Cloud Computing

Activities-2-Report

Supervised by Pr. Chakir El Amrani

Realized by EL GHAZI Loubna

Contents

1-Exercice 1

We used **CloudAnalyst** to simulate the performance and cost of a Cloud Computing platform with the following inputs:

- UB1 (Africa)

- DC1 (Europe), DC2 (N. America)

- Requests per user, per Hour: 100

- Peak hours: 19h – 22h

- Service Broker Policy: Optimize Response Time

- DC1 includes 5 computers, all are 2 Go RAM, 2 cores, 10000 MIPS

- DC2 includes 2 computers, all are 8 Go RAM, 4 cores, 20000 MIPS

- DC1 provides 2 VMs with size 50 Mo, 1 Go RAM, BW 1000 (bytes/s)

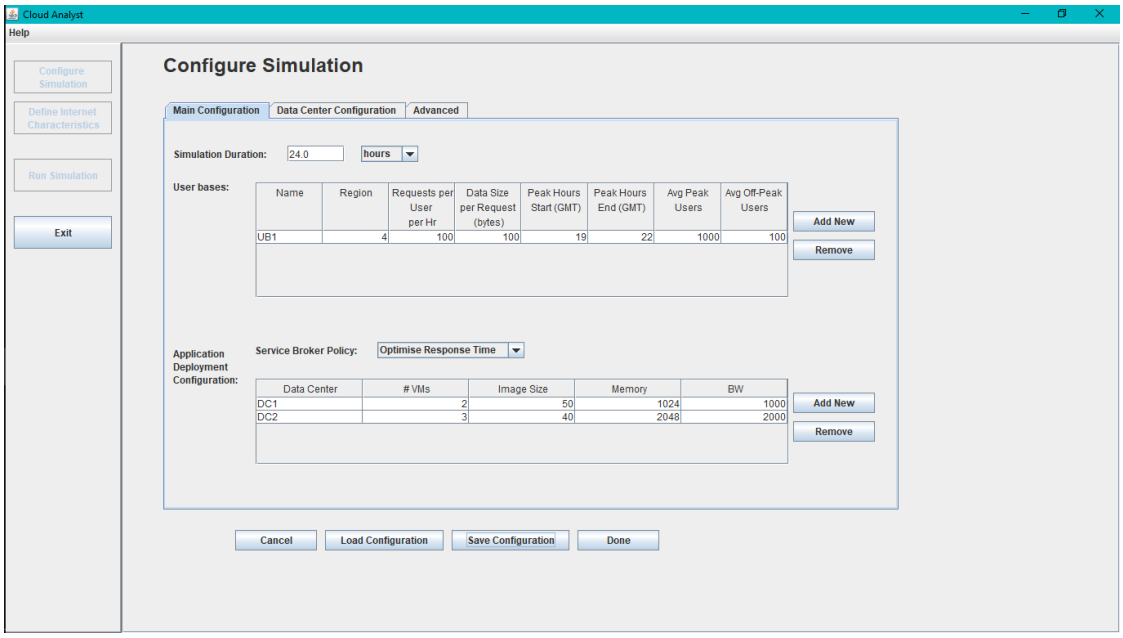
- DC2 provides 3 VMs with size 40 Mo, 2 Go RAM, BW 2000 (bytes/s)

