

API Engineering

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Week#1 2018 Fall

Topic: AWS EC2

AWS EC2

- Virtual machine: a software computer, like a physical computer, runs an operating system and applications
- AWS EC2 is a compute service that provides on-demand and scalable computing service in the cloud
- AWS EC2 allows you to create and run virtual machines on AWS infrastructure
- Choose a VM that fits your needs and gain the performance of AWS's worldwide network

EC2 Features

- Virtual computing environments in the cloud, known as instances.
- Preconfigured templates for instances, known as AMIs, that package the bits needed for server(including OS and additional software)
- Various configurations of CPU, memory, storage, and networking capacity of instances, known as instance types
- Secure login information for instances using key pairs (AWS stores the public key, and the private key is provided to the who provisions the server instance)
- Storage volumes for temporary data that's deleted when the instance are stopped or terminated
- Persistent storage volumes for the data using Amazon Elastic Block Store(Amazon EBS)
- Multiple physical locations for the resources
- A firewall that enables user to specify the protocols, ports, and source IP ranges
- Static IPv4 address for dynamic could computing
- Etc...

public key shared b/t many parties.

using public key of receiver, sender encrypts the data

only the receiver can decrypt the data (using the private key); no one else can decrypt the data

Amazon Machine Images(AMI) (1/2)

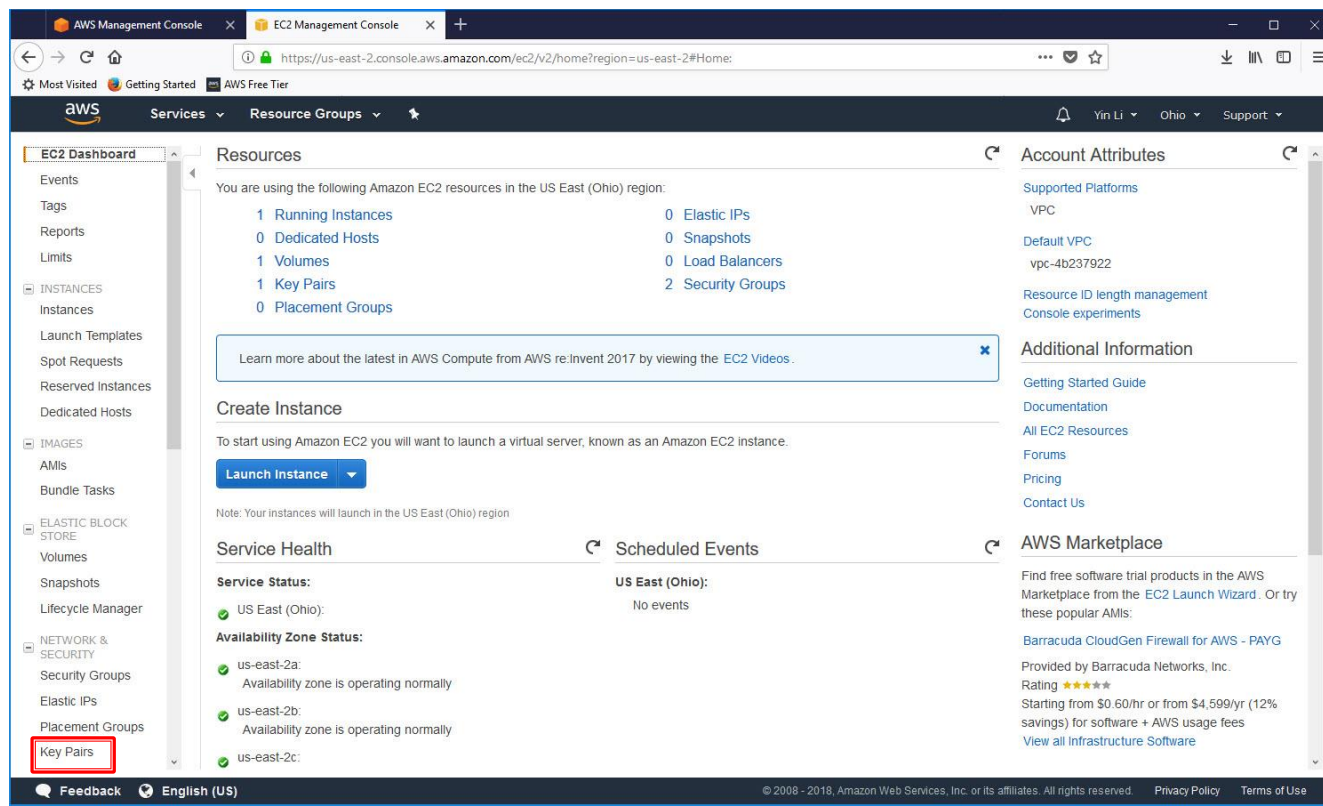
- An AMI provides the information required to launch an instance, which is a virtual server in the cloud
- A source AMI must be specified when you launch an instance
- Multiple instances can be launched from a single AMI when multiple instances with the same configuration are needed.
- Different AMIs can be used to launch instances with different configurations

