Comprehensive list of ==performance test cases== **to plan and execute during an** ==on-prem to AWS migration==. These test cases ensure ==performance parity, resilience, observability, and scalability== of the migrated workloads.

✅ 1. Baseline Performance Test Cases (On-Premise Benchmarking)

ID	Test Case	Description	Metrics
TC-01	Baseline Throughput Test	Measure current TPS or RPS (Requests per second) on-prem for each key transaction.	TPS, Latency, CPU, Memory, DB throughput
TC-02	Baseline Response Time Distribution	Measure 50th, 90th, 95th, 99th percentile response times.	P50, P90, P95, P99 Latency
TC-03	Baseline Concurrency Load	Identify max supported user concurrency on-prem without SLA degradation.	Max concurrent users, error rate
TC-04	Baseline Resource Utilization	Capture CPU, Memory, Disk, Network, GC behavior during peak loads.	Resource graphs, GC logs
TC-05	Baseline Database Query Performance	Measure top SQL queries (Avg exec time, buffer gets, CPU).	SQL latency, buffer gets
TC-06	Baseline Cache Utilization	Check cache hit ratio, latency under load.	Hit ratio, eviction rate

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✅ 2. Environment Parity Validation Test Cases

ID	Test Case	Description	Metrics
TC-07	Config Equivalence	Validate JVM, DB, OS, app config between on-prem & AWS.	Param diff, GC flags
TC-08	Network Latency Baseline	Validate inter-component latencies (app to DB, app to external APIs) in AWS.	RTT, packet loss
TC-09	Storage IOPS Benchmark	Validate EBS/FSx IOPS and latency vs on-prem SAN/NAS.	IOPS, read/write latency

ID	Test Case	Description	Metrics
TC-10	Autoscaling Configuration Readiness	Validate autoscaling rules and their triggering logic.	Min/Max instance counts

✅ 3. Pre-Migration Performance Comparison (AWS)

ID	Test Case	Description	Metrics
TC-11	Functional Performance Sanity	Validate core flows under nominal load post-deployment on AWS.	Pass/fail with basic load
TC-12	Single User Latency Test	Verify API and page latencies with no load (cold starts).	First byte time, cold start time
TC-13	Load Profile Simulation	Re-run baseline load from on-prem on AWS for direct comparison.	TPS, latency, error rate
TC-14	GC Performance Comparison	Compare GC behavior (pause time, frequency, throughput) in AWS.	GC logs
TC-15	DB Query Comparison	Compare DB execution plans, latency, buffers, indexes in RDS/Aurora.	AWR / Performance Insights
TC-16	Infrastructure Cost vs Performance	Estimate cost-per-request in AWS under normal load.	$/req

✅ 4. Peak Load / Stress Test Cases

ID	Test Case	Description	Metrics
TC-17	Peak Load Sustenance Test	Run high-concurrency test based on max peak + 20% buffer.	Sustained TPS, resource stability
TC-18	Breakpoint Test	Increase load until system starts failing.	Max supported RPS, error threshold
TC-19	Stress GC & Memory	Push system to high memory to validate GC tuning.	GC pause time, OOM risk
TC-20	Load Spikes Test	Sudden surge in traffic to test elasticity.	Scaling reaction time

✅ **5. Endurance / Soak Test Cases**

ID	Test Case	Description	Metrics
TC-21	8/12/24-Hour Soak Test	Long-duration test at average load to detect memory leaks or resource drift.	Memory delta, CPU trend
TC-22	Thread Leak Detection	Track thread count trend during long execution.	Thread pool usage
TC-23	DB Connection Pool Leak	Track connection pool behavior over time.	Connection leak, pool saturation

✅ **6. Failover & Resilience Test Cases**

ID	Test Case	Description	Metrics
TC-24	App Instance Failure	Terminate EC2/Container and observe failover.	Recovery time, errors
TC-25	AZ Outage Simulation	Fail one AZ and validate HA architecture.	Resilience, fallback behavior
TC-26	DB Failover Test (Aurora/RDS Multi-AZ)	Force failover to standby.	Failover time, impact on queries
TC-27	DNS/Route 53 Failover	Simulate endpoint unavailability and validate Route 53 health checks.	DNS switch time

✅ **7. Network & Latency Focused Test Cases**

ID	Test Case	Description	Metrics
TC-28	Intra-Service Latency	Measure latency between microservices.	Network RTT
TC-29	CDN Performance (CloudFront)	Validate static file delivery latency from edge locations.	Time to first byte

ID	Test Case	Description	Metrics
TC-30	External API Calls	Test latency of external service integrations from AWS.	API response time
TC-31	TLS/Handshake Latency	Measure SSL/TLS latency for each service.	TLS handshake duration

✅ **8. Observability / Monitoring Validation Test Cases**

ID	Test Case	Description	Metrics
TC-32	Logs Validation	Validate structured logs, error logs, latency logs in CloudWatch.	Log completeness
TC-33	APM Tracing Coverage	Check end-to-end trace coverage (e.g., X-Ray, Dynatrace, New Relic).	% endpoints traced
TC-34	Alerting Test	Simulate errors/load spikes to test CloudWatch alerts.	Alerting time, notification accuracy
TC-35	Dashboards	Validate dashboards for CPU, Memory, Latency, TPS, GC, DB.	Accuracy of dashboards

✅ **9. Cost-Aware Performance Tests**

ID	Test Case	Description	Metrics
TC-36	Cost vs TPS Optimization	Run cost benchmarking at different load levels.	$/TPS, $/hour
TC-37	Spot vs On-Demand Load Testing	Test performance and fault tolerance using spot instances.	Interruption rate
TC-38	Lambda Performance/Cost Test	Measure cold start vs warm execution impact for AWS Lambda.	Duration, Cost

✅ 10. Security/Encryption Impact Performance Tests

ID	Test Case	Description	Metrics
TC-39	EBS Encryption Impact	Compare performance with and without EBS encryption.	IOPS, latency
TC-40	TLS Enabled Endpoints	Test performance of HTTPS endpoints.	SSL overhead
TC-41	KMS-Backed Secrets	Measure performance overhead of AWS KMS decryption in runtime.	Latency during startup

✅ 11. Specialized Domain-Based Tests (Optional)

ID	Test Case	Description	Metrics
TC-42	Mobile Performance Testing (CloudFront, Latency)	Validate mobile user response time from multiple geos.	Geo latency
TC-43	CRM System Throughput	Test bulk operations in CRM modules post-migration.	Records/sec
TC-44	SAP Connector Load	Test SAP interface workloads to AWS (BAPI, IDOC, RFC).	Interface throughput

✅ 12. Post-Migration Regression Load Test

ID	Test Case	Description	Metrics
TC-45	Production Readiness Test	Simulate full prod-like load with all integrations active.	Full system KPIs
TC-46	Performance Regression Test	Compare every key transaction's P90 against baseline.	% Regression or improvement
TC-47	Warmup & Caching Validation	Measure performance before and after warm cache.	Warm vs Cold diff
TC-48	User Journey Load Test	Simulate real user journeys across UI/API layers.	Realistic UX timing

📌 **Test Case Matrix by AWS Service Type**

Service	Tests to Include
EC2	CPU stress, EBS IOPS, network throughput
ECS/EKS	Pod/container autoscaling, node failover
Lambda	Cold start, concurrency burst
RDS	Failover, connection pooling, query tuning
S3	PUT/GET latency, throughput test
ELB/ALB	Load distribution, idle timeout, SSL termination

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