AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

XNT304

Modernizing .NET applications with purpose-built databases

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Agenda



What's a modern application?



Why consider purpose-built databases?



AWS databases: the right tool for the right job

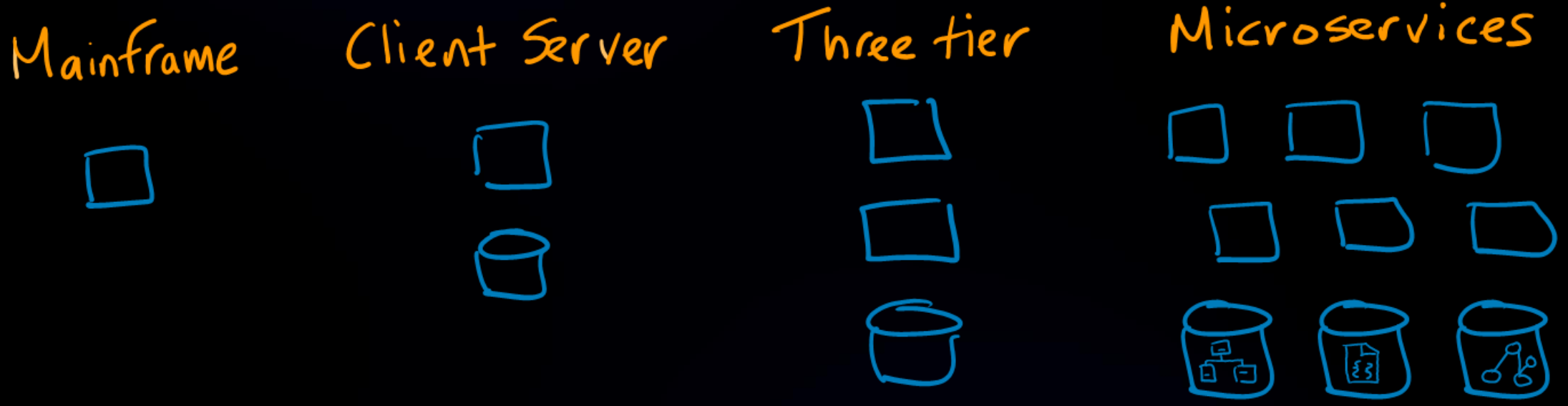
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What's a modern application?



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Application architectures and patterns have evolved

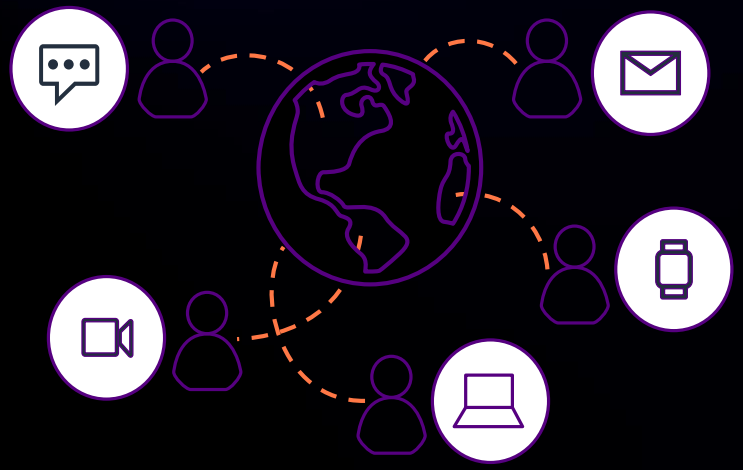


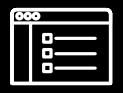
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Modern application requirements

