Data Management within Microservices

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Relational Database

Tables with rows and columns

Retrieve and manage data using SQL

Constraints and referential integrity

Transaction support

Demo

Azure SQL Database

Platform as a Service	Upgrading and Patching	Backups and Monitoring
Latest Version of SQL Server	Flexible Pricing	Flexible Deployment

Azure SQL
Managed Instance

Broadest set of SQL Server capabilities

Managed platform

Deploy into VNET

Patching, updates, backups

High availability

Azure Database
for MySQL

- Open-source tools and platform compatibility
- MySQL Community Edition
- Flexible pricing options
- High-availability
- Dynamic scalability
- Encryption
- Automated patching and backup

Azure Database
for PostgreSQL

Supports complex data structures

Geometric data types

Extensions for GIS, etc.

Managed database features

Module Overview

Relational databases in Azure

Entity Framework Core

NoSQL databases with Cosmos Db

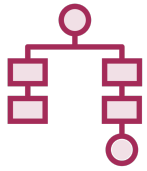
EF Core with Cosmos Db

Azure Cache for Redis

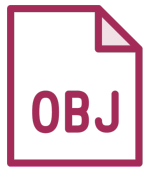
Azure Storage for unstructured data

Database Mapping Using Entity Framework Core

Entity Framework Core

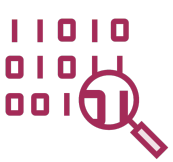


ORM – Object Relational Mapping



Entities are C# objects in code

DbContext represents a session with the database



Query and manipulate objects using LINQ

Language Integrated Query (LINQ)

