

COS20019 Cloud Computing Architecture

Assignment 1b - Semester 2, 2023

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Class: Wednesday 6:30PM

Creating and deploying Photo Album website onto a simple AWS infrastructure

I. Abstract

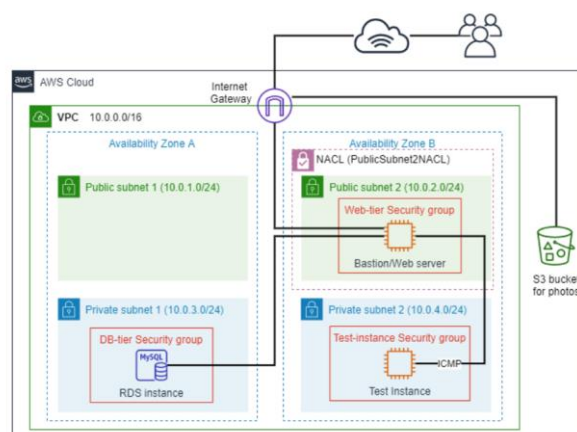
Cloud computing a method of delivering infrastructure of computing resources. For instance, Amazon Web Services (AWS) provides servers, remote computing, security, storages, ... services. However, it requires several basic knowledge and managing skill of AWS infrastructure. Therefore, this report demonstrates the method of creating and deploying a website onto a simple AWS infrastructure.

II. Introduction

Assignment 1b is based on the previous one, which is assignment 1a. However, this assignment is more complex with the implementation of managing Virtual Private Cloud (VPC) with subnets, routing table security group, deploying Web Server Instance with an additional layer of security (Network ACL) and enable users to view the display photos using meta-data in S3 Bucket.

III. Report

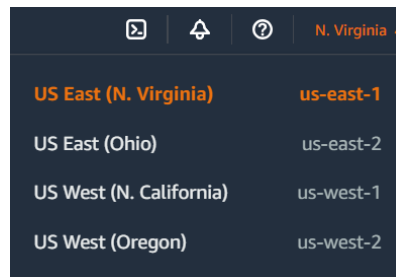
The infrastructure of this report illustrates by this diagram.

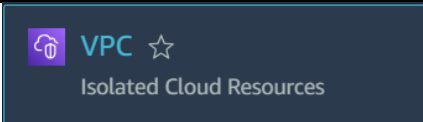
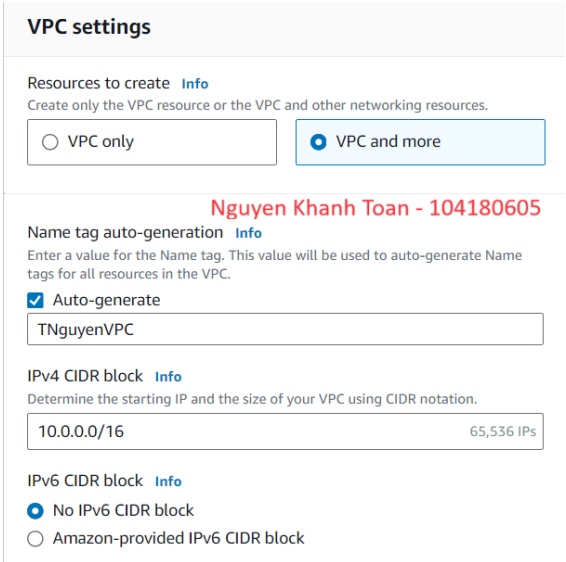
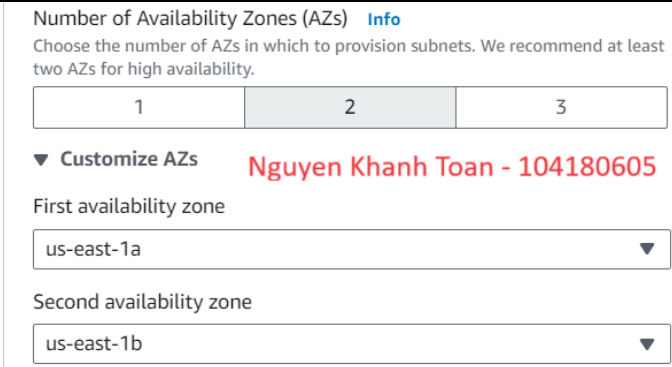


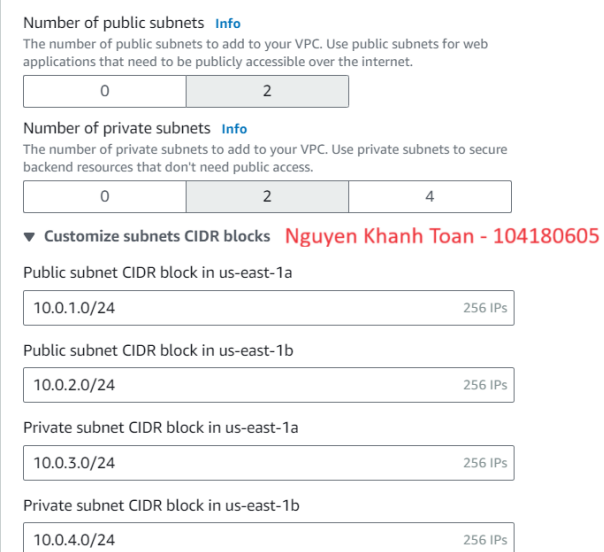
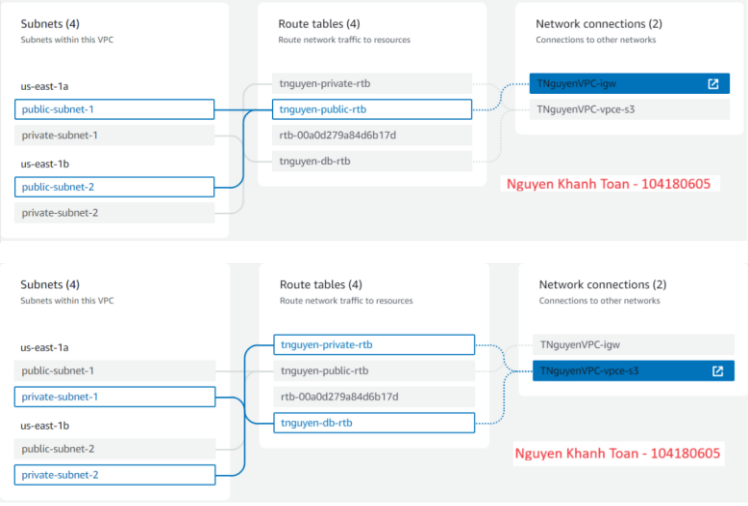
The URL of the album.php page:

