aws INNOVATE

MODERN APPLICATIONS EDITION

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Build modern applications with purpose-built databases

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Agenda

- What is a modern application?
- Why purpose-built databases?
- AWS databases – the right tool for the job
- Modern architecture examples

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What’s a modern application?

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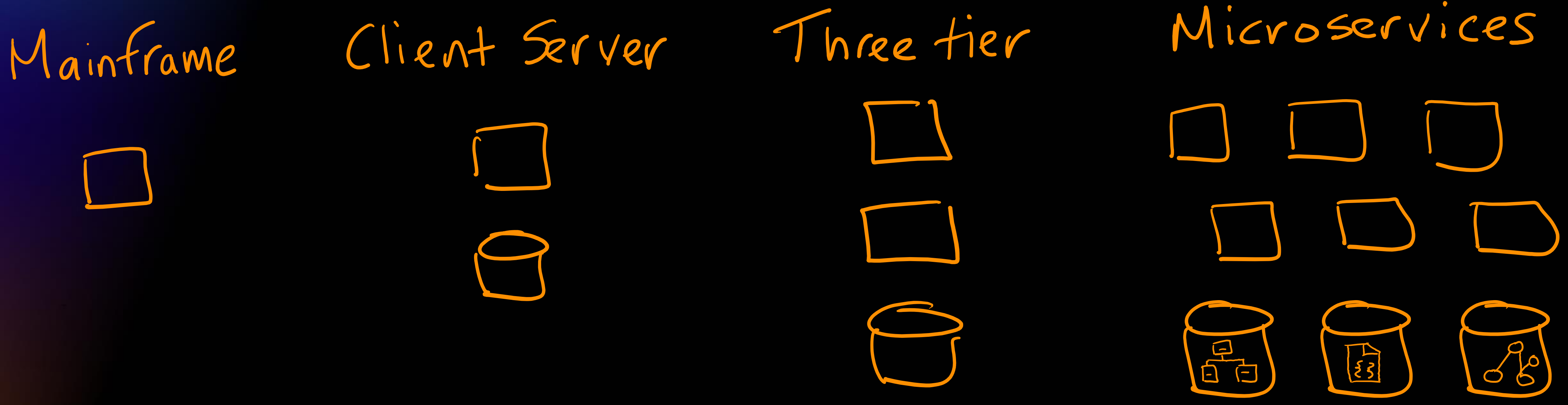
App architectures & patterns have evolved



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Modern application requirements

Requires more performance, scale, and availability

E-commerce

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	Apps and storage are decoupled

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Instead of a monolithic application