LINQ to SQL

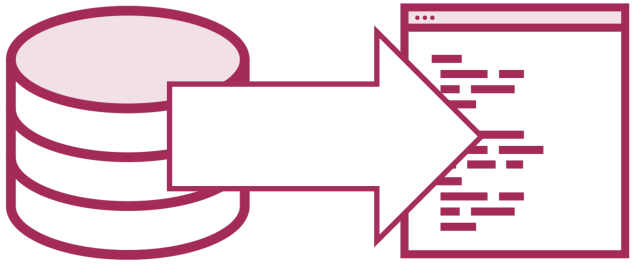
LINQ to Objects

LINQ to XML

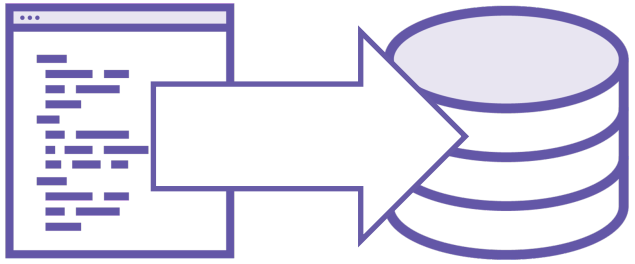
Demo

Entity Framework Core Workflows

Maintain Model and Database Separately



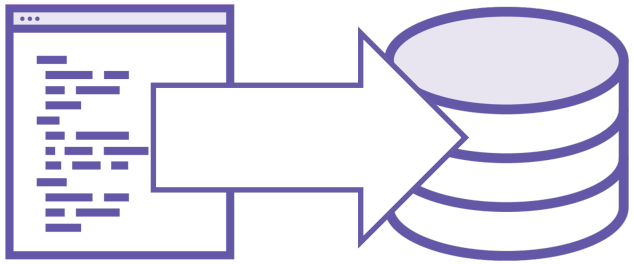
Reverse Engineer Model from Database



Code First to Generate Database

Demo

EF Core Code First Migrations



Incremental database changes

- When app first starts
- On-demand by running commands
- Generate SQL scripts

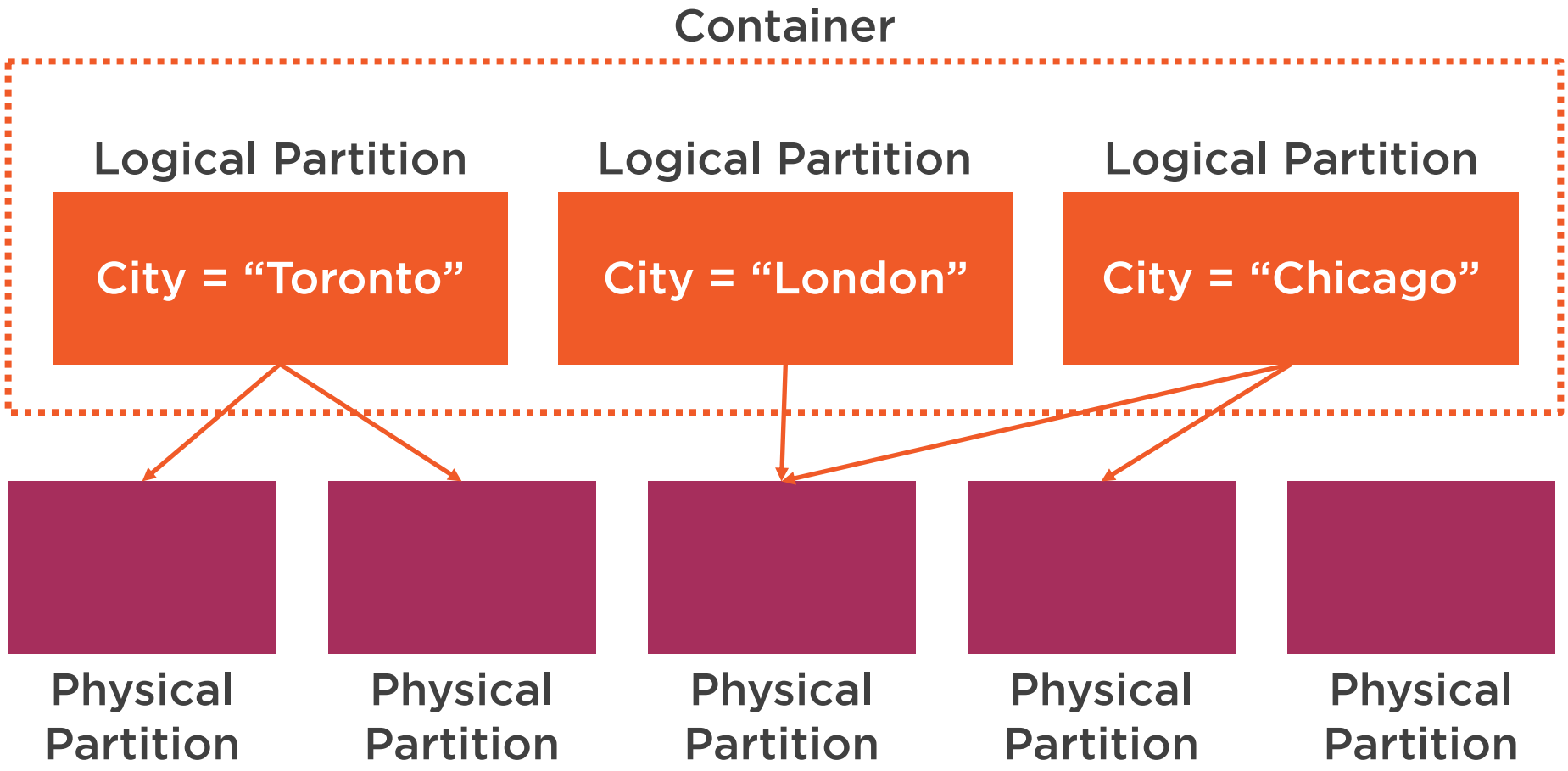
Storing NoSQL Data with Azure Cosmos DB

Characteristics of NoSQL Databases

- Flexible data structures
- Generally open source
- Can handle large datasets
- High throughput
- Limited transaction ability

Demo

Cosmos Db Structure



Cosmos Db API's

SQL (Core) API

Document database

LINQ and SQL Syntax

EF Core supported

Mongo Db API

Document database

Mongo specific tooling and query language

Easy migration

Cassandra API

Apache Cassandra

Wide-column database

Cassandra Query Language (CQL)

