

## LAB 02: APP SCALING ON AMAZON WEB SERVICES

By Ali Miladi &amp; Dany Tchente

## TASK 1: SET UP

- 1- Copy the estimated costs that were shown in the launch wizard into the report. **Picture 1:**

The screenshot shows the AWS Free Usage Tier calculator. The main title is "Estimate of your Monthly Bill (\$ 17.38)". The "Choose region" dropdown is set to "Europe Central (Frankfurt)". A note states: "Inbound Data Transfer is Free and Outbound Data Transfer is 1 GB free per region per month". The "Amazon RDS On-Demand DB Instances" section contains a table with one row: Description (empty), DB Instances (1), Usage (100 % Utilized/M), DB Engine and License (MySQL), Class and Deployment (db.t2.micro), Storage (Standard (Single-A)), I/O (General F), Provisioned IOPS (0), and Storage (20 GB). Below this is an "Additional Backup Storage" section with a table for "Backup Type" and "Backup Storage". To the right, a sidebar titled "Common Customer Samples" lists various AWS application types.

**Picture 2:**

The screenshot shows the AWS Free Usage Tier calculator with a detailed breakdown of the monthly bill. The title is "Estimate of Your Monthly Bill" with a value of "\$ 17.38". A note says: "Below you will see an estimate of your monthly bill. Expand each line item to see cost breakout of each service. To save this bill and input values, click on 'Save and Share' button. To remove the service from the estimate, jump back to the service and clear the specific service's form." The "Amazon RDS Service (Europe Central)" section is expanded, showing "DB instances" costing \$ 14.64 and "Storage" costing \$ 2.74. The "AWS Support (Basic)" section is also expanded, showing a cost of \$ 0.00. The total monthly payment is listed as \$ 17.38. The sidebar on the right remains the same as in Picture 1.

2- Compare the costs of your RDS instance to a continuously running EC2 instance of the same size using the AWS calculator. (Don't forget to uncheck the Free Usage Tier checkbox at the top.)

**Picture 3:**

The screenshot shows the AWS Cost Explorer interface. On the left, a sidebar lists various AWS services. The main area displays an estimate for a monthly bill of \$12.19. A section titled 'Compute: Amazon EC2 Instances' shows one entry: 'Description' (empty), 'Instances' (1), 'Usage' (100 % Utilized/h), 'Type' (Linux on t2.micro), 'Billing Option' (On-Demand (No Cor)), and 'Monthly Cost' (\$ 9.81). Below this is a section for 'Compute: Amazon EC2 Dedicated Hosts' with a placeholder row for 'Add New Row'. To the right, a vertical column titled 'Common Customer Samples' lists several scenarios: 'Free Website on AWS', 'AWS Elastic Beanstalk Default', 'Marketing Web Site', 'Large Web Application (All On-Demand)', 'Media Application', 'European Web Application', and 'Disaster Recovery and Backup'.

**Picture 4:**

This screenshot shows a detailed breakdown of the monthly bill. The total is \$12.19, broken down into Compute (\$ 9.81), EBS Volumes (\$ 2.38), and EBS IOPS (\$ 0.00). The bill includes a section for 'AWS Support (Basic)' which adds \$ 0.00 to the total. At the bottom, a summary table shows the 'Total Monthly Payment' as \$ 12.19. The right side of the screen features the same 'Common Customer Samples' sidebar as in Picture 3.

The **RDS** instance is finally more expensive than the **EC2** instance continuously running. But this is worth it because the **RDS** instance is dedicated for the storage and has more space in our case.

3- In a two-tier architecture the web application and the database are kept separate and run on different hosts. Imagine that for the second tier instead of using RDS to store the data you would create a virtual machine in EC2 and install and run yourself a database on it. If you were the Head of IT of a medium-size business, how would you argue in favor of using a database as a service instead of running your own database on an EC2 instance? How would you argue against it?

The usage of **RDS** is better than a self-hosted **DB** in an **EC2** instance. In fact there are a lot of advantages

- **RDS** ensures that the users have **DBaaS** without installing any software.
- **AWS** is responsible for the installation and maintainance of the **DB** software.
- The installation of an **RDS** database is easier than a custom **DB** on **EC2**.
- **RDS** offers automatic backup and point-in-time recovery.
- **RDS** has a better performance than a self-hosted **DB** in an **EC2** instance.

