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# CLOUD COMPUTING

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PROJECT REPORT



Prepared By

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## Project Report

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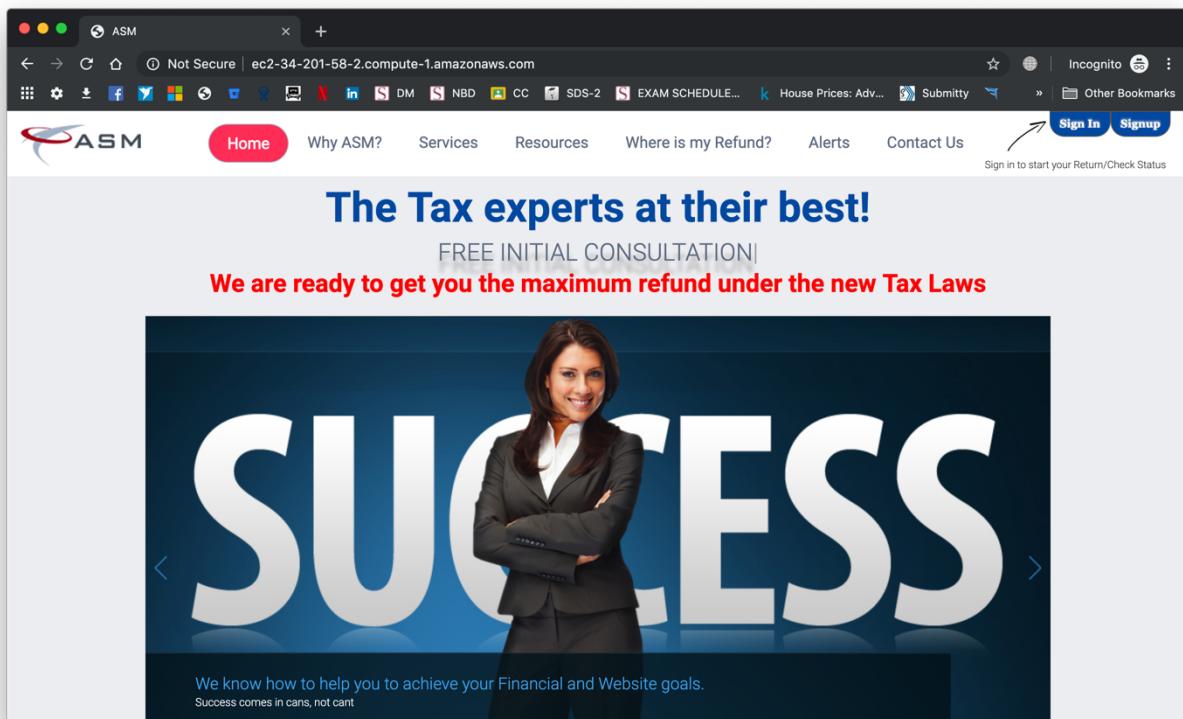
### 1. Web Application

This application is a complete **Online Tax System** solution it has complete **admin side** and it has also front-side to attract the new users. It provides these features:

1. Tax Services.
2. Payroll Services.
3. Business Formation.
4. Accounting and Book Keeping.
5. Tax Planning .
6. IRS Audit Handling and Representation.

Also variety of other services.

To go to front side you just need to click on <http://ec2-34-201-58-2.compute-1.amazonaws.com/>. We are going to attach some photos regarding that.



Not Secure | ec2-34-201-58-2.compute-1.amazonaws.com

Home Why ASM? Services Resources Where is my Refund? Alerts Contact Us Sign In Sign Up

## Our Services

### CORE BUSINESS AND SERVICE OVERVIEW

Our Experts provide advice and insights specific to your industry, type of business or individual tax situation. We help you understand the big picture and lead you to get maximum available benefits in your situation. We have variety of services as follows,



**TAX SERVICES**

A core specialty is the preparation of tax returns for individual taxpayers and Small businesses. Whether your company is a C corporation, S Corp, Limited Liability Company, Partnership, Sole Proprietor or non-profit organization, a properly prepared tax return is...



**PAYROLL SERVICES**

Total payroll services for small business clients have been provided for many years. Services include: Set up and maintenance of all records, time card tabulations, withholding of tax and benefit contributions, Federal and State tax filings, issuance of checks or direct...



**BUSINESS FORMATIONS**

All kinds of business formations in all 50 states, agent services and business management while keeping good records and minutes. There are many challenges that come with starting a business and several types of business formations to choose from: C-Corporation...

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## We are Here to Help

Hello!!!

Please Contact us through any desired channel

**Name** First & Last Name

**Email** example@domain.com

**Subject** How to ...

**Message**

ERROR for site owner:  
Invalid domain for site key

The screenshot shows a web browser window with the URL [Not Secure | ec2-34-201-58-2.compute-1.amazonaws.com](https://ec2-34-201-58-2.compute-1.amazonaws.com). The page has a red header with the title "Why ASM?". Below the header is a paragraph of text about the company's services. There are three sections with sub-sections: "WE STAND BEHIND OUR WORK", "HOW WE WORK", and "Step#1".

**Why ASM?**

Our Tax Professionals are fully qualified and have in-depth knowledge of all the deductions and credits those guarantees to get you the MAXIMUM refund. Since we take our clients very seriously and are available throughout the year to advise on life changes or IRS problems that may arise. There will inevitably be events that impact your tax situation such as the birth of a child, start of a new business, sale or purchase of a home or inheritance from your parents, IRA(s) and health saving accounts etc. We analyze your life changes not only for tax risks, but for opportunities that can be availed. We help you devise a strategy that can surely save you a lot on taxes.

**WE STAND BEHIND OUR WORK**

When we prepare your return, we stand behind our work and will take full responsibility to pay any penalties and interest on federal, state and local returns which are assessed due to an ASM error. In addition, if the IRS audits you, we will assist you in the audit process and can represent you as Enrolled Agent with some additional cost.

**HOW WE WORK**

**Step#1**

We conduct an effective interview with the taxpayer to collect and confirm the correct information. We use various communication techniques to gather accurate information we need to prepare a complete and accurate tax return.

As it is complete application there is a lot functionalities that can be discussed but we will discussed it all here.

## Admin Side:

To login as admin you need proper credentials. Which are:

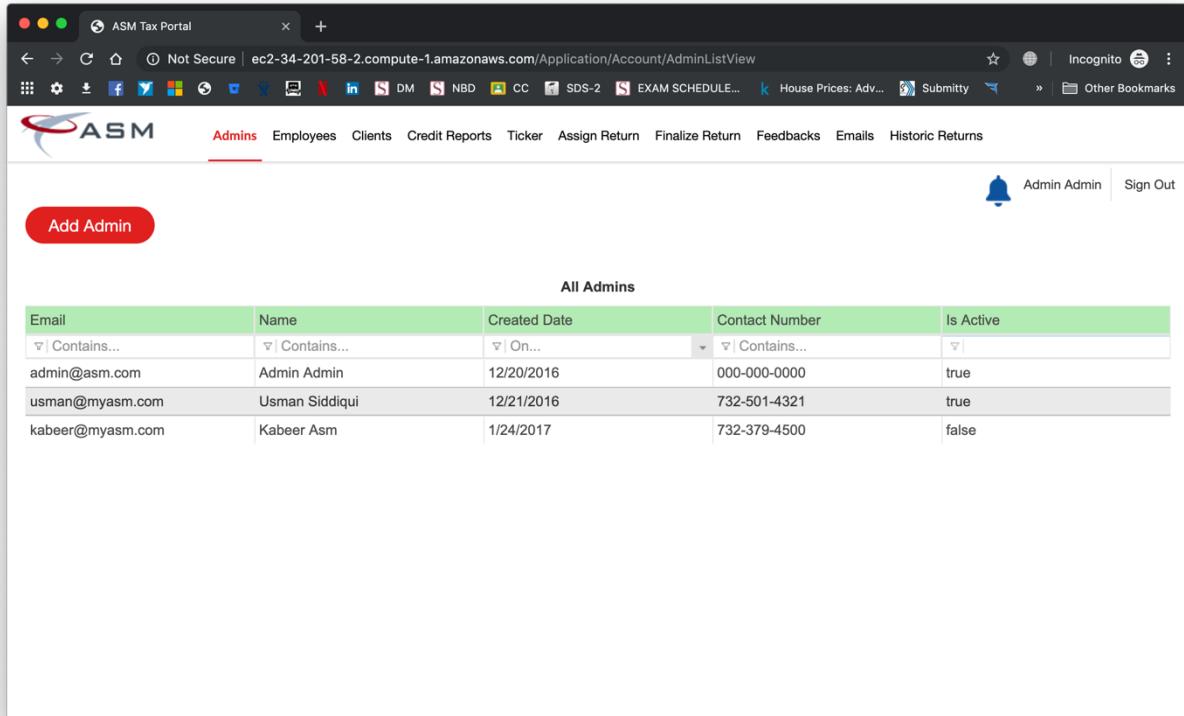
Email: [admin@asm.com](mailto:admin@asm.com)

Password: Pegasus744

When you will login you will see all application functionalities which includes

1. Complete management of all the admins.
2. Complete management of all the employees.
3. Complete management of Clients.
4. Complete management of feedbacks given by clients.
5. Reports about Credits.
6. Complete management of the returns.
7. Complete management of sending large number of emails to clients.
8. Downloading the previous returns as CSV.

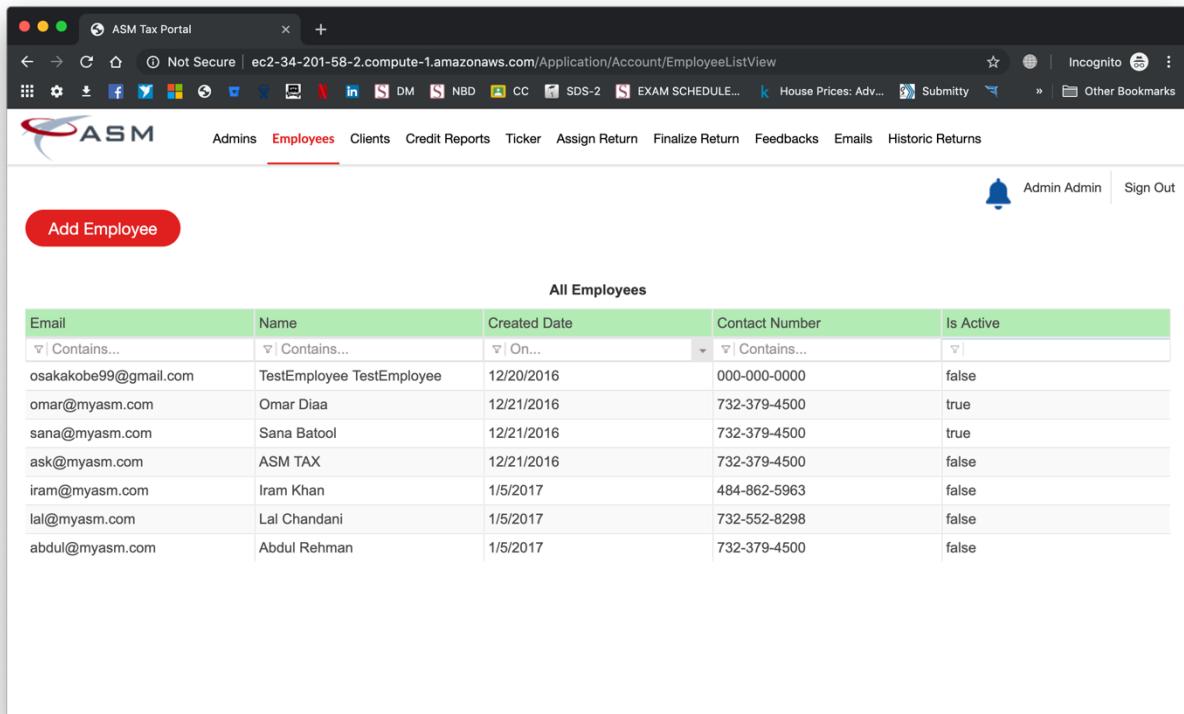
## 1. Complete management of all the admins.



