



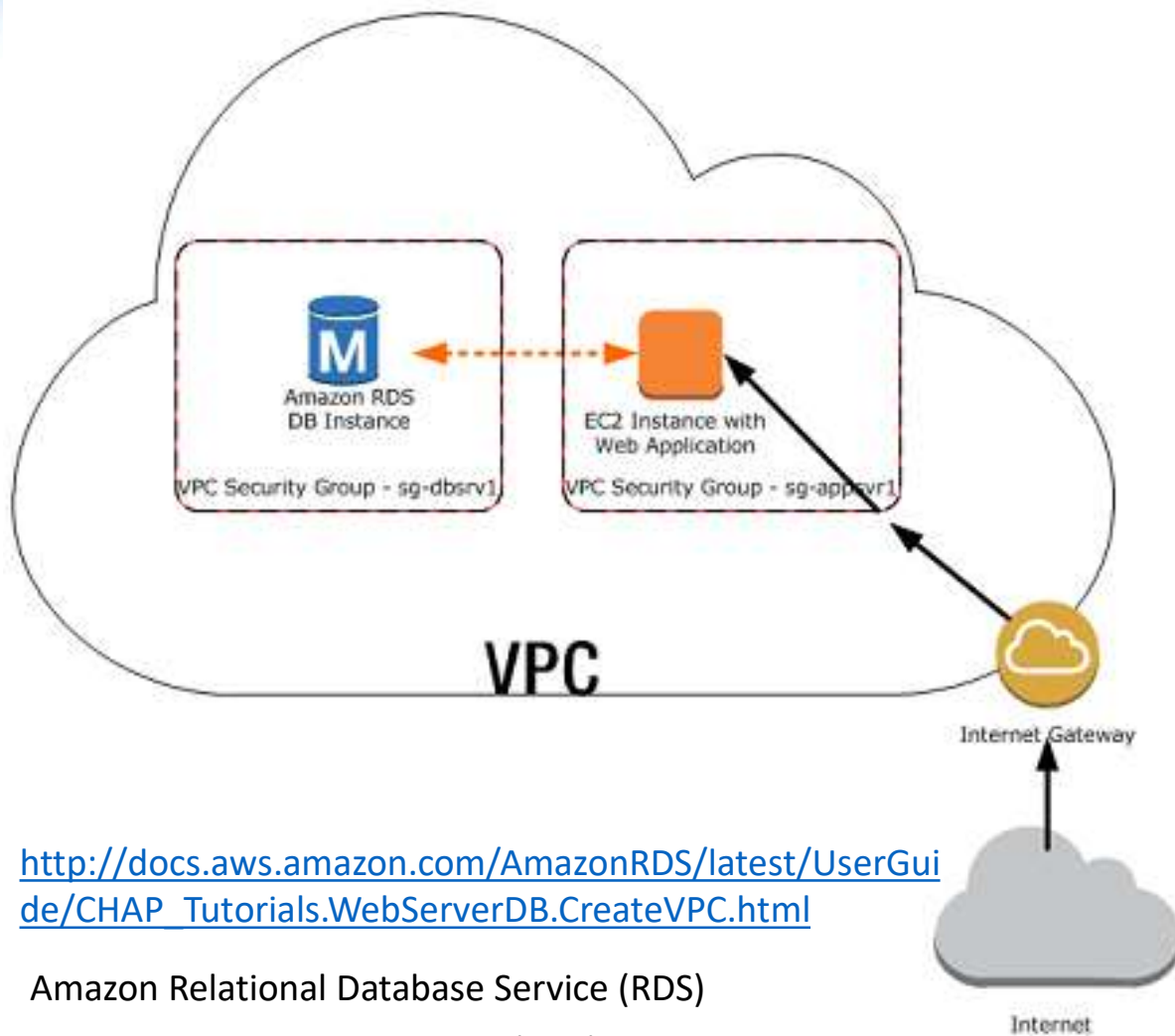
PA1 Tutorial

CS 4740 Cloud Computing

Department of Computer Science, University of Virginia, USA

Goal of this PA

- Gain hand-on experience about EC2



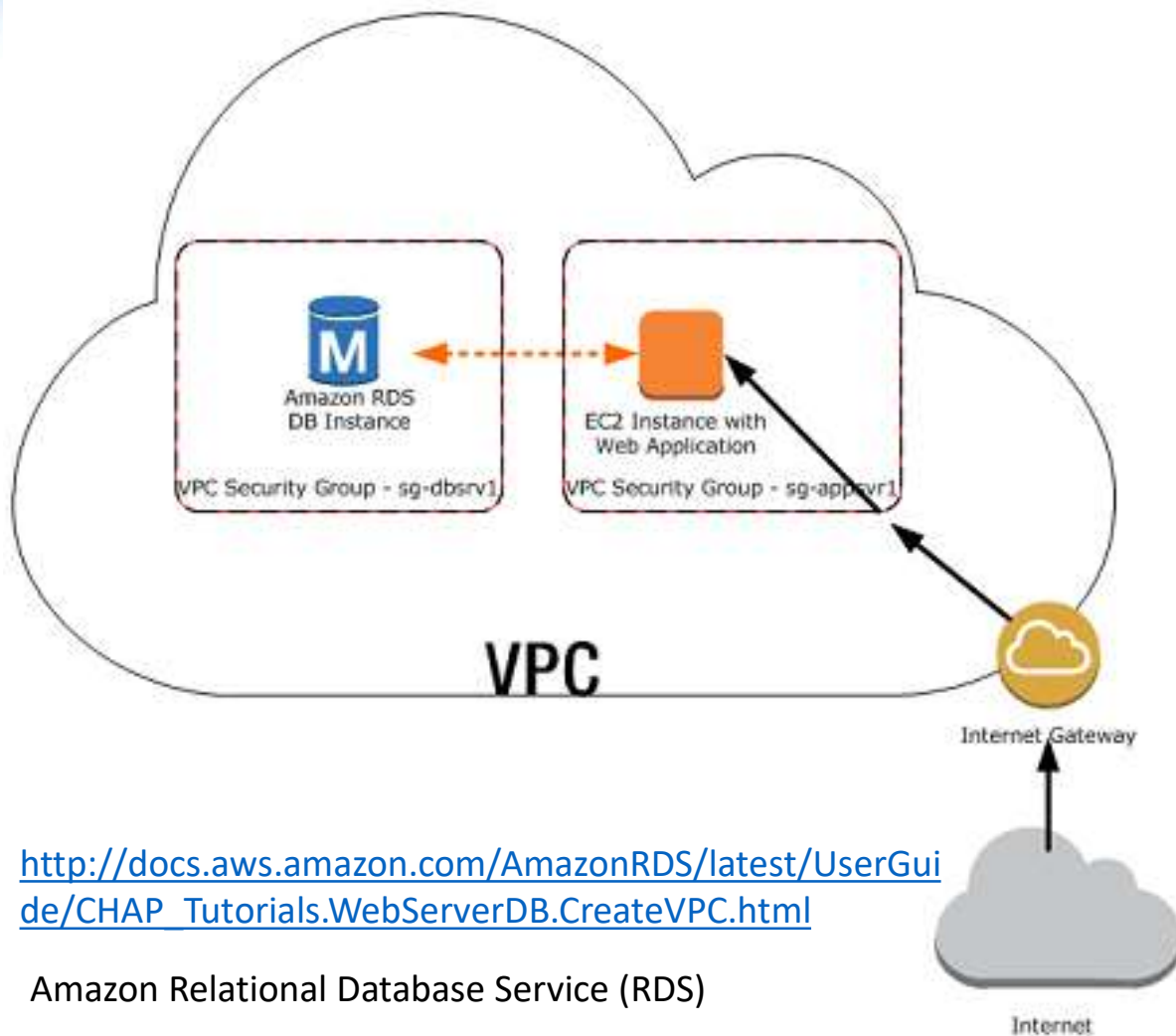
Steps:

- (i) Create an AWS account.
- (ii) Launch a database instance.
- (iii) Create an EC2 Instance and Install a Web Server.

http://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/CHAP_Tutorials.WebServerDB.CreateVPC.html

Amazon Relational Database Service (RDS)

Amazon Virtual Private Cloud (VPC)



http://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/CHAP_Tutorials.WebServerDB.CreateVPC.html

Amazon Relational Database Service (RDS)

Amazon Virtual Private Cloud (VPC)

- Because your Amazon RDS DB instance only needs to be available to your web server, and not to the public Internet, you create a VPC with both public and private subnets.
- The web server is hosted in the public subnet, so that it can reach the public Internet.
- The Amazon RDS DB instance is hosted in a private subnet.
- The web server is able to connect to the Amazon RDS DB instance because it is hosted within the same VPC.
- But the Amazon RDS DB instance is not available to the public Internet, providing greater security.

