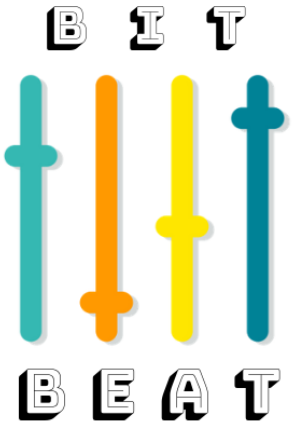
README



World Domination One Beat At A Time

Congratulations! You are the newest employee at **BitBeat.** We are a new start-up that is planning to take the record industry--and the world--by storm with our new product **BitBanger,** a web-based music mixer app.

The company is prepping for an official launch. We are operating on a shoestring budget. We are going to the cloud, which means we need a cloud network that we can use to host our public website, our internal website, email, and that gives our employees access to resources like printers and private tools and information.

That's where you come in. **BitBeat** has hired you to set up their infrastructure. You've already gathered **BitBeat's** requirements and are ready to get started.

BEFORE GETTING STARTED

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

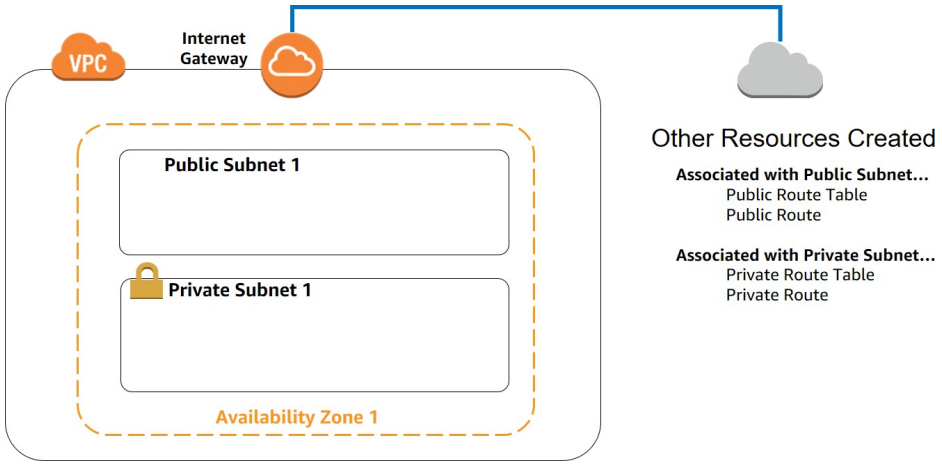
Activity time: 60 min

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.

TASK OVERVIEW

In this hands-on activity, you will create an **Amazon Virtual Private Cloud (Amazon VPC**). When you create the Amazon VPC, you will create a public and a private subnet to manage the flow of traffic between the subnet and the internet gateway. Below is a diagram of the infrastructure you will build:



You will create:

- an Amazon VPC
- A private and a public subnet
- An internet gateway

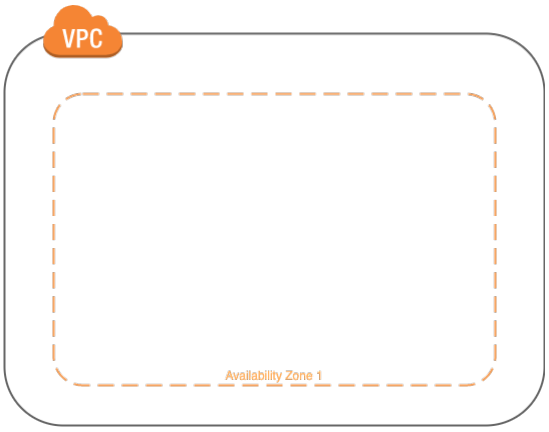
LEARNING OUTCOMES

After completing this activity, you should be able to:

- Build an Amazon VPC in the AWS Management Console and discuss its purpose.
- Create subnets and route tables and explain their role within an Amazon VPC.
- Create an internet gateway and summarize its role within the Amazon VPC.

Let's get started!

Create an Amazon VPC



When you register for an Amazon Web Services (AWS) account, a **default Amazon VPC** is associated with your account and ready for use. It's useful for launching things like a personal blog or simple website. Since you want control over our infrastructure, you are going to create a ***non-default Amazon VPC*** following these steps:

