Cloud Network Services & Connectivity

TEKsystems Global Services

WORKFORCE DEVELOPMENT

COURSE STRUCTURE

Day 1: Networking Fundamentals I

Day 2: Networking Fundamentals II

Day 3: Networking in the Cloud Era

Day 4: Cloud Network Services & Connectivity

Day 5: Availability & Troubleshooting in the Cloud

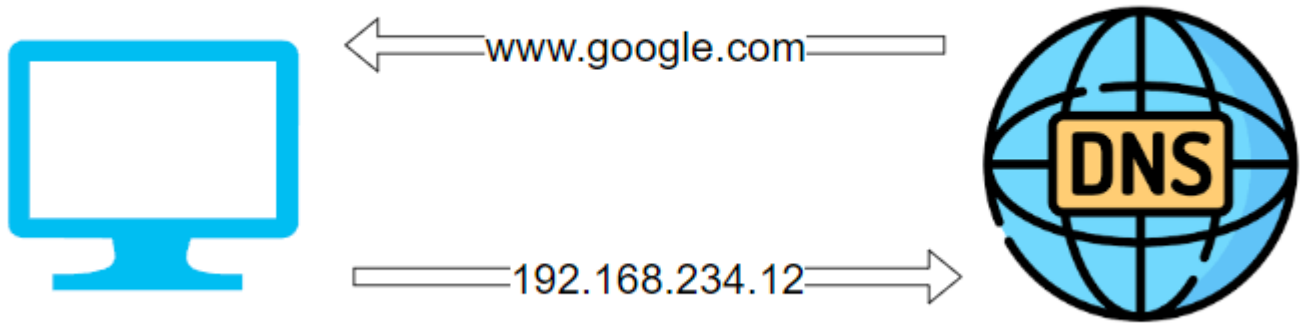
AGENDA FOR DAY 4

1. DNS & Route 53
2. Load Balancing with AWS
3. Hybrid Connectivity & Private Services
4. Troubleshooting Cloud Connectivity