<http://ec2-3-232-68-97.compute-1.amazonaws.com/cos20019/photoalbum/album.php>

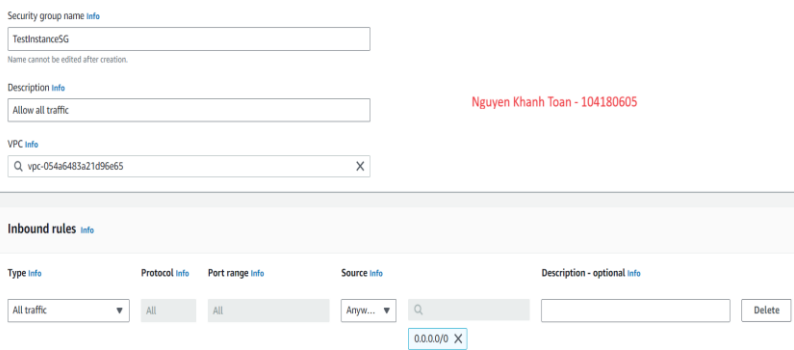
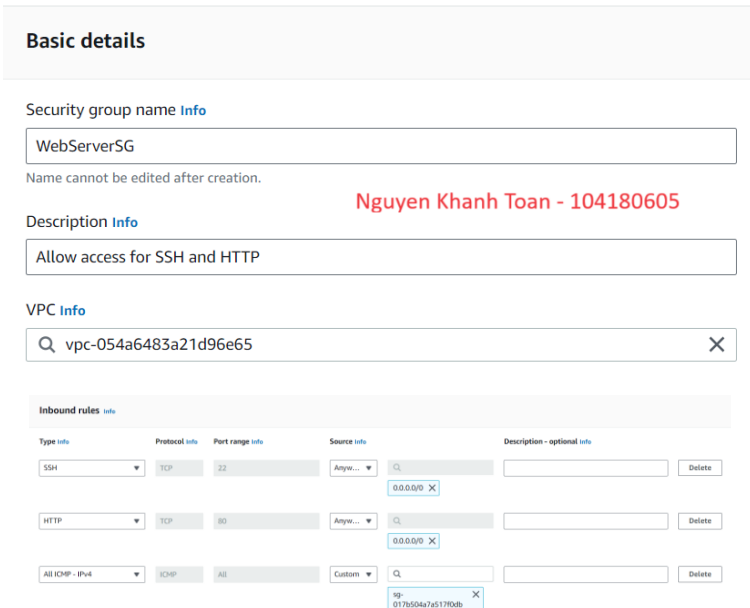
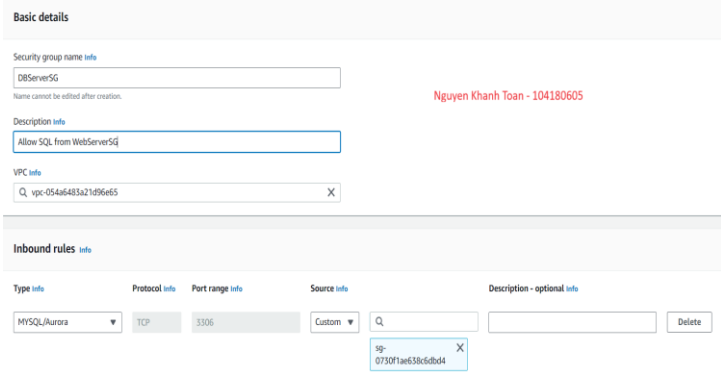
*All the infrastructure operates in region “us-east-1”.



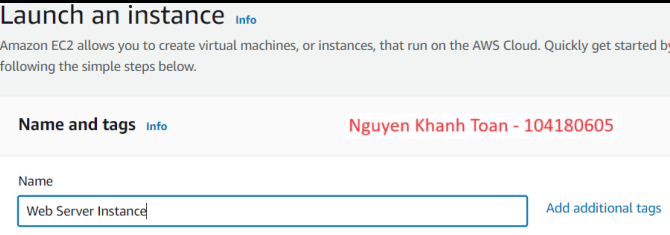
VPC with 2 public and 2 private subnets		
Step	Description	Screenshot
1	Choose VPC in the list of services.	
2	Create VPC named “TNguyenVPC” with IPv4 CIDR as 10.0.0.0/16.	 <p>VPC settings</p> <p>Resources to create Info Create only the VPC resource or the VPC and other networking resources. <input type="radio"/> VPC only <input checked="" type="radio"/> VPC and more</p> <p>Nguyen Khanh Toan - 104180605</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. <input checked="" type="checkbox"/> Auto-generate TNguyenVPC</p> <p>IPv4 CIDR block Info Determine the starting IP and the size of your VPC using CIDR notation. 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>
3	Number of AZs set to 2 with us-east-1a and us-east-1b	 <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> <p>1 2 3</p> <p>▼ Customize AZs Nguyen Khanh Toan - 104180605</p> <p>First availability zone us-east-1a ▼</p> <p>Second availability zone us-east-1b ▼</p>

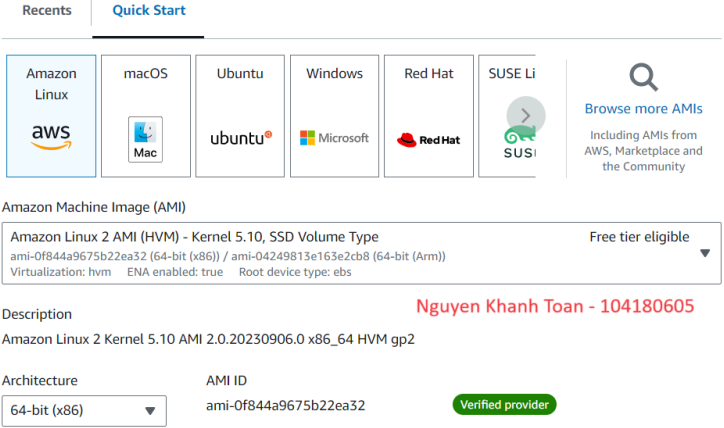
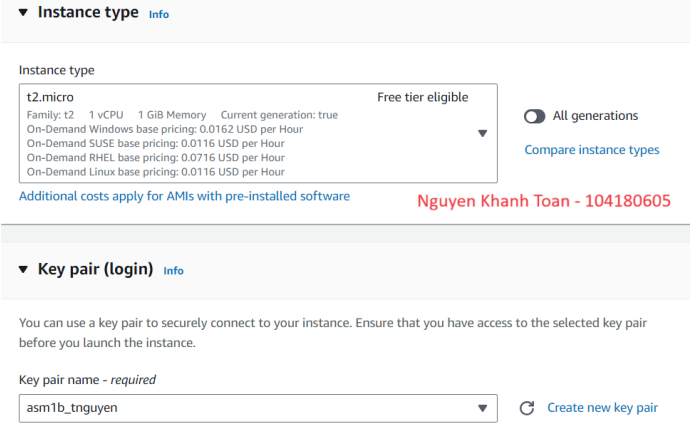
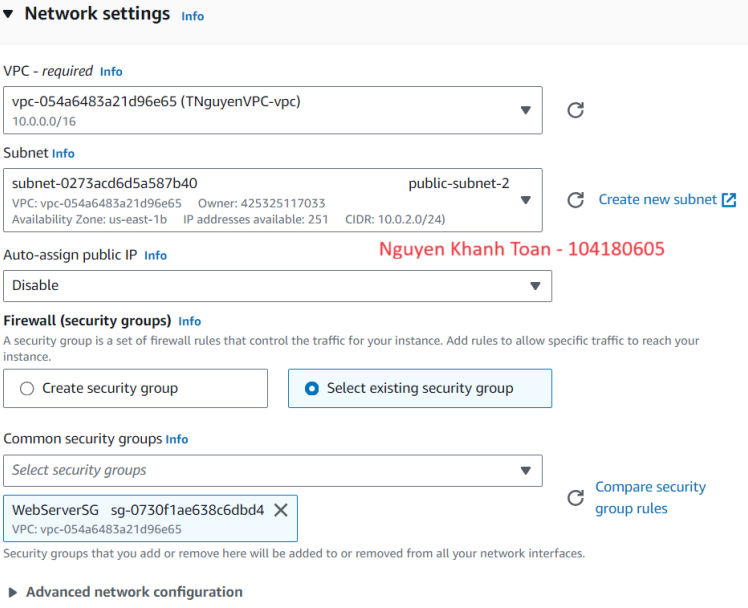
Correct Public and Private Routing tables with correct subnet associations		
Step	Description	Screenshot
1	<p>Create 4 subnet and associate it as following.</p> <ul style="list-style-type: none"> -public-subnet-1: 10.0.1.0/24 AZ: us-east-1a -public-subnet-2: 10.0.2.0/24 AZ: us-east-1b -public-subnet-1: 10.0.3.0/24 AZ: us-east-1a -public-subnet-2: 10.0.4.0/24 AZ: us-east-1b 	 <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> <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> <p>▼ Customize subnets CIDR blocks Nguyen Khanh Toan - 104180605</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	<p>Create route table for VPC “TNguyenVPC”</p> <ul style="list-style-type: none"> -tnguyen-public-rtb -tnguyen-private-rtb -tnguyen-db-rtb <p>Associate the subnet to the right route table.</p> <ul style="list-style-type: none"> - public-subnet-2 => tnguyen-public-rtb - private-subnet-2 => tnguyen-private-rtb - private-subnet-1 => tnguyen-db-rtb - private-subnet-1 => tnguyen-db-rtb 	 <p>Subnets (4) Subnets within this VPC</p> <p>Route tables (4) Route network traffic to resources</p> <p>Network connections (2) Connections to other networks</p> <p>us-east-1a public-subnet-1 private-subnet-1 us-east-1b public-subnet-2 private-subnet-2</p> <p>tnguyen-private-rtb tnguyen-public-rtb rtb-00a0d279a84d6b17d tnguyen-db-rtb</p> <p>TNguyenVPC-igw TNguyenVPC-vpc-s3</p> <p>Nguyen Khanh Toan - 104180605</p>