build microservices with purpose-built tools

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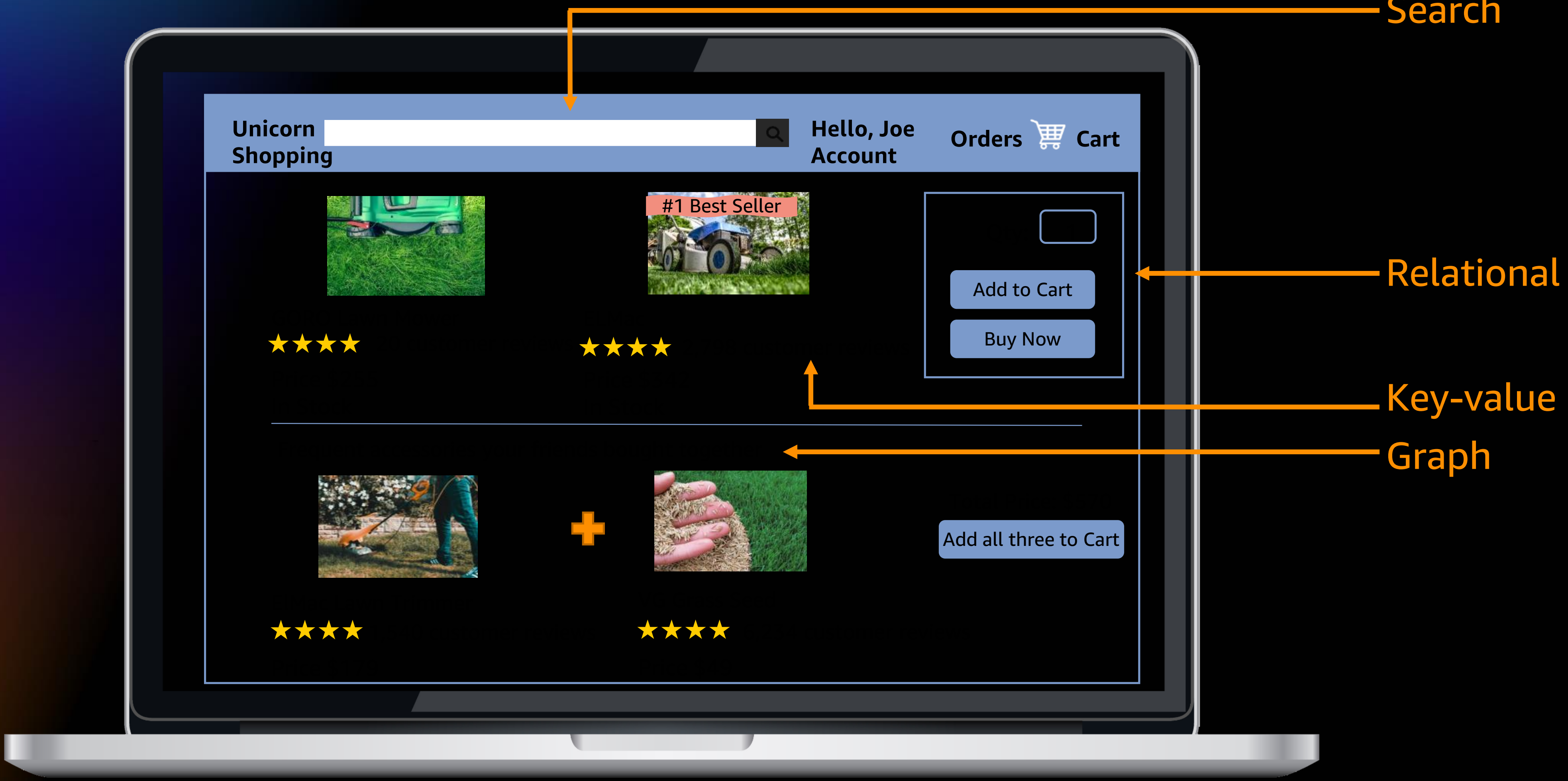
Modern cloud-based applications

