



Assignment 1b: Creating and deploying Photo Album website onto a simple AWS infrastructure

June 18, 2023

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Class: Morning Saturday

Infrastructure Requirements

Marking scheme: VPC with 2 public and 2 private subnets

Step	Description	Screenshot			
1	Create a VPC named LHoangVPC in the us-east-1 region with 10.0.0.0/16 IPv4 CIDR block.	<p>VPC settings</p> <p>Resources to create Info Create only the VPC resource or the VPC and other networking resources.</p> <p><input type="radio"/> VPC only <input checked="" type="radio"/> VPC and more</p> <p>Name tag auto-generation Info Enter a value for the Name tag. This value will be used to auto-generate Name tags for all resources in the VPC.</p> <p><input checked="" type="checkbox"/> Auto-generate LHoangVPC</p> <p>IPv4 CIDR block Info Determine the starting IP and the size of your VPC using CIDR notation.</p> <p>10.0.0.0/16 65.536 IPs</p> <p>IPv6 CIDR block Info <input checked="" type="radio"/> No IPv6 CIDR block <input type="radio"/> Amazon-provided IPv6 CIDR block</p>			
2	Number of AZs set to 2 with us-east-1a as first AZ and us-east-1b as AZ B.	<p>Number of Availability Zones (AZs) Info Choose the number of AZs in which to provision subnets. We recommend at least two AZs for high availability.</p> <table border="1"> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> </table> <p>Customize AZs</p> <p>First availability zone us-east-1a</p> <p>Second availability zone us-east-1b</p>	1	2	3
1	2	3			

3

Both the number of public subnets and private subnets are set to **2**.
Public subnet CIDR block is set with the following configuration that aligns with the VPC architecture diagram provided in the assignment description.

Number of public subnets [Info](#)

The number of public subnets to add to your VPC. Use public subnets for web applications that need to be publicly accessible over the internet.

0	2
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Number of private subnets [Info](#)

The number of private subnets to add to your VPC. Use private subnets to secure backend resources that don't need public access.

0	2	4
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▼ Customize subnets CIDR blocks**Public subnet CIDR block in us-east-1a**

10.0.1.0/24	256 IPs
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Public subnet CIDR block in us-east-1b

10.0.2.0/24	256 IPs
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Private subnet CIDR block in us-east-1a

10.0.3.0/24	256 IPs
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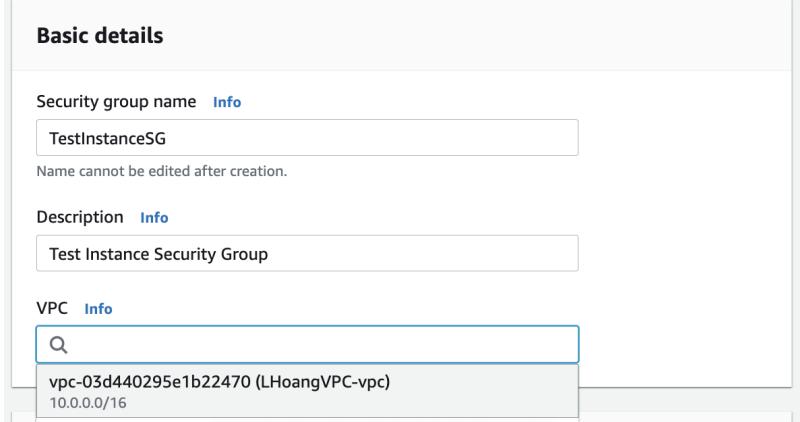
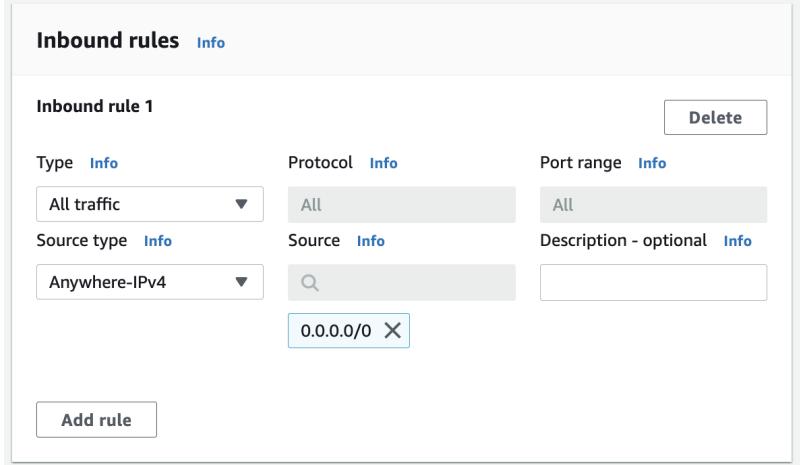
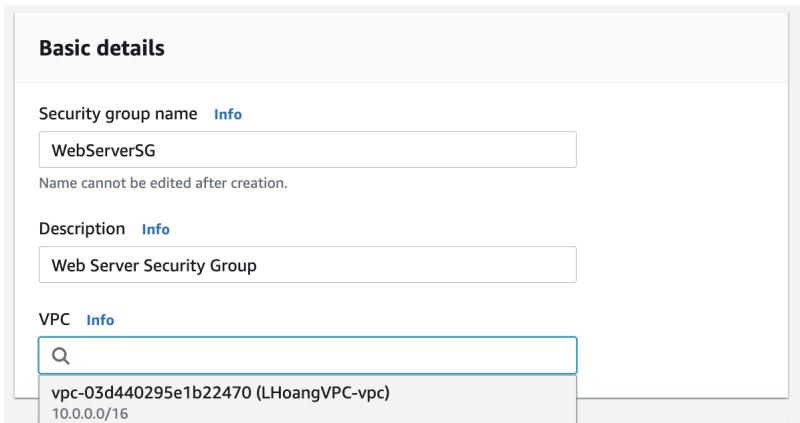
Private subnet CIDR block in us-east-1b

10.0.4.0/24	256 IPs
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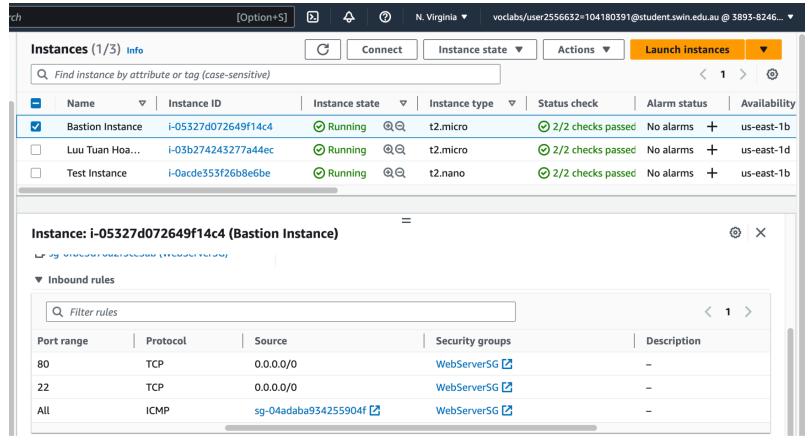
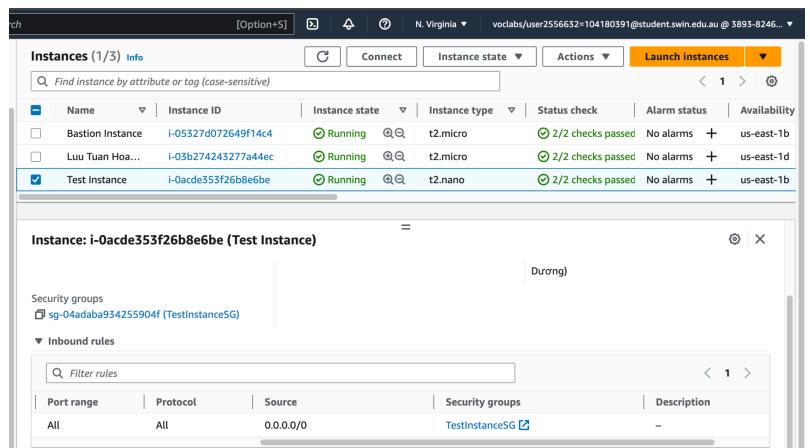
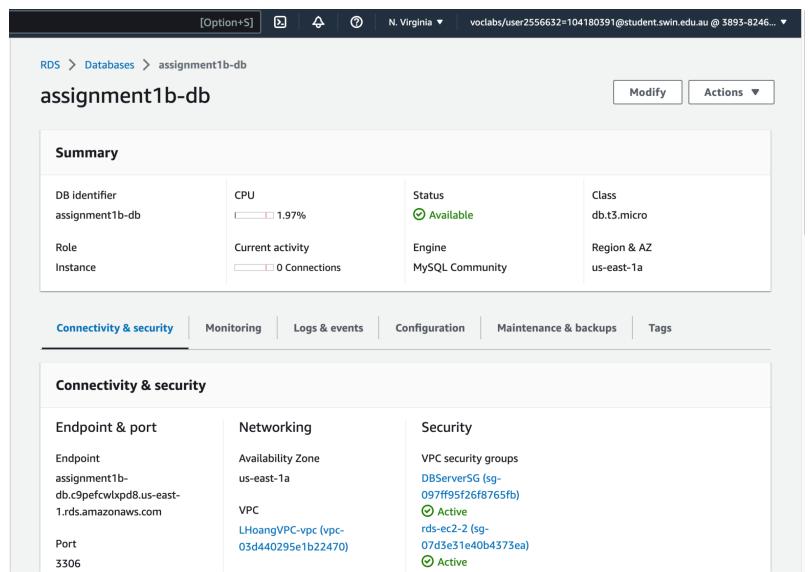
Marking scheme: Correct Public and Private Routing tables with correct subnet associations