REQUIRES MORE PERFORMANCE, SCALE, AND AVAILABILITY





Ecommerce



Media streaming



Social media



Online gaming



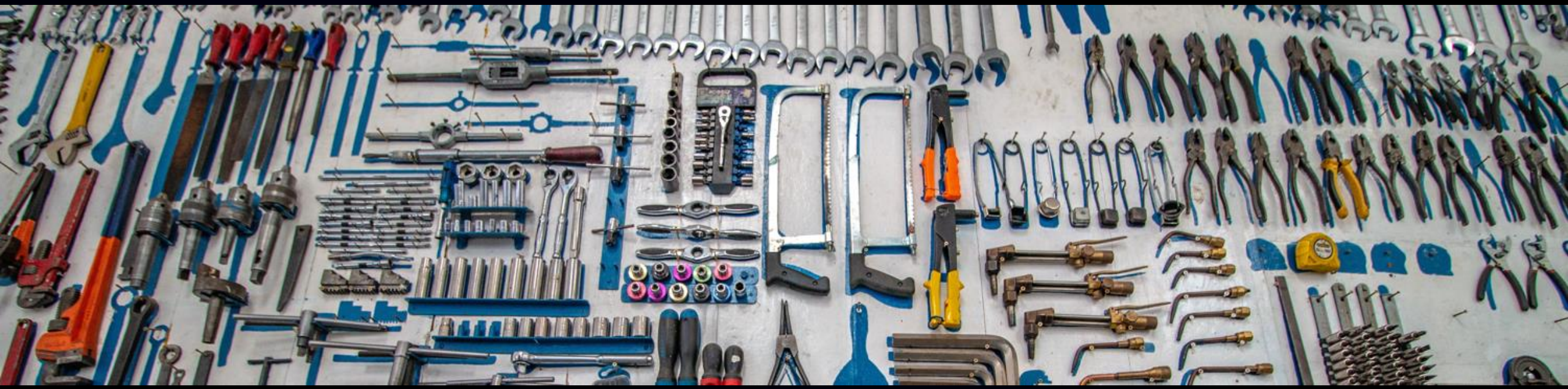
Shared economy

Users	1M+
Data volume	Terabytes–petabytes
Locality	Global
Performance	Microsecond latency
Request rate	Millions per second
Access	Mobile, IoT, devices
Scale	Virtually unlimited
Economics	Pay as you go
Developer access	Instance API access
Development	Applications and storage are decoupled

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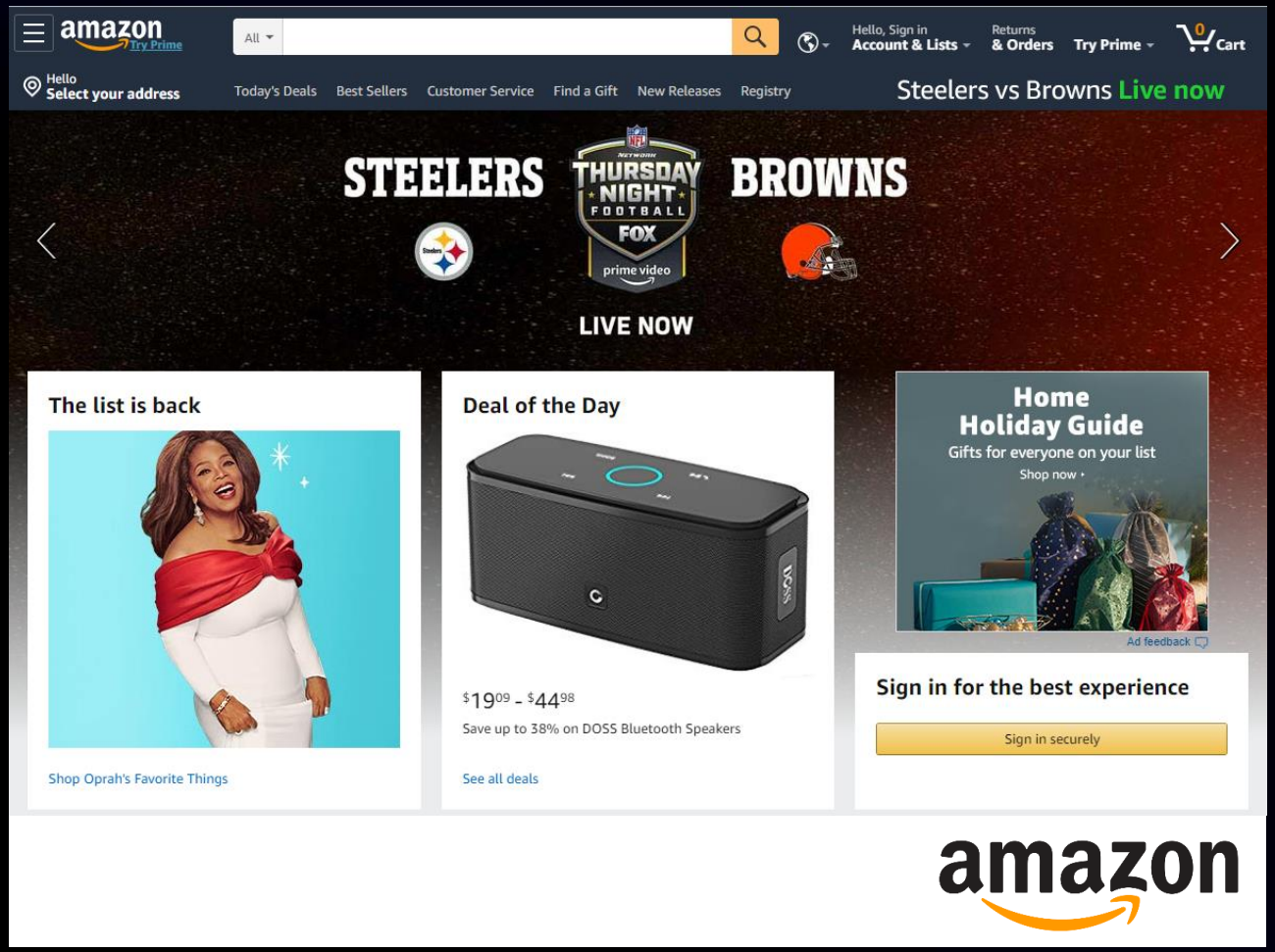
Instead of a monolithic application . . .



. . . build microservices with purpose-built tools

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Internet-scale ecommerce



The world's largest ecommerce business, Amazon.com, migrated entirely to **purpose-built AWS databases** because of

- Cost savings
- Performance improvements
- Administrative overhead reductions

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Why consider purpose-built databases?