Cosmos Db API's

Table API

Tables with columns and rows

Similar to Azure Table Storage

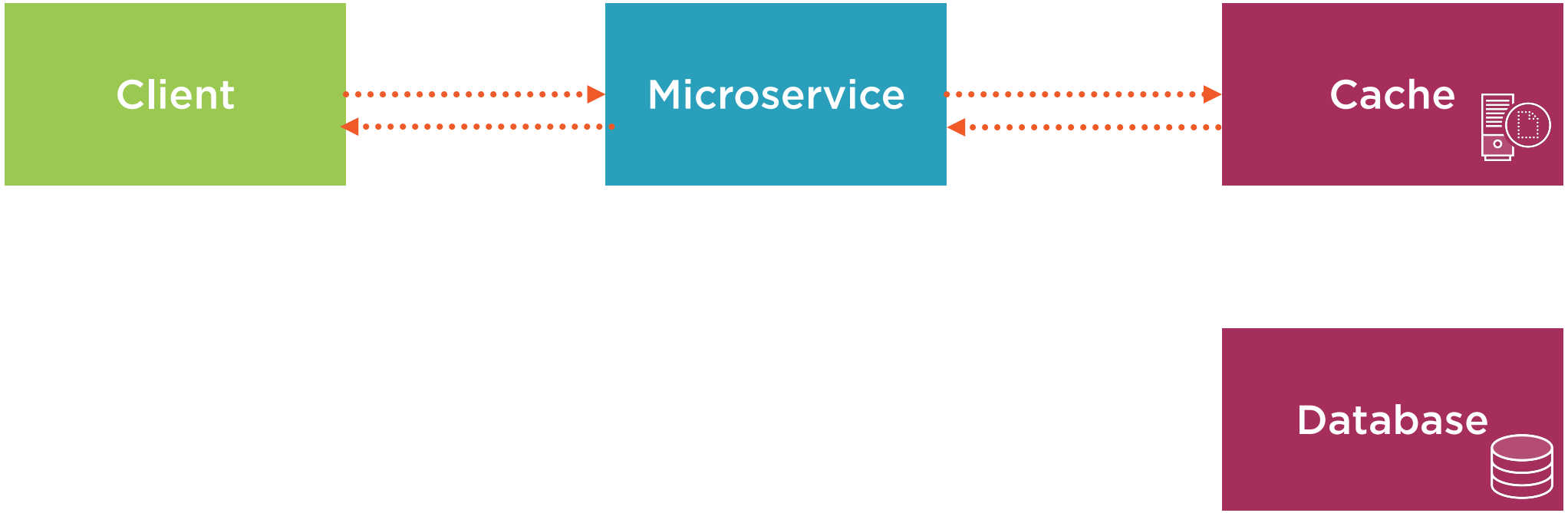
Gremlin API

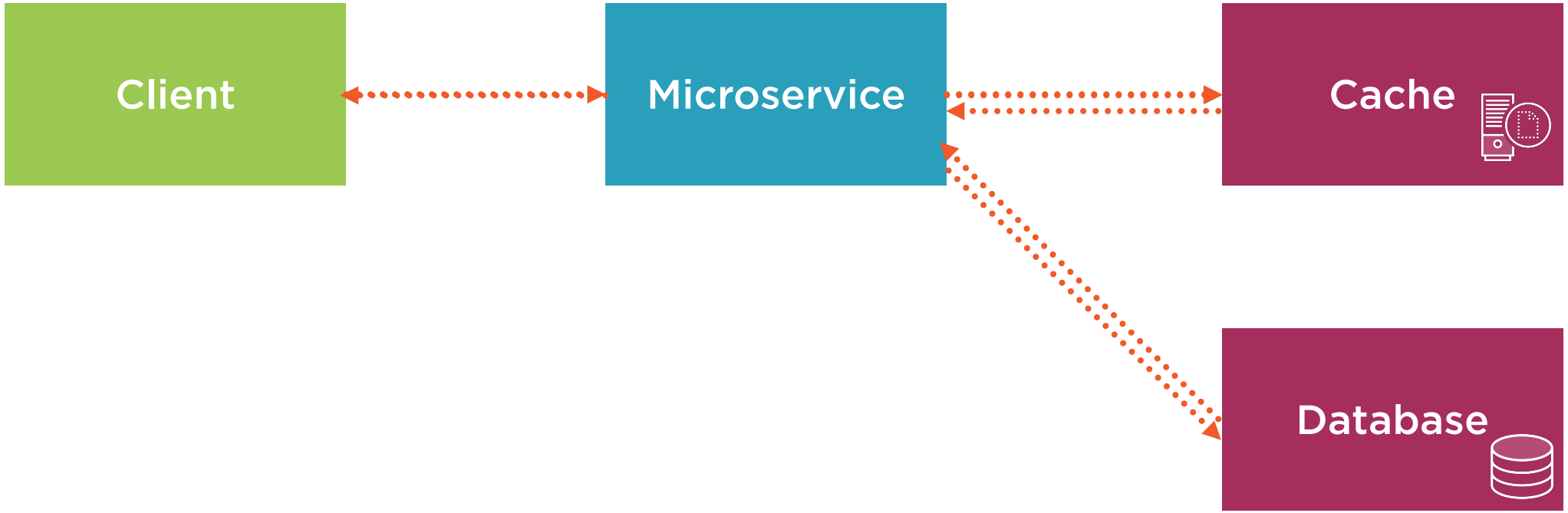