The screenshot shows the 'All Admins' list view in the ASM Tax Portal. The page title is 'All Admins'. It features a table with columns: Email, Name, Created Date, Contact Number, and Is Active. There are search filters at the top of each column. The data in the table is as follows:

Email	Name	Created Date	Contact Number	Is Active
admin@asm.com	Admin Admin	12/20/2016	000-000-0000	true
usman@myasm.com	Usman Siddiqui	12/21/2016	732-501-4321	true
kabeer@myasm.com	Kabeer Asm	1/24/2017	732-379-4500	false

## 2. Complete management of all the employees.



The screenshot shows the 'All Employees' list view in the ASM Tax Portal. The page title is 'All Employees'. It features a table with columns: Email, Name, Created Date, Contact Number, and Is Active. There are search filters at the top of each column. The data in the table is as follows:

Email	Name	Created Date	Contact Number	Is Active
osakakobe99@gmail.com	TestEmployee TestEmployee	12/20/2016	000-000-0000	false
omar@myasm.com	Omar Diaa	12/21/2016	732-379-4500	true
sana@myasm.com	Sana Batool	12/21/2016	732-379-4500	true
ask@myasm.com	ASM TAX	12/21/2016	732-379-4500	false
iram@myasm.com	Iram Khan	1/5/2017	484-862-5963	false
lal@myasm.com	Lal Chandani	1/5/2017	732-552-8298	false
abdul@myasm.com	Abdul Rehman	1/5/2017	732-379-4500	false

### 3. Complete management of Clients.

All Clients

Name	Date Created	Email	Contact Number	Credit Balance
Kishalay Majumdar	Tuesday, January 3, 2017	lovetatai@gmail.com	267-414-4806	0
Sujit Nimble	Tuesday, January 3, 2017	sujit.nimble@gmail.com	732-331-3096	0
iram MUZAFFAR	Wednesday, January 4, 2017	IRAMKHAN_USA@YAHOO.COM	732-410-8846	0
SENTHIL BALASUBRAMANIAN	Friday, January 6, 2017	senthilnathan81@gmail.com	972-693-8276	0
sandeep adivarekar	Saturday, January 7, 2017	sandeep.adivarekar@gmail.com	414-839-8914	0
Ghulam Jilani	Saturday, January 7, 2017	gjilimonj@gmail.com	908-405-8766	0
azmat shahzad	Saturday, January 7, 2017	azmat14@gmail.com	732-393-2300	0
Prasanna Rajagopalan	Saturday, January 7, 2017	rprasanna83@gmail.com	408-680-9682	0
Anirban Das	Saturday, January 7, 2017	anirbandasigd@gmail.com	425-635-8984	0
sivaraj ramaraj	Saturday, January 7, 2017	sivarajr230@gmail.com	323-736-7953	0
Naveed Ulislam Shaikh-Siddiqi	Sunday, January 8, 2017	naveed_siddiq2000@yahoo.com	917-587-8769	0
Ravitheja Chinni	Sunday, January 8, 2017	chinniraviteja@gmail.com	732-476-4399	0
Himanshu Singh	Sunday, January 8, 2017	him.singh@gmail.com	678-476-5524	0
Adnan Saeed	Sunday, January 8, 2017	m.adnans@live.com	732-567-4660	0
Muhammad Farooq	Monday, January 9, 2017	mfarooq977@gmail.com	917-353-0038	0

### 4. Complete management of feedbacks given by clients.

All Feedbacks

Client Name	Date Created	Client Email	Feedback	Response
Luna Das	3/4/2019	lunadasld@gmail.com	Hi team, when do I get the North Carolina State tax return? Also where is the updated IRS document that I can print out ? Thanks, Luna	
Luna Das	2/27/2019	lunadasld@gmail.com	When do I get the return filed and IRS copies? When will the payment be made to my bank account?	
RAJIV GARG	2/19/2019	RajivGarg19@gmail.com	I spoke to representative at given no and she agreed that the relevant person will call me. I am awaiting for the call	
RAJIV GARG	2/19/2019	RajivGarg19@gmail.com	Dear team, I am awaiting for update on my tax return calculation. I am in India and so please make a call to me @ +91-8800.288.344	
			I want to file my tax return for 2018 as Married file Jointly with my wife	

## 5. Reports about Credits.

The screenshot shows a web browser window for the 'ASM Tax Portal' at the URL 'ec2-34-201-58-2.compute-1.amazonaws.com/Application/CreditManagement/CreditAdmin'. The page title is 'Credit Reports'. The navigation bar includes links for Admins, Employees, Clients, Credit Reports (which is highlighted in red), Ticker, Assign Return, Finalize Return, Feedbacks, Emails, and Historic Returns. Below the navigation is a search bar labeled 'Filter Client' with a dropdown menu showing 'All'. To the right are three red buttons: 'Get Credit Requests', 'Get Credit Transactions', and 'Get Referral Details'. A user profile 'Admin Admin' and a 'Sign Out' link are in the top right corner.

## 6. Complete management of the returns.

The screenshot shows a web browser window for the 'ASM Tax Portal' at the URL 'ec2-34-201-58-2.compute-1.amazonaws.com/Application/ProcessAssignment'. The page title is 'Assign Return'. The navigation bar includes links for Admins, Employees, Clients, Credit Reports, Ticker, Assign Return (which is highlighted in red), Finalize Return, Feedbacks, Emails, and Historic Returns. Below the navigation is a search bar with a dropdown menu showing 'All'. The main content area is titled 'All Tax Returns' and contains a table with columns: Return Type, Client Name, Client Email, Employee Name, Employee Assign Date, and Return Stage. A message '0 - 0 of 0 records' is displayed below the table. Navigation controls for 'prev' and 'next' are shown at the bottom right, along with a page number '1'.

## 7. Complete management of sending large number of emails to clients.

The screenshot shows the 'Emails' section of the ASM Tax Portal. At the top, there's a navigation bar with links like Admins, Employees, Clients, Credit Reports, Ticker, Assign Return, Finalize Return, Feedbacks, and a red-highlighted 'Emails'. Below the navigation is a search bar and a user profile with 'Admin Admin' and 'Sign Out'. A red 'Add Category' button is located on the left. The main area is titled 'All Categories' and contains a table with the following data:

Name	Description	Clients Selected	Send Email
test	my personal email for testing	1	Email
All	All clients	4014	Email
Client Activation Email	Sample Email template for client Activation	2	Email
ClientNotifyEmailCategory	To Notify the Client	1	Email
TaxSeason2019	Sending notification to clients	4014	Email

## 8. Downloading the previous returns as CSV.(But of course files are not there)

The screenshot shows the 'Historic Returns' section of the ASM Tax Portal. At the top, there's a navigation bar with links like Admins, Employees, Clients, Credit Reports, Ticker, Assign Return, Finalize Return, Feedbacks, and a red-highlighted 'Emails'. Below the navigation is a search bar and a user profile with 'Admin Admin' and 'Sign Out'. The main area is titled 'Historic Files' and contains a table with the following data:

File Name	Year	User Name	User Email	Files
1065-ASM ASSOCIATES LLC-010975742	2016	ASM	ask@myasm.com	Download
1065-ASM ASSOCIATES LLC-EXT-010975742	2015	ASM	ask@myasm.com	Download
1065-ASM ASSOCIATES LLC-010975742	2015	ASM	ask@myasm.com	Download
2017-1120S-ASM ASSOCIATES LLC-010975742.pdf	2017	ASM	ask@myasm.com	Download
DMAJUMDAR-688854721	2016	Kishalay	lovetatai@gmail.com	Download
KMAJUMDAR-071083110	2016	Kishalay	lovetatai@gmail.com	Download
KMAJUMDAR-071083110	2015	Kishalay	lovetatai@gmail.com	Download
14-1192-KMAJUMDAR-3110	2014	Kishalay	lovetatai@gmail.com	Download
2017-DMAJUMDAR-688854721.pdf	2017	Kishalay	lovetatai@gmail.com	Download
2017-KMAJUMDAR-071083110.pdf	2017	Kishalay	lovetatai@gmail.com	Download
SBALASUBRAMANIAN-9593	2015	SENTHIL	senthilnathan81@gmail.com	Download
14-0047-ITIN-SBALASUBRAMANIAN-9593	2014	SENTHIL	senthilnathan81@gmail.com	Download
14-0118-ITIN-SBALASUBRAMANIAN-9593	2014	SENTHIL	senthilnathan81@gmail.com	Download
13-0424-SBALASUBRAMANIAN-157239593	2013	SENTHIL	senthilnathan81@gmail.com	Download
12-0445-SBALASUBRAMANIAN-157239593	2012	SENTHIL	senthilnathan81@gmail.com	Download

It will be satisfying following requirements:

- Being online by resorting to an EC2 computing environment, and a Linux instance specifically,  
**(IR1. The infrastructure should support load balancing among application instances running in the same datacenter)**
- being available over multiple areas in order to avoid excessively long waiting times,  
**(IR3. The infrastructure should allow the deployment of VMs in multiple availability zones)**
- being able to manage variable loads of access requests in different moments, that is: it cannot be down due to an high number of accesses, on the contrary, to a higher volume of requests must correspond an higher availability,  
**(IR4. The infrastructure should allow horizontal auto-scaling (both scale-in and scale-out))**
- in case of node failure, it has to find out about the fault and avoid to cause any further access problem that could slow down the website functioning, or worse, cause a breakdown.  
**(IR5. The infrastructure should support self-healing (e.g. restart of nodes in case of failures, maintain a target number of nodes))**

## 2. Infrastructure

The infrastructure to be described configuration will comply with the aforementioned conditions. Lastly, every component will be briefly analyzed.

### 2.1 VM choice and launch

#### 2.1.1 Service and instance description

In this paragraph we'll talk about the service choice and the related instance. The "service" can be: a computing service (EC2), a database service, etc. For "instance", instead, we mean the software type to be used. It can be a Linux Machine, a Windows Machine, etc.

#### 2.1.2 Configuration

We select "Services" -> "EC2" -> "Launch Instance". Then we pick: **Windows\_Server-2019-English-Full-Base-2019.06.12(ami-09ef280df1a6a5330)**. This is of the type "Free tier eligible" (free).

We decided to select windows machine server because it is compatible with .NET application and we would like to deploy the application on the machine which is fully compatible with .NET.

#### IMPORTANT:

***We have created two instances one for only deploying the MySQL Server and one instance for only deploying .NET application as described above.***

Time to select the instance type. By “Instance type” we refer to the instance’s hardware specifics (vCPUs, memory, ...)

<input checked="" type="checkbox"/>	General purpose	t2.micro <small>Free tier eligible</small>	1	1	EBS only	-	Low to Moderate	Yes
-------------------------------------	-----------------	---	---	---	----------	---	-----------------	-----

We opted for this alternative because it's free and we do not need to operate massive computations. Through the option “EBS only” we can “Embed” memory volumes to the next instance (EBS will be later explained). Ultimately, thanks to the “Auto-Scaling” service we'll cope with the lack of a high “Performance Network” (it indicates the network power).

This is the only free instance.

Now we can configure the instance details, i.e.: instances number, network, etc.

### Step 3: Configure Instance Details

Number of instances	<input type="text" value="1"/>	Launch into Auto Scaling Group <a href="#">(i)</a>
Purchasing option <a href="#">(i)</a>	<input type="checkbox"/> Request Spot instances	
Network <a href="#">(i)</a>	vpc-3d840e47 (default)	<a href="#">Create new VPC</a>
Subnet <a href="#">(i)</a>	No preference (default subnet in any Availability Zone)	<a href="#">Create new subnet</a>
Auto-assign Public IP <a href="#">(i)</a>	Use subnet setting (Enable)	
Placement group <a href="#">(i)</a>	<input type="checkbox"/> Add instance to placement group	
Capacity Reservation <a href="#">(i)</a>	Open	<a href="#">Create new Capacity Reservation</a>
IAM role <a href="#">(i)</a>	None	
Shutdown behavior <a href="#">(i)</a>	Stop	
Enable termination protection <a href="#">(i)</a>	<input type="checkbox"/> Protect against accidental termination	
Monitoring <a href="#">(i)</a>	<input type="checkbox"/> Enable CloudWatch detailed monitoring <a href="#">Additional charges apply.</a>	
Tenancy <a href="#">(i)</a>	Shared - Run a shared hardware instance	
Elastic Inference <a href="#">(i)</a>	<input type="checkbox"/> Add an Elastic Inference accelerator <a href="#">Additional charges apply.</a>	

[Cancel](#) [Previous](#) [Review and Launch](#) [Next: Add Storage](#)

Premise: we're going to describe just some of the details.

- **Number of Instance.** We chose to launch just one instance of this type because, thanks to the “Auto-scaling” service, the number of VM’s will increase or decrease in observance of the requests load,
- **Network.** We are not changing the default option since we don’t have any urge of creating a new one and, considering that it is the first instance we are launching and the first service used, we didn’t create any other network,
- **IAM Role.** For the moment the instance will not have an IAM Role, it will be configured later,
- **Shutdown behavior.** We left the default value, because we need to stop it and try to solve the problem at a later time,in order to understand the reason of the fault.

Now we add storage to the instance.

By “Storage” we mean the memory added to the instance and used by the latter. A “root” storage must always be present, logically.

Volume Type <a href="#">(i)</a>	Device <a href="#">(i)</a>	Snapshot <a href="#">(i)</a>	Size (GiB) <a href="#">(i)</a>	Volume Type <a href="#">(i)</a>	IOPS <a href="#">(i)</a>	Throughput (MB/s) <a href="#">(i)</a>	Delete on Termination <a href="#">(i)</a>	Encryption <a href="#">(i)</a>
Root	/dev/sda1	snap-0217f9ef30ecd08d7	<input type="text" value="30"/>	<a href="#">General Purpose SSD (gp2)</a>	100 / 3000	N/A	<input checked="" type="checkbox"/>	<a href="#">Not Encrypted</a>
<a href="#">Add New Volume</a>								

We decided to add not the EBS volume.

Amazon Elastic Block Store (Amazon EBS) volume offers persistent block storage volumes to be used with Amazon EC2 instance in AWS cloud. Every Amazon EBS volume gets automatically replicated inside the availability zone in order to protect the user from potential components failures, guaranteeing substantial availability and durability. Amazon EBS volumes offers indispensable tools, in terms of consistency and low latency, to perform efficient workload management. With

Amazon EBS it is possible to increase or decrease in few minutes the employed resources: this will translate into a cost reduction, since you pay just for what you consume.

We decided to use not the EBS volume because, for the sake of completeness, we want to understand how a new one could be added to an instance already running. If it's necessary to add a new EBS to our instance, we cannot configure and launch a new instance again, we need instead to learn how to embed a new one in a second moment.