Step	Description	Screenshot
1	Correct subnet association.	<p>Number of public subnets Info The number of public subnets to add to your VPC. Use public subnets for web applications that need to be publicly accessible over the internet.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <input type="button" value="0"/> <input checked="" type="button" value="2"/> <input type="button" value="4"/> </div> <p>Number of private subnets Info The number of private subnets to add to your VPC. Use private subnets to secure backend resources that don't need public access.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <input type="button" value="0"/> <input checked="" type="button" value="2"/> <input type="button" value="4"/> </div> <p>▼ Customize subnets CIDR blocks</p> <p>Public subnet CIDR block in us-east-1a 10.0.1.0/24 256 IPs</p> <p>Public subnet CIDR block in us-east-1b 10.0.2.0/24 256 IPs</p> <p>Private subnet CIDR block in us-east-1a 10.0.3.0/24 256 IPs</p> <p>Private subnet CIDR block in us-east-1b 10.0.4.0/24 256 IPs</p>
2	Correct routing table.	<p>The diagram illustrates the VPC architecture with three main components:</p> <ul style="list-style-type: none"> Subnets (4): Subnets within this VPC. It shows two AZs: us-east-1a and us-east-1b. Each AZ contains two subnets: a public subnet (e.g., LHoangVPC-subnet-public1-us-east-1a) and a private subnet (e.g., LHoangVPC-subnet-private1-us-east-1a). Route tables (4): Route network traffic to resources. It shows four route tables: <ul style="list-style-type: none"> rtb-0d27fe971b4c62e31 (associated with us-east-1a public subnet) LHoangVPC-rtb-public (associated with us-east-1a private subnet) LHoangVPC-rtb-private2-us-east-1b (associated with us-east-1b public subnet) LHoangVPC-rtb-private1-us-east-1a (associated with us-east-1b private subnet) Network connections (2): Connections to other networks. It shows two connections: <ul style="list-style-type: none"> LHoangVPC-igw (Gateway endpoint to S3) LHoangVPC-vpce-s3 (Gateway endpoint to S3) <p>Connections are shown as dashed lines between the subnets and their corresponding route tables. The LHoangVPC-vpce-s3 connection is highlighted with a red box.</p>

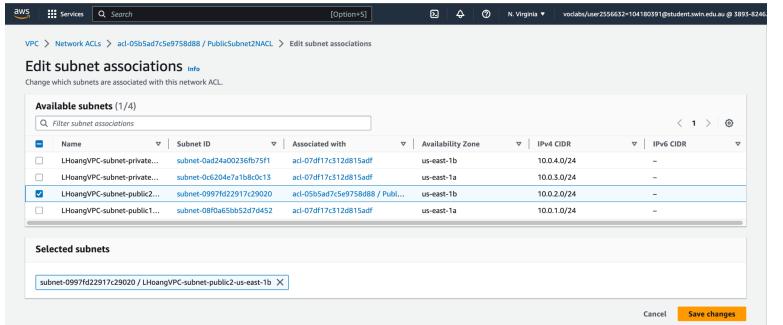
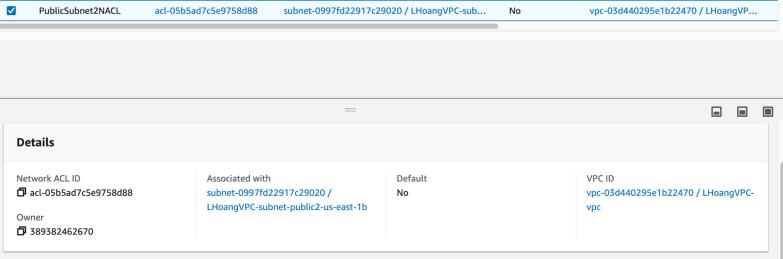
Marking scheme: Security groups properly configured and attached

Step	Description	Screenshot
1	Create a new security group named TestInstanceSG .	
2	Inbound rule with type All traffic from Anywhere .	
3	Create a new security group named WebServerSG .	

4	<p>Inbound rule with type SSH (22) and HTTP (80) from Anywhere and All ICMP - IPv4 from security group TestInstanceSG.</p>	<p>The screenshot shows the 'Edit inbound rules' interface. It lists three rules:</p> <ul style="list-style-type: none"> sg-0bce136dbddff7aaa: Type: HTTP, Protocol: TCP, Port range: 80, Source: Custom (Anywhere), Description: 0.0.0.0/0. sg-0b7aa75d9201db8d4: Type: All ICMP - IPv4, Protocol: ICMP, Port range: All, Source: Custom (TestInstanceSG), Description: sg-04adb8934255904f. -: Type: SSH, Protocol: TCP, Port range: 22, Source: Anywhere, Description: 0.0.0.0/0. <p>Buttons at the bottom include 'Add rule', 'Cancel', 'Preview changes', and 'Save rules'.</p>
5	<p>Create a new security group named DBServerSG.</p>	<p>The screenshot shows the 'Basic details' interface for creating a new security group:</p> <ul style="list-style-type: none"> Security group name: DBServerSG Description: Database Server Security Group VPC: vpc-03d440295e1b22470 (LHoangVPC-vpc) 10.0.0.0/16
6	<p>Inbound rule with type MySQL (3306) from security group WebServerSG.</p>	<p>The screenshot shows the 'Inbound rules' interface for creating an inbound rule:</p> <ul style="list-style-type: none"> Inbound rule 1: <ul style="list-style-type: none"> Type: MYSQL/Aurora, Protocol: TCP, Port range: 3306. Source type: Custom, Source: sg-0fbe5d70a2f3ce5ab (WebServerSG). Description - optional: (empty) <p>Buttons at the bottom include 'Add rule' and 'Delete'.</p>

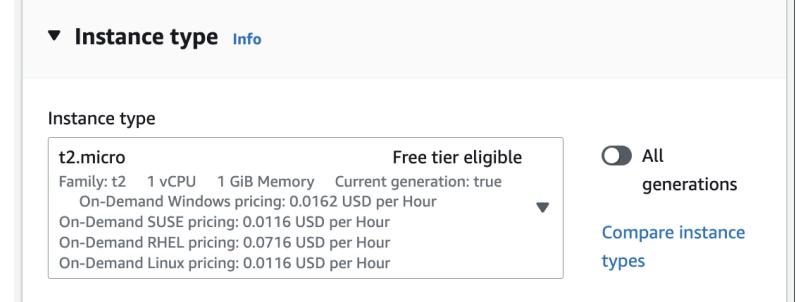
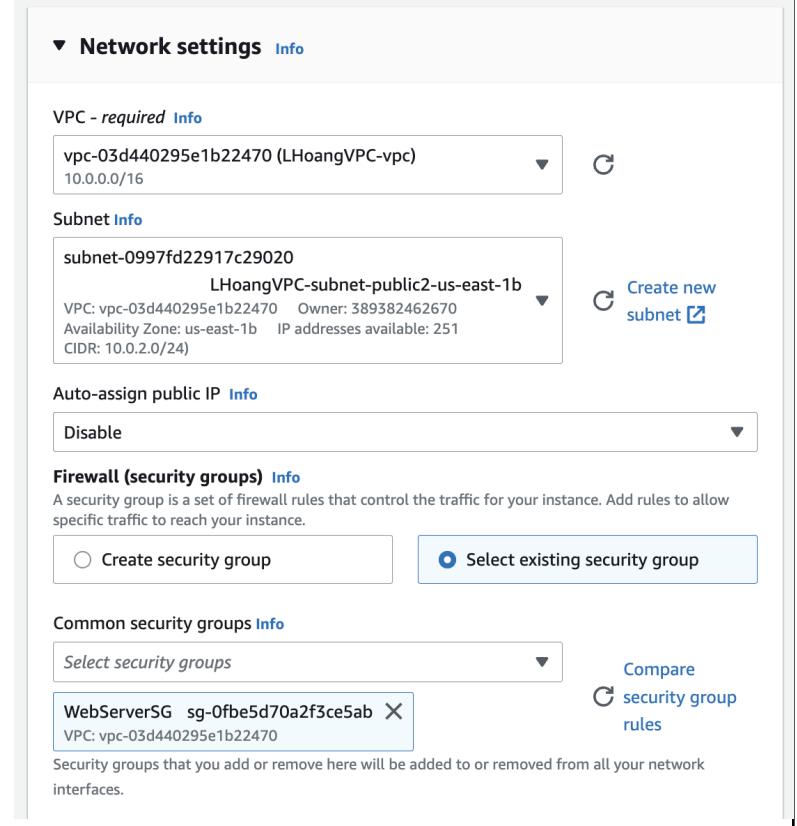
7	WebServerSG attached to EC2 Bastion Instance	
8	TestInstanceSG attached to EC2 Test Instance.	
9	DBServerSG attached to assignment1b-db RDS.	