Security groups properly configured and attached.

Step	Description	Screenshot
1	Create Test Instance Security Group with inbound settings to allow all traffic and	
2	Create Web Server Security Group with inbound settings to allow HTTP, SSH and ICMP from Test Instance.	
3	Create Database Server Security Group with inbound settings to allow MySQL from Web Server	

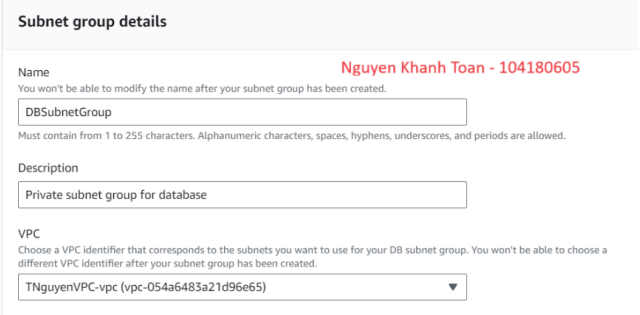
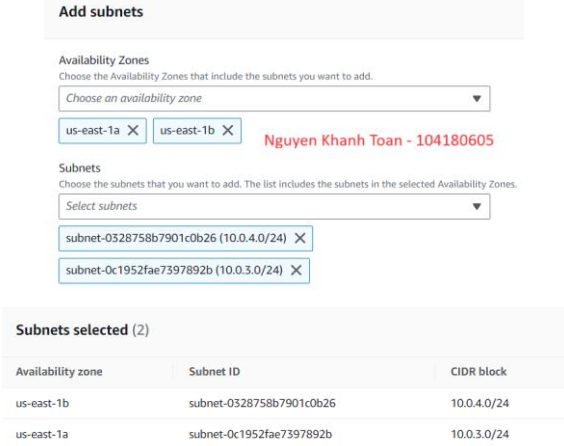
Network ACL properly configured and attached																																																										
Step	Description	Screenshot																																																								
1	Create new Network ACL with name “PublicSubnet2NACL” for “TNguyenVPC”	 <p>Network ACL settings</p> <p>Name - <i>optional</i> 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-0b99c24b3afd4da4d (TNguyenVPC)</p>																																																								
2	Inbound rules configuration for “PublicSubnet2NACL”	 <p>Edit inbound rules info</p> <p>Inbound rules control the incoming traffic that's allowed to reach the VPC.</p> <p>Nguyen Khanh Toan - 104180605</p> <table><thead><tr><th>Rule number</th><th>Type</th><th>Protocol</th><th>Port range</th><th>Source</th><th>Allow/Deny</th><th>Remove</th></tr></thead><tbody><tr><td>1</td><td>SSH (22)</td><td>TCP (6)</td><td>22</td><td>0.0.0.0/0</td><td>Allow</td><td>Remove</td></tr><tr><td>2</td><td>HTTP (80)</td><td>TCP (6)</td><td>80</td><td>0.0.0.0/0</td><td>Allow</td><td>Remove</td></tr><tr><td>3</td><td>HTTPS (443)</td><td>TCP (6)</td><td>443</td><td>0.0.0.0/0</td><td>Allow</td><td>Remove</td></tr><tr><td>4</td><td>All TCP</td><td>TCP (6)</td><td>All</td><td>10.0.3.0/24</td><td>Allow</td><td>Remove</td></tr><tr><td>5</td><td>All TCP</td><td>TCP (6)</td><td>All</td><td>10.0.4.0/24</td><td>Allow</td><td>Remove</td></tr><tr><td>6</td><td>All ICMP - IPv4</td><td>ICMP (1)</td><td>All</td><td>10.0.4.0/24</td><td>Allow</td><td>Remove</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><td>Remove</td></tr></tbody></table>	Rule number	Type	Protocol	Port range	Source	Allow/Deny	Remove	1	SSH (22)	TCP (6)	22	0.0.0.0/0	Allow	Remove	2	HTTP (80)	TCP (6)	80	0.0.0.0/0	Allow	Remove	3	HTTPS (443)	TCP (6)	443	0.0.0.0/0	Allow	Remove	4	All TCP	TCP (6)	All	10.0.3.0/24	Allow	Remove	5	All TCP	TCP (6)	All	10.0.4.0/24	Allow	Remove	6	All ICMP - IPv4	ICMP (1)	All	10.0.4.0/24	Allow	Remove	*	All traffic	All	All	0.0.0.0/0	Deny	Remove
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4	All TCP	TCP (6)	All	10.0.3.0/24	Allow	Remove																																																				
5	All TCP	TCP (6)	All	10.0.4.0/24	Allow	Remove																																																				
6	All ICMP - IPv4	ICMP (1)	All	10.0.4.0/24	Allow	Remove																																																				
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3	Outbound rules configuration for “PublicSubnet2NACL”	 <p>Edit outbound rules info</p> <p>Outbound rules control the outgoing traffic that's allowed to leave the VPC.</p> <p>Nguyen Khanh Toan - 104180605</p> <table><thead><tr><th>Rule number</th><th>Type</th><th>Protocol</th><th>Port range</th><th>Destination</th><th>Allow/Deny</th><th>Remove</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><td>Remove</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><td>Remove</td></tr></tbody></table> <p>Add new rule Sort by rule number</p>	Rule number	Type	Protocol	Port range	Destination	Allow/Deny	Remove	1	All traffic	All	All	0.0.0.0/0	Allow	Remove	*	All traffic	All	All	0.0.0.0/0	Deny	Remove																																			
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*	All traffic	All	All	0.0.0.0/0	Deny	Remove																																																				
4	Associate with “public-subnet-2”	 <p>Edit subnet associations info</p> <p>Change which subnets are associated with this network ACL.</p> <p>Nguyen Khanh Toan - 104180605</p> <p>Available subnets (1/4)</p> <p>Filter subnet associations</p> <table><thead><tr><th><input checked="" type="checkbox"/></th><th>Name</th><th>Subnet ID</th><th>Associated with</th><th>Availability Zone</th><th>IPv4 CIDR</th><th>IPv6 CIDR</th></tr></thead><tbody><tr><td><input checked="" type="checkbox"/></td><td>public-subnet-2</td><td>subnet-0273ac06d5a587b49</td><td>ac3-dx1a4d76137043c43</td><td>us-east-1b</td><td>10.0.2.0/24</td><td>--</td></tr><tr><td><input type="checkbox"/></td><td>private-subnet-1</td><td>subnet-0c19521ae7397892b</td><td>ac3-dx1a4d76137043c43</td><td>us-east-1a</td><td>10.0.3.0/24</td><td>--</td></tr><tr><td><input type="checkbox"/></td><td>public-subnet-1</td><td>subnet-015abaf4f890868bd</td><td>ac3-dx1a4d76137043c43</td><td>us-east-1a</td><td>10.0.1.0/24</td><td>--</td></tr><tr><td><input type="checkbox"/></td><td>private-subnet-2</td><td>subnet-032875db7901c8b26</td><td>ac3-dx1a4d76137043c43</td><td>us-east-1b</td><td>10.0.4.0/24</td><td>--</td></tr></tbody></table>	<input checked="" type="checkbox"/>	Name	Subnet ID	Associated with	Availability Zone	IPv4 CIDR	IPv6 CIDR	<input checked="" type="checkbox"/>	public-subnet-2	subnet-0273ac06d5a587b49	ac3-dx1a4d76137043c43	us-east-1b	10.0.2.0/24	--	<input type="checkbox"/>	private-subnet-1	subnet-0c19521ae7397892b	ac3-dx1a4d76137043c43	us-east-1a	10.0.3.0/24	--	<input type="checkbox"/>	public-subnet-1	subnet-015abaf4f890868bd	ac3-dx1a4d76137043c43	us-east-1a	10.0.1.0/24	--	<input type="checkbox"/>	private-subnet-2	subnet-032875db7901c8b26	ac3-dx1a4d76137043c43	us-east-1b	10.0.4.0/24	--																					
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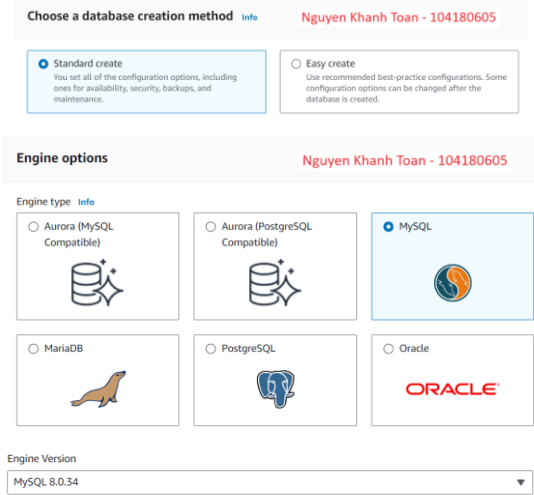
Correct Web server and Test instances running in correct subnets		
Step	Description	Screenshot
1	Create instance named “Web Server Instance”	 <p>Launch an instance</p> <p>Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.</p> <p>Name and tags</p> <p>Nguyen Khanh Toan - 104180605</p> <p>Name</p> <p>Web Server Instance</p> <p>Add additional tags</p>