Graph database

Modeling relationships

Gremlin Query Language

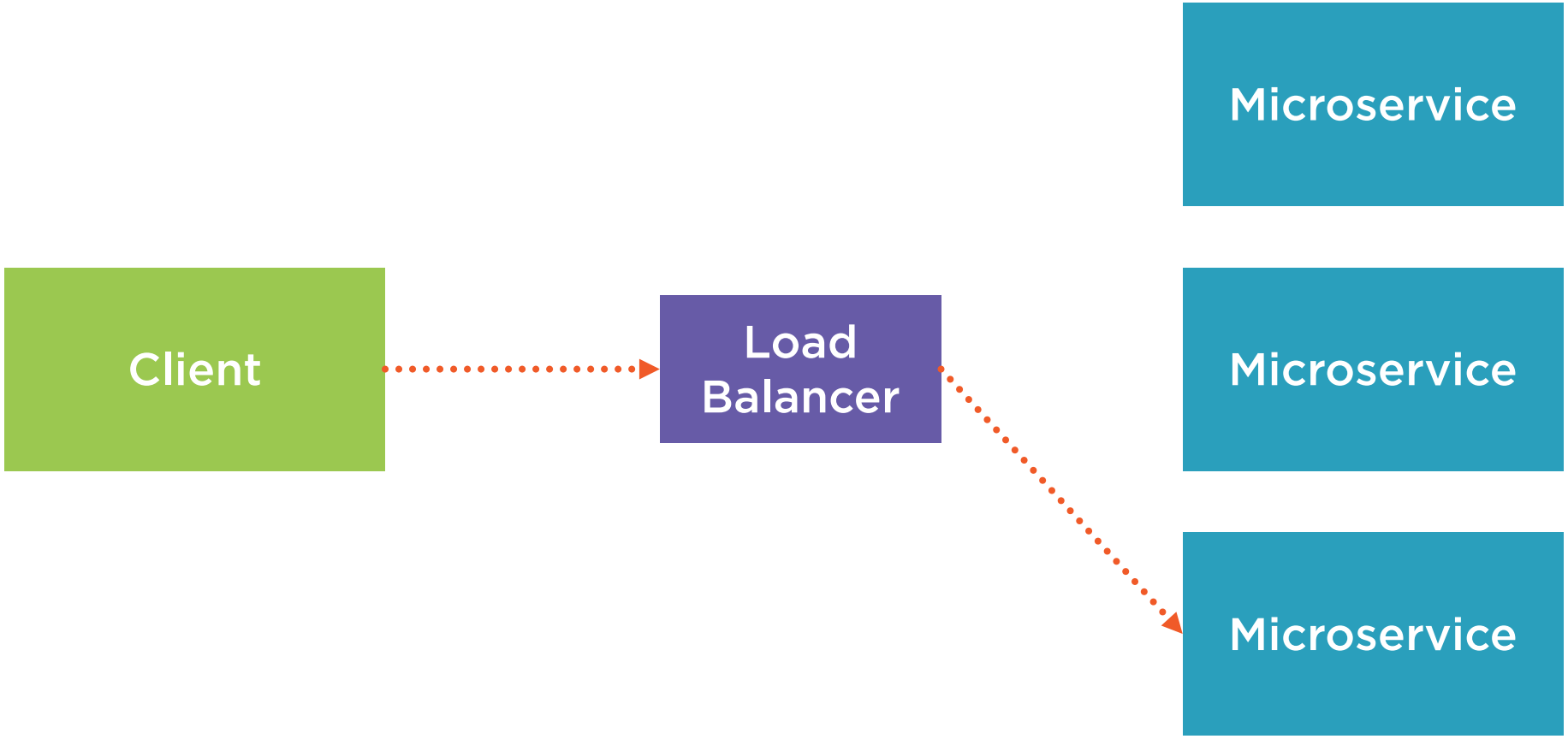
Using a Distributed Cache as a Data Store


