

Practical : 1

Aim: To get familiar with the Cloud Analyst simulator for analyzing the performance of cloud computing environments.

Cloud Analyst:

- It is a tool that enables users to configure various parameters for simulation, including user communities, data centers, and network characteristics, providing detailed insights into the performance of social networks.
- Cloud Analyst is a user-friendly simulation tool based on the Cloudsim framework. It helps to:
 - Simulate and analyze large-scale cloud environments.
 - Configure user communities, data centers, and network parameters.
 - Generate detailed performance insights with visual outputs such as charts and tables.

Key Features:

- Easy setup with a graphical user interface (GUI).
- Detailed metrics such as response time, processing time, and cost.
- Support for multiple configurations (e.g., load balancing and service broker policies).

Important Terms:

1. **Broker Policy:** Broker policies determine how user requests are routed to data centers for processing. The following policies were implemented:
 - a. **Closest Data Center Policy:** Routes requests to the geographically nearest data center, reducing latency and improving response time.
 - b. **Optimized Response Time Policy:** Directs requests to the data center that offers the best response time based on current load and network latency.

- c. Reconfigure Dynamically Policy:** Dynamically reassigns requests to different data centers based on changing workloads to optimize resource usage.

2. Client-Side Services: Client-side services define how resources in a data center are allocated for processing user requests. The following were implemented for each broker policy:

- a. Throttled:** Allocates tasks to data centers only if they meet predefined performance criteria.
- b. Equally Spread Current Execution Load:** Distributes the incoming workload evenly across all available VMs in a data center for better utilization and reduced bottlenecks.
- c. Round Robin:** Assigns requests to VMs in a cyclic order, ensuring a balanced distribution of requests across all available VMs.

3. Response Time:

- a. Measures the time taken (in milliseconds) for a user request to be processed and a response to be received.
- b. Lower response time is better for user experience.

4. Data Center Processing Time:

- a. Measures the time taken by a data center to process a task after receiving it.
- b. Indicates how efficiently data centers handle their workload.

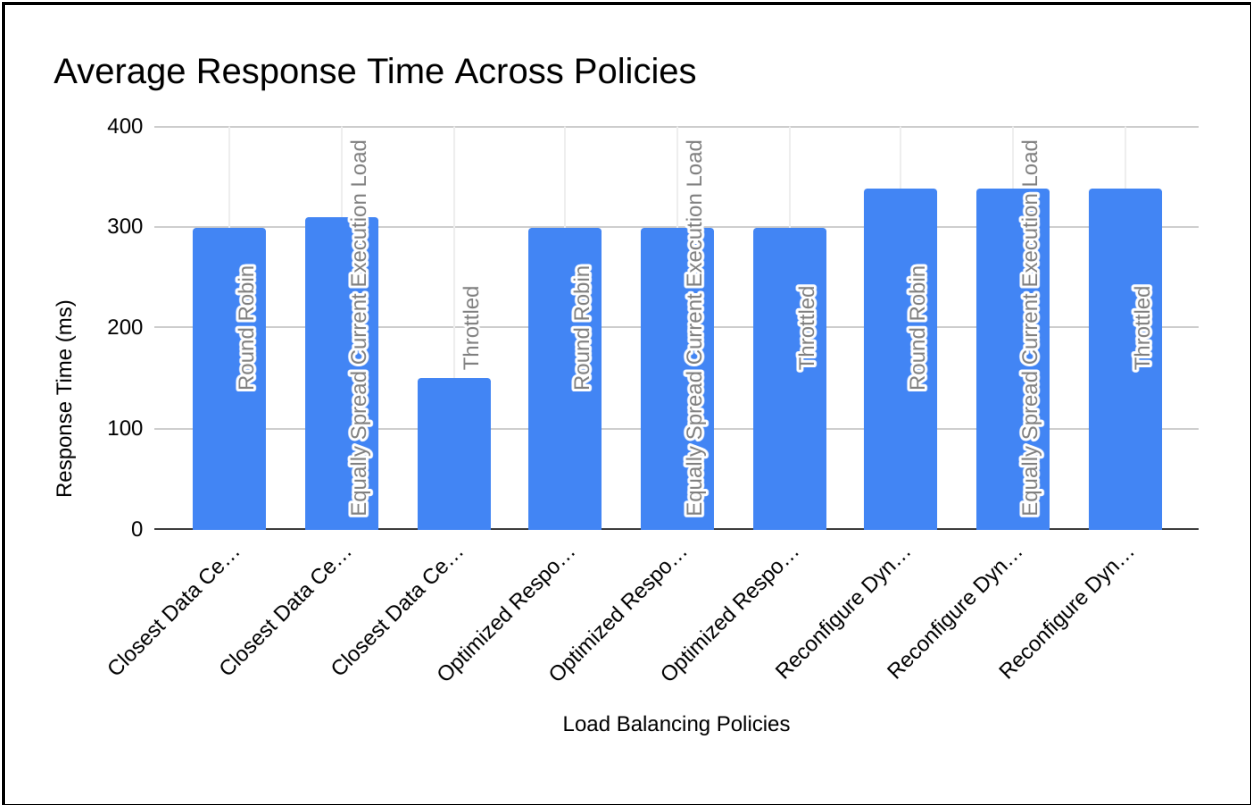
Performance Analysis of Service Broker Policies and Load Balancing Policies