Marking scheme: Network ACL properly configured and attached																																																		
Step	Description	Screenshot																																																
1	Create a new network ACL named PublicSubnet2NACL .	<p>VPC > Network ACLs > Create network ACL</p> <p>Create network ACL <small>Info</small></p> <p>A network ACL is an optional layer of security that acts as a firewall for controlling traffic in and out of a subnet.</p> <p>Network ACL settings</p> <p>Name - optional Creates a tag with a key of 'Name' and a value that you specify.</p> <p>PublicSubnet2NACL</p> <p>VPC VPC to use for this network ACL.</p> <p>vpc-03d440295e1b22470 (LHoangVPC-vpc)</p> <p>Tags A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.</p> <p>Key Value - optional</p> <p>Q Name X Q PublicSubnet2NACL X Remove tag</p> <p>Add tag</p> <p>You can add 49 more tags</p> <p>Create network ACL</p>																																																
2	Configuration of the inbound rules.	<p>VPC > Network ACLs > ad-05b5ad7c5e9758d88 / PublicSubnet2NACL > Edit inbound rules</p> <p>Edit inbound rules <small>Info</small></p> <p>Inbound rules control the incoming traffic that's allowed to reach the VPC.</p> <table border="1"> <thead> <tr> <th>Rule number</th> <th>Type</th> <th>Protocol</th> <th>Port range</th> <th>Source</th> <th>Allow/Deny</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SSH (22)</td> <td>TCP (6)</td> <td>22</td> <td>0.0.0.0</td> <td>Allow</td> </tr> <tr> <td>2</td> <td>All ICMP - IPv4</td> <td>ICMP (1)</td> <td>All</td> <td>10.0.4.0/24</td> <td>Allow</td> </tr> <tr> <td>3</td> <td>HTTP (80)</td> <td>TCP (6)</td> <td>80</td> <td>0.0.0.0/0</td> <td>Allow</td> </tr> <tr> <td>4</td> <td>HTTPS (443)</td> <td>TCP (6)</td> <td>443</td> <td>0.0.0.0/0</td> <td>Allow</td> </tr> <tr> <td>5</td> <td>All TCP</td> <td>TCP (6)</td> <td>All</td> <td>10.0.3.0/24</td> <td>Allow</td> </tr> <tr> <td>6</td> <td>All TCP</td> <td>TCP (6)</td> <td>All</td> <td>10.0.4.0/24</td> <td>Allow</td> </tr> <tr> <td>*</td> <td>All traffic</td> <td>All</td> <td>All</td> <td>0.0.0.0/0</td> <td>Deny</td> </tr> </tbody> </table> <p>Add new rule Sort by rule number</p> <p>Save changes</p>	Rule number	Type	Protocol	Port range	Source	Allow/Deny	1	SSH (22)	TCP (6)	22	0.0.0.0	Allow	2	All ICMP - IPv4	ICMP (1)	All	10.0.4.0/24	Allow	3	HTTP (80)	TCP (6)	80	0.0.0.0/0	Allow	4	HTTPS (443)	TCP (6)	443	0.0.0.0/0	Allow	5	All TCP	TCP (6)	All	10.0.3.0/24	Allow	6	All TCP	TCP (6)	All	10.0.4.0/24	Allow	*	All traffic	All	All	0.0.0.0/0	Deny
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6	All TCP	TCP (6)	All	10.0.4.0/24	Allow																																													
*	All traffic	All	All	0.0.0.0/0	Deny																																													
3	Outbound rule set to All traffic .	<p>VPC > Network ACLs > ad-05b5ad7c5e9758d88 / PublicSubnet2NACL > Edit outbound rules</p> <p>Edit outbound rules <small>Info</small></p> <p>Outbound rules control the outgoing traffic that's allowed to leave the VPC.</p> <table border="1"> <thead> <tr> <th>Rule number</th> <th>Type</th> <th>Protocol</th> <th>Port range</th> <th>Destination</th> <th>Allow/Deny</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>All traffic</td> <td>All</td> <td>All</td> <td>0.0.0.0/0</td> <td>Allow</td> </tr> <tr> <td>*</td> <td>All traffic</td> <td>All</td> <td>All</td> <td>0.0.0.0/0</td> <td>Deny</td> </tr> </tbody> </table> <p>Add new rule Sort by rule number</p> <p>Save changes</p>	Rule number	Type	Protocol	Port range	Destination	Allow/Deny	1	All traffic	All	All	0.0.0.0/0	Allow	*	All traffic	All	All	0.0.0.0/0	Deny																														
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1	All traffic	All	All	0.0.0.0/0	Allow																																													
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4	Associate the NACL to Public Subnet 2 (CIDR 10.0.2.0/24 and us-east-1b AZ).	 <p>The screenshot shows the AWS VPC Network ACLs interface. A specific Network ACL, 'acl-05b5ad7c5e9758d88', is selected. In the 'Edit subnet associations' section, a public subnet, 'subnet-0997fd22917c29020', is selected and associated with the Network ACL. The subnet is located in the 'us-east-1b' Availability Zone and has a CIDR range of 10.0.2.0/24.</p>
5	NACL successfully associated with the Public Subnet 2 (CIDR 10.0.2.0/24 and us-east-1b AZ).	 <p>The screenshot shows the 'Details' page for the Network ACL 'acl-05b5ad7c5e9758d88'. It displays the following information:</p> <ul style="list-style-type: none"> Network ACL ID: acl-05b5ad7c5e9758d88 Associated with: subnet-0997fd22917c29020 / LHoangVPC-subnet-public2-us-east-1b Default: No VPC ID: vpc-03d440295e1b22470 / LHoangVPC-vpc

Marking scheme: Correct Web server and Test instances running in correct subnets

Step	Description	Screenshot
1	Create a web server instance named Bastion Instance .	<p>Launch an instance <small>Info</small></p> <p>Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.</p> <p>Name and tags <small>Info</small></p> <p>Name Bastion Instance</p> <p>Add additional tags</p>
2	Use Amazon Linux 2 AMI (HVM), SSD Volume Type for OS image.	<p>Application and OS Images (Amazon Machine Image) <small>Info</small></p> <p>An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below</p> <p>Search our full catalog including 1000s of application and OS images</p> <p>Recents Quick Start</p> <p>Amazon Linux macOS Ubuntu Windows</p> <p>Amazon Machine Image (AMI)</p> <p>Amazon Linux 2 AMI (HVM) - Kernel 5.10, SSD Volume Type</p> <p>Free tier eligible</p> <p>ami-09988af04120b3591 (64-bit (x86)) / ami-013e77ebd63dc2197 (64-bit (Arm))</p> <p>Virtualization: hvm ENA enabled: true Root device type: ebs</p> <p>Description</p> <p>Amazon Linux 2 Kernel 5.10 AMI 2.0.20230530.0 x86_64 HVM gp2</p> <p>Architecture AMI ID</p> <p>64-bit (x... ▾ ami-09988af04120b3591 Verified provider</p>

3	<p>Choose t2.micro for Instance type.</p>	 <p>Instance type</p> <p>t2.micro Free tier eligible</p> <p>Family: t2 1 vCPU 1 GiB Memory Current generation: true On-Demand Windows pricing: 0.0162 USD per Hour On-Demand SUSE pricing: 0.0116 USD per Hour On-Demand RHEL pricing: 0.0176 USD per Hour On-Demand Linux pricing: 0.0116 USD per Hour</p> <p><input checked="" type="checkbox"/> All generations</p> <p>Compare instance types</p>
4	<p>Choose LHoangVPC as the VPC for the instance.</p> <p>Choose LHoangVPC-subnet-public2-us-east-1b (CIDR 10.0.2.0/24) as subnet association.</p> <p>Use WebServerSG security group.</p>	 <p>Network settings</p> <p>VPC - required</p> <p>vpc-03d440295e1b22470 (LHoangVPC-vpc) 10.0.0.0/16</p> <p>Subnet</p> <p>subnet-0997fd22917c29020 LHoangVPC-subnet-public2-us-east-1b VPC: vpc-03d440295e1b22470 Owner: 389382462670 Availability Zone: us-east-1b IP addresses available: 251 CIDR: 10.0.2.0/24</p> <p>Auto-assign public IP</p> <p>Disable</p> <p>Firewall (security groups)</p> <p>A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.</p> <p><input type="radio"/> Create security group <input checked="" type="radio"/> Select existing security group</p> <p>Common security groups</p> <p>Select security groups</p> <p>WebServerSG sg-0fbe5d70a2f3ce5ab X VPC: vpc-03d440295e1b22470</p> <p>Security groups that you add or remove here will be added to or removed from all your network interfaces.</p> <p>Compare security group rules</p>

5	<p>Bash script to install Apache web server and other PHP packages to the Bastion Instance.</p>	<p>User data - <i>optional</i> Info Enter user data in the field.</p> <pre>#!/bin/bash yum update -y amazon-linux-extras install -y lamp-mariadb10.2-php7.2 php7.2 service httpd start yum install -y httpd mariadb-server php-mbstring php-xml systemctl start httpd systemctl enable httpd usermod -a -G apache ec2-user chown -R ec2-user:apache /var/www chmod 2775 /var/www find /var/www -type d -exec sudo chmod 2775 {} \; find /var/www -type f -exec sudo chmod 0664 {} \; echo "<?php echo '<h2>Welcome to COS80001. Installed PHP version: ' . phpversion() . '</h2>'; ?>" > /var/www/html/phpinfo.php</pre> <p><input type="checkbox"/> User data has already been base64 encoded</p>
6	<p>Create a web server instance named Test Instance.</p>	<p>Name and tags Info</p> <p>Name</p> <input type="text" value="Test Instance"/>

7

Use Amazon Linux 2 AMI (HVM), SSD Volume Type for OS image.

Application and OS Images (Amazon Machine Image) Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below.

Search our full catalog including 1000s of application and OS images

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Browse more AMIs Including AMIs from AWS, Marketplace and the Community

Amazon Machine Image (AMI)

Amazon Linux 2 AMI (HVM) - Kernel 5.10, SSD Volume Type Free tier eligible

ami-09988af04120b3591 (64-bit (x86)) / ami-013e77ebd63dc2197 (64-bit (Arm))
Virtualization: hvm ENA enabled: true Root device type: ebs

Description
Amazon Linux 2 Kernel 5.10 AMI 2.0.20230530.0 x86_64 HVM gp2

Architecture: 64-bit (x...) | AMI ID: ami-09988af04120b3591 Verified provider

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Choose t2.nano for Instance type.