Client
Microservice
Cache
Database

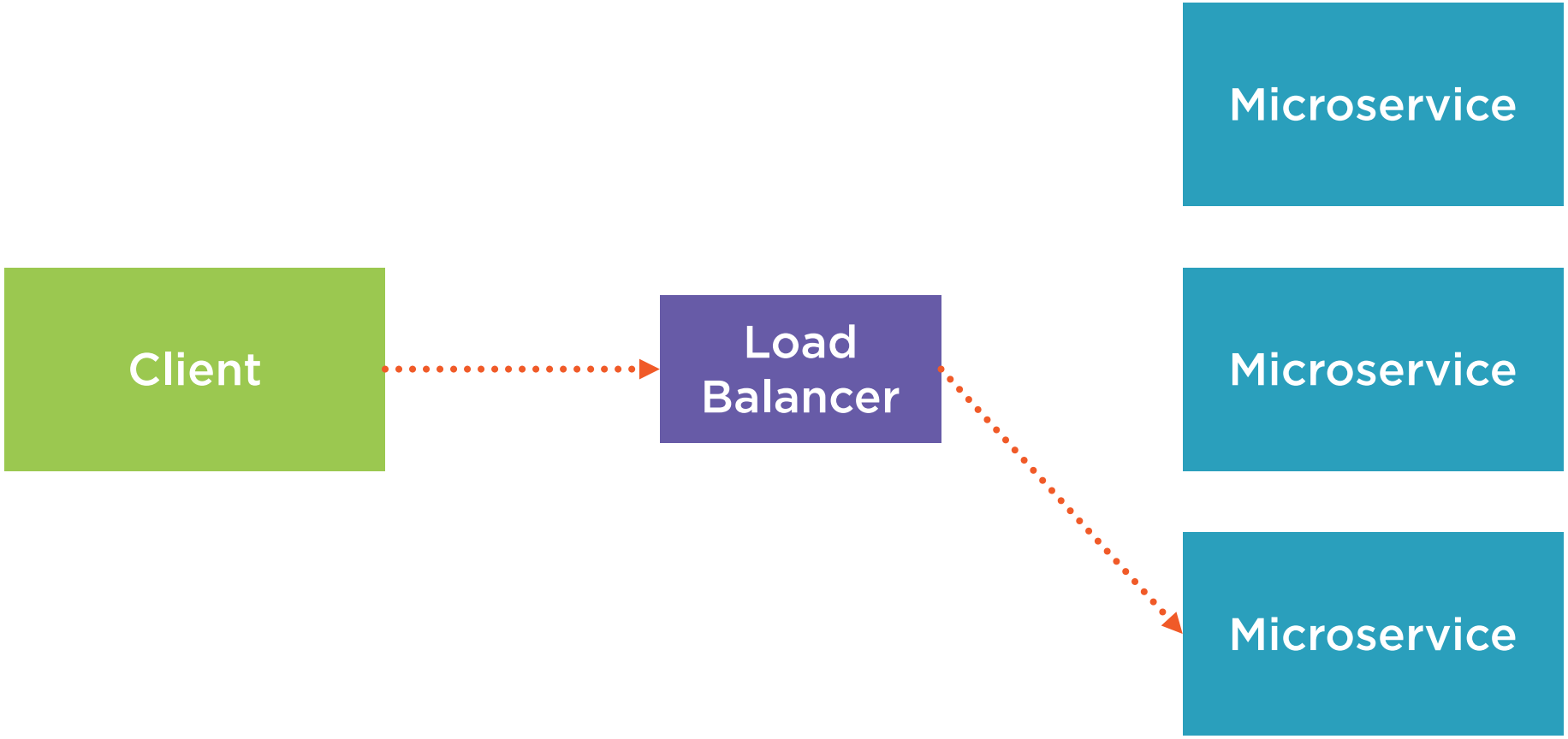

Client
Microservice
Cache
Database


Client
Microservice
Cache

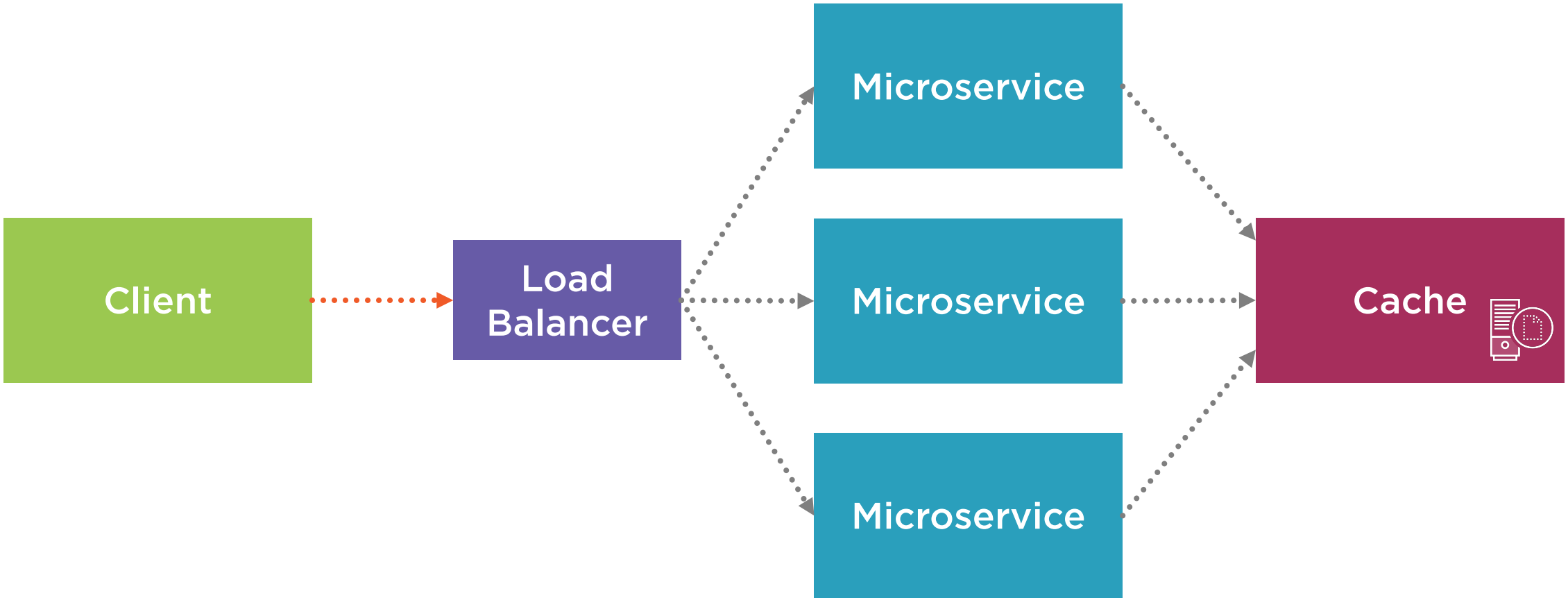
IMemoryCache



IMemoryCache



IDistributedCache



IDistributedCache

public byte[] Get (string key)

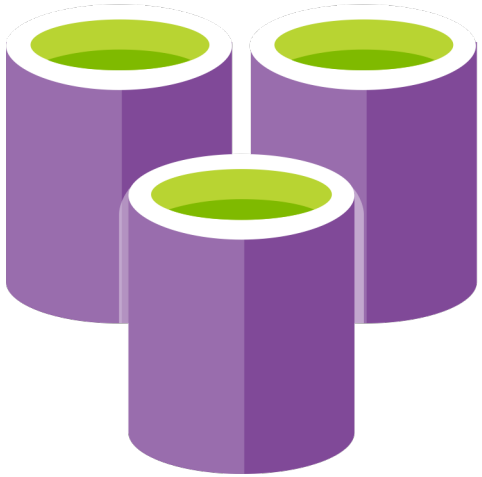
public void Set (string key, byte[] value, Microsoft.Extensions.Caching.Distributed.DistributedCacheEntryOptions options)

public void Refresh (string key)

public void Remove (string key)

IDistributedCache Implementations

- Memory Cache
- SQL Server
- Ncache Cache
- Redis Cache



Azure Cache for Redis

Managed hosting of Redis Cache in Azure

Uses:

