to hexadecimal Segment: Offset address 0000:7C00 or 07C0:0000 (maps to the same ultimate address) and transfers execution to the boot code.
System Image

- A system image is a copy of the entire state of a computer system.
- A system is said to be capable of using system images if it can be shut down and later restored to exactly the same state.
- E.g., hibernation
Virtualization

- Hardware virtualization or platform virtualization is the creation of a virtual machine that acts like a real computer with an operating system.
- Software executed on these virtual machines is separated from the underlying hardware resources.
- For example: Virtual PC, Vmware, VirtualBox.
Amazon Machine Image

- A special type of virtual machine.
- The main component of an AMI is a read-only file system image which includes an operating system (e.g., Linux, UNIX, or Windows) and any additional software required to deliver a service or a portion of it.
Thus …

• In order to use Amazon EC2, one needs to:
  – Select the virtual hardware.
  – Pick an AMI to run on the virtual hardware.
  – Associate security credentials in order to log in to the virtual machine.
Overview

• Understanding AMI (Amazon Machine Image)
• Launching, using, and shutting down a Windows instance.
• Launching, using, and shutting down a Linux instance.
Region Selection

- Amazon has four regions. Each region should be viewed as totally separated from each other, i.e., with different images, key pairs, and so on.
Launch a Windows Instance

### Getting Started

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 (Virginia) region.

### Current Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="green-check.png" alt="Green Check" /></td>
<td>Amazon EC2 (US East - N. Virginia) Service is operating normally</td>
</tr>
</tbody>
</table>

### Related Links

- Documentation
- All EC2 Resources
- Forums
- Feedback
- Report an Issue
Choose an AMI

<table>
<thead>
<tr>
<th>AMI Name</th>
<th>AMI ID</th>
<th>Description</th>
<th>Root Device Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUSE Linux Enterprise Server 11 64-bit</td>
<td>ami-e4a3578d</td>
<td>SUSE Linux Enterprise Server 11 Service Pack 1 basic install, EBS boot, 64-bit architecture with Amazon EC2 AMI Tools preinstalled; Apache 2.2, MySQL 5.0, PHP 5.3, Ruby 1.8.7, and Rails 2.3.</td>
<td>15 GB</td>
</tr>
<tr>
<td>Microsoft Windows Server 2008 Base</td>
<td>ami-c3e40daa</td>
<td>Microsoft Windows 2008 R1 SP2 Datacenter edition and 32-bit architecture.</td>
<td>30 GB</td>
</tr>
<tr>
<td>Microsoft Windows Server 2008 R2 Base</td>
<td>ami-ee926087</td>
<td>Microsoft Windows 2008 R2 Datacenter edition and 64-bit architecture.</td>
<td>35 GB</td>
</tr>
<tr>
<td>Microsoft Windows Server 2008 R2 with SQL Server Express and IIS</td>
<td>ami-e0916389</td>
<td>Microsoft Windows Server 2008 R2 Datacenter edition, 64-bit architecture, Microsoft SQLServer 2008 Express, Internet Information Services 7, ASP.NET 3.5.</td>
<td>35 GB</td>
</tr>
<tr>
<td>Microsoft Windows Server 2008 R2 with SQL Server Standard</td>
<td></td>
<td>Free tier eligible if used with a micro instance. See AWS free tier for complete details and terms.</td>
<td></td>
</tr>
</tbody>
</table>
Launch Instance

<table>
<thead>
<tr>
<th>Request Instances Wizard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Instances:</strong></td>
</tr>
<tr>
<td><strong>Availability Zone:</strong></td>
</tr>
<tr>
<td><strong>Instance Type:</strong></td>
</tr>
</tbody>
</table>

**Launch Instances**

EC2 Instances let you pay for compute capacity by the hour with no long term commitments. This transforms what are commonly large fixed costs into much smaller variable costs.