Instance type Info

Instance type: t2.nano

Family: t2 1 vCPU 0.5 GiB Memory
Current generation: true
On-Demand Linux pricing: 0.0058 USD per Hour
On-Demand SUSE pricing: 0.0058 USD per Hour
On-Demand Windows pricing: 0.0081 USD per Hour

All generations Compare instance types

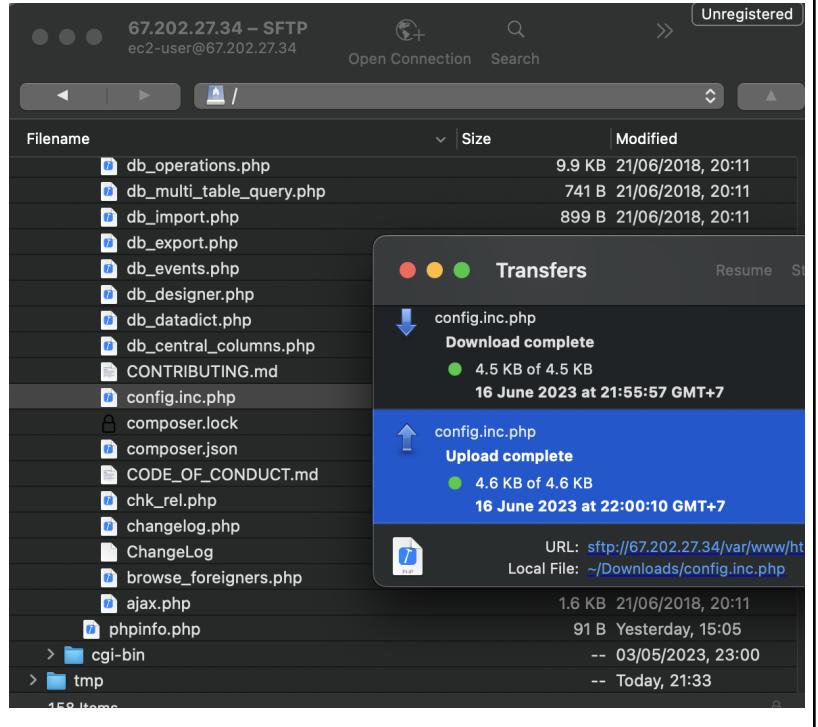
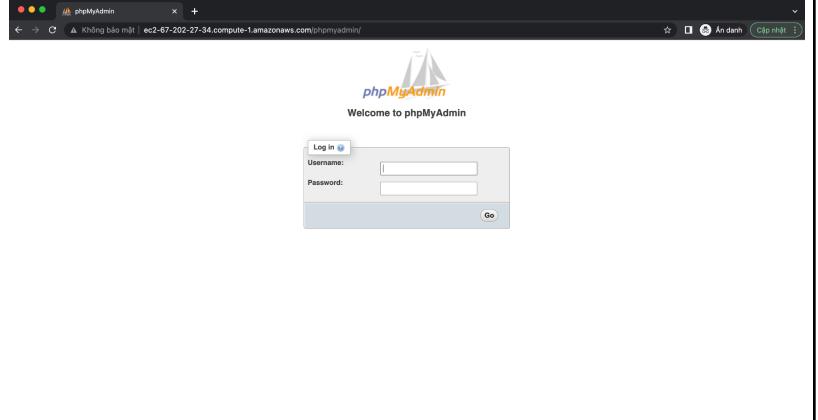
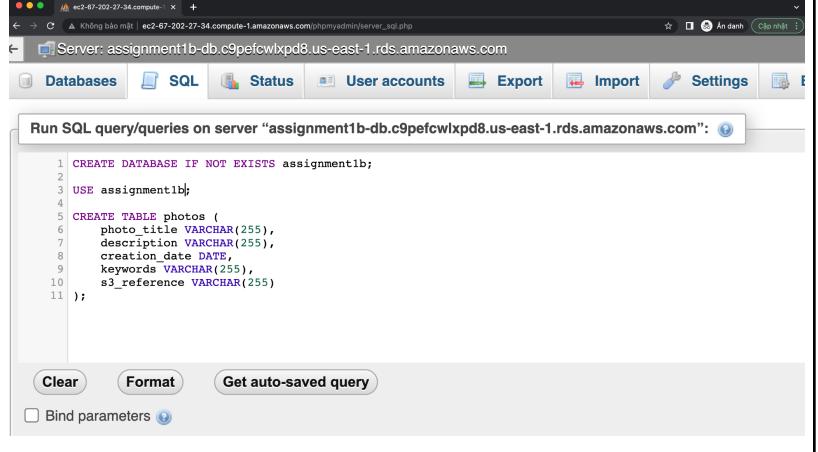
9	<p>Choose LHoangVPC as the VPC for the instance.</p> <p>Choose LHoangVPC-subnet-private2-us-east-1b (CIDR 10.0.4.0/24) as subnet association.</p> <p>Use TestInstanceSG security group.</p>	<p>Network settings Info</p> <p>VPC - required Info vpc-03d440295e1b22470 (LHoangVPC-vpc) 10.0.0.0/16</p> <p>Subnet Info subnet-0ad24a00236fb75f1 LHoangVPC-subnet-private2-us-east-1b VPC: vpc-03d440295e1b22470 Owner: 389382462670 Availability Zone: us-east-1b IP addresses available: 251 CIDR: 10.0.4.0/24</p> <p>Auto-assign public IP Info Disable</p> <p>Firewall (security groups) Info A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.</p> <p><input type="radio"/> Create security group <input checked="" type="radio"/> Select existing security group</p> <p>Common security groups Info Select security groups</p> <p>TestInstanceSG sg-04adaba934255904f X VPC: vpc-03d440295e1b22470</p> <p>Compare security group rules</p> <p>Security groups that you add or remove here will be added to or removed from all your network interfaces.</p>
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Marking scheme: Database schema as specified		
Step	Description	Screenshot
1	Create new RDS with the engine type option of MySQL .	<p>Create database</p> <p>Choose a database creation method <small>Info</small></p> <p><input checked="" type="radio"/> Standard create You set all of the configuration options, including ones for availability, security, backups, and maintenance.</p> <p><input type="radio"/> Easy create Use recommended best-practice configurations. Some configuration options can be changed after the database is created.</p> <p>Engine options</p> <p>Engine type <small>Info</small></p> <p><input type="radio"/> Aurora (MySQL Compatible) </p> <p><input type="radio"/> Aurora (PostgreSQL Compatible) </p> <p><input checked="" type="radio"/> MySQL </p>
2	<p>As MySQL 8.0.25 is not available as an option to choose, we will proceed with MySQL 8.0.28 instead.</p> <p>Use the Free tier template for the RDS.</p>	<p>Engine Version MySQL 8.0.28</p> <p>Templates Choose a sample template to meet your use case.</p> <p><input type="radio"/> Production Use defaults for high availability and fast, consistent performance.</p> <p><input type="radio"/> Dev/Test This instance is intended for development use outside of a production environment.</p> <p><input checked="" type="radio"/> Free tier Use RDS Free Tier to develop new applications, test existing applications, or gain hands-on experience with Amazon RDS. <small>Info</small></p>

3	<p>Assign the DB instance identifier with the name assignment1b-db.</p> <p>Modify credentials settings for master account.</p>	<p>Settings</p> <p>DB instance identifier Info Type a name for your DB instance. The name must be unique across all DB instances owned by your AWS account in the current AWS Region. <input type="text" value="assignment1b-db"/> The DB instance identifier is case-insensitive, but is stored as all lowercase (as in "mydbinstance"). Constraints: 1 to 60 alphanumeric characters or hyphens. First character must be a letter. Can't contain two consecutive hyphens. Can't end with a hyphen.</p> <p>Credentials Settings</p> <p>Master username Info Type a login ID for the master user of your DB instance. <input type="text" value="admin"/> 1 to 16 alphanumeric characters. First character must be a letter.</p> <p><input type="checkbox"/> Manage master credentials in AWS Secrets Manager Manage master user credentials in Secrets Manager. RDS can generate a password for you and manage it throughout its lifecycle.</p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <p>i If you manage the master user credentials in Secrets Manager, some RDS features aren't supported. Learn more</p> </div> <p><input type="checkbox"/> Auto generate a password Amazon RDS can generate a password for you, or you can specify your own password.</p> <p>Master password Info <input type="password" value="*****"/> Constraints: At least 8 printable ASCII characters. Can't contain any of the following: / (slash), '(single quote), "(double quote) and @ (at sign).</p> <p>Confirm master password Info <input type="password" value="*****"/></p>
4	<p>In this case, opt to not connect to an EC2 immediately.</p> <p>Choose LHoangVPC for the DB instance.</p>	<p>Connectivity Info</p> <p>Compute resource Choose whether to set up a connection to a compute resource for this database. Setting up a connection will automatically change connectivity settings so that the compute resource can connect to this database.</p> <p><input checked="" type="radio"/> Don't connect to an EC2 compute resource Don't set up a connection to a compute resource for this database. You can manually set up a connection to a compute resource later.</p> <p><input type="radio"/> Connect to an EC2 compute resource Set up a connection to an EC2 compute resource for this database.</p> <p>Network type Info To use dual-stack mode, make sure that you associate an IPv6 CIDR block with a subnet in the VPC you specify.</p> <p><input checked="" type="radio"/> IPv4 Your resources can communicate only over the IPv4 addressing protocol.</p> <p><input type="radio"/> Dual-stack mode Your resources can communicate over IPv4, IPv6, or both.</p> <p>Virtual private cloud (VPC) Info Choose the VPC. The VPC defines the virtual networking environment for this DB instance.</p> <p><input type="text" value="LHoangVPC-vpc (vpc-03d440295e1b22470)"/> 4 Subnets, 2 Availability Zones</p> <p>Only VPCs with a corresponding DB subnet group are listed.</p>