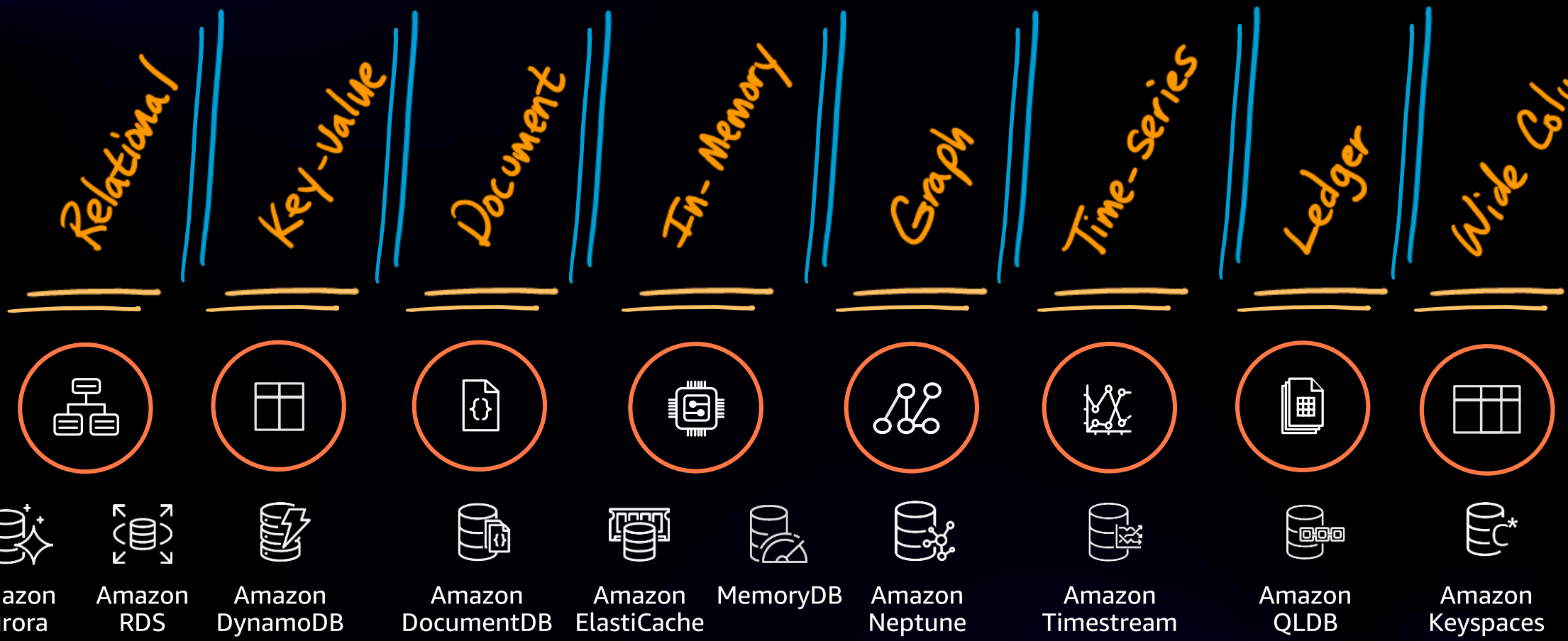
Scale

Performance

Availability

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Purpose-built databases



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Amazon Aurora

MYSQL AND POSTGRESQL-COMPATIBLE RELATIONAL DATABASE BUILT FOR THE CLOUD



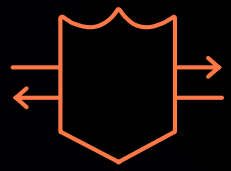
Performance and scalability

5x throughput of standard MySQL and 3x of standard PostgreSQL; scale-out up to 15 read replicas



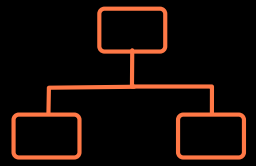
Availability and durability

Fault-tolerant, self-healing storage; six copies of data across three Availability Zones; continuous backup to Amazon S3



Highly secure

Network isolation, encryption at rest and in transit



Fully managed

Managed by Amazon RDS: no server provisioning, software patching, setup, configuration, or backups

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Amazon DynamoDB

FAST AND FLEXIBLE KEY-VALUE DATABASE SERVICE FOR ANY SCALE



Performance at scale

Consistent, single-digit millisecond response times at any scale; build applications with virtually unlimited throughput



Serverless architecture

No hardware provisioning, software patching, or upgrades; scales up or down automatically; continuously backs up your data



Enterprise security

Encrypts all data by default and fully integrates with AWS Identity and Access Management (IAM) for robust security



Global replication

Build global applications with fast access to local data by easily replicating tables across multiple AWS Regions