**Request Spot Instances**

**Launch Instances Into Your Virtual Private Cloud**
Advanced Instance Options

Here you can choose a specific kernel or RAM disk to use with your instances. You can also choose to enable CloudWatch Detailed Monitoring or enter data that will be available from your instances once they launch.

**Kernel ID:** [Use Default]  
**RAM Disk ID:** [Use Default]

**Monitoring:**  
- Enable CloudWatch detailed monitoring for this instance  
  (additional charges will apply)

**User Data:**

- base64 encoded

**Termination Protection:**
- Prevention against accidental termination.

**Shutdown Behavior:**  
- [Terminate] Choose the behavior when the instance is shutdown from within the instance.
Add tags to your instance to simplify the administration of your EC2 infrastructure. A form of metadata, tags consist of a case-sensitive key/value pair, are stored in the cloud and are private to your account. You can create user-friendly names that help you organize, search, and browse your resources. For example, you could define a tag with key = Name and value = Webserver. You can add up to 10 unique keys to each instance along with an optional value for each key. For more information, go to Using Tags in the EC2 User Guide.

<table>
<thead>
<tr>
<th>Key (127 characters maximum)</th>
<th>Value (255 characters maximum)</th>
<th>Remove</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EC2 Tag

- Each EC2 tag consists of a key and a value, both of which the user defines.
- Tag keys and values are case sensitive.
- Prefix AWS is reserved.
- AWS doesn't apply any semantic meaning to your tags; they're interpreted strictly as strings of characters. AWS doesn't automatically set any tags on resources.
Key Pair for Accessing the Instance

Public/private key pairs allow you to securely connect to your instance after it launches. To create a key pair, enter a name and click **Create & Download your Key Pair**. You will then be prompted to save the private key to your computer. Note, you only need to generate a key pair once - not each time you want to deploy an Amazon EC2 instance.

**Choose from your existing Key Pairs**

**Create a new Key Pair**

1. Enter a name for your key pair:*
   - Windows_USEast_Keypair (e.g., jdoekey)

2. Click to create your key pair:*
   - **Create & Download your Key Pair**

   Save this file in a place you will remember. You can use this key pair to launch other instances in the future or visit the Key Pairs page to create or manage existing ones.

**Proceed without a Key Pair**

← Back
Key Pair File
Public Key System
Key Idea

The key for public system is to construct a one-way encryption function $f$ which is easy to encrypt but hard to decrypt.

For example, the lock box with a lock open is a one-way function. It is easy to put the letter in the box and lock it (i.e., encrypt), but is hard to open the box once it is locked (decrypt).
RSA Public Key System

- Developed by Ron Rivest, Adi Shamir, Len Adleman in 1977, who later shared the 2002 Turing Award.
- The idea of RSA system is based on number theory in particular the factorization of large numbers.
Number Theory behind RSA

Let \( p \) and \( q \) be distinct primes and \( k \) is any integer. Then:

(a) For any integer \( a \) with \( \gcd(a, pq) = 1 \),
\[
a^{k(p-1)(q-1)} \mod pq = 1
\]

(b) For any integer \( a \),
\[
a^{k(p-1)(q-1)+1} \mod pq = a.
\]
Example

\( p = 5, \ q = 7, \ a = 19 \)

\( GCD(a, pq) = 1 \)

\( k = 3, \ a^{k(p-1)(q-1)} = 19^{3 \times 4 \times 6} = 19^{72} \)

\( = 1.1755991641121183246595167229728 \times 10^{92} \)

\( a^{k(p-1)(q-1)} \mod pq = 1 \)

\( a^{k(p-1)(q-1)+1} = 19^{3 \times 4 \times 6 + 1} = 19^{73} \)

\( = 2.2336384118130248168530817736483 \times 10^{93} \)

\( a^{k(p-1)(q-1)+1} \mod pq = 19. \)
How to use the theorem?

- Suppose we have two primes $p$ and $q$.
  
  $m = pq$
  
  $n = (p - 1)(q - 1)$
  
  $s$: GCD$(s, n) = 1$

- Announce $m$ and $s$.