2	<p>Choose “Amazon Linux 2 AMI” for Application and OS Images.</p>	 <p>Recents Quick Start</p> <p>Amazon Linux macOS Ubuntu Windows Red Hat SUSE Linux</p> <p>Amazon Machine Image (AMI)</p> <p>Amazon Linux 2 AMI (HVM) - Kernel 5.10, SSD Volume Type ami-0f844a9675b22ea32 (64-bit (x86)) / ami-04249813e163e2cb8 (64-bit (Arm)) Virtualization: hvm ENA enabled: true Root device type: ebs</p> <p>Description Amazon Linux 2 Kernel 5.10 AMI 2.0.20230906.0 x86_64 HVM gp2</p> <p>Architecture 64-bit (x86)</p> <p>AMI ID ami-0f844a9675b22ea32</p> <p>Free tier eligible</p> <p>Verified provider</p> <p>Nguyen Khanh Toan - 104180605</p>
3	<p>Choose “t2.micro” as a Instance type</p> <p>Create a keypair to access SSH through PuTTY named “asm1b-tnguyen”</p>	 <p>Instance type Info</p> <p>Instance type t2.micro Family: t2 1 vCPU 1 GiB Memory Current generation: true On-Demand Windows base pricing: 0.0162 USD per Hour On-Demand SUSE base pricing: 0.0116 USD per Hour On-Demand RHEL base pricing: 0.0716 USD per Hour On-Demand Linux base pricing: 0.0116 USD per Hour</p> <p>Free tier eligible</p> <p>All generations</p> <p>Compare instance types</p> <p>Additional costs apply for AMIs with pre-installed software</p> <p>Nguyen Khanh Toan - 104180605</p> <p>Key pair (login) Info</p> <p>You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.</p> <p>Key pair name - required asm1b_tnguyen</p> <p>Create new key pair</p>
4	<p>Configuration for Network settings to deploy instance on “TNguyenVPC” with “public-subnet-2” and “WebServerSG”.</p>	 <p>Network settings Info</p> <p>VPC - required Info vpc-054a6483a21d96e65 (TNguyenVPC-vpc) 10.0.0.0/16</p> <p>Subnet Info subnet-0273acd6d5a587b40 public-subnet-2 VPC: vpc-054a6483a21d96e65 Owner: 425325117033 Availability Zone: us-east-1b IP addresses available: 251 CIDR: 10.0.2.0/24</p> <p>Create new subnet</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>Create security group Select existing security group</p> <p>Common security groups Info Select security groups WebServerSG sg-0730f1ae638c6dbd4 VPC: vpc-054a6483a21d96e65</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> <p>Advanced network configuration</p> <p>Nguyen Khanh Toan - 104180605</p>

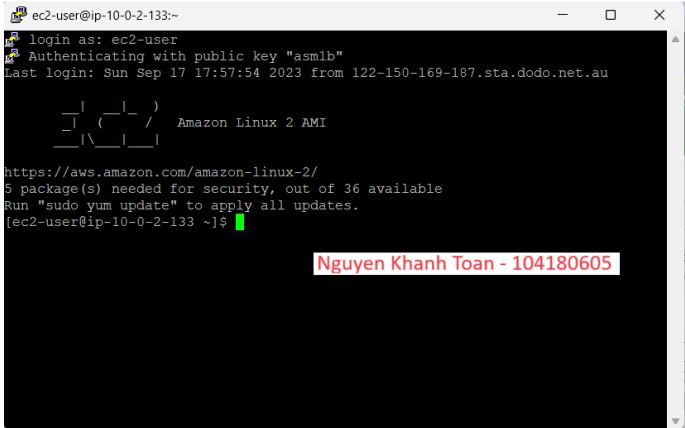
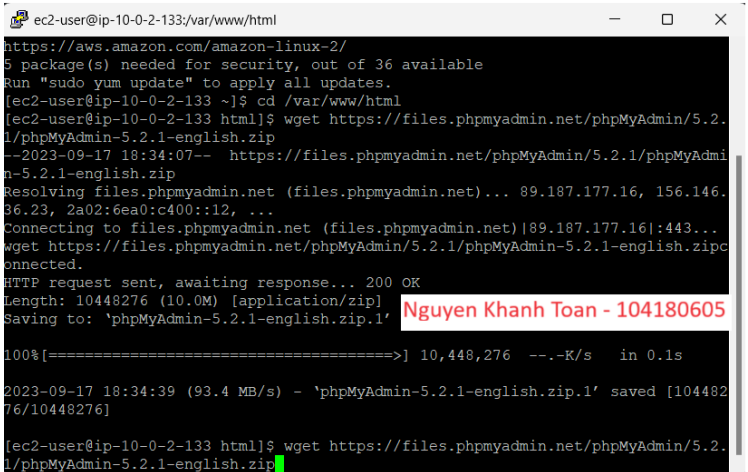
5	Upload script to install web server in user data.	<p>User data - <i>optional</i> Info</p> <p>Upload a file with your user data or enter it in the field.</p> <div>  Choose file </div> <pre>#!/bin/bash yum update -y amazon-linux-extras install -y lamp-mariadb10.2-php7.2 php7.2 service httpd start yum 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>
6	Create Elastic IP address and associate the IP with “Web Server Instance”	<p>Elastic IP address: 3.232.68.97</p> <p>Resource type Choose the type of resource with which to associate the Elastic IP address.</p> <p> <input checked="" type="radio"/> Instance Nguyen Khanh Toan - 104180605 </p> <p> <input type="radio"/> Network interface </p> <div>  If you associate an Elastic IP address with an instance that already has an Elastic IP address associated, the previously associated Elastic IP address will be disassociated, but the address will still be allocated to your account. Learn more </div> <p>If no private IP address is specified, the Elastic IP address will be associated with the primary private IP address.</p> <p>Instance</p> <div> <input type="text" value="i-0d9918ae753e7749d"/> × ↺ </div> <p>Private IP address The private IP address with which to associate the Elastic IP address.</p> <div> <input type="text" value="Choose a private IP address"/> </div> <p>Reassociation Specify whether the Elastic IP address can be reassociated with a different resource if it already associated with a resource.</p> <p> <input type="checkbox"/> Allow this Elastic IP address to be reassociated </p> <div> Cancel Associate </div>
7	Create instance named “Test Instance”	<p>Launch an instance Info</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 Info Nguyen Khanh Toan - 104180605</p> <p>Name</p> <div> <input type="text" value="Test Instance"/> Add additional tags </div>