Create a non-default Amazon VPC

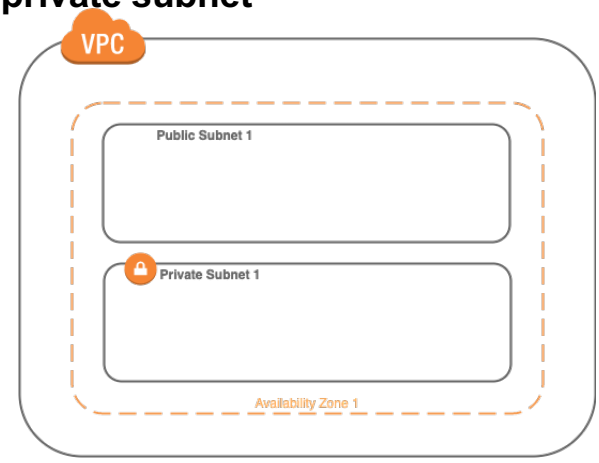
1. In the **AWS Management Console** find the **VPC dashboard**.
2. Click on **Your VPCs**.
3. Click **Create VPC**.
4. Configure the following settings, leaving other fields at their default values:
    - **VPC name: MyVPC**
    - **Public subnet's IPv4 CIDR: 10.0.0.0/16**
    - **IPv6 CIDR Block:** No IPV6 CIDR Block
    - **Tenancy:** Default
5. Click **Create** to create your Amazon VPC.
6. Click **Close** to return to your VPC Dashboard.

DID YOU KNOW?

A **default Amazon VPC** is automatically configured with a /16 IPv4 CIDR block (172.31.0.0/16), a /20 subnet in each availability zone, an associated internet gateway, a default security group, network access control list (ACL), and DHCP. A **non-default Amazon VPC** has a private IP address but does NOT have a public IP address. It can only access resources using an EIP, VPN, or gateway instance.

Your new Amazon VPC, called **MyVPC,** appears in your dashboard along with your default VPC.

Create a public and a private subnet



Now, you want to run a public-facing web application, while maintaining back-end servers that aren't publicly accessible. This is a common example of a multi-tier website. The web servers are in a public subnet and the application and database servers are in a private subnet. You can set up security and routing so that the web servers can communicate with other resources in your Amazon VPC. The instances in the public subnet can send outbound traffic directly to the internet, but the instances in the private subnet cannot. Instead, the instances in the private subnet can access the internet by using a network address translation (NAT) that resides in the public subnet. In this activity, we are focusing on our infrastructure so we will not be creating a **NAT**.

Next, continue to build the **BitBeat** infrastructure by creating public and private subnets.

Create a public subnet

1. In the **VPC dashboard,** click **Subnets** in the left sidebar.
2. Click **Create subnet**.
3. Enter a **Name tag**: Public Subnet 1.
4. Select the Amazon VPC you just created from the dropdown list.
5. Save the **Availability Zone** as **No preference**.
6. **IPv4 CIDR Block:** 10.0.1.0/24
7. Click **Create.**

Create a private subnet

1. Repeat steps 2-7 using the following information:
    a. Enter a **Name tag**: Private Subnet 1
    b. IPv4 CIDR block: 10.0.2.0/24

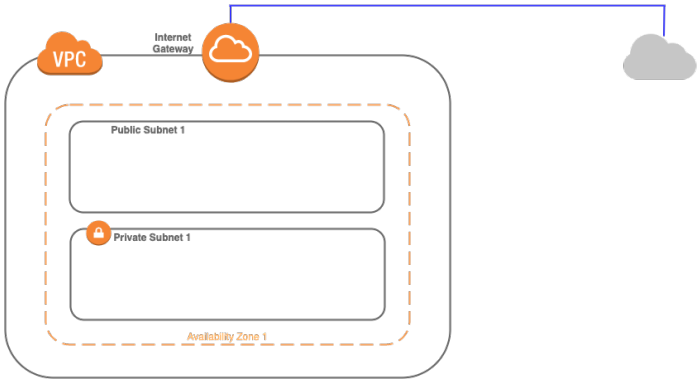
DID YOU KNOW?

Each subnet you create must reside entirely within one Availability Zone and cannot span zones. The minimum size of a subnet is /28 (or 14 IP addresses) for IPv4. For IPv6, the subnet is fixed to be a /64. Only one IPv6 CIDR block can be allocated to a subnet. All VPCs and subnets must have IPv4 CIDR blocks. The allowed block size is between /16 (~65,536 IP addresses) and /28 (16 IP addresses). The first four IP addresses and the last IP address in each subnet CIDR block are not available for you to use and cannot be assigned to an instance.

DID YOU KNOW?

Traditionally, a NAT is a configured Amazon Elastic Compute Cloud (Amazon EC2) instance located in a public subnet that serves as the means by which resources in private subnets can communicate out to the internet for patches, service calls, and more. An AWS NAT Gateway is a managed version of a standard NAT resource. Find out more here.

Create an internet gateway



Our **BitBeat** website needs to be publicly accessible for our customers. To do this, we need to create an internet gateway and attach it to our Amazon VPC. An internet gateway is a managed Amazon VPC component that allows communication between instances in your Amazon VPC and the internet.