Service Broker Policy	Load Balancing Policy	Response Time (ms)			Data Center Processing Time (ms)		
		Min	Avg	Max	Min	Avg	Max
Closest Data Center	Round Robin	229.6	300.13	373.6 9	0.02	0.36	0.67
	Equally Spread Current Execution Load	40.11	310.51	617.6 1	0.03	0.32	0.86
	Throttled	40.38	150.76	370.0 6	0.02	0.31	0.89
Optimized Response Time	Round Robin	232.6 1	300.06	388.6 4	0.02	0.37	0.67
	Equally Spread Current Execution Load	232.6 2	300.06	388.6 4	0.02	0.37	0.68
	Throttled	232.6 1	300.06	388.6 4	0.02	0.37	0.68
Reconfigure Dynamically w/Load	Round Robin	153.2 4	338.73	618.2 4	0.02	0.85	27
	Equally Spread Current Execution Load	153.2 8	338.71	618.2 4	0.02	2.15	25
	Throttled	153.2 8	338.67	618.2 4	0.79	2.06	2.15

Case 1: Average Response Time

- This graph displays the average response time for different combinations of service broker and load balancing policies.
- **Observation:** The "Throttled" policy performs best under "Closest Data Center" (150.76 ms), while "Equally Spread" takes longer.

Average Response Time Across Policies		
Service Broker Policy	Load Balancing Policy	Avg Response Time (ms)
Closest Data Center	Round Robin	300.13
Closest Data Center	Equally Spread Current Execution Load	310.51
Closest Data Center	Throttled	150.76
Optimized Response Time	Round Robin	300.06
Optimized Response Time	Equally Spread Current Execution Load	300.06
Optimized Response Time	Throttled	300.06
Reconfigure Dynamically w/Load	Round Robin	338.73
Reconfigure Dynamically w/Load	Equally Spread Current Execution Load	338.71
Reconfigure Dynamically w/Load	Throttled	338.67