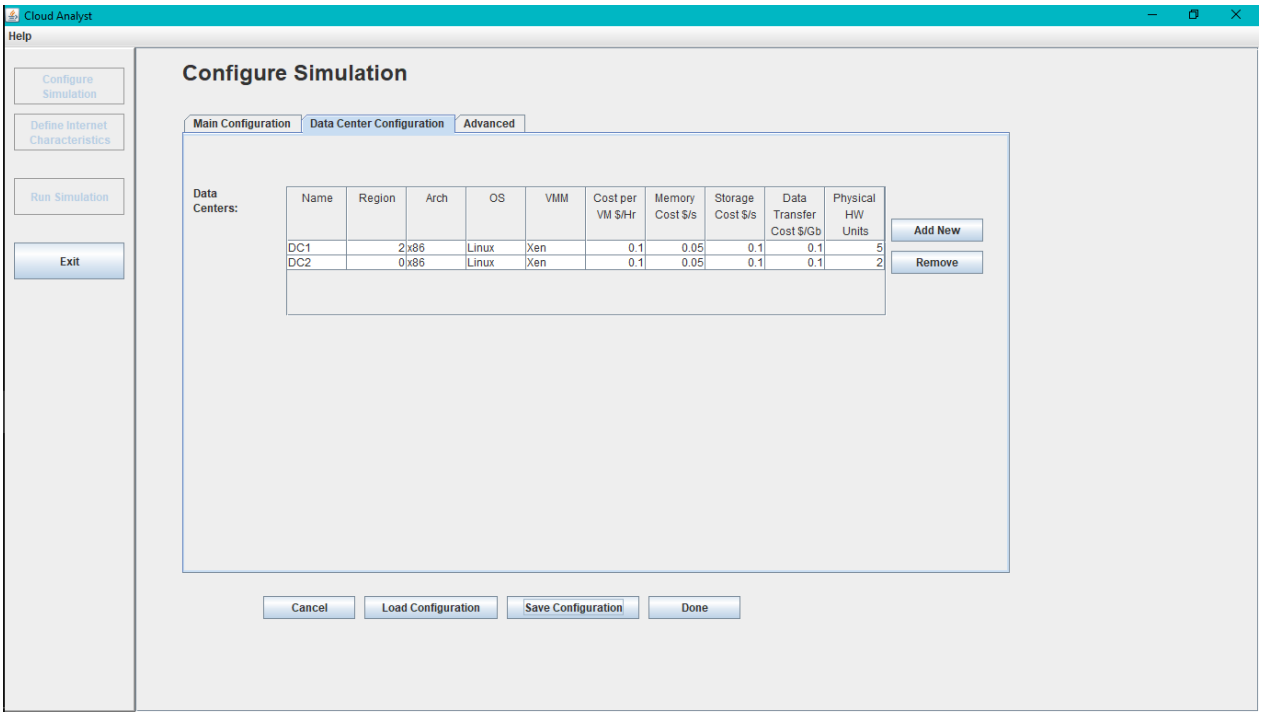
- Executable instruction length per request: 150 bytes