Steps of PA1

- Step 1: Create an AWS account
- Step 2: Launch a database instance
 - 2.1: Create and configure a VPC
 - 2.2: Create a RDS instance
- Step 3: Create an EC2 instance and Install a Web Server

Make sure you start this assignment when you have at least 2-3 hours available!

Step 1. Create an AWS account

- Create a free account on <https://aws.amazon.com/>
- Apply for AWS Educate here
<https://aws.amazon.com/education/awseducate/apply/>

While applying **you do not select the option** “AWS Educate Starter Account”.

Please apply ASAP!!

Step 2: Launch a database instance

--Step 2.1: Create and configure a VPC

- Please read carefully and follow the tutorial in



https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/CHAP_Tutorials.WebServerDB.CreateVPC.html


There are some changes from the tutorial, be careful about those notes.

Step 2: Launch a database instance

--Step 2.1 Create and configure a VPC

Note 1: Choosing the region

 Services ▾ Resource Groups ▾ 

 Tanmoy058 ▾ **N. Virginia** ▾ Support ▾

VPC with a Single Public Subnet

VPC with Public and Private Subnets

VPC with Public and Private Subnets and Hardware VPN Access

VPC with a Private Subnet Only and Hardware VPN Access

In addition to containing a public subnet, this configuration adds a private subnet whose instances are not addressable from the Internet. Instances in the private subnet can establish outbound connections to the Internet via the public subnet using Network Address Translation (NAT).

Creates:

A /16 network with two /24 subnets. Public subnet instances use Elastic IPs to access the Internet. Private subnet instances access the Internet via Network Address Translation (NAT). (Hourly charges for NAT devices apply.)

Select



Step 2: Launch a database instance

----Step 2.1 Create and configure a VPC

Note 2: Different availability zone

- When creating the second subnet, choose an Availability Zone different from the one that you chose for the first private subnet. For example, if you choose **us-east-1a** for the first subnet, then choose **us-east-1b** for the second subnet.

Step 2: Launch a database instance

----Step 2.1 Create and configure a VPC

Note 3: Inbound rule in security group

VPC Dashboard

Filter by VPC:

Q Select a VPC:

Virtual Private Cloud

Your VPCs

Subnets

Route Tables

Internet Gateways

Egress Only Internet Gateways

DHCP Options Sets

Elastic IPs

Endpoints

Endpoint Services

NAT Gateways

Peering Connections

Security

Network ACLs

Security Groups

VPN Connections

Customer Gateways

Virtual Private Gateways

VPN Connections

Create Security Group

Security Group Actions

Filter All security groups

Search Security Groups and th X

| <input type="checkbox"/> | Name tag | Group ID | Group Name | VPC | Description |
|-------------------------------------|------------------|-------------------|------------------------|--------------------------------|--|
| <input checked="" type="checkbox"/> | PA1-scuritygroup | sg-0305ee13ef... | PA1-scuritygroup | vpc-034ca56f8ae93f0b4 PA-... | PA1 Security Group |
| <input type="checkbox"/> | | sg-04d9c7cad... | launch-wizard-1 | vpc-119b066a | launch-wizard-1 created 2018-05-08T09:... |
| <input type="checkbox"/> | | sg-0640154a5... | ElasticMapReduce-m... | vpc-119b066a | Master group for Elastic MapReduce cre... |
| <input type="checkbox"/> | | sg-06b825426... | default | vpc-034ca56f8ae93f0b4 PA-... | default VPC security group |
| <input type="checkbox"/> | | sg-094011f2f94... | ElasticMapReduce-sl... | vpc-119b066a | Slave group for Elastic MapReduce creat... |
| <input type="checkbox"/> | | sg-0bd3d4ccd... | Open | vpc-119b066a | Open to Every Instance of the world |
| <input type="checkbox"/> | | sg-f08cb186 | default | vpc-119b066a | default VPC security group |