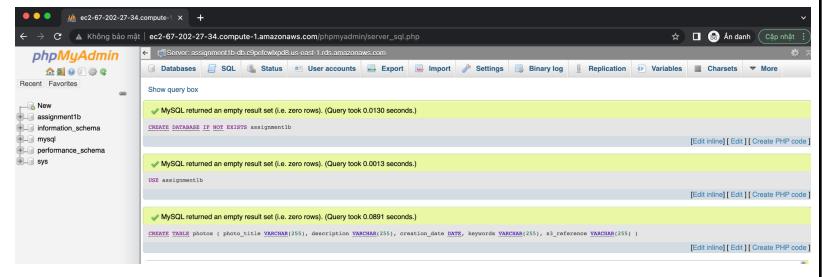
5	<p>Public access set to No.</p> <p>Use DBServerSG for VPC security group.</p> <p>AZ set to us-east-1a (AZ 1 according to the provided diagram).</p>	<p>DB subnet group Info Choose the DB subnet group. The DB subnet group defines which subnets and IP ranges the DB instance can use in the VPC that you selected.</p> <p>Create new DB Subnet Group</p> <p>Public access Info</p> <p><input type="radio"/> Yes RDS assigns a public IP address to the database. Amazon EC2 instances and other resources outside of the VPC can connect to your database. Resources inside the VPC can also connect to the database. Choose one or more VPC security groups that specify which resources can connect to the database.</p> <p><input checked="" type="radio"/> No RDS doesn't assign a public IP address to the database. Only Amazon EC2 instances and other resources inside the VPC can connect to your database. Choose one or more VPC security groups that specify which resources can connect to the database.</p> <p>VPC security group (firewall) Info Choose one or more VPC security groups to allow access to your database. Make sure that the security group rules allow the appropriate incoming traffic.</p> <p><input checked="" type="radio"/> Choose existing Choose existing VPC security groups</p> <p><input type="radio"/> Create new Create new VPC security group</p> <p>Existing VPC security groups</p> <p>Choose one or more options</p> <p>DBServerSG X</p> <p>Availability Zone Info</p> <p>us-east-1a</p>
6	<p>Connect EC2 Bastion Instance to the created RDS instance.</p>	<p>EC2 > Instances > Connect RDS database</p> <p>Connect RDS database Info</p> <p>Connecting an RDS database to your EC2 instance automatically creates and adds security groups to allow traffic between the database and the EC2 instance.</p> <p>EC2 Instance ID i-05327d072649f14c4</p> <p>Instance VPC ID vpc-03d440295e1b22470</p> <p>Select the RDS database to connect to your EC2 instance.</p> <p>Database role</p> <p><input type="radio"/> Cluster Apply security groups to all database instances within a cluster (Only regional clusters supported)</p> <p><input checked="" type="radio"/> Instance Apply security groups to individual database instances that are not part of a cluster</p> <p>RDS database</p> <p>A security group is added to the EC2 instance. A security group is also added to the database with an inbound rule that allows the EC2 instance to access the database port.</p> <p>assignment1b-db Engine: MySQL Community Region and AZ: us-east-1a</p> <p>Create RDS database</p> <p>ⓘ You will incur data transfer fees because your EC2 instance and your RDS database are in different Availability Zones. To avoid incurring these charges, they must be in the same Availability Zone.</p> <p>Cancel Connect</p>

7	Installing PHP to the EC2 instance.	<pre>Tải về — ec2-user@ip-10-0-2-187:/var/www/html — ssh -A ec2-user@67.202.27.34 [ec2-user@ip-10-0-2-187 html]\$ mv phpMyAdmin-4.8.2-english phpmyadmin [ec2-user@ip-10-0-2-187 html]\$ [ec2-user@ip-10-0-2-187 html]\$</pre>															
8	phpMyAdmin successfully installed in the Bastion Instance .	<table border="1"> <thead> <tr> <th>Filename</th> <th>Size</th> <th>Modified</th> </tr> </thead> <tbody> <tr> <td>phpMyAdmin-4.8.2-english.zip</td> <td>6.4 MB</td> <td>22/06/2018, 01:21</td> </tr> <tr> <td>phpmyadmin</td> <td></td> <td>-- 21/06/2018, 20:12</td> </tr> <tr> <td>phpinfo.php</td> <td>91 B</td> <td>Yesterday, 15:05</td> </tr> <tr> <td>cgi-bin</td> <td></td> <td>-- 03/05/2023, 23:00</td> </tr> </tbody> </table>	Filename	Size	Modified	phpMyAdmin-4.8.2-english.zip	6.4 MB	22/06/2018, 01:21	phpmyadmin		-- 21/06/2018, 20:12	phpinfo.php	91 B	Yesterday, 15:05	cgi-bin		-- 03/05/2023, 23:00
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9	<p>Rename config.sample.inc.php to config.inc.php.</p>	 <p>The screenshot shows the SFTP interface of FileZilla connected to the server at 67.202.27.34. The left pane lists files in the directory /var/www/html. The right pane shows two transfers: one download of config.inc.php from the server to the local machine, and one upload of config.inc.php from the local machine back to the server. Both transfers are completed.</p>
10	<p>Login to phpMyAdmin using created master credentials in the RDS creation step.</p>	 <p>The screenshot shows a web browser window with the URL http://ec2-67-202-27-34.compute-1.amazonaws.com/phpmyadmin/. The page displays the phpMyAdmin logo and a "Welcome to phpMyAdmin" message. Below this is a "Log in" form with fields for "Username:" and "Password:", and a "Go" button.</p>
11	<p>Create the database as well as a new table in phpMyAdmin using the following SQL commands.</p> <p>Table: photos</p> <p>Columns:</p> <ul style="list-style-type: none"> - photo_title (varchar(255) type) - description (varchar(255) type) - creation_date (date type) - keywords (varchar(255) type) - s3_reference (varchar(255) type) 	 <p>The screenshot shows the phpMyAdmin SQL query editor. The top bar indicates the server is assignment1b-db.c9pefcwlxd8.us-east-1.rds.amazonaws.com. The SQL tab is selected, showing the following SQL code:</p> <pre> 1 CREATE DATABASE IF NOT EXISTS assignment1b; 2 3 USE assignment1b; 4 5 CREATE TABLE photos (6 photo_title VARCHAR(255), 7 description VARCHAR(255), 8 creation_date DATE, 9 keywords VARCHAR(255), 10 s3_reference VARCHAR(255) 11); </pre> <p>Below the code are buttons for "Clear", "Format", "Get auto-saved query", and "Bind parameters".</p>

12

Database and table successfully created.



The screenshot shows the phpMyAdmin interface on a web browser. The left sidebar lists databases: New, assignment1b, information_schema, mysql, performance_schema, and sys. The main area displays three SQL queries in a query box:

- CREATE DATABASE IF NOT EXISTS assignment1b; (Success)
- USE assignment1b; (Success)
- CREATE TABLE phone (photo LITTLEVARCHAR(10), description VARCHAR(255), creation_date DATE, keywords VARCHAR(255), s1 reference YANHAN(25)); (Success)

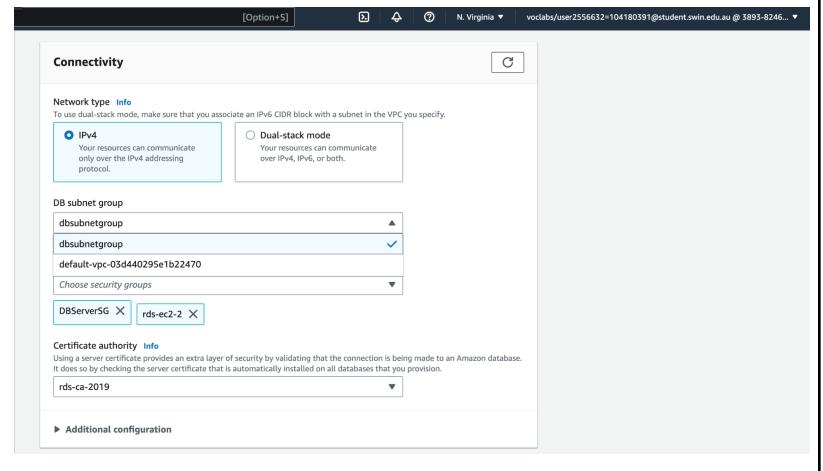
Each query has a green checkmark and a timestamp: 0.0130 seconds, 0.0013 seconds, and 0.0891 seconds respectively. Below the queries are "Edit inline", "Edit", and "Create PHP code" buttons.