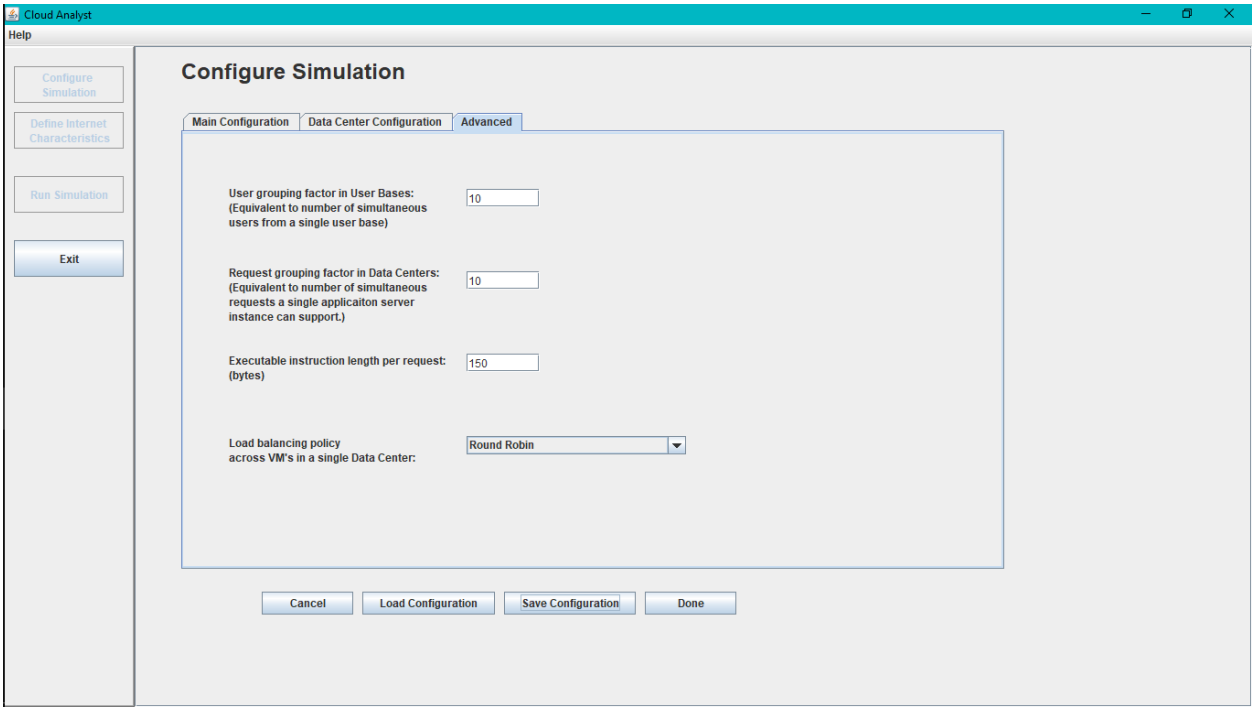
- Load balancing policy: Round Robin

- Simulation should last 24 hours

As shown below :




Cloud Analyst
Help
Configure Simulation
Define Internet Characteristics
Run Simulation
Exit
Configure Simulation
Main Configuration
Data Center Configuration
Advanced
Data Centers:
Name
Region
Arch
OS
VMM
Cost per VM $/Hr
Memory Cost $/s
Storage Cost $/s
Data Transfer Cost $/Gb
Physical HW Units
DC1 2 x86 Linux Xen 0.1 0.05 0.1 0.1 5
DC2 0 x86 Linux Xen 0.1 0.05 0.1 0.1 2
Add New
Remove
Cancel
Load Configuration
Save Configuration
Done


Cloud Analyst
Help
Configure Simulation
Define Internet Characteristics
Run Simulation
Exit
Configure Simulation
Main Configuration
Data Center Configuration
Advanced
User grouping factor in User Bases: (Equivalent to number of simultaneous users from a single user base)
10
Request grouping factor in Data Centers: (Equivalent to number of simultaneous requests a single applicaiton server instance can support.)
10
Executable instruction length per request: (bytes)
150
Load balancing policy across VM's in a single Data Center:
Round Robin
Cancel
Load Configuration
Save Configuration
Done

The simulation contributes to these results :

Overall Response Time Summary

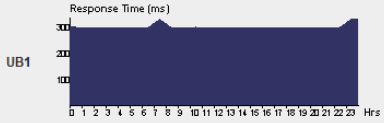
Export Results

	Average (ms)	Minimum (ms)	Maximum (ms)
Overall Response Time:	301.71	210.26	35539.52
Data Center Processing Time:	1.83	0.02	35245.51

Response Time By Region

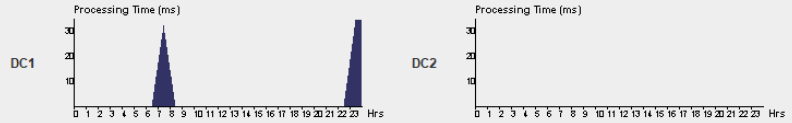
Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	301.713	210.26	35,539.521

User Base Hourly Average Response Times

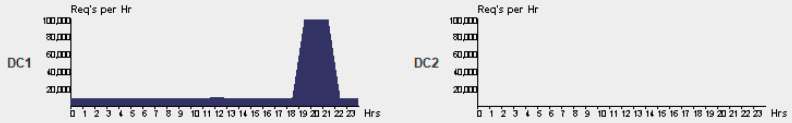


Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	1.83	0.022	35,245.509
DC2	0.076	0.076	0.076



