Cloud Computing

Iga Karpińska
276372

13.01.2019

1. Introduction

Nowadays, more and more computers require bigger computing power. For that reason the most obvious and easy way is to use cloud computing services.

Cloud computing is the on-demand delivery of compute power, database storage, applications, and other IT resources through a cloud services platform via the internet with pay-as-you-go pricing.

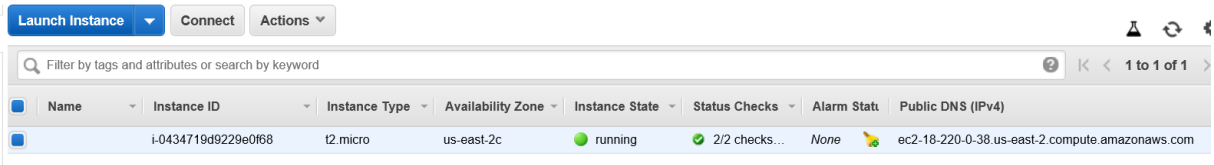
In that case AWS Amazon cloud services was used to compute integral value from example function, determined on existing interval, with use of numerical method.

Computing was created with Amazon EC2 – Elastic Compute Cloud, which provides using serves and configuring security and networking.

2. Obtaining computing instance

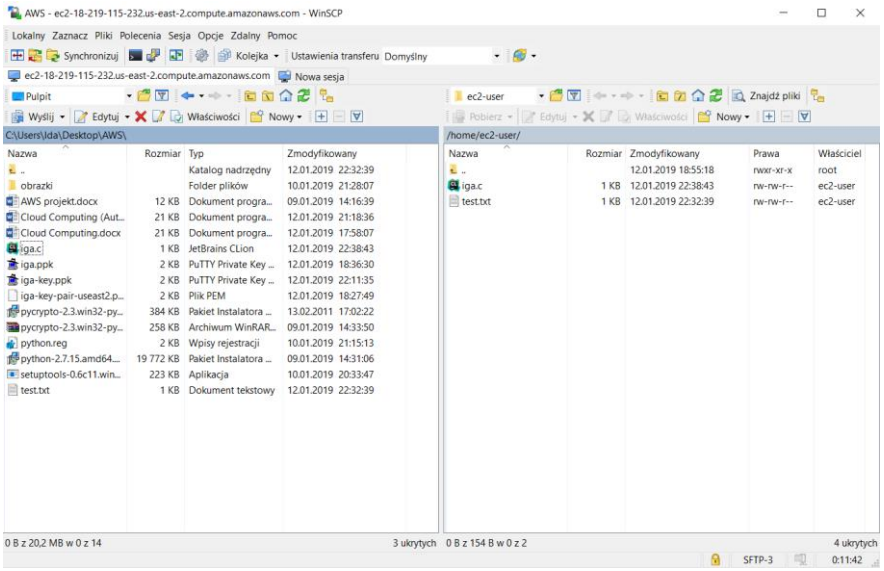
At first, environment was prepared:

- AWS account was created and limited free access to services was granted.
- AWS account was configured (Identity and Access Management user was created, Key Pair was created to provide the connection with the instance, Virtual Private Cloud and Security Group were created).
- EC2 instance was launched with the following settings:



Instance ID	i-0434719d9229e0f68	Public DNS (IPv4)	ec2-18-220-0-38.us-east-2.compute.amazonaws.com
Instance state	running	IPv4 Public IP	18.220.0.38
Instance type	t2.micro	IPv6 IPs	-
Elastic IPs		Private DNS	ip-172-31-46-228.us-east-2.compute.internal
Availability zone	us-east-2c	Private IPs	172.31.46.228
Security groups	default. view inbound rules. view outbound rules	Secondary private IPs	
Scheduled events	No scheduled events	VPC ID	vpc-50767738
AMI ID	amzn2-ami-hvm-2.0.20190110-x86_64-gp2 (ami-049ceee18ac22d417)	Subnet ID	subnet-56af611a
Platform	-	Network interfaces	eth0
IAM role	-	Source/dest. check	True
Key pair name	iga-key-pair-useast2	T2/T3 Unlimited	Disabled
Owner	719436404418	EBS-optimized	False
Launch time	January 13, 2019 at 8:20:30 AM UTC+1 (less than one hour)	Root device type	ebs
Termination protection	False	Root device	/dev/xvda
Lifecycle	normal	Block devices	/dev/xvda

- PuTTY application was installed and connected with AWS instance.
- WinSCP application was installed and connected with AWS instance to provide better visibility and make the use of PuTTY easier.