Loosely coupled micro-services and purpose-built data stores



Search

Relational

Key-value

Graph

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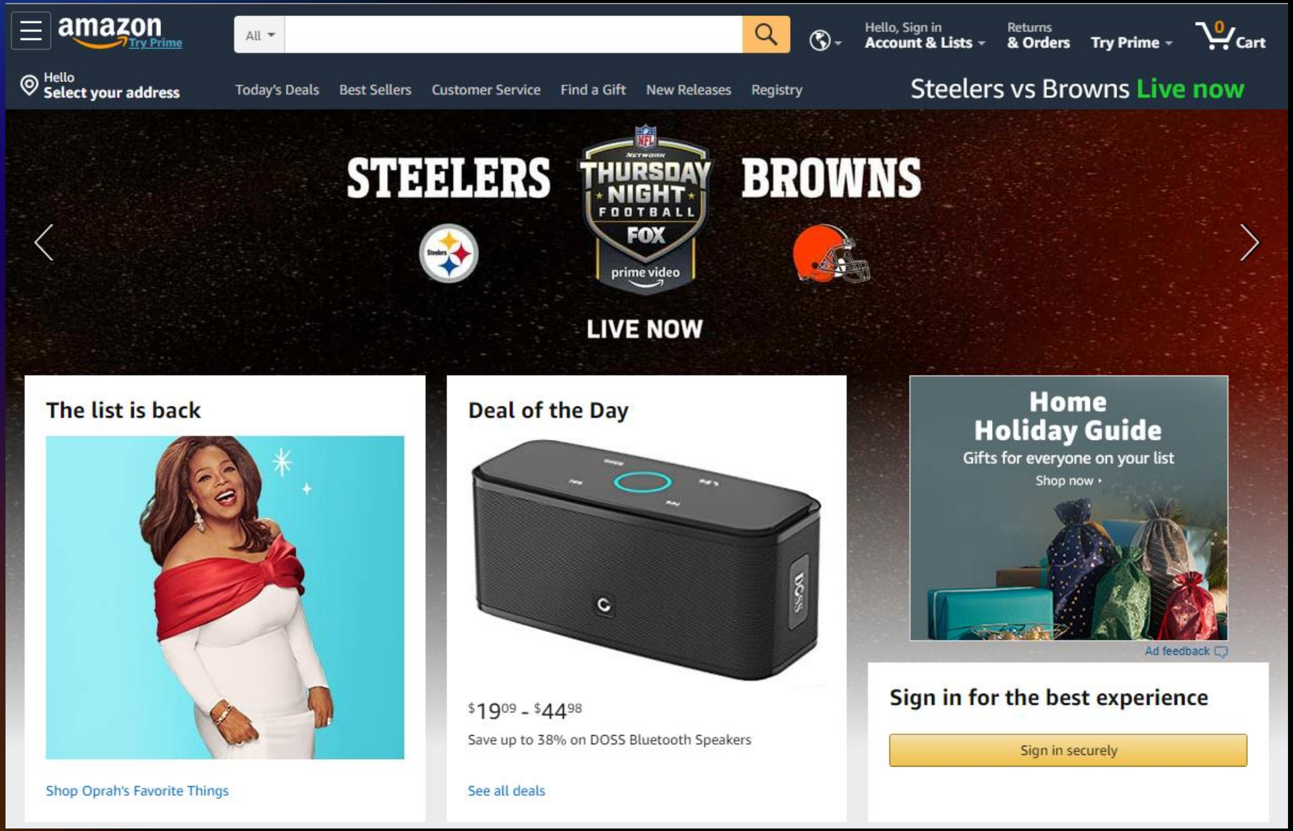
Internet-scale e-commerce



Save up to 38% on DOSS Bluetooth Speakers

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

- Cost savings
- Performance improvements
- Administrative overhead reductions

https://aws.amazon.com/solutions/case-studies/amazon-database-migration/

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Why consider purpose-built databases?

Scale

Performance

Availability

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AWS purpose-built databases – The right tool for the right job

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Purpose-built databases

Relational	Key-value	Document	In-Memory	Graph	Time-series	Ledger	Wide Column
Amazon Aurora Amazon Relational Database Service (Amazon RDS)	Amazon DynamoDB	Amazon DocumentDB	Amazon ElastiCache Amazon MemoryDB	Amazon Neptune	Amazon Timestream	Amazon QLDB	Amazon Keyspaces (for Apache Cassandra)

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Capital One migrated its monolithic mainframe to **highly available** AWS databases for their microservices-based applications

Transactional data: **Amazon RDS**

- State management

Analytics: **Amazon Redshift**

- Web logs

Consistent low latency: **Amazon DynamoDB**

- User data and mobile app

https://aws.amazon.com/solutions/case-studies/capital-one-all-in-on-aws/

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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 Simple Storage Service (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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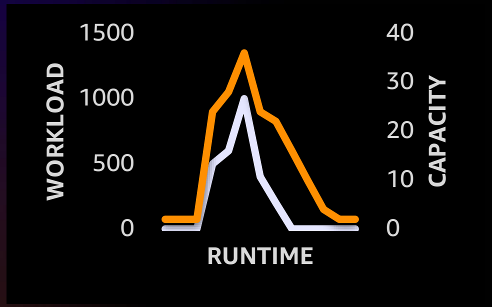
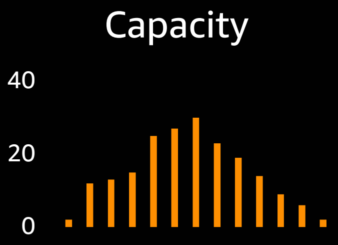
Introducing Amazon Aurora Serverless v2 (preview)