DNS & ROUTE 53

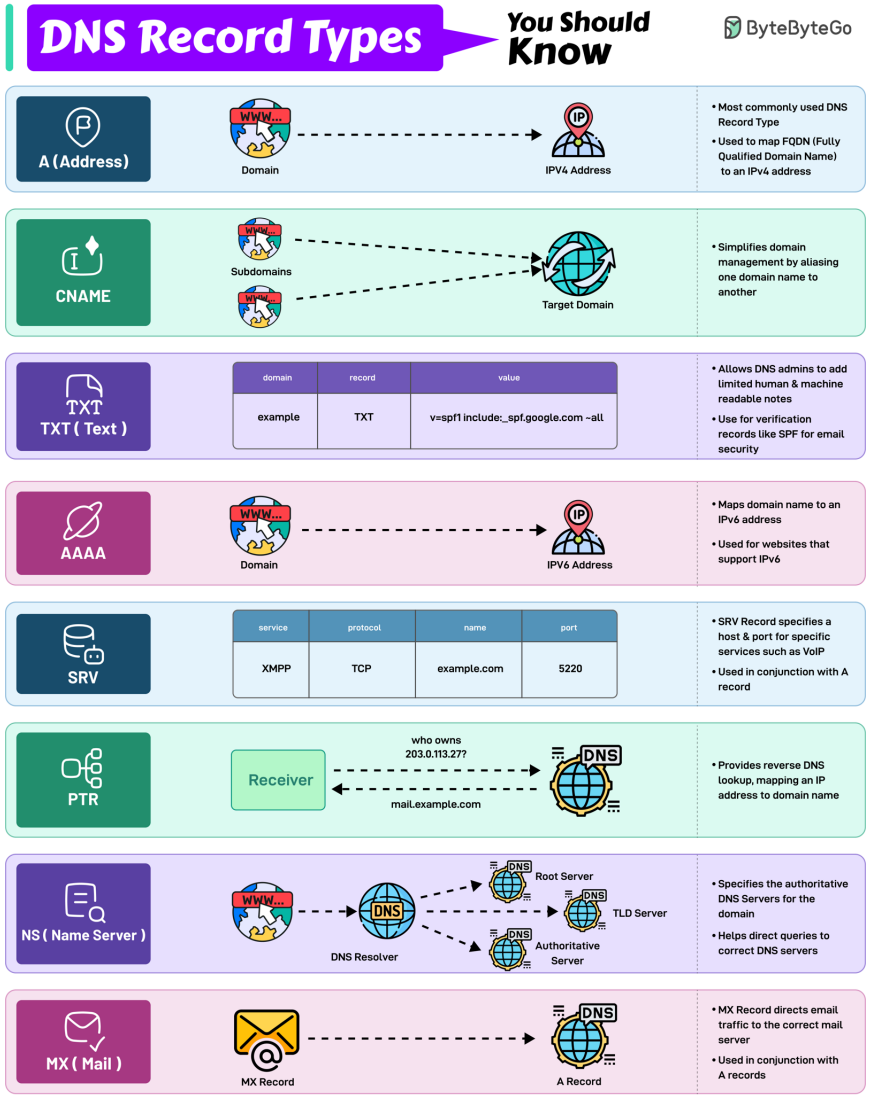
INTRODUCTION TO DNS

- DNS translates human-readable names into IP addresses.
- Hierarchical structure: Root → TLD → Domain → Subdomain.
- Enables scalable and distributed resolution.
- Used both publicly (internet) and privately (VPC internal DNS).



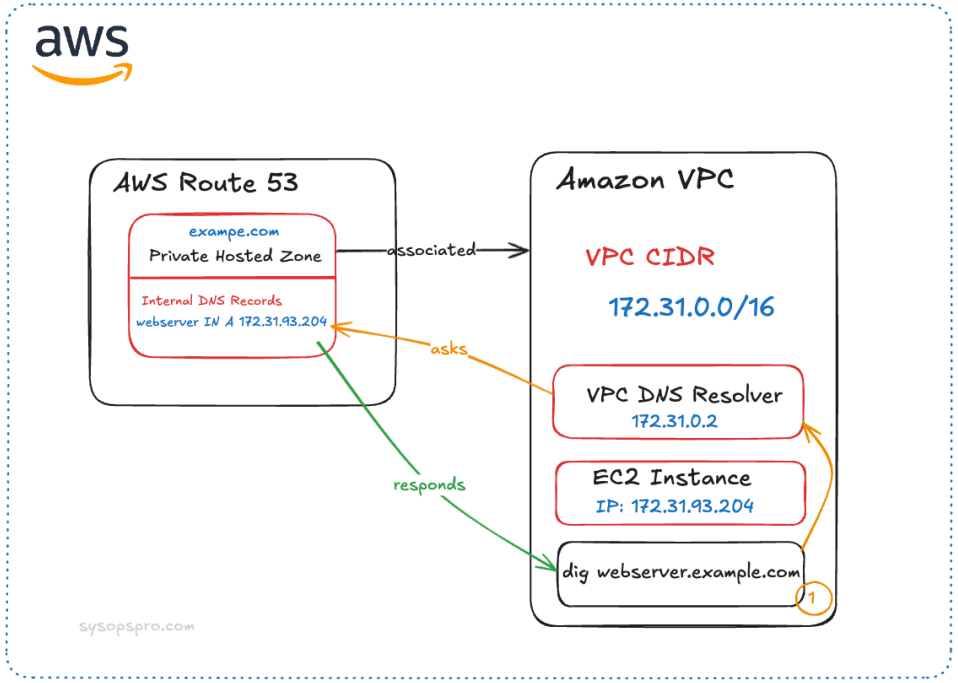
DNS RECORD TYPES

- A / AAAA: Maps name to IPv4/IPv6 address.
- CNAME: Alias to another DNS name.
- MX: Mail exchange records.
- TXT: Text data (e.g., SPF, DKIM).
- Alias: AWS-specific pointer to load balancers, CloudFront, etc.