The device and the snapshot are default options, so we cannot modify them. The dimension of the default root it's ok, so we are not going to increase or decrease it. We leave the gp2 type of volume because it's not our interest to change it. Lastly, the root data cannot be encrypted, as opposed to the EBS.

We then add the tags. These are useful to group the instances by project; in this case it's a academic project, but in a working environment there are more instances and it's necessary to group them by the pursued project, so it's good to differentiate one from another.

#### Step 5: Add Tags

A tag consists of a case-sensitive key-value pair. For example, you could define a tag with key = Name and value = Webserver.

A copy of a tag can be applied to volumes, instances or both.

Tags will be applied to all instances and volumes. [Learn more](#) about tagging your Amazon EC2 resources.

The screenshot shows the 'Tag Editor' interface. At the top, there are two input fields: 'Key (128 characters maximum)' and 'Value (256 characters maximum)'. Below these, a table lists the tag 'asm' with two checkboxes: 'Instances' (checked) and 'Volumes' (checked). There is also a delete button (X) for the tag. At the bottom left is a button 'Add another tag' and at the bottom right is a note '(Up to 50 tags maximum)'.

We decided to add the tag (asm,adm) and keep it one all our instances and volumes associated to the first instance. The last option (Volumes) is very useful for the same reasons previously descripted.

We configure now the security group. A security group is a set of firewall rules which scan the traffic of your instance. In this page we can add rules to allow the specific traffic to reach our instance. For example: if you wish to configure a Web Server and allow the Internet traffic to reach the instance, you add rules permitting unlimited access to the http and HTTPS ports.

The screenshot shows the 'Create New Security Group' interface. It includes fields for 'Assign a security group': 'Create a new security group' (radio button selected) and 'Select an existing security group'. Below are fields for 'Security group name: launch-wizard-3' and 'Description: launch-wizard-3 created 2019-04-30T10:50:57.202+02:00'. The main area shows a table of security rules:

Type	Protocol	Port Range	Source	Description
SSH	TCP	22	Custom 0.0.0.0/0	e.g. SSH for Admin Desktop
HTTP	TCP	80	Custom 0.0.0.0/0, ::/0	e.g. SSH for Admin Desktop
HTTPS	TCP	443	Custom 0.0.0.0/0, ::/0	e.g. SSH for Admin Desktop

At the bottom left is a 'Add Rule' button.

As shown in the figure above, we created a new security group, since we didn't have one. Going on, we added types, that is we opened the HTTP e HTTPS ports, because it's necessary to permit the users to access the front site. At last, the SSH type is needed to remotely connect to the instance. Port numbers are given by default.

We can now review the configuration chosen for the instance, that is a summary of the selected instance characteristics, and launch it. Before we can start the instance it's essential to set up a key to use to remotely access it. We create a new one, we name it and we start the instance. The key allows only us and who we share it with to access the instance.

The next figure shows the result.

The screenshot shows the AWS EC2 Instances page. On the left, there's a sidebar with options like EC2 Dashboard, Events, Tags, Reports, Limits, Instances (which is selected), Launch Templates, Spot Requests, Reserved Instances, Dedicated Hosts, Scheduled Instances, Capacity Reservations, Images, AMIs, Bundle Tasks, and Elastic Block Store. The main area has tabs for Launch Instance, Connect, and Actions. A search bar at the top says "Filter by tags and attributes or search by keyword". Below it, a table lists instances. One instance is highlighted: "windows-simple-instance" (win-autoscall-group). The table columns include Name, Instance ID, Instance Type, Availability Zone, Instance State, and Status. The instance details show: Instance ID i-0ac3427f4835e51c1, Instance Type t2.micro, Availability Zone us-east-1a, Instance State running, and Status 2/2. Public DNS is ec2-34-201-58-2.compute-1.amazonaws.com. Below the table, there are tabs for Description, Status Checks, Monitoring, and Tags. The Description tab shows detailed information: Instance ID i-0ac3427f4835e51c1, Instance state running, Instance type t2.micro, Elastic IPs -, Availability zone us-east-1a, Security groups launch-wizard-1, view inbound rules, view outbound rules, Scheduled events No scheduled events, AMI ID Windows\_Server-2019-English-Full-Base-2019.06.12 (ami-09ef280df1a6a5330), Platform windows, IAM role -, Public DNS (IPv4) ec2-34-201-58-2.compute-1.amazonaws.com, IPv4 Public IP 34.201.58.2, IPv6 IPs -, Private DNS ip-172-31-88-206.ec2.internal, Private IPs 172.31.88.206, Secondary private IPs -, VPC ID vpc-c3ee82b9, Subnet ID subnet-39297717, Network interfaces eth0, and Source/dest. check True.

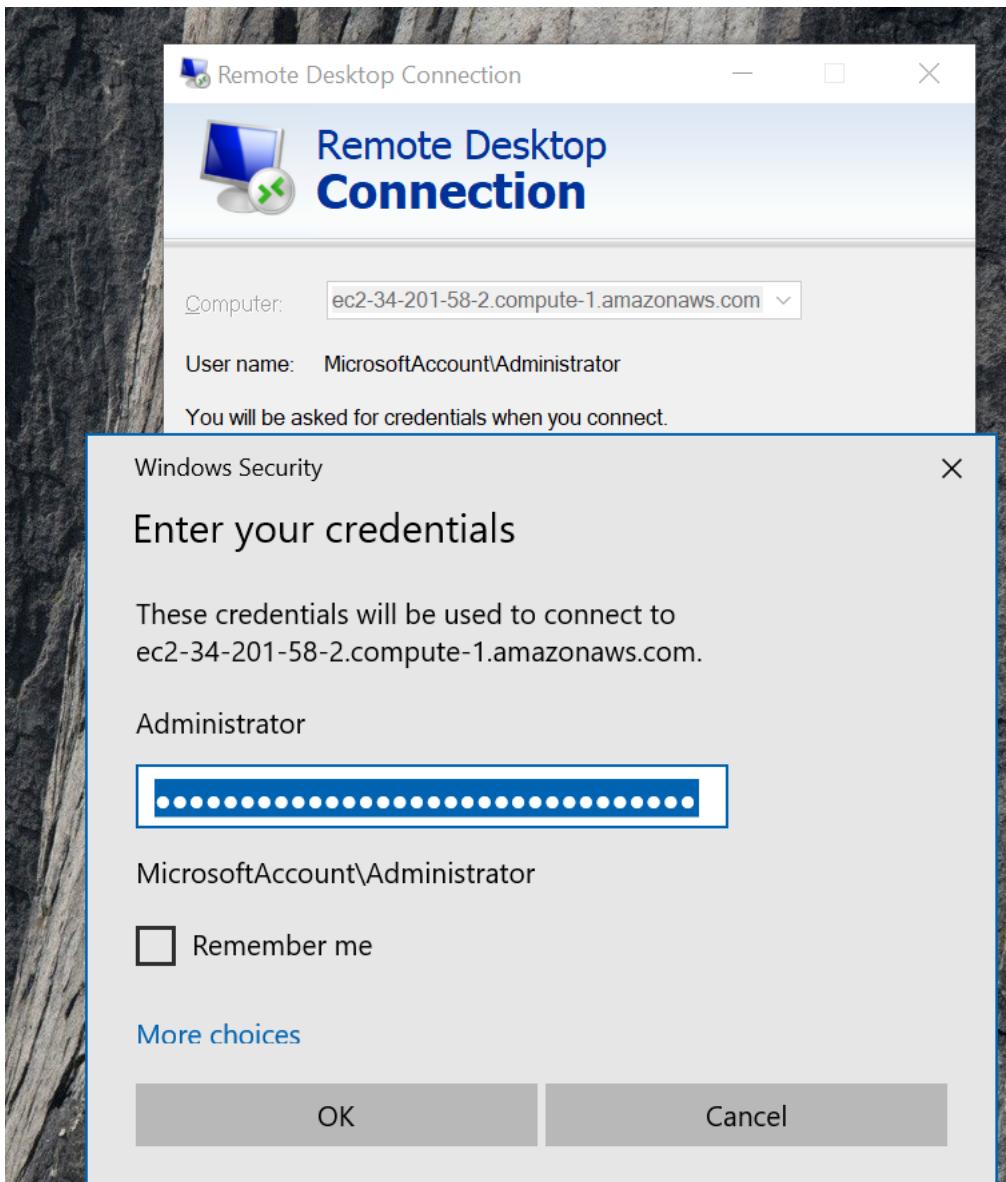
As we can see, our first instance is running. The information seen in this picture describe the crucial characteristics we need to be aware of. Let us avoid to analyze them all right now.

## 2.2 Configuration and upload of the material

By doing so we configured and launched our first instance. This is currently empty and not updated, so, through its configuration and other softwares installation, we'll set it up. To do that, we need to connect to the instance and, in second moment, use the software to upload the website.

### 2.2.1 Connection and upload of the instance

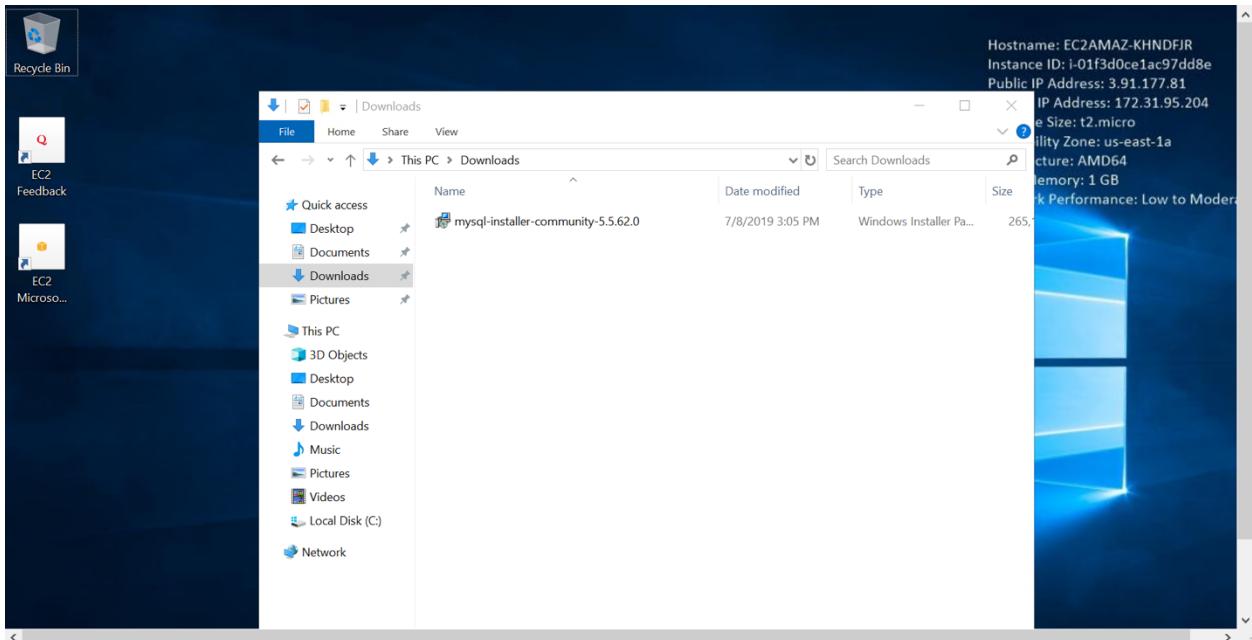
We connected to server using remote desktop for building MYSQL database.



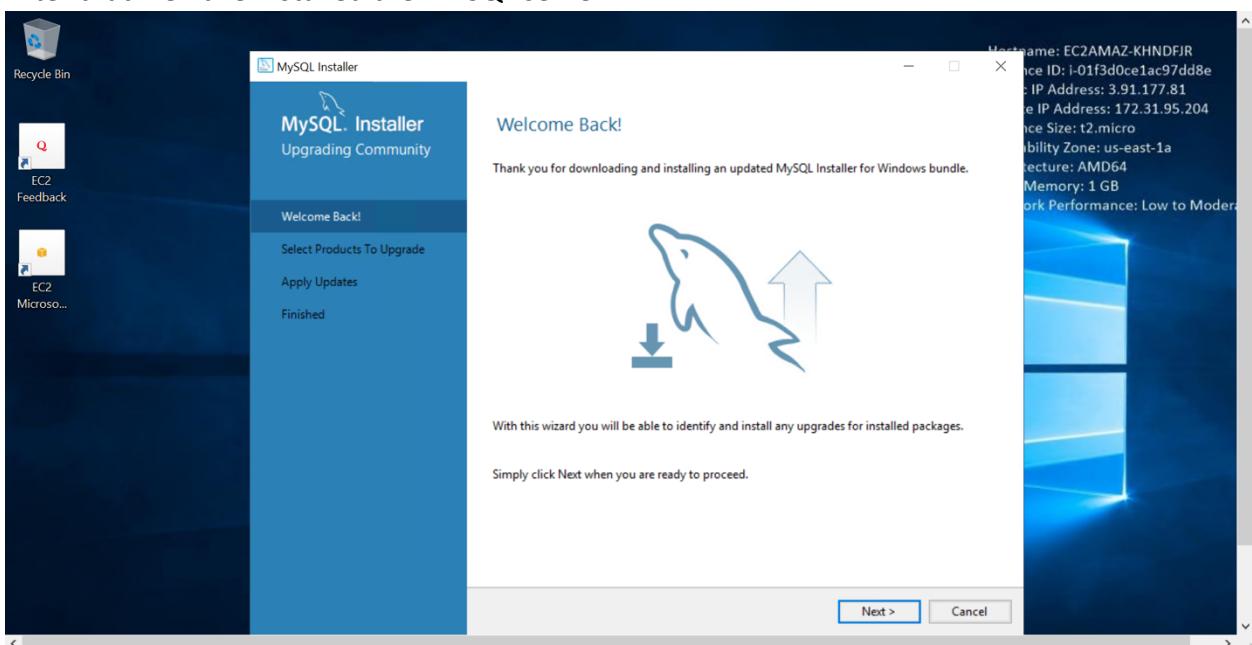
After connect It looks like below.