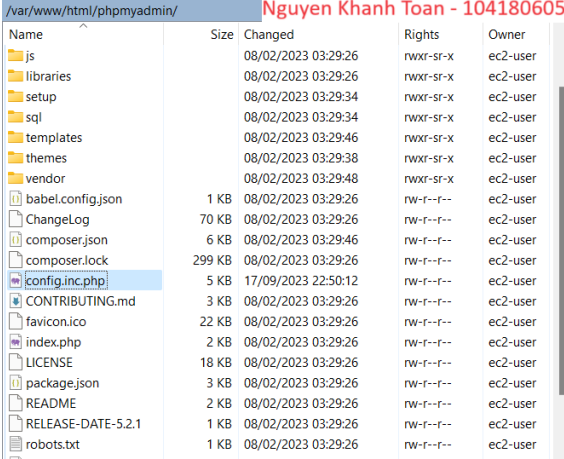
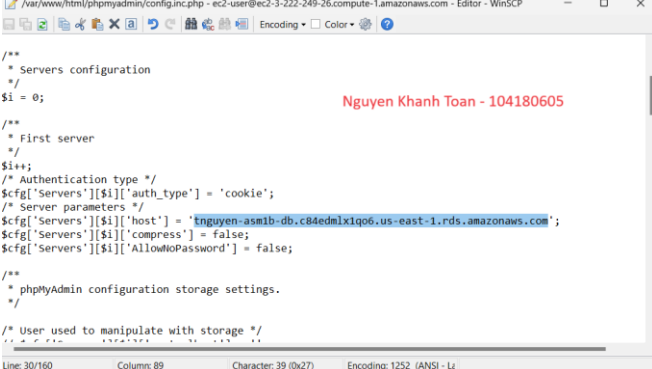

8	Choose “Amazon Linux 2 AMI” for Application and OS Images.	<div> <div> <div>Recents</div> <div>Quick Start</div> </div> <div> <div> <div>Amazon Linux</div> <div>aws</div> </div> <div> <div>macOS</div> <div>Mac</div> </div> <div> <div>Ubuntu</div> <div>ubuntu</div> </div> <div> <div>Windows</div> <div>Microsoft</div> </div> <div> <div>Red Hat</div> <div>Red Hat</div> </div> <div> <div>SUSE Li</div> <div>SUSE</div> </div> <div> <div>Browse more AMIs</div> <div>Including AMIs from AWS, Marketplace and the Community</div> </div> </div> <div> <div>Amazon Machine Image (AMI)</div> <div> <div>Amazon Linux 2 AMI (HVM) - Kernel 5.10, SSD Volume Type</div> <div>Free tier eligible</div> </div> <div> <div>ami-0f844a9675b22ea32 (64-bit (x86)) / ami-04249813e163e2cb8 (64-bit (Arm))</div> <div>Virtualization: hvm ENA enabled: true Root device type: ebs</div> </div> </div> <div> <div>Description</div> <div>Amazon Linux 2 Kernel 5.10 AMI 2.0.20230906.0 x86_64 HVM gp2</div> </div> <div> <div>Architecture</div> <div>64-bit (x86)</div> </div> <div> <div>AMI ID</div> <div>ami-0f844a9675b22ea32</div> <div>Verified provider</div> </div> </div>
9	Choose “t2.micro” as a Instance type	<div> <div>▼ Instance type</div> <div>Info</div> </div> <div> <div>Instance type</div> <div> <div>t2.micro</div> <div>Free tier eligible</div> </div> <div> <div>Family: t2 1 vCPU 1 GiB Memory Current generation: true</div> <div>On-Demand Windows base pricing: 0.0162 USD per Hour</div> <div>On-Demand SUSE base pricing: 0.0116 USD per Hour</div> <div>On-Demand RHEL base pricing: 0.0716 USD per Hour</div> <div>On-Demand Linux base pricing: 0.0116 USD per Hour</div> </div> <div> <div>All generations</div> <div>Compare instance types</div> </div> </div> <div> <div>Additional costs apply for AMIs with pre-installed software</div> </div>

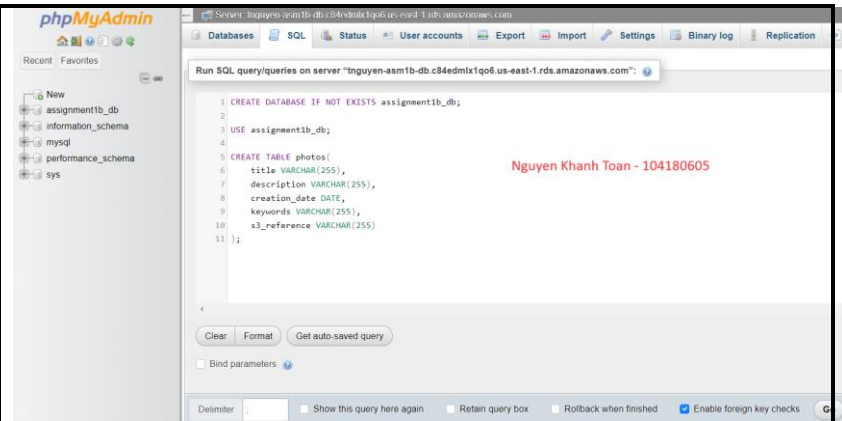
Database running in correct subnets											
Step	Description	Screenshot									
1	Create subnet group and name with “DBSubnetGroup” that use private subnet in “TNguyenVPC”	 <p>Subnet group details</p> <p>Name: DBSubnetGroup (You won't be able to modify the name after your subnet group has been created.)</p> <p>Description: Private subnet group for database</p> <p>VPC: TNguyenVPC-vpc (vpc-054a6483a21d96e65)</p>									
2	Add subnet from AZ: us-east-1a us-east-1b Subnet: private-subnet-2 10.0.4.0/24 private-subnet-1 10.0.3.0/24	 <p>Add subnets</p> <p>Availability Zones: us-east-1a, us-east-1b</p> <p>Subnets selected (2):</p> <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-0328758b7901c0b26</td> <td>10.0.4.0/24</td> </tr> <tr> <td>us-east-1a</td> <td>subnet-0c1952fae7397892b</td> <td>10.0.3.0/24</td> </tr> </tbody> </table>	Availability zone	Subnet ID	CIDR block	us-east-1b	subnet-0328758b7901c0b26	10.0.4.0/24	us-east-1a	subnet-0c1952fae7397892b	10.0.3.0/24
Availability zone	Subnet ID	CIDR block									
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us-east-1a	subnet-0c1952fae7397892b	10.0.3.0/24									