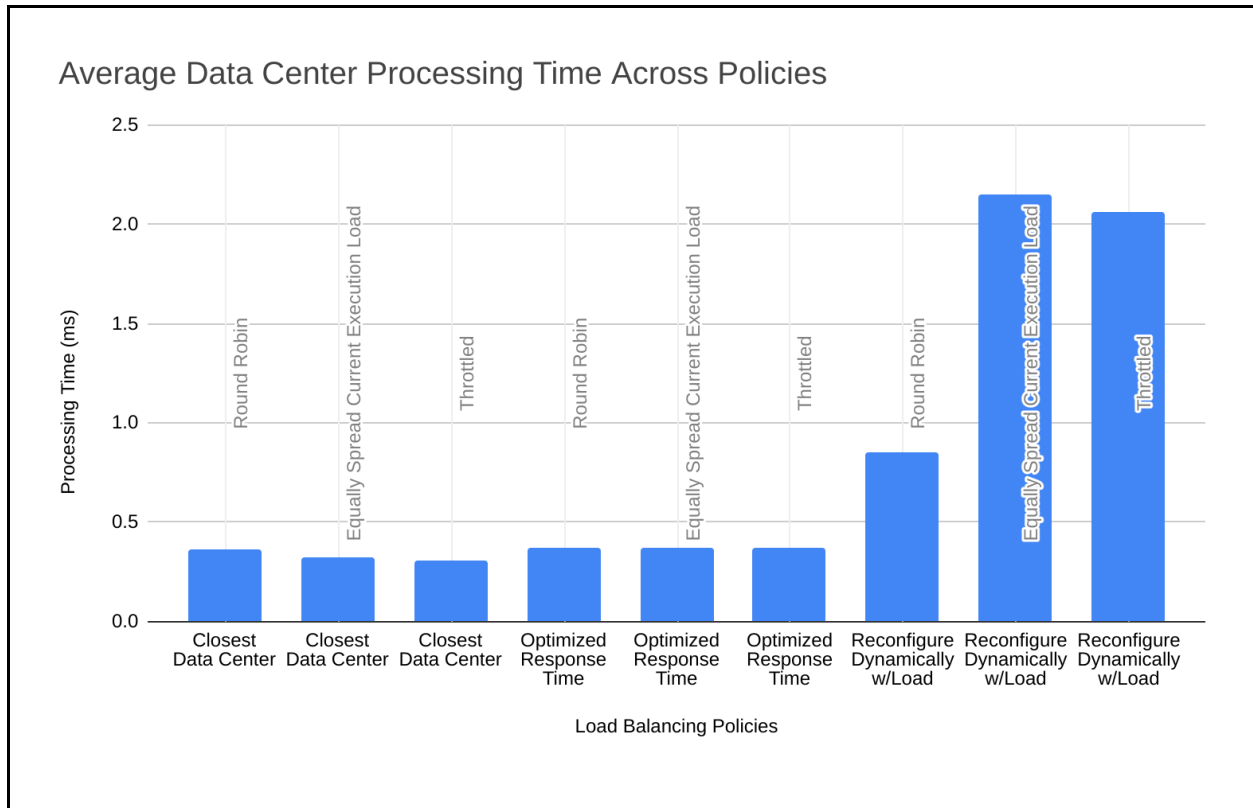


Case 2: Average Data Center Processing Time

- This graph highlights the average processing time for data centers under different policies.
- **Observation:** Most policies stay under 0.4 ms, but "Reconfigure Dynamically with Load" incurs higher processing times (0.85 ms) due to dynamic adjustments.

Average Data Center Processing Time Across Policies		
Service Broker Policy	Load Balancing Policy	Avg Data Center Processing

Average Data Center Processing Time Across Policies		
		Time (ms)
Closest Data Center	Round Robin	0.36
Closest Data Center	Equally Spread Current Execution Load	0.32
Closest Data Center	Throttled	0.31
Optimized Response Time	Round Robin	0.37
Optimized Response Time	Equally Spread Current Execution Load	0.37
Optimized Response Time	Throttled	0.37
Reconfigure Dynamically w/Load	Round Robin	0.85
Reconfigure Dynamically w/Load	Equally Spread Current Execution Load	2.15
Reconfigure Dynamically w/Load	Throttled	2.06



Conclusion

1. The Closest Data Center with Throttled Policy demonstrated the best response time , making it suitable for latency-sensitive applications.
2. Reconfigure Dynamically with Load increased processing time due to higher overhead but excelled in handling dynamic and unpredictable workloads.
3. The choice of policies should align with application priorities, balancing between response time, scalability, and resource utilization.