DEVCONF
Tennessee Developer Conference

THE HITCHHIKER'S GUIDE TO THE COSMOS

Chad Green

TALELEARNCODE
TALELEARNCODE
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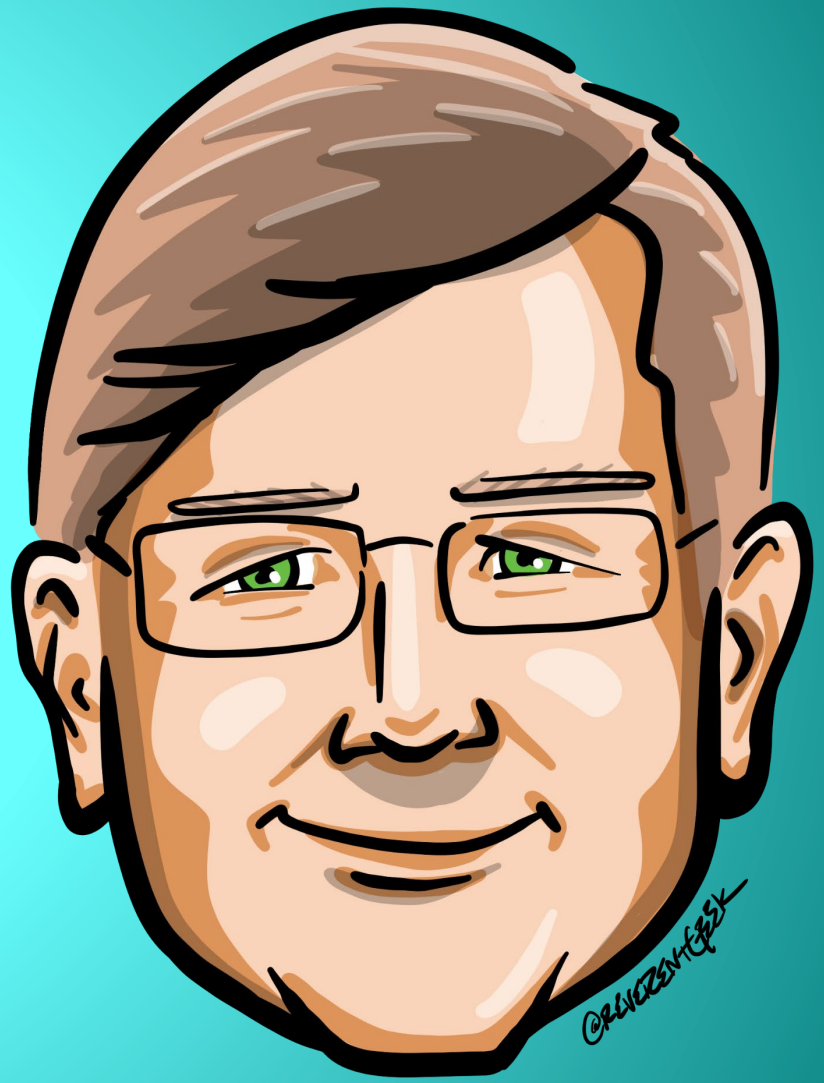
TALELEARNCODE.COM
CHADGREEN

Who is Chad Green

- chadgreen@chadgreen.com
- TaleLearnCode
- TaleLearnCode.com
- ChadGreen & TaleLearnCode
- ChadwickEGreen



What is Cosmos DB

The Hitchhiker's Guide to the Cosmos

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