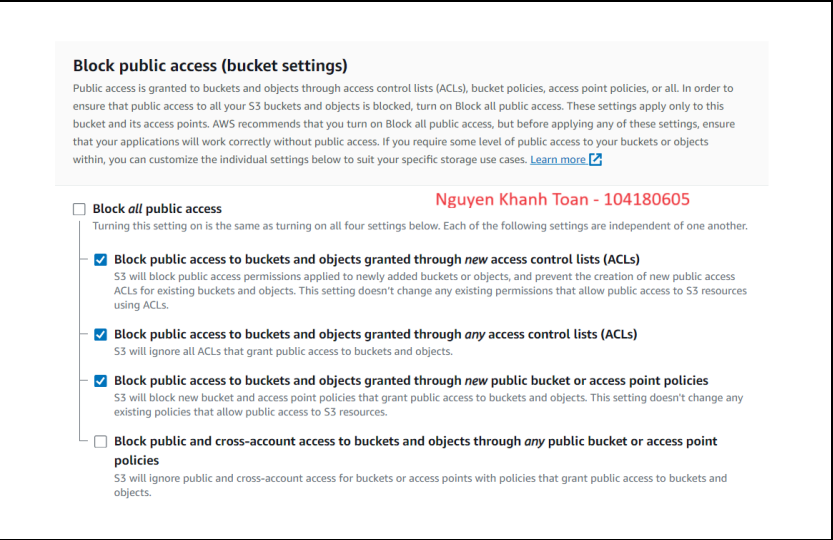
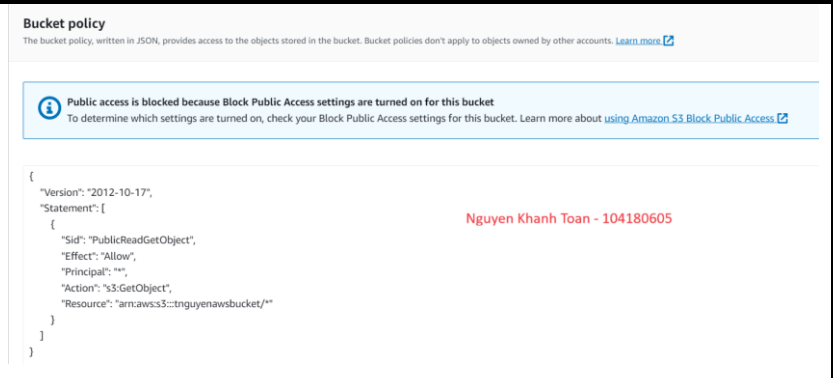
Database schema as specified		
Step	Description	Screenshot
1	Create new RDS with standard create and engine type MySQL version 8.0.34	 <p>Choose a database creation method</p> <p><input checked="" type="radio"/> Standard create (You set all of the configuration options, including ones for availability, 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: MySQL</p> <p>Engine Version: MySQL 8.0.34</p>

2	Use Free tier template	<div> <div> Templates Choose a sample template to meet your use case. </div> <div> <div> <input type="radio"/> Production Use defaults for high availability and fast, consistent performance. </div> <div> <input type="radio"/> Dev/Test This instance is intended for development use outside of a production environment. </div> <div> <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. Info </div> </div> </div>
3	Setting configuration: Assign name of DB instance with “tnguyen-asmlb-db”. Master username: admin Master password: 104180605 (My studentID)	<div> <div> Settings </div> <div> <div> 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. </div> <div> tnguyen-asmlb-db </div> <div> 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. </div> </div> <div> <div> ▼ Credentials Settings </div> <div> Master username Info Type a login ID for the master user of your DB instance. </div> <div> admin </div> <div> 1 to 16 alphanumeric characters. The first character must be a letter. </div> <div> Master password Info <div>*****</div> </div> <div> Constraints: At least 8 printable ASCII characters. Can't contain any of the following: / (slash), ' (single quote), " (double quote) and @ (at sign). </div> <div> Confirm master password Info <div>*****</div> </div> </div> </div>
4	Choose “TNguyenVPC” for this DB Instance	<div> <div> Connectivity Info </div> <div> <div> 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. </div> <div> <div> <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. </div> <div> <input type="radio"/> Connect to an EC2 compute resource Set up a connection to an EC2 compute resource for this database. </div> </div> <div> <div> 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. </div> <div> <div> <input checked="" type="radio"/> IPv4 Your resources can communicate only over the IPv4 addressing protocol. </div> <div> <input type="radio"/> Dual-stack mode Your resources can communicate over IPv4, IPv6, or both. </div> </div> <div> <div> Virtual private cloud (VPC) Info Choose the VPC. The VPC defines the virtual networking environment for this DB instance. </div> <div> TNguyenVPC-vpc (vpc-054a6483a21d96e65) 4 Subnets, 2 Availability Zones </div> <div> Only VPCs with a corresponding DB subnet group are listed. </div> </div> </div> </div></div>
5	Choose the “dbsubnetgroup” that create in DB subnet group. And public access set to “No”	<div> <div> 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. </div> <div> dbsubnetgroup 2 Subnets, 2 Availability Zones </div> <div> Public access Info <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. </div> <div> <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. </div> </div>

6	VPC Security group choose “DBServerSG” from AZ: us-east-1a	<p>VPC security group (firewall) Info</p> <p>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> <div> <input checked="" type="radio"/> Choose existing Choose existing VPC security groups </div> <div> <input type="radio"/> Create new Create new VPC security group </div> <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> <p>Nguyen Khanh Toan - 104180605</p>
7	Assign database name as “assignment1b_db”	<p>▼ Additional configuration</p> <p>Database options, encryption turned on, backup turned on, backtrack turned off, maintenance, CloudWatch Logs, delete protection turned off.</p> <p>Database options</p> <p>Initial database name Info</p> <p>assignment1b_db</p> <p>If you do not specify a database name, Amazon RDS does not create a database.</p> <p>Nguyen Khanh Toan - 104180605</p>
8	Connect to ec2 instance Linux through PuTTY as assignment1a.	 <p>Nguyen Khanh Toan - 104180605</p>
9	Install phpmyadmin	 <p>Nguyen Khanh Toan - 104180605</p>