Marking scheme: Database running in correct subnets

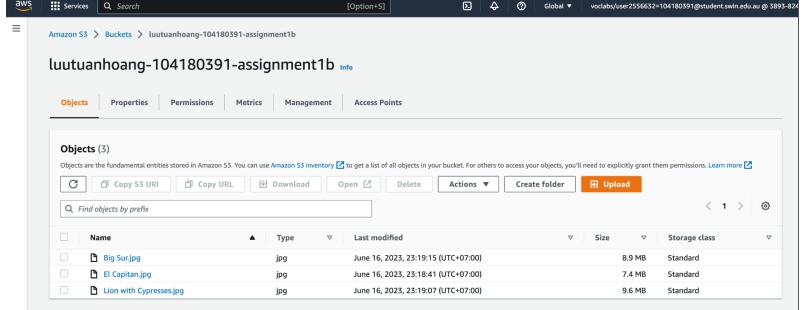
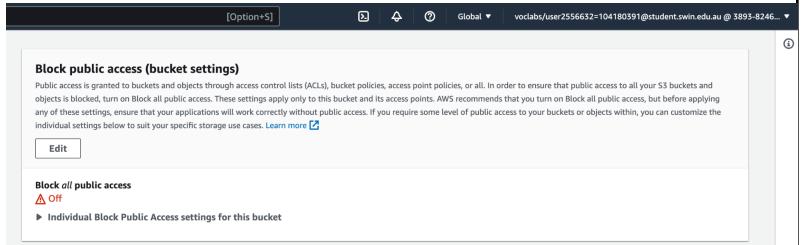
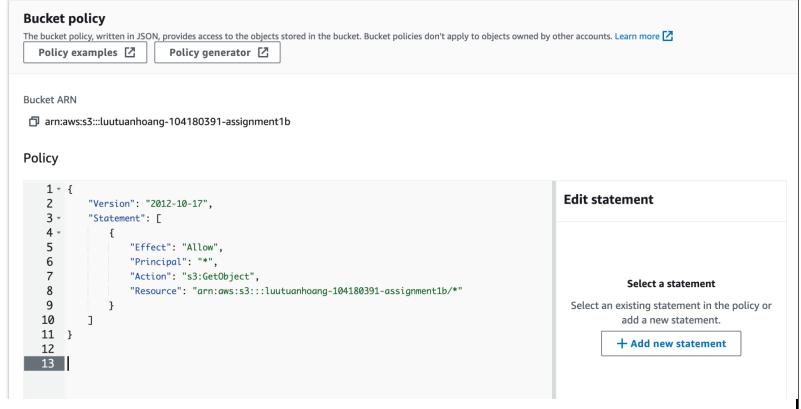
Step	Description	Screenshot									
1	<p>Create a new subnet group named DBSubnetGroup in LHoang VPC.</p> <p>Configuration:</p> <ul style="list-style-type: none"> - AZ: Choose us-east-1a and us-east-1b. - Subnets: Choose private subnets (CIDR 10.0.3.0/24 and 10.0.4.0/24). 	<p>The screenshot shows the AWS Subnet Group creation process across four panels:</p> <ul style="list-style-type: none"> Step 1: Subnet group details: Shows the name "DBSubnetGroup" and description "Private Subnet Group" fields. The VPC dropdown is set to "LHoangVPC-vpc (vpc-03d440295e1b22470)". Step 2: Add subnets: Shows the "Availability Zones" section with "us-east-1a" and "us-east-1b" selected. The "Subnets" section lists two subnets: "subnet-0ad24a00236fb75f1 (10.0.4.0/24)" and "subnet-0c6204e7a1b8c0c13 (10.0.3.0/24)". A note states: "For Multi-AZ DB clusters, you must select 3 subnets in 3 different Availability Zones.". Step 3: Subnets selected (2): Displays the selected subnets in a table: <table border="1"> <thead> <tr> <th>Availability zone</th> <th>Subnet ID</th> <th>CIDR block</th> </tr> </thead> <tbody> <tr> <td>us-east-1b</td> <td>subnet-0ad24a00236fb75f1</td> <td>10.0.4.0/24</td> </tr> <tr> <td>us-east-1a</td> <td>subnet-0c6204e7a1b8c0c13</td> <td>10.0.3.0/24</td> </tr> </tbody> </table> Step 4: Summary: Shows the final configuration and a "Create" button. 	Availability zone	Subnet ID	CIDR block	us-east-1b	subnet-0ad24a00236fb75f1	10.0.4.0/24	us-east-1a	subnet-0c6204e7a1b8c0c13	10.0.3.0/24
Availability zone	Subnet ID	CIDR block									
us-east-1b	subnet-0ad24a00236fb75f1	10.0.4.0/24									
us-east-1a	subnet-0c6204e7a1b8c0c13	10.0.3.0/24									

2

Connect the RDS instance with the created subnet group.

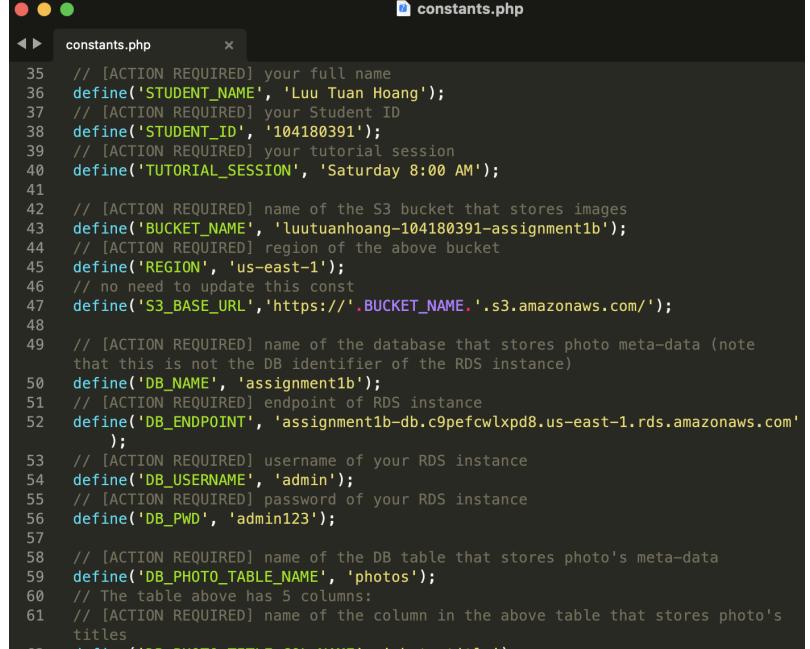
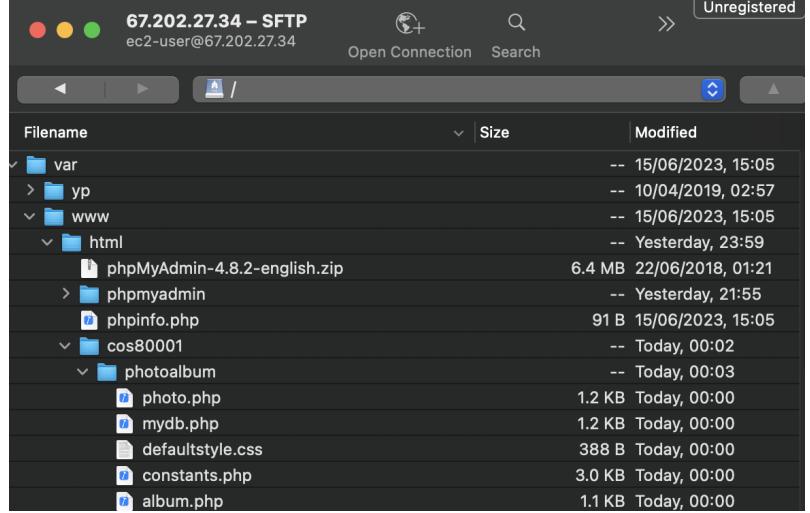


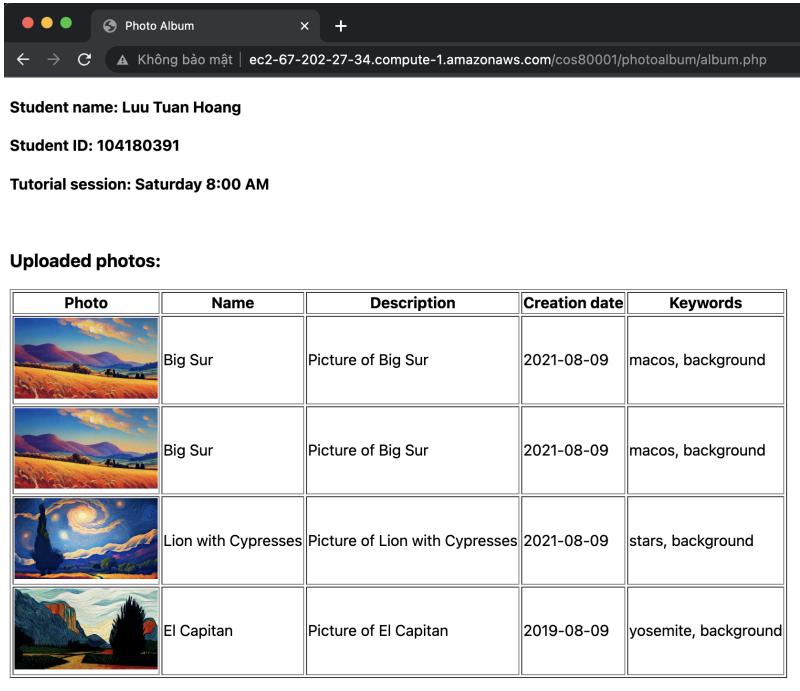
Marking scheme: S3 objects publicly accessible, using proper access policy

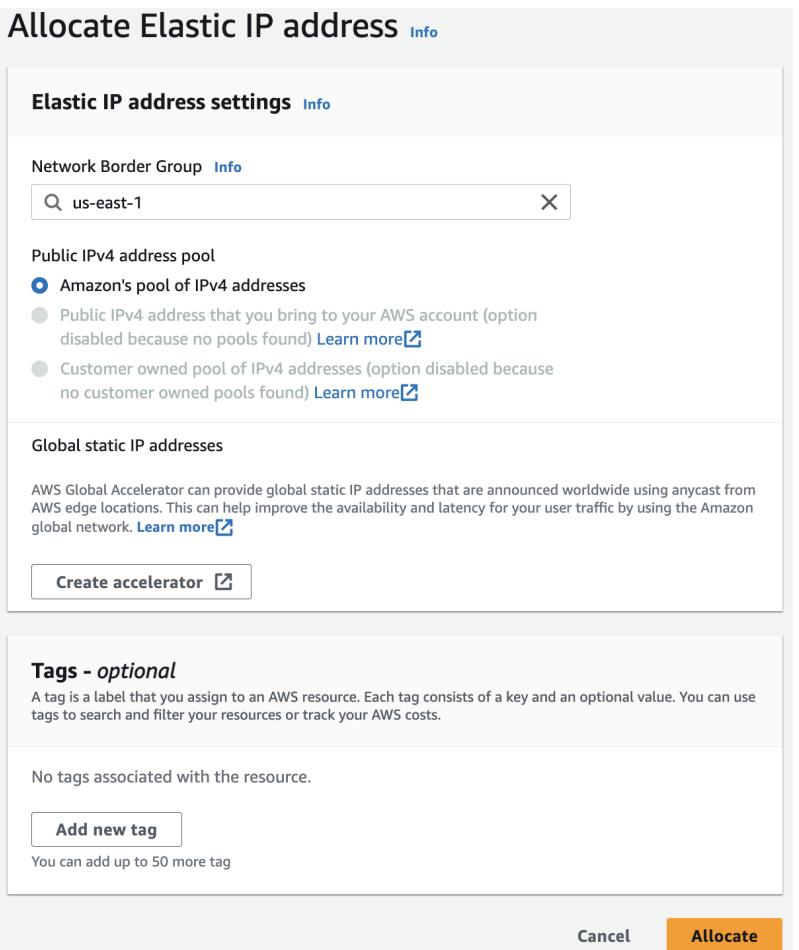
Step	Description	Screenshot
1	Create a new bucket named luutuanhoang-104180391-assignment1b Manually add photos into the bucket.	
2	Block all public access set to Off .	
3	The following policy is used to enable public access to all available objects in this S3 bucket.	 <pre> 1 - { 2 "Version": "2012-10-17", 3 "Statement": [4 { 5 "Effect": "Allow", 6 "Principal": "*", 7 "Action": "s3:GetObject", 8 "Resource": "arn:aws:s3:::luutuanhoang-104180391-assignment1b/*" 9 } 10] 11 } 12 13 </pre>