An auto-scaling configuration for Amazon Aurora that now supports even the most demanding applications and database workloads



Scale instantly, from hundreds to hundreds-of-thousands of transactions, in a fraction of a second



Scale in fine-grained increments to provide just the right amount of database capacity

Full breadth of Amazon Aurora capabilities including multi-AZ, global database

Up to 90% cost savings when compared to provisioning for peak load

https://aws.amazon.com/rds/aurora/serverless/

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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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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

Deeply integrated with AWS services

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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
Non-disruptive scaling

Consistent high performance

In-memory data store and cache for sub-millisecond 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 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, SPARQL and openCypher

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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

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 AWS Identity and Access Management (IAM)

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Modern application architecture examples

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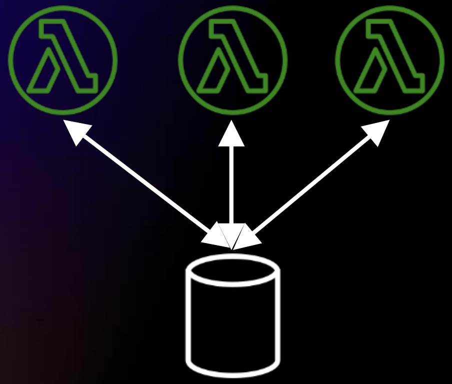
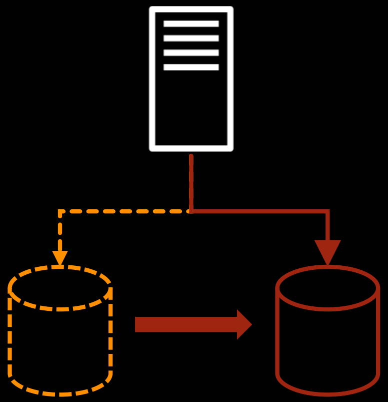
Today's applications demand

Scalability



Scale to hundreds of thousands of connections

Availability



Increase app availability and reduce DB failover times

Security

Manage app data security with DB access controls

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Choices include

Over-provisioning

- Precious database compute resources spent on managing connections
- Maintain complex failure handling code to overcome transient failures

Self-managing a database proxy

- Deploy, patch, and manage yet another component
- Distribute across AZs for high availability

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Amazon RDS Proxy: Skip the heavy lifting

Amazon RDS Proxy

- A fully managed, highly available database proxy for Amazon RDS and Amazon Aurora
- Pools and shares DB connections to make applications more scalable, more resilient to database failures, and more secure

Fully managed

No need to deploy and maintain a proxy, highly available, MySQL- and PostgreSQL-compatible