Amazon Machine Images(AMI) (2/2)

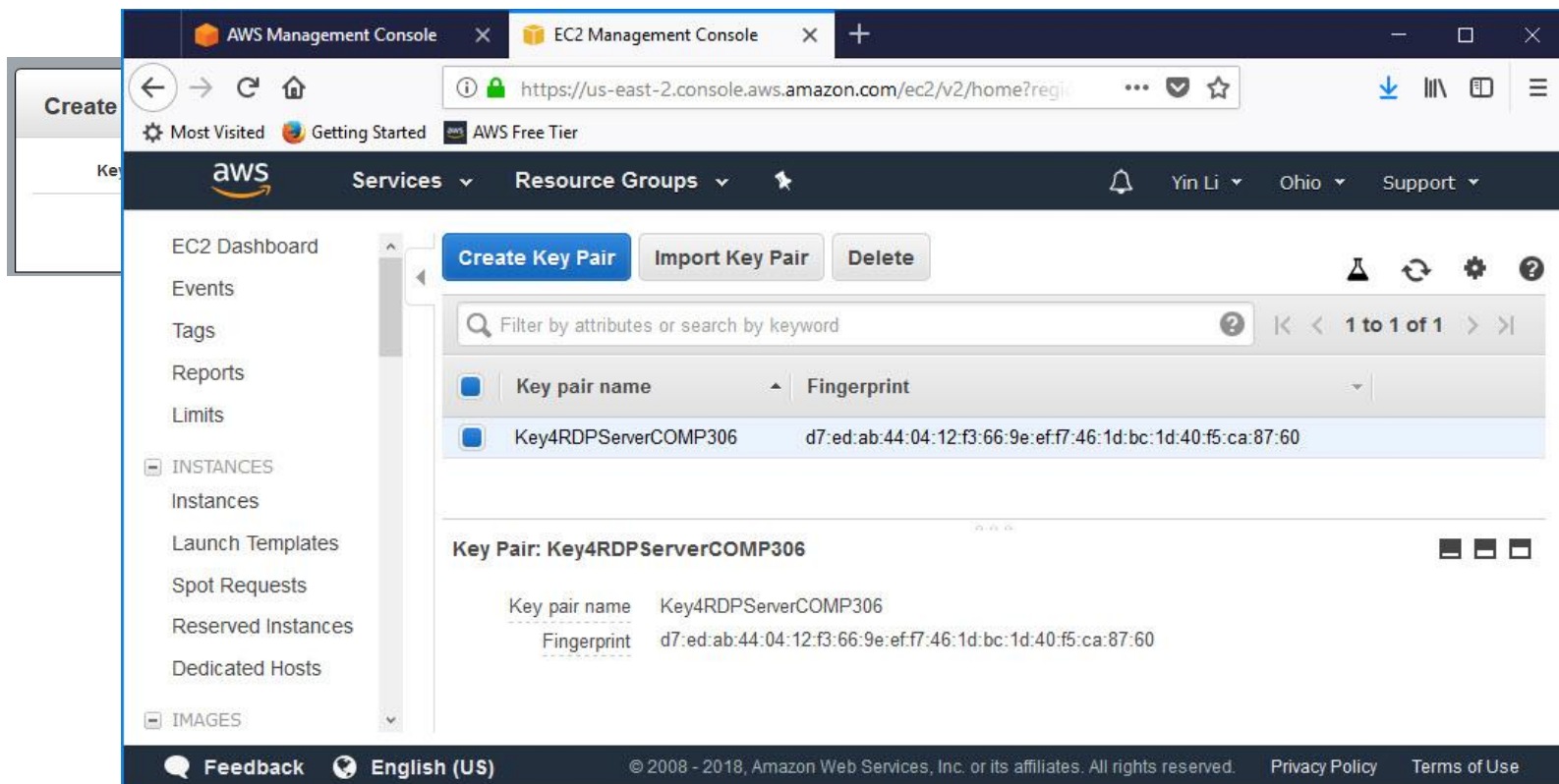
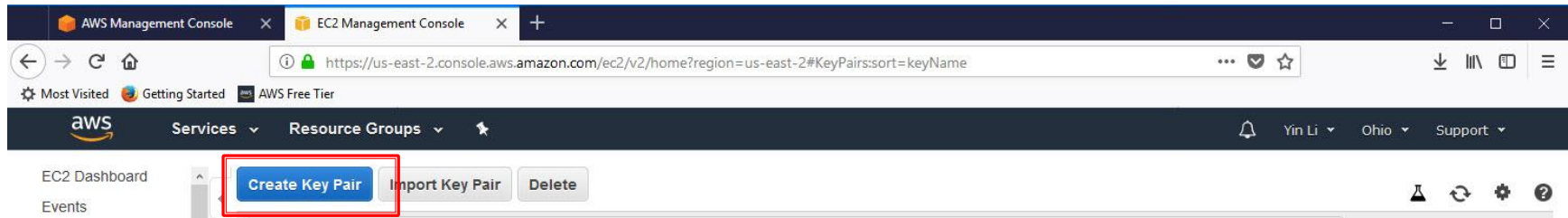
- An AMI includes the following:
 - A template for the root volume for the instance(e.g., an operating system, an application server, and applications)
 - Launch permissions that control which AWS accounts can use the AMI to launch instances
 - A block device mapping that specifies the volumes to attach to the instance when it's launched