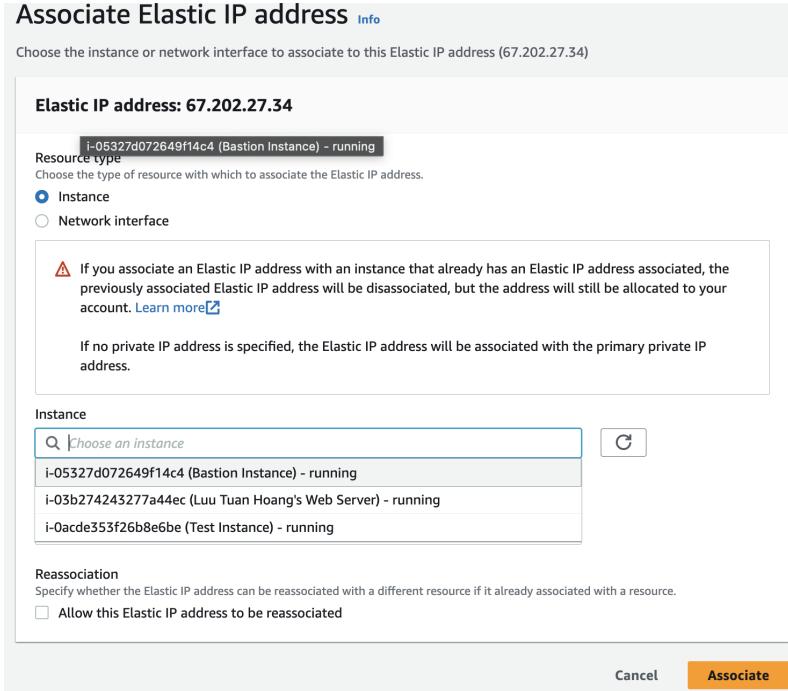
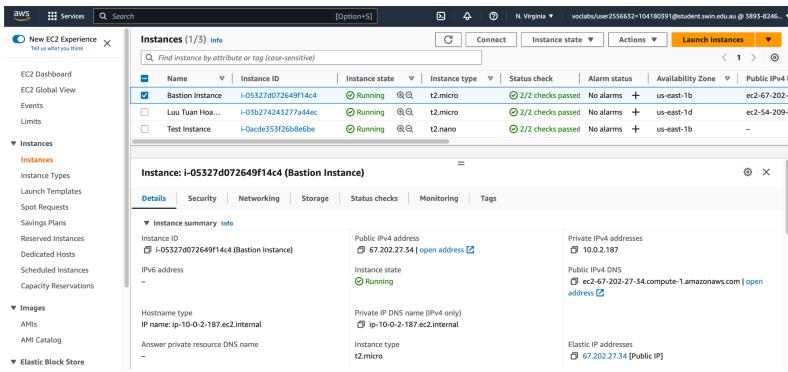
Functional Requirements

Marking scheme: album.php page displayed from EC2 Web server

Step	Description	Screenshot
1	Modify constants in constants.php .	
2	Transfer website source code to Bastion Instance . Directory: var/www/html/cos80001/photoalbum/ album.php	

3	album.php page successfully displayed from EC2 Web server (Bastion Instance).	 <p>Photo Album</p> <p>Student name: Luu Tuan Hoang Student ID: 104180391 Tutorial session: Saturday 8:00 AM</p> <p>Uploaded photos:</p> <table border="1"><thead><tr><th>Photo</th><th>Name</th><th>Description</th><th>Creation date</th><th>Keywords</th></tr></thead><tbody><tr><td></td><td>Big Sur</td><td>Picture of Big Sur</td><td>2021-08-09</td><td>macos, background</td></tr><tr><td></td><td>Big Sur</td><td>Picture of Big Sur</td><td>2021-08-09</td><td>macos, background</td></tr><tr><td></td><td>Lion with Cypress</td><td>Picture of Lion with Cypress</td><td>2021-08-09</td><td>stars, background</td></tr><tr><td></td><td>El Capitan</td><td>Picture of El Capitan</td><td>2019-08-09</td><td>yosemite, background</td></tr></tbody></table>	Photo	Name	Description	Creation date	Keywords		Big Sur	Picture of Big Sur	2021-08-09	macos, background		Big Sur	Picture of Big Sur	2021-08-09	macos, background		Lion with Cypress	Picture of Lion with Cypress	2021-08-09	stars, background		El Capitan	Picture of El Capitan	2019-08-09	yosemite, background
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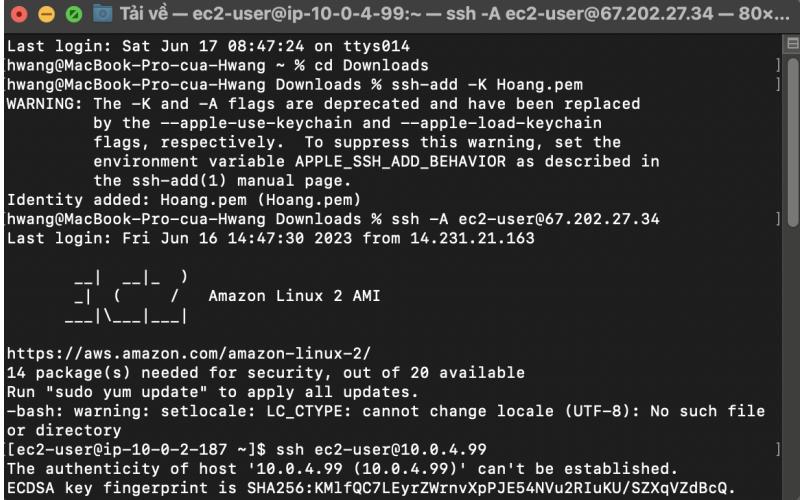
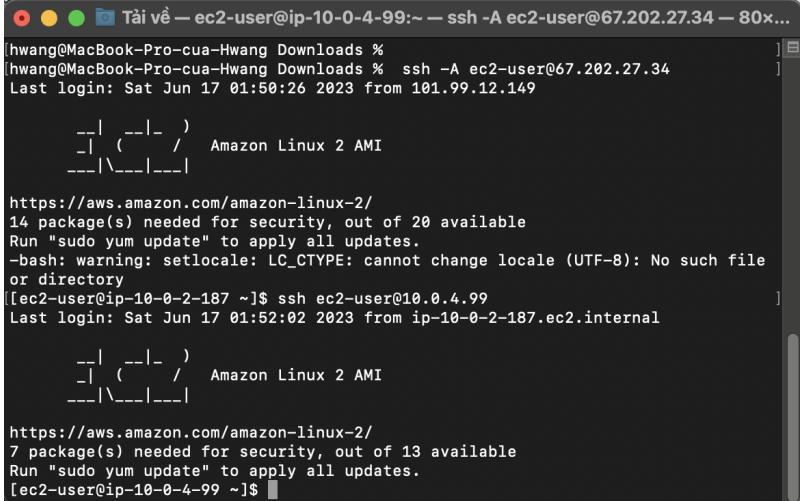
Marking scheme: Provided URL is persistent (Elastic IP Association)		
Step	Description	Screenshot
1	Allocate the new Elastic IP address from us-east-1 Network Border Group .	 <p>The screenshot shows the 'Allocate Elastic IP address' page. In the 'Network Border Group' search bar, 'us-east-1' is selected. Under 'Public IPv4 address pool', 'Amazon's pool of IPv4 addresses' is chosen. A 'Create accelerator' button is visible. The 'Tags - optional' section indicates no tags are associated with the resource, and an 'Add new tag' button is present. At the bottom right are 'Cancel' and 'Allocate' buttons.</p>