Create an internet gateway

1. In the **VPC dashboard**, click **Internet gateways** in the left sidebar.
2. Click **Create internet gateway**.
3. Enter a **Name tag**: MyVPC_IG.
4. Click **Create**.

Attach your internet gateway to your Amazon VPC

1. In the **VPC dashboard**, click **internet gateways** in the left sidebar.
2. Find your internet gateway and notice the state: *detached*.
3. Select your internet gateway and **Go to Actions → Attach to VPC**.
4. Select the *non-default Amazon VPC* names **MyVPC** from the list and click **Attach**.
5. Click **Close**.

Once you have attached the internet gateway to your Amazon VPC, pause here. Take a minute to discuss what you just created.

Adjust the subnet route tables

The resources in our public subnet need a route to allow communication out to the internet.

Our **BitBeat** web servers need to be able to respond to our customer's requests. To accomplish this, we need to alter the Amazon VPC route tables to point all traffic destined for the public internet to the internet gateway we just created and attached to our Amazon VPC.

Create route table

1. In the **VPC dashboard**, click **route tables** in the left sidebar.
2. Click **Create route table**.
3. Enter a **Name tag**: MyVPC Public Route Table.
4. Select the VPC: MyVPC.
5. Click **Create** and then click **Close**.
6. Select the route table you just created and then go to the bottom of the screen and select the **routes** tab.
7. Click **Edit routes**.
    a. Note that a route already exists that coincides with your Amazon VPC CIDR range. This route keeps all local traffic in your Amazon VPC within your Amazon VPC.
8. Click **Add route**.
9. Enter destination: 0.0.0.0/0 representing all internet traffic.
10. Enter target.
    a. Select **Internet gateway**.
    b. Select the internet gateway you created previously.
11. Click **Save routes** and then click **Close**.

You have created a public route table that will allow resources to communicate with the internet through the internet gateway. The only remaining step is to associate this route table to our public subnet where our **BitBeat** web servers will be deployed.

Associate route table

1. With the route table you just created selected, find the tab **Subnet associations**.
    a. Note that it is not associated with any subnet that you created.
2. Click **Edit subnet associations**.
3. Select the checkbox next to the Public Subnet you created earlier and click **Save**.

GREAT JOB!

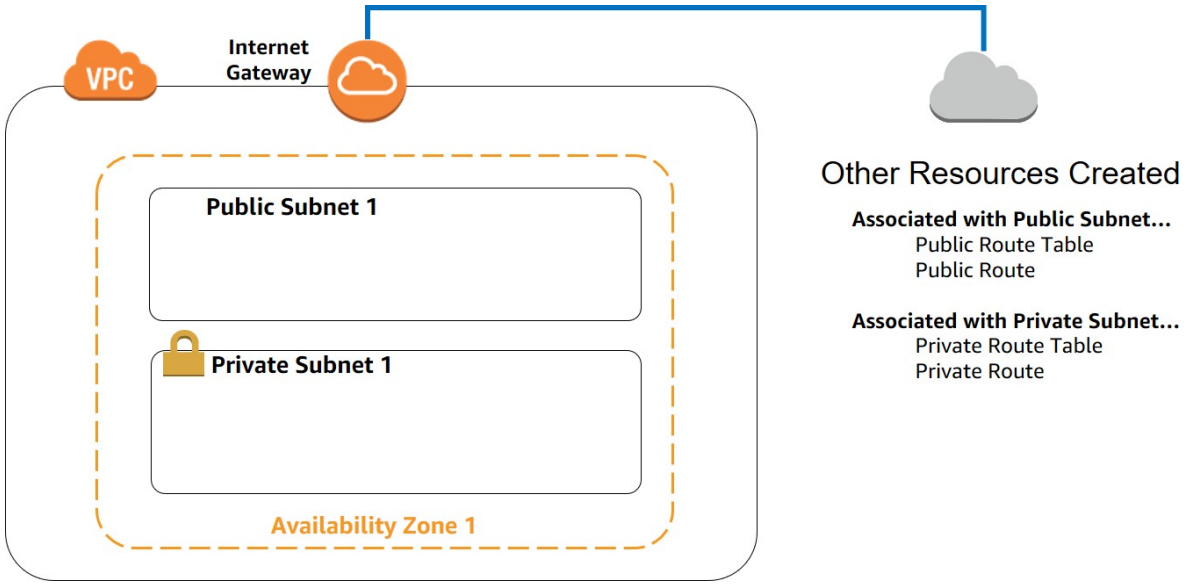
You have successfully created and configured **BitBeat**'s virtual infrastructure

Let's review

You were able to create the first virtual private network for **BitBeat**, which will be the eventual location of their new web-based music service **BitBanger**. You also created subnets within your Amazon VPC to allow for secure segmentation of the resources you will launch. This is one of the first steps of creating a cloud architecture using AWS without the cost and complexity of a physical network. You have access to more resources to help you focus on helping your company launch and grow.