Cancel

Save

| Type | Protocol | Port Range | Source | Description | Remove |
|------------------|----------|------------|-----------|-------------|--------|
| SSH (22) | TCP (6) | 22 | 0.0.0.0/0 | | |
| HTTP (80) | TCP (6) | 80 | 0.0.0.0/0 | | |
| Add another rule | | | | | |

Step 2: Launch a database instance

----Step 2.1 Create and configure a VPC

- Note 4: Same routing table

aws Services Resource Groups

VPC Dashboard

Filter by VPC: Select a VPC

Create subnet Actions

Filter by tags and attributes or search by keyword

| Name | Subnet ID | State | VPC | IPv4 CIDR |
|----------------|--------------------------|-----------|-----------------------|----------------|
| Public subnet | subnet-0046912c28e54cec2 | available | vpc-034ca56f8ae93f0b4 | 10.0.0.0/24 |
| PA_1-Private 2 | subnet-02a817ef968eab883 | available | vpc-034ca56f8ae93f0b4 | 10.0.2.0/24 |
| PA_1-Private 1 | subnet-04ecf203bf9e8830 | available | vpc-034ca56f8ae93f0b4 | 10.0.1.0/24 |
| | subnet-ab808584 | available | vpc-119b066a | 172.31.80.0/20 |
| | subnet-762c162b | available | vpc-119b066a | 172.31.32.0/20 |
| | subnet-65349b6a | available | vpc-119b066a | 172.31.48.0/20 |
| | subnet-0dc1df69 | available | vpc-119b066a | 172.31.0.0/20 |
| | subnet-289f5162 | available | vpc-119b066a | 172.31.16.0/20 |
| | subnet-814862be | available | vpc-119b066a | 172.31.64.0/20 |

Subnet: subnet-04ecf203bf9e8830

Description Flow Logs Route Table Network ACL Tags

Edit route table association

Route Table: rtb-0da8693aa638a809f

| Destination | Target |
|-------------|--------|
| 10.0.0.0/16 | local |

VPC Dashboard

Filter by VPC: Select a VPC

Virtual Private Cloud

Your VPCs

Subnets

Route Tables

Internet Gateways

Egress Only Internet Gateways

DHCP Options Sets

Elastic IPs

Endpoints

Endpoint Services

NAT Gateways

Peering Connections

Security

Network ACLs

Security Groups

VPN Connections

Customer Gateways

Virtual Private Gateways

VPN Connections

Create subnet Actions

Filter by tags and attributes or search by keyword

| Name | Subnet ID | State | VPC |
|----------------|--------------------------|-----------|-----------------------|
| Public subnet | subnet-0046912c28e54cec2 | available | vpc-034ca56f8ae93f0b4 |
| PA_1-Private 2 | subnet-02a817ef968eab883 | available | vpc-034ca56f8ae93f0b4 |
| PA_1-Private 1 | subnet-04ecf203bf9e8830 | available | vpc-034ca56f8ae93f0b4 |
| | subnet-ab808584 | available | vpc-119b066a |
| | subnet-762c162b | available | vpc-119b066a |
| | subnet-65349b6a | available | vpc-119b066a |
| | subnet-0dc1df69 | available | vpc-119b066a |
| | subnet-289f5162 | available | vpc-119b066a |
| | subnet-814862be | available | vpc-119b066a |

Subnet: subnet-02a817ef968eab883

Description Flow Logs Route Table Network ACL Tags

Edit route table association

Route Table: rtb-0da8693aa638a809f

| Destination | Target |
|-------------|--------|
| 10.0.0.0/16 | local |

Step 2: Launch a database instance

--Step 2.2: Create a RDS instance

- Please read and follow the tutorial on:

http://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/CHAP_Tutorials.WebServerDB.CreateDBInstance.html

Notes:

- i) When creating DB instance, for the storage type: select “General purpose (SSD)”.
- ii) Please remember the **Master password**