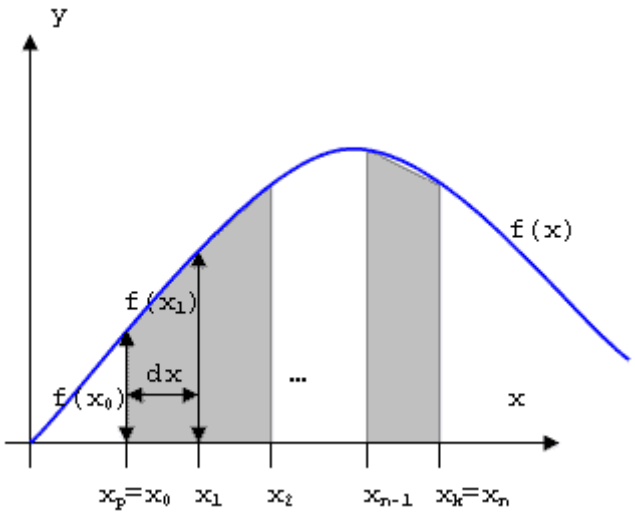


3. Script

While the environment was prepared, the attention was put into providing the code for determined type of computing. Code was prepared using C language and was able to compute the following integral with different options for the number of iterations:

$$\int_0^{10} x^2 dx$$

Integral was computed using numerical method, which sums the area of trapezes determined under the line of the function.



The analytical result of the presented integral is:

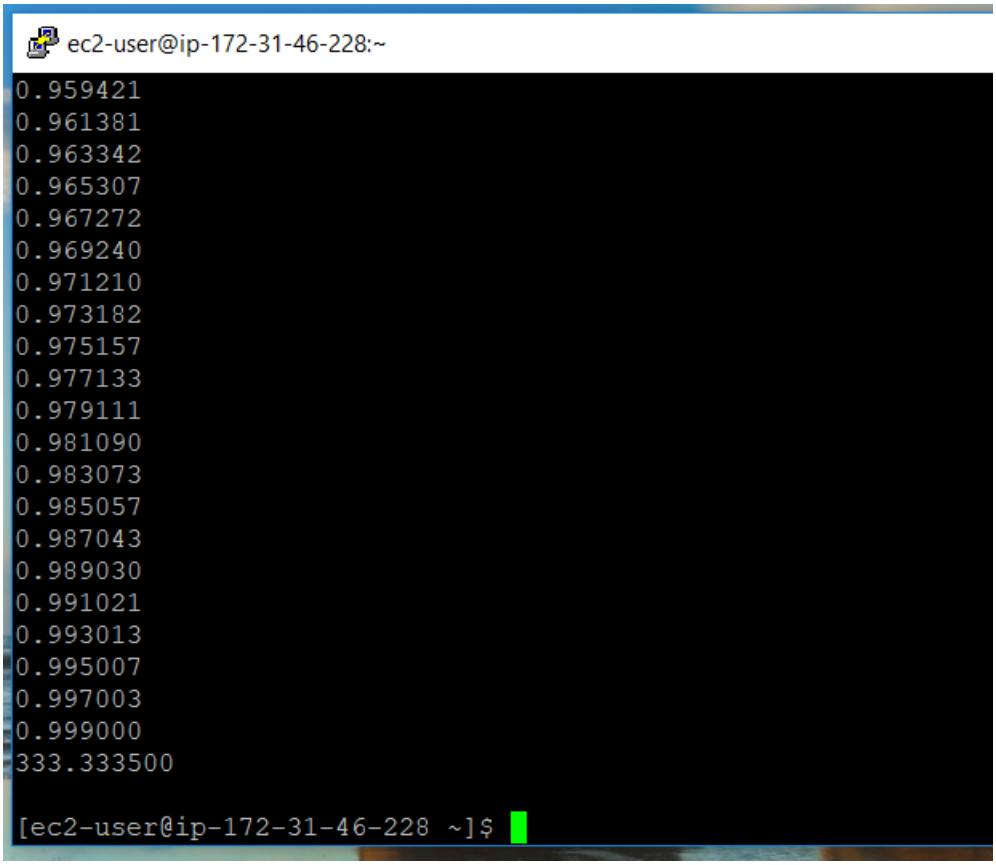
$$\int_0^{10} x^2 dx = \frac{1000}{3} = 333,(3)$$

The number was compared with the output of the prepared program for different options of iterations using trapezes method. Results of the analytics are presented in the last part of this report.

