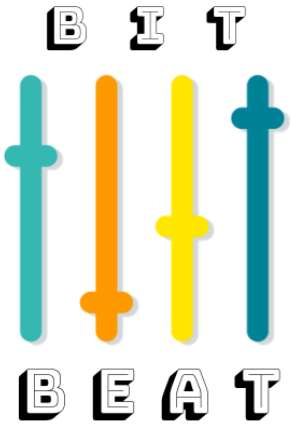
README



World Domination One Beat At A Time

As one of the newest employees at **BitBeat** you've been tasked to provision a webserver for your company to deploy the newest version of its product **BitBanger**, which is set to take the record industry and the world by storm.

The product team is currently building the **BitBanger** application and has asked you for some help. At this point, they need to be able to deploy the early versions of their product to a virtual machine so they can test out if everything works. **BitBeat** is on a tight budget and because this is not for customers, they don't need something overly expensive

The product team sent you the following requirements:

- We need a webserver.
- It must be a Linux machine.
- It must be configured as an Apache HTTP Server ("httpd").
- We want it to be inexpensive.
- The webserver must be publicly accessible (Public IP).

BEFORE GETTING STARTED

Here's some important information to know before starting this hands-on activity.

Activity time: 60 minutes

Requirements: You must have an AWS Educate account. If you have not registered for an AWS Educate account, follow the instructions provided on this page.

Getting help: If you experience any issues as you complete this activity, please ask your instructor for assistance.

ELASTIC CLOUD COMPUTE

DID YOU KNOW

Amazon EC2 a web service that provides resizable compute capacity in the cloud in the form of a virtual machine. In this activity you will get hands-on practice launching, configuring, and resizing an Amazon EC2 instance.

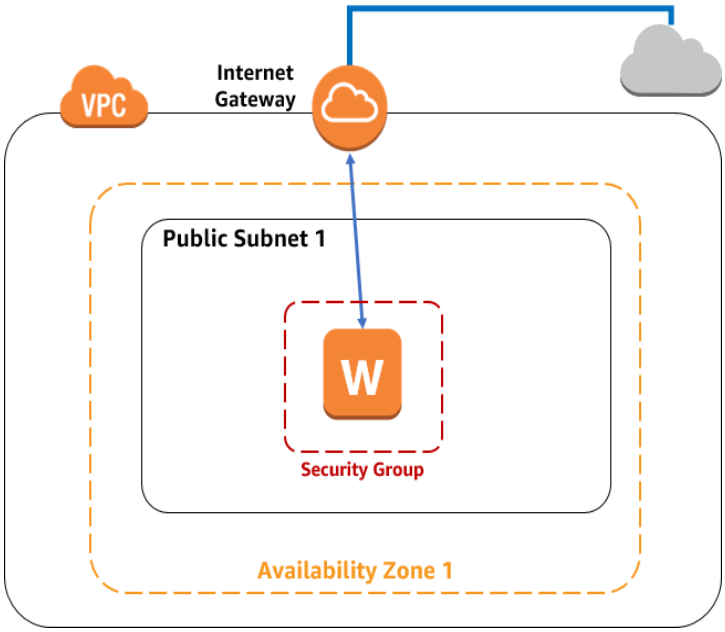
Task overview

Roll up your sleeves. In this hands-on activity, you are going to build a proof of concept (POC) cloud webserver. In order to deliver this POC, you will need to **create and launch a t2.micro Amazon Elastic Compute Cloud (Amazon EC2) instance** using a free tier **Linux Amazon Machine Image (AMI)** that is configured to be a webserver.

An **AMI** is a template used to create a virtual machine within Amazon EC2. An Amazon EC2 instance provides scalable computing capacity in the Amazon Web Services (**AWS**) Cloud. When you launch an Amazon EC2 instance, you are creating a virtual server. This means you secure space on a physical server located in an AWS data center for your use. The allocated space consists of the processor, memory, storage, and network resources you need to run your workloads, apps, services, and more.

You will:

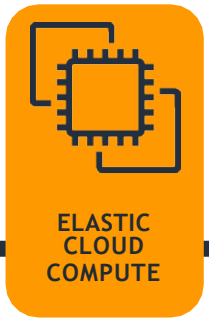
- Launch and configure an Amazon EC2
- Troubleshoot your Amazon EC2
- Update the security groups
- Create and test a rule
- Resize an instance



Learning outcomes

Provision and launch an Amazon EC2 instance selecting the right AMI and instance type to create a virtual machine that can be used by an organization as a webserver.