Create Amazon EC2 Key Pairs(1/2)

- Amazon EC2 uses public-key cryptography to encrypt and decrypt login information. Public-key cryptography uses a public key to encrypt a piece of data, such as a password, then the recipient uses the private key to decrypt the data. The public key and private keys are known as a key pair



Create Amazon EC2 Key Pairs(2/2)



Launch EC2 Instance(1/9)

The screenshot displays the AWS Management Console interface. At the top, there are two tabs: 'AWS Management Console' and 'EC2 Management Console'. The browser address bar shows the URL: <https://us-east-2.console.aws.amazon.com/ec2/v2/home?region=us-east-2>. The main navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information (Yin Li, Ohio, Support). The left sidebar shows the 'EC2 Dashboard' with links to Events, Tags, Reports, Limits, INSTANCES (Instances, Launch Templates, Spot Requests, Reserved Instances, Dedicated Hosts), and IMAGES. The main content area is titled 'Create Instance' and contains the text: 'To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.' Below this text is a blue button labeled 'Launch Instance' with a dropdown arrow, which is circled in red. To the right of the 'Launch Instance' button is a note: 'Note: Your instances will launch in the US East (Ohio) region'. Below the note are three sections: 'Service Health' (Service Status: US East (Ohio): ✔), 'Scheduled Events' (US East (Ohio): No events), and 'AWS Marketplace' (Find free software trial products in the AWS Marketplace from the EC2 Launch Wizard. Or try these popular AMIs:). The footer includes 'Feedback', 'English (US)', and copyright information: '© 2008 - 2018, Amazon Web Services, Inc. or its affiliates. All rights reserved. Privacy Policy Terms of Use'.

Launch EC2 Instance(2/9)

The screenshot shows the AWS Management Console interface for launching an EC2 instance. The browser address bar indicates the URL: <https://us-east-2.console.aws.amazon.com/ec2/v2/home?region=us-east-2#LaunchInstanceWizard:>. The console header shows the AWS logo, navigation tabs (Most Visited, Getting Started, AWS Free Tier), and user information (Yin Li, Ohio, Support). The main content area is titled "Step 1: Choose an Amazon Machine Image (AMI)" and includes a "Cancel and Exit" link. Below the title, there are four AMI options, each with a "Select" button. The first AMI, "Microsoft Windows Server 2016 Base", has its "Select" button circled in red. The other three AMIs are "Deep Learning AMI (Ubuntu) Version 13.0", "Deep Learning AMI (Amazon Linux) Version 13.0", and "Deep Learning Base AMI (Ubuntu) Version 9.0". Each AMI entry includes a logo, name, ID, description, and "Root device type" and "Virtualization type" information.

Logo	AMI Name	AMI ID	Description	Root device type	Virtualization type	Architecture	Action
Windows	Microsoft Windows Server 2016 Base	ami-0b714f9b34964c255	Microsoft Windows 2016 Datacenter edition. [English]	ebs	hvm	64-bit	Select
Ubuntu	Deep Learning AMI (Ubuntu) Version 13.0	ami-0f5cf11f20486daa0	Comes with latest binaries of deep learning frameworks pre-installed in separate virtual environments: MXNet, TensorFlow, Caffe, Caffe2, PyTorch, Keras, Chainer, Theano and CNTK. Fully-configured with NVidia CUDA, cuDNN and NCCL as well as Intel MKL-DNN	ebs	hvm	64-bit	Select
Amazon Linux	Deep Learning AMI (Amazon Linux) Version 13.0	ami-0aa47654b2bcb1e36	Comes with latest binaries of deep learning frameworks pre-installed in separate virtual environments: MXNet, TensorFlow, Caffe, Caffe2, PyTorch, Keras, Chainer, Theano and CNTK. Fully-configured with NVidia CUDA, cuDNN and NCCL as well as Intel MKL-DNN	ebs	hvm	64-bit	Select
Ubuntu	Deep Learning Base AMI (Ubuntu) Version 9.0	ami-02a0ddcb34e1d8407	Comes with foundational platform of NVidia CUDA, cuDNN, NCCL, GPU Drivers, Intel MKL-DNN and other system libraries to deploy your own custom deep learning environment	ebs	hvm	64-bit	Select

All services that offer a free tier have limits on what you can use without being charged. Many services have multiple types of limits. EC2 has limits on both the type of instance you can use and how many hours you can use in one month.

