

Exploring AWS Database Resources

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS



Rahulraj Singh
Technical Product Manager

Introduction to Database as a Service (DBaaS)

Access databases without configuring physical infrastructure or installing software



Relational databases

Introduction to Database as a Service (DBaaS)

Access databases without configuring physical infrastructure or installing software



Relational databases



NoSQL databases

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NoSQL databases



Memory-based databases

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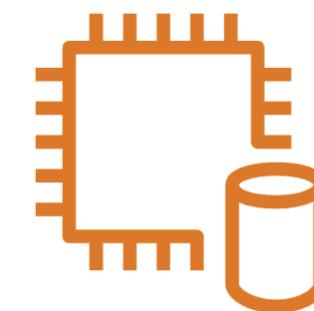
Relational databases



NoSQL databases



Memory-based databases



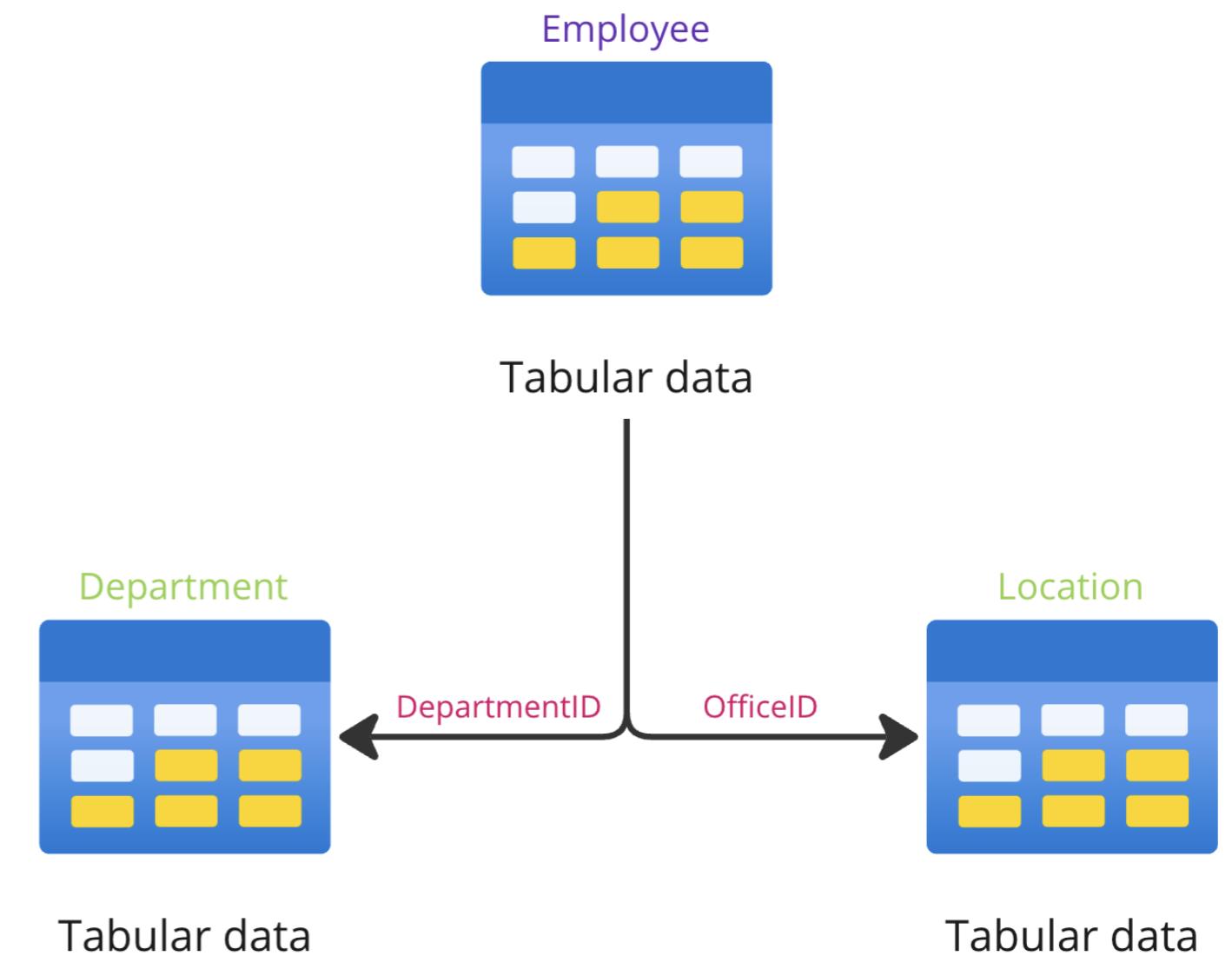
Compute-hosted databases

What are relational databases?

Structured storage systems organizing data into tables with predefined relationships

Why use relational databases?

- Data integrity
- Consistency
- Scalability



Relational databases in AWS



Amazon RDS

Relational databases in AWS



Amazon RDS



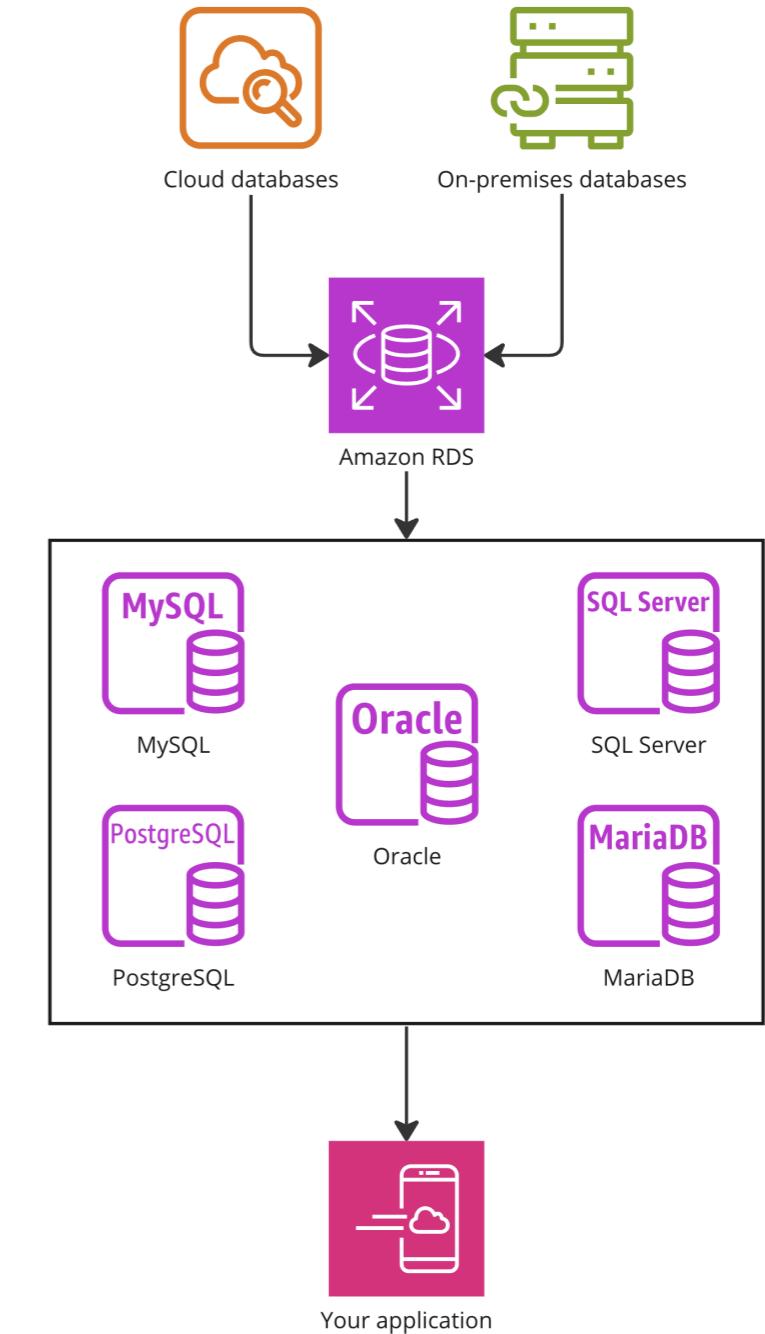
Amazon Aurora

Amazon RDS

Fully managed relational database service

Key features

- Wide range of supported database engines
- Efficient scaling for cloud and on-premises databases

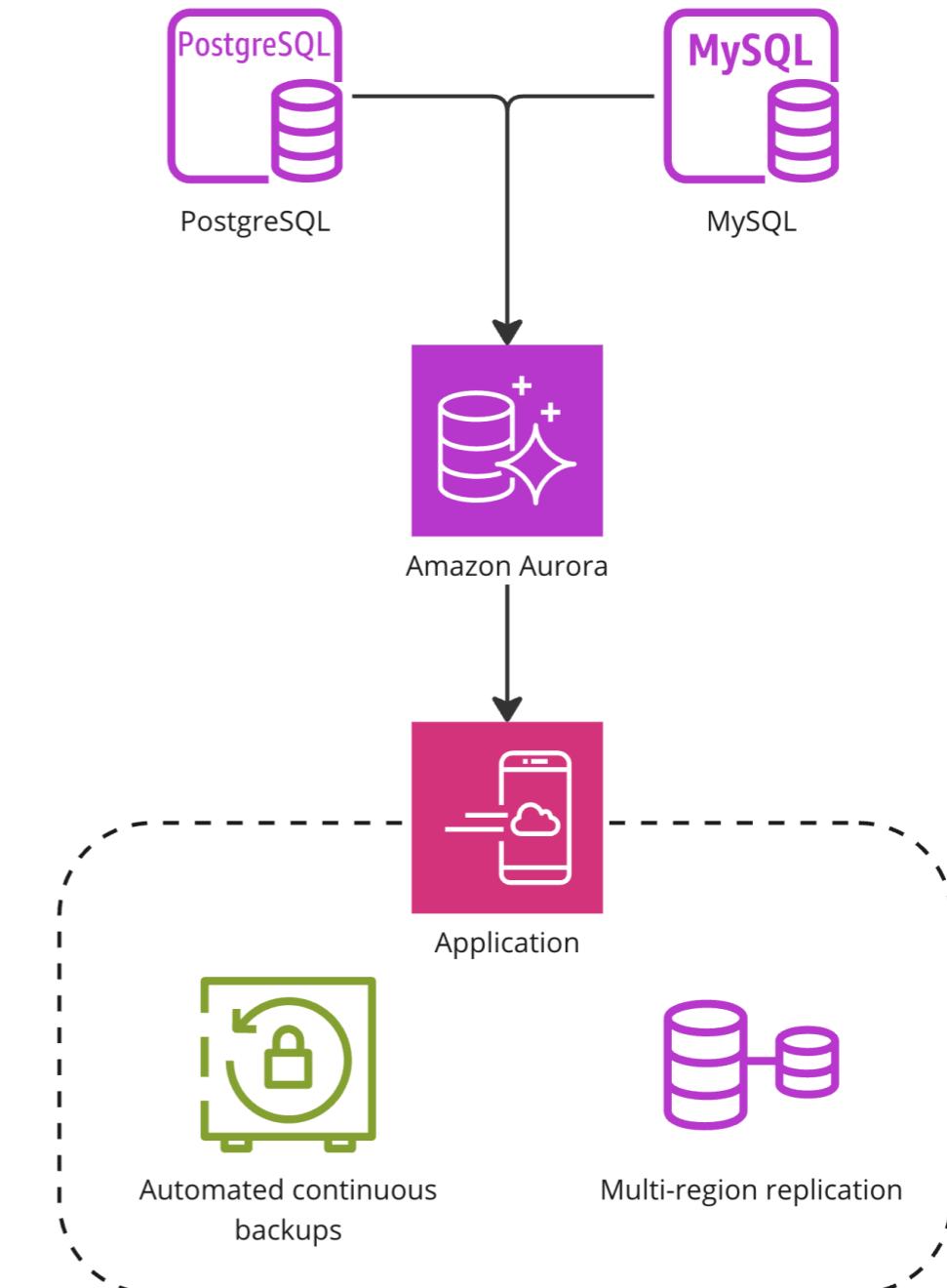


AWS Aurora

Relational database service optimized for MySQL and PostgreSQL engines

Key features

- High performance at approximately one-tenth of the cost
- In-built continuous backup
- Automated multi-region replication



NoSQL databases in AWS

Accommodate diverse data models beyond traditional relational databases, such as JSON and raw documents



Amazon DynamoDB

Key features

- Schema flexibility
- Horizontal scalability

NoSQL databases in AWS

Accommodate diverse data models beyond traditional relational databases, such as JSON and raw documents



Amazon DynamoDB

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- Horizontal scalability



Amazon DocumentDB

Amazon DynamoDB

Serverless, NoSQL, fully managed database
with single-digit millisecond performance at
any scale



High throughput
and storage

Key features

- High performance with nearly unlimited throughput and storage

Amazon DynamoDB

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High throughput
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Key features

- High performance with nearly unlimited throughput and storage
- 99.999% global availability



High global
availability

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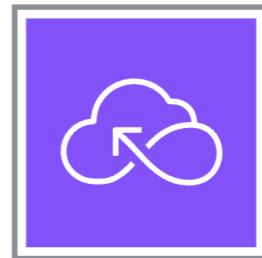
High throughput
and storage

Key features

- High performance with nearly unlimited throughput and storage
- 99.999% global availability
- Serverless capabilities for seamless scaling



High global
availability



Serverless capabilities

DynamoDB use cases

- Real-time video streaming and interactive content in media/entertainment



Video streaming

DynamoDB use cases

- Real-time video streaming and interactive content in media/entertainment
- Tracking inventory or shopping carts based on customer profiles



Video streaming



Tracking carts

DynamoDB use cases

- Real-time video streaming and interactive content in media/entertainment
- Tracking inventory or shopping carts based on customer profiles
- Game platform with player data, session history, and leaderboards



Video streaming



Tracking carts



Gaming data

Amazon DocumentDB

- Fully managed native JSON document database with MongoDB compatibility
- Operate critical document workloads of any scale



MongoDB
compatibility

Amazon DocumentDB

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MongoDB
compatibility



Heavy document
workloads

Amazon DocumentDB

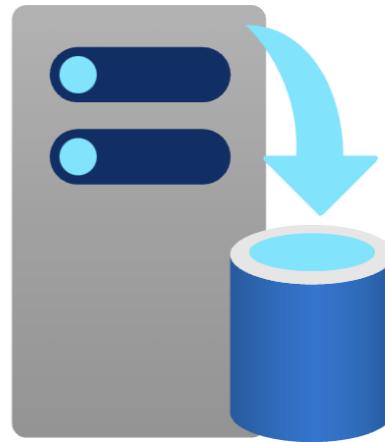
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MongoDB
compatibility



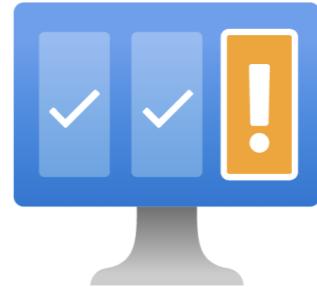
Heavy document
workloads



No infrastructure
management

When to use DocumentDB?

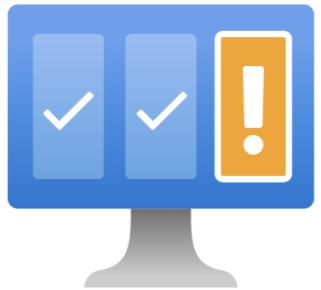
- Fast, reliable access to content in your CMS like reviews and images



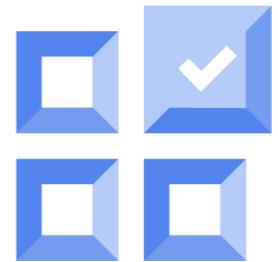
Content management systems

When to use DocumentDB?

- Fast, reliable access to content in your CMS like reviews and images
- Generate customer recommendations and manage millions of user profiles



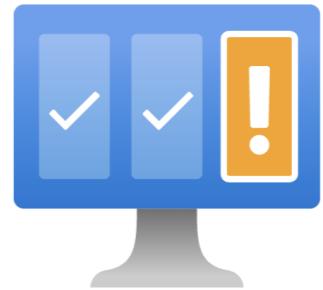
Content management systems



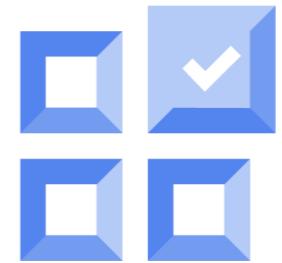
Recommendation engines

When to use DocumentDB?

- Fast, reliable access to content in your CMS like reviews and images
- Generate customer recommendations and manage millions of user profiles
- Unlock GenAI use cases such as semantic search, product recommendations, and chatbots



Content management systems



Recommendation engines



Generative AI

Memory-based databases in AWS

Designed for high-performance data storage and retrieval, utilizing RAM for faster access



Real-time data access

Optimal use cases

- Caching frequently accessed data
- Real-time analytics and data processing
- High-speed transactional applications



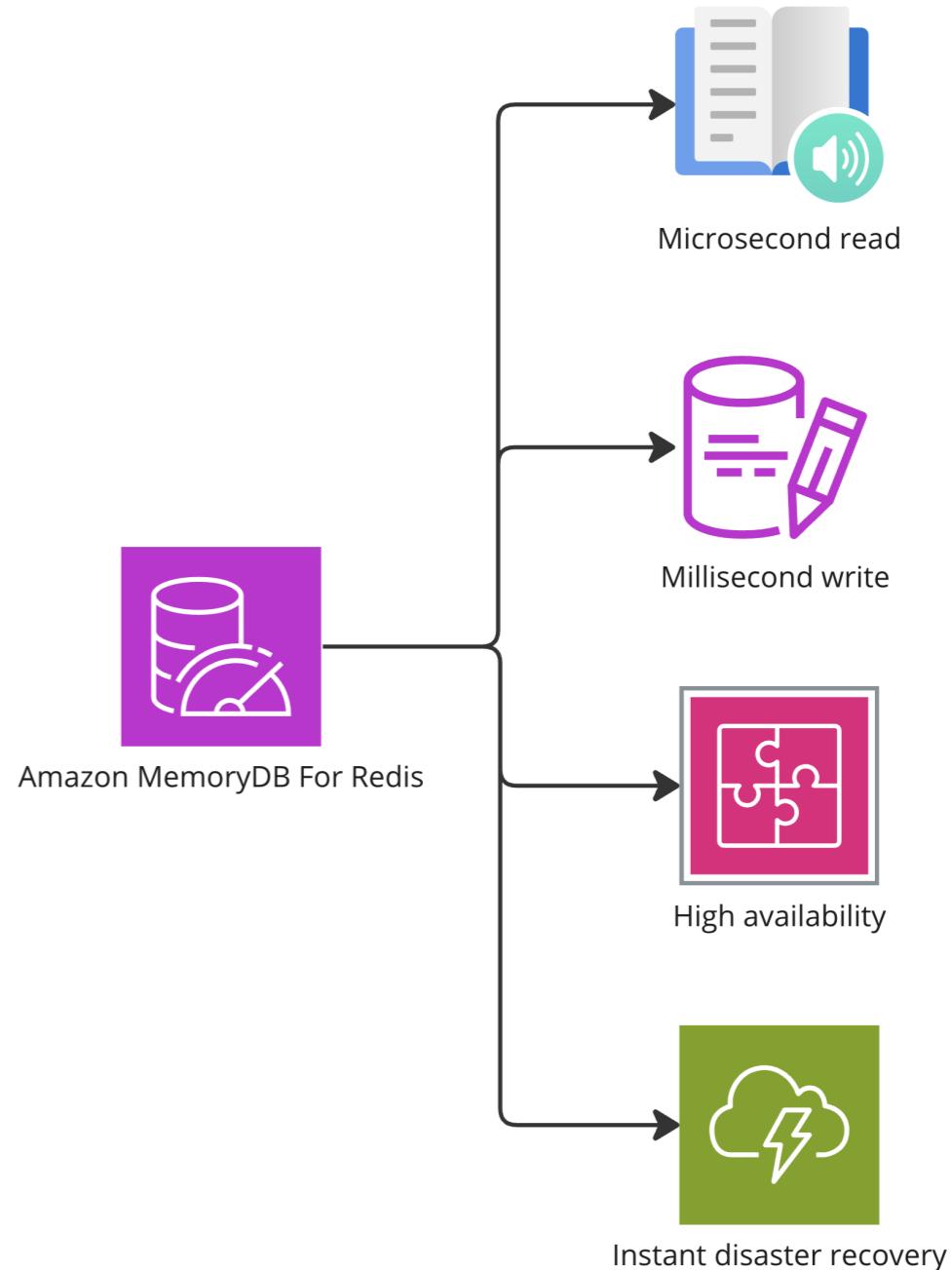
High throughput

MemoryDB for Redis

AWS's offering for running memory-based databases

Key features

- Super-fast read and write capabilities
- 99.99% availability
- Near instantaneous recovery without any data loss



What are EC2-hosted databases?