Let's get started!



DID YOU KNOW

When you create your AWS account, AWS creates a default Amazon Virtual Private Cloud (Amazon VPC) for you in each region. Your default Amazon VPC contains a default subnet.

Launch an Amazon EC2 instance

Our first requirement is that our product team would like a Linux webserver that has Apache installed on it. They would also like for it to be publicly accessible, so let's get going.

1. In the **AWS Management Console**, find and select the Amazon EC2 dashboard
2. From the Amazon **EC2 dashboard**, click 

3. Notice the variety of AMIs located on the AMI page. These are different templates for different types of machines. Select the **Amazon Linux 2 AMI** (HVM)
4. Notice the variety of instance types available. Select the **t2.micro instance**.
5. Select Next: **Configure Instance Details**

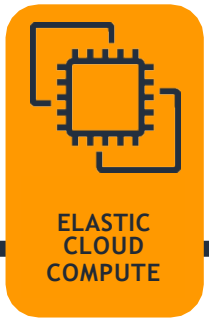
Because this is just a POC, we are going to use our default Amazon VPC and launch our Amazon EC2 instance into the default public subnet where it will automatically assign our virtual machine a public IP address.

6. Accept the default settings for the **Step 3: Configure Instance Details** page and scroll down to the bottom to see the **Advanced Details** section.
    a. Expand Advanced Details. A field for user data will appear.
    b. Copy the following commands and paste them into the **user data** field. (This is called *bootstrapping*, providing code that runs when a computer starts up.)

```
#!/bin/bash
yum-y install httpd
systemctl enable httpd
systemctl start httpd
echo '<html><h1>Hello Earthling, Take meto your leader!
</h1></html>' > /var/www/html/index.html
```

Here's what this bash script does. See if you can identify which actions each line of script executes :

i. Installs, enables, and starts the Apache HTTP Server.
ii. Creates an index.html page with a message.



Let's add some storage to our instance, tags, and security groups:

7. Click **Next: Add Storage**
    a. We will not need another Amazon Elastic Block Store (Amazon EBS) volume
8. Click **Next: Add Tags**
9. Click **Add tag** then configure:
    a. **Key:** Name **Value**: BitBeat WebServer
10. Click **Next: Configure Security Group**
11. Configure a **new** security group as follows:
    a. **Security group** name: Webserver SG
    b. **Description:** Security group for my web server
    c. Click **Review and Launch**.
12. Review the details, scroll down and click **Launch**.
13. The key pair modal displays. In the dropdown select **Proceed without a key pair,** check the box next to the **I acknowledge…** statement, and then click **Launch Instances**
14. On the **Launch Status** page, scroll to the bottom and click **View Instances.** You'll be taken to the Instances page.

Security groups

AWS security groups (SGs) are associated with Amazon EC2 instances and provide security at the protocol and port access level.

A **security group** works very much the same way as a firewall. It contains a set of rules that filter traffic coming into and out of an Amazon EC2 instance. By default, all non-local traffic is blocked.

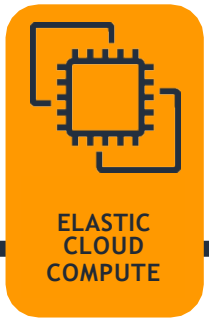
For example, webservers typically allow public traffic access on **port 80 (HTTP)** and/or **port 443 (HTTPS).**

Wait for your new Amazon EC2 instance state to display as **running.**

Test your webpage

1. Select your **BitBeat webServer** Instance and copy the **IPV4 public IP** address to your clipboard
2. Paste the **public IP** address into a new browser window and observe the results.

Did your webpage load properly? If not, what may be the issue?



Troubleshooting Amazon EC2

We successfully launched our **BitBeat Webserver** but when we tried to access the **Public IP** address, there is an error: **This site cannot be reached**. Our product team won't be able to access their **BitBanger** application if they can't reach the webserver. It is our job to figure out how to fix this issue.

Look back at the previous steps and read about security groups. ***Are you allowing normal web traffic (Port 80) to access your webserver? Did you configure this properly?***

Update your security group

1. Keep the web browser open and go back to the Amazon **EC2 Management Console** tab
2. In the left navigation pane, under **Network and Security,** click **Security Groups**
3. Select the **webserver security group** or the security group you created when launching your Amazon EC2 instance
4. Expand the **security group** info pane at the bottom of the screen and click the **Inbound** tab. Notice the security group currently has **no HTTP rules**.

Create a rule

Let's create a rule in the **inbound** tab.

1. Click **Edit**
2. Click **Add Rule** and then configure the following settings
   - **Type**: HTTP
   - **Source**: Anywhere
   - Click **Save**

The new **Inbound HTTP** rule will create an entry for both IPV4 IP address (0.0.0.0/0) as well as IPV6 IP address (::/0)

Test your rule

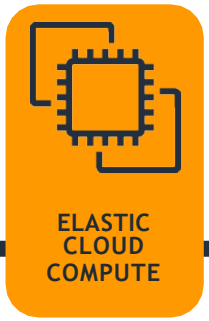
1. Return to the tab you previously opened with the webserver public IP address
2. Refresh the browser page

   You should see the message: ***Hello Earthling! Take me to your leader!***

DID YOU KNOW

When you launch an instance in Amazon EC2, you have the option of passing user data to the instance that can be used to perform common automated configuration tasks and even run scripts after the instance starts.

If you are familiar with shell scripting, this is the simplest and most complete way to send instructions to an instance at launch. Adding these tasks at boot time adds to the amount of time it takes to boot the instance. You should allow a few minutes of extra time for the tasks to complete before you test that the user script has finished successfully.



Congratulations! We successfully launched our **BitBeat webserver,** and our product team is very pleased to have a POC for launching **BitBanger**. To make sure we did everything right, you should revisit the requirements.

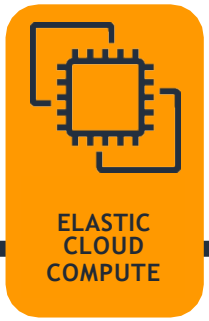
Requirement	Status
We need a webserver.	Complete
Webserver should be a Linux machine.	Complete
Webserver should have Apache installed.	Complete
Webserver must minimize cost.	Amazon EC2 T2 Pricing Guide (Hint: Look at On-Demand Price/hour) https://aws.amazon.com/ec2/instance-types/t2/
Webserver must be publicly accessible.	Complete

Cost effectiveness

You used a t2.micro instance but what are some other ways that we can save on cost for your company? Cloud computing services use a **utility-based pricing** model. Basically, if you leave your light on, there is an associated cost that will show up in your electricity bill. If our product team only works on Mondays through Fridays between the hours of 8:00 AM and 6:00 PM, can we minimize cost by turning off our **BitBeat Webserver** when we aren't using it?

Stop your Amazon EC2 instance

1. In the Amazon **EC2 Management Console**, click **Instances** in the left navigation.
2. Select your running instance and then at the top of the screen click **Actions** > **Instance State > Stop**.
3. Your instance will do a normal shutdown and then will stop running.



DID YOU KNOW

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instance types comprise varying combinations of CPU, memory, storage, and networking capacity giving you the flexibility to choose the appropriate mix of resources for your applications. Each instance type includes one or more instance sizes. This allows you to scale your resources to the requirements of your target workload.

Getting help: If you experience any issues as you complete this activity, please ask your instructor for assistance.

New requirement

The BitBanger product team has noticed that the virtual machine you have provided for them is underpowered. Their software requires a little bit more horsepower, and they've asked for your help.

Resize your instance

1. In the **Actions** menu, select **Instance > Change Instance Type**
2. Then configure the following:
    a. **Instance Type:** t2.small
    b. Click **Apply**

Start the resized instance

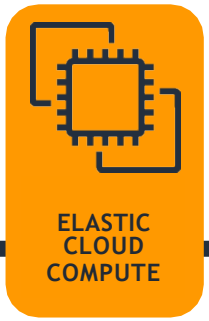
1. In the left navigation pain, click **Instances**.
2. In the Actions menu, select **Instance State > Start**.
3. Click **Yes, Start** in the modal
4. Copy and paste the **new** Amazon EC2 public IP address from the Amazon EC2 Details
5. Open up a browser tab and enter the address.

Public IP addresses

When you stop and start an instance, your instance public **IPv4** address is released and a new pubic IPv4 address is assigned.