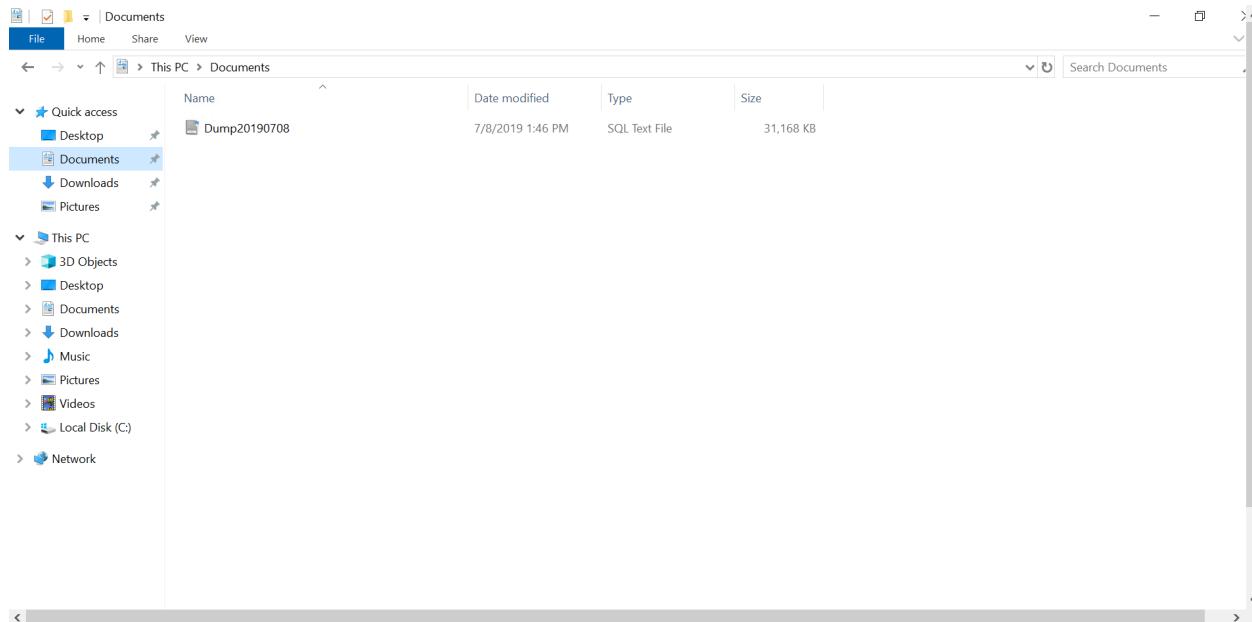
We have downloaded MYSQL exe file.



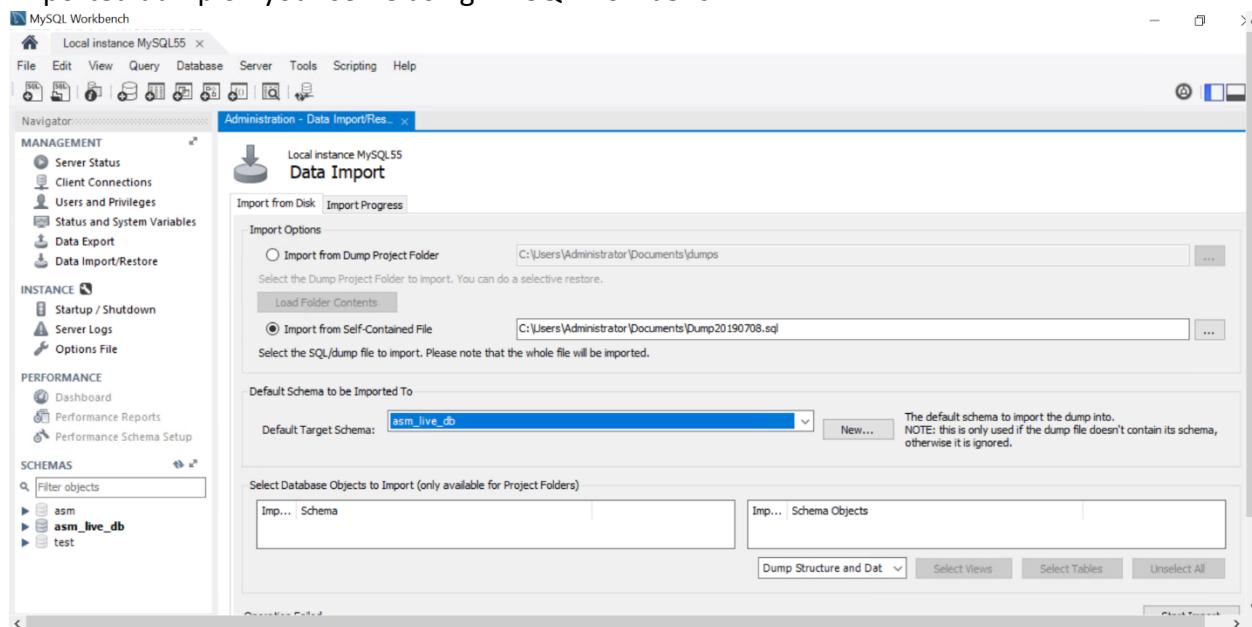
After that we have installed the MYSQL server.



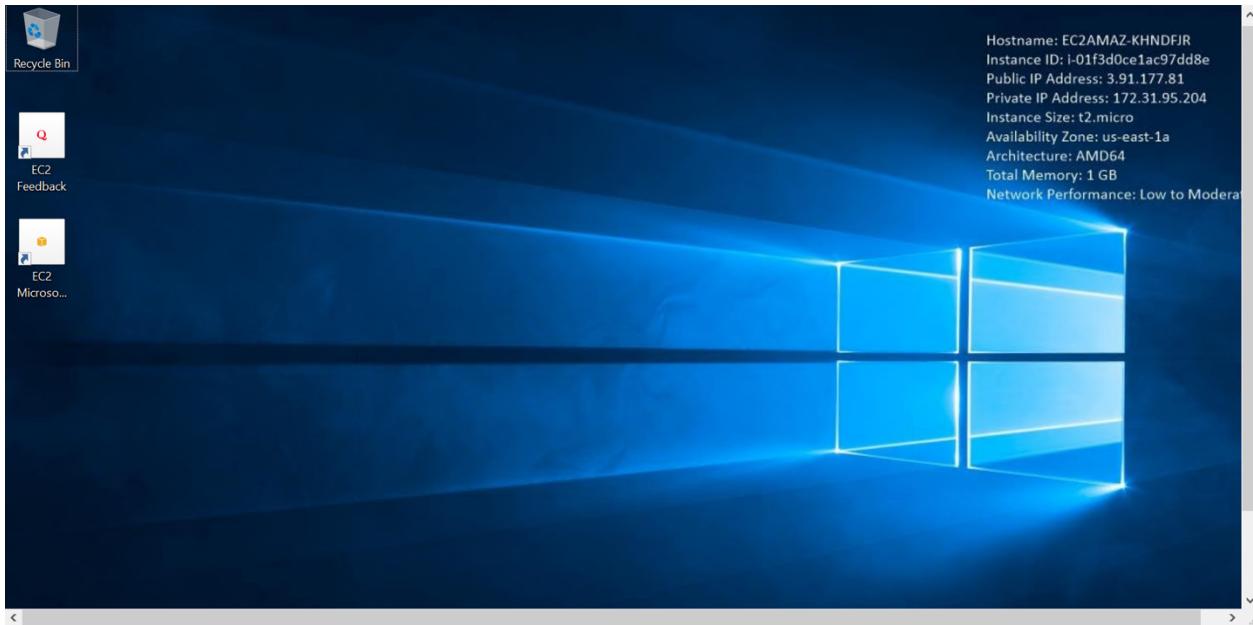
We have copied the SQL dump for database.



Imported dump on your serve using MYSQL workbench.



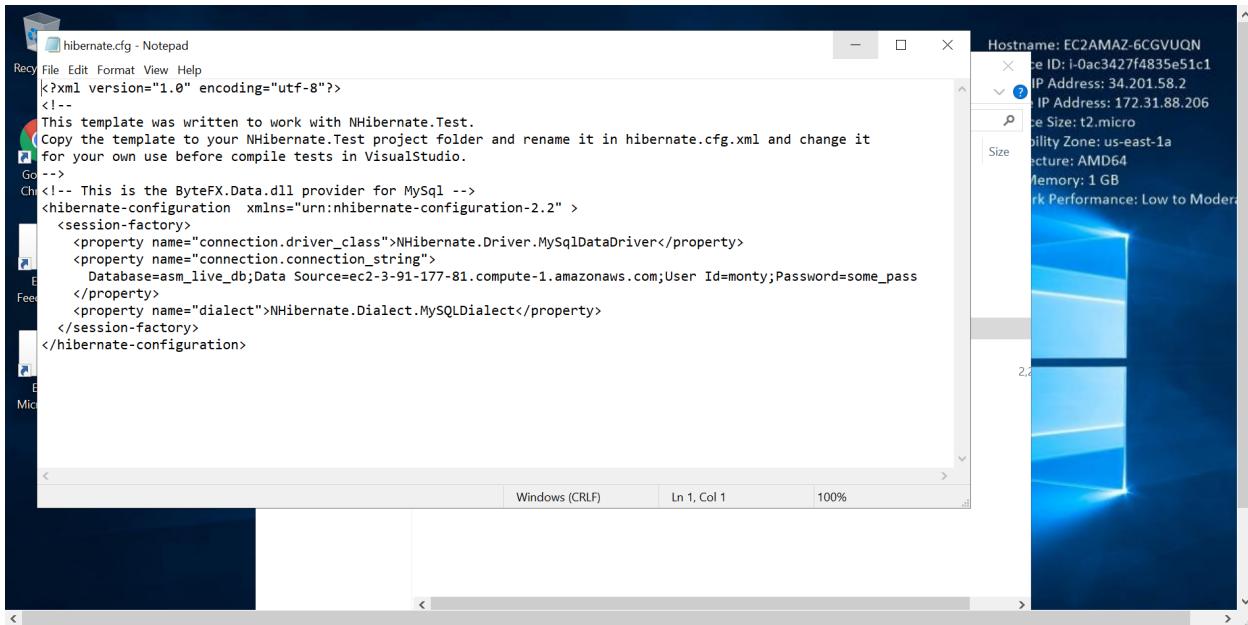
## Connected App Server instance using Remote Desktop.



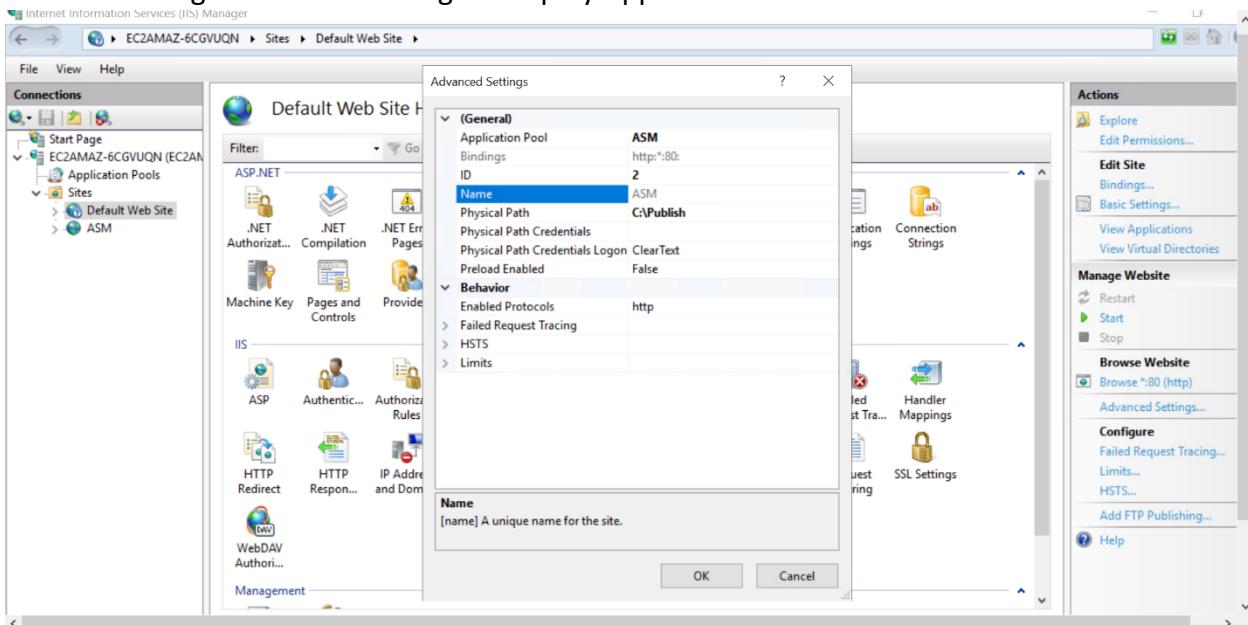
Copied application files using simple drag and drop.