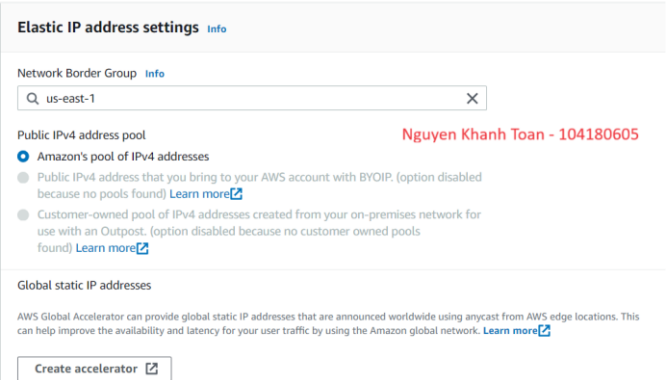
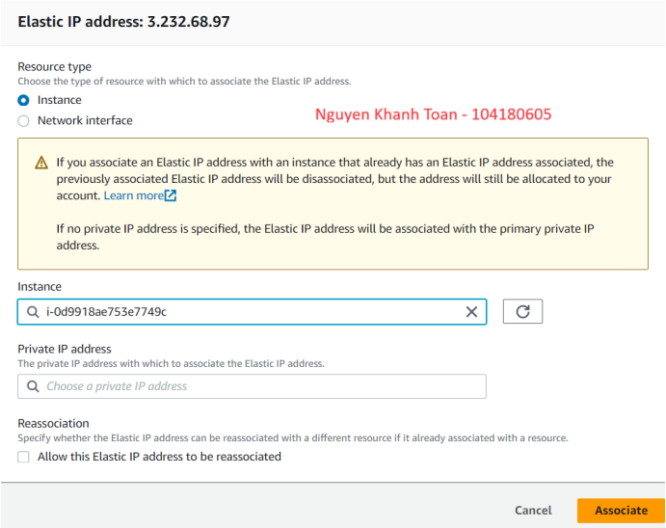
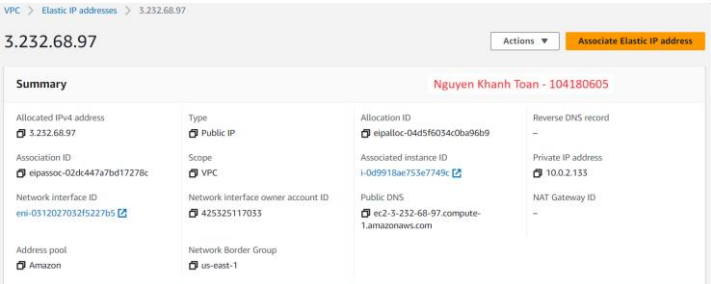
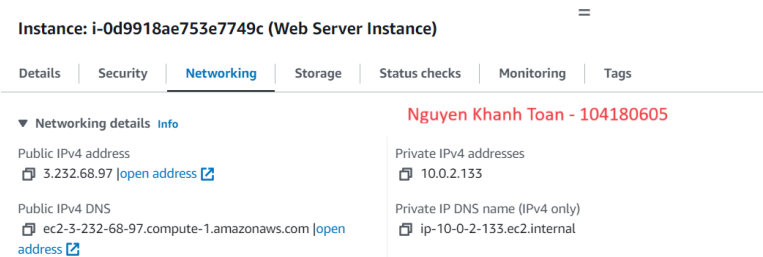
10	<p>After successfully installed phpMyAdmin, change the <i>config.sample.inc.php</i> to <i>config.inc.php</i></p>	 <p>Nguyen Khanh Toan - 104180605</p>
11	<p>Enter config.inc.php file</p> <p>Change the line</p> <p>To</p> <pre>\$cfg['Servers'][\$i]['host'] = 'localhost';</pre> <p>To</p> <pre>\$cfg['Servers'][\$i]['host'] = 'nguyen-asm1b-db.c84edmlx1qo6.us-east-1.rds.amazonaws.com';</pre>	 <p>Nguyen Khanh Toan - 104180605</p>
12	<p>Access phpMyAdmin on the browser by this link</p> <p>http://ec2-3-222-249-26.compute-1.amazonaws.com/phpmyadmin/</p> <p>And login with</p> <p>User: admin</p> <p>Password: 104180605</p>	 <p>Nguyen Khanh Toan - 104180605</p>

	Create table with following SQL queries.	 <p>The screenshot shows the phpMyAdmin interface. On the left, a sidebar lists databases: 'New', 'assignment1b_db', 'information_schema', 'mysql', 'performance_schema', and 'sys'. The main area displays SQL queries for creating a database and a table. The queries are:</p> <pre> 1 CREATE DATABASE IF NOT EXISTS assignment1b_db; 2 3 USE assignment1b_db; 4 5 CREATE TABLE photos(6 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 queries are buttons for 'Clear', 'Format', and 'Get auto-saved query'. At the bottom, there are checkboxes for 'Bind parameters', 'Show this query here again', 'Retain query box', 'Rollback when finished', and 'Enable foreign key checks'.</p>

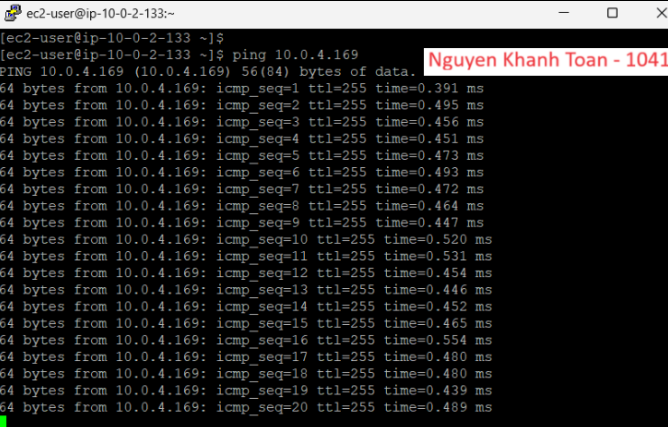
S3 objects publicly accessible, using proper access policy		
Step	Description	Screenshot
1	Uncheck	 <p>The screenshot shows the 'Block public access (bucket settings)' section in the AWS S3 console. It explains that public access is granted through ACLs, bucket policies, access point policies, or all. It recommends turning on 'Block all public access' to ensure public access is blocked. Below this, there are five settings, each with a checkbox and a description:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Block all public access Turning this setting on is the same as turning on all four settings below. Each of the following settings are independent of one another. <input checked="" type="checkbox"/> Block public access to buckets and objects granted through new access control lists (ACLs) S3 will block public access permissions applied to newly added buckets or objects, and prevent the creation of new public access ACLs for existing buckets and objects. This setting doesn't change any existing permissions that allow public access to S3 resources using ACLs. <input checked="" type="checkbox"/> Block public access to buckets and objects granted through any access control lists (ACLs) S3 will ignore all ACLs that grant public access to buckets and objects. <input checked="" type="checkbox"/> Block public access to buckets and objects granted through new public bucket or access point policies S3 will block new bucket and access point policies that grant public access to buckets and objects. This setting doesn't change any existing policies that allow public access to S3 resources. <input type="checkbox"/> Block public and cross-account access to buckets and objects through any public bucket or access point policies S3 will ignore public and cross-account access for buckets or access points with policies that grant public access to buckets and objects.
2		 <p>The screenshot shows the 'Bucket policy' section in the AWS S3 console. It explains that the bucket policy, written in JSON, provides access to the objects stored in the bucket. Below this, there is a blue box with an information icon and the text: 'Public access is blocked because Block Public Access settings are turned on for this bucket. To determine which settings are turned on, check your Block Public Access settings for this bucket. Learn more about using Amazon S3 Block Public Access.' Below this, there is a JSON policy snippet:</p> <pre> { "Version": "2012-10-17", "Statement": [{ "Sid": "PublicReadGetObject", "Effect": "Allow", "Principal": "*", "Action": "s3:GetObject", "Resource": "arn:aws:s3:::nguyenawsbucket/*" }] } </pre>