However, the **instance** will retain:

- Its private IPv4 addresses
- Any Elastic IP addresses
- Any IPv6 addresses



DID YOU KNOW

You can resize an instance only if its current instance type and the new instance type that you want are compatible in the following ways:

- **Virtualization type**: Linux AMIs use one of two types of virtualization—paravirtual (PV) or hardware virtual machine (HVM). You can't resize an instance that was launched from a PV AMI to an instance type that is HVM only. Check your instance type in the instance **Description** tab under **Virtualization**.
- **Architecture:** Amazon Machine Images (AMIs) are specific to the architecture of the processor, so you must select an instance type with the same processor architecture as the current instance type.

GREAT JOB!

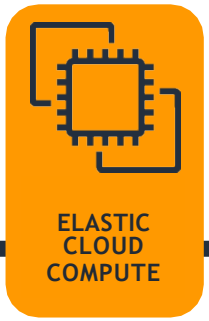
You have successfully launched a **BitBeat** virtual server that will host its **BitBanger** application, and you have met all of the product team's requirements

Let's review

You have completed the activity and successfully launched and configured an Amazon EC2 webserver to host your team's product. Looking forward, think about the types of steps you might take next.

In this activity, you:

- Launched an Amazon EC2 instance
- Created user data (bootstrapping) instructions for your Amazon EC2 instance
- Configured security group settings
- Resized an existing Amazon EC2 instance
- Demonstrated ways to minimize cost



Test your knowledge

You launched and configured an Amazon EC2 instance, resized it, and changed the security group.

- ☐ What is the purpose of Amazon **EC2**? _____
- ☐ What is the purpose of an **Amazon Machine Image (AMI)**?

  _____
- ☐ Why did we select the t2.micro **AMI**? _____
- ☐ What is the purpose of **user data**?

  _____
- ☐ What do you use to control what types of traffic can access your Amazon **EC2 instances**?

  _____
- ☐ Why is **tagging** your resources important? _____

  _____
- ☐ Why would you want to resize an Amazon **EC2** instance?

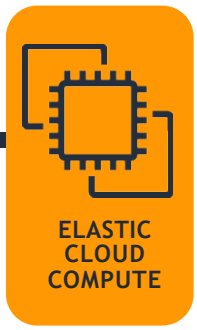
  _____

Bonus activity – Clean up your environment

The BitBanger product team has fully deployed their software in a production setting. You are requested to get rid of the testing machine you created.

Steps

1. Find and select your **BitBeat Webserver**
2. Select Actions > Instance State > Terminate



Assessments

Key concepts and terminology assessment

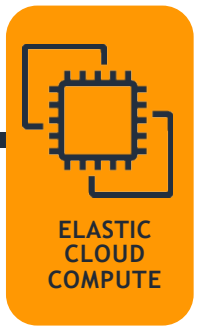
1. Amazon Elastic Compute Cloud (EC2) provides scalable computing capacity in the Amazon Web Services (AWS) Cloud.
   True False
   Say: Amazon Elastic Compute Cloud (EC2) provides scalable computing capacity in the Amazon Web Services (AWS) Cloud. Is this true or false? Explain your reasoning.
   [Answer: True]

2. You can use Amazon EC2 to launch as many or as few virtual servers as you need, configure security and networking, and manage storage. Amazon EC2 requires you to forecast traffic.
   True False
   Say: You can use Amazon EC2 to launch as many or as few virtual servers as you need, configure security and networking, and manage storage. Amazon EC2 requires you to forecast traffic.
   Is this true or false? Explain your reasoning.
   [Answer: False. Amazon EC2 enables you to scale up or down to handle changes in requirements or spikes in popularity, reducing your need to forecast traffic.

3. VPCs are preconfigured templates for your instances.
   True False
   Say: VPCs are preconfigured templates for your instances. Is this true or false? Explain your reasoning.
   [Answer: False. AMIs are preconfigured templates for your instances.]

4. Which of the following is a feature of Amazon EC2?
   Instances
   AMIs
   Key pairs
   Ask: Which of the following is a feature of Amazon EC2? Explain your reasoning.
   [Answer: All of the above.]