Step 3: Create an EC2 instance and Install a Web Server

- Create an EC2 Instance and Install a Web Server. Connect the web server to the RDS database. Please read and follow the tutorial on http://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/CHAP_Tutorials.WebServerDB.CreateWebServer.html

Step 3: Create an EC2 instance and Install a Web Server

Note 1: Download key-pair

Select an existing key pair or create a new key pair

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

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

Create a new key pair

Key pair name
PA1-key-pair

Download Key Pair

You have to download the **private key file** (*.pem file) before you can continue. **Store it in a secure and accessible location.** You will not be able to download the file again after it's created.

Cancel

Launch Instances

Connecting to EC2 instance using putty

- To connect the instance you create from Windows, you will need to use Putty or an SSH client.
- Follow this tutorial:

<https://linuxacademy.com/howtoguides/posts/show/topic/17385-use-putty-to-access-ec2-linux-instances-via-ssh-from-windows>

Step 3: Create an EC2 instance and Install a Web Server

--Note 2: Change in commands

- `sudo yum update -y`
- `-remove the -y option if it does not work`
- `sudo yum install -y httpd24 php56 php56-mysqlnd`

Step 3: Create an EC2 instance and Install a Web Server

--Note 3: Setting the dbinfo.inc

- DB_SERVER – Endpoint of the database instance without port
- DB_USERNAME, DB_PASSWORD and DB_DATABASE values are set from RDS instance

```
1 <?php
2
3 define('DB_SERVER', 'tutorial-db-instance.cuginu3hi8qn.us-east-1.rds.amazonaws.com');
4 define('DB_USERNAME', [REDACTED]);
5 define('DB_PASSWORD', [REDACTED]);
6 define('DB_DATABASE', 'sample');
7
8 ?>
```

Step 3: Create an EC2 instance and Install a Web Server –Note 4: Finding public DNS name of EC2 instance for dbinfo.inc


- You can find the endpoint values from the created RDS instance.

Summary

DB identifier
tutorial-db-instance

Role
Instance

CPU
 2.50%

Current activity
 0 Connections

Info
 Available
Engine
MySQL Community

Class
db.t2.small
Region & AZ
us-east-1a

Connectivity & security

Monitoring

Logs & events

Configuration

Maintenance & backups

Tags

Connectivity & security

Endpoint & port

Endpoint
tutorial-db-instance.cuqinu3hi8qn.us-east-1.rds.amazonaws.com

Port
3306

Networking

Availability zone
us-east-1a
VPC
[tutorial-vpc \(vpc-05550439556e714fc\)](#)

Security

VPC security groups
[tutorial-db-securitygroup \(sg-0b219883c8fc615de\)](#)
(active)
Public accessibility
No

Step 3: Create an EC2 instance and Install a Web Server –Note 5: Finding the RDS username and database name for dbinfo.inc

Amazon RDS

Dashboard

Instances

Clusters

Performance Insights

Snapshots

Reserved instances

Option groups

Events

Event subscriptions

Recommendations

ARN

arn:aws:rds:us-east-1:214656367649:db:pa1-db

Engine

MySQL 5.7.22

License Model

General Public License

Created Time

Thu Sep 13 09:09:20 GMT-400 2018

DB Name

sample

Username

PA1_user

Option Group

default:mysql-5-7

Parameter group

default.mysql5.7 (in-sync)

Resource ID

db-A5E63KVK3VSKYGHBBVX4MPAKRA

IAM DB Authentication Enabled

Availability zone

us-east-1b

VPC

PA-1-VPC (vpc-034ca56f8ae93f0b4)

Subnet group

pa_1-db-subnet-group

Subnets

subnet-04ecef203bf9e8830
subnet-0046912c28e54cec2
subnet-02a817ef968eab883

Security groups

PA-1-db-securitygroup (sg-00e479e64e27e7b77)
(active)
default (sg-06b8254269e896cce)
(active)

Publicly accessible

No

Endpoint

pa1-db.cuqinu3hi8qn.us-east-1.rds.amazonaws.com

Certificate authority

Instance Class

db.r4.xlarge

Storage Type

General Purpose (SSD)