album.php page displayed from EC2 Web server		
Step	Description	Screenshot

1	Changing constants to match the bucket name, DB name, DB endpoint, DB username and password, and table column value name.	<pre>35 // [ACTION REQUIRED] your full name 36 define('STUDENT_NAME', 'Khanh Toan Nguyen'); 37 // [ACTION REQUIRED] your Student ID 38 define('STUDENT_ID', '104180605'); 39 // [ACTION REQUIRED] your tutorial session 40 define('TUTORIAL_SESSION', 'Wednesday 6:30PM'); 41 42 // [ACTION REQUIRED] name of the S3 bucket that stores images 43 define('BUCKET_NAME', 'tnguyenawsbucket'); 44 // [ACTION REQUIRED] region of the above bucket 45 define('REGION', 'us-east-1'); 46 // no need to update this const 47 define('S3_BASE_URL', 'https://'.BUCKET_NAME.'.s3.amazonaws.com/'); 48 49 // [ACTION REQUIRED] name of the database that stores photo meta-data (note that this is not the DB identifier of the RDS instance) 50 define('DB_NAME', 'assignment1b_db'); 51 // [ACTION REQUIRED] endpoint of RDS instance 52 define('DB_ENDPOINT', 'tnguyen-asm1b-db.c7hoadbtherr.us-east-1.rds.amazonaws.com'); 53 // [ACTION REQUIRED] username of your RDS instance 54 define('DB_USERNAME', 'admin'); 55 // [ACTION REQUIRED] password of your RDS instance 56 define('DB_PWD', '104180605'); 57 58 // [ACTION REQUIRED] name of the DB table that stores photo's meta-data 59 define('DB_PHOTO_TABLE_NAME', 'photos'); 60 // The table above has 5 columns: 61 // [ACTION REQUIRED] name of the column in the above table that stores photo's titles 62 define('DB_PHOTO_TITLE_COL_NAME', 'title'); 63 // [ACTION REQUIRED] name of the column in the above table that stores photo's descriptions 64 define('DB_PHOTO_DESCRIPTION_COL_NAME', 'description'); 65 // [ACTION REQUIRED] name of the column in the above table that stores photo's creation dates 66 define('DB_PHOTO_CREATIONDATE_COL_NAME', 'creation_date'); 67 // [ACTION REQUIRED] name of the column in the above table that stores photo's keywords 68 define('DB_PHOTO_KEYWORDS_COL_NAME', 'keywords'); 69 // [ACTION REQUIRED] name of the column in the above table that stores photo's links in S3 70 define('DB_PHOTO_S3REFERENCE_COL_NAME', 's3_reference');</pre>																				
2	Transfer all the web server code file to the EC2 Instance (Web Server Instance)																					
1	Album.php displayed from EC2 “Web Server Instance”	<div><div>← → ↻ ⚠ Not secure ec2-3-232-68-97.compute-1.amazonaws.com/cos20019/photoalbum/album.php</div><div><p>Student name: Khanh Toan Nguyen</p><p>Student ID: 104180605</p><p>Tutorial session: Wednesday 6:30PM</p><p>Uploaded photos:</p><table><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>Swinburne Logo</td><td>Logo of Swinburne uni</td><td>2021-08-09</td><td>logo, university</td></tr><tr><td></td><td>MilkyMeowyyy</td><td>Image of a cat named Milk</td><td>2021-06-06</td><td>milk, cat</td></tr><tr><td></td><td>Milk Logo</td><td>Logo of a cat named Milk</td><td>2021-06-04</td><td>milk, cat, logo</td></tr></tbody></table></div></div>	Photo	Name	Description	Creation date	Keywords		Swinburne Logo	Logo of Swinburne uni	2021-08-09	logo, university		MilkyMeowyyy	Image of a cat named Milk	2021-06-06	milk, cat		Milk Logo	Logo of a cat named Milk	2021-06-04	milk, cat, logo
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2																						

Provided URL is persistent (Elastic IP Association)		
Step	Description	Screenshot
1	Allocate Elastic IP address	
2	Associate Elastic IP address with “Web Server Instance”	
3	The Elastic IP address	
4	Public IPv4 address of Instance associate with Elastic IP address	

Photos loaded from S3 with matching metadata from RDS																								
Step	Description	Screenshot																						
1	The SQL queries to insert data to the “photos” table	<div><div>Run SQL queryqueries on database assignmentfb_db: </div><div><pre>1 2 INSERT INTO photos (title, description, creation_date, keywords,s3_reference) 3 VALUES ('Milk Logo', 'Logo of a cat named Milk', '2021-06-04', 'milk, cat, logo','https://tnguyenawsbucket.s3.amazonaws.com/Milk.jpg'); 4 5 INSERT INTO photos (title, description, creation_date, keywords,s3_reference) 6 VALUES ('MilkyMeowyyy', 'Image of a cat named Milk', '2021-06-06', 'milk, cat','https://tnguyenawsbucket.s3.amazonaws.com/milkymeowyyy.jpg'); 7 8 INSERT INTO photos (title, description, creation_date, keywords,s3_reference) 9 VALUES ('Milk Logo', 'Logo of a cat named Milk', '2021-06-04', 'milk, cat, logo','https://tnguyenawsbucket.s3.amazonaws.com/Milk.jpg');</pre></div></div> <div>Nguyen Khanh Toan - 104180605</div>																						
2	SQL queries successfully insert to “photos” table	<table><thead><tr><th>title</th><th>description</th><th>creation_date</th><th>keywords</th><th>s3_reference</th></tr></thead><tbody><tr><td>Swinburne Logo</td><td>Logo of Swinburne uni</td><td>2021-08-09</td><td>logo, university</td><td>https://tnguyenawsbucket.s3.amazonaws.com/Swinburn...</td></tr><tr><td>MilkyMeowyyy</td><td>Image of a cat named Milk</td><td>2021-06-06</td><td>milk, cat</td><td>https://tnguyenawsbucket.s3.amazonaws.com/milkymeoo...</td></tr><tr><td>Milk Logo</td><td>Logo of a cat named Milk</td><td>2021-06-04</td><td>milk, cat, logo</td><td>https://tnguyenawsbucket.s3.amazonaws.com/Milk.jpg</td></tr></tbody></table> <div>Nguyen Khanh Toan - 104180605</div>			title	description	creation_date	keywords	s3_reference	Swinburne Logo	Logo of Swinburne uni	2021-08-09	logo, university	https://tnguyenawsbucket.s3.amazonaws.com/Swinburn...	MilkyMeowyyy	Image of a cat named Milk	2021-06-06	milk, cat	https://tnguyenawsbucket.s3.amazonaws.com/milkymeoo...	Milk Logo	Logo of a cat named Milk	2021-06-04	milk, cat, logo	https://tnguyenawsbucket.s3.amazonaws.com/Milk.jpg
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Web server instance reachable from Test instance via ICMP		
Step	Description	Screenshot
1	Ping successfully from the Test Instance	 <pre> ec2-user@ip-10-0-2-133:~\$ ec2-user@ip-10-0-2-133 ~]\$ ping 10.0.4.169 PING 10.0.4.169 (10.0.4.169) 56(84) bytes of data: 64 bytes from 10.0.4.169: icmp_seq=1 ttl=255 time=0.391 ms 64 bytes from 10.0.4.169: icmp_seq=2 ttl=255 time=0.495 ms 64 bytes from 10.0.4.169: icmp_seq=3 ttl=255 time=0.456 ms 64 bytes from 10.0.4.169: icmp_seq=4 ttl=255 time=0.451 ms 64 bytes from 10.0.4.169: icmp_seq=5 ttl=255 time=0.473 ms 64 bytes from 10.0.4.169: icmp_seq=6 ttl=255 time=0.493 ms 64 bytes from 10.0.4.169: icmp_seq=7 ttl=255 time=0.472 ms 64 bytes from 10.0.4.169: icmp_seq=8 ttl=255 time=0.464 ms 64 bytes from 10.0.4.169: icmp_seq=9 ttl=255 time=0.447 ms 64 bytes from 10.0.4.169: icmp_seq=10 ttl=255 time=0.520 ms 64 bytes from 10.0.4.169: icmp_seq=11 ttl=255 time=0.531 ms 64 bytes from 10.0.4.169: icmp_seq=12 ttl=255 time=0.454 ms 64 bytes from 10.0.4.169: icmp_seq=13 ttl=255 time=0.446 ms 64 bytes from 10.0.4.169: icmp_seq=14 ttl=255 time=0.452 ms 64 bytes from 10.0.4.169: icmp_seq=15 ttl=255 time=0.465 ms 64 bytes from 10.0.4.169: icmp_seq=16 ttl=255 time=0.554 ms 64 bytes from 10.0.4.169: icmp_seq=17 ttl=255 time=0.480 ms 64 bytes from 10.0.4.169: icmp_seq=18 ttl=255 time=0.480 ms 64 bytes from 10.0.4.169: icmp_seq=19 ttl=255 time=0.439 ms 64 bytes from 10.0.4.169: icmp_seq=20 ttl=255 time=0.489 ms </pre>