4- Copy the endpoint address of the database into the report.

Picture 5:

Connect		
Endpoint danycleve-drupal.cjubjtwz1ab.eu-central-1.rds.amazonaws.com	Port 3306	Publicly accessible Yes

## TASK 2: CONFIGURE THE DRUPAL MASTER INSTANCE TO USE THE RDS DATABASE

```
?php
//
// database access settings in php format
// automatically generated from /etc/dbconfig-common/drupal7.conf
// by /usr/sbin/dbconfig-generate-include
//
// by default this file is managed via ucf, so you shouldn't have to
// worry about manual changes being silently discarded. *however*, 
// you'll probably also want to edit the configuration file mentioned
// above too.
//
// This file ends up being too verbose because the semantics for the
// options used in it differ per database type (and dbconfig's
// templating system does not handle conditionals); should you choose
// not to use debconf/dbconfig to handle Drupal's database
// configuration, you will probably prefer to discard $dbs, and store
// the declarations straight into $databases.

$dbs['mysql'] = array(
    'driver' => 'mysql',
    'database' => 'drupal7',
    'username' => 'drupal7',
    'password' => 'Nguemessu01',
    'host' => 'danycleve-drupal.cjubjtwz1ab.eu-central-1.rds.amazonaws.com',
    'port' => '',
    'prefix' => ''
);
$dbs['pgsql'] = array(
    'driver' => 'mysql',
    'database' => 'drupal7',
    'username' => 'drupal7',
    'password' => 'Nguemessu01',
    'host' => 'danycleve-drupal.cjubjtwz1ab.eu-central-1.rds.amazonaws.com',
    'port' => '',
    'prefix' => ''
);
$dbs['sqlite'] = array(
    'driver' => 'mysql',
    'database' => '/drupal7',
);
$databases['default']['default'] = $dbs['mysql'];
```

## TASK 3: CREATE A CUSTOM VIRTUAL MACHINE IMAGE

The screenshot shows the AWS Management Console interface for creating a new AMI. The 'Actions' dropdown is open, and the 'Lancer' button is highlighted. The search bar at the top right contains the placeholder 'Filtrer par balises et attributs ou rechercher par mot clé'. The main table lists one item: 'DanyCleve Dr...', with ID 'ami-eef59b81'. The details tab is active, showing the following configuration:

ID d'AMI	ami-eef59b81	Nom d'AMI	DanyCleve Dr...	Source	944399408852/...	Propriétaire	944399408852
Propriétaire	944399408852	Statut	available	Visibilité	Privé	Statut	available
Date de création	8 mars 2018 13:03:17 UTC+1	Architecture	x86_64	Plateforme	Other Linux	Date de création	8 mars 2018 13:03:17
Type de virtualisation	hvm	Type d'image	machine	Description	Drupal connected to RDS database		
Nom du périphérique racine	/dev/sda1	Type de périphérique racine	ebs	ID du noyau	-		
ID de disque RAM	-	Périphériques de stockage en mode bloc	/dev/sda1=snap-0840d8f7b30b36f57:8:true:gp2				
Codes produit	-						

## TASK 4: CREATE A LOAD BALANCER

1- On your local machine resolve the DNS name of the load balancer into an IP address using the nslookup command (Linux or Windows). Write the DNS name and the resolved IP Address(es) into the report