Launch EC2 Instance(3/9)

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

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AWS Management Console

EC2 Management Console

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Most Visited Getting Started AWS Free Tier

aws

Services

Resource Groups

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Yin Li

Ohio

Support

1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Add Tags

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.

Filter by:

All Instance types

Current generation

Show/Hide Columns

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

	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Support
<input type="checkbox"/>	General purpose	t2.nano	1	0.5	EBS only	-	Low to Moderate	Yes
<input checked="" type="checkbox"/>	General purpose	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.small	1	2	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.medium	2	4	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.large	2	8	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.xlarge	4	16	EBS only	-	Moderate	Yes
<input type="checkbox"/>	General purpose	t2.2xlarge	8	32	EBS only	-	Moderate	Yes
<input type="checkbox"/>	General purpose	t3.nano	2	0.5	EBS only	Yes	Up to 5 Gigabit	Yes
<input type="checkbox"/>	General purpose	t3.micro	2	1	EBS only	Yes	Up to 5 Gigabit	Yes
<input type="checkbox"/>	General purpose	t3.small	2	2	EBS only	Yes	Up to 5 Gigabit	Yes
<input type="checkbox"/>	General purpose	t3.medium	2	4	EBS only	Yes	Up to 5 Gigabit	Yes
<input type="checkbox"/>	General purpose	t3.large	2	8	EBS only	Yes	Up to 5 Gigabit	Yes

Cancel

Previous

Review and Launch

Next: Configure Instance Details

Feedback

English (US)

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Launch EC2 Instance(4/9)

AWS Management Console x EC2 Management Console x

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

Most Visited Getting Started AWS Free Tier

Services Resource Groups

Yin Li Ohio Support

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

Step 3: Configure Instance Details

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.

Number of instances 1 [Launch into Auto Scaling Group](#)

Purchasing option ☐ Request Spot instances

Network vpc-4b237922 (default) [Create new VPC](#)

Subnet No preference (default subnet in any Availability Zone) [Create new subnet](#)

Auto-assign Public IP Use subnet setting (Enable)

Placement group ☐ Add instance to placement group.

Domain join directory None [Create new directory](#)

IAM role None [Create new IAM role](#)

Shutdown behavior Stop

Enable termination protection ☒ Protect against accidental termination

Monitoring ☐ Enable CloudWatch detailed monitoring
[Additional charges apply.](#)

Tenancy Shared - Run a shared hardware instance
[Additional charges will apply for dedicated tenancy.](#)

Elastic GPU ☐ Add GPU
[Additional charges apply.](#)

T2/T3 Unlimited ☐ Enable
[Additional charges may apply](#)

[Cancel](#) [Previous](#) [Review and Launch](#) [Next: Add Storage](#)

Feedback English (US)

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Launch EC2 Instance(5/9)

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Most Visited

Getting Started

AWS Free Tier

aws

Services ▾

Resource Groups ▾

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Yin Li ▾

Ohio ▾

Support ▾

1. Choose AMI

2. Choose Instance Type

3. Configure Instance

4. Add Storage

5. Add Tags

6. Configure Security Group

7. Review

Step 7: Review Instance Launch

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.

▼ AMI Details

🏠

Free tier eligible

Microsoft Windows Server 2016 Base - ami-0b714f9b34964c255

Microsoft Windows 2016 Datacenter edition. [English]

Root Device Type: ebs Virtualization type: hvm

[Edit AMI](#)

▼ Instance Type

Instance Type	ECUs	VCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
t2.micro	Variable	1	1	EBS only	-	Low to Moderate

[Edit instance type](#)

▼ Security Groups

Security group name

launch-wizard-1

Description

launch-wizard-1 created 2018-09-05T08:58:43.817-04:00

Type ⓘ	Protocol ⓘ	Port Range ⓘ	Source ⓘ	Description ⓘ
This security group has no rules				

[Edit security groups](#)

▶ Instance Details

[Edit instance details](#)

▶ Storage

[Edit storage](#)

▶ Tags

[Edit tags](#)

Cancel

Previous

Launch

Feedback

English (US)

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Launch EC2 Instance(6/9)

Select an existing key pair or create a new key pair



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

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

Choose an existing key pair

Select a key pair

No key pairs found

No key pairs found

You don't have any key pairs. Please create a new key pair by selecting the **Create a new key pair** option above to continue.