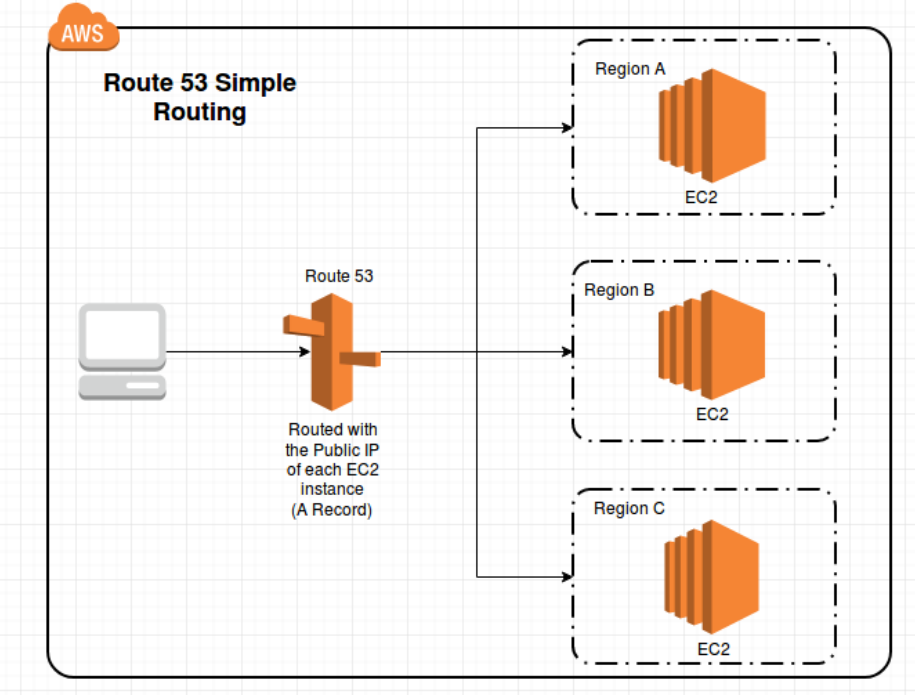
HOSTED ZONES & DELEGATION

- Public Hosted Zone: Accessible from the internet.
- Private Hosted Zone: Resolved only within a VPC.
- Each zone includes record sets managed via Route 53.



ROUTING POLICIES

- Simple: One record per name.
- Weighted: Split traffic between resources.
- Latency-Based: Routes based on user location.
- Failover: Active/passive setup for DR.
- Geolocation: Routes based on country or regior



POP QUIZ:

What is the primary function of DNS?

A. Encrypting network traffic
B. Translating human-readable names into IP addresses
C. Monitoring cloud health
D. Routing only private IPs

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B. Private zones are cached globally
C. Public zones cannot contain MX records
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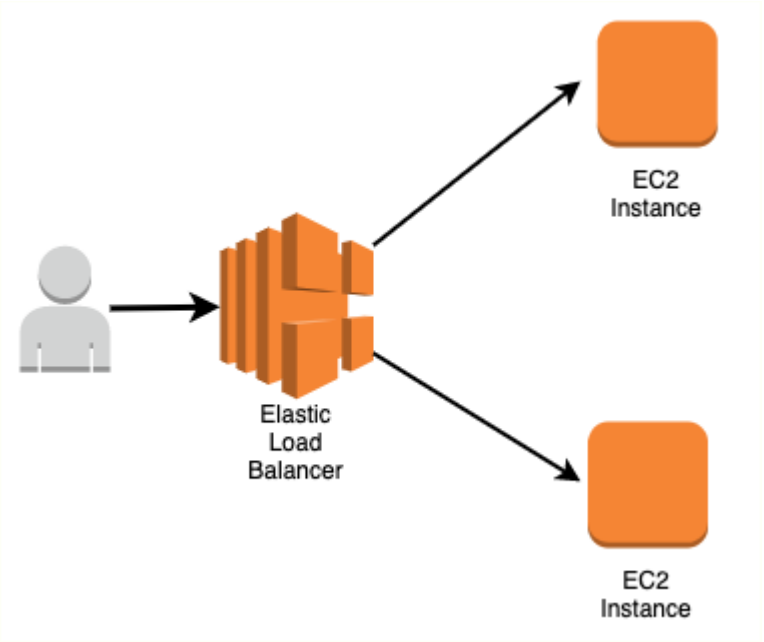
LAB 1: CONFIGURING ROUTE 53

- Goal: Implement scalable DNS management.
- Steps:
  - Register domain and configure hosted zone.
  - Create A, CNAME, and MX records.
  - Set up health checks for failover.
  - Test DNS resolution and propagation.

LOAD BALANCING IN THE CLOUD

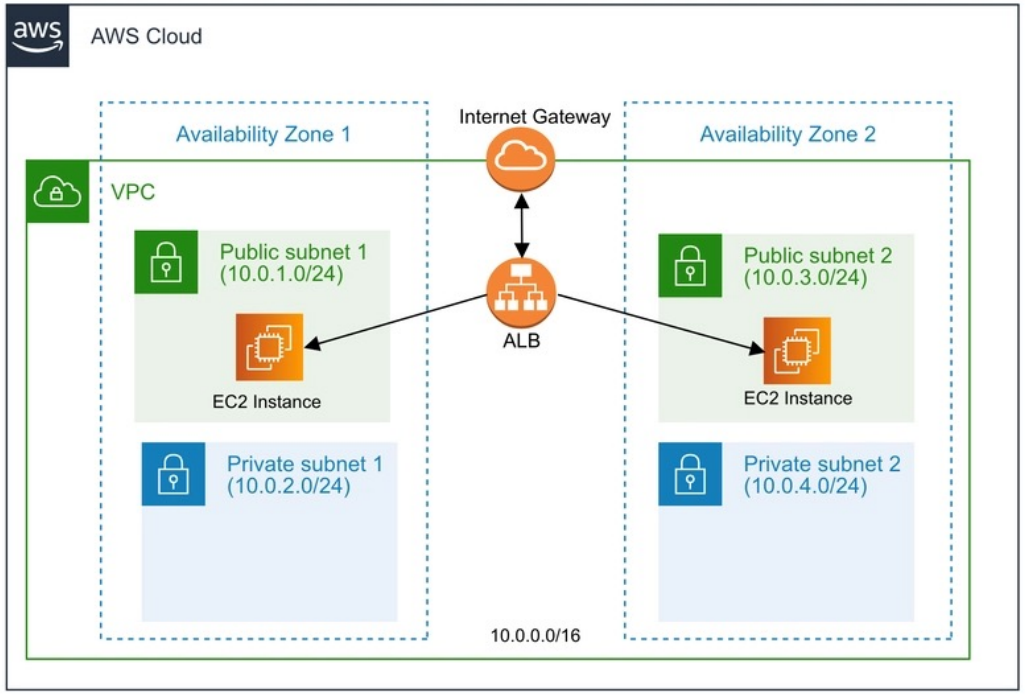
LOAD BALANCING CONCEPTS

- Distributes traffic across multiple instances.
- Ensures high availability and scalability.
- Key AWS types:
  - ALB (Application, Layer 7)
  - NLB (Network, Layer 4)
  - GLB (Gateway, Layer 3/4)



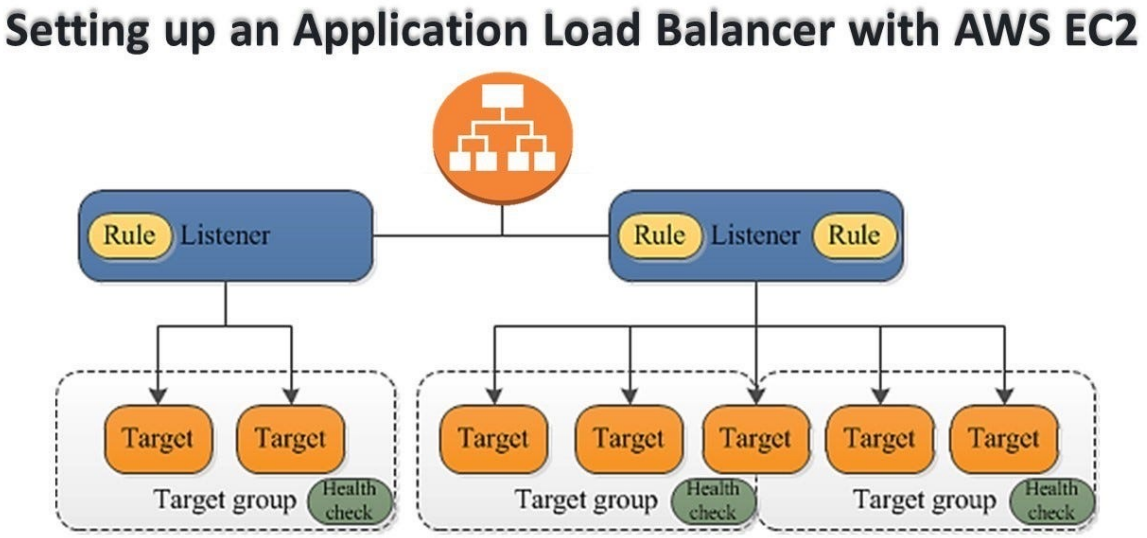
ARCHITECTURE OVERVIEW

- ALB sits in public subnets.
- Targets reside in private subnets.
- Internet Gateway provides external access.
- Multi-AZ design for redundancy.



LISTENERS & TARGET GROUPS

- Listener: Port/protocol (e.g., HTTP 80).
- Rules: Define routing logic (path or host-based).
- Target Group: Registered instances or IPs.
- Health checks ensure targets are responsive.



HEALTH CHECKS & MONITORING

- Periodic HTTP/TCP checks for instance health.
- Automatically removes unhealthy targets.
- Monitor using CloudWatch metrics:
  - UnhealthyHostCount
  - RequestCount
  - TargetResponseTime

SSL CERTIFICATE

- Use AWS Certificate Manager (ACM) for SSL/TLS.
- Terminate SSL at ALB for simplicity.
- Re-encrypt traffic to backend (optional).
- Automatic certificate renewal.

LAB 2: BUILDING A LOAD-BALANCED WEB TIER

- Goal: Distribute traffic across multiple web servers.
- Steps:
  - Deploy Application Load Balancer.
  - Configure target groups and health checks.
  - Set up Auto Scaling Group for elasticity.
  - Test load distribution and failover scenarios.

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B. To distribute network traffic across multiple instances
C. To increase DNS resolution speed
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B. To verify instance responsiveness and remove unhealthy targets
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HYBRID CONNECTIVITY & PRIVATE SERVICES

HYBRID NETWORKING INTRODUCTION

- Combines on-prem and cloud resources.
- Use cases:
  - Data migration
  - DR
  - Centralized authentication
- Key tools: VPN, Direct Connect, Peering, PrivateLink.

VPN ARCHITECTURE

- Customer Gateway (CGW): The on-premises endpoint — typically a physical or software VPN device managed by your organization.
- Virtual Private Gateway (VGW): The AWS-side endpoint attached to your VPC for inbound/outbound VPN traffic.
- Connection:
  - Uses an encrypted IPsec tunnel over the public Internet to ensure data confidentiality and integrity.
- Routing Options:
  - Supports both static routes and dynamic routing using BGP (Border Gateway Protocol).

DIRECT CONNECT OVERVIEW

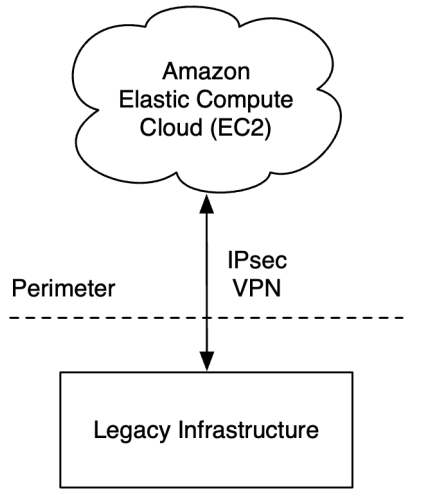
- **Dedicated Fiber Link:** Establishes a private, high-speed fiber connection between your on-premises data center and AWS.
- **No Internet Dependency:** Bypasses the public Internet, providing a more secure and consistent network experience.
- Ideal Use Cases:
  - Low Latency: For real-time applications and high-performance workloads.
  - High Throughput: For large data transfers or hybrid cloud architectures.
  - Regulatory Compliance: Meets strict data sovereignty and security requirements.

VPC PEERING CONCEPTS

Private VPC-to-VPC Communication: Enables secure, private connectivity between two VPCs using the AWS global backbone — no Internet traffic involved.

Manual Configuration: Route tables must be manually updated in both VPCs to enable bidirectional communication.

- Non-Transitive: Peering connections are point-to-point — VPC A can't communicate with VPC C through VPC B.
- Use Case: Ideal for interconnecting environments (e.g., development ↔ production) or multi-account architectures.



Virtual Private Cloud (VPC)

PRIVATELINK (INTERFACE ENDPOINTS)

- Private Service Access: Enables secure, private connectivity to services across VPCs using the AWS internal network.

- How It Works:
  - Service Providers expose services privately through VPC Endpoints.
  - Service Consumers connect to these endpoints without using public IPs.

- Supported Services:
- Works with both AWS-managed services (e.g., S3, EC2 API, Kinesis) and custom applications.

- Key Benefit:
- Eliminates Internet exposure, improving security, latency, and compliance.

TROUBLESHOOTING CLOUD CONNECTIVITY

- VPC Flow Logs: Capture and analyze allowed and denied network traffic for your VPC, subnets, or ENIs.
- Reachability Analyzer: Visually maps network paths to identify configuration or routing issues between resources.
- Network Utilities: Use traceroute, ping, or curl commands to verify connectivity and latency from instances.
- Amazon CloudWatch Metrics:
  - Monitor performance indicators such as latency, packet drops, and throughput trends to detect anomalies.

WRAP-UP & KEY TAKEAWAYS

- DNS enables discoverability and routing.
- Load Balancers provide scalability and availability.
- Hybrid solutions integrate cloud with on-prem securely.
- Next: Multi-AZ design and availability patterns (Day 5).

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A. CloudFormation
B. CloudWatch
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LAB 3: VPC PEERING HYBRID CONNECTIVITY

- Goal: Connect multiple VPCs and on-premises networks.
- Steps:
  - Create VPC peering connections.
  - Configure Site-to-Site VPN tunnel.
  - Set up routing for hybrid connectivity.
  - Test cross-VPC and on-premises communication.