Connection pooling

Pool and share DB connections for improved scalability

Fast and seamless failovers

66% faster failovers and no loss of connectivity

Improved security

Store passwords in AWS Secrets Manager and enforce IAM authentication

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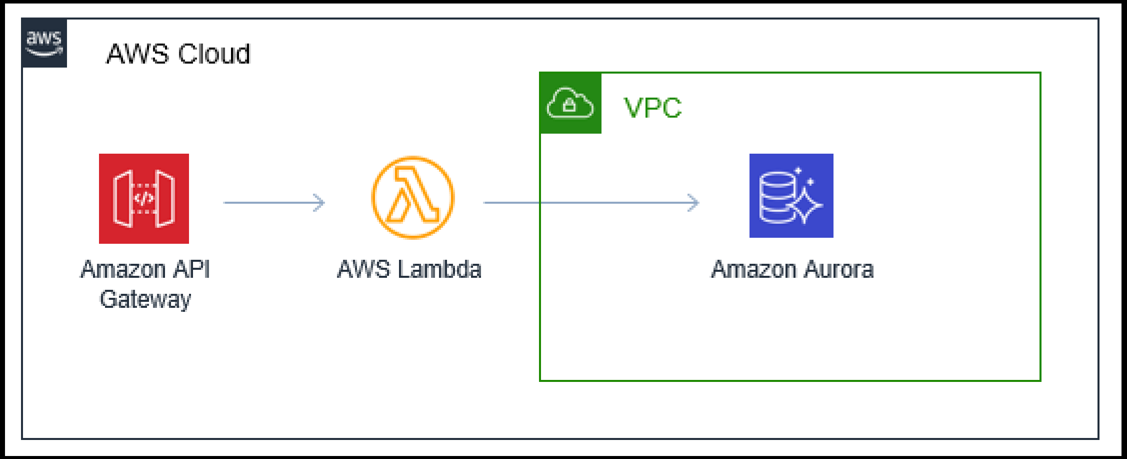
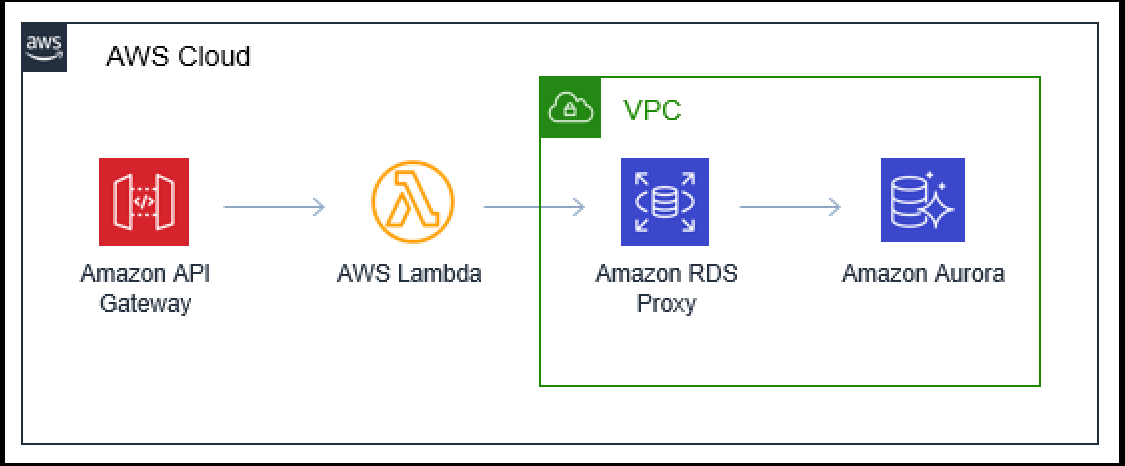
Traditional vs modern connection approach