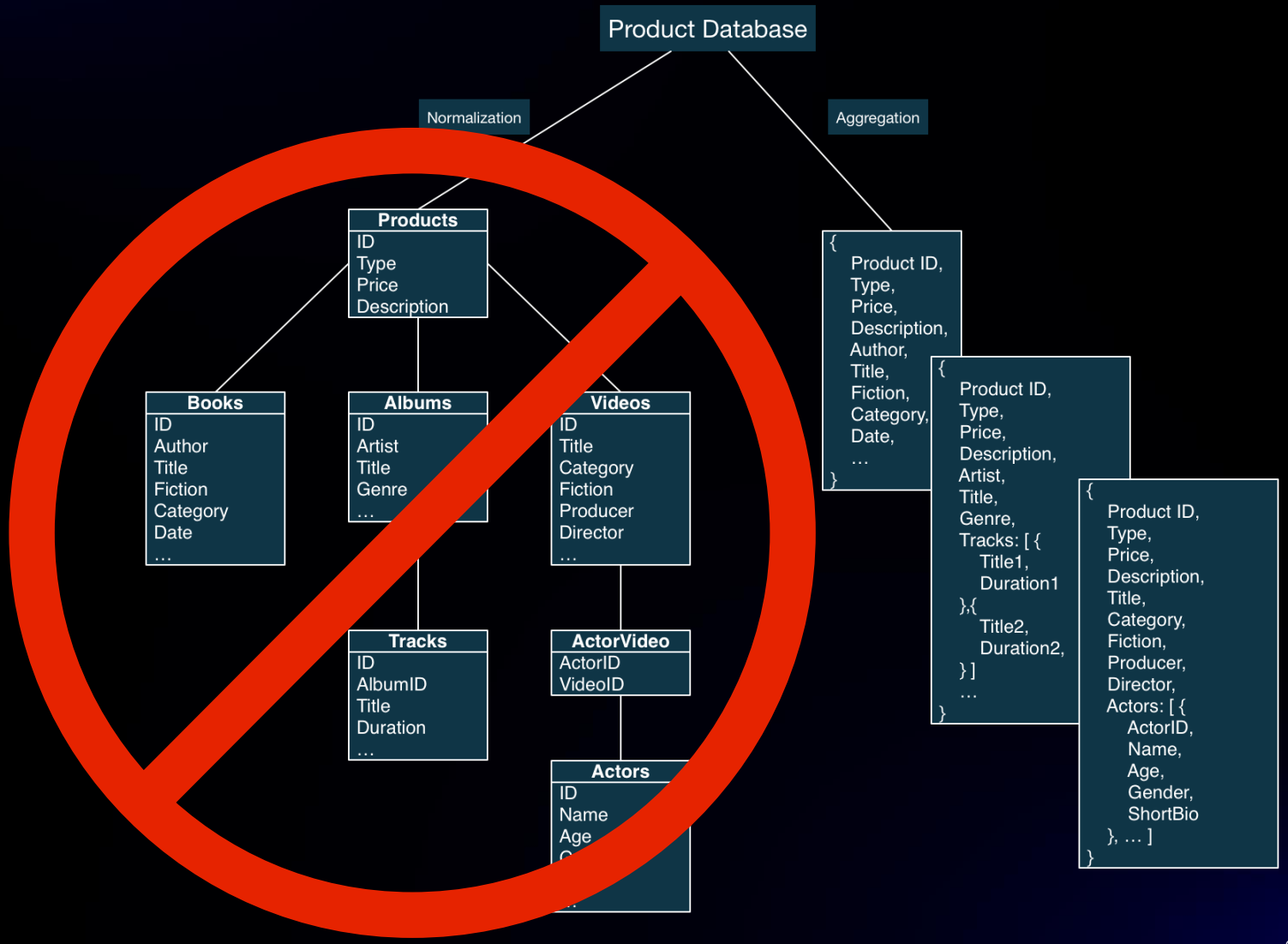
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Demo

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SQL vs. NoSQL design pattern



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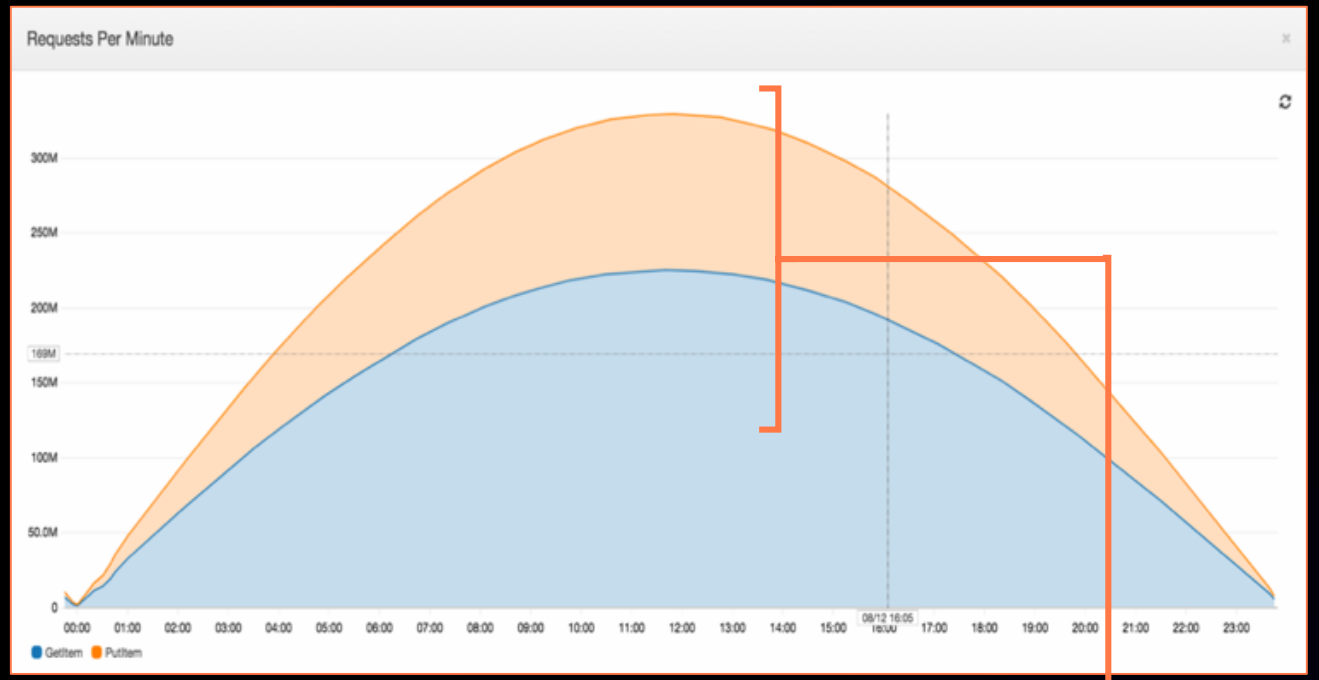
Tenets of NoSQL data modeling