Deployed on EC2 instances following a traditional, manual approach to database hosting

- Provides granular control over configuration and management
- Responsibility for backups and patching lies with the user



Full control over configurations



Manual backups and recovery

Compute databases vs. static databases?

EC2-hosted databases



Manual setup



Full control over configurations

AWS-managed databases



Automated deployment



Managed maintenance and administration

Let's practice!

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS

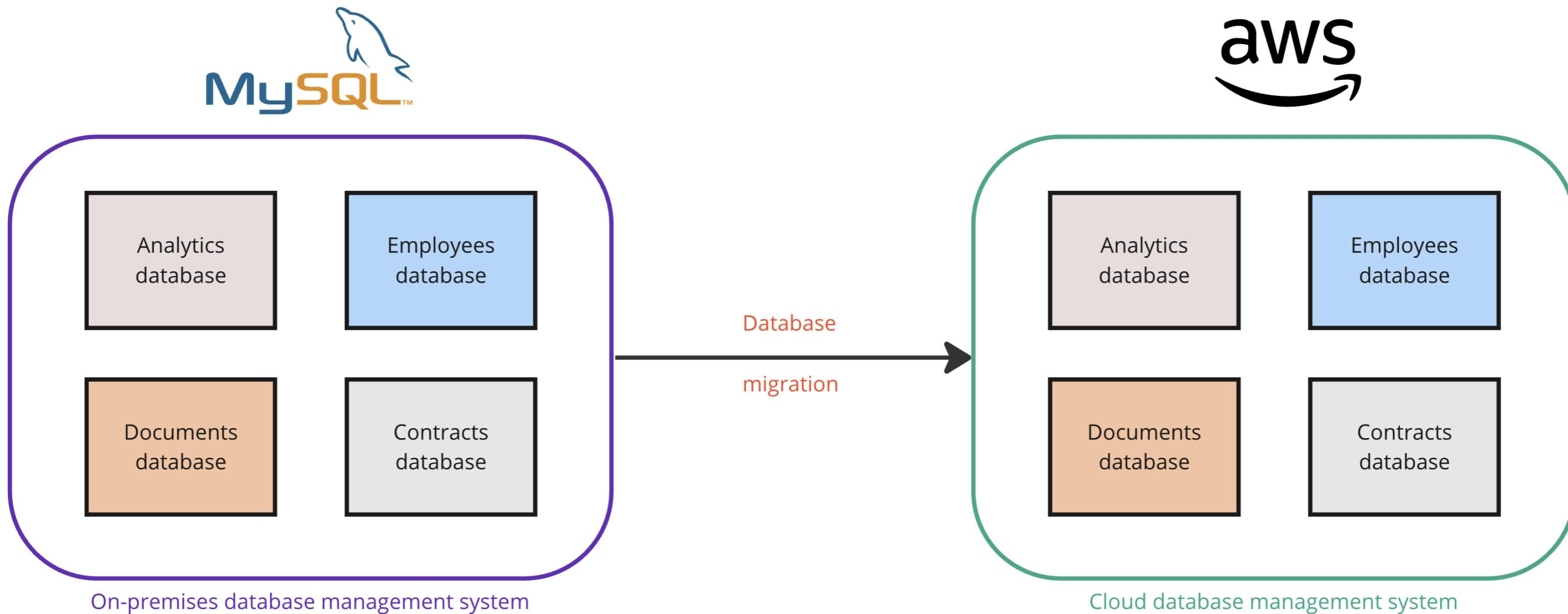
Database Migration Services in AWS

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS



Rahulraj Singh
Technical Product Manager

What is database migration?



Why do we need data migration?

- Legacy systems unable to meet rapid scalability and efficiency demands



Why do we need data migration?

- Legacy systems unable to meet rapid scalability and efficiency demands
- Generative AI has advanced systemic needs for compute and storage



Scalability



Modern day applications

Why do we need data migration?

- Adapt to evolving business needs for scalability and efficiency
- Modernize from legacy systems to meet the demands of contemporary applications
- Facilitate unified data management for a diverse sources



Scalability

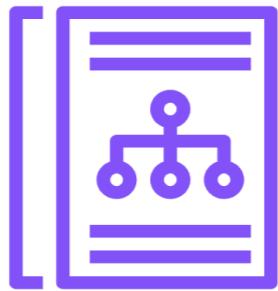


Modern day applications



Data management

Data migration in practice

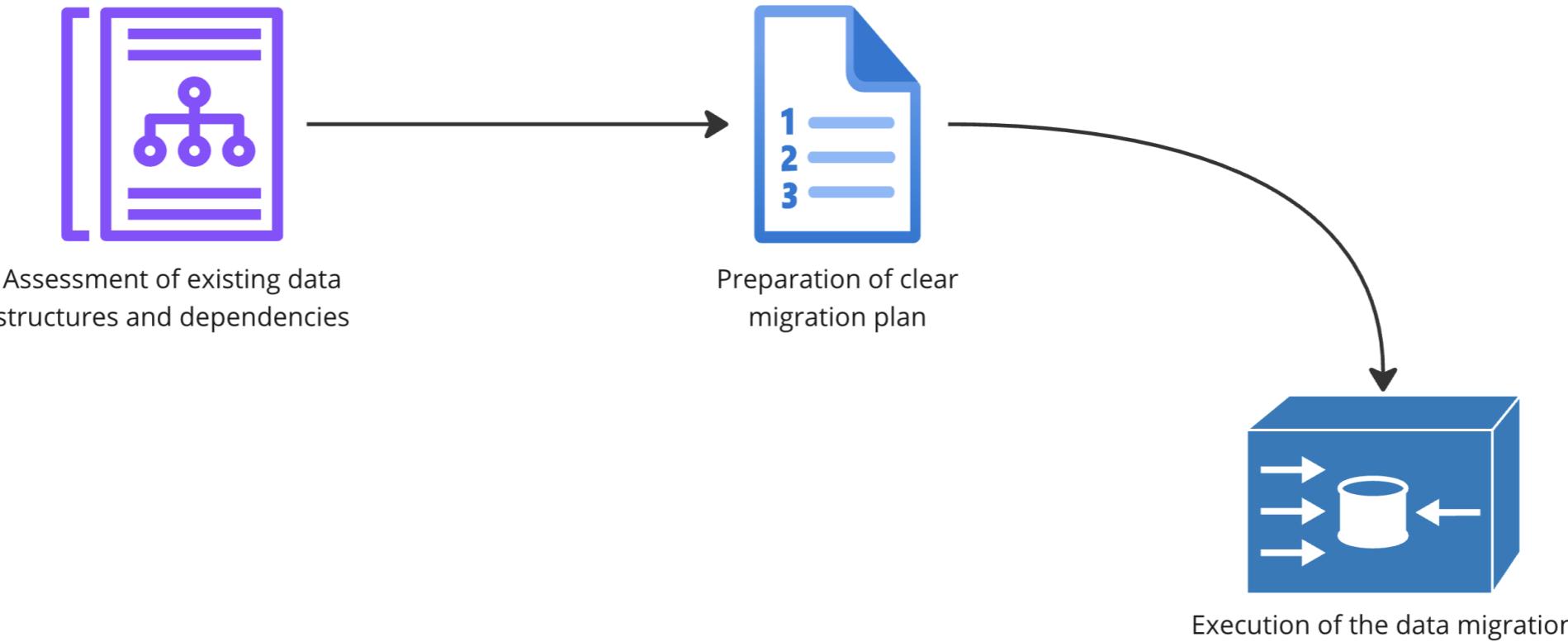


Assessment of existing data structures and dependencies

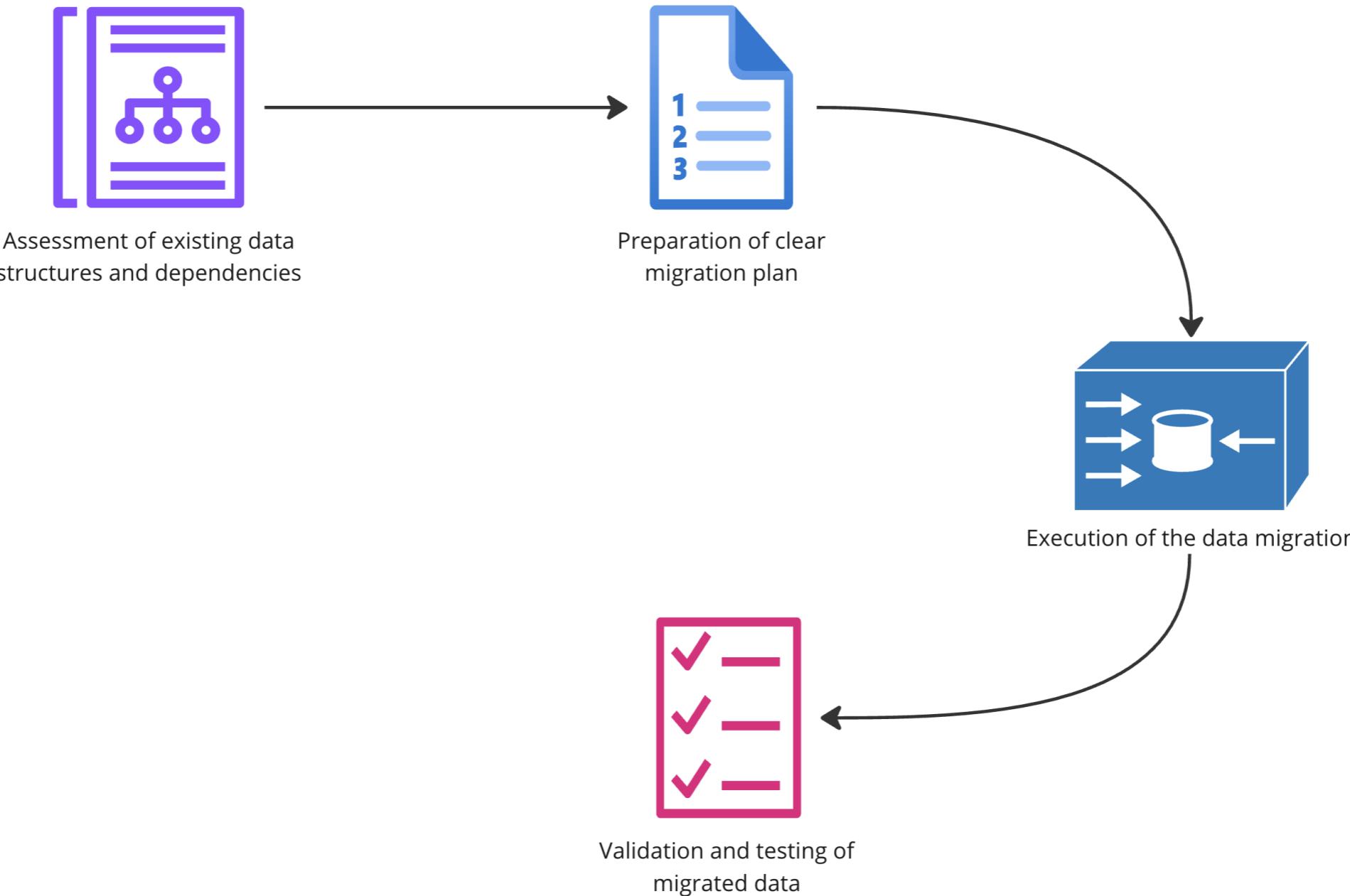
Data migration in practice



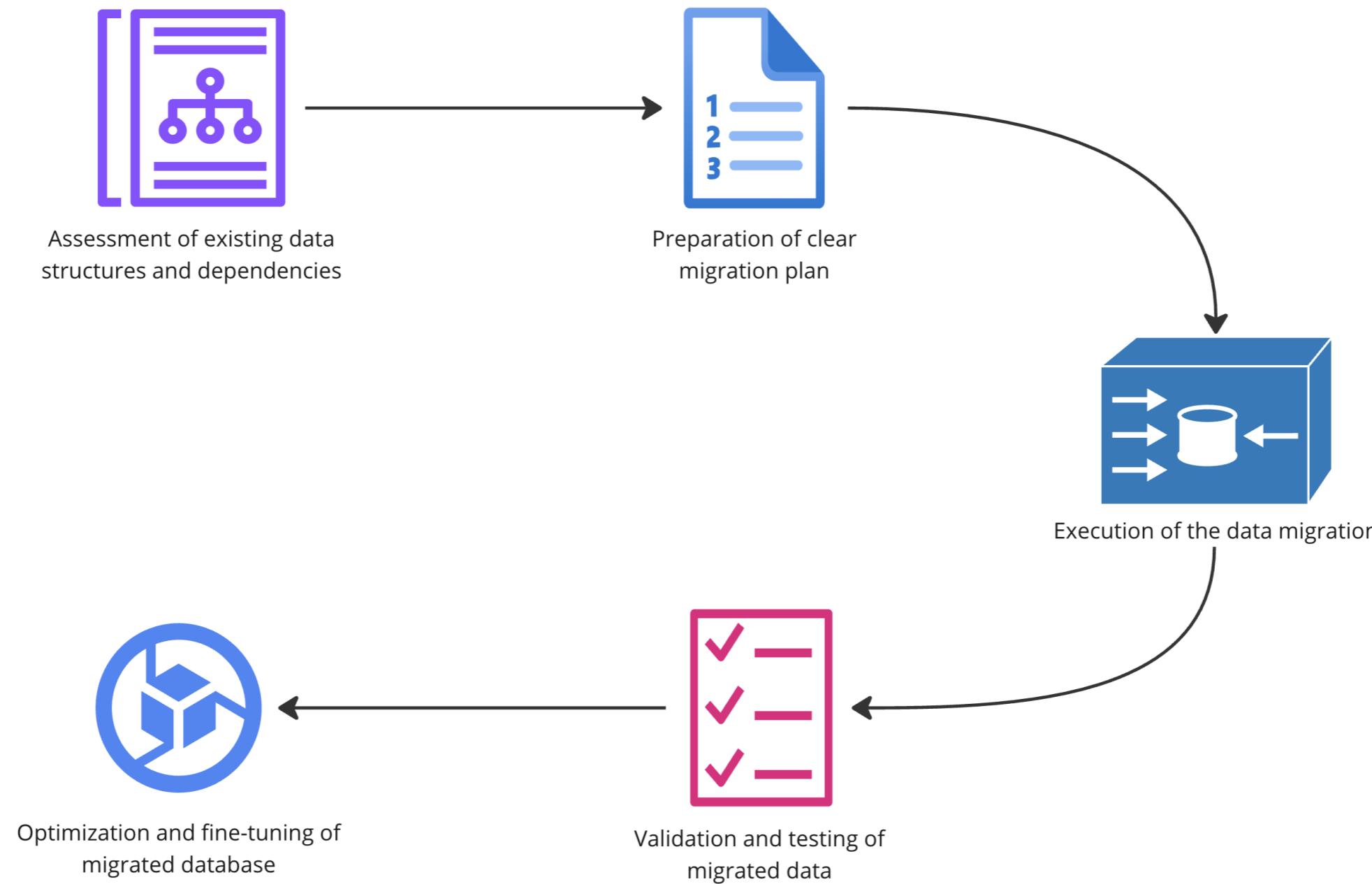
Data migration in practice



Data migration in practice



Data migration in practice



Migration in AWS



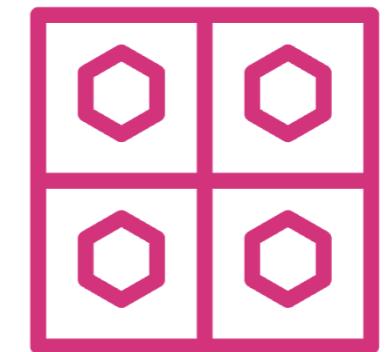
AWS Database Migration Service



AWS Snow Family



AWS DataSync

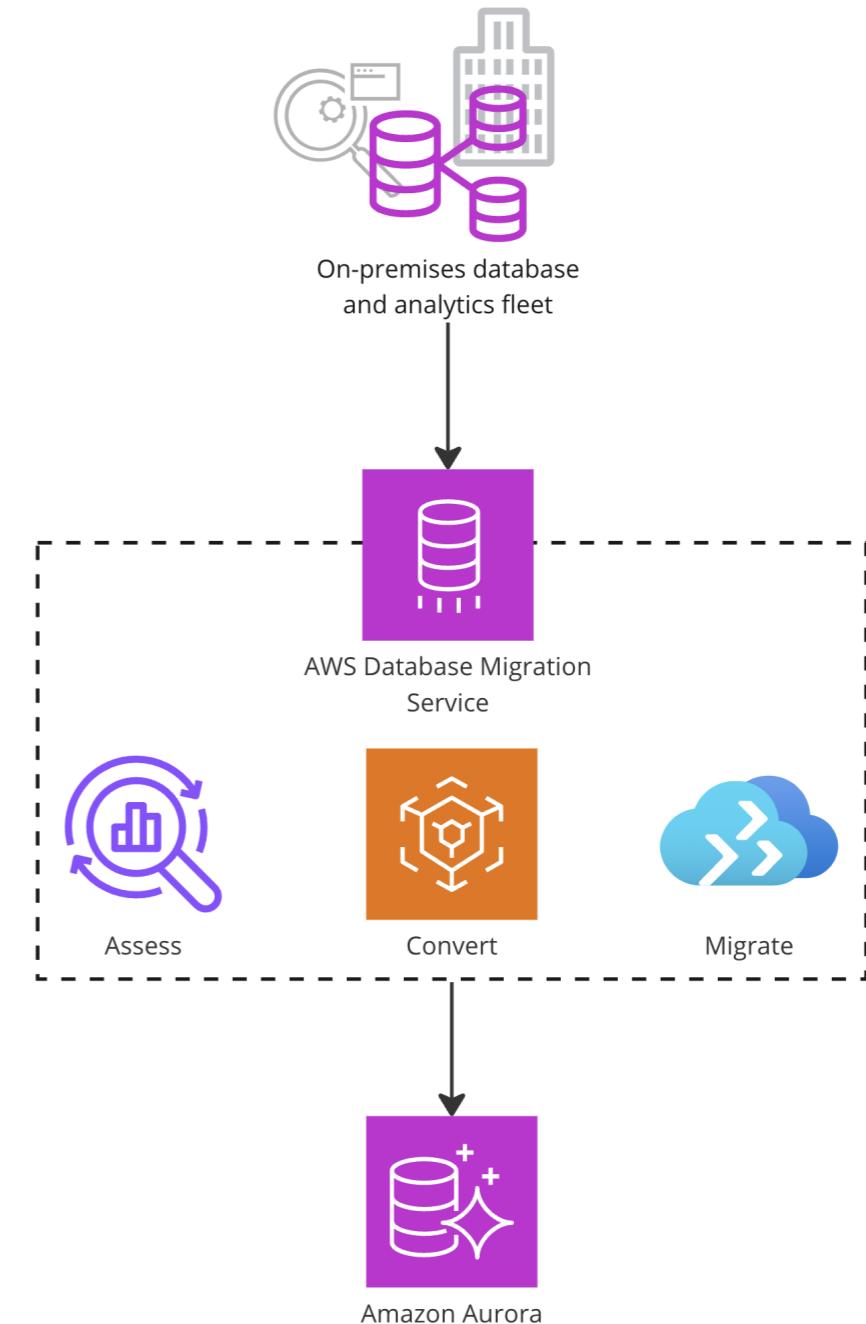


AWS Schema
Conversion Tool

AWS Database Migration Service

Managed service facilitating the movement of
20+ database and analytics engines to AWS