- Encoding
  
  Someone wants to send me a message $a$.
  
  Encryption rule: send me $b = a^s \mod m$

- Decoding:
  
  GCD$(s, n) = 1$, then $ts + kn = 1$
  
  $b^t \mod m = (a^s)^t \mod m = a^{-kn+1} \mod m = a$
Security Rules

Security groups determine whether a network port is open or blocked on your instances. You may use an existing security group, or we can help you create a new security group to allow access to your instances using the suggested ports below. Add additional ports now or update your security group anytime using the Security Groups page.

Choose one or more of your existing Security Groups

Create a new Security Group

Group Name: Luan_Windows_Test
Group Description: Windows US East

Inbound Rules

TCP
Port (Service) | Source | Action
--- | --- | ---
3389 (RDP) | 0.0.0.0/0 | Delete
0 - 65535 | 0.0.0.0/0 | Delete
80 (HTTP) | 0.0.0.0/0 | Delete
443 (HTTPS) | 0.0.0.0/0 | Delete
110 (POP3) | 0.0.0.0/0 | Delete
**Summary**

### Request Instances Wizard

Please review the information below, then click **Launch**.

<table>
<thead>
<tr>
<th>AMI:</th>
<th>Windows AMI ID ami-c3e40dab (i386)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Microsoft Windows Server 2008 Base</td>
</tr>
<tr>
<td>Description:</td>
<td>Microsoft Windows 2008 R1 SP2 Datacenter edition and 32-bit architecture.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Instances:</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability Zone:</td>
<td>us-east-1a</td>
</tr>
<tr>
<td>Instance Type:</td>
<td>Small (m1.small)</td>
</tr>
<tr>
<td>Instance Class:</td>
<td>On Demand</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monitoring:</th>
<th>Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenancy:</td>
<td>Default</td>
</tr>
<tr>
<td>Kernel ID:</td>
<td>Use Default</td>
</tr>
<tr>
<td>RAM Disk ID:</td>
<td>Use Default</td>
</tr>
<tr>
<td>User Data:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Termination Protection:</th>
<th>Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shutdown Behavior:</td>
<td>Terminate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Pair Name:</th>
<th>Luan_Windows_USEast_Keypair</th>
</tr>
</thead>
</table>

| Security Group(s):      | sg-78af9d11 |

Edit AMI

Edit Instance Details

Edit Advanced Details

Edit Key Pair

Edit Firewall

Launch
Launched

Launch Instance Wizard

Your instances are now launching.
Note: Your instances may take a few minutes to launch, depending on the software you are running.

- View your instances on the Instances page

Other AWS Features

Spot Instances
Spot Instances enable customers to lower their Amazon EC2 costs by up to 75% by bidding on unused capacity and running instances for as long as the maximum bid exceeds the current Spot Price.

- Go to Amazon EC2 Spot Instances

Reserved Instances
Reserved Instances provide substantial savings over On-Demand instances and ensure that the capacity you need is available to you when required.

- Go to Amazon EC2 Reserved Instances

Suse Linux Instances
Suse Linux instances are a proven platform with superior reliability and security and are automatically kept up to date with Novell's security patches, bug fixes and new features.

- Go to Amazon EC2 running SUSE Linux

Close
AWS Console
Retrieve Windows Password
Retrieving Password (cont.)

Retrieved Default Windows Administrator Password

⚠️ Not available yet.
Password generation and encryption can sometimes take more than 30 minutes. Please wait at least 15 minutes after launching an instance before trying to retrieve the generated password.

Close
Retrieving Password (cont.)

To access this instance remotely (e.g., Remote Desktop Connection), you will need your Windows Administrator password. A default password was created when the instance was launched and is available encrypted in the system log.

To decrypt your password, you will need your key pair for this instance. Simply copy & paste the contents of your private key file into the text box below, then click Decrypt Password.