Cancel

Launch Instances

Select an existing key pair or create a new key pair



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

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

Choose an existing key pair

Select a key pair

Key4RDPServerCOMP306

☒ I acknowledge that I have access to the selected private key file (Key4RDPServerCOMP306.pem), and that without this file, I won't be able to log into my instance.

Cancel

Launch Instances

Launch EC2 Instance(7/9)

The screenshot displays the AWS Management Console interface for the EC2 service. The browser tabs show 'AWS Management Console' and 'EC2 Management Console'. The address bar indicates the URL: <https://us-east-2.console.aws.amazon.com/ec2/v2/home?region=us-east-2#LaunchInstanceWizard>. The console header includes the AWS logo, navigation links for 'Services' and 'Resource Groups', and user information for 'Yin Li' in the 'Ohio' region. The main content area is titled 'Launch Status' and features two informational boxes. The first box, with a green checkmark, states 'Your instances are now launching' and lists the instance ID 'i-0e9d87452627ec467' with a link to 'View launch log'. The second box, with an information icon, says 'Get notified of estimated charges' and provides instructions on creating billing alerts. Below these boxes, a section titled 'How to connect to your instances' explains the process from launching to the 'running' state. At the bottom, a section 'Here are some helpful resources to get you started' lists links to the Amazon EC2 User Guide, Microsoft Windows Guide, Discussion Forum, and a guide on connecting to Windows instances. The footer contains a 'Feedback' link, 'English (US)' language selection, and copyright information for Amazon Web Services, Inc.

Launch Status

✓ **Your instances are now launching**
The following instance launches have been initiated: [i-0e9d87452627ec467](#) [View launch log](#)

i **Get notified of estimated charges**
Create [billing alerts](#) to get an email notification when estimated charges on your AWS bill exceed an amount you define (for example, if you exceed the free usage tier).

How to connect to your instances

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

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

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

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

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Launch EC2 Instance(8/9)

The screenshot shows the AWS Management Console with the EC2 Management Console tab selected. The browser address bar shows the URL: <https://us-east-2.console.aws.amazon.com/ec2/v2/home?region=us-east-2#Home:>. The console header includes the AWS logo, navigation links for Services, Resource Groups, and a user profile for Yin Li in the Ohio region. The left sidebar contains a navigation menu with categories like EC2 Dashboard, INSTANCES, IMAGES, ELASTIC BLOCK STORE, and NETWORK &.

The main content area is titled "Resources" and displays a summary of EC2 resources in the US East (Ohio) region:

- 1 Running Instances** (circled in red)
- 0 Elastic IPs
- 0 Dedicated Hosts
- 0 Snapshots
- 1 Volumes
- 0 Load Balancers
- 1 Key Pairs
- 2 Security Groups
- 0 Placement Groups

Below the resource summary, there is a blue box with the text: "Learn more about the latest in AWS Compute from AWS re:Invent 2017 by viewing the [EC2 Videos](#)."

The "Create Instance" section provides instructions on how to launch an Amazon EC2 instance and includes a "Launch Instance" button.

The "Service Health" section shows the status of the US East (Ohio) region as "OK".

The "Scheduled Events" section shows "No events" for the US East (Ohio) region.

The right sidebar contains "Account Attributes" (Supported Platforms, Default VPC, Resource ID length management, Console experiments) and "Additional Information" (Getting Started Guide, Documentation, All EC2 Resources, Forums, Pricing, Contact Us).

The bottom of the console features a footer with "Feedback", "English (US)", and copyright information: "© 2008 - 2018, Amazon Web Services, Inc. or its affiliates. All rights reserved. Privacy Policy Terms of Use".

Launch EC2 Instance(9/9)

The screenshot displays the AWS Management Console interface for the EC2 service. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information (Yin Li, Ohio, Support). The left sidebar lists navigation options: EC2 Dashboard, Events, Tags, Reports, Limits, INSTANCES (highlighted), Launch Templates, Spot Requests, Reserved Instances, Dedicated Hosts, IMAGES, AMIs, and Bundle Tasks.

The main content area shows the 'Launch Instance' button and a 'Connect' button. Below this is a search bar and a table of instances. The table has columns: Name, Instance ID, Instance Type, Availability Zone, Instance State, Status Checks, Alarm Status, Public DNS (IPv4), and IPv4 Public IP. One instance is listed with ID 'i-0e9d87452627ec467', type 't2.micro', and state 'running'.

Below the table, the details for the selected instance are shown. The 'Description' tab is active, displaying the Instance ID 'i-0e9d87452627ec467', Public DNS (IPv4) 'ec2-18-223-112-197.us-east-2.compute.amazonaws.com', and IPv4 Public IP '18.223.112.197'. Other tabs include 'Status Checks', 'Monitoring', and 'Tags'.