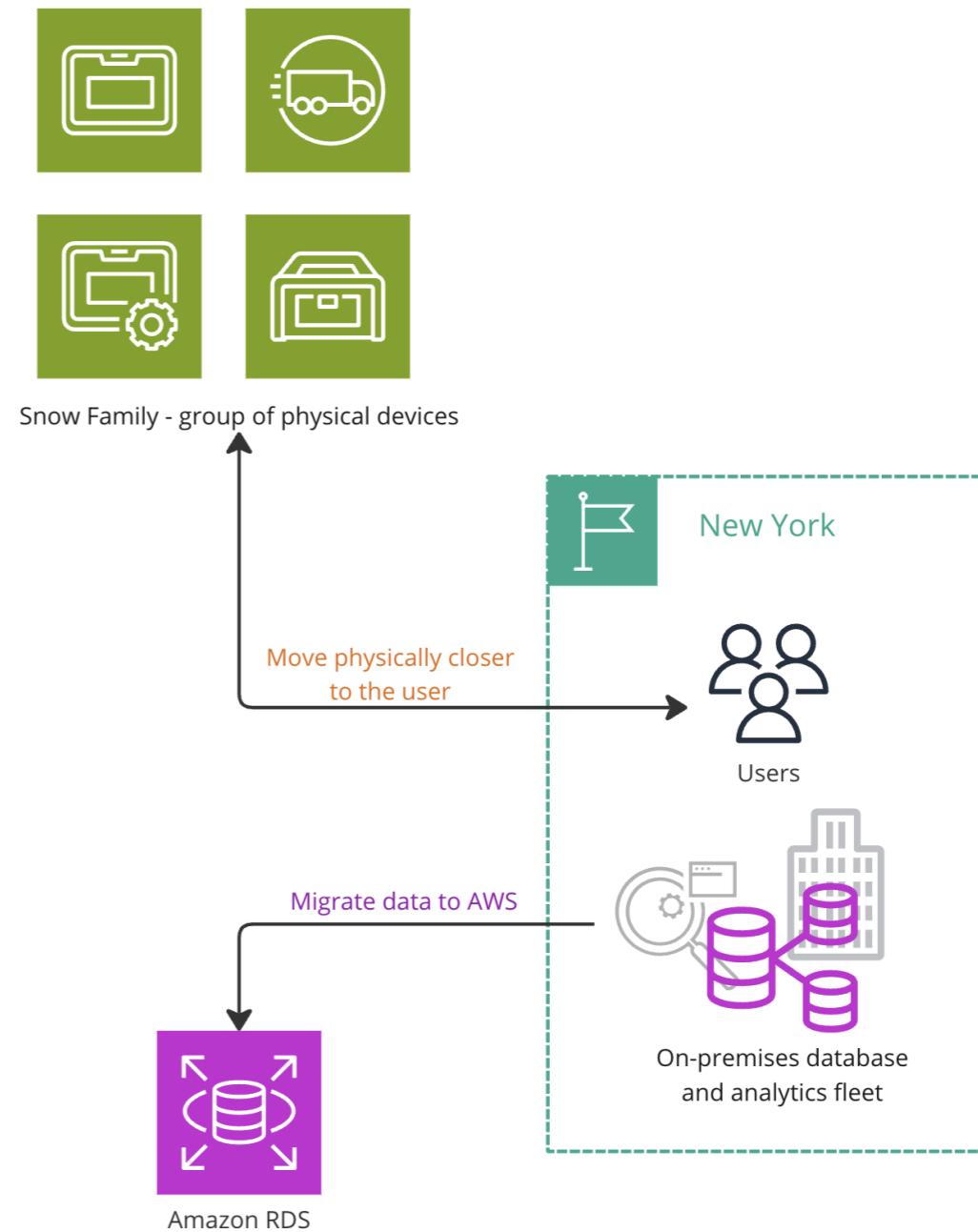
- Minimizes downtime with automated real-time data replication
- Supports diverse source and target databases
- Provides validation checks and task monitoring



AWS Snow Family

Offers physical devices to facilitate offline data transfer of petabyte-scale to and from AWS

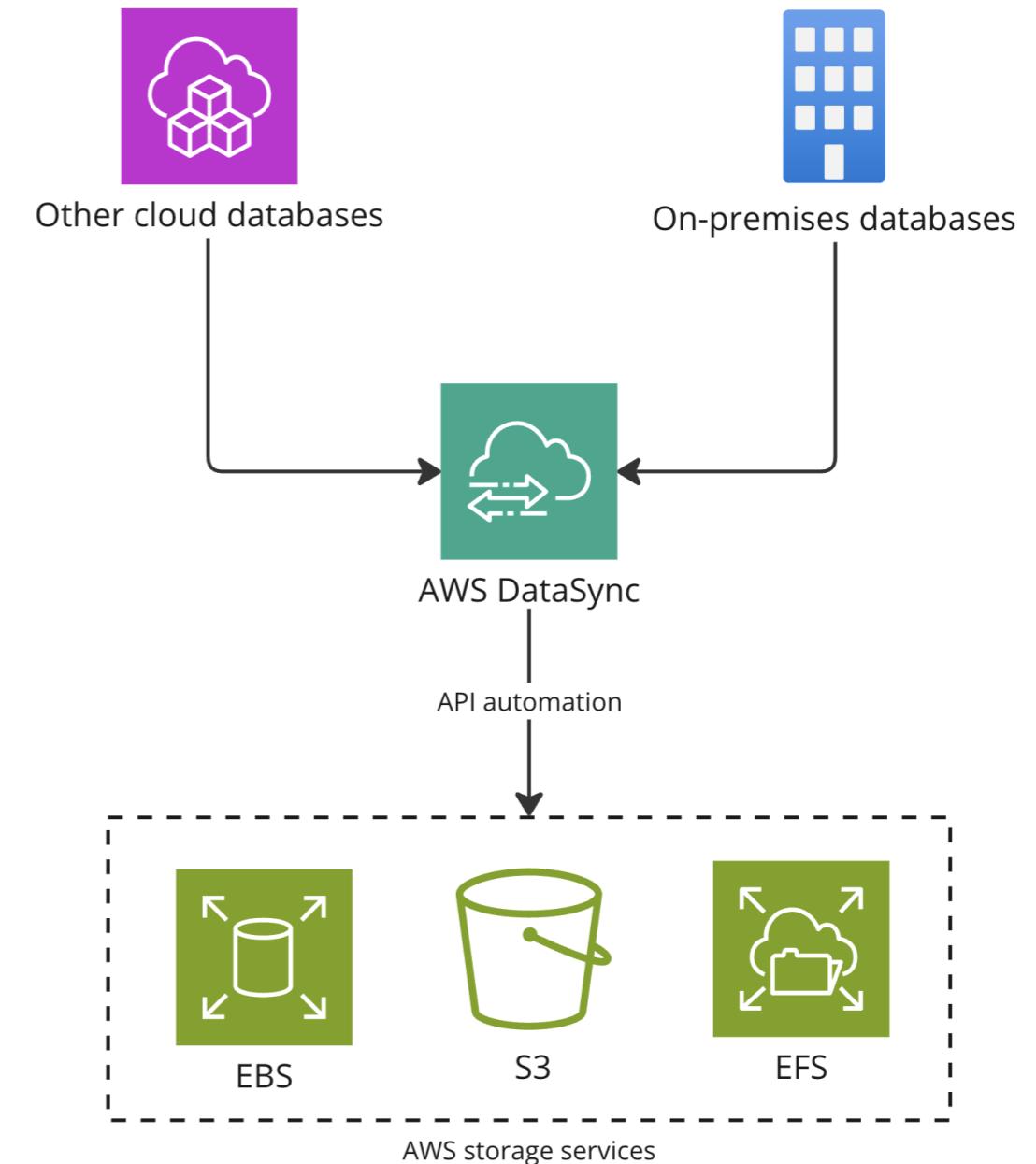
- Enables processing data at the edge for fast large-scale data movement
- Robust security measures to ensure data integrity



AWS DataSync

Simplifies, automates, and accelerates large data transfers between on-premises storage and AWS Cloud

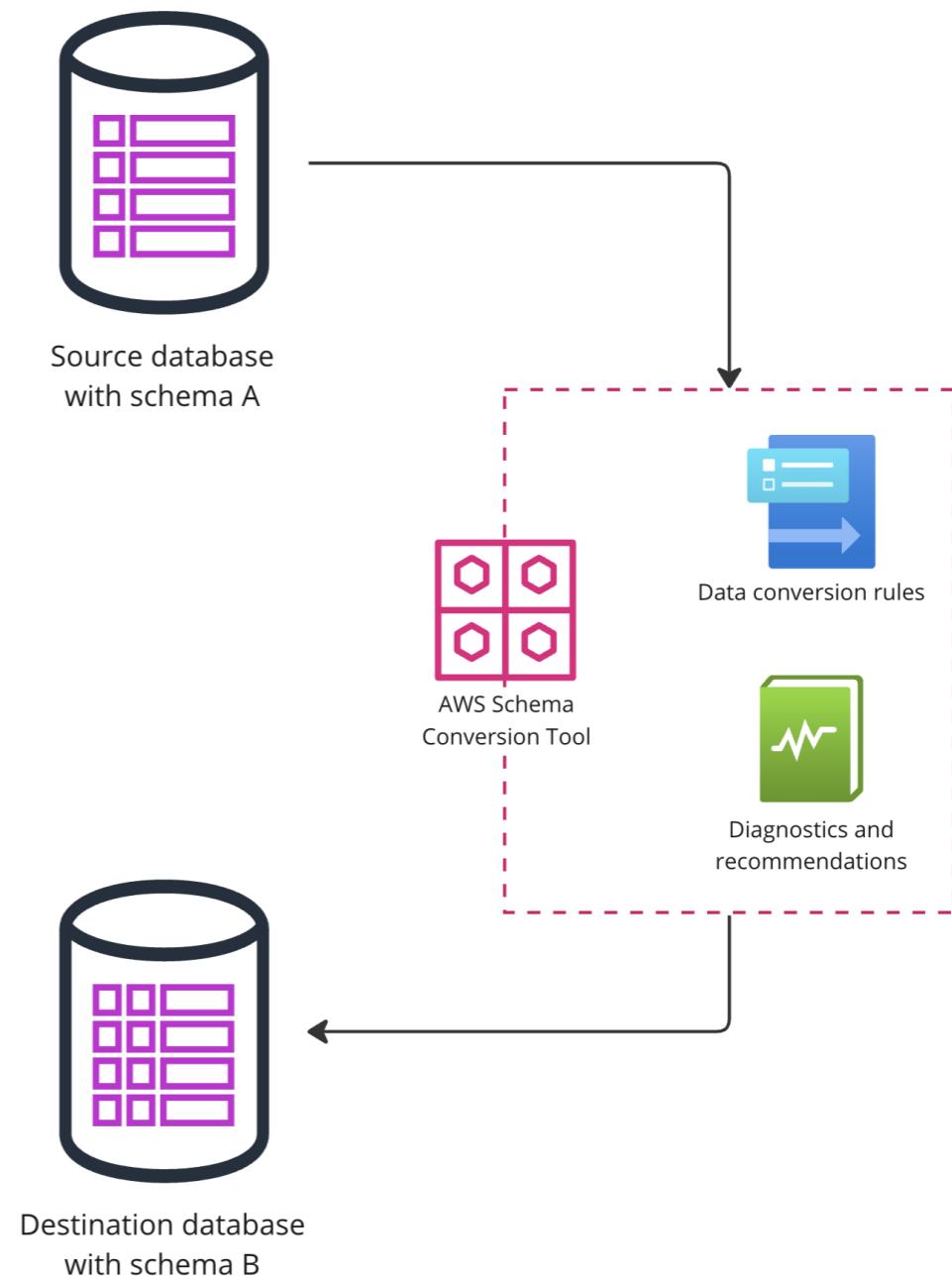
- Fast and efficient data transfer through parallel processing
- Seamless integration with other AWS storage services
- Automation through AWS Management Console or APIs



AWS Schema Conversion Tool

Facilitates database migrations by automatically converting source database schema to match the target

- Automates database schema conversion
- Customization of conversion rules
- Diagnostics and recommendations



When to use which service?



AWS Database Migration
Service

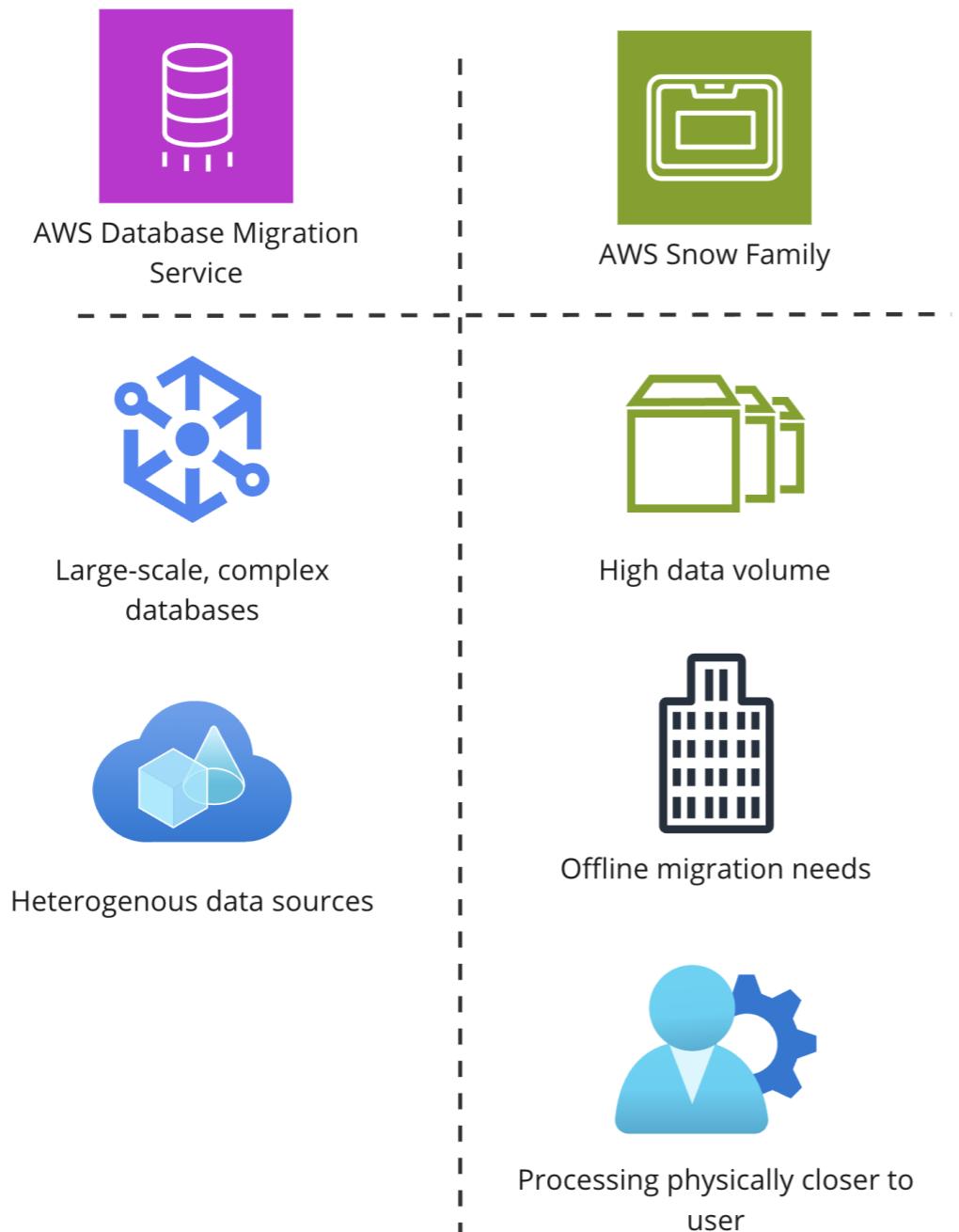


Large-scale, complex
databases

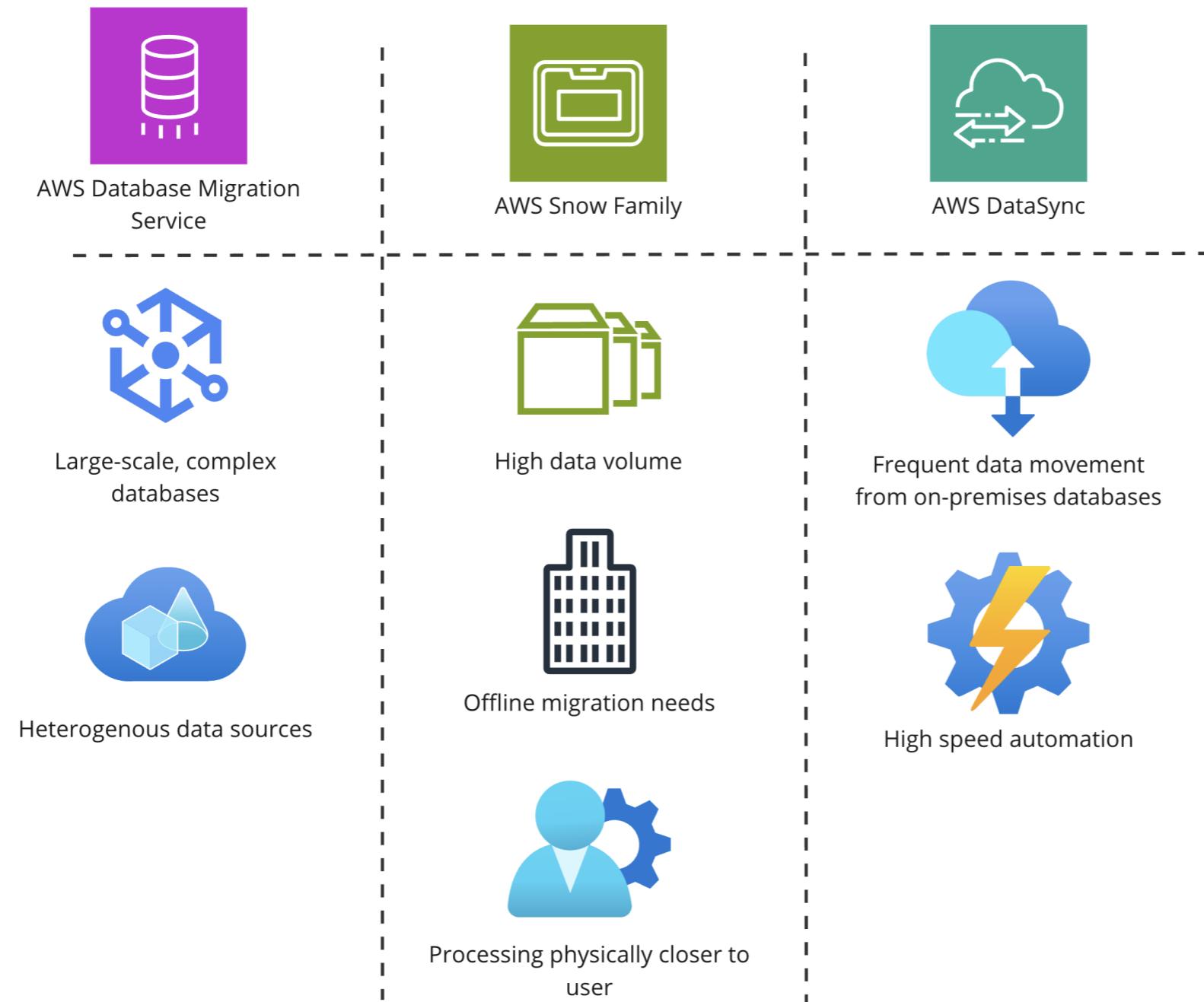


Heterogenous data sources

When to use which service?



When to use which service?



When to use which service?



Let's practice!