Name	Date modified	Type	Size
Areas	7/9/2019 7:35 PM	File folder	
bin	7/9/2019 7:28 PM	File folder	
Content	7/9/2019 7:20 PM	File folder	
Scripts	7/9/2019 7:22 PM	File folder	
Templates	7/9/2019 7:22 PM	File folder	
Views	7/9/2019 7:22 PM	File folder	
Global.asax	6/17/2019 4:07 PM	ASAX File	1 KB
hibernate.cfg	7/9/2019 7:32 PM	XML Document	1 KB
Iesi.Collections	6/17/2019 4:07 PM	XML Document	39 KB
NHibernate	6/17/2019 4:07 PM	XML Document	2,294 KB
packages	6/17/2019 4:07 PM	CONFIG File	3 KB
Web	7/9/2019 7:31 PM	CONFIG File	9 KB

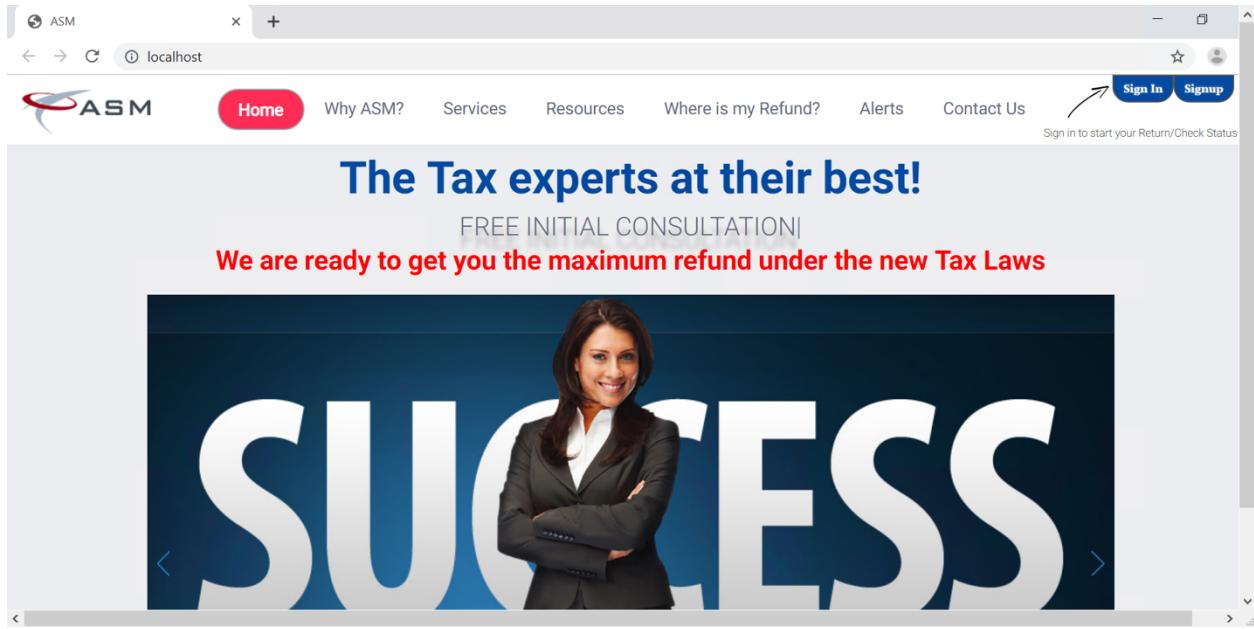
We have changed DB Settings of our application.



We have configured our IIS settings to deploy App.



We have tested our app after deploying.



## 2.3 Recap

We chose, launched and configured our instance and successively we uploaded of our material. Now our website is online but, should it suffer from any inconvenience, it wouldn't be available anymore. Example: if multiple users request the access, it could fail, if Amazon Web Service should suffer any fault we could be not aware of it and have our site down. For a bunch of reasons we need to configure an Auto Scaling Groups able to answer the access requests of our users and balance the service, that is: increase the availability of VMs when indispensable and reduce it when not (Requirement IR4). We cannot dare to set up new VMs, we designate AWS to do that. Lastly, before we configure this service, we enable the status checks of our VM.

## 2.4 Status Checks

In this paragraph we set up the status check. By Status Check we intend a service that can be enabled over an instance and which permits us to be informed if this report any issue forcing it to break. It's fundamental to set it up to be constantly updated about his status. To do that pick the console AWS and click on EC2 -> Instances -> Status Checks.

The screenshot shows the AWS EC2 Instances page. On the left, there's a sidebar with links like EC2 Dashboard, Events, Tags, Reports, Limits, Instances, Launch Templates, Spot Requests, Reserved Instances, Dedicated Hosts, Scheduled Instances, Capacity Reservations, Images, AMIs, Bundle Tasks, and Elastic Block Store. The main area has tabs for Launch Instance, Connect, and Actions. A search bar at the top says "Filter by tags and attributes or search by keyword". Below it is a table with columns: Name, aws:autoscaling:groupName, Instance ID, Instance Type, Availability Zone, Instance State, and Status. Two instances are listed: "windows-simple-instance" (win-autoscale-group) and "windows-instance-ms-sql-cc". Both are in the "running" state. Below the table, it says "Instance: i-0ac3427f4835e51c1 (windows-simple-instance)" and "Public DNS: ec2-34-201-58-2.compute-1.amazonaws.com". There are tabs for Description, Status Checks (which is selected), Monitoring, and Tags. A note says "Status checks detect problems that may impair this instance from running your applications. Learn more about status checks." A "Create Status Check Alarm" button is present. Below this, there are sections for System Status Checks and Instance Status Checks, both of which show "System reachability check passed". A note at the bottom says "Submit feedback if our checks do not reflect your experience with this instance or if they do not detect the issues you are having. Please note that we will not respond to customer support issues reported via this form. Please post your issue on the Developer Forums or contact AWS".

## 2.5 Launching instances in other areas

To launch new instances in different zones it's necessary to create an image of our current instance (configured with respect to our choices) and launch it by the means of the image, positioning in the new area.

### 2.5.1 Create an AMI

To create an image of the instance a snapshot is needed.

#### 2.5.1.1 Create a VM snapshot

We have already created two snapshots one for windows-instance and one for MySQL instance.

The screenshot shows the AWS EC2 console with the 'Snapshots' section selected. On the left, a sidebar lists various AWS services like Instances, AMIs, and Network & Security. The main area displays a table of snapshots owned by the user. The table has columns for Name, Snapshot ID, Size, Description, and Status. Two snapshots are listed: 'windows-simple-instance-snapshot' and 'windows-mysql-snapshot', both of which are completed.

Name	Snapshot ID	Size	Description	Status
windows-simple-instance-snapshot	snap-05280d4c732...	30 GiB	windows-simple-instance-snapshot	completed
windows-mysql-snapshot	snap-093b45f7e12d...	30 GiB	windows-mysql-snapshot	completed

At this point we have a snapshot of our Root volumes of both instances. They contains all the configurations created and the added files.

Now that we got our snapshot, we create an image based on it. Let us head to **Elastic Block Store - > Snapshot**. We have already created images. Here is screenshots.

The screenshot shows the AWS EC2 console interface. On the left, there's a navigation sidebar with links like EC2 Dashboard, Instances, AMIs, and Images. The main area displays a table of AMIs under the heading "Owned by me". The table has columns for Name, AMI Name, AMI ID, Source, Owner, and Visibility. Two entries are listed: "windows-mysql-image" and "windows-simple-image". Below the table, a specific AMI, "windows-simple-image", is selected and its details are shown in a modal window. The "Details" tab is active, displaying information such as AMI ID (ami-0d294372582ab9635), Owner (744531876476), Status (available), Creation date (July 12, 2019 at 5:20:05 PM UTC+2), Architecture (x86\_64), Virtualization type (hvm), Root Device Name (/dev/sda1), AMI Name (windows-simple-image), Source (744531876476/windows-simple-image), Platform (Windows), Image Type (machine), Description (-), and Root Device Type (ebs).

At this point, thanks to AWS, we can change zone, on the top right (we can switch from Virginia to Asia Pacific(Mumbai) for example).

But before doing that I had to copied the images to Mumbai Region.

This screenshot is similar to the previous one but focuses on the "Copy AMI" option. A context menu is open over the "windows-mysql-image" row in the AMI list. The menu options include Launch, Spot Request, Deregister, Register New AMI, Copy AMI (which is highlighted in yellow), Modify Image Permissions, Add/Edit Tags, and Modify Boot Volume Setting. The rest of the interface is identical to the first screenshot, showing the detailed view of the "windows-simple-image" AMI.

Among the EC2 images, we can see the one previously created. Now we can launch it.

The screenshot shows the AWS EC2 Dashboard with the 'AMIs' section selected. A table lists two AMIs: 'windows-mysql-image' and 'windows-simple-image'. The 'Launch' button is highlighted for the second row. A context menu is open over the 'Launch' button, listing options: Launch, Spot Request, Deregister, Register New AMI, Copy AMI, Modify Image Permissions, Add/Edit Tags, and Modify Boot Volume Setting. Below the table, a detailed view for the 'Image: ami-09a316433f07d4c0c' is shown, which is the copied version of the 'windows-simple-image'. The details tab displays the AMI ID as 'ami-09a316433f07d4c0c', Owner as '744531876476', AMI Name as 'windows-simple-image', and Source as '744531876476/windows-simple-image'. At the bottom, there are links for Feedback, English (US), and a copyright notice.

Obviously AWS will make us go back to the configuration of our VM. We apply the same schema used in paragraph 2, because, as we will see, security groups and IAM role are missing in Northern Virginia's area. This happens because we have no other elements besides the VM. Let us configure everything again, then we can launch and verify our instance.

## 2.6 Configure Auto Scaling Groups

Finally we got to the crucial element of AWS: Auto Scaling. This service allows us to delegate to Amazon's service the elasticity configuration of our system, that is, basing on the access requests, we can increase or decrease the number of instances identical to the first one created.

To have an auto-scaling system, we'll use Auto Scaling and Load Balancing.

Let us check the requirements:

- Create a Virtual Private Cloud (VPC) with a public subnet in two or more availability areas V
- Start a VPC instance V
- Connect to the instance and personalize it V
- Test the application over the instance to ensure that the latter is correctly configured V
- Create an Amazon Machine Image (AMI) personalized by instance V
- Create an AMI Linux supported by Amazon EBS or create an AMI Linux supported by the instance store X
- Create an IAM role allowing the application to access the needed AWS X

V: Satisfied point

X: Unsatisfied point

Let us start from the first unsatisfied point: creation of an EBS.

## 2.6.1 Create Amazon EBS

As previously said, Amazon Elastic Block Store (Amazon EBS) offers persistent blocks storage volumes to be used with Amazon EC2 instance in AWS cloud. Every volume in Amazon EBS gets automatically replicated inside the availability zone to protect the user from potential components faults, guaranteeing high availability and durability. Amazon EBS volumes offer the needed performance in terms of consistency and low latency to manage the workload. With Amazon EBS, it is possible to increase and decrease in few minutes the resources: this will result in a cost reduction since only the effective usage gets paid.

Let us head to Volumes and create a new one.

The screenshot shows the 'Create Volume' wizard on the AWS Management Console. The configuration fields are as follows:

- Volume Type:** General Purpose SSD (gp2)
- Size (GiB):** 100 (Min: 1 GiB, Max: 16384 GiB)
- IOPS:** 300 / 3000 (Baseline of 3 IOPS per GiB with a minimum of 100 IOPS, burstable to 3000 IOPS)
- Availability Zone:** us-east-1b
- Throughput (MB/s):** Not applicable
- Snapshot ID:** snap-05280d4c732759856
- Encryption:** Encrypt this volume (checkbox checked)
- Tags:** A tag named 'windows-additional-volume' is added with a value of 'volume'.

\* Required

Cancel **Create Volume**

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What interests us is the snapshot ID. We browse among them and pick the one we previously created. Ultimately we insert the usual tag and create the volume.

At this point, we select “Volumes” and choose the one we created. We then attach it to an instance.

The screenshot shows the AWS EC2 Dashboard with the 'Volumes' section selected. A modal window titled 'Attach Volume' is open, showing the following details:

- Volume:** vol-0420ac5a3ce26222b (windows-additional-volume) in us-east-1a
- Instance:** i-0ac3427f4835e51c1 in us-east-1a
- Device:** xvdf

Below the modal, a detailed view of the volume's properties is shown:

Volume ID	vol-0420ac5a3ce26222b	Alarm status	None
Size	100 GB	Snapshot	snap-05280d4c732759856
Created	July 13, 2019 at 2:41:15 PM UTC+2	Availability Zone	us-east-1a
State	available	Encryption	Not Encrypted
Attachment information		KMS Key ID	
Volume type	gp2	KMS Key Aliases	
Product codes	marketplace: ["intrinsicAmiProperties": {"virt-	KMS Key ARN	

Chosen the instance, we attach it.

The second unsatisfied point is: IAM Role).

## 2.6.2 Create an IAM role

AWS developed IAM roles to allow the applications to securely run API's instances requests without any need for applications' credentials management. Instead of creating and distributing AWS credentials, we can authorise API requests using IAM roles.

We tried to attach "I am role" but there isn't any so we selected create new role.