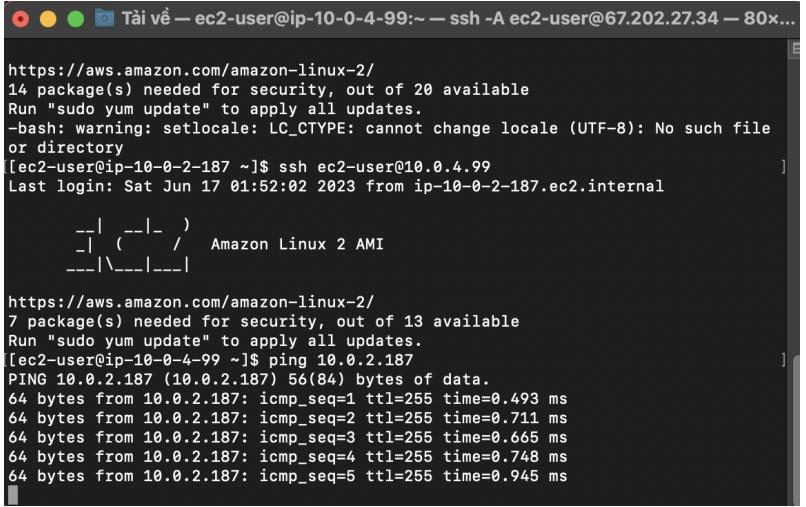
2	<p>Associated created Elastic IP address to the Bastion Instance.</p>	 <p>The dialog box shows the Elastic IP address 67.202.27.34 selected for association. It includes a note about disassociating the IP if it's already associated with another instance. Below the note is a dropdown menu for selecting the instance to associate with.</p>
3	<p>Bastion Instance associated with the Elastic IP address.</p> <p>Elastic IP address: 67.202.27.34</p> <p>Website URL: ec2-67-202-27-34.compute-1.amazonaws.com/cos80001/photoalbum/album.php</p>	 <p>The screenshot shows the AWS EC2 Instances page with two instances listed: 'Bastion Instance' (running, t2.micro, us-east-1b) and 'Test Instance' (running, t2.nano, us-east-1b). The Bastion Instance is selected. On the right, detailed information for the Bastion Instance is shown, including its Public IPv4 address (67.202.27.34), Public IP DNS (ec2-67-202-27-34.compute-1.amazonaws.com), and its private IP (10.0.2.187).</p>

Marking scheme: Photos loaded from S3 with matching metadata from RDS

Step	Description	Screenshot																														
1	Insert metadata into the database using SQL commands.	<pre> USE assignment1; INSERT INTO photos (photo, title, description, creation_date, keywords, a3_references) VALUES ('Big Sur', 'Picture of Big Sur', '2021-08-09', 'macos, background', 'https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/BigSur.jpg'); INSERT INTO photos (photo, title, description, creation_date, keywords, a3_references) VALUES ('Lion with Cypress', 'Picture of Lion with Cypress', '2021-08-09', 'stars, background', 'https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/LionWithCypress.jpg'); INSERT INTO photos (photo, title, description, creation_date, keywords, a3_references) VALUES ('El Capitan', 'Picture of El Capitan', '2019-08-09', 'yosemite, background', 'https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/ElCapitan.jpg'); </pre>																														
2	Data records in the database.	<p>Current selection does not contain a unique column. Grid edit, checkbox, Edit, Copy and Delete features are not available.</p> <p>Showing rows 0 - 3 (4 total). Query took 0.00016 seconds.</p> <table border="1"> <thead> <tr> <th>Photo</th> <th>Title</th> <th>Description</th> <th>Creation date</th> <th>Keywords</th> <th>a3 reference</th> </tr> </thead> <tbody> <tr> <td>Big Sur</td> <td>Picture of Big Sur</td> <td>2021-08-09</td> <td>macos, background</td> <td></td> <td>https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/BigSur.jpg</td> </tr> <tr> <td>Big Sur</td> <td>Picture of Big Sur</td> <td>2021-08-09</td> <td>macos, background</td> <td></td> <td>https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/BigSur.jpg</td> </tr> <tr> <td>Lion with Cypress</td> <td>Picture of Lion with Cypress</td> <td>2021-08-09</td> <td>stars, background</td> <td></td> <td>https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/LionWithCypress.jpg</td> </tr> <tr> <td>El Capitan</td> <td>Picture of El Capitan</td> <td>2019-08-09</td> <td>yosemite, background</td> <td></td> <td>https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/ElCapitan.jpg</td> </tr> </tbody> </table>	Photo	Title	Description	Creation date	Keywords	a3 reference	Big Sur	Picture of Big Sur	2021-08-09	macos, background		https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/BigSur.jpg	Big Sur	Picture of Big Sur	2021-08-09	macos, background		https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/BigSur.jpg	Lion with Cypress	Picture of Lion with Cypress	2021-08-09	stars, background		https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/LionWithCypress.jpg	El Capitan	Picture of El Capitan	2019-08-09	yosemite, background		https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/ElCapitan.jpg
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El Capitan	Picture of El Capitan	2019-08-09	yosemite, background		https://luthuanhoang-104180391-assignment1.s3.amazonaws.com/ElCapitan.jpg																											
3	The website is able to list all the photos (stored in the S3 bucket) along with their meta-data (stored in the database).	<p>Student name: Luu Tuan Hoang Student ID: 104180391 Tutorial session: Saturday 8:00 AM</p> <p>Uploaded photos:</p> <table border="1"> <thead> <tr> <th>Photo</th> <th>Name</th> <th>Description</th> <th>Creation date</th> <th>Keywords</th> </tr> </thead> <tbody> <tr> <td></td> <td>Big Sur</td> <td>Picture of Big Sur</td> <td>2021-08-09</td> <td>macos, background</td> </tr> <tr> <td></td> <td>Big Sur</td> <td>Picture of Big Sur</td> <td>2021-08-09</td> <td>macos, background</td> </tr> <tr> <td></td> <td>Lion with Cypress</td> <td>Picture of Lion with Cypress</td> <td>2021-08-09</td> <td>stars, background</td> </tr> <tr> <td></td> <td>El Capitan</td> <td>Picture of El Capitan</td> <td>2019-08-09</td> <td>yosemite, background</td> </tr> </tbody> </table>	Photo	Name	Description	Creation date	Keywords		Big Sur	Picture of Big Sur	2021-08-09	macos, background		Big Sur	Picture of Big Sur	2021-08-09	macos, background		Lion with Cypress	Picture of Lion with Cypress	2021-08-09	stars, background		El Capitan	Picture of El Capitan	2019-08-09	yosemite, background					
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Marking scheme: Web server instance reachable from Test instance via ICMP

Step	Description	Screenshot
1	SSH to Bastion Instance.	 <pre> Tài về — ec2-user@ip-10-0-4-99:~ — ssh -A ec2-user@67.202.27.34 — 80x... Last login: Sat Jun 17 08:47:24 on ttys014 hwang@MacBook-Pro-cua-Hwang ~ % cd Downloads hwang@MacBook-Pro-cua-Hwang Downloads % ssh-add -K Hoang.pem WARNING: The -K and -A flags are deprecated and have been replaced by the --apple-use-keychain and --apple-load-keychain flags, respectively. To suppress this warning, set the environment variable APPLE_SSH_ADD_BEHAVIOR as described in the ssh-add(1) manual page. Identity added: Hoang.pem (Hoang.pem) hwang@MacBook-Pro-cua-Hwang Downloads % ssh -A ec2-user@67.202.27.34 Last login: Fri Jun 16 14:47:30 2023 from 14.231.21.163 -- _-- _ _ (_ / Amazon Linux 2 AMI --- \--- _ https://aws.amazon.com/amazon-linux-2/ 14 package(s) needed for security, out of 20 available Run "sudo yum update" to apply all updates. -bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): No such file or directory [ec2-user@ip-10-0-2-187 ~]\$ ssh ec2-user@10.0.4.99 The authenticity of host '10.0.4.99 (10.0.4.99)' can't be established. ECDSA key fingerprint is SHA256:KMLfQC7LEyrZWrnvXpPJE54NVu2RIuKU/SZXqVzdBcQ. </pre>
2	SSH from Bastion Instance to Test Instance.	 <pre> Tài về — ec2-user@ip-10-0-4-99:~ — ssh -A ec2-user@67.202.27.34 — 80x... hwang@MacBook-Pro-cua-Hwang Downloads % hwang@MacBook-Pro-cua-Hwang Downloads % ssh -A ec2-user@67.202.27.34 Last login: Sat Jun 17 01:50:26 2023 from 101.99.12.149 -- _-- _ _ (_ / Amazon Linux 2 AMI --- \--- _ https://aws.amazon.com/amazon-linux-2/ 14 package(s) needed for security, out of 20 available Run "sudo yum update" to apply all updates. -bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): No such file or directory [ec2-user@ip-10-0-2-187 ~]\$ ssh ec2-user@10.0.4.99 Last login: Sat Jun 17 01:52:02 2023 from ip-10-0-2-187.ec2.internal -- _-- _ _ (_ / Amazon Linux 2 AMI --- \--- _ https://aws.amazon.com/amazon-linux-2/ 7 package(s) needed for security, out of 13 available Run "sudo yum update" to apply all updates. [ec2-user@ip-10-0-4-99 ~]\$ </pre>

3	Successfully ping the Bastion Instance from the Test instance.	 <p>The screenshot shows a terminal window with the title "Tải về — ec2-user@ip-10-0-4-99:~ — ssh -A ec2-user@67.202.27.34 — 80x...". The terminal displays the following text:</p> <pre>https://aws.amazon.com/amazon-linux-2/ 14 package(s) needed for security, out of 20 available Run "sudo yum update" to apply all updates. -bash: warning: setlocale: LC_CTYPE: cannot change locale (UTF-8): No such file or directory [ec2-user@ip-10-0-2-187 ~]\$ ssh ec2-user@10.0.4.99 Last login: Sat Jun 17 01:52:02 2023 from ip-10-0-2-187.ec2.internal -- -- _ _ (_ / Amazon Linux 2 AMI --- _-- _-- </pre> <p>https://aws.amazon.com/amazon-linux-2/ 7 package(s) needed for security, out of 13 available Run "sudo yum update" to apply all updates. [ec2-user@ip-10-0-4-99 ~]\$ ping 10.0.2.187 PING 10.0.2.187 (10.0.2.187) 56(84) bytes of data. 64 bytes from 10.0.2.187: icmp_seq=1 ttl=255 time=0.493 ms 64 bytes from 10.0.2.187: icmp_seq=2 ttl=255 time=0.711 ms 64 bytes from 10.0.2.187: icmp_seq=3 ttl=255 time=0.665 ms 64 bytes from 10.0.2.187: icmp_seq=4 ttl=255 time=0.748 ms 64 bytes from 10.0.2.187: icmp_seq=5 ttl=255 time=0.945 ms</p>
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