Instance: i-ed54b383

Encrypted Password: [redacted]

Key Pair: Luan_Windows_USEast_Keypair.pem
Note: You were prompted to download and save this when you created your key pair.

Private Key*:
Please include the entire text, including the Begin and End lines (Ex: "-----BEGIN RSA PRIVATE KEY-----")
After 15 Minutes

Retrieve Default Windows Administrator Password

Password decrypted for instance i-ed54b383

Password change recommended.
We recommend that you change your password to one you will remember and know privately.

Please note that passwords can persist through bundling phases and will not be retrievable through this tool. It is therefore important that you change your password to one that you will remember if you intend to bundle a new AMI from this instance.

You can connect remotely using this information:

Computer: ec2-50-19-12-0.compute-1.amazonaws.com
User: Administrator
Decrypted Password: [REDACTED]
Connecting to Windows
Connecting to Windows (cont.)
Connecting to Windows (cont.)

Remote Desktop Connection

Enter your credentials

These credentials will be used to connect to ec2-50-19-12-0.compute-1.amazonaws.com.

User name: 
Password: 
Domain: ec2-50-19-12-0.compute-1.amazonaws.com

☐ Add user information to your keychain

Cancel OK
Connecting to Windows (cont.)
Using Windows
Using Windows (cont.)
Terminate Windows Instance
Instance Terminated
Overview

• Understanding AMI (Amazon Machine Image)
• Launching, using and shutting down a Windows instance.
• Launching, using and shutting down a Linux instance.
EC2 Tab in the Management Console

Getting Started

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 (Virginia) region.

Service Health

Current Status | Details
--- | ---
Amazon EC2 (US East - N. Virginia) | Service is operating normally

My Resources

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

- 0 Running Instances
- 0 Elastic IPs
- 0 EBS Volumes
- 0 EBS Snapshots
- 4 Key Pairs
- 0 Security Groups
- 0 Load Balancers
- 0 Placement Groups

Related Links

- Documentation
- All EC2 Resources
- Forums
- Feedback
- Report an Issue
### Request Instances Wizard

**Choose an AMI**  
Choose an Amazon Machine Image (AMI) from one of the tabbed lists below by clicking its **Select** button.

<table>
<thead>
<tr>
<th>Quick Start</th>
<th>My AMIs</th>
<th>Community AMIs</th>
</tr>
</thead>
</table>

**Basic 32-bit Amazon Linux AMI 2010.11.1 Beta** (AMI Id: ami-76f0061f)  
Amazon Linux AMI Base 2010.11.1, EBS boot, 32-bit architecture with Amazon EC2 AMI Tools. **Root Device Size:** 8 GiB  
[Select](#)

**Basic 64-bit Amazon Linux AMI 2010.11.1 Beta** (AMI Id: ami-74f0061d)  
Amazon Linux AMI Base 2010.11.1, EBS boot, 64-bit architecture with Amazon EC2 AMI Tools. **Root Device Size:** 8 GiB  
[Select](#)

**SUSE Linux Enterprise Server 11 32-bit** (AMI Id: ami-e0a35789)  
SUSE Linux Enterprise Server 11 Service Pack 1 basic install, EBS boot, 32-bit architecture with Amazon EC2 AMI Tools preinstalled; Apache 2.2, MySQL 5.0, PHP 5.3, Ruby 1.8.7, and Rails 2.3. **Root Device Size:** 15 GiB  
[Select](#)

**SUSE Linux Enterprise Server 11 64-bit** (AMI Id: ami-e4a3578d)  
SUSE Linux Enterprise Server 11 Service Pack 1 basic install, EBS boot, 64-bit architecture with Amazon EC2 AMI Tools preinstalled; Apache 2.2, MySQL 5.0, PHP 5.3, Ruby 1.8.7, and Rails 2.3. **Root Device Size:** 15 GiB  
[Select](#)

**Getting Started on Microsoft Windows Server 2008** (AMI Id: ami-c5e40dac)  
Microsoft Windows Server 2008 R1 SP2 Datacenter edition, 32-bit architecture, Microsoft SQL Server 2008 Express, Internet Information Services 7, ASP.NET 3.5. **Root Device Size:** 30 GiB  
[Select](#)
Request Instance (cont.)