Now we pick the service that will use this role: EC2.

Create role

Select type of trusted entity

- AWS service** EC2, Lambda and others
- Another AWS account Belonging to you or 3rd party
- Web identity Cognito or any OpenID provider
- SAML 2.0 federation Your corporate directory

Allows AWS services to perform actions on your behalf. [Learn more](#)

Choose the service that will use this role

**EC2**  
Allows EC2 instances to call AWS services on your behalf.

**Lambda**  
Allows Lambda functions to call AWS services on your behalf.

API Gateway	Comprehend	EMR	Kinesis	S3
AWS Backup	Config	ElastiCache	Lambda	SMS
AWS Support	Connect	Elastic Beanstalk	Lex	SNS
Amplify	DMS	Elastic Container Service	License Manager	SWF
AppSync	Data Lifecycle Manager	Elastic Transcoder	Machine Learning	SageMaker

\* Required [Cancel](#) [Next: Permissions](#)

Create role

▼ Attach permissions policies

Choose one or more policies to attach to your new role.

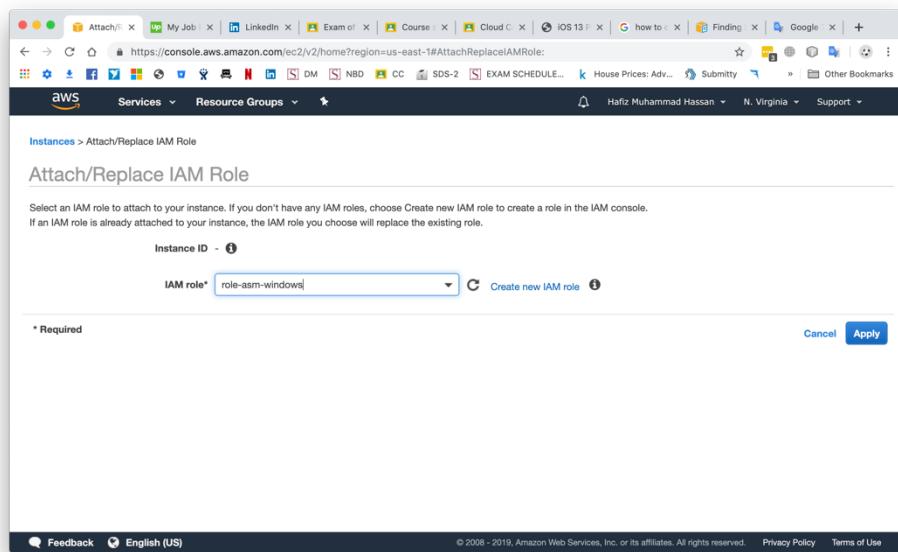
[Create policy](#)

Filter policies		Search	Showing 540 results
	Policy name	Used as	Description
<input type="checkbox"/>	AdministratorAccess	Permissions policy (1)	Provides full access to AWS services an...
<input type="checkbox"/>	AlexaForBusinessDeviceSetup	None	Provide device setup access to AlexaFor...
<input type="checkbox"/>	AlexaForBusinessFullAccess	None	Grants full access to AlexaForBusiness r...
<input type="checkbox"/>	AlexaForBusinessGatewayExecution	None	Provide gateway execution access to Al...
<input type="checkbox"/>	AlexaForBusinessNetworkProfileServicePolicy	None	This policy enables Alexa for Business to...
<input type="checkbox"/>	AlexaForBusinessReadOnlyAccess	None	Provide read only access to AlexaForBu...
<input type="checkbox"/>	AmazonAPIGatewayAdministrator	None	Provides full access to create/edit/delete...
<input type="checkbox"/>	AmazonAPIGatewayInvokeFullAccess	None	Provides full access to invoke APIs in A...

\* Required [Cancel](#) [Previous](#) [Next: Tags](#)

In the “Attach permissions policy” page we do not pick any policy but leave the default value.

We have not attached any tag. But we have created name for the role which was role-asm-windows. Now I am able to select the role to attach it to currently available instance.



We select the IAM role to link to the instance, then click on Apply.

Name	aws:autoscaling:groupName	Instance ID	Instance Type	Availability Zone	Instance State	Status
windows-simple-instance	win-autoscall-group	i-0ac3427f4835e51c1	t2.micro	us-east-1a	running	2/2
windows-instance-ms-sql-cc		i-01f3d0ce1ac97dd8e	t2.micro	us-east-1a	running	2/2

Instance state	running	IPv4 Public IP	34.201.58.2
Instance type	t2.micro	IPv6 IPs	-
Elastic IPs		Private DNS	ip-172-31-88-206.ec2.internal
Availability zone	us-east-1a	Private IPs	172.31.88.206
Security groups	launch-wizard-1, view inbound rules, view outbound rules	Secondary private IPs	
Scheduled events	No scheduled events	VPC ID	vpc-c3ee82b9
AMI ID	Windows_Server-2019-English-Full-Base-2019.06.12 (ami-09ef280df1a6a5330)	Subnet ID	subnet-39297717
Platform	windows	Network interfaces	eth0
IAM role	role-asn-windows	Source/dest. check	True
Key pair name	windows-key-pair-to-generate-	T2/T3 Unlimited	Disabled

As we can see, when a new instance is created from another one already provided with an IAM role, the new one keeps the same role.

IAM roles allow applications to securely run API's requests from instances without a need for security credentials management.

To set up Auto-Scaling, we must firstly configure the Load Balancer.

## 2.6.3 Load Balancer

The Load Balancer allows us to balance the workload.

As is intelligible from the definition, this service permits us to authorize automatic horizontal and vertical Scaling.

Firstly Load Balancers must be created **Load Balancing -> Load Balancers** and create a new Load Balancer.

Since our project is a

The screenshot shows the AWS Elastic Load Balancing 'Select load balancer type' wizard. At the top, there's a navigation bar with links like Services, Resource Groups, and Support. Below the navigation bar, the main content area has three cards:

- Application Load Balancer**: Features a circle icon with 'HTTP HTTPS' and a 'Create' button. A descriptive text block explains it's for web applications with HTTP and HTTPS traffic, operating at the request level. A 'Learn more >' link is provided.
- Network Load Balancer**: Features a circle icon with 'TCP TLS UDP' and a 'Create' button. A descriptive text block explains it's for ultra-high performance with TLS offloading, centralized certificate deployment, and support for UDP. A 'Learn more >' link is provided.
- Classic Load Balancer**: Features a dark grey header and a 'Create' button. A descriptive text block says it's for 'PREVIOUS GENERATION' for HTTP, HTTPS, and TCP. It's for existing applications in the EC2-Classic network. A 'Learn more >' link is provided.

At the bottom of the page, there are footer links for Feedback, English (US), Privacy Policy, and Terms of Use. A 'Cancel' button is also visible.

website, we'll pick a balanced workload over HTTP/HTTPS.

We set up the values as shown in the following figures:

The screenshot shows the AWS EC2 Create Load Balancer Wizard Step 1: Configure Load Balancer. The 'Name' field is set to 'windows-load-balancer'. The 'Scheme' dropdown has 'internet-facing' selected. The 'IP address type' dropdown is set to 'ipv4'. There are tabs for 1. Configure Load Balancer, 2. Configure Security Settings, 3. Configure Security Groups, 4. Configure Routing, 5. Register Targets, and 6. Review.

## Step 1: Configure Load Balancer

### Basic Configuration

To configure your load balancer, provide a name, select a scheme, specify one or more listeners, and select a network. The default configuration is an Internet-facing load balancer in the selected network with a listener that receives HTTP traffic on port 80.

Name	<input type="text" value="windows-load-balancer"/>
Scheme	<input checked="" type="radio"/> internet-facing <input type="radio"/> internal
IP address type	<input type="text" value="ipv4"/>

### Listeners

A listener is a process that checks for connection requests, using the protocol and port that you configured.

Load Balancer Protocol	Load Balancer Port
HTTP	80
HTTPS (Secure HTTP)	443

[Add listener](#)

[Cancel](#) [Next: Configure Security Settings](#)

The screenshot shows the AWS EC2 Create Load Balancer Wizard Step 1: Configure Load Balancer. Under 'Availability Zones', several subnets are listed with their assigned IPv4 addresses:

- us-east-1a: subnet-39297717 (Assigned by AWS)
- us-east-1b: subnet-ad9576e0 (Assigned by AWS)
- us-east-1c: subnet-ff500ca3 (Assigned by AWS)
- us-east-1d: subnet-fae0b09d (Assigned by AWS)
- us-east-1e: subnet-1451362a (Assigned by AWS)
- us-east-1f: subnet-d87663d7 (Assigned by AWS)

There is a 'Tags' section and a 'Next: Configure Security Settings' button at the bottom.

We chose the name windows-load-balancer the remaining are default values. Availability Zones are Virginia sub-areas. For the sake of security and completeness, we left them unchanged.

The listening port is just the HTTP, since the HTTPS requires a certificate in the following phase, with an additional cost.

Then we choose the default VPC for the created instance and enable every subnet. We skip Security Settings configuration and proceed to Configure Security Groups. As usual we recur to the previously created one.

**Step 3: Configure Security Groups**

A security group is a set of firewall rules that control the traffic to your load balancer. On this page, you can add rules to allow specific traffic to reach your load balancer. First, decide whether to create a new security group or select an existing one.

Assign a security group:

- Create a new security group
- Select an existing security group

Security Group ID	Name	Description	Actions
sg-92ba03c8	default	default VPC security group	<a href="#">Copy to new</a>
sg-0e762a860ebbeb92b0	launch-wizard-1	launch-wizard-1 created 2019-06-30T15:01:59.427+02:00	<a href="#">Copy to new</a>
sg-07633dbf8ea3281f1	launch-wizard-2	launch-wizard-2 created 2019-06-30T16:58:19.022+02:00	<a href="#">Copy to new</a>
sg-0f3e2ef64e2e26fd	launch-wizard-3	launch-wizard-3 created 2019-06-30T18:57:38.564+02:00	<a href="#">Copy to new</a>

[Cancel](#) [Previous](#) [Next: Configure Routing](#)

We set up the Routing as follows:

- We create a new Target Group and set up the name.
- We leave Instance as target type, the others requires too complicated setups, and we do not need them right now.
- We use the HTTP protocol.
- We set up the Path to reach our site. So we choose / as default path. Next, we add our instance to the registered targets:

**Step 5: Register Targets**

Register targets with your target group. If you register a target in an enabled Availability Zone, the load balancer starts routing requests to the targets as soon as the registration process completes and the target passes the initial health checks.

**Registered targets**

To deregister instances, select one or more registered instances and then click Remove.

Remove	Instance	Name	Port	State	Security groups	Zone
<input type="checkbox"/>	i-0ac3427f4835e51c1	windows-simple-instance	80	<span style="color: green;">● running</span>	launch-wizard-1	us-east-1a

**Instances**

To register additional instances, select one or more running instances, specify a port, and then click Add. The default port is the port specified for the target group. If the instance is already registered on the specified port, you must specify a different port.

Add to registered	on port 80						
<input type="checkbox"/>	Search Instances <input type="text"/>						
Instance	Name	State	Security groups	Zone	Subnet ID	Subnet CIDR	
<input checked="" type="checkbox"/>	i-0ac3427f4835e51c1	windows-simple-instance	<span style="color: green;">● running</span>	launch-wizard-1	us-east-1a	subnet-39297717	172.31.80.0/20
<input type="checkbox"/>	i-01f3d0ce1ac97d...	windows-instance-ms-sql-cc	<span style="color: green;">● running</span>	launch-wizard-3	us-east-1a	subnet-39297717	172.31.80.0/20

[Cancel](#) [Previous](#) [Next: Review](#)

We did it by picking the instance and adding it through **Add to register**; then it automatically inserts it to **Registered targets**. It has moreover been necessary to register the instance. We continue with the summary and create the load balancer.

The shown result will be the following:

## 2.6.4 Create the Auto Scaling

I have already created autoscaling groups and launch configuration. Here are some screenshots of that.

The screenshot shows the AWS Auto Scaling console interface. On the left, there is a navigation sidebar with various service links like EC2, Inst..., My..., Link..., Exam..., Col..., iOS..., aws..., AWS..., Goo..., YouTube..., and New Tab... The main content area has a header "Services" and "Resource Groups". A prominent callout box says "Save up to 90% on Compute" with a subtext about optimizing costs. Below it is a "Create Auto Scaling group" button and an "Actions" dropdown. A table lists one Auto Scaling group: "win-autoscall-g..." with "win-autoscall-group" as its name. The table includes columns for Name, Launch Configuration, Instances, Desired, Min, Max, Availability Zones, Default Cooldown, and Health Check Grace. The "Availability Zones" column shows "us-east-1a, us-east-1b, us-e...". The "Default Cooldown" is set to 300 and "Health Check Grace" is 0. At the bottom, there's a footer with "Feedback", "English (US)", "© 2008 - 2019, Amazon Web Services, Inc. or its affiliates. All rights reserved.", "Privacy Policy", and "Terms of Use".

Screenshot of the AWS Auto Scaling Groups management console showing the Instances tab for the 'win-autoscall-group'.