The footer contains 'Feedback', 'English (US)', and copyright information: '© 2008 - 2018, Amazon Web Services, Inc. or its affiliates. All rights reserved. Privacy Policy Terms of Use'.

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4 Public IP
	i-0e9d87452627ec467	t2.micro	us-east-2c	running	2/2 checks ...	None	ec2-18-223-112-197.us-...	18.223.112.197

Instance: i-0e9d87452627ec467 Public DNS: ec2-18-223-112-197.us-east-2.compute.amazonaws.com

Description Status Checks Monitoring Tags

Instance ID: i-0e9d87452627ec467 Public DNS (IPv4): ec2-18-223-112-197.us-east-2.compute.amazonaws.com IPv4 Public IP: 18.223.112.197

Instance state: running

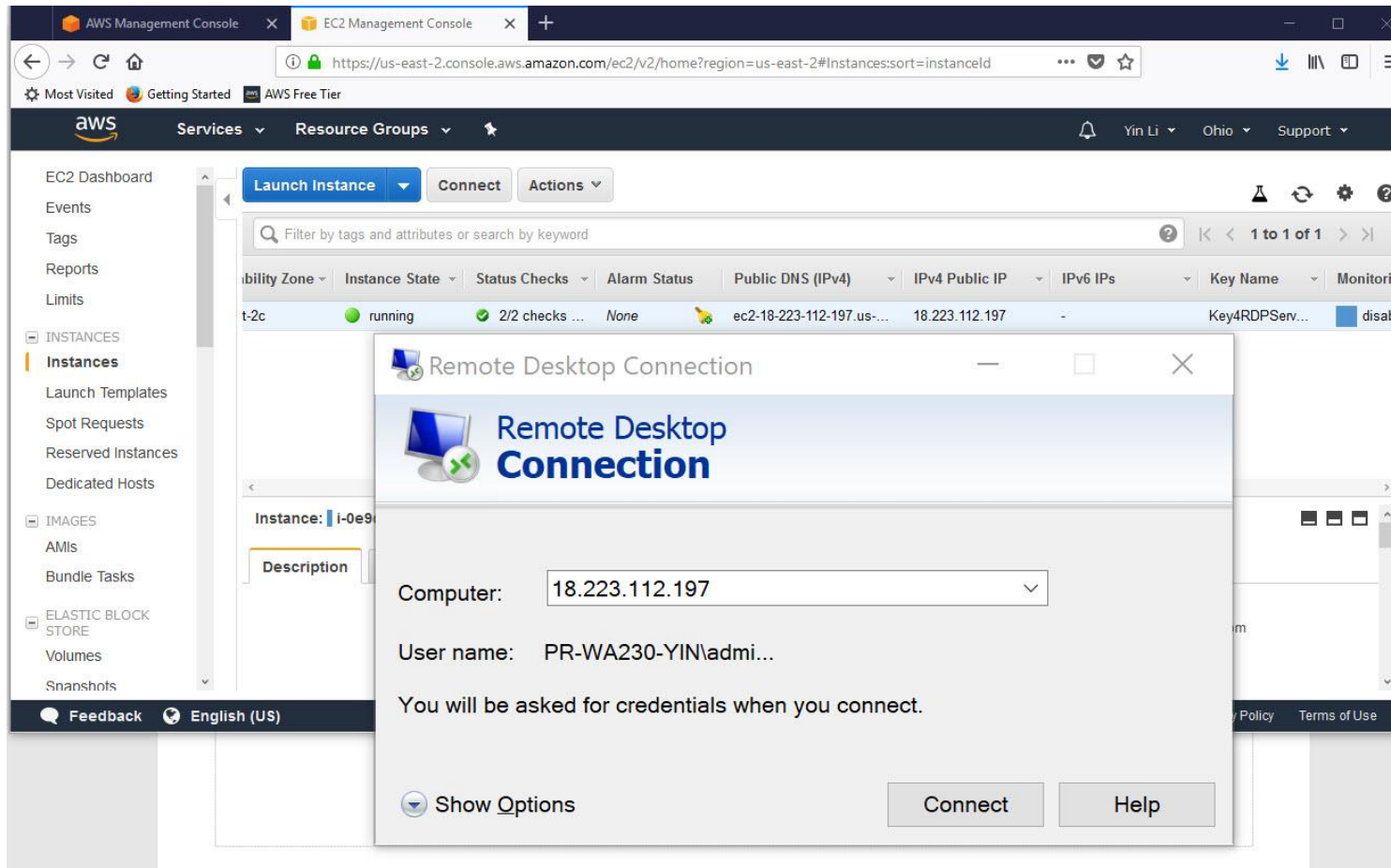
Connect to Launched Instance(1/3)