- **Define the use case**
- Identify the access patterns
  - Read/write workloads
  - Query dimensions
  - Aggregations
- Data modeling
  - Avoid relational design patterns
  - Start with one table
- Application type: OLTP vs. OLAP
- Data lifecycle – TTL, backup/archival, etc.
- Identify primary keys
  - How are inserts and reads?
  - Overload items into partitions

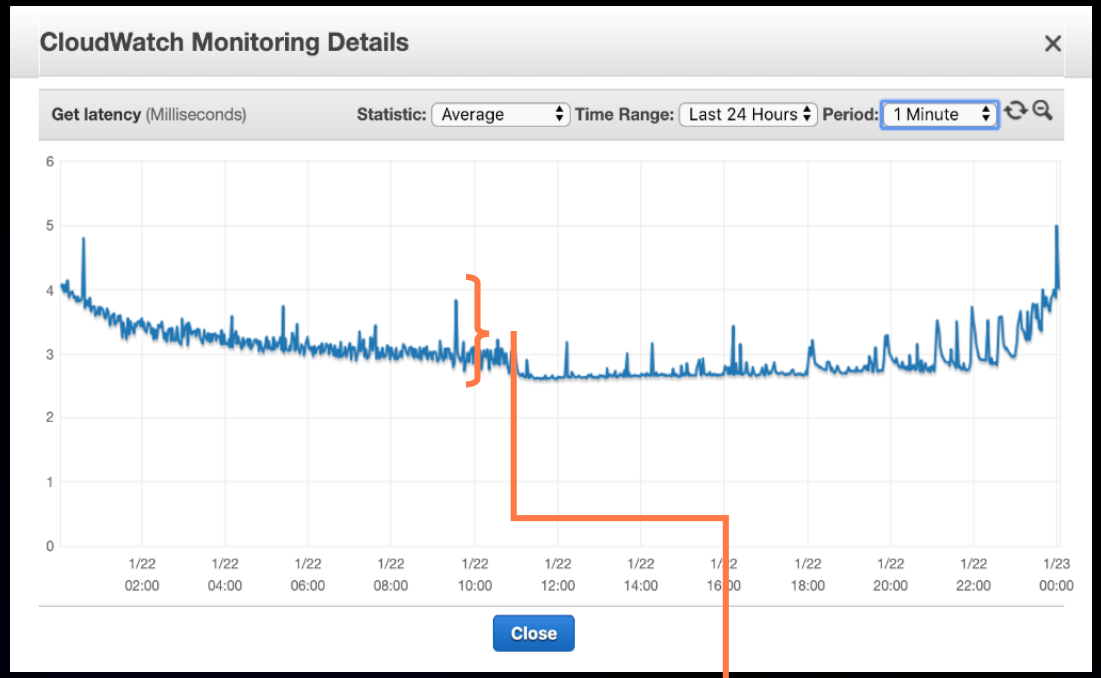
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Consistent low latency – Even during high request volume