**Instances Tab:**

Name	Launch Configuration /	Instances	Desired	Min	Max	Availability Zones	Default Cooldown	Health Check Grace Period
win-autoscall-g...	win-autoscall-group	2	2	2	4	us-east-1a, us-east-1b, us-e...	300	0

**Instances List:**

Instance ID	Lifecycle	Launch Configuration / Template	Availability Zone	Health Status	Protected from
i-0ac3427f4835e51c1	InService	win-autoscall-group	us-east-1a	Healthy	
i-0e27f8c4bdc913e20	InService	win-autoscall-group	us-east-1b	Healthy	

---

Screenshot of the AWS Auto Scaling Groups management console showing the Launch Configuration details for the 'win-autoscall-group'.

**Launch Configuration Details:**

Name	Launch Configuration /	Instances	Desired	Min	Max	Availability Zones	Default Cooldown	Health Check Grace Period
win-autoscall-g...	win-autoscall-group	2	2	2	4	us-east-1a, us-east-1b, us-e...	300	0

**Configuration Options:**

- Launch Configuration:** win-autoscall-group
- Desired Capacity:** 2
- Min:** 2
- Max:** 4
- Availability Zone(s):** us-east-1a, us-east-1b, us-east-1c, us-east-1d, us-east-1e, us-east-1f
- Subnet(s):** subnet-39297717, subnet-f500ca3, subnet-ad9576e0, subnet-d87663d7, subnet-fae0b09d, subnet-1451362a
- Classic Load Balancers:** (None)
- Target Groups:** (None)
- Health Check Type:** EC2
- Health Check Grace Period:** 0
- Instance Protection:** (None)
- Termination Policies:** Default
- Suspended Processes:** (None)
- Placement Groups:** (None)
- Default Cooldown:** 300
- Enabled Metrics:** (None)

As you can see minimum instances is 2 and Max is 4 and Desired are 2. It will automatically create more instances based on that.

The screenshot shows the AWS Auto Scaling console with the URL <https://console.aws.amazon.com/ec2/autoscaling/home?region=us-east-1#LaunchConfigurations:id=win-autoscall-group>. The left sidebar lists various AWS services like Reserved Instances, Dedicated Hosts, Scheduled Instances, Capacity Reservations, AMIs, ELASTIC BLOCK STORE, NETWORK & SECURITY, LOAD BALANCING, and AUTO SCALING (with Launch Configurations selected). The main content area displays a 'Save up to 90% on Compute' banner and a table for 'Launch Configuration: win-autoscall-group'. The table shows one entry: Name: win-autoscall-group, AMI ID: ami-09ef280df..., Instance Type: t2.micro, and Creation Time: June 30, 2019 at 4:01:25 PM U... A 'Details' tab is open, showing configuration details: AMI ID (ami-09ef280df1a6a5330), IAM Instance Profile (Key Name: windows-key-pair-to-generate-password, EBS Optimized: false, RAM Disk ID: -), and Instance Type (t2.micro). Other fields include Kernel ID, Monitoring (true), Security Groups (sg-0e762a860ebcb92b0), Creation Time (Sun Jun 30 16:01:25 GMT+200 2019), and Block Devices (-). A 'Copy launch configuration' button is visible.

Name	AMI ID	Instance Type	Spot Price	Creation Time
win-autoscall-group	ami-09ef280df...	t2.micro		June 30, 2019 at 4:01:25 PM U...

Above I just assigned the windows instance which is running our website.

Recall that, through the image, we can launch our instance over different areas and, repeating the previous steps, we can replicate that service.

Ultimately, we can prove the success of our auto scaling as follows. To prove autoscaling feature I have defined a **Simple Scaling Policy** based on CPU utilization. If CPU utilization is greater than 75% for more than a minute it will automatically create new instance. I have attached some screenshots to prove that.

EC2 Dashboard      Services      Resource Groups

[Create Auto Scaling group](#)    Actions

Filter:  Filter Auto Scaling groups...

Name	Launch Configuration /	Instances	Desired	Min	Max	Availability Zones	Default Cooldown	Health Check Gr...
win-autoscall-g...	win-autoscall-group	4	4	2	4	us-east-1a, us-east-1b, us-e...	300	0

win-autoscall-group

CPU Utilization (Percent)

Disk Reads (Bytes)

Disk Read Operations (Operations)

Disk Writes (Bytes)

Disk Write Operations (Operations)

Network In (Bytes)

Network Out (Bytes)

Status Check Failed (Any) (Count)

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EC2 Dashboard      Services      Resource Groups

[Create Auto Scaling group](#)    Actions

Filter:  Filter Auto Scaling groups...

Name	Launch Configuration /	Instances	Desired	Min	Max	Availability Zones	Default Cooldown	Health Check Gr...
win-autoscall-g...	win-autoscall-group	4	4	2	4	us-east-1a, us-east-1b, us-e...	300	0

Auto Scaling Group: win-autoscall-group

Instances

Actions

Filter: Any Health Status    Any Lifecycle State     Filter instances...

Instance ID	Lifecycle	Launch Configuration / Template	Availability Zone	Health Status	Protected from
i-04e8811c3f814a033	InService	win-autoscall-group	us-east-1c	Healthy	
i-0a52d4c5fad0cda3f	InService	win-autoscall-group	us-east-1e	Healthy	
i-0ac34274835e51c1	InService	win-autoscall-group	us-east-1a	Healthy	
i-0e27f8c4bcd913e20	InService	win-autoscall-group	us-east-1b	Healthy	

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Screenshot of the AWS EC2 Instances page showing a list of running instances. The search bar filters by 'aws:autoscaling:groupName'. The table includes columns for Name, Instance ID, Instance Type, Availability Zone, Instance State, Status Checks, and Alarm State.

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm State
win-autoscall-group	i-04e8811c3f814a033	t2.micro	us-east-1c	running	2/2 checks ...	None
win-autoscall-group	i-0a52d4c5fa00cdaf3f	t2.micro	us-east-1e	running	2/2 checks ...	None
win-autoscall-group	i-0e27f8c4bdc913e20	t2.micro	us-east-1b	running	2/2 checks ...	None
windows-simple-instance	i-0ac3427f4835e51c1	t2.micro	us-east-1a	running	2/2 checks ...	None
windows-instance-ms-sql-cc	i-01f3d0ce1ac97dd8e	t2.micro	us-east-1a	running	2/2 checks ...	None

Select an instance above

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Screenshot of the AWS Auto Scaling Groups page showing a single group named 'win-autoscall-g...'. The table includes columns for Name, Launch Configuration, Instances, Desired, Min, Max, Availability Zones, Default Cooldown, and Health Check Grace.

Name	Launch Configuration	Instances	Desired	Min	Max	Availability Zones	Default Cooldown	Health Check Grace
win-autoscall-g...	win-autoscall-group	4	4	2	4	us-east-1a, us-east-1b, us-e...	300	0

Auto Scaling Group: win-autoscall-group

Scaling Policies Instances Monitoring Notifications Tags Scheduled Actions Lifecycle Hooks

Add policy

**Scaling-policy-action**

Policy type: Simple scaling  
 Execute policy when: awsec2-win-autoscall-group-CPU-Utilization  
 breaches the alarm threshold: CPUUtilization >= 75 for 60 seconds  
 for the metric dimensions AutoScalingGroupName = win-autoscall-group  
 Take the action: Add 1 instances  
 And then wait: 300 seconds before allowing another scaling activity

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The screenshot shows the AWS CloudWatch Alarms interface. On the left sidebar, under the 'Alarms' section, there is a red notification bubble with the number '1'. The main area displays a single alarm named 'awsec2-win-autoscall-group-CPU-Utilization'. The alarm is currently in an 'In alarm' state, indicated by a red warning icon. The condition for the alarm is 'CPUUtilization >= 75 for 1 datapoints within 1 minute'. The alarm was created on July 13, 2019, at 15:45:02 UTC+2.

## 2.7 Test

We tested our VMs to prove that our application complies with the required conditions. The controls we ran are following:

- Test over the CPU.
- Test over the internet traffic.
- Test over the disk

Every test satisfies AR1 e AR2 requirements.

Before the execution, we configured Cloud Watch to monitor the VMs state in case of stress.

### 2.7.1 Cloud Watch

We created a Monitoring environment using Cloud Watch.  
(the collected datapoint are available for 3 hours after they are recorded).  
We decided to create a Dashboard with the following metrics:

- CPUUtilization,
- DiskReadOps, and DiskWriteOps,
- DiskReadBytes, and DiskWriteBytes.
- Network in and out

## 2.7.1 Preview

Before we start describing the tests, we inform the reader that each paragraph was structured as follows:

- Why do we run the test?
- Which software was used to test the application?
- What is reported:
  - By the VM prompt
  - By Cloud Watch
- Does it exists a condition because of which the system completely fail?
- If yes, what does it report? And which are the sufficient parameters to do that?

We won't explain every general command seen at lesson.

## 2.7.2 CPU test

We tried to overload the CPU, since we do not know if the system would have to provide a computing service someday.

Those tests were run resorting to HeavyLoad software, which we installed on a VM linked to the Auto Scaling Group.

We start from this situation:

The screenshot shows the AWS EC2 Instances page. On the left, there's a sidebar with links like EC2 Dashboard, Events, Tags, Reports, Limits, Instances (which is selected), Launch Templates, Spot Requests, Reserved Instances, Dedicated Hosts, Scheduled Instances, Capacity Reservations, Images, AMIs, Bundle Tasks, Elastic Block Store, Volumes, Snapshots, Lifecycle Manager, and Network & Security. The main content area has tabs for Launch Instance, Connect, and Actions. A search bar says "Filter by tags and attributes or search by keyword". Below it is a table with columns: Name, Instance ID, Instance Type, Availability Zone, Instance State, Status Checks, and Alarm State. The table lists three instances:

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm State
win-autoscall-group	i-0e27f8c4bcd913e20	t2.micro	us-east-1b	running	2/2 checks ...	None
windows-simple-instance	i-0ac3427f4835e51c1	t2.micro	us-east-1a	running	2/2 checks ...	None
windows-instance-ms-sql-cc	i-01f3d0ce1ac97dd8e	t2.micro	us-east-1a	running	2/2 checks ...	None

Select an instance above

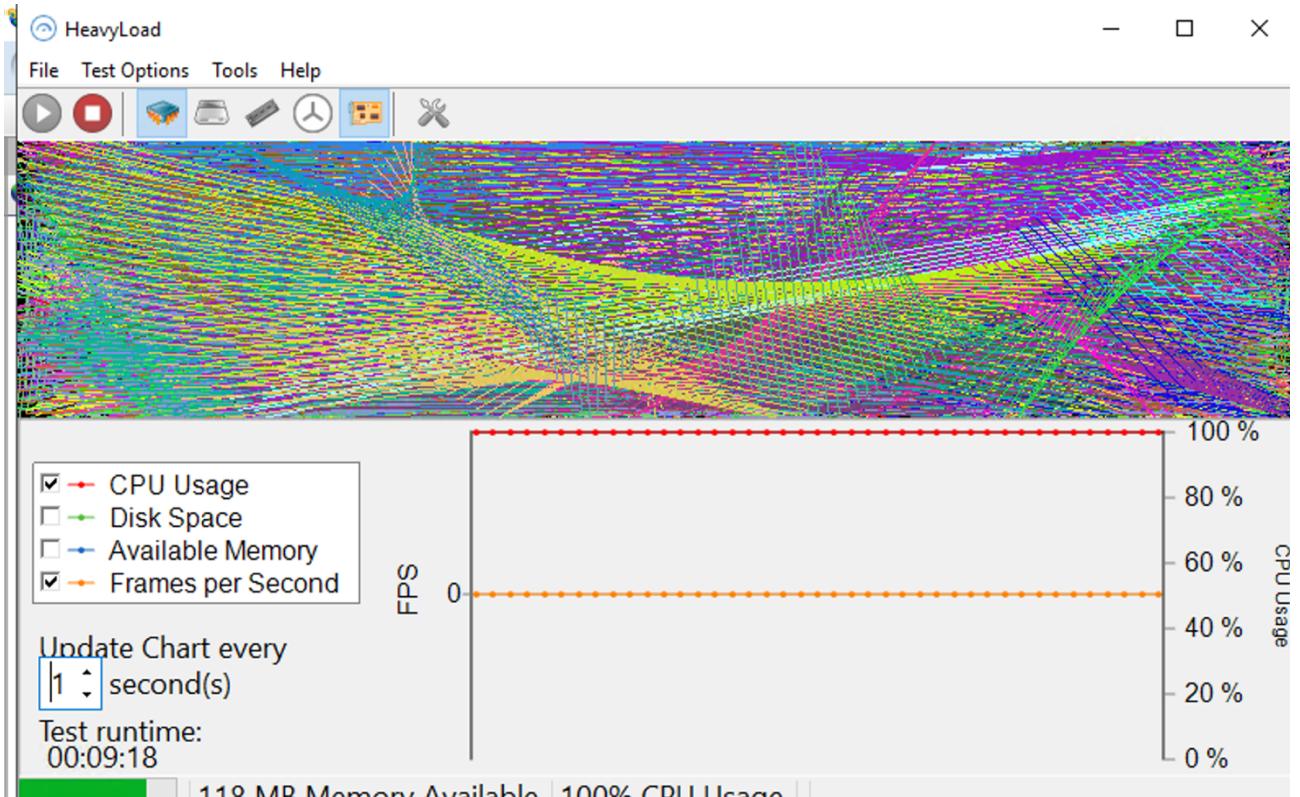
There are three launched instances. Below is depicted the Auto Scaling Group history, which shows the actions chronology, allowing us to store them and figure out any workload peak.