The screenshot shows the AWS Management Console interface. In the left-hand navigation pane, the 'Instances' section is selected. The main content area displays a list of EC2 instances. The 'Connect' button in the 'Actions' column is highlighted with a red box. Below the instance list, a modal window titled 'Connect To Your Instance' is open. This modal provides instructions on how to connect to a Windows instance using a remote desktop client. It lists the following details:

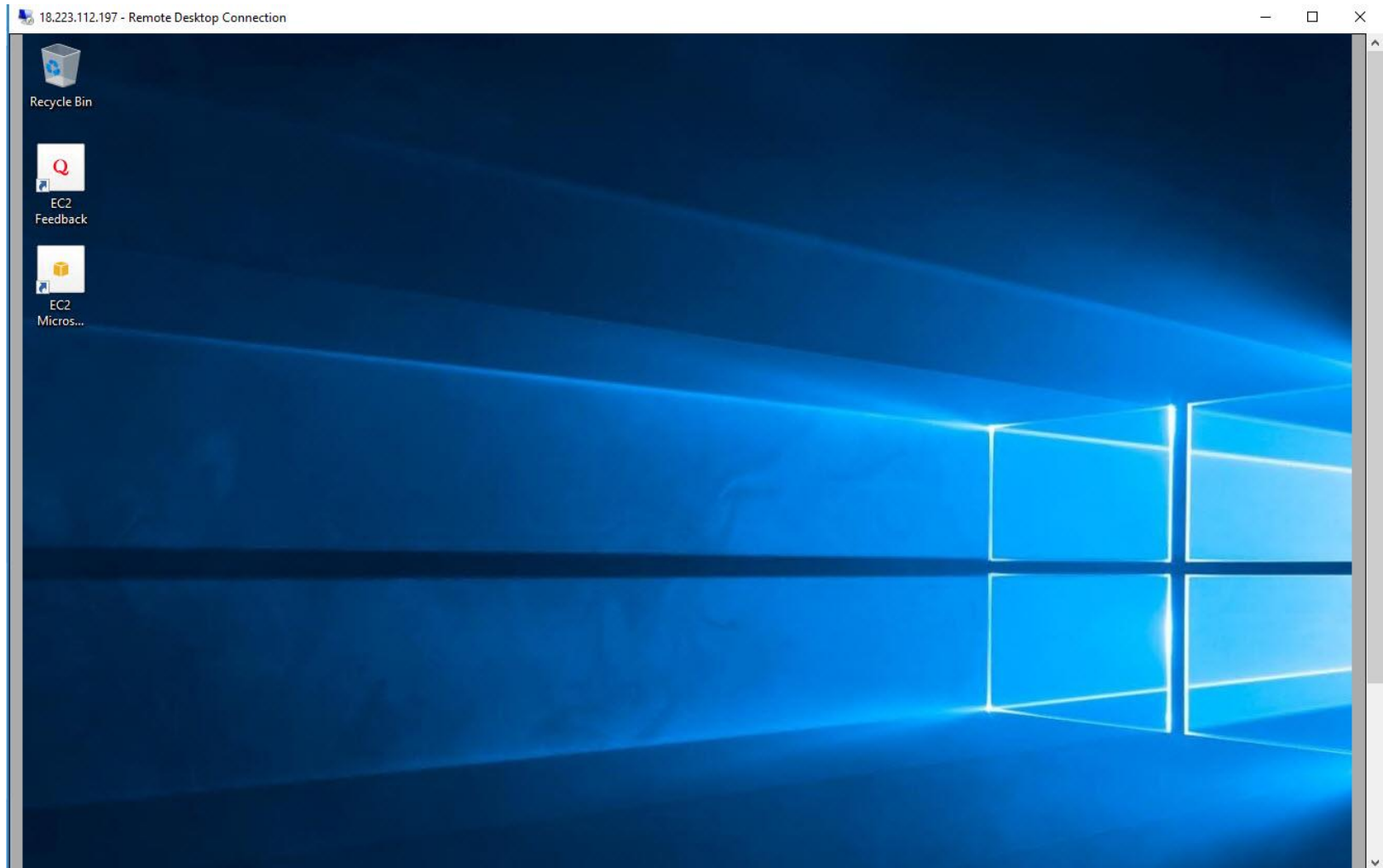
- Public DNS:** ec2-18-223-112-197.us-east-2.compute.amazonaws.com
- User name:** Administrator
- Password:** [Get Password](#) (highlighted with a red box)

The modal also includes a 'Download Remote Desktop File' button and a 'Close' button at the bottom right.