PERFORMANCE AT SCALE



Millions of requests per second

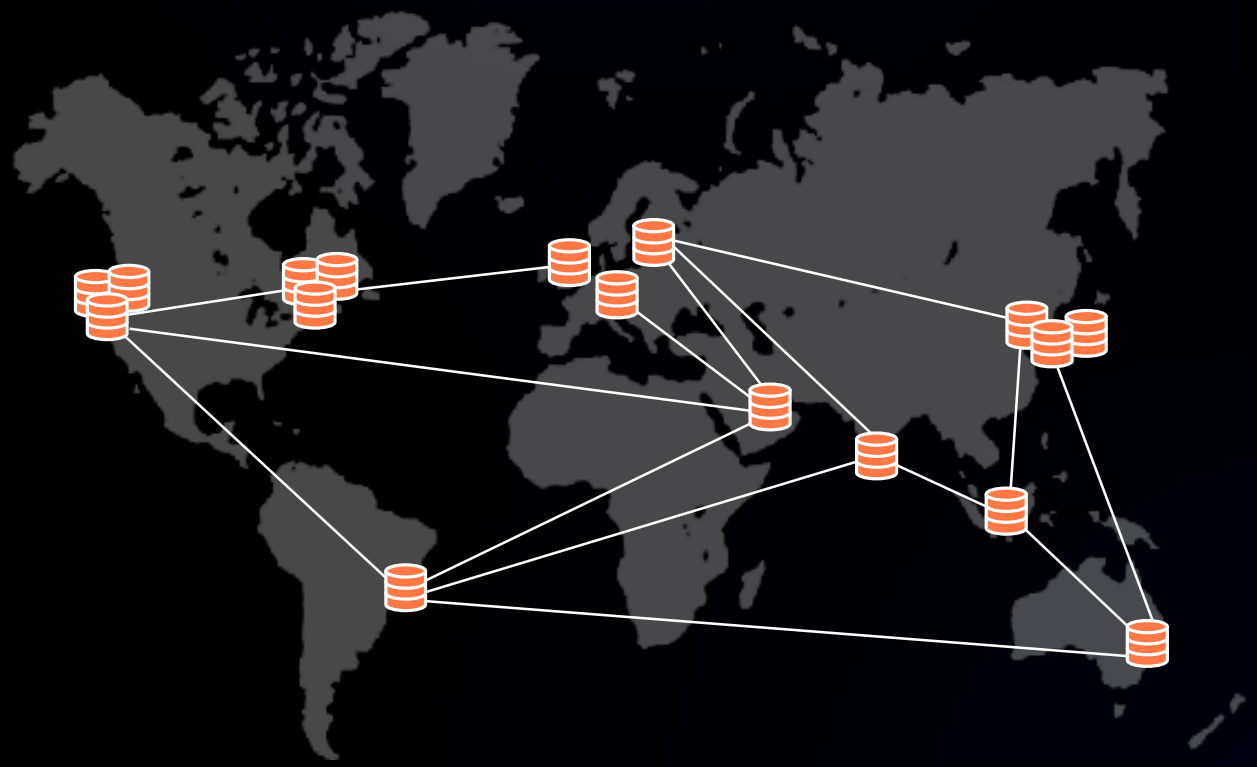


Only **1-millisecond** variance

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Global tables provide applications with multi-Region replication