Storage

20 GiB

Availability and durability

DB instance status

backing-up

Multi AZ

No

Backup and Restore

Automated backups

Enabled (7 Days)

Backup window

03:27-03:57 UTC (GMT)

Copy tags to snapshots

Yes

Auto minor version upgrade

Yes

Maintenance window

thu:06:05-thu:06:35 UTC (GMT)

Pending Modifications

None

Pending maintenance

none

Encryption details

Encryption enabled

No

value of DB_DATABASE

Step 3: Create an EC2 instance and Install a Web Server –Note 6: Finding the RDS Password for dbinfo.inc

- Use the master password set for your user during creation of the RDS instance as value for DB_PASSWORD.

Master username [Info](#)
Specify an alphanumeric string that defines the login ID for the master user.

Master Username must start with a letter. Must contain 1 to 16 alphanumeric characters.

Master password [Info](#) Confirm password [Info](#)

Master Password must be at least eight characters long, as in "mypassword". Can be any printable ASCII character except "/", "", or "@".

Step 3: Create an EC2 instance and Install a Web Server

--Note 7: Change in SamplePage.php

- In the SamplePage.php file, please replace the header tag (`<h1>Sample page</h1>`), with a header tag with your computing ID (e.g., `<h1>ts5xm</h1>`).
- Please add your name and address classroom (Thronton Hall 303) to the database.

Deliverables - 1

The screenshot shows the AWS Management Console interface for Amazon RDS. The left sidebar contains a navigation menu with the following items: Dashboard, Instances (highlighted), Clusters, Performance Insights, Snapshots, Reserved instances, Subnet groups, Parameter groups, Option groups, Events, Event subscriptions, and Recommendations. The main content area is titled "RDS > Instances" and displays a table of database instances. The table has columns for DB instance, Engine, Status, CPU, Current activity, Maintenance, Class, VPC, and Multi-AZ. A single instance, "pa1-db-instance", is listed with the following details: Engine: MySQL, Status: available, CPU: 1.31%, Current activity: 0 Connections, Maintenance: none, Class: db.t2.small, VPC: vpc-034ca56f8ae93f0b4, and Multi-AZ: No. Above the table, there are buttons for "Instance actions", "Restore from S3", and "Create database". A search bar labeled "Filter instances" is also present.

| DB instance | Engine | Status | CPU | Current activity | Maintenance | Class | VPC | Multi-AZ |
|-----------------|--------|-----------|-------|------------------|-------------|-------------|-----------------------|----------|
| pa1-db-instance | MySQL | available | 1.31% | 0 Connections | none | db.t2.small | vpc-034ca56f8ae93f0b4 | No |

Deliverables - 2

Test Page

This page is used to test the proper operation of the Apache HTTP server after it has been installed. If you can read this page, it means that the Apache HTTP server installed at this site is working properly.

If you are a member of the general public:

The fact that you are seeing this page indicates that the website you just visited is either experiencing problems, or is undergoing routine maintenance.

If you would like to let the administrators of this website know that you've seen this page instead of the page you expected, you should send them e-mail. In general, mail sent to the name "webmaster" and directed to the website's domain should reach the appropriate person.

For example, if you experienced problems while visiting www.example.com, you should send e-mail to "webmaster@example.com".

If you are the website administrator:

You may now add content to the directory `/var/www/html/`. Note that until you do so, people visiting your website will see this page, and not your content. To prevent this page from ever being used, follow the instructions in the file `/etc/httpd/conf.d/welcome.conf`.

You are free to use the image below on web sites powered by the Apache HTTP Server.



Deliverables - 3

Sample page

NAME

ADDRESS

Add Data

| ID | NAME | ADDRESS |
|----|-------|---------------------|
| 1 | ts5xm | Room 220, Rice Hall |
| 2 | test | XYZ |

After Finishing the Assignment

- In <https://console.aws.amazon.com/rds/> for RDS, right click on the DB instance and select 'Take snapshot', name it as "pa1-done". When the snapshot has been created, **delete your RDS instance**.
- In <https://console.aws.amazon.com/ec2/> for EC2, right click on your VM instances and select "instance state ->stop" (**NOT "terminate"!**)



Questions?