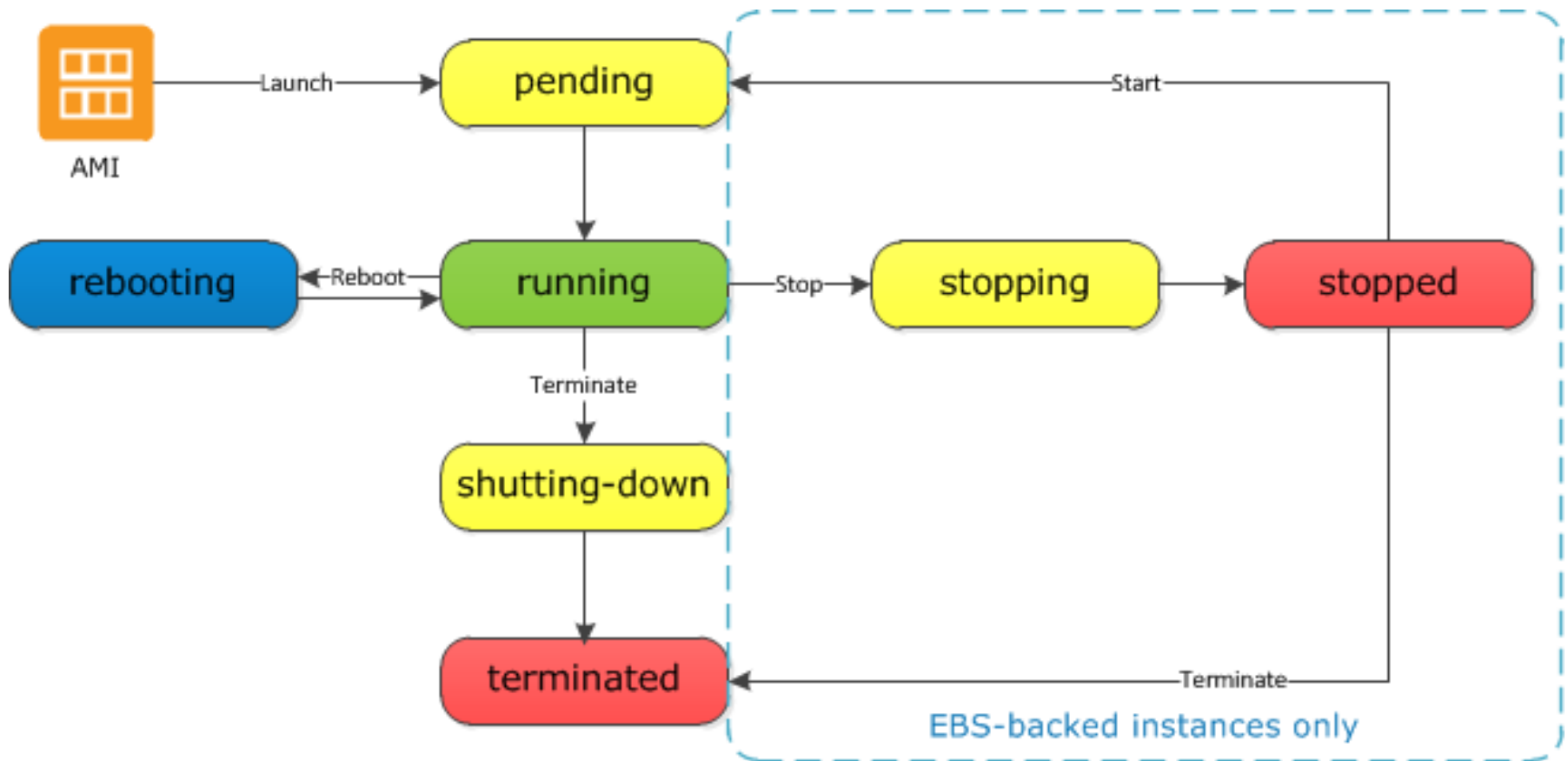
Connect to Launched Instance(2/3)



Connect to Launched Instance(3/3)



EC2 Instance Life Cycle



Reference

- <https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/concepts.html>
- <https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AMIs.html>
- https://en.wikipedia.org/wiki/Remote_Desktop_Protocol
- <https://aws.amazon.com/getting-started/tutorials/launch-windows-vm/>

- <https://www.youtube.com/watch?v=r4Yldn2eTm4>

- <https://www.youtube.com/watch?v=uJssXPyMfos>
- <https://www.youtube.com/watch?v=5FepK5pV39c\>

A **Spot Instance** is an unused EC2 **instance** that is available for less than the On-Demand price. Because **Spot Instances** enable you to request unused EC2 **instances** at steep discounts, you can lower your Amazon EC2 costs significantly. The hourly price for a **Spot Instance** is called a **Spot price**.

- e.g. have 4 bkups instead of 3 bkups, share that 4th one with others, auction it off at discounted price
however, this means not good for real time services because it is offered to highest bidder; only good for ad hoc services