Provide the details for your instance(s). You may also decide whether you want to launch your instances as "on-demand" or "spot" instances.

- **Number of Instances:** 1
- **Availability Zone:** No Preference
- **Instance Type:** Small (m1.small, 1.7 GB)

**Launch Instances**

EC2 Instances let you pay for compute capacity by the hour with no long term commitments. This transforms what are commonly large fixed costs into much smaller variable costs.

**Request Spot Instances**

**Launch Instances Into Your Virtual Private Cloud**
Request Instance (cont.)

Provide the details for your instance(s). You may also decide whether you want to launch your instances as "on-demand" or "spot" instances.

Number of Instances: 1
Availability Zone: No Preference
Instance Type: Small (m1.small, 1.7 GB)

<table>
<thead>
<tr>
<th>Type</th>
<th>CPU Units</th>
<th>CPU Cores</th>
<th>Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro (t1.micro)</td>
<td>Up to 2 ECUs</td>
<td>1 Core</td>
<td>613 MB</td>
</tr>
<tr>
<td>Small (m1.small)</td>
<td>1 ECU</td>
<td>1 Core</td>
<td>1.7 GB</td>
</tr>
<tr>
<td>High-CPU Medium (c1.medium)</td>
<td>5 ECUs</td>
<td>2 Cores</td>
<td>1.7 GB</td>
</tr>
</tbody>
</table>
Request Instance (cont.)

Request Instances Wizard

Provide the details for your instance(s). You may also decide whether you want to launch your instances as "on-demand" or "spot" instances.

Number of Instances: 1  Availability Zone:

Instance Type: Small (m1.small, 1.7 GB)

Launch Instances

EC2 Instances let you pay for compute capacity by the hour with no long term commitments. This transforms what are commonly large fixed costs into much smaller variable costs.

Request Spot Instances

Launch Instances Into Your Virtual Private Cloud
Request Instance (cont.)

**Request Instances Wizard**

- **Number of Instances:** 1
- **Availability Zone:** No Preference

**Advanced Instance Options**

Here you can choose a specific kernel or RAM disk to use with your instances. You can also choose to enable CloudWatch Detailed Monitoring or enter data that will be available from your instances once they launch.

**Kernel ID:** Use Default

**RAM Disk ID:** Use Default

**Monitoring:** [ ] Enable CloudWatch detailed monitoring for this instance

(additional charges will apply)

**User Data:**

- [ ] base64 encoded
Request Instance (cont.)

Add tags to your instance to simplify the administration of your EC2 infrastructure. A form of metadata, tags consist of a case-sensitive key/value pair, are stored in the cloud and are private to your account. You can create user-friendly names that help you organize, search, and browse your resources. For example, you could define a tag with key = Name and value = Webserver. You can add up to 10 unique keys to each instance along with an optional value for each key. For more information, go to Using Tags in the EC2 User Guide.

<table>
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<tr>
<th>Key</th>
<th>Value</th>
<th>Remove</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Add another Tag. (Maximum of 10)
Public/private key pairs allow you to securely connect to your instance after it launches. To create a key pair, enter a name and click *Create & Download your Key Pair*. You will then be prompted to save the private key to your computer. Note, you only need to generate a key pair once - not each time you want to deploy an Amazon EC2 instance.

### Choose from your existing Key Pairs

**Your existing Key Pairs**:
- compmedkey
- compmedroy
- sluan_linux_key
- sluan_windows_key

### Options:
- **Create a new Key Pair**
- **Proceed without a Key Pair**
Key Pair

• A key pair is a security credential similar to a password, which you use to securely connect to your instance once it's running.
Request Instance (cont.)

