🔄 What is Cross-Zone Load Balancing in AWS?

Cross-Zone Load Balancing is a feature in AWS Elastic Load Balancer (ELB) that allows the load balancer to **distribute incoming traffic evenly across all registered targets in all Availability Zones (AZs)**, **regardless of the source AZ** of the request.

📌 Why It Matters

Without cross-zone load balancing:

- The load balancer sends traffic **only to targets in the same AZ** as the client.
- If you have an uneven **number of targets** across AZs, it leads to **uneven traffic distribution**.

With cross-zone load balancing:

- The load balancer **treats all targets equally**, distributing requests evenly across all healthy targets in all AZs.

🧠 Example Scenario (With and Without Cross-Zone)

Assume you have:

- 2 Availability Zones (AZ1 and AZ2)
- ELB in front of 3 EC2 instances
    - AZ1 has 1 instance
    - AZ2 has 2 instances

🚫 Without Cross-Zone Load Balancing:

- If the traffic is 50% from each AZ, then:
    - AZ1 instance gets 50% of traffic
    - AZ2 instances share 50% (25% each)
- AZ1 instance is **overloaded**

✅ **With Cross-Zone Load Balancing:**

- Traffic is split **evenly** across all 3 instances:
    - Each instance gets ~33% of traffic
- Utilization is **balanced and optimized**

🔍 **Load Balancer Type Support**

Load Balancer Type	Cross-Zone Load Balancing Supported?	Default Behavior
Application (ALB)	✅ Yes	Enabled by default (Free)
Network (NLB)	✅ Yes	Disabled by default (Costs may apply if enabled)
Gateway (GWLB)	❌ Not applicable	N/A
Classic (CLB)	✅ Yes	Enabled by default

💰 **Cost Implication**

- For **NLB**, enabling cross-zone load balancing **may incur additional data transfer costs**, because traffic between AZs counts as **inter-AZ traffic**, which is **billable**.

- **ALB and CLB**: Free to use cross-zone load balancing.