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS

Network Services

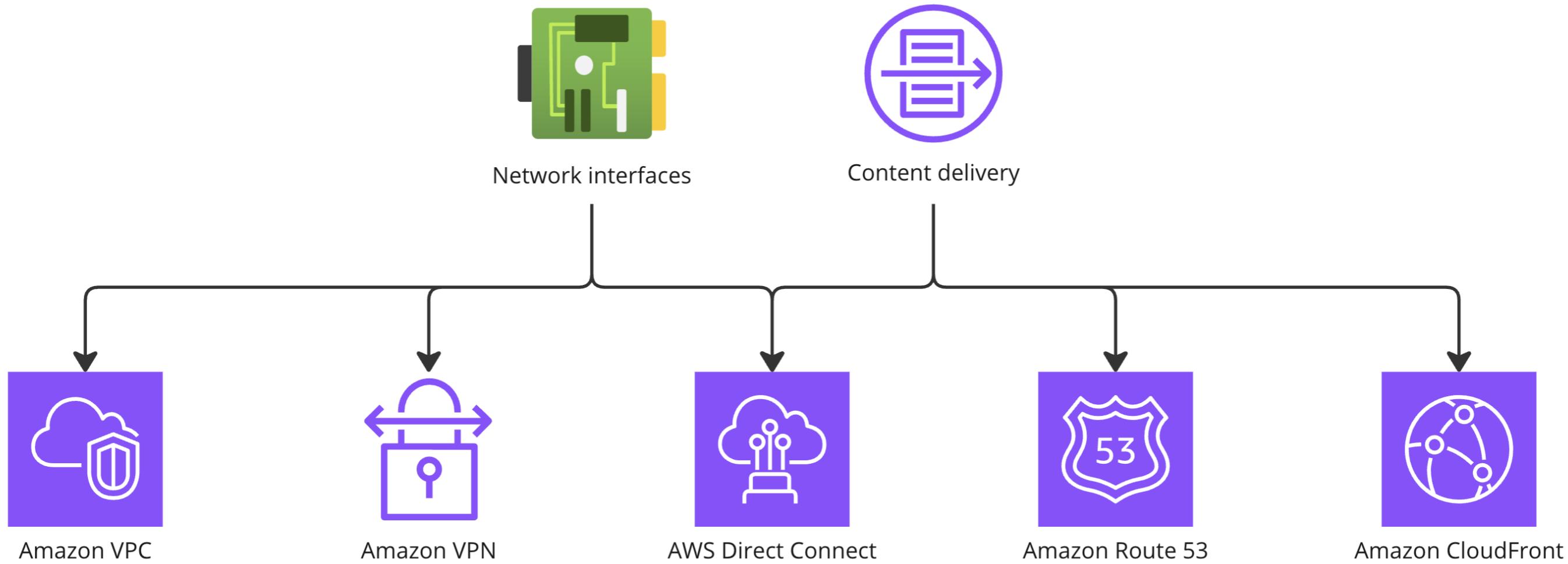
AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS



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Unlock the power of AWS networking services

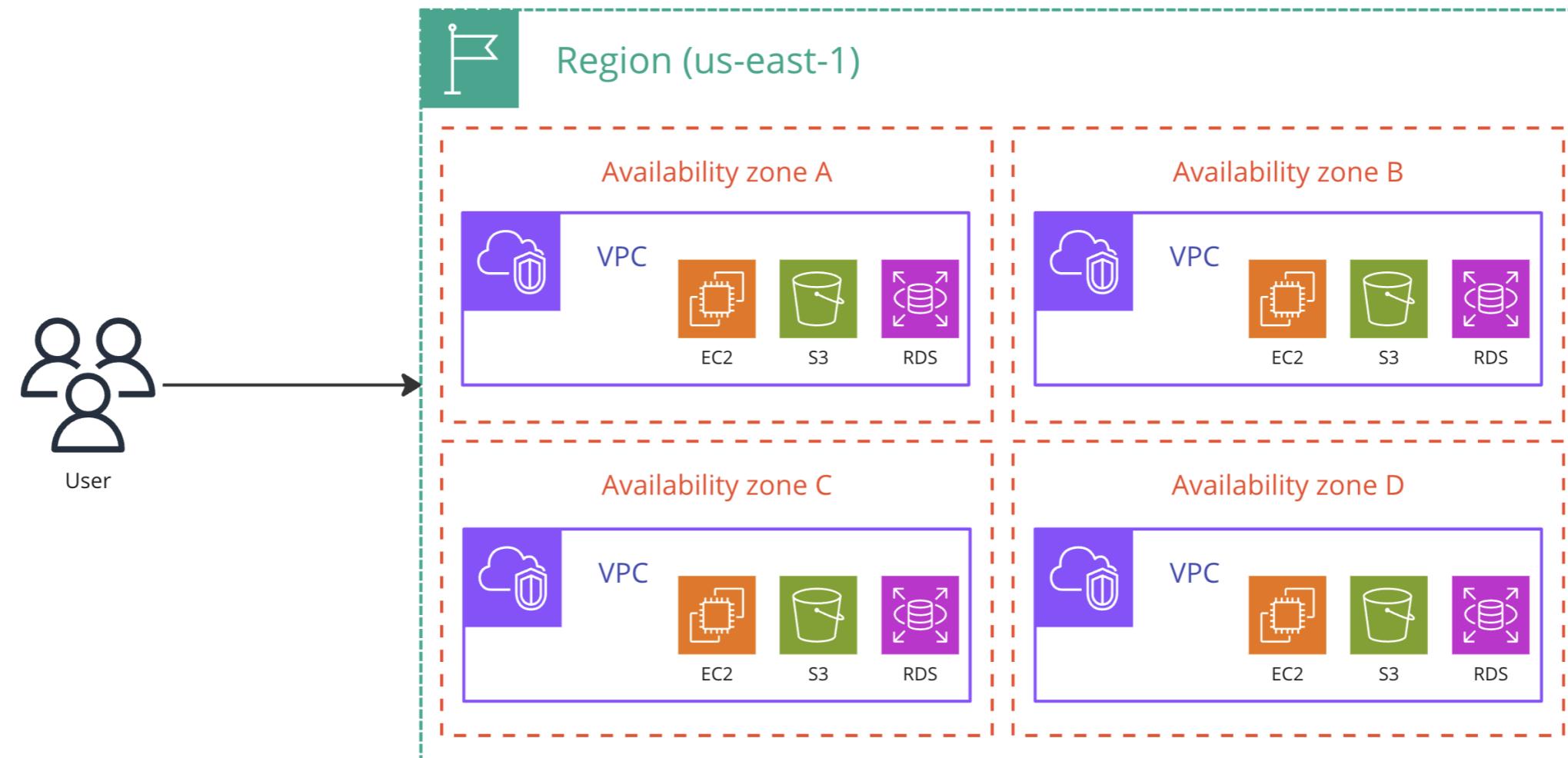
- Building secure and efficient network environments in the cloud
- Designing robust content delivery mechanisms



Networking in the cloud

Amazon Virtual Private Cloud (VPC)

Logically isolated section of the AWS cloud to launch and manage your own resources



Building a logically isolated virtual network

Amazon Virtual Private Cloud (VPC)

- IPv4 and IPv6 support with custom configurable IP address range



Custom IP configuration

Building a logically isolated virtual network

Amazon Virtual Private Cloud (VPC)

- IPv4 and IPv6 support with custom configurable IP address range
- Security Layers: security groups and network access control lists (ACLs)



Custom IP configuration



Security groups



Network access control list

Building a logically isolated virtual network

Amazon Virtual Private Cloud (VPC)

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Custom IP configuration

- Security Layers: security groups and network access control lists (ACLs)



Security groups



Network access control list

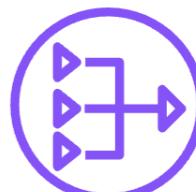
- Complete control: subnets, route tables and network gateways



Subnet



Route table

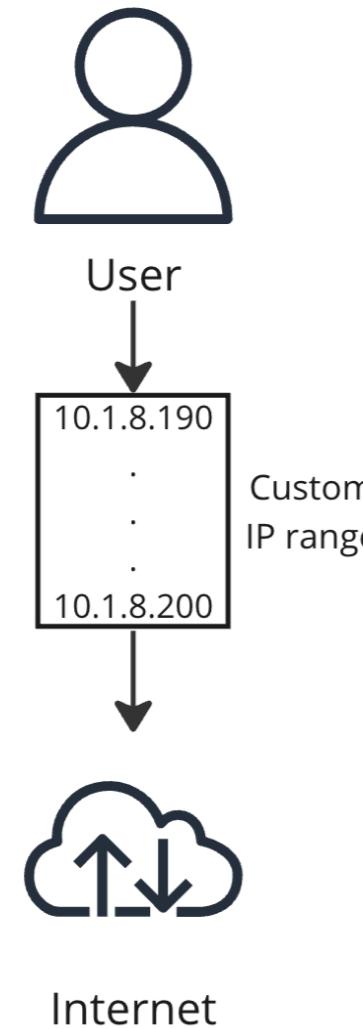


Network gateway

Understanding key VPC concepts

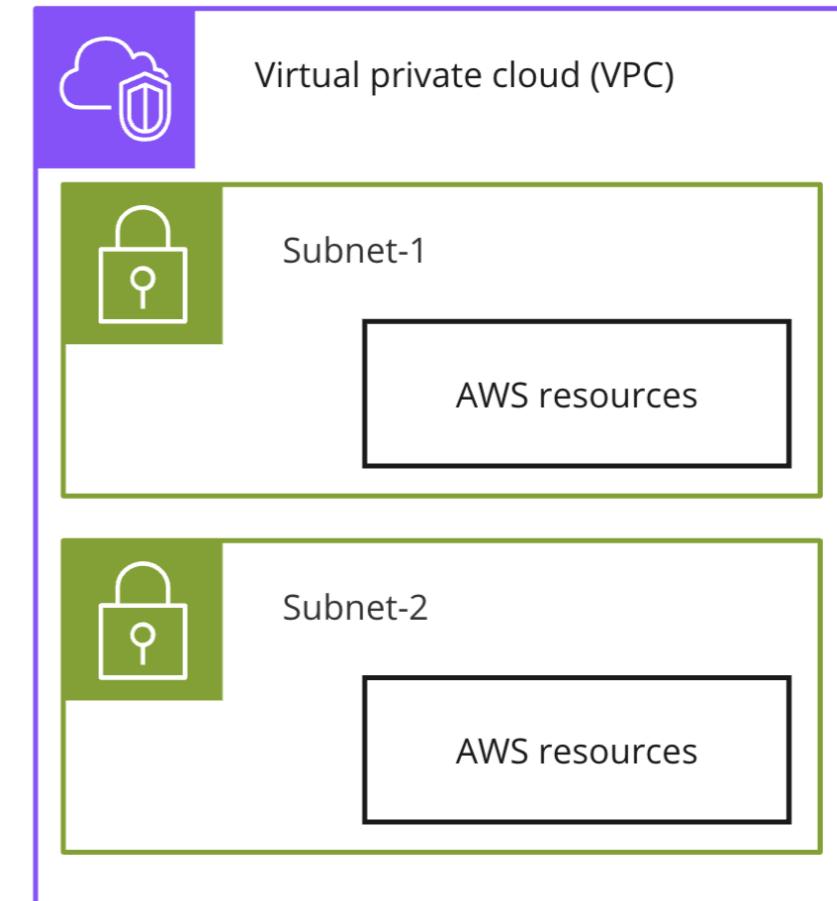
Custom configurable IP address range

- Your virtual address space in the cloud



Subnets

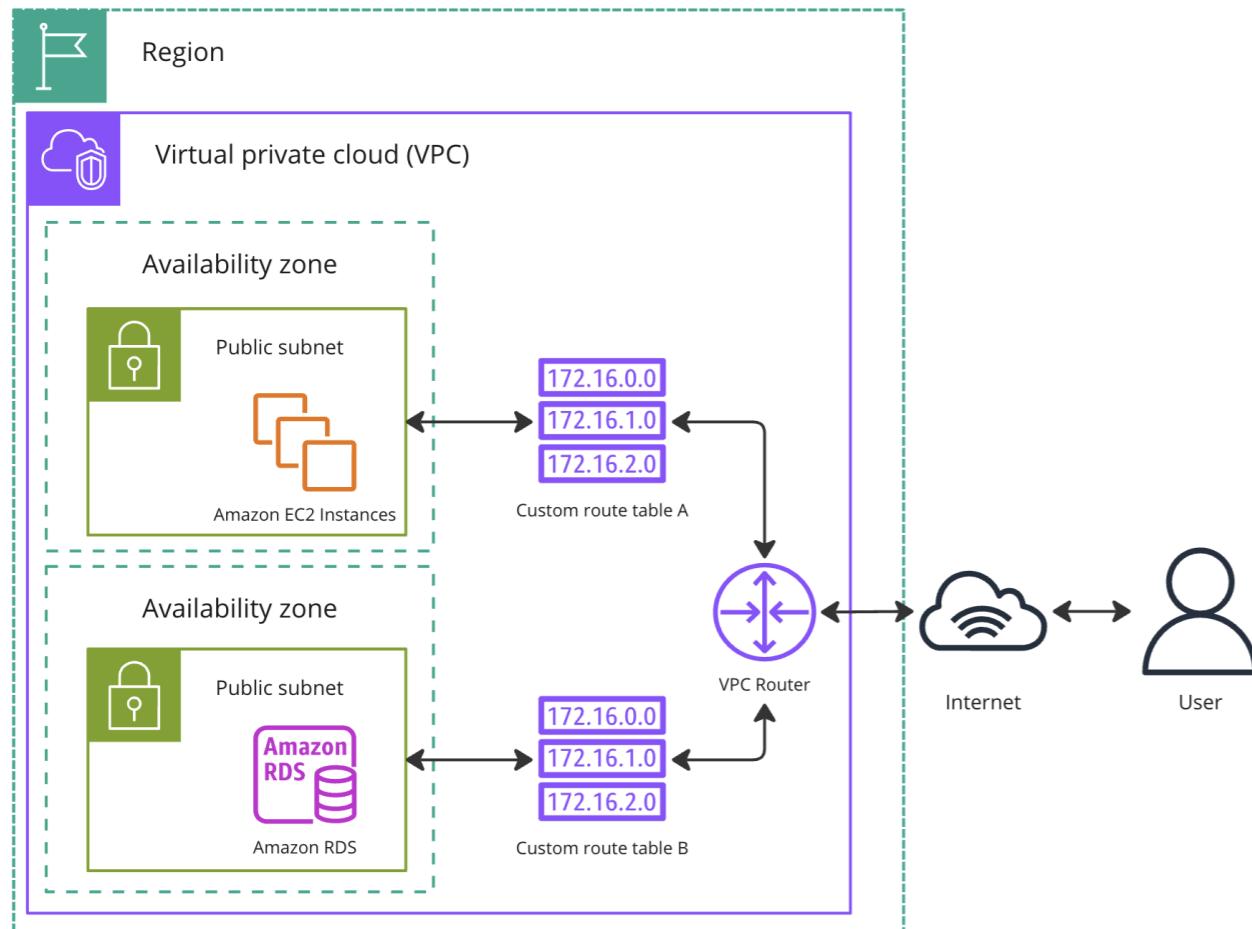
- Dividing your VPC IP address range into smaller, manageable segments



Understanding key VPC concepts

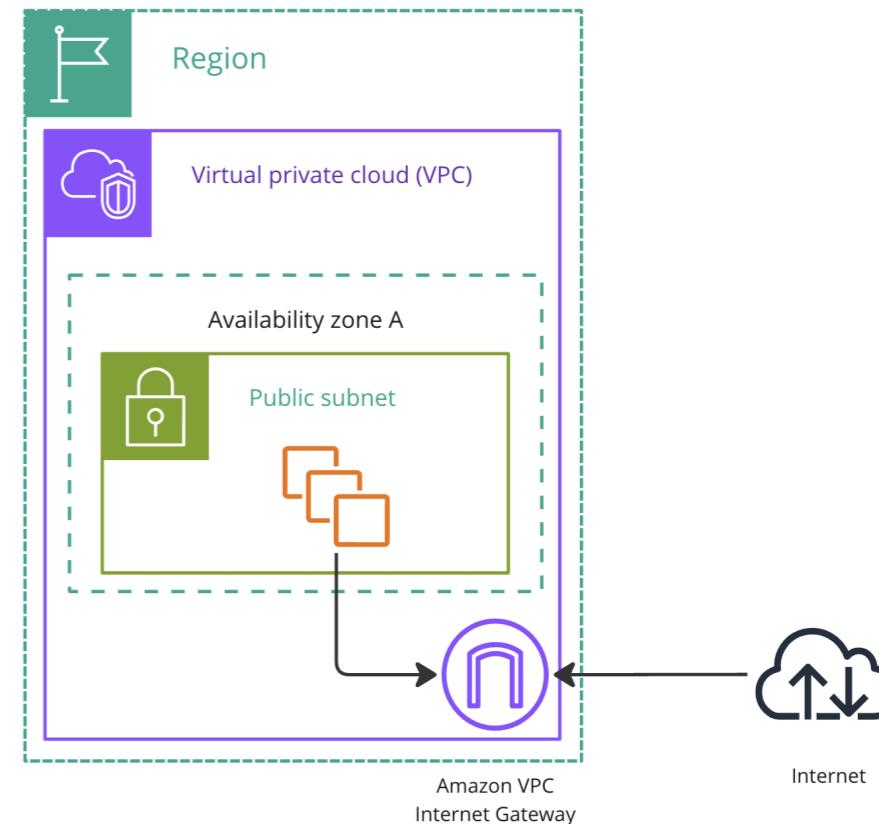
Route tables

- Determines where network traffic from your subnet or gateway is directed



Network gateway

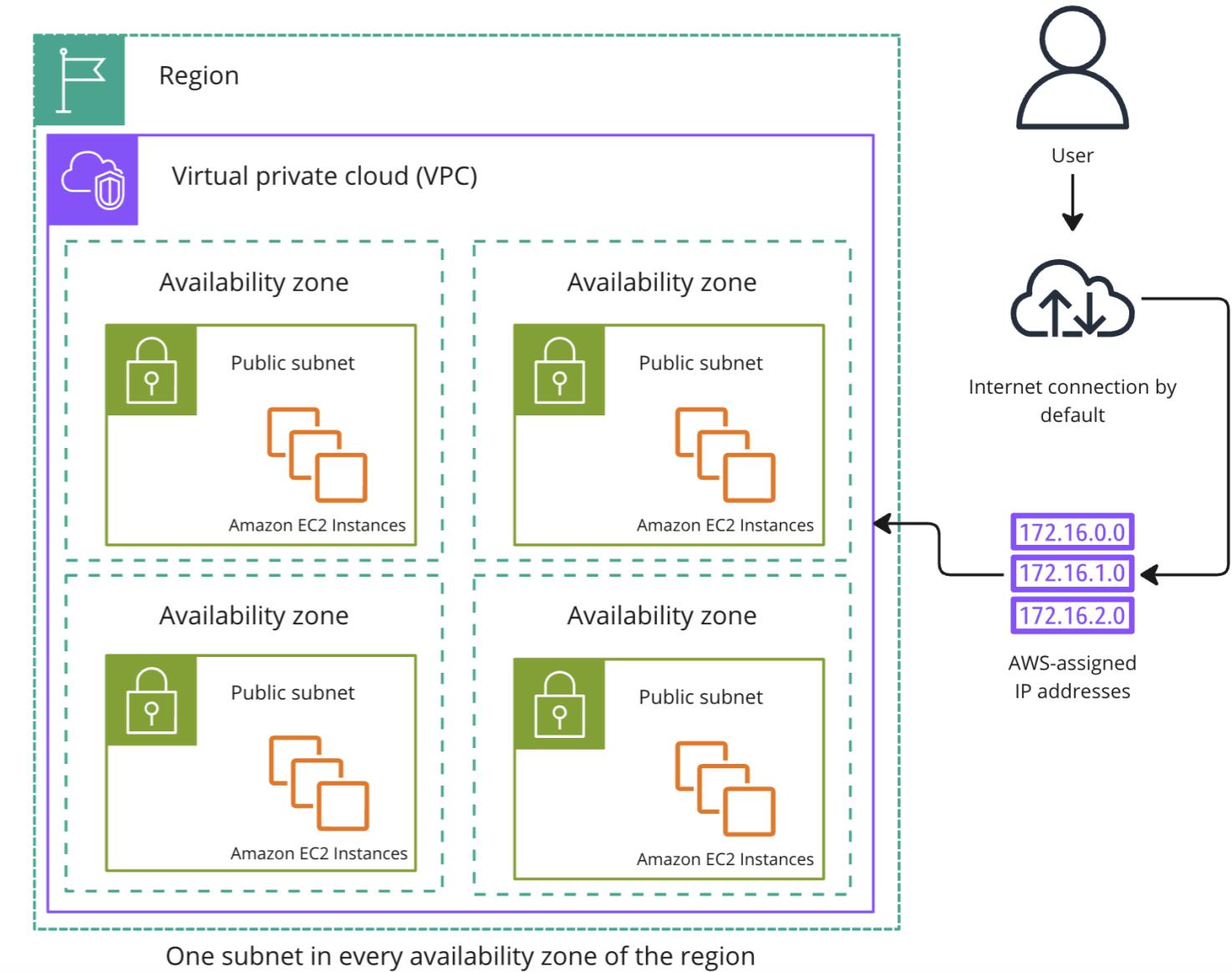
- Connects your VPC to the internet or other VPCs and controls inbound and outbound traffic