Request Instances Wizard

Public/private key pairs allow you to securely connect to your instance after it launches. To create a key pair, enter a name and click **Create & Download your Key Pair**. You will then be prompted to save the private key to your computer. Note, you only need to generate a key pair once - not each time you want to deploy an Amazon EC2 instance.

**Choose from your existing Key Pairs**

**Create a new Key Pair**

1. Enter a name for your key pair:* luan_MC_key (e.g., jdoekey)
2. Click to create your key pair:*

   ![Create & Download your Key Pair]

   Save this file in a place you will remember. You can use this key pair to launch other instances in the future or visit the Key Pairs page to create or manage existing ones.

**Proceed without a Key Pair**
Secure Shell (SSH)

• Designed to replace Telnet, which send information, notably passwords, in plaintext.
• Intended to provide confidentiality and integrity of data over an unsecured network such as the Internet.
• Uses public-key cryptography to authenticate the remote computer and the user.
SSH Preparation: Client

- As a user, you generate an “identity” on the client system by running the ssh-keygen.
- This program creates a subdirectory $HOME/.ssh and inserts in it two files named identity and identity.pub which contain your private and public keys for your account on the client system.
- This latter file can then be appended to a file $HOME/.ssh/authorized_keys that should reside on any/all servers where you will make ssh connections.
SSH Preparation: Server

• As a system administrator, you generate a public and private key pair for the system itself.

• If someone wants to fake the server, they will have to break into the system and steal its private key.

• The biggest task is collecting and distributing the keys that identify all the hosts which run ssh.
SSH Authentication

• A user attempts to SSH into the server.
• The server sends its PUBLIC KEY to the user.
• The user checks to see if the PUBLIC KEY exists already in its system. If not, the user is warned. Once the user accepts the key, it is added to the trusted list.
• The user uses the server's PUBLIC KEY to encrypt all communications to the server.
• At the initial stage, this would include user name, password.
SSH Authentication (cont.)

• The user also sends its PUBLIC KEY to the server. (NOT the same as the Server's PUBLIC KEY).

• The server uses its own PRIVATE KEY to decrypt all communications from the user (encrypted using the server's PUBLIC KEY). The server then uses the user's PUBLIC KEY to encrypt all communications to the user.

• The user uses its PRIVATE KEY to decrypt all communications sent by the server (encrypted using the user's PUBLIC KEY).
No Password Authentication

• Client attempts to connect to the server.
• Server checks to see if .rhosts or /etc/hosts.equiv exist (or .shosts and /etc/shosts.equiv)
• Server checks to see if client's host public key is known (i.e. if it exists in /etc/ssh_known_hosts or ~/.ssh/ssh_known_hosts)
• If found server uses the client's public key and generates an encrypted challenge to the client.
• Client decrypts challenge using its host private key and responds.
• Session is authenticated without use of a password.
Key Pairs from EC2

• I think the key pair we downloaded from EC2 contains the public and private key used by the client.

• This is why “Amazon does not store the private key for security reasons. This is most easily retrieved from one of the other Compmed staff. If the private key is lost or stolen, then a new public and private certificate should be generated as soon as possible”.
Select a key pair from your existing key pairs: compmedkey, compmedroy, sluan_linux_key, sluan_windows_key.
Request Instance (cont.)
Request Instance (cont.)

Launch Instance Wizard

Your instances are now launching.
Note: Your instances may take a few minutes to launch, depending on the software you are running.

› View your instances on the Instances page

Other AWS Features

Relational Database Service
Amazon RDS makes it easy to set up, operate, and scale a relational database deployment. Launch a pre-configured, resizable MySQL deployment in minutes and let Amazon manage automated backups, patching, and high availability replication.

› Go to Amazon RDS

Volumes
EBS Volumes provide off-instance storage that persists independently of the life of an instance. Add a persistent storage device to an instance using the Elastic Block Store (EBS) Volumes page.

› Go to EBS Volumes

Elastic IPs
Elastic IP addresses allow you to remap a public IP address to any instance in your account. Elastic IPs also enable you to engineer around problems by quickly remapping your Elastic IP address to a replacement instance.