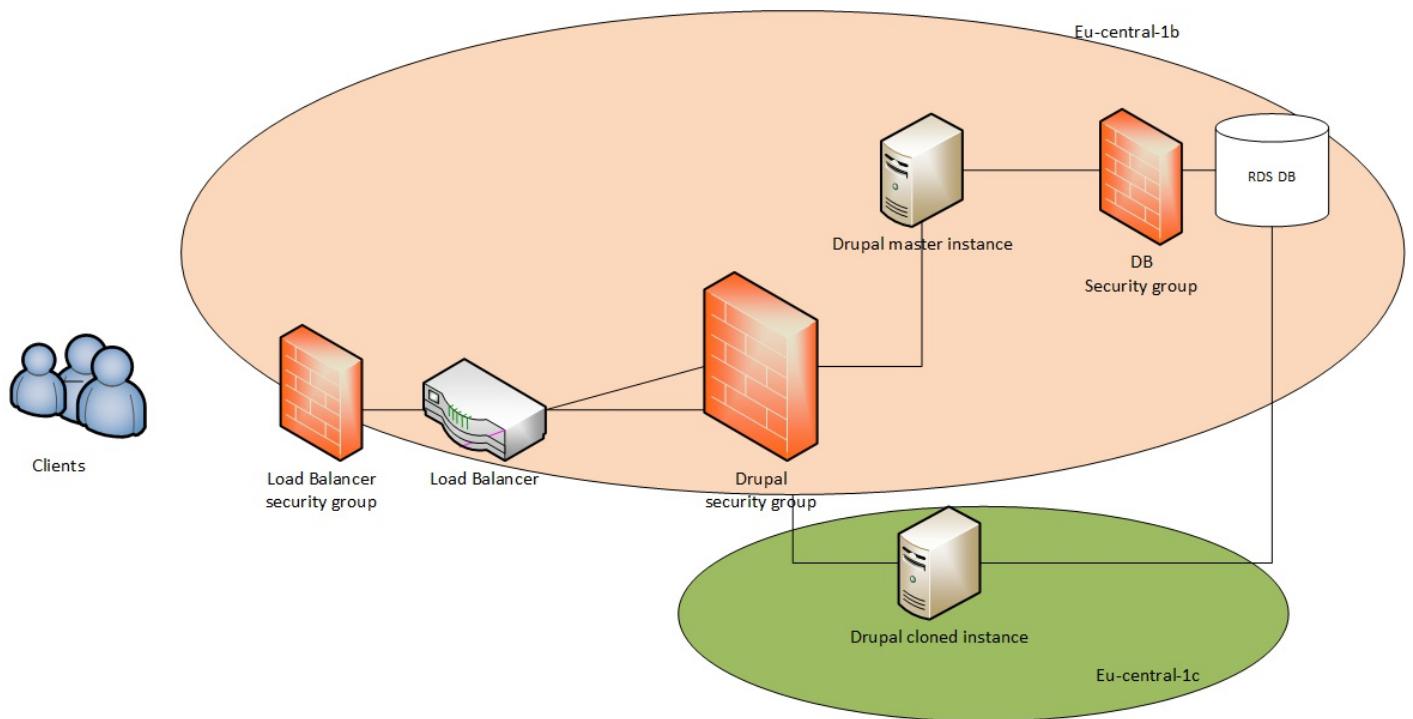
```
mbp-sims:Lab01 Sims$ nslookup
>
>
> DanyCleve-Drupal-467924870.eu-central-1.elb.amazonaws.com
Server:      10.192.22.5
Address:      10.192.22.5#53

Non-authoritative answer:
Name:  DanyCleve-Drupal-467924870.eu-central-1.elb.amazonaws.com
Address: 35.156.115.135
Name:  DanyCleve-Drupal-467924870.eu-central-1.elb.amazonaws.com
Address: 54.93.107.68
>
```

2- In the Apache access log identify the health check accesses from the load balancer and copy some samples into the report

## TASK 5: LAUNCH A SECOND INSTANCE FROM THE CUSTOM IMAGE

1- Draw a diagram of the setup you have created showing the components (instances, database, load balancer, client) and how they are connected. Include the security groups as well.



2- Using the Simple Monthly Calculator calculate the monthly cost of this setup. You can ignore traffic costs. (Make sure you don't forget to include a component in the calculation. Also don't forget to uncheck the Free Usage Tier checkbox at the top.)