Default vs. custom Amazon VPC

Default Amazon VPC

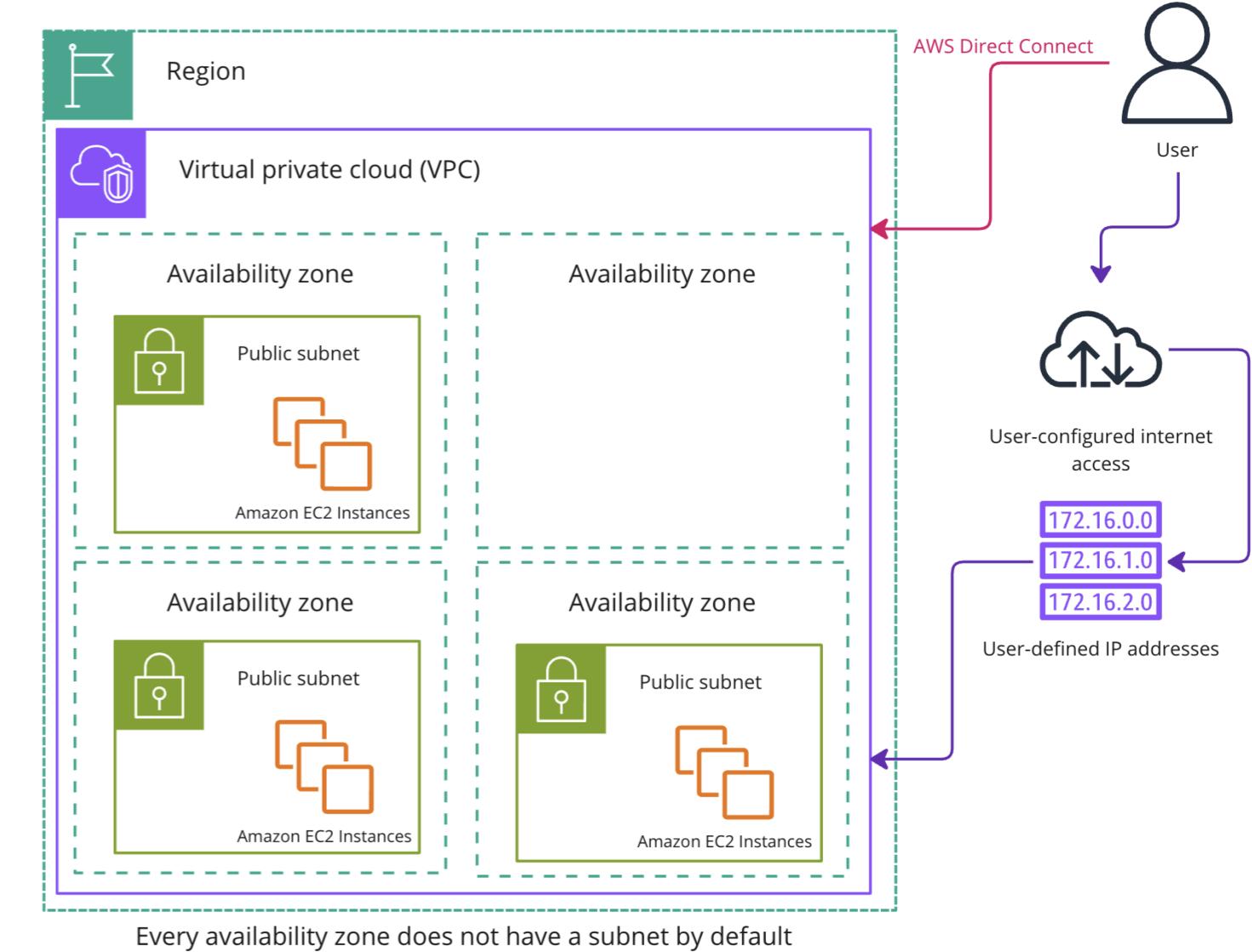
- Automatic creation with AWS-assigned IP addresses
- Pre-configured settings with a subnet in every availability zone
- Communicate with the internet by default



Default vs. custom Amazon VPC

Custom Amazon VPC

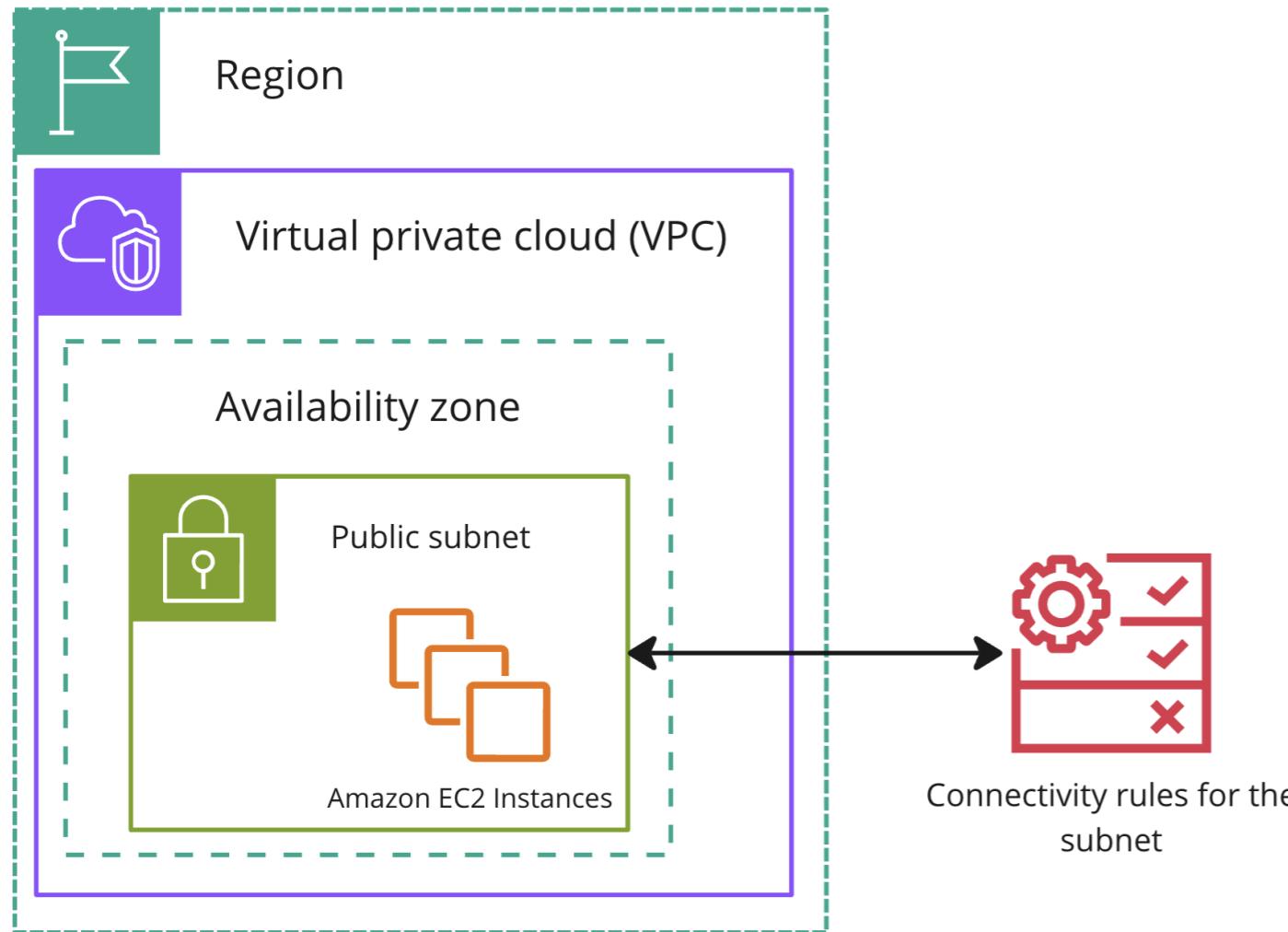
- User-defined
- Customize IP address range, subnets, and route tables
- Require explicit configuration for internet access



Network security

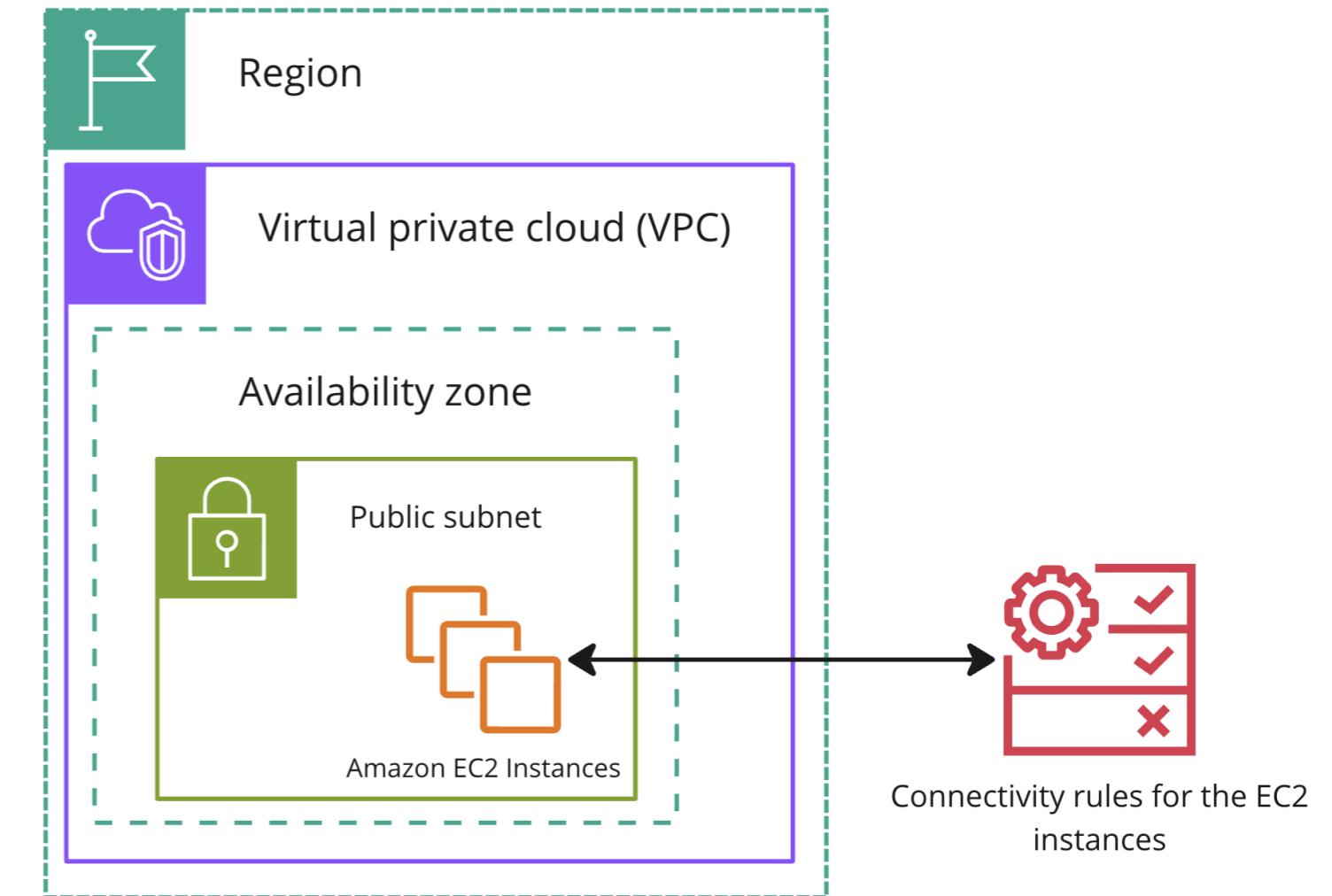
Network Access Control Lists (ACL)

- Firewall for your subnet



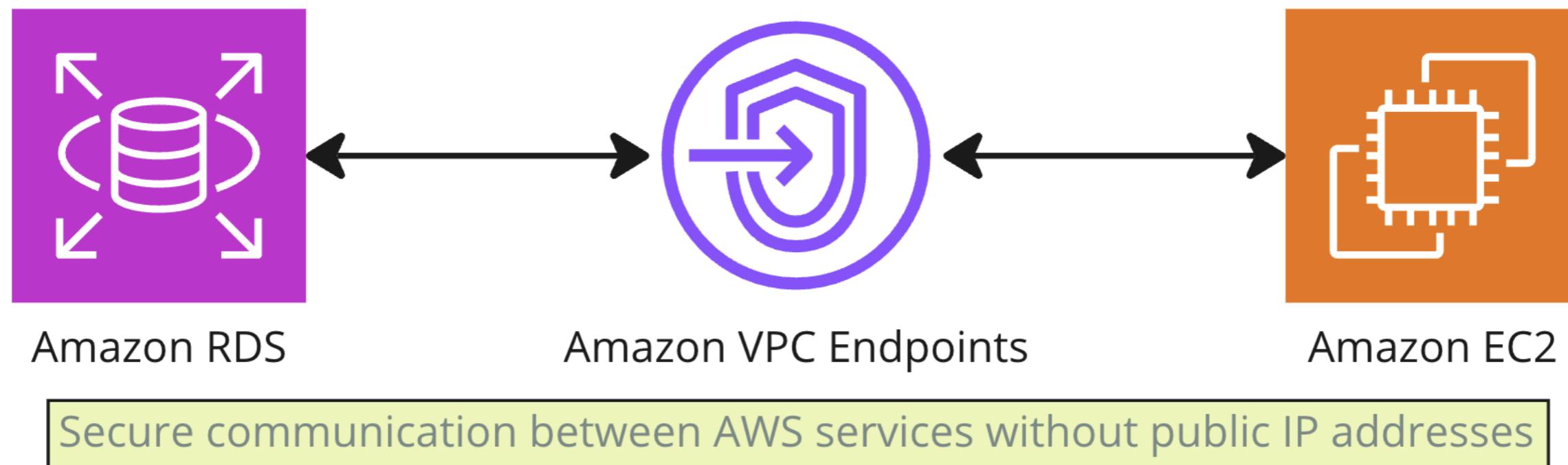
Network Security Groups (NSGs)

- Firewall for your instances



VPC endpoints

- Enable private connections between AWS services
- Enhances security by allowing communication between services without public IP addresses

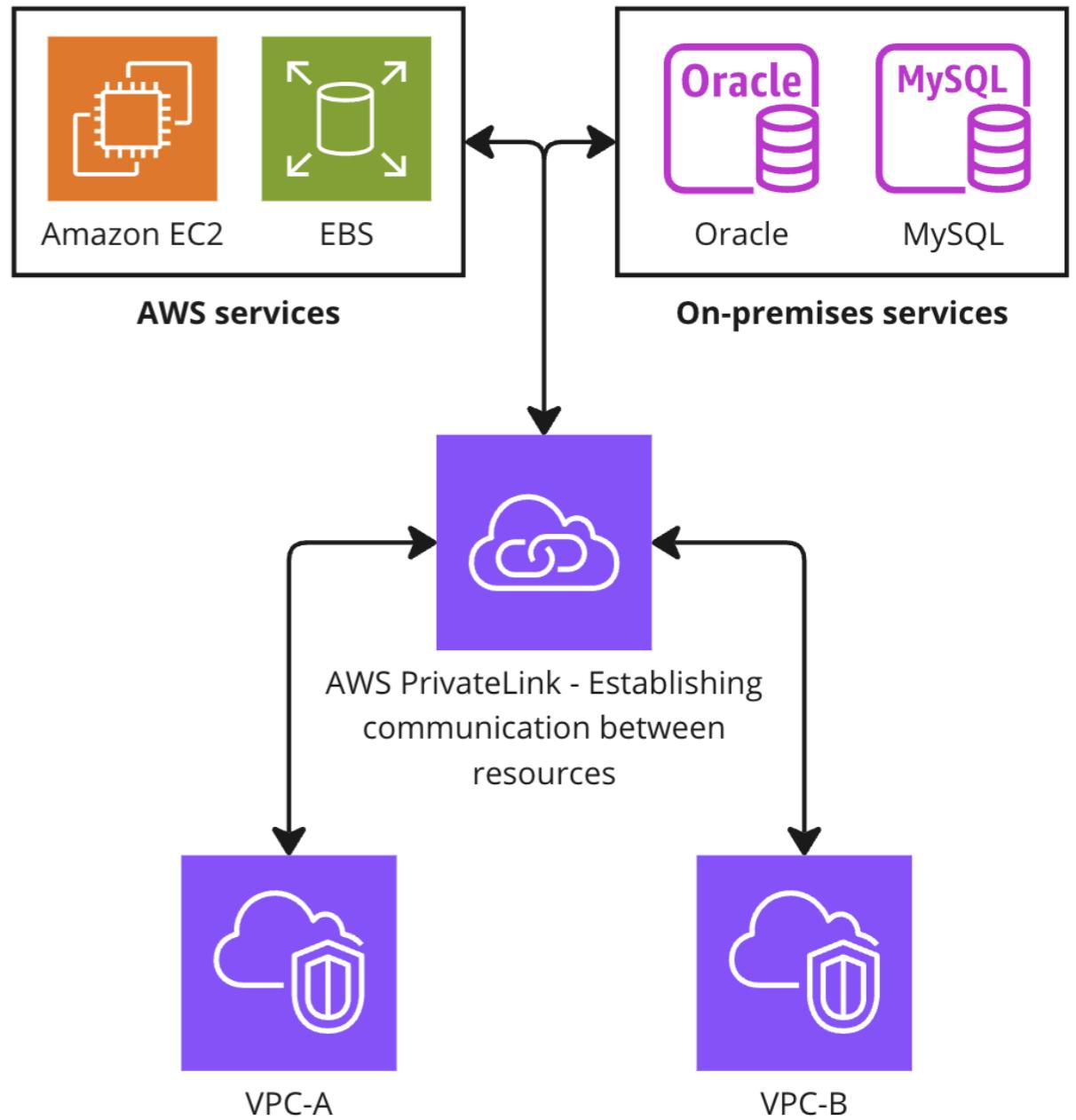


What is AWS PrivateLink?