Data Center Loading



Cost

Total Virtual Machine Cost : $12.00

Total Data Transfer Cost : $5.38

Grand Total : $17.38

Data Center	VM Cost	Data Transfer Cost	Total
DC2	7.2	0	7.201
DC1	4.8	5.379	10.179

Key Results :

1. Overall Response Time Summary:

Average Response Time: 301.71 ms

This is the average time it takes for the system to respond to a user's request, including processing time and network delays.

Minimum Response Time: 210.26 ms

The fastest response recorded during the simulation.

Maximum Response Time: 35,539.52 ms

The slowest response, likely due to high load or network latency at specific times.

Data Center Processing Time: 1.83ms (average), 0.02ms (minimum), and 35,245.51ms (maximum)

This indicates how long the data centers (DC1 and DC2) take to process the requests.

2. Response Time by Region (User Base UB1 - Africa):

Average Response Time for UB1: 301.713ms

Since the user base is in Africa and DC1 is located in Europe, there is likely some delay due to the geographic distance between Africa and Europe. However, the overall response time is still relatively low.

3. Data Center Request Servicing Times:

DC1 (Europe):

Average Processing Time: 1.83ms, with a minimum of 0.022ms and a maximum of 35,245.509 ms.

This shows that DC1 handled the requests efficiently but had occasional spikes in processing time.

DC2 (North America):

Average Processing Time: 0.076ms (same for both min and max values), which indicates highly consistent and fast processing by DC2.

4. Cost Breakdown:

Total Virtual Machine Cost: $12.00

This reflects the cost of using the virtual machines in both DC1 and DC2.

Total Data Transfer Cost: $5.38

This cost accounts for the data transferred between users and data centers.

Grand Total: $17.38

The total cost of running the simulation for 24 hours.

5. Data Center Loading:

DC1 and DC2 Load:

DC1 had peak load between hours 19:00 to 22:00, which is expected since these are the peak hours for the simulation.

DC2 showed similar peak activity, reflecting the balanced distribution of requests between the data centers.

6. Load Balancing Policy - Round Robin:

The system used the Round Robin load balancing technique, meaning it distributed user requests evenly across both data centers.

7. Service Broker Policy - Optimize Response Time:

The service broker was set to optimize response time, prioritizing sending user requests to the data center that would provide the fastest response, which seems to have been effective in keeping the average response time low.

In summary, the simulation shows that the system handled requests efficiently, with the majority of response times remaining under 500 ms. DC1 had some spikes in processing time, but overall, both data centers handled the peak hours well. The costs incurred for virtual machines and data transfer were modest for the 24-hour simulation period.