In this activity, you:

- Created a new Amazon VPC
- Built both a public and a private subnet
- Launched an internet gateway
- Configured the Amazon VPC so traffic can flow between the public subnet and the internet gateway using route tables
- Explored the basic components of an Amazon VPC



Test your knowledge

- ☐ What does the acronym VPC stand for? _____
- ☐ What is a VPC? _____
- ☐ What are your public and private subnet IDs?

  _____
- ☐ What is the purpose of your public subnet and the private subnet?

  _____
- ☐ What are the two routes in the public subnet? (*Hint: Look at your route tables.*)

  _____
- ☐ What is the purpose of the internet gateway?

  _____
- ☐ Can resources launched in your private subnet communicate to the internet gateway directly?

  _____
- ☐ What is a NAT? What is a NAT gateway? _____
- ☐ What is the allowed block size for a VPC? _____
- ☐ What is the minimum size for a VPC subnet? _____

Resources

Reference tools

CIDR notation
Subnet calculator
VPC and subnet documentation

CIDR reference

The following is a list of CIDR Blocks, with available IP range, subnet mask, and IP addresses you can use as reference:

CIDR Block	IP Range	Subnet Mask	IP Qty
10.0.0.0/32	10.0.0.0 – 10.0.0.0	255.255.255.255	1
10.0.0.0/31	10.0.0.0 – 10.0.0.1	255.255.255.254	2
10.0.0.0/30	10.0.0.0 – 10.0.0.3	255.255.255.252	4
10.0.0.0/29	10.0.0.0 – 10.0.0.7	255.255.255.248	8
10.0.0.0/28	10.0.0.0 – 10.0.0.15	255.255.255.240	16
10.0.0.0/27	10.0.0.0 – 10.0.0.31	255.255.255.224	32
10.0.0.0./26	10.0.0.0 – 10.0.0.63	255.255.255.192	64
10.0.0.0/25	10.0.0.0 – 10.0.0.127	255.255.255.128	128
10.0.0.0/24	10.0.0.0 – 10.0.0.255	255.255.255.0	256
10.0.0.0/16	10.0.0.0 – 10.0.255.255	255.255.0.0	65536

Assessments

Key concepts and terminology assessment

1. A virtual private cloud (VPC) is a virtual network dedicated to your AWS account.
   True
   False
   Say: A virtual private cloud (VPC) is a virtual network dedicated to your AWS account. Is this true or false? Explain your reasoning.
   [Answer: True]

2. A subnet is a range of IP addresses in your VPC.
   True
   False
   Say: A subnet is a range of IP addresses in your VPC. Is this true or false? Explain your reasoning.
   [Answer: True]

3. A route table is a set of rules, called tables, that are used to determine where network traffic is directed.
   True
   False
   Say: A route table is a set of rules, called tables, that are used to determine where network traffic is directed. Is this true or false? Explain your reasoning.
   [Answer: False. A route table is a set of rules, called routes, that are used to determine where network traffic is directed.]

4. An internet gateway is a gateway that you attach to your Amazon VPC to enable communication between resources in your VPC and the internet.
   True
   False
   Say: An internet gateway is a gateway that you attach to your VPC to enable communication between resources in your VPC and the internet. Is this true or false? Explain your reasoning.
   [Answer: True.]

Task assessment

1. You should create a default VPC when you want control over your infrastructure.
   True
   False
   Say: In this activity, you created a non-default Amazon VPC. Did you create a default Amazon VPC for control over your infrastructure? Is this true or false? Explain your reasoning. [Answer: False. Create a non-default Amazon VPC when you want control over your infrastructure.]

2. Why did you need to build a public subnet and a private subnet in this activity?
   Say: You created a public and private subnet. Explain why. [Answer: If you deployed web servers, it would need to be in a public subnet to create BitBeat's infrastructure. Application and database servers typically reside in a private subnet.]

3. What was the main reason for creating an internet gateway?
   Say: You needed to create an internet gateway for BitBeat. Why? [Answer: BitBeat's requirements included having a publicly accessible website. The internet gateway was required to enable this requirement.]

4. How did you enable BitBeat's web servers to be able to respond to customers' requests?
   Say: You needed to enable BitBeat's web servers to respond to requests. How did you do that? [Answer: You created a public route table that allows resources to communicate with the internet through the internet gateway.]

Performance-based assessment
Have students build a new Amazon VPC in the AWS Management Console without referring to the steps in this activity.

As the students create their Amazon VPCs, have them document their work with a diagram that includes labels and captions.