Services		Estimate of your Monthly Bill (\$ 81.98)																																	
<input type="button" value="Reset All"/> Choose region: Europe Central (Frankfurt) <input type="button" value="Clear Form"/>		Inbound Data Transfer is Free and Outbound Data Transfer is 1 GB free per region per month																																	
<b>Amazon EC2</b>		Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers. Amazon Elastic Block Store (EBS) provides persistent storage to Amazon EC2 instances.																																	
Amazon S3																																			
Amazon Route 53																																			
Amazon CloudFront																																			
Amazon RDS																																			
Amazon DynamoDB																																			
Amazon ElastiCache																																			
Amazon CloudWatch																																			
Amazon SES																																			
Amazon SNS																																			
Amazon WorkSpaces																																			
AWS Directory Service																																			
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Amazon SWF																																			
Amazon Elastic MapReduce																																			
Amazon Kinesis Streams																																			
Amazon CloudSearch																																			
AWS GovCloud (US)																																			
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Reset All Services Estimate of your Monthly Bill (\$ 81.97)

Choose region: Europe Central (Frankfurt) Inbound Data Transfer is Free and Outbound Data Transfer is 1 GB free per region per month

Amazon EC2 Amazon S3 Amazon Route 53 Amazon CloudFront Amazon RDS Amazon DynamoDB Amazon ElastiCache Amazon CloudWatch Amazon SES Amazon SNS Amazon WorkSpaces AWS Directory Service Amazon Redshift Amazon Glacier Amazon SQS

**Amazon RDS On-Demand DB Instances:**

Description	DB Instances	Usage	DB Engine and License	Class and Deployment	Storage	I/O
RDS drupal	1	100 % Utilized/Mo	MySQL	db.t2.micro Multi-AZ	General Pur 20 GB	Provisioned IOPS: 0

+ Add New Row

**Additional Backup Storage (Free backup storage up to 100% of provisioned Storage):**

Backup Type	Backup Storage
+ Add New Row	

**Amazon RDS Reserved DB Instances:**

Description	DB Instances	Usage	DB Engine and License	Class and Deployment	Offering and Term	Storage	I/O
+ Add New Row							