2-Exercice 2

Based on the same configuration,

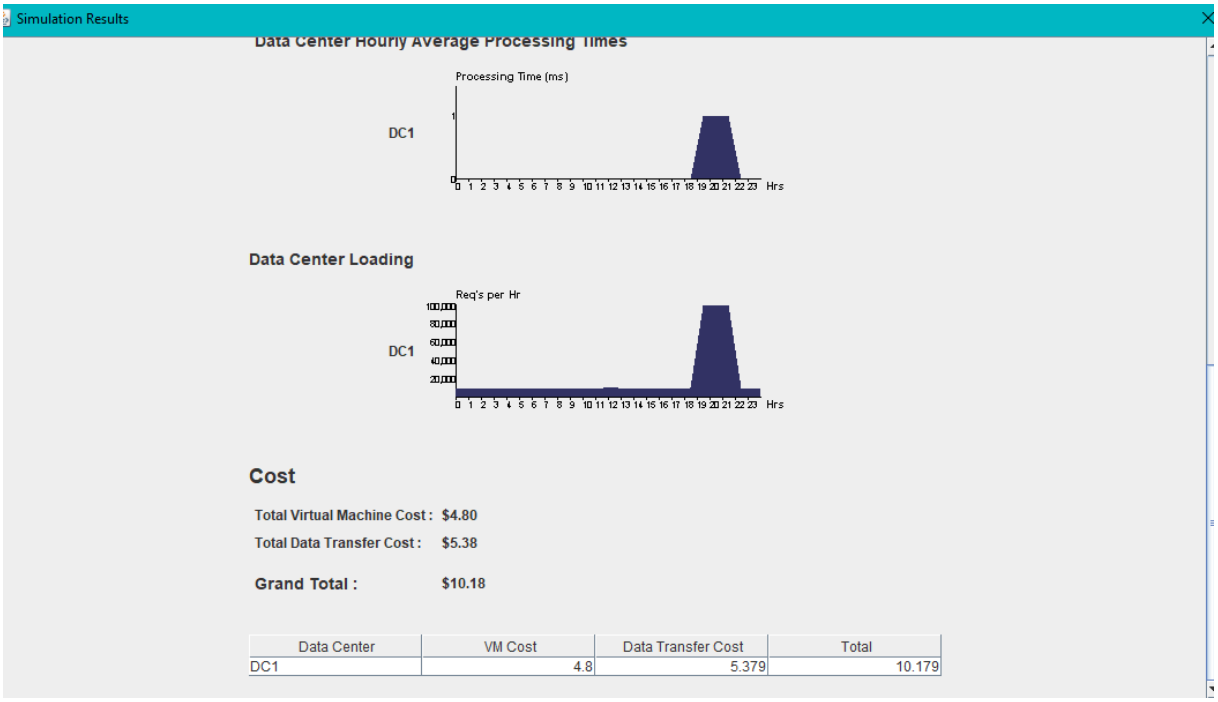
-The Load Balancing Policy that would likely allow minimal cost is Equally Spread Current Execution Load since it ensures efficient use of all available resources, reducing unnecessary expenditures.

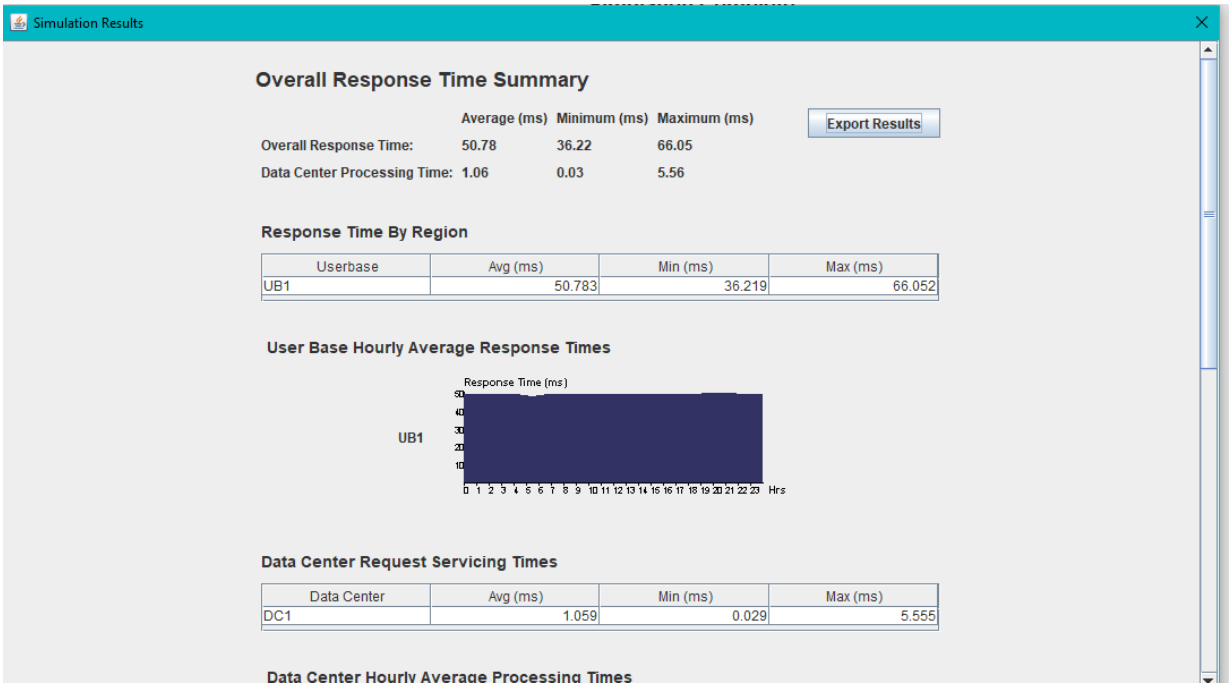
-The Service Broker Policy that provides the optimal cost is Optimize Cost, as it directs requests to the most cost-efficient data center, reducing overall spending.