Private connectivity between VPCs, supported AWS services, and on-premises networks

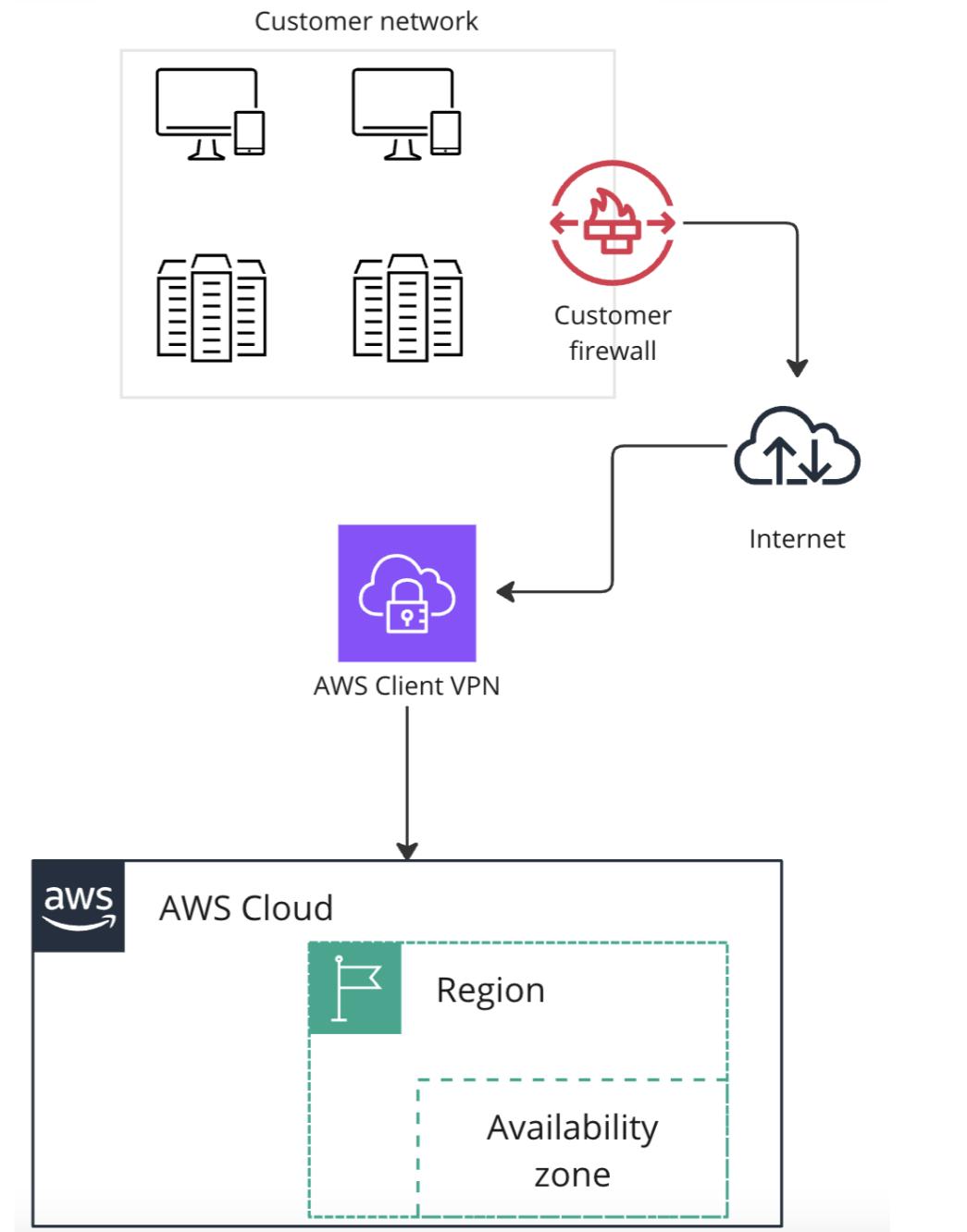
Benefits

- Secure data exchange with SaaS applications
- Simplified network management



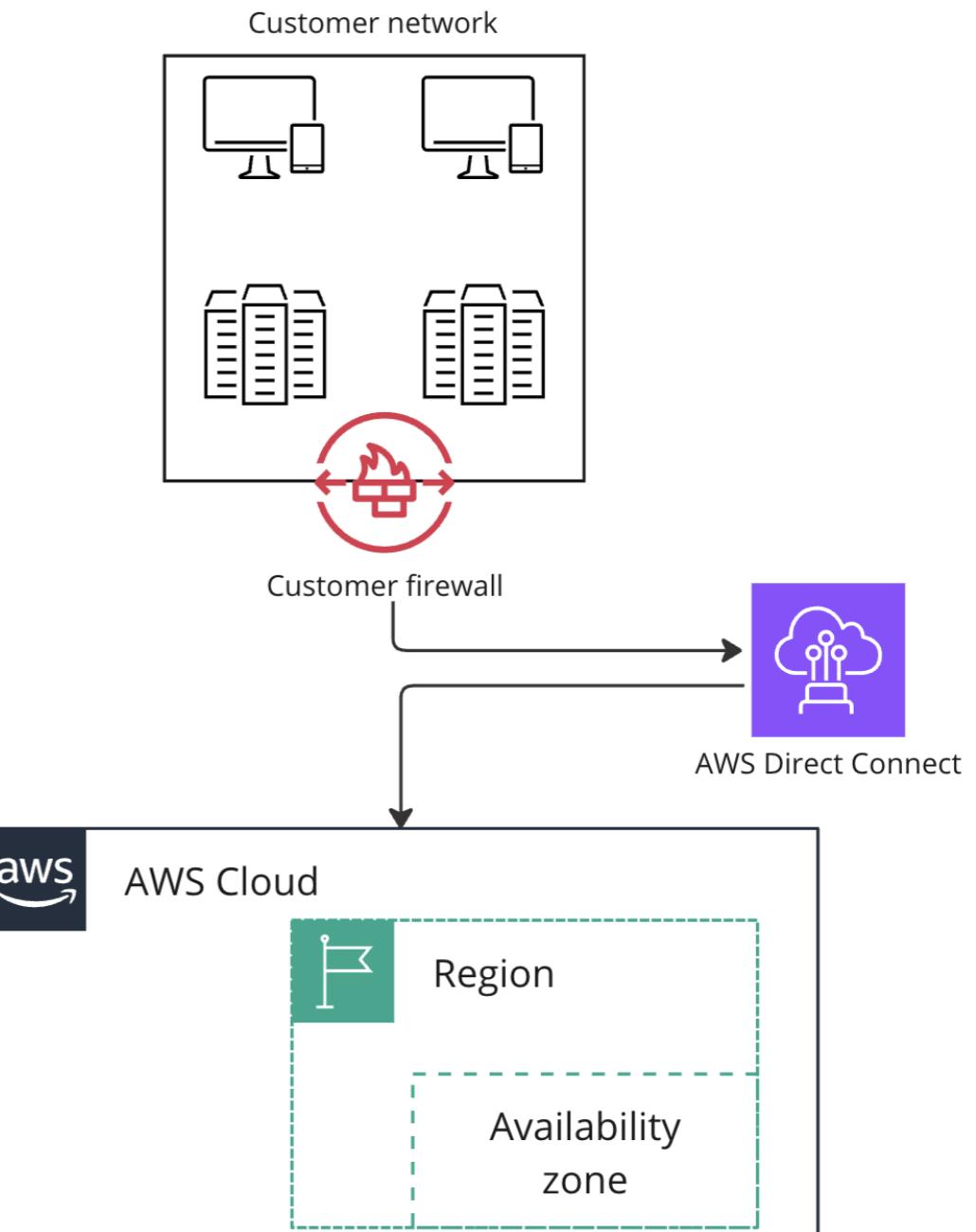
Connections - AWS VPN

- Securely connects your on-premises network to AWS over the internet
- Flexible and accessible, suitable for smaller workloads or temporary connections



Connections - AWS Direct Connect

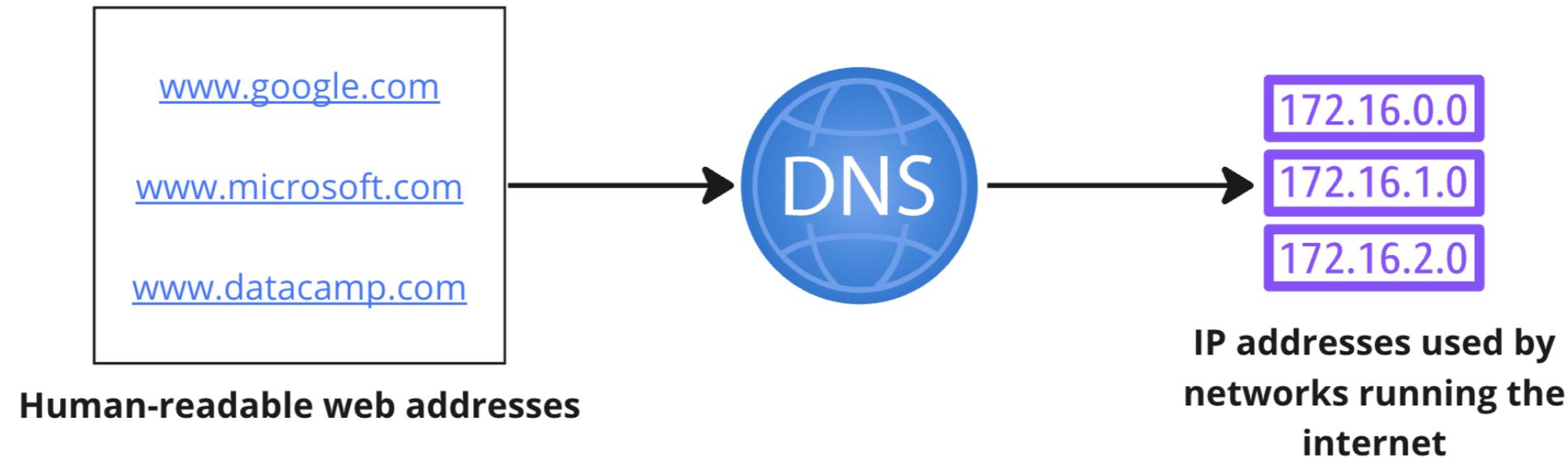
- Dedicated network connection between your on-premises data center and AWS
- High bandwidth, low latency, ideal for consistent and mission-critical workloads



DNS - Internet's address book

Domain Name System (DNS)

Resolves human-readable domain names to IP addresses used by computers

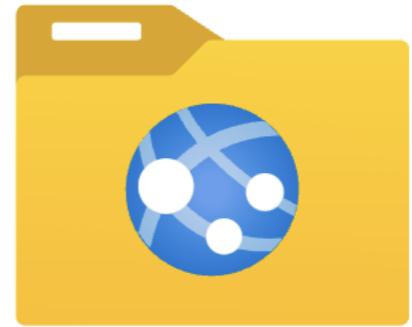


- Communication between devices on the internet
- Access websites using user-friendly domain names

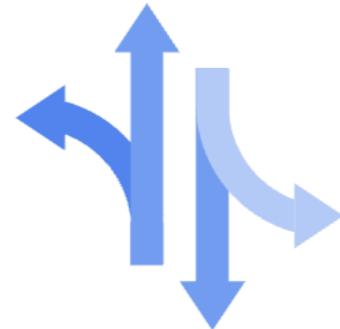
Amazon Route 53

Manages domain names and translate them to IP addresses

- Integration with AWS ecosystem and external services
- Scalability
- High availability



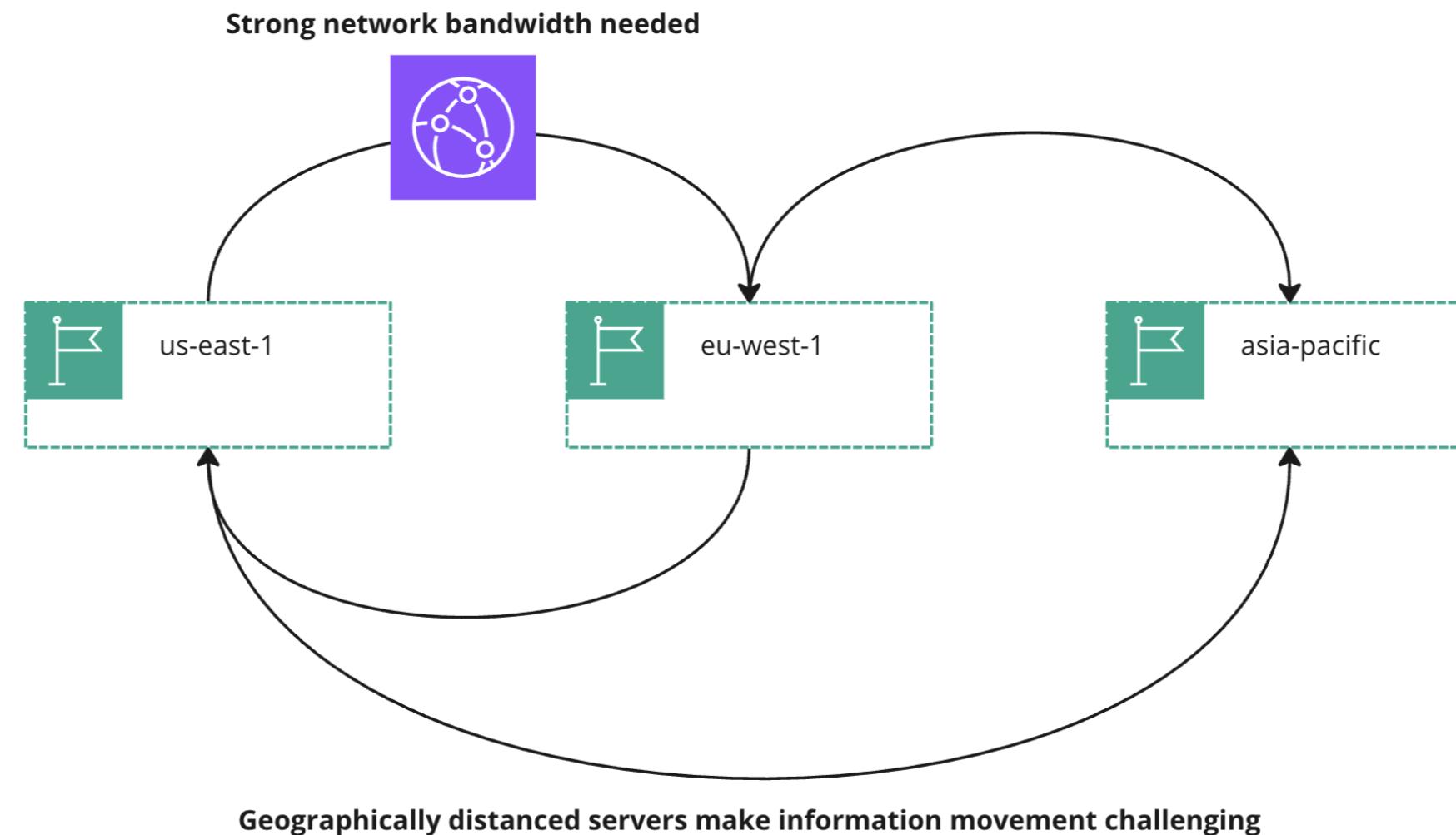
Website hosting



Network traffic direction

Information movement in the cloud

- Delay in loading content due to geographical distance
- Limited network capacity impacting content delivery speed



Content Delivery Networks (CDNs)

Distributed network of servers strategically placed globally

Key characteristics

- Caching for faster content loading



Caching for faster data delivery

Content Delivery Networks (CDNs)

Distributed network of servers strategically placed globally

Key characteristics

- Caching for faster content loading
- Delivering digital content to end-users over the internet



Caching for faster data delivery



Digital content movement

Content Delivery Networks (CDNs)

Distributed network of servers strategically placed globally

Key characteristics

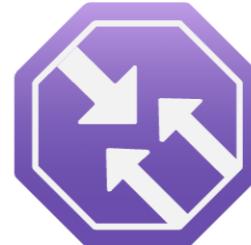
- Caching for faster content loading
- Delivering digital content to end-users over the internet
- Efficiently handle increased user traffic and demand



Caching for faster data delivery



Digital content movement

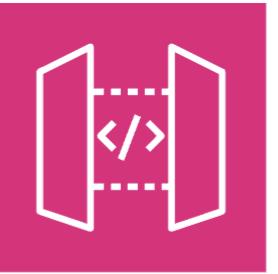


Handle increased traffic demand

Amazon CloudFront

Enhance the speed and security of content delivery to end-users in AWS

- Integrates seamlessly with AWS services

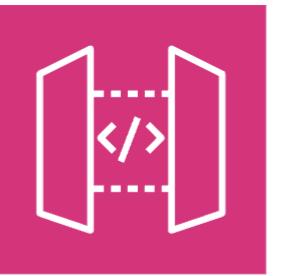


Seamless integration
between services

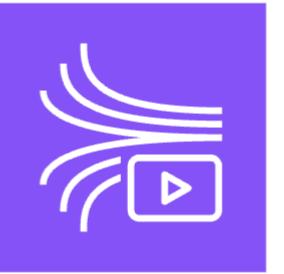
Amazon CloudFront

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- Accelerates web content, APIs, and streaming



Seamless integration
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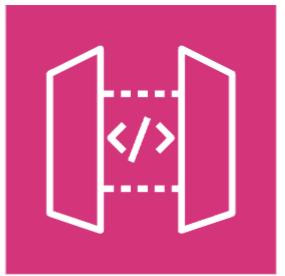


Web content and streaming

Amazon CloudFront

Enhance the speed and security of content delivery to end-users in AWS

- Integrates seamlessly with AWS services
- Accelerates web content, APIs, and streaming
- Enhances security with DDoS protection and HTTPS support



Seamless integration
between services



Web content and streaming



Enhanced security

How is CloudFront used?



Accelerate website
content movement

How is CloudFront used?



Accelerate website
content movement

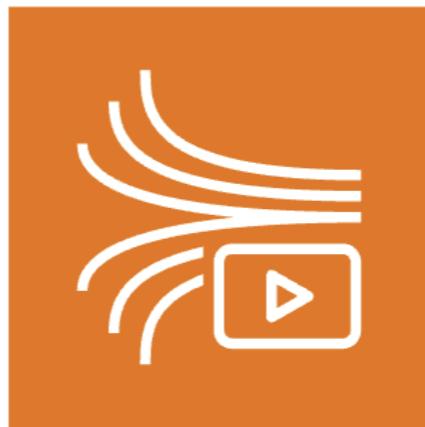


Optimize streaming &
reduced buffer times

How is CloudFront used?



Accelerate website
content movement



Optimize streaming &
reduced buffer times



Transmit over-the-air updates
to devices

Let's practice!

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS

Mastering AWS Storage Solutions

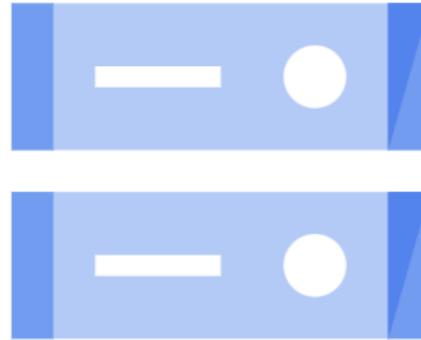
AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS



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Introduction to AWS storage

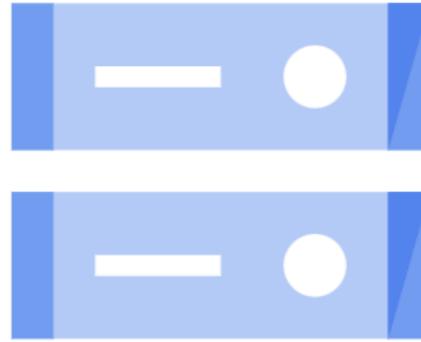
- AWS provides a diverse range of storage services tailored to meet various needs
- Crucial for securely managing, storing, and retrieving data in the cloud



Data Storage

Introduction to AWS storage

- AWS provides a diverse range of storage services tailored to meet various needs
- Crucial for securely managing, storing, and retrieving data in the cloud



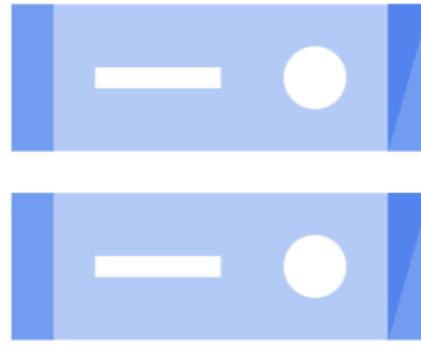
Data Storage



Storage
lifecycle policies

Introduction to AWS storage

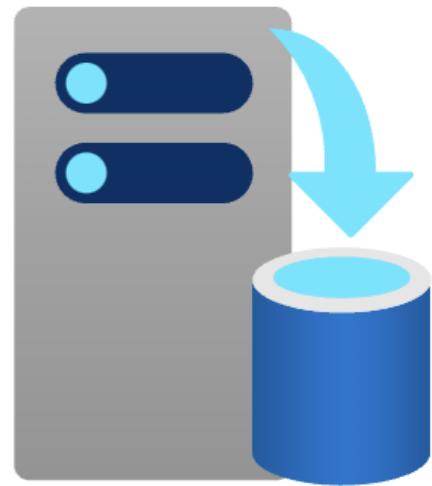
- AWS provides a diverse range of storage services tailored to meet various needs
- Crucial for securely managing, storing, and retrieving data in the cloud



Data Storage



Storage
lifecycle policies



Backup services

Storage types in AWS



Object storage



Block storage



File storage



Cache storage

What is object storage?