- Data cache
- Site acceleration
- Session store
- Job and message queue

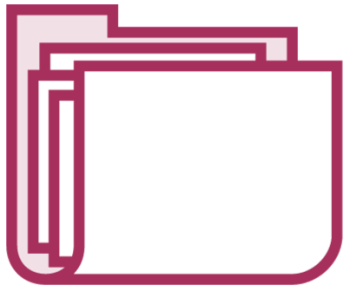
Pricing tiers

- Basic
- Standard
- Premium

Azure Storage for Unstructured Data

Azure Storage Services

Blob Storage



File Storage

Disk Storage

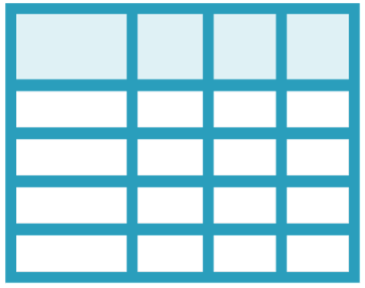
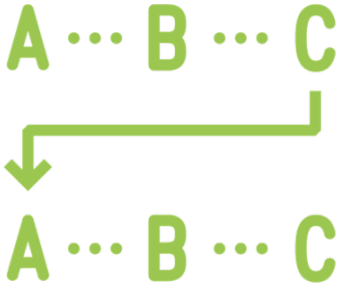


Table Storage



Queue Storage

Azure Storage
Blob Service

Binary Large OBject

File, document, image, video, VM disk, database, etc.