› Go to Elastic IPs

Close
Instances

<table>
<thead>
<tr>
<th>Name</th>
<th>Status</th>
<th>Security Groups</th>
<th>Type</th>
<th>AMI Launch Index</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>i-36fa8272</td>
<td>running</td>
<td>Luan_SSH_HTTP</td>
<td>m1.small</td>
<td>0</td>
<td>us-west-1c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

**AMI ID:** ami-655a0a20

**Security Groups:** Luan_SSH_HTTP

**Status:** running

**VPC ID:** -

**Virtualization:** paravirtual

**Reservation:** r-da0879e

**Platform:** -

**Kernel ID:** aki-99a01dc

**AMI Launch Index:** 0

**Device:** /dev/sda1

**Block Devices:** /dev/sda1=vol-8b4c949e1:attached:2011-02-07T02:18:30.000Z

**Lifecycle:** normal

**Public DNS:** ec2-50-18-1490.us-west-1.compute.amazonaws.com

**Private DNS:** ip-10-170-243-31.us-west-1.compute.internal

**Private IP Address:** 10.170.245.31

**Launch Time:** 2011-02-06 19:18 MST

**State Transition Reason:**
Login to Instance

Shuang-Luans-MacBook-Pro:US_West sluan$ ssh -i Luan_West_MC_keypair.pem root@ec2-50-18-14-190.us-west-1.compute.amazonaws.com
Please login as the ec2-user user rather than root user.

Connection to ec2-50-18-14-190.us-west-1.compute.amazonaws.com closed.
Shuang-Luans-MacBook-Pro:US_West sluan$ ssh -i Luan_West_MC_keypair.pem ec2-user @ec2-50-18-14-190.us-west-1.compute.amazonaws.com

___|__|__  )  Amazon Linux AMI
   | ( /
   ___\___|___|

See /usr/share/doc/amzn-ami/image-release-notes for latest release notes. :-)
[ec2-user@ip-10-170-245-31 ~]$ which gcc
/usr/bin/which: no gcc in (/usr/local/bin:/bin:/usr/bin:/opt/aws/bin:/home/ec2-user/bin)
[ec2-user@ip-10-170-245-31 ~]$ which wget
/usr/bin/wget
[ec2-user@ip-10-170-245-31 ~]$ which g++
/usr/bin/which: no g++ in (/usr/local/bin:/bin:/usr/bin:/opt/aws/bin:/home/ec2-user/bin)
[ec2-user@ip-10-170-245-31 ~]$ 

Installing gcc

```
[ec2-user@ip-10-170-245-31 bin]$ uname -a
Linux ip-10-170-245-31 2.6.34.7-56.40.amzn1.i686 #1 SMP Fri Oct 22 18:48:33 UTC 2010 i686 i686 i386 GNU/Linux
[ec2-user@ip-10-170-245-31 bin]$ which rpm
/bin/rpm
[ec2-user@ip-10-170-245-31 bin]$ sudo yum install gcc
[ec2-user@ip-10-170-245-31 bin]$
```
Installing g++

[ec2-user@ip-10-170-246-221 ~]$ sudo yum install gcc-c++
Loaded plugins: fastestmirror, security
Loading mirror speeds from cached hostfile
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package gcc-c++.i386 0:4.1.2-48.14.amzn1 set to be updated
---> Running transaction check
---> Package libstdc++-devel.i386 0:4.1.2-48.14.amzn1 set to be updated
--> Finished Dependency Resolution

Dependencies Resolved

=================================================================================================================================================================

<table>
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<tr>
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<th>Arch</th>
<th>Version</th>
<th>Repository</th>
<th>Size</th>
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<td>gcc-c++</td>
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<td>i386</td>
<td>4.1.2-48.14.amzn1</td>
<td>amzn</td>
<td>2.8 M</td>
</tr>
</tbody>
</table>

Transaction Summary
Thank You.