- Storage architecture that manages and organizes data as discrete units called "objects"



Multimedia
storage

Key characteristics:

- Horizontal scaling
- Metadata management
- Storing unstructured data



Backup and
archives

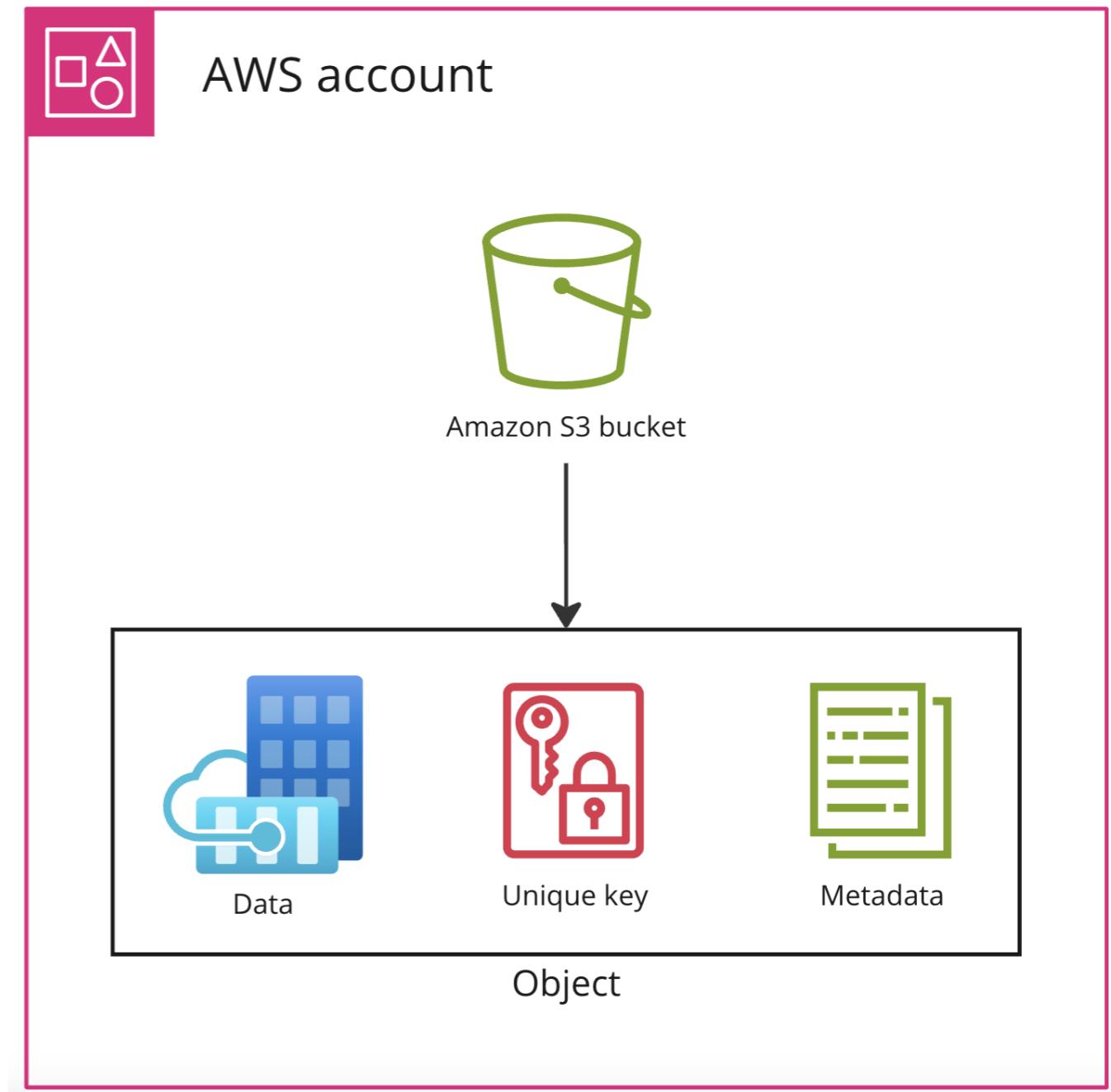


High storage
web applications

Amazon S3

A highly scalable and durable object storage service offered by AWS

- Designed for 99.999999999% (11 9's) durability
- Available in all AWS regions



Storage classes in S3



Amazon S3
Standard



Amazon S3
Intelligent Tiering



Amazon S3
One Zone IA



Amazon S3
Glacier



Amazon S3
Glacier Deep Archive



Amazon S3
On Outposts

S3 storage classes

Standard

- Durable, scalable, and available in all AWS regions
- Suitable for frequently accessed data



Amazon S3
Standard

Intelligent Tiering

- Automatic cost optimization
- Moves objects between tiers based on changing access patterns



Amazon S3
Intelligent Tiering

S3 storage classes

One Zone-Infrequent Access (IA)

- Cost-effective, single availability zone
- Ideal for infrequently accessed data that can be easily reproduced



Amazon S3
One Zone IA

Glacier

- Low cost, archival storage
- Long-term archival with retrieval times ranging from minutes to hours



Amazon S3
Glacier

S3 storage classes

Glacier Deep Archive

- Lowest cost, longest retrieval time
- Data with minimal access requirements



Amazon S3
Glacier Deep Archive

S3 Outposts

- On-premises storage extension
- Combine private and public cloud data



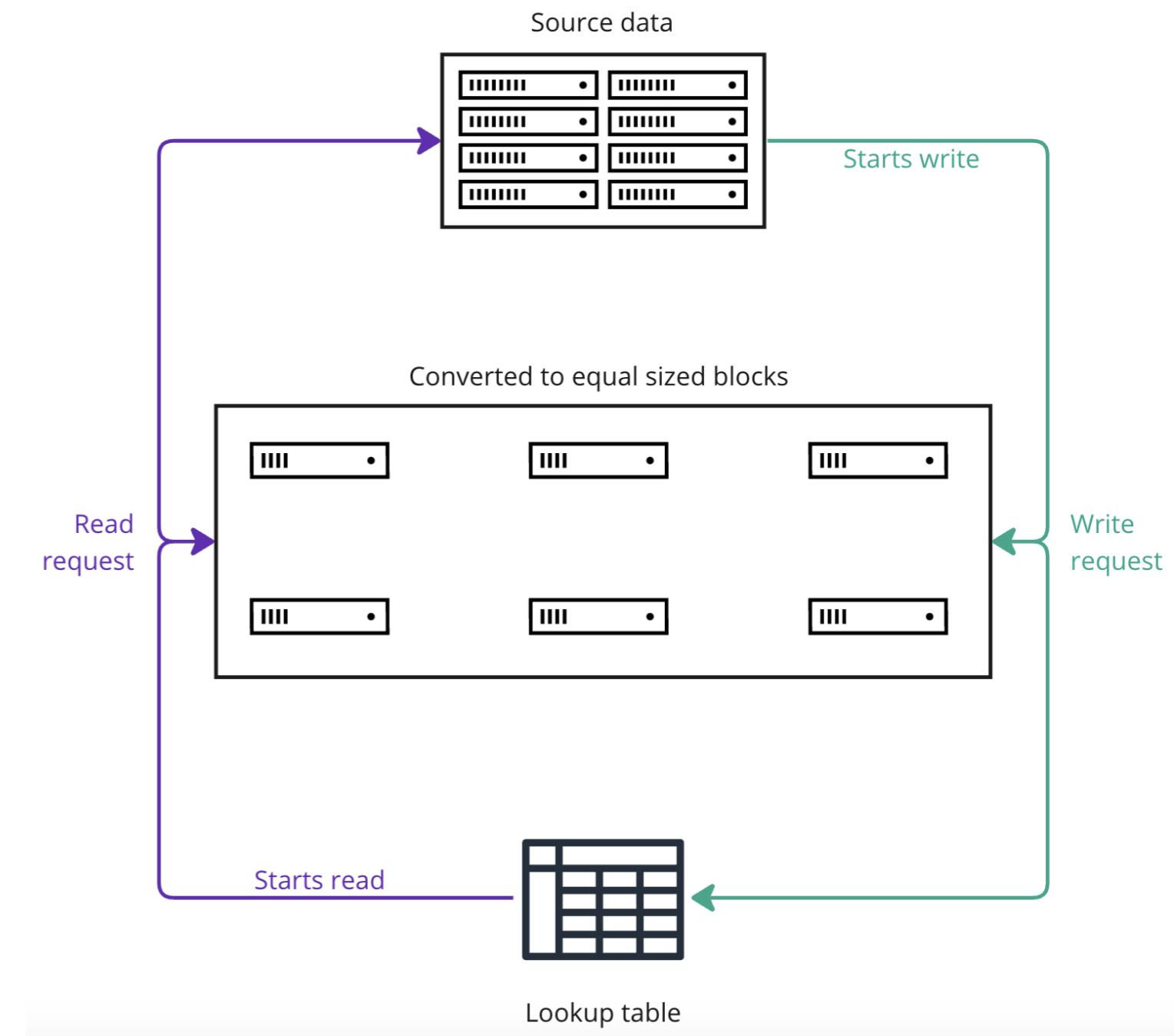
Amazon S3
On Outposts

What is block storage?

Divides data into fixed-sized blocks, each with its unique address

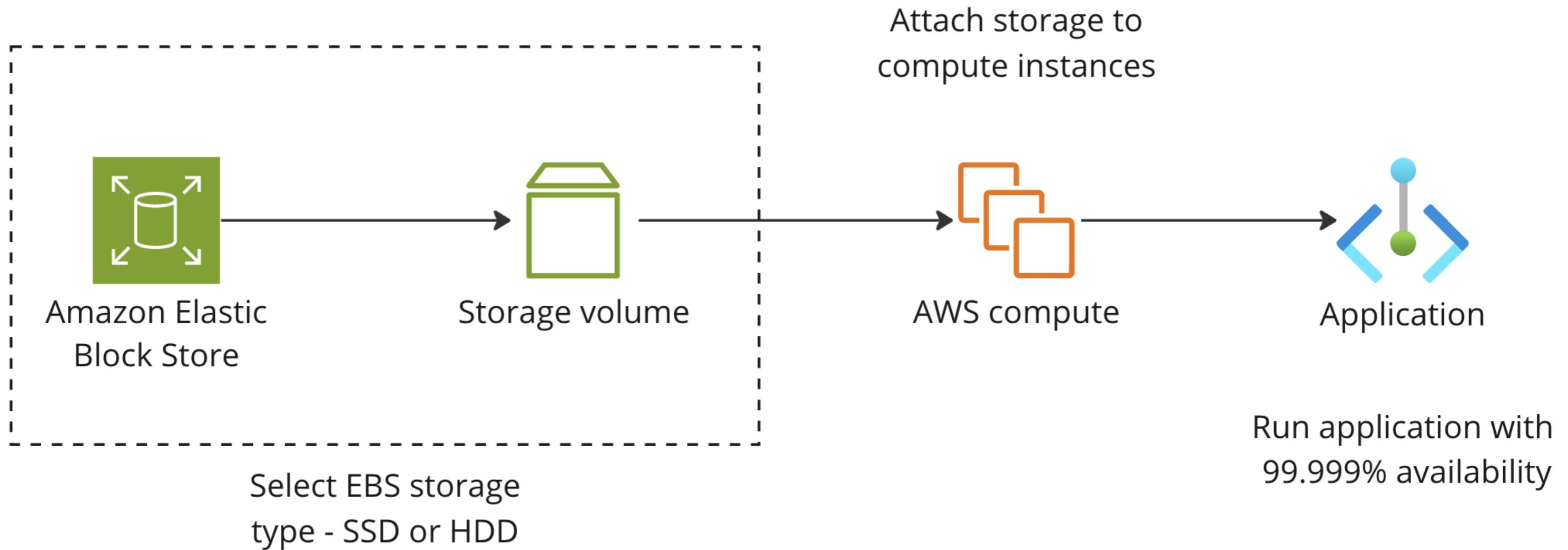
Use cases

- Running I/O intensive transactional web applications
- Right-size big data analytics engines



Amazon EBS

A scalable, high-performance block storage service designed for use with Amazon compute services

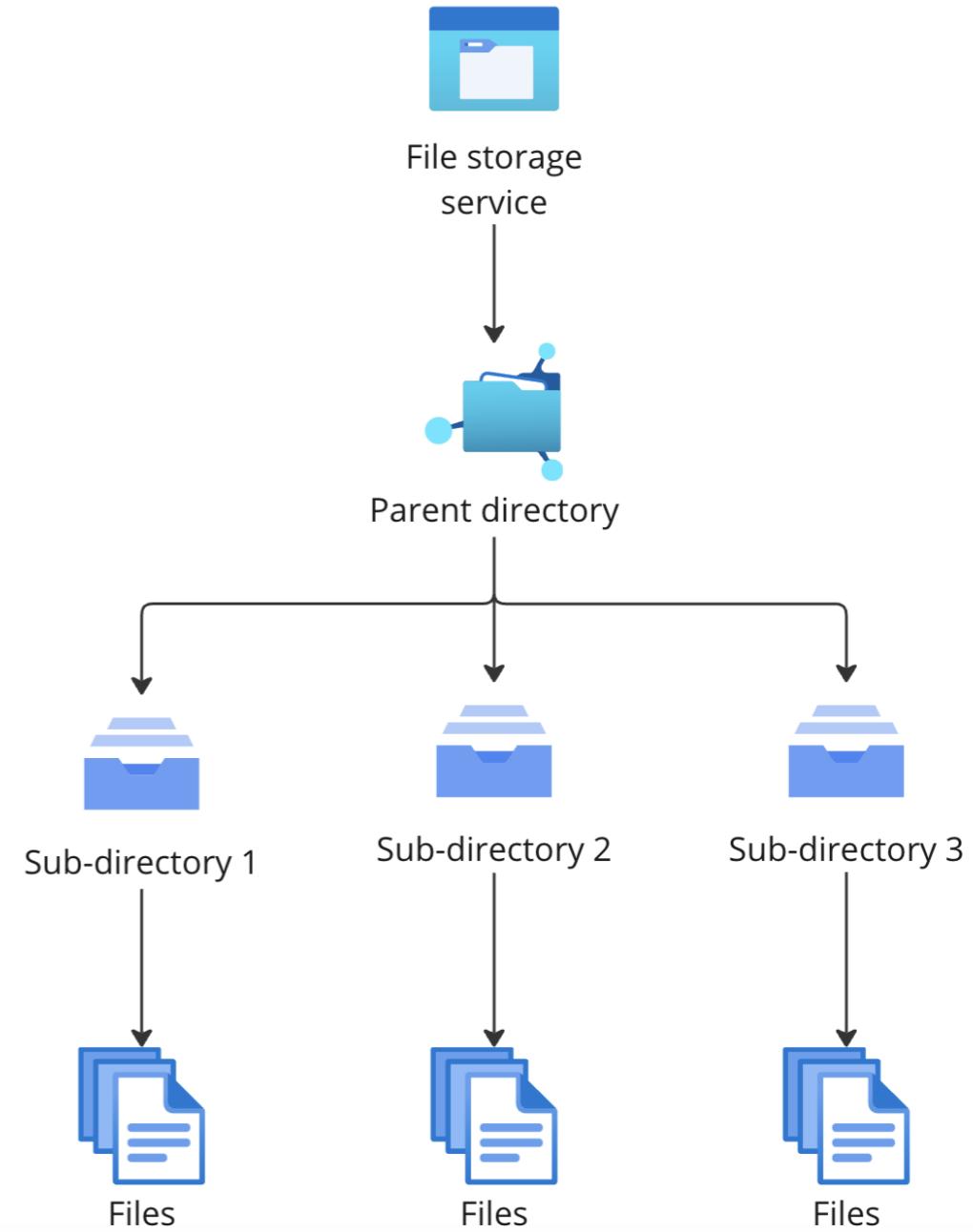


Exploring file storage services

Organizes and stores data in a hierarchical structure

Key characteristics

- Allows multiple concurrent reads and writes across users and services
- Stores metadata about files

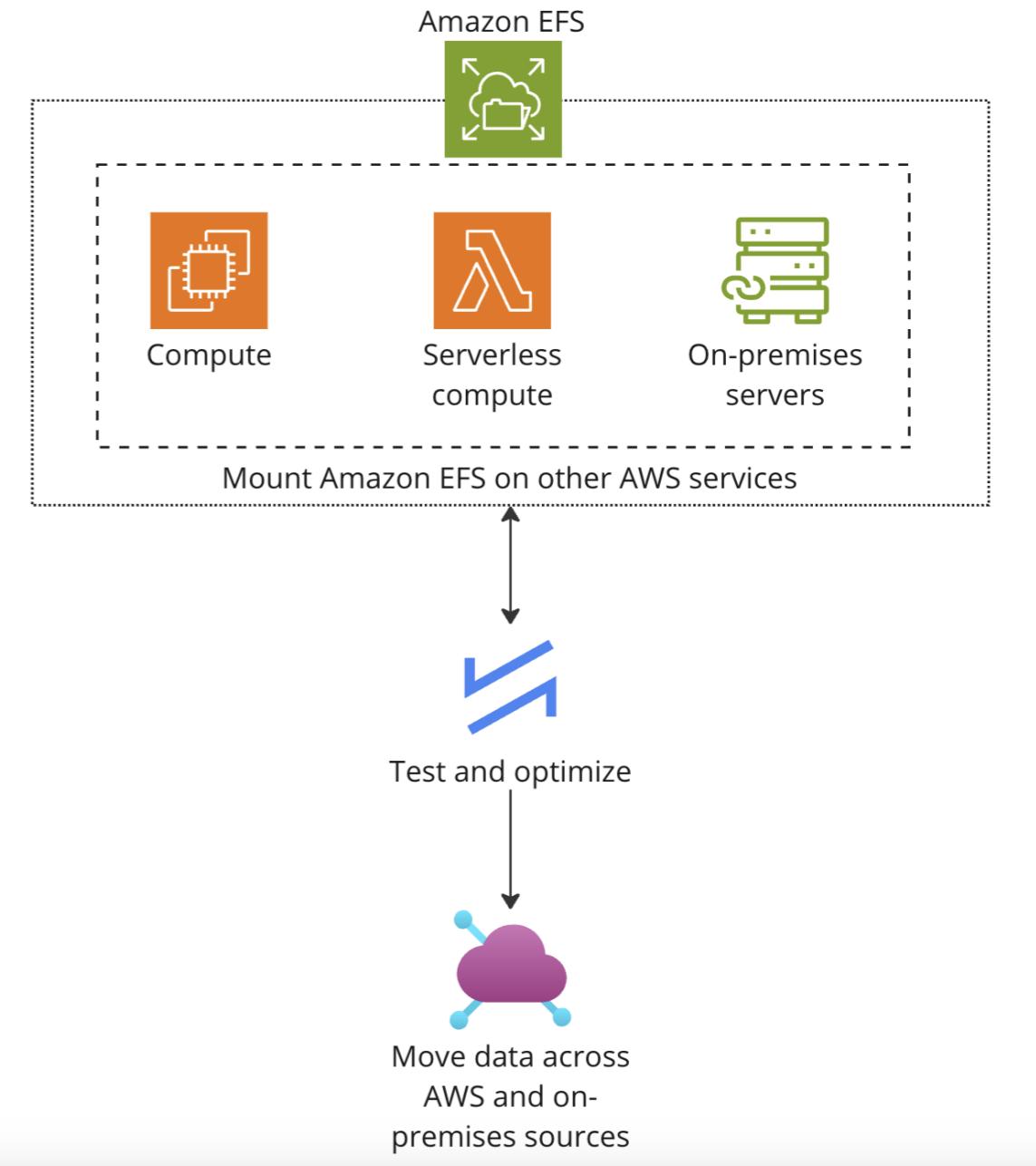


Amazon EFS

File storage service designed for use with AWS cloud services and on-premises resources