PERFORMANCE AT SCALE



Build high-performance, globally distributed applications

Low-latency reads and writes to locally available tables

Multi-Region redundancy and resiliency and 99.999% availability

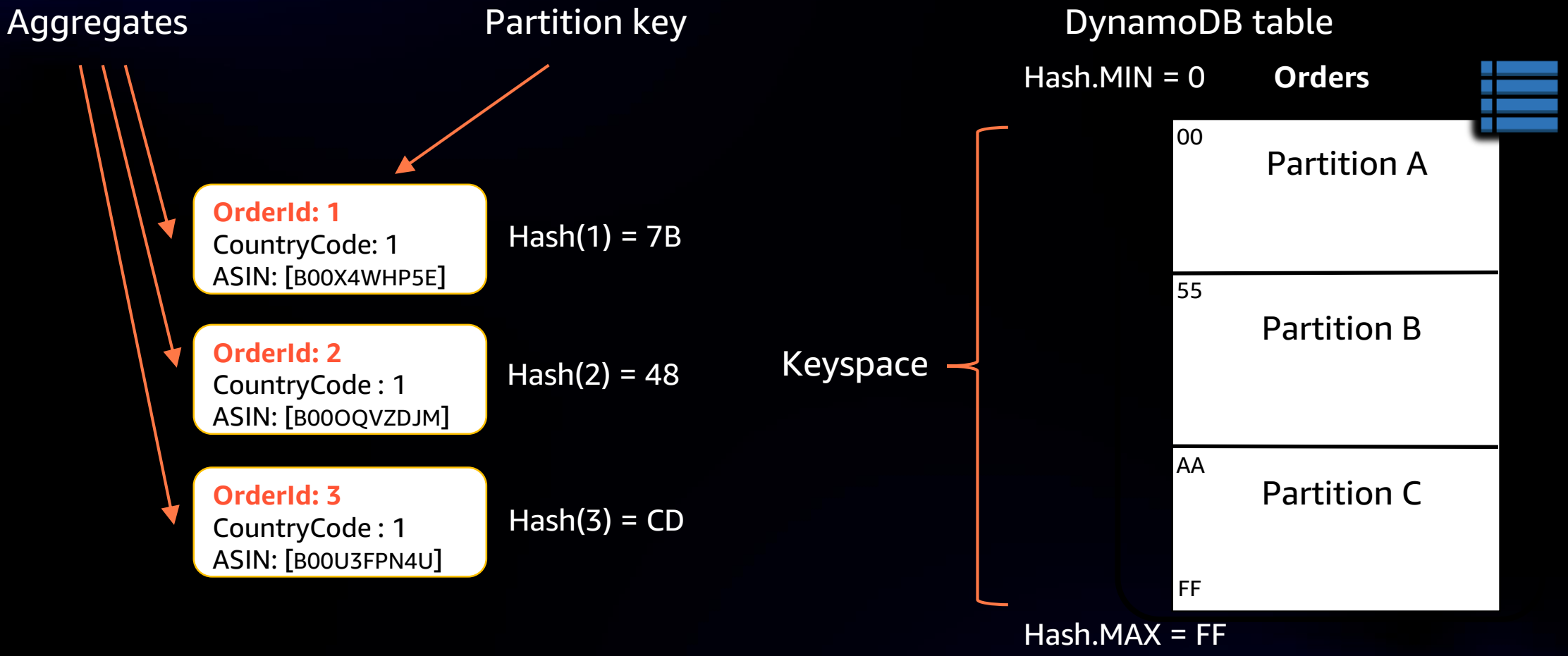
Multi-active writes from any Region

Easy to set up and no application rewrites required

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Item distribution (happy path)



Related data (aggregate) is stored together for efficient access

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Amazon ElastiCache

MANAGED REDIS OR MEMCACHED-COMPATIBLE IN-MEMORY CACHING SERVICE



Unlimited scale

Read scaling with replicas; write and memory scaling with sharding; nondisruptive scaling



Consistent high performance

In-memory data store and cache for submillisecond response times



Fully managed

AWS manages all hardware and software setup, configuration, and monitoring

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Amazon MemoryDB for Redis

REDIS-COMPATIBLE, DURABLE, IN-MEMORY DATABASE SERVICE



Ultra-fast performance

Microsecond read and single-digit millisecond write latencies with millions of transactions per second



Redis compatibility

Flexible and friendly data structures and APIs



Durability and high availability

Multi-AZ transactional for durability and high availability



Security

Amazon VPC, encryption at rest and in transit, access control list (ACL)



Fully managed

AWS-managed hardware and software setup, configuration, monitoring, and snapshots



High scalability

More than 100 TB of storage per cluster (with 1 replica per shard)

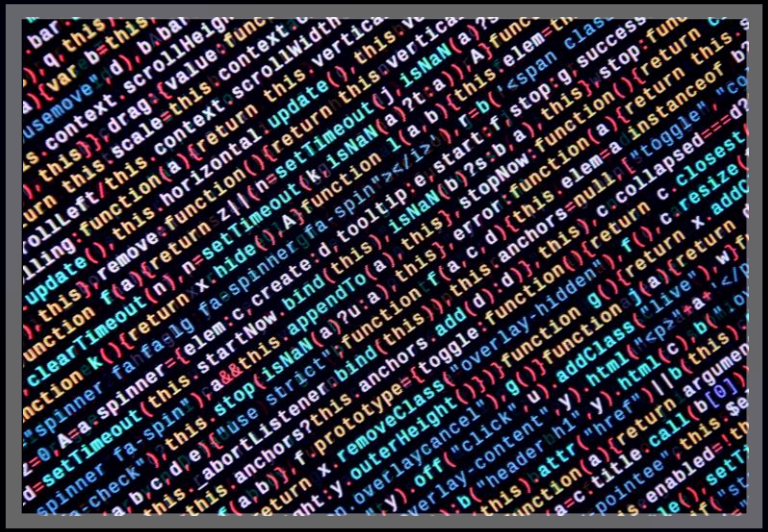
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Amazon OpenSearch Service

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Amazon OpenSearch Service is a powerful analytics engine



Text search

Natural language

Boolean queries

Relevance



Streaming data

High-volume ingest

Near real time

Distributed storage



Analysis

Time-based visualizations

Nestable statistics

Time-series tools

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How does it work?

1. Send data as JSON via REST APIs
2. Data is indexed – all fields searchable, including nested JSON
3. REST APIs, for fielded matching, Boolean expressions, sorting, and analysis



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Demo

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Amazon DocumentDB

FAST, SCALABLE, HIGHLY AVAILABLE MONGODB-COMPATIBLE DATABASE SERVICE



Millions of requests per second, millisecond latency



Same code, drivers, and tools you use with MongoDB



Simple and fully managed



Secure and compliant



2x throughput of managed MongoDB services



Deeply integrated with AWS services

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Amazon Neptune

FAST, RELIABLE GRAPH DATABASE BUILT FOR THE CLOUD

Open



Supports Apache TinkerPop and W3C RDF graph models

Fast



Query billions of relationships with millisecond latency

Reliable



Six replicas of data across three Availability Zones with full backup and restore

Easy



Build powerful queries easily with Gremlin and SPARQL

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Amazon Timestream

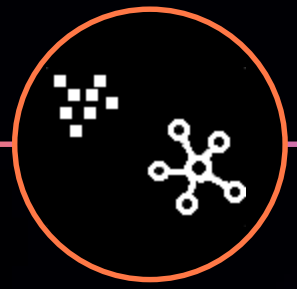
FAST, SCALABLE, FULLY MANAGED TIME-SERIES DATABASE

1,000x faster and 1/10th the cost of relational databases



Collect data at the rate of millions of inserts per second (10M/second)

Trillions of daily events



Adaptive query processing engine maintains steady, predictable performance

Time-series analytics



Built-in functions for interpolation, smoothing, and approximation

Serverless



Automated setup, configuration, server provisioning, software patching

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Amazon Quantum Ledger Database (Amazon QLDB)

FULLY MANAGED LEDGER DATABASE; TRACK AND VERIFY THE HISTORY OF ALL CHANGES MADE TO YOUR APPLICATION'S DATA

Immutable and transparent



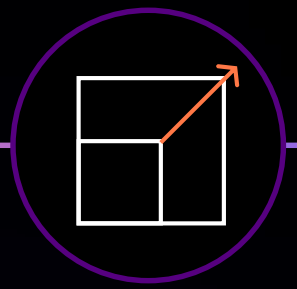
Append-only, immutable journal tracks history of all changes that cannot be deleted or modified; get full visibility into entire data lineage

Cryptographically verifiable



All changes are cryptographically chained and verifiable

Highly scalable



Executes 2–3x as many transactions as ledgers in common blockchain frameworks

Easy to use



Flexible document model; query with familiar SQL-like interface

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Amazon Keyspaces (for Apache Cassandra)

SCALABLE, HIGHLY AVAILABLE, AND MANAGED APACHE CASSANDRA–COMPATIBLE DATABASE SERVICE

Apache Cassandra–compatible



Use the same Cassandra drivers and tools

No servers to manage



No need to provision, configure, and operate large Cassandra clusters

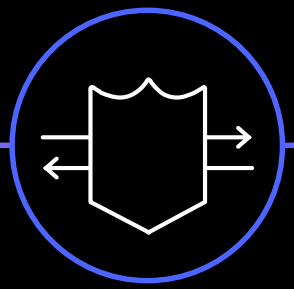
Single-digit millisecond performance at scale



Scale tables up and down automatically

Virtually unlimited throughput and storage

Highly available and secure



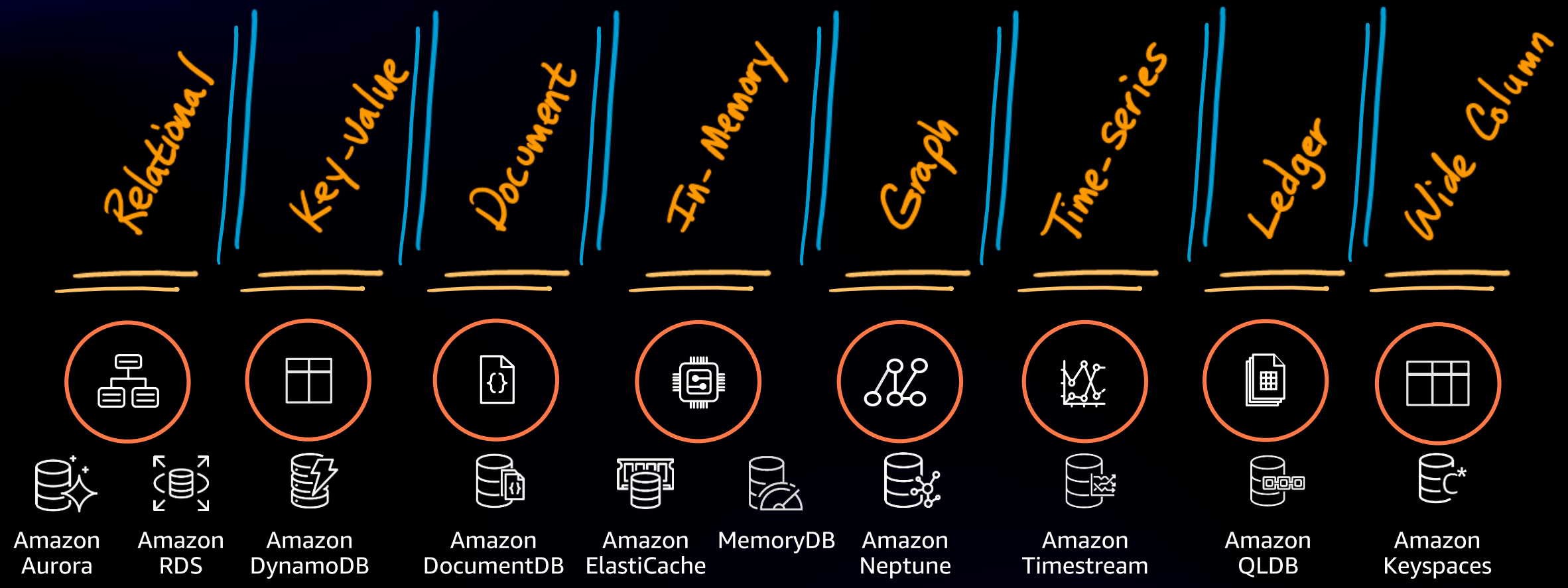
99.99% availability SLA within an AWS Region

Data encrypted at rest; integrated with IAM

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Purpose-built databases



Broadest selection of purpose-built databases

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