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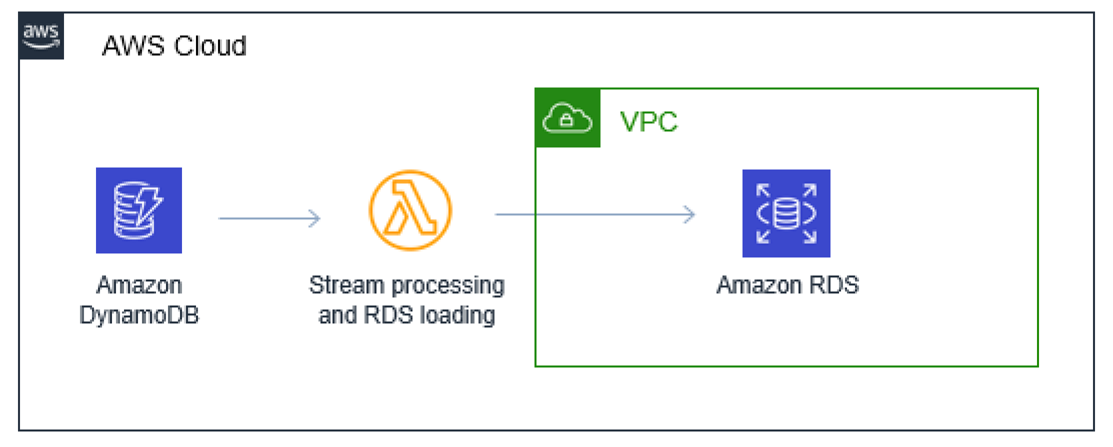
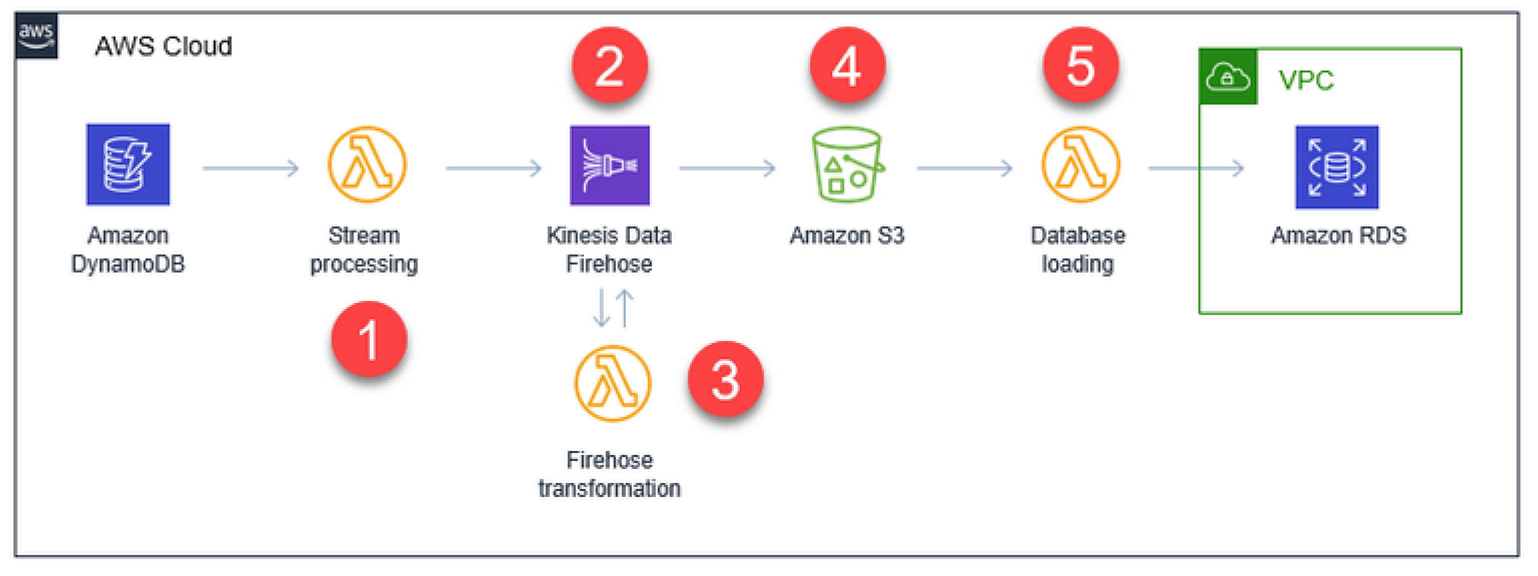
Moving data between databases





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Recap and resources

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Recap

- Application architecture has evolved from mainframes to microservices
- Monolithic databases are moving to purpose-built databases
- AWS has 16 purpose-built database engines that cover common use cases
- You can use multiple AWS database services in modern application architectures

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Our approach

Architect services ground up for the cloud and for the explosion of data

Offer a portfolio of purpose-built services that are optimized for your workloads

Help you innovate faster through managed services

Provide services that help you migrate existing apps and databases to the cloud

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Other resources

1. Databases on AWS
2. AWS Database Migration Service
3. AWS Schema Conversion Tool
4. Amazon RDS Proxy
5. Zerobase creates private, secure, and automated contact tracing using Amazon Neptune

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Visit the Modern Applications Resource Hub for more resources

Dive deeper with these resources to help you develop an effective plan for your modernization journey.

- Build modern applications on AWS e-book
- Build mobile and web apps faster e-book
- Modernize today with containers on AWS e-book
- Adopting a modern Dev+Ops model e-book
- Modern apps need modern ops e-book
- Determining the total cost of ownership: Comparing Serverless and Server-based technologies paper
- Continuous learning, continuous modernization e-book
- … and more!

https://bit.ly/3yfOvbK

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