There appeared the need to install gcc complier to provide the ability to compute. Gcc complier was installed and after compilation, current user achieved the permission to use it.

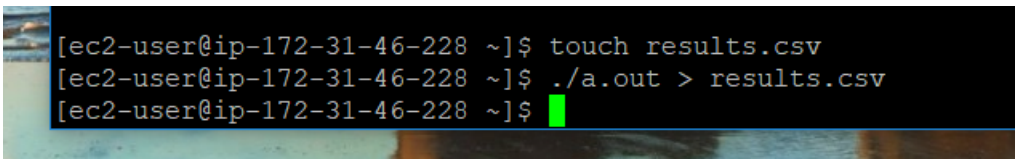
```
[ec2-user@ip-172-31-46-228 ~]$ gcc calka.c
[ec2-user@ip-172-31-46-228 ~]$ chmod +x a.out
[ec2-user@ip-172-31-46-228 ~]$ ./a.out
0.000500
0.002500
0.006500
0.012500
0.020500
0.030500
0.042500
0.056500
0.072500
0.090500
```

The output of the program had the following structure:



4. Results

After computing the results for different options of iterations, the program output was saved in csv file using the following command:



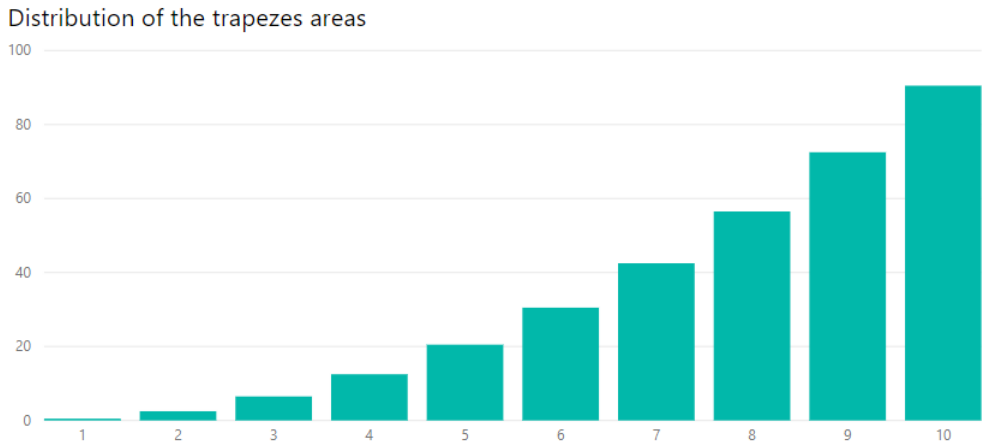
Results were analysed with the use of Microsoft Excel and Power BI software.

Down below is shown the table with the integral value computed:

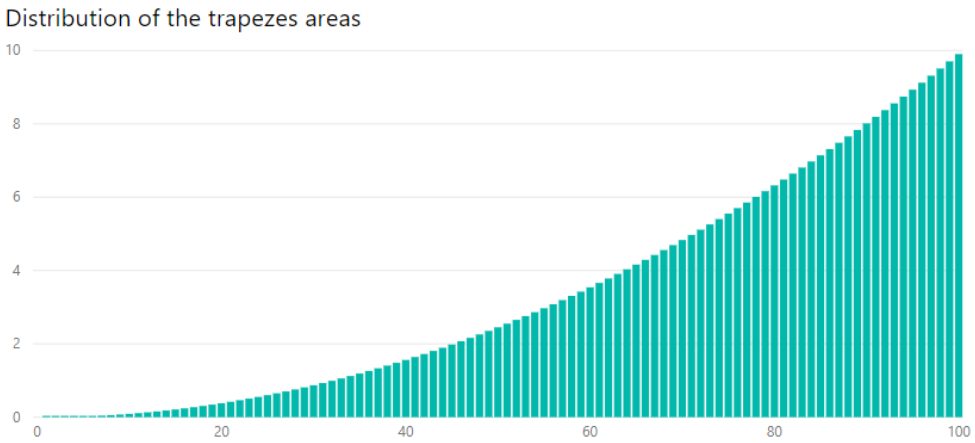
Method	Integral value
10 iterations (trapezes method)	**335.0**
100 iterations (trapezes method)	**333.35**
1000 iteration (trapezes method)	**333.3335**
Analytical result	**333.(3)**

Down below are shown charts showing the distribution of the area which is adding after every iteration:

10 iterations:



100 iterations:



1000 iterations: