AWS Service Selection Rationale

3-Tier E-Commerce Platform Architecture

This document provides the technical and business justification for each AWS service selected in the 3-tier e-commerce platform architecture. Service selection prioritizes the AWS Well-Architected Framework pillars: Operational Excellence, Security, Reliability, Performance Efficiency, and Cost Optimization.

Tier 1 — Presentation Layer

Amazon CloudFront	Global CDN distributing content via 400+ edge locations reduces latency for international customers. Integrated WAF protection blocks Layer 7 attacks at the edge before they reach origin servers. Native integration with S3 and ALB simplifies configuration.
Route 53	Authoritative DNS with 100% SLA. Latency-based routing directs users to nearest region. Health checks monitor endpoint availability and trigger automatic failover within 60 seconds, ensuring continuous service during regional outages.
Application Load Balancer	Layer 7 load balancing with path-based routing enables microservices architecture. SSL termination offloads encryption from application servers. Health checks automatically remove unhealthy instances, maintaining service availability.
S3 Static Hosting	Infinitely scalable object storage for static assets (HTML, CSS, JS, images) with 99.999999999% durability. Versioning enables rollback. Lifecycle policies automatically transition objects to cheaper storage tiers, reducing costs by up to 68%.

Tier 2 — Application Layer

EC2 Auto Scaling	Dynamic horizontal scaling based on CloudWatch metrics (CPU, request count) ensures performance during traffic spikes while minimizing cost during low-traffic periods. Scales from 2 to 20 instances automatically.
Lambda + API Gateway	Serverless architecture eliminates server management and scales automatically from zero to thousands of concurrent executions. Pay-per-invocation model reduces cost for intermittent workloads (webhooks, image processing, notifications).
ElastiCache Redis	In-memory caching with sub-millisecond latency reduces RDS load by up to 90%. Cluster mode with automatic failover ensures high availability. Caches product catalogue, session data, and query results.
Cognito	Fully managed authentication with MFA, social login federation, and JWT token issuance. Eliminates need to build and maintain custom auth systems. GDPR and PCI-DSS compliant out of the box.

Tier 3 — Data Layer

RDS MySQL Multi-AZ	Managed relational database with automatic backups, patching, and Multi-AZ synchronous replication. Automatic failover provides RTO of 60-120 seconds and RPO near-zero. Read replicas offload analytics queries from primary.
DynamoDB	Serverless NoSQL database with single-digit millisecond latency at any scale. On-demand capacity automatically handles traffic spikes (Black Friday). Global Tables provide active-active replication for disaster recovery.
Redshift	Petabyte-scale data warehouse optimized for OLAP queries. Columnar storage and parallel processing deliver 10x faster analytics than traditional databases. Redshift Spectrum queries S3 data lake directly without ETL.
Secrets Manager	Centralized secret storage with automatic rotation eliminates hardcoded credentials. Applications retrieve secrets at runtime via SDK. KMS integration provides envelope encryption. Meets PCI-DSS and SOC 2 compliance requirements.

Cross-Cutting Services

IAM + KMS	Least-privilege IAM roles prevent lateral movement in security breaches. KMS envelope encryption protects data at rest across all services (RDS, S3, DynamoDB). Automatic key rotation and CloudTrail integration provide audit trails.
CloudWatch + X-Ray	Unified monitoring with custom dashboards tracks KPIs (requests/sec, P99 latency, error rates). CloudWatch Alarms trigger Auto Scaling and PagerDuty alerts. X-Ray distributed tracing identifies performance bottlenecks across microservices.

Summary: This architecture leverages AWS managed services to minimize operational overhead while maximizing reliability, security, and cost efficiency. Each service selection directly supports Well-Architected Framework principles and aligns with e-commerce platform requirements for high availability (99.99%), sub-second performance, and enterprise-grade security.