ELB Comparison: ALB vs NLB vs GWLB

Introduction

AWS Elastic Load Balancing (ELB) offers multiple types of load balancers for different use cases: Application Load Balancer (ALB), Network Load Balancer (NLB), and Gateway Load Balancer (GWLB). Understanding their features, performance characteristics, and intended use cases is essential for designing scalable, secure, and cost-effective architectures.

Overview

Feature	ALB (Application LB)	NLB (Network LB)	GWLB (Gateway LB)
Protocols	HTTP, HTTPS, gRPC	TCP, TLS, UDP, TCP_UDP	Geneve (port 6081)
Layer	7 (Application)	4 (Transport)	3/4 (Network)
Target Types	Instance, IP, Lambda	Instance, IP, ALB	Appliance VMs (firewalls, etc.)
Static IP / EIP support	No (uses DNS)	Yes (EIP support)	Yes (via EIP)
TLS Termination	Yes	Yes	No
Throughput	Medium	Very High	High
Connection Type	Stateful (with cookies, etc.)	Stateless	Stateless
Health Checks	HTTP/S based	TCP, HTTP/S	GWLB-specific
Cross-Zone Load Balancing	Optional	Enabled by default	Optional
WebSocket Support	Yes	Yes	No
IP Preservation	No	Yes	Yes
Use with PrivateLink	Consumer	Consumer	Provider
Pricing Model	LCU-based + data processed	LCU-based + data processed	Hourly + data processed

Pre-requisites

- VPC and Subnet planning
- Security Group configurations (ALB only)
- IAM for TLS certificates (if applicable)

Benefits / Use Cases / Examples

ALB

- **Use Cases**: Web apps, containerized services (ECS, EKS), microservices routing
- **Benefits**:
  - Path and host-based routing
  - Native support for HTTP/2, gRPC, and WebSockets
  - Integration with WAF and Cognito for authentication

NLB

- **Use Cases**: High-throughput/low-latency apps, IoT, game servers, TLS passthrough
- **Benefits**:
  - Supports static IPs and Elastic IPs
  - Suitable for workloads that require client IP preservation
  - Handles millions of requests per second

GWLB

- **Use Cases**: Transparent traffic inspection via third-party appliances (e.g., firewalls, IDS/IPS)
- **Benefits**:
  - Centralized traffic inspection
  - Compatible with AWS Marketplace security appliances
  - Operates transparently with no app changes

Considerations

- **Latency**: NLB is the lowest-latency option; ALB is sufficient for web traffic
- **Elastic IPs**: Only NLB and GWLB support this
- **Layer 7 Logic**: Only ALB supports advanced routing and headers manipulation
- **Security**: Use ALB for integration with WAF and OIDC providers

- **Pricing**: All use LCUs but vary in what contributes (e.g., rule evaluations in ALB)
- **Availability**: All support multi-AZ, but NLB and GWLB tend to scale more horizontally for stateless traffic

Documentation

- AWS ELB Overview: Elastic Load Balancing
- ALB Docs: What is an Application Load Balancer?
- NLB Docs: What is a Network Load Balancer?
- GWLB Docs: What is a Gateway Load Balancer?