Three types of Blobs in Azure

Can’t change blob type after upload

Blob Types

Block Blob

Composed of blocks

Optimized for efficient upload

Append Blob

Can only Append Blocks

Ideal for log and audit files

Page Blob

For frequent read/write operations

VM disks and databases

Fast access to random locations

Blob Access Tiers

Highest storage cost

Lowest data access cost

Lower storage cost

Higher data access cost

Lowest storage cost

Highest data retrieval cost

Blob Service Features

Snapshots

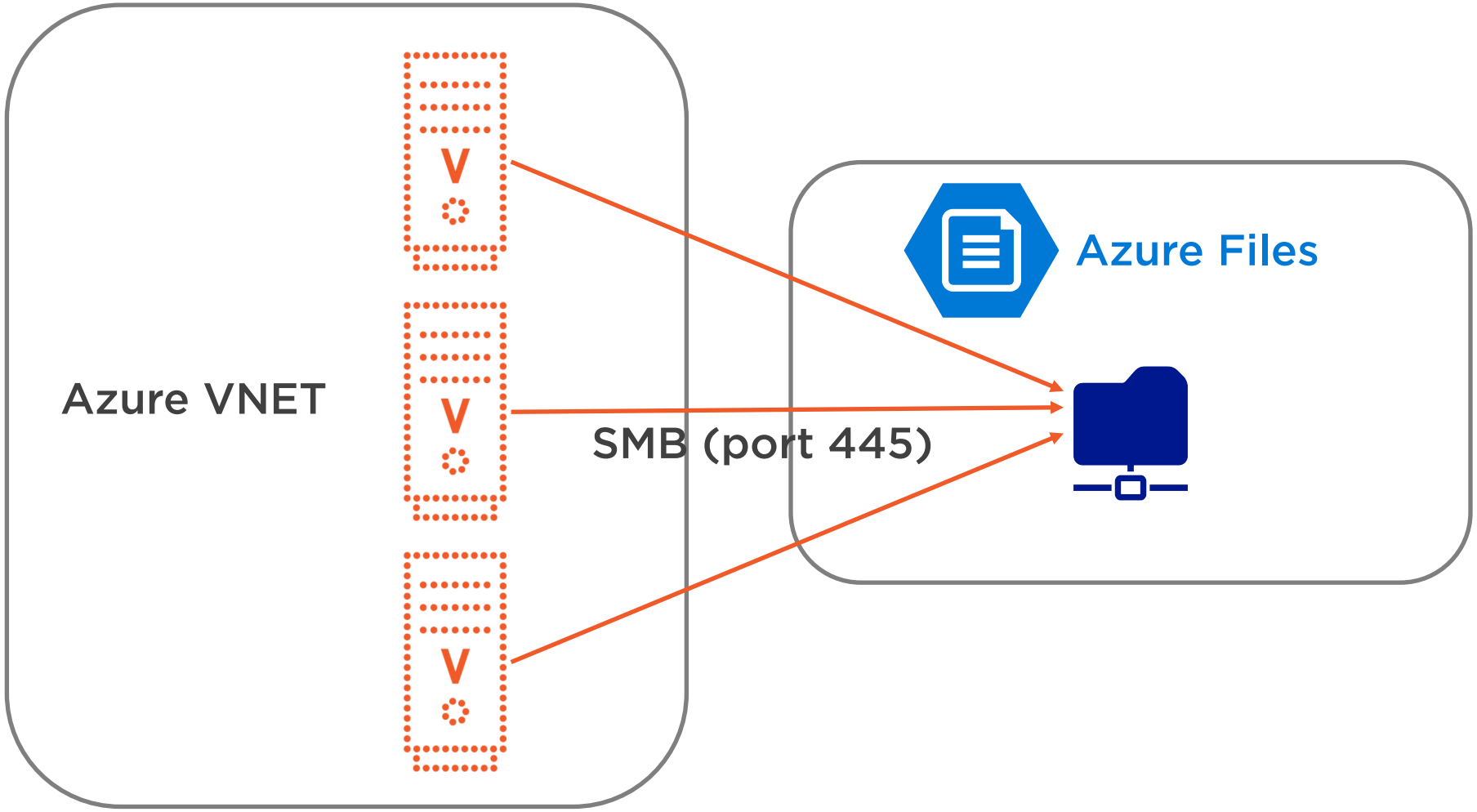
Leasing

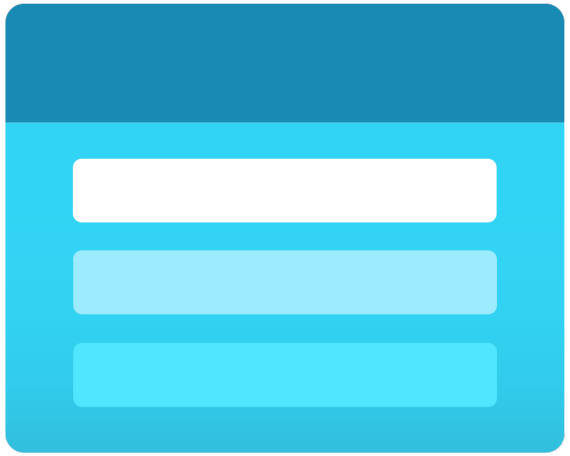
Soft Delete

Azure CDN Integration

Azure Search Integration

Azure File Storage





Azure Storage Accounts

Data is encrypted at rest

- Service-managed or customer-managed keys

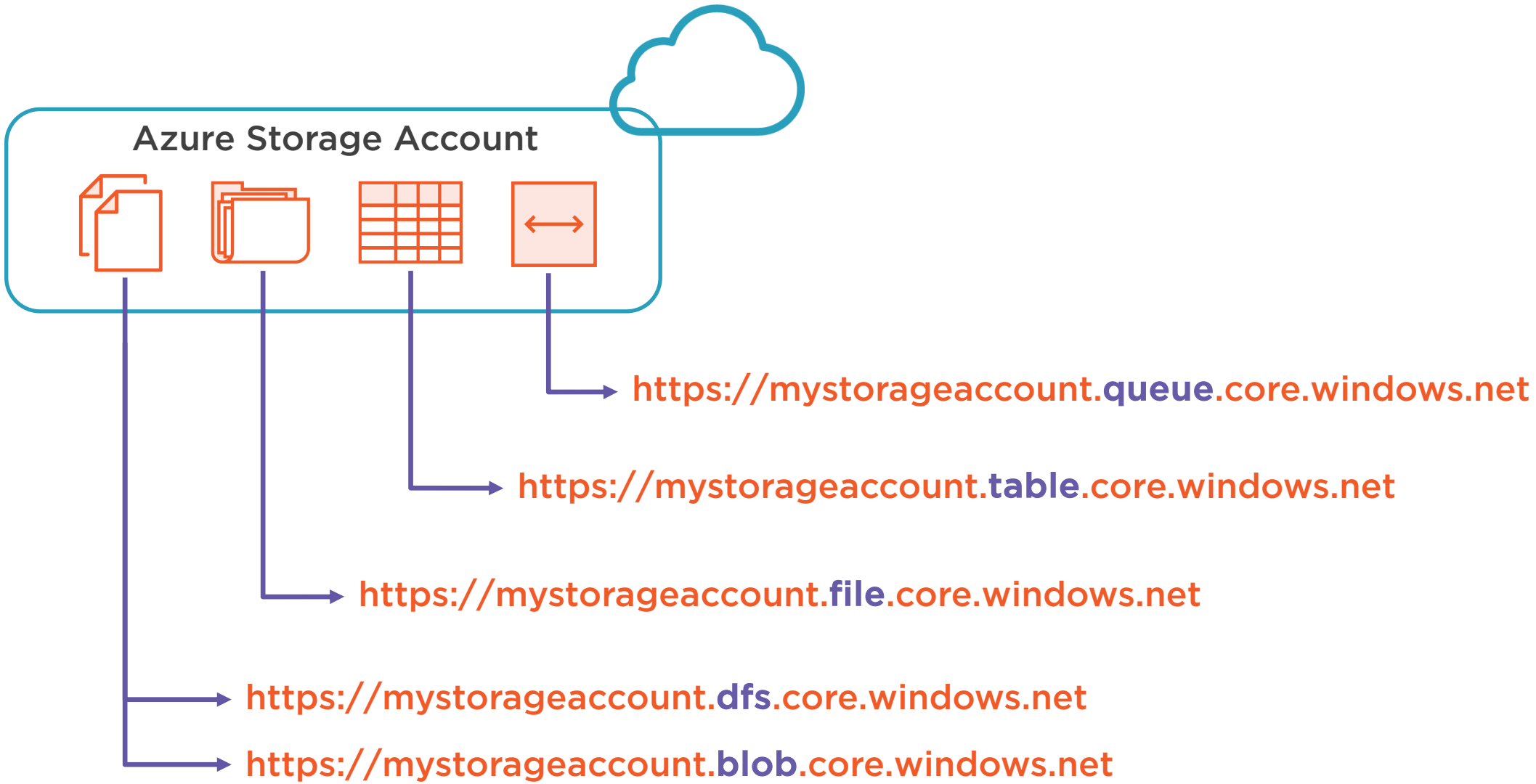