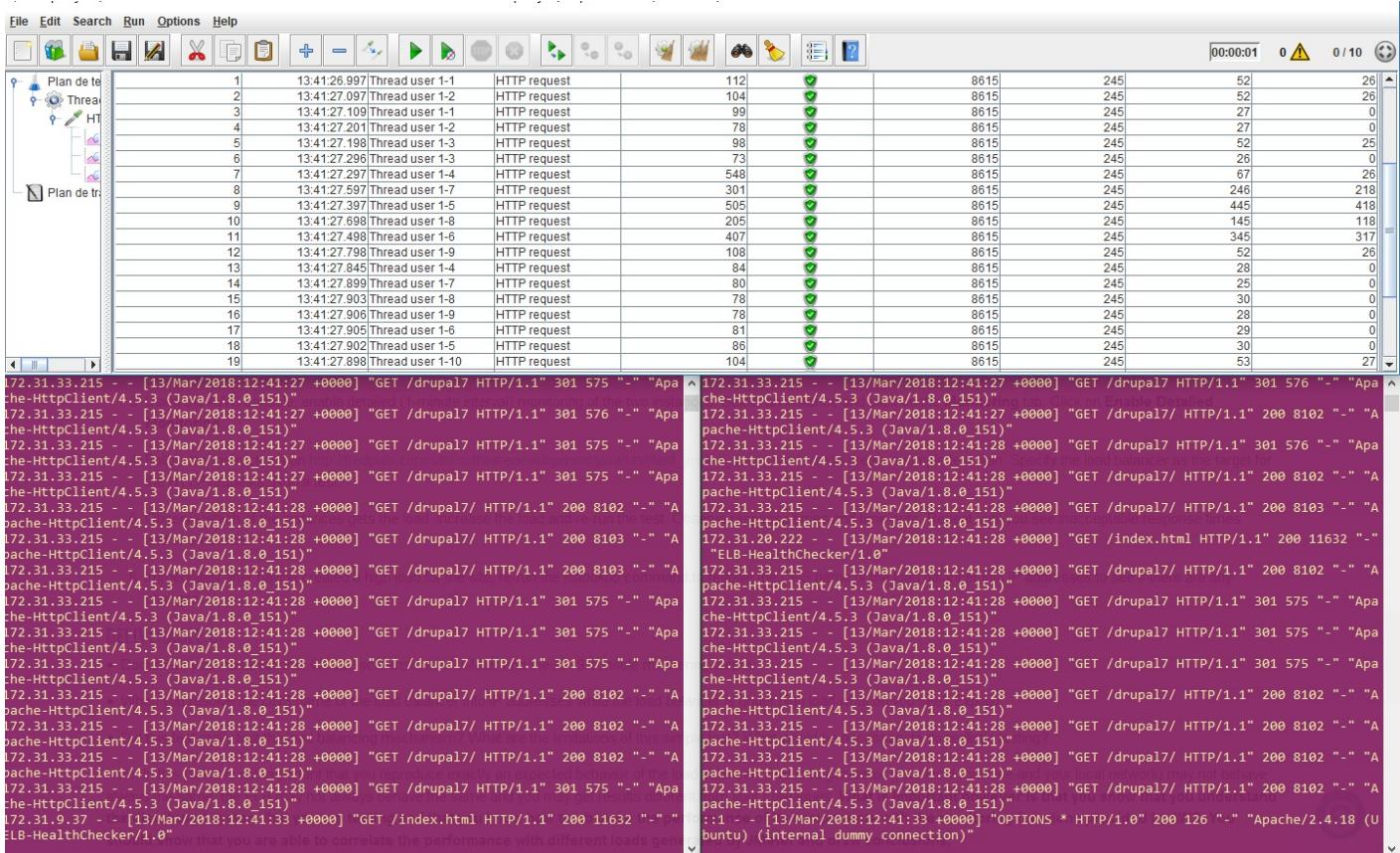
**Data Transfer:**

Inter-Region Data Transfer Out:	0 GB/Month
Data Transfer Out:	0 GB/Month
Data Transfer In:	0 GB/Month
Intra-Region Data Transfer:	0 GB/Month

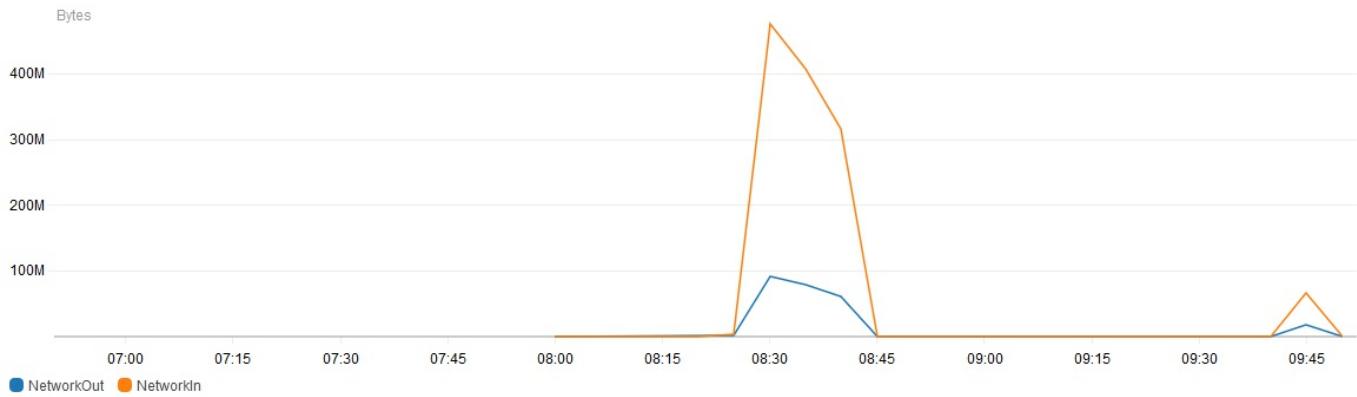
## TASK 6: TEST THE DISTRIBUTED APPLICATION

- 1- Document your observations. Include screenshots of JMeter and the AWS console monitoring output

Picture 6:



**Picture 7:**



2- When you resolve the DNS name of the load balancer into IP addresses while the load balancer is under high load what do you see? Explain

The only difference between the output of the `nslookup` command before and during the generated high load is that the address of the first server changes. Actually, depending on the used `DNS` server, it can see one or more public IP addresses of the load balancer's public `DNS` name. In our case, we could see two or three public `IP`s and the first one changes depending on the `DNS` server. The only explanation that we found about the first address changing during the high load is that `AWS` assigns a set of public `IP` addresses and does a sort of load balancing over the load balancer itself.

3- Did this test really test the load balancing mechanism? What are the limitations of this simple test? What would be necessary to do realistic testing?

This test is not realistic because