5. Which of the following is metadata that you can create and assign to your Amazon EC2 resources?
   instances
   instance types
   tags
   Say: Which of the following is metadata that you can create and assign to your Amazon EC2 resources? Explain your reasoning. [Answer: tags]



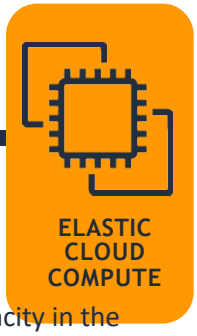
6. One Amazon EC2 feature is a firewall that enables you to specify the protocols, ports, and source IP ranges that can reach your instances using security groups.
   True
   False
   Say: One Amazon EC2 feature is a firewall that enables you to specify the protocols, ports, and source IP ranges that can reach your instances using security groups. Is this true or false? Explain your reasoning.
   [Answer: True]

7. Virtual Private Clouds (VPCs) are virtual networks that you can create which are merged with the rest of the AWS Cloud.
   True
   False
   Say: Virtual Private Clouds (VPCs) are virtual networks that you can create which are merged with the rest of the AWS Cloud. Is this true or false? Explain your reasoning.
   [Answer: False. VPCs are logically isolated from the rest of the AWS cloud.]

8. Your instances keep running until you stop or terminate them, or until they fail. If an instance fails, you can launch a new one from the AMI.
   True
   False
   Say: Your instances keep running until you stop or terminate them, or until they fail. If an instance fails, you can launch a new one from the AMI. Is this true or false? Explain your reasoning.
   [Answer: True.]

9. Inbound rules control the outgoing traffic from your instance and inbound rules control the incoming traffic to your instance.
   True
   False
   Say: Inbound rules control the outgoing traffic from your instance and inbound rules control the incoming traffic to your instance. Is this true or false? Explain your reasoning.
   [Answer: False. Inbound rules control the incoming traffic to your instance, and outbound rules control the outgoing traffic from your instance.]

10. If you don't specify a security group, Amazon EC2 uses the default security group.
    True
    False
    Say: If you don't specify a security group, Amazon EC2 uses the default security group. True or False? Explain your reasoning.
    [Answer: True.]

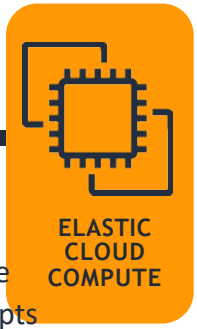


Task assessment

1. The purpose of the web service known as Amazon EC2 is to provide resizable compute capacity in the cloud in the form of a virtual machine.
   True
   False
   Say: The purpose of the web service known as Amazon EC2 is to provide resizable compute capacity in the cloud in the form of a virtual machine.
   Is this true or false? Explain your reasoning.
   [Answer: True]

2. The purpose of an Amazon Machine Image (AMI) is to serve as a template to create a virtual machine within Amazon EC2. There is only one template for different types of machines.
   True
   False
   Say: The purpose of an Amazon Machine Image (AMI) is to serve as a template to create a virtual machine within Amazon EC2. There is only one template for different types of machines. Is this true or false? Explain your reasoning.
   [Answer: False. There are different templates for different types of machines.]

3. You selected the t2.micro AMI because T2 instances are low-cost, general purpose instance types that provide a baseline level of CPU performance with the ability to burst above the baseline when needed.
   True
   False
   Say: You selected the t2.micro AMI because T2 instances are low-cost, general purpose instance types that provide a baseline level of CPU performance with the ability to burst above the baseline when needed.. Is this true or false? Explain your reasoning.
   [Answer: True.]



4. When you launch an instance in Amazon EC2, you have the option of passing user data to the instance that can be used to perform common automated configuration tasks and even run scripts after the instance starts. You can pass two types of user data to Amazon EC2: Shell scripts and cloud-init directives.
True
False
Say: When you launch an instance in Amazon EC2, you have the option of passing user data to the instance that can be used to perform common automated configuration tasks and even run scripts after the instance starts. You can pass two types of user data to Amazon EC2: Shell scripts and cloud-init directives. Is this true or false? Explain your reasoning.
[Answer: True]

5. You use security groups to control traffic into and out of an EC2 instance.
True
False
Say: You use security groups to control traffic into and out of an EC2 instance.
Is this true or false? Explain your reasoning. [Answer:
True]

6. Tagging resources is important because tags enable
you to categorize your AWS resources in different ways,
such as by purpose, owner, or environment.
Say: Tagging resources is important because tags enable you to categorize your AWS resources in different ways, such as by purpose, owner, or environment. Is this true or false? Explain your reasoning.
[Answer: True]

7. You want to resize an EC2 Instance because each
instance type has one or more size options that address
different workload sizes.
Say: You want to resize an EC2 Instance because each instance type has one or more size options that address different workload sizes. Is this true or false? Explain your reasoning.
[Answer: True]

Performance-based assessment
Have students launch and configure a new Amazon EC2 webserver to host their own idea.
As students create their servers, have them document their work with a diagram that includes labels and captions.