Can require HTTPS

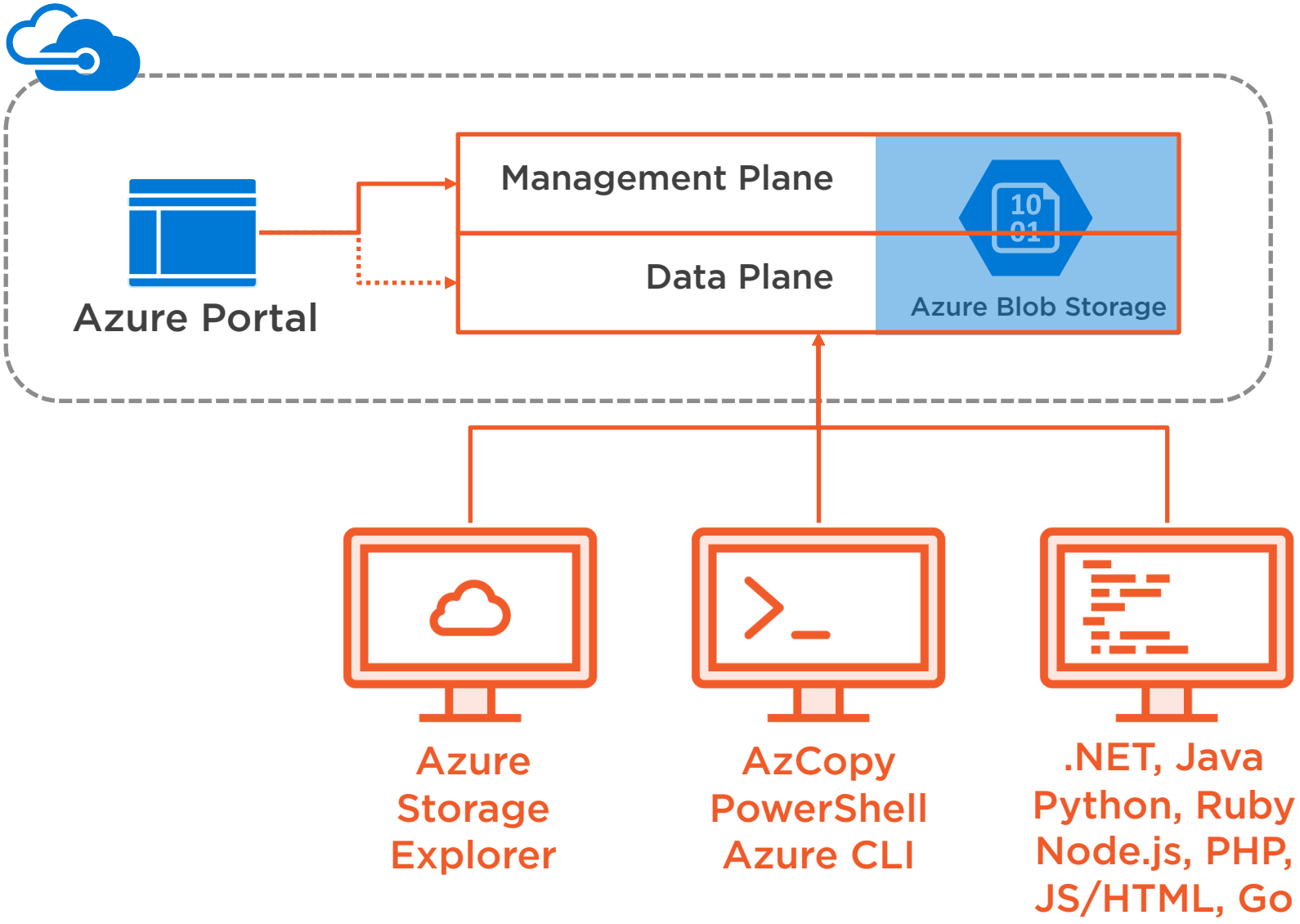
Can restrict IP ranges

VNET restrictions

Role based access control (RBAC)

Shared Access Signature


Azure Storage Account
https://mystorageaccount.queue.core.windows.net
https://mystorageaccount.table.core.windows.net
https://mystorageaccount.file.core.windows.net
https://mystorageaccount.dfs.core.windows.net
https://mystorageaccount.blob.core.windows.net


Management Plane
Data Plane
Azure Blob Storage
Azure Portal
Azure Storage Explorer
AzCopy PowerShell Azure CLI
.NET, Java Python, Ruby Node.js, PHP, JS/HTML, Go

Demo

Module Summary

- Relational database options
- Entity Framework Core
- Cosmos DB as a NoSQL database
- Azure Cache for Redis
- Azure Storage for unstructured data

Up Next:
Data Consistency Across Microservices