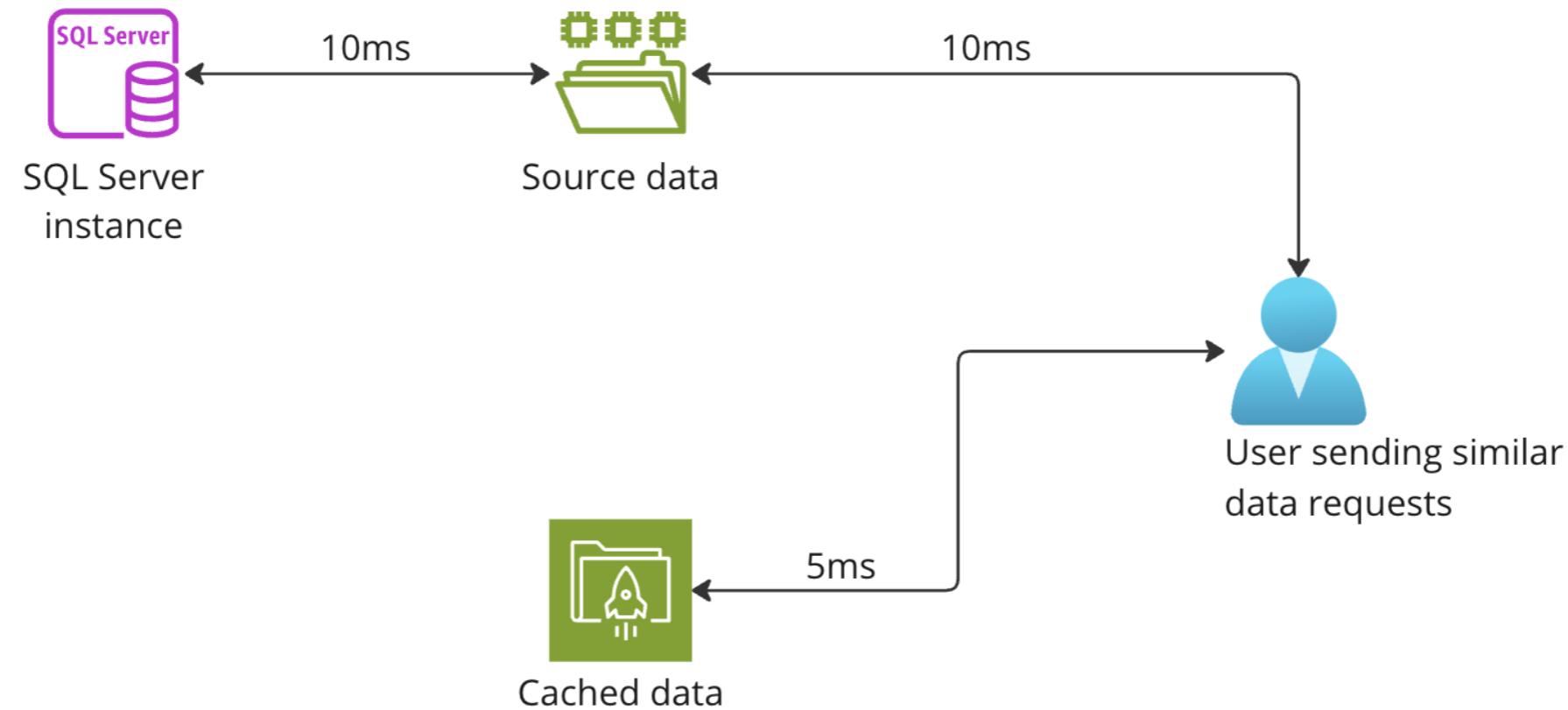
Use cases

- Simplify DevOps
- Enhance content management systems
- Accelerate data science



Cache storage services in AWS

Storing frequently accessed data in a quickly retrievable location



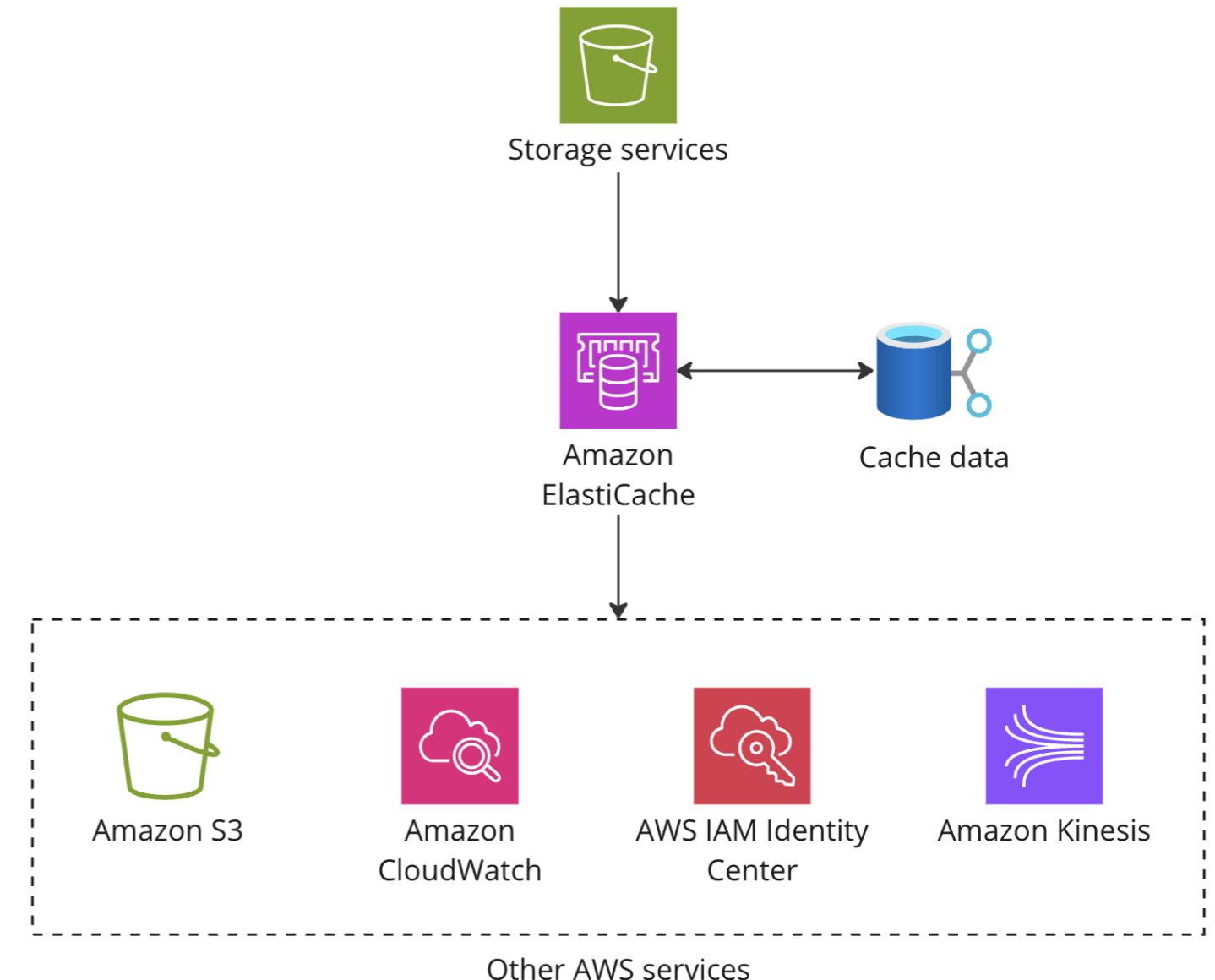
- Accelerates application response times by reducing data retrieval latency
- Minimizes the load on backend servers

Amazon ElastiCache

Caching service that enables seamless, high-speed access to frequently used data

Use cases

- Store web application session data in-memory
- Accelerates access to real-time analytics data



Revisiting AWS storage types



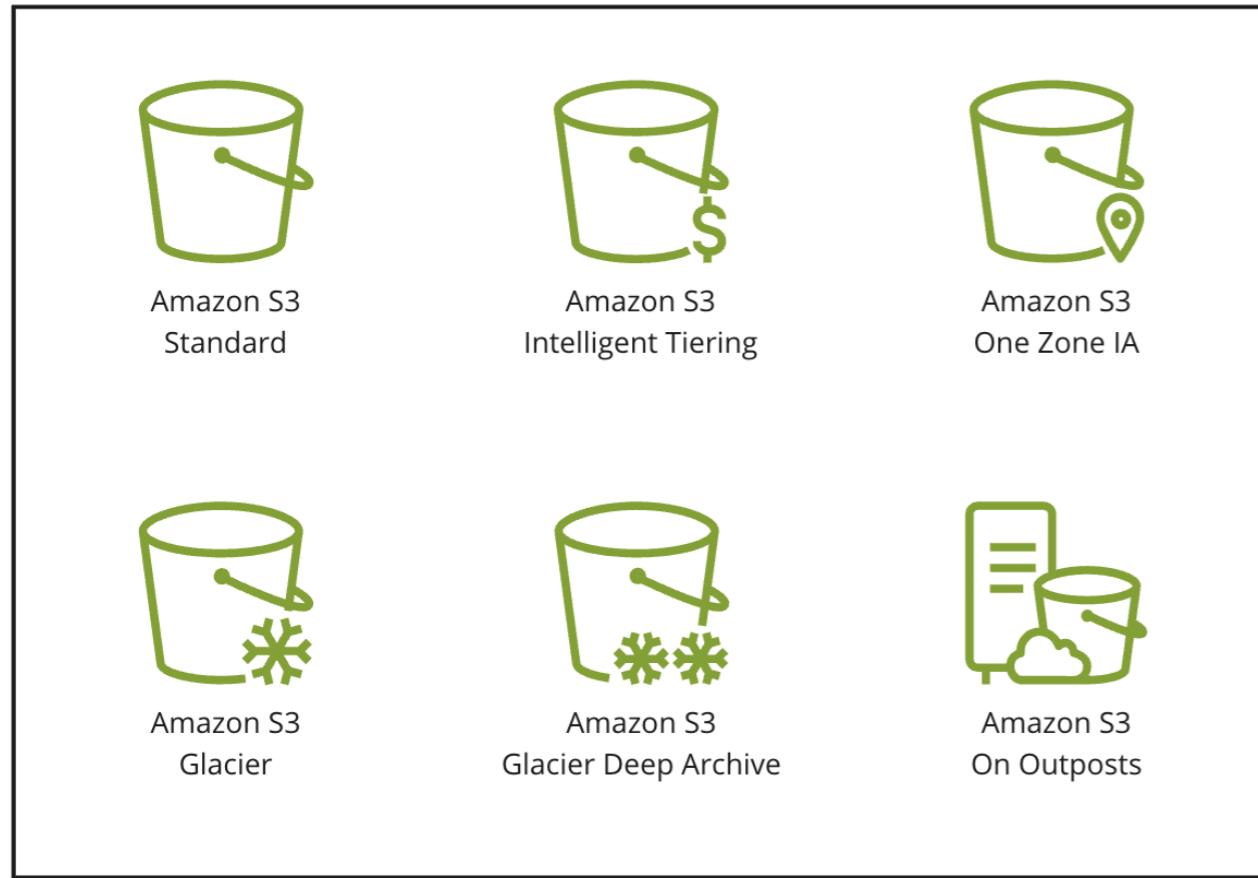
Revisiting AWS storage types



Object storage



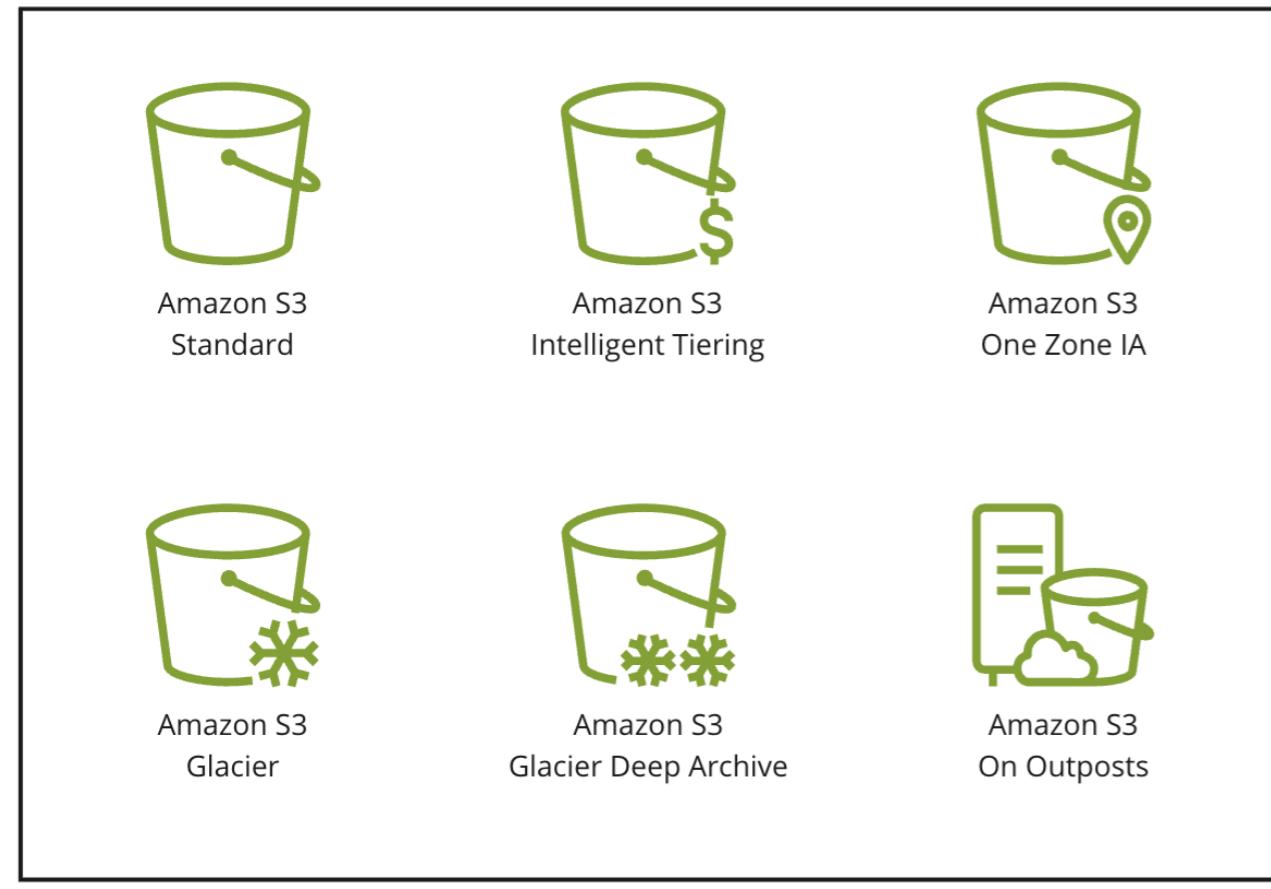
Revisiting AWS storage types



Object storage



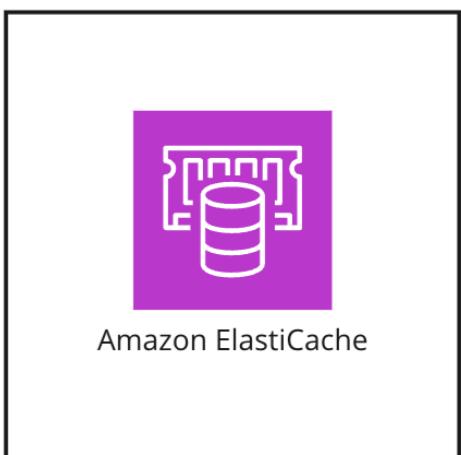
Revisiting AWS storage types



Block storage



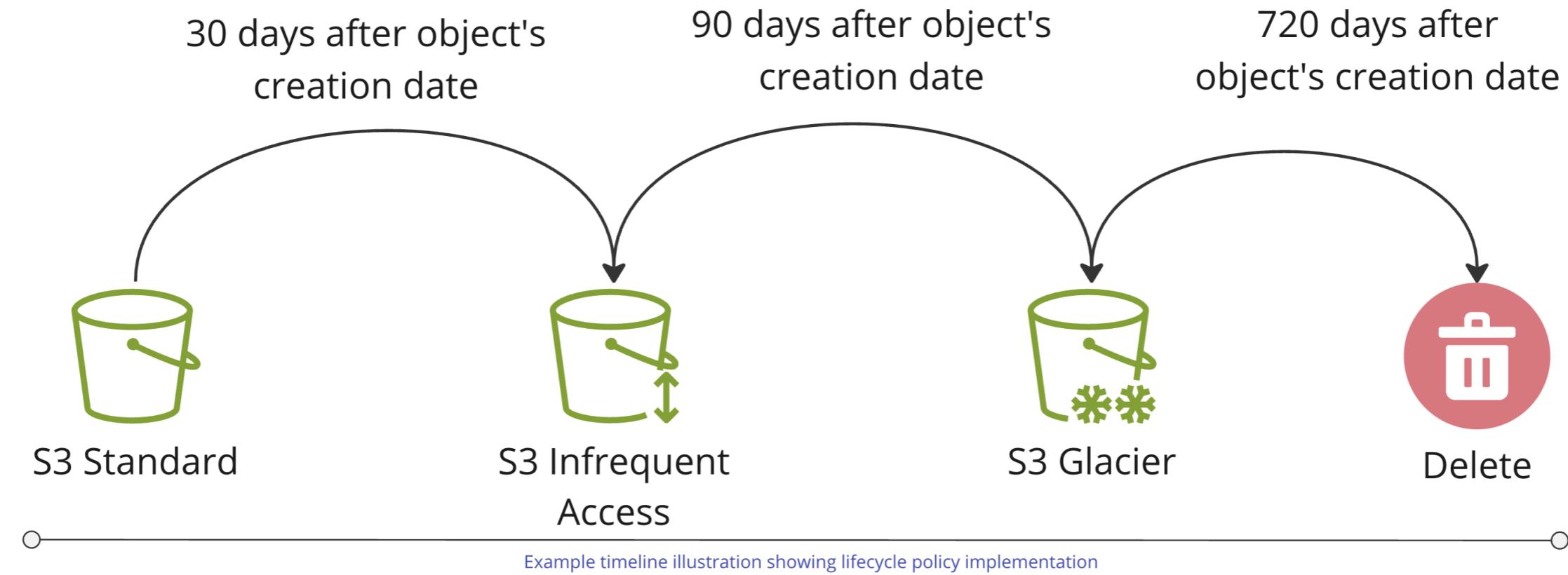
File storage



Cache storage

Storage lifecycle policies

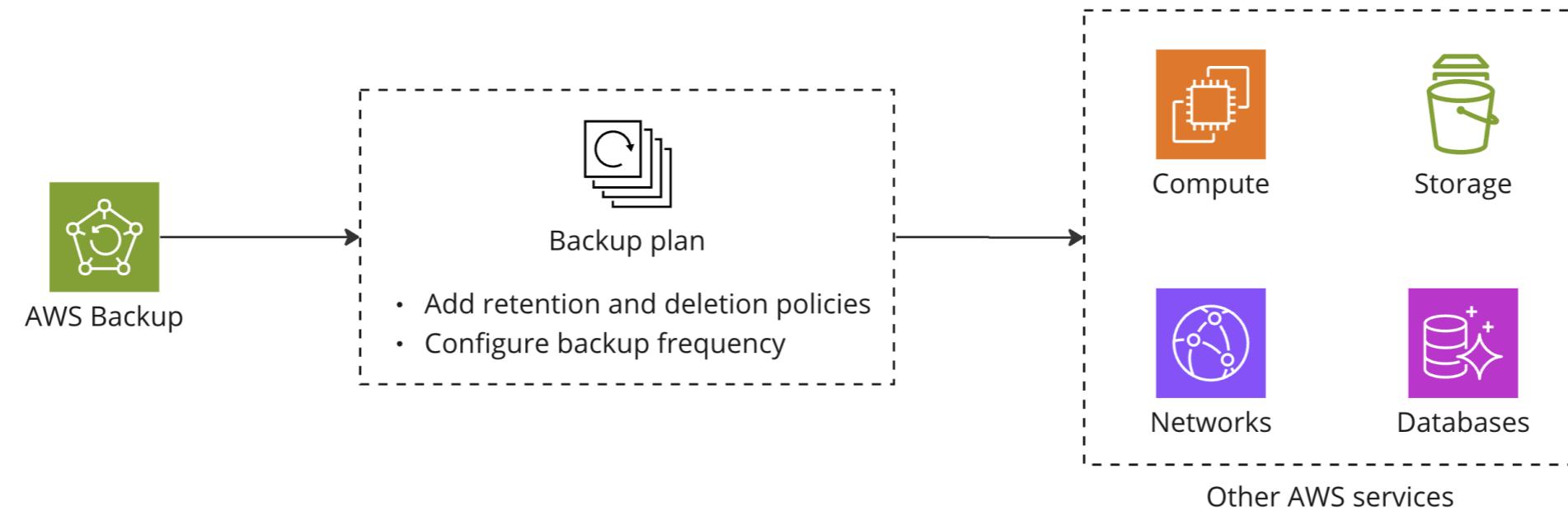
Defines the transition of objects between storage classes in S3, based on predefined rules



- Cost and performance optimization
- Improves data management and compliance

AWS Backup

Cost-effective, fully managed service that centralizes and automates backup across AWS services



- Cross-region backups
- Set retention and deletion policies

Let's practice!

AWS CLOUD TECHNOLOGY AND SERVICES CONCEPTS