3-Exercice 3

We replaced DC1 (Europe) and DC2 (America) by DC1 (Africa). But all other parameters remain the same.

We obtained :





Observation and Comparison :

1. Response Time:

Exercise 1 (Europe & N. America):
- Average: 301.72 ms
- Maximum: 35,539.52 ms
- Minimum: 210.26 ms

Exercise 3 (Africa):
- Average: 50.78 ms
- Maximum: 66.05 ms
- Minimum: 36.22 ms

Observation: In Exercise 3, the response time is significantly faster and more stable than in Exercise 1.

2. Processing Time:

Exercise 1 :
- Maximum Processing Time: 35,245.51 ms

Exercise 3 (Africa):
- Maximum Processing Time: 5.56 ms

Observation: The processing time in the Africa data center (Exercise 3) is far more stable and consistent with a significantly lower maximum processing time than (Exercise 1).

3. Cost Comparison:

Exercise 1:
- Total VM Cost: $12.00
- Total Data Transfer Cost: $5.38
- Grand Total: $17.38

Exercise 3:
- Total VM Cost: $4.80
- Total Data Transfer Cost: $5.38
- Grand Total: $10.18

Observation: Exercise 3 is not only more efficient in terms of response and processing times but also reduces costs by 41.43%. The total cost for Exercise 3 ($10.18) is significantly lower than that of Exercise 1 ($17.38).

Conclusion:

Exercise 3 (Africa Data Center) provides both better performance and lower cost compared to Exercise 1 (Europe & N. America).
Switching to the Africa Data Center significantly enhanced the overall performance in terms of response time. This configuration provides a much faster and more stable response time compared to the configuration using Europe and North America data centers .

4-Exercice 4

In this exercise, we will compare the costs associated with virtual machines (VMs) using three major cloud providers: Amazon EC2, Microsoft Azure, and Google Cloud. The goal is to determine which provider offers the most cost-effective solution based on the specifications outlined in the previous exercises.

Provider Pricing

1.Amazon EC2 Pricing (t3.micro - Africa Region):

Hourly cost: $0.0116.
24-hour cost per VM: $0.0116 × 24 = $0.2784.

2. Microsoft Azure Pricing (B1s - South Africa Region):

Hourly cost: $0.012.
24-hour cost per VM: $0.012 × 24 = $0.288.

3. Google Cloud Pricing (e2-micro - Closest Region: Europe):

Hourly cost: $0.0076.
24-hour cost per VM: $0.0076 × 24 = $0.1824.

Calculation Assumptions:

Since DC1 provides 2 VMs, we calculate the total cost for two VMs for each provider.
The data transfer and response time calculations require more detailed network metrics, but here we are focusing on VM costs**.**

Conclusion

Google Cloud provides the lowest total VM cost for this configuration at $0.3648 for 24 hours.
Amazon EC2 follows with a cost of $0.5568.
Microsoft Azure is the most expensive at $0.576.

Thus, Google Cloud is the most cost-effective provider for this scenario.