The screenshot shows the AWS Auto Scaling Groups page. The sidebar is identical to the previous one. The main content area has tabs for Create Auto Scaling group, Actions, and Activity History. The Activity History tab is selected. It shows a table with columns: Name, Launch Configuration, Instances, Desired, Min, Max, Availability Zones, Default Cooldown, and Health Check Grace. One row is shown for the group "win-autoscall-g...". Below this is a section titled "Auto Scaling Group: win-autoscall-group" with tabs for Details, Activity History, Scaling Policies, Instances, Monitoring, Notifications, Tags, Scheduled Actions, and Lifecycle Hooks. The Activity History tab is selected. It shows a table with columns: Status, Description, Start Time, and End Time. Seven history items are listed:

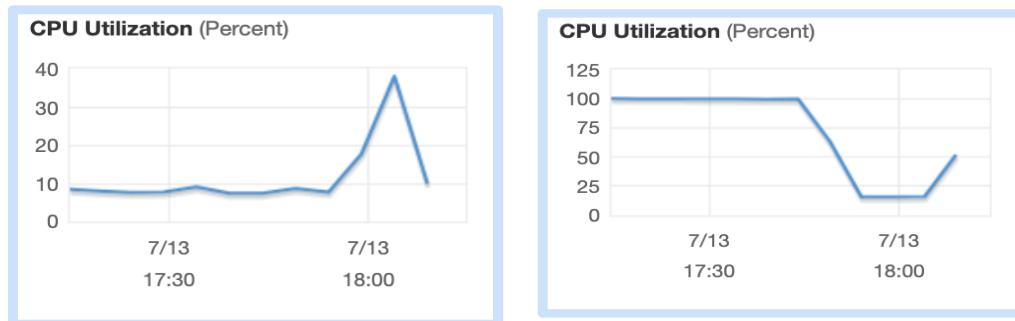
Status	Description	Start Time	End Time
Successful	Launching a new EC2 instance: i-0e27f8c4bcd913e20	2019 July 13 15:44:28 UTC+2	2019 July 13 15:45:02 UTC+2
Successful	Terminating EC2 instance: i-03b4008139ce14366	2019 July 13 15:43:56 UTC+2	2019 July 13 15:43:59 UTC+2
Successful	Launching a new EC2 instance: i-03b4008139ce14366	2019 July 13 15:33:53 UTC+2	2019 July 13 15:34:25 UTC+2
Successful	Terminating EC2 instance: i-0cedacb1080b84f1f	2019 June 30 19:28:35 UTC+2	2019 June 30 19:28:36 UTC+2
Successful	Launching a new EC2 instance: i-0ac3427f4835e51c1	2019 June 30 19:27:36 UTC+2	2019 June 30 19:28:09 UTC+2
Cancelled	Launching a new EC2 instance: i-0ff422c7f91fde109	2019 June 30 19:26:07 UTC+2	2019 June 30 19:26:38 UTC+2
Successful	Attaching an existing EC2 instance: i-0cedacb1080b...	2019 June 30 16:01:26 UTC+2	2019 June 30 16:01:28 UTC+2

After connecting to the instance, we installed the HeavyLoad to test the CPU usage. It is the best software for testing simple CPU utilization.

This was the answer:



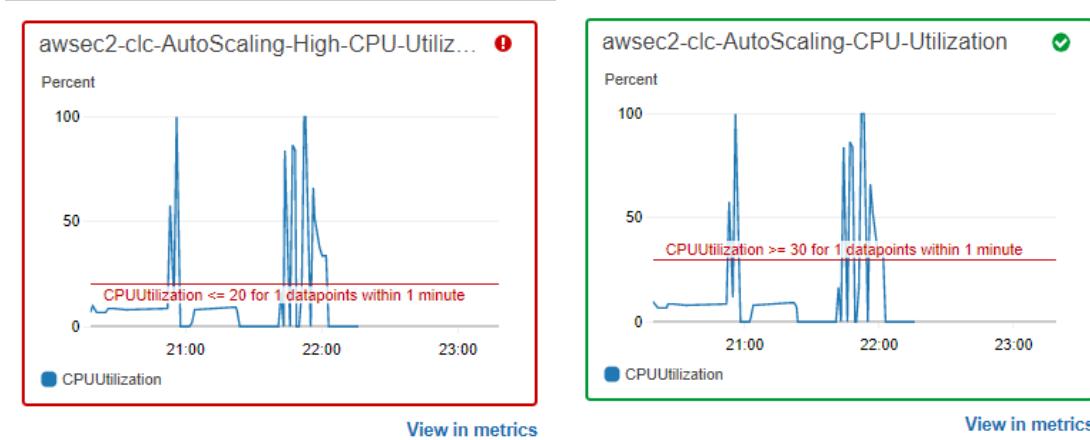
In the figure we see that the instance never went down, but there has been a peak in the CPU usage request, as shown in the Cloud Watch plots below.



Those plots allow us to identify peaks of CPU usage and so on. Ultimately we show how the Auto-Scaling works, creating new instances when the workload increases.

Every stopped instance was replaced by a new one, as previously seen. It's fundamental to figure out that: the broken instances are the ones which were interrupted due to stress; nevertheless, running the command again and stressing the running ones, they get stopped.

Let us proceed noting that this event was reported by our alarm, which notifies when the CPU overtakes the limit.



We set up two different values for the CPU usage, maintaining the same tests.

Thanks to what we showed, we proved that our system satisfies the two requirements regarding the CPU stress.

Now our attention is focused on the following question: does it exits a CPU stress so high to provoke a collapse of the whole system?

The answer is: yes. The system, naturally will never fully collapse, the service will just be off for a brief period of time. This is unavoidable since, in our opinion, it is necessary to carry out an analysis, preceding the system creation, which allows to define the maximum and the minimum load that will occur. We have also decided to setup an alarm when CPU usage goes to 100 percent for 3 minutes. Then CloudWatch was showing me this notification.

The screenshot shows the AWS CloudWatch Alarms page. On the left sidebar, under the 'Alarms' section, there is a red notification badge with the number '1'. The main area displays a table of alarms:

Name	State	Conditions	Actions
TargetTracking-win-autoscall-group-AlarmHigh-79da66c8-086b-4824-8e36-6143b2d4b199	OK	CPUUtilization > 100 for 3 datapoints within 3 minutes	Valid

At the top right, there are buttons for 'Create alarm', 'Action', and 'Switch to your original interface'. The bottom of the page includes standard AWS footer links like Feedback, English (US), and copyright information.

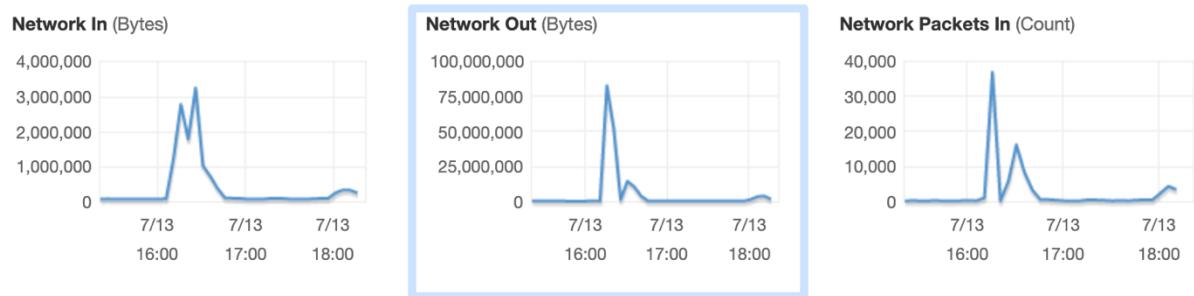
For us for peaks point CPU never crashed using above software. It's essential to understand that those tests are strictly necessary to gain knowledge about the limits of an application and its usage.

## 2.7.3 Stress Network

Our application is a front site so it's mandatory to test it over the network, on traffic in particular. To execute this tests we used Online Tool named Load Impact. Here are the result of its stress testing.



We'll avoid to descript every single information, we'll focus instead on the data shown by Cloud Watch.



As we can see, our application didn't suffer from any issue, neither scaled. From this point of view, EC2 totally complied with the request to benefit from an elastic service capable of sustaining large quantities of requests from the website.

Just like the CPU tests, it is not necessary to run them on every VM.

Ultimately, what's the http requests quantity that could jeopardize our system capacity to cope with the workload?

## 2.7.4 Stress Disk

As we do not know if our application will have to manage big volumes of data and how much will the site be augmented by the file dimension point of view (html pages), we decided to run a disk test that allows us to evaluate the instance behavior. To test the application we ran a Diskspd, firstly I have used this command.

```
.\diskspd.exe -c5G -d60 -r -w90 -t8 -o8 -b8K -h -L C:\ClusterStorage\Volume1\testfile.dat
```

Parameter	Description
-c5G	-c is the size of the file used. In this case 5 GB which should be as large as possible since a small file will skew the results (because of short stroking)
-d60	-d is the duration of the test, in this case 60 seconds which should be considered the minimum for most tests
-r	-r specifies random IOs, alternatively use -s for sequential
-w90	-w configures the percentage of the IOs that are writes, in this case 90% which would mean 10% reads

-t8           -t is the number of threads per file, in this  
 case 8. For small IOs you should have a large  
 number of threads, ideally equal to the  
 number of cores on the system  
 -o8           Number of outstanding IOs  
 -b8k          Size of the IO. 8KB in this case  
 -h             Disable hardware and software caching

Secondly we ran the second command for the test:

```
.\diskspd.exe -c10G -d100 -r -w90 -t100 -o8 -b8K -h -L C:\ClusterStorage\Volume1\testfile.dat
```

I just changed the file size to 10G and ran it for 100s.

Here's the result:

```
Administrator: Windows PowerShell

Command Line: C:\Users\Administrator\Downloads\DiskSpd-2.0.21a\x86\diskspd.exe -c5G -d60 -r -w90 -t8 -o8 -b8K -h -L C:\ClusterStorage\Volume1\testfile.dat

Input parameters:
  timespan: 1
  -----
  duration: 60s
  warm up time: 5s
  cool down time: 0s
  measuring latency
  random seed: 0
  path: 'C:\ClusterStorage\Volume1\testfile.dat'
    think time: 0ms
    burst size: 0
    software cache disabled
    hardware write cache disabled, writethrough on
    performing mix test (read/write ratio: 10/90)
    block size: 8192
    using random I/O (alignment: 8192)
    number of outstanding I/O operations: 8
    thread stride size: 0
    threads per file: 8
    using I/O Completion Ports
    IO priority: normal

System information:
  computer name: EC2AMAZ-6CGVUQN
  start time: 2019/07/13 20:02:15 UTC

Results for timespan 1:
*****
actual test time:      60.01s
thread count:          8
proc count:            1

CPU | Usage | User | Kernel | Idle
----|---|---|---|---
  0| 20.60%| 3.02%| 17.58%| 79.40%
----|---|---|---|---
avg.| 20.60%| 3.02%| 17.58%| 79.40%
----|---|---|---|---
Total IO
```

```

Administrator: Windows PowerShell
PS C:\Users\Administrator\Downloads\DiskSpd-2.0.21a\x86> ./diskspd.exe -c10G -d100 -r -w90 -t100 -o8 -b8K -h -L C:\ClusterStorage\Volume1\testfile.dat

Command Line: C:\Users\Administrator\Downloads\DiskSpd-2.0.21a\x86\diskspd.exe -c10G -d100 -r -w90 -t100 -o8 -b8K -h -L
C:\ClusterStorage\Volume1\testfile.dat

Input parameters:

    timespan: 1
    -----
    duration: 100s
    warm up time: 5s
    cool down time: 0s
    measuring latency
    random seed: 0
    path: 'C:\ClusterStorage\Volume1\testfile.dat'
        think time: 0ms
        burst size: 0
        software cache disabled
        hardware write cache disabled, writethrough on
        performing mix test (read/write ratio: 10/90)
        block size: 8192
        using random I/O (alignment: 8192)
        number of outstanding I/O operations: 8
        thread stride size: 0
        threads per file: 100
        using I/O Completion Ports
        IO priority: normal

System information:

    computer name: EC2AMAZ-6CGVUQN
    start time: 2019/07/13 20:07:07 UTC

Results for timespan 1:
*****
actual test time:      100.00s
thread count:          100
proc count:             1

CPU | Usage | User | Kernel | Idle
---|---|---|---|---
 0 | 16.95%| 1.13%| 15.83%| 83.05%
---|---|---|---|---
avg | 16.95%| 1.13%| 15.83%| 83.05%

```

Namely, information regarding the time taken and similar stuff are shown. We do not describe this data, since trivial, ma but what does not appear to be trivial resides in the way our system reacted to the test, and we are now showing that through Cloud Watch.



As you can see when we were testing our application its read and write throughput get increased. Is there any condition, related to disk memory, due to which our system fails? We cannot answer to this question because, in reality, neither the VM fails when the space is over, but continues to run instead, while a new VM gets instantiated. There is a case in which a system could go down even because but not just due to VM's memory stress: if every VM memory gets filled and the maximum number of VMs is reached, then it suffices a little spark to make the whole system fail.

### **3. Conclusions**

Our infrastructure satisfies every condition and, at the same time, requires much less attention in comparison to a system created and managed by us directly. Furthermore, even the cost is lower than the other one.

Amazon Web Service offers a huge amount of services and is able to lighten the company workload. Lastly, the tests run confirm our idea: the infrastructure resists to a high workload both direct (http requests) and indirect (cpu and space on disk).

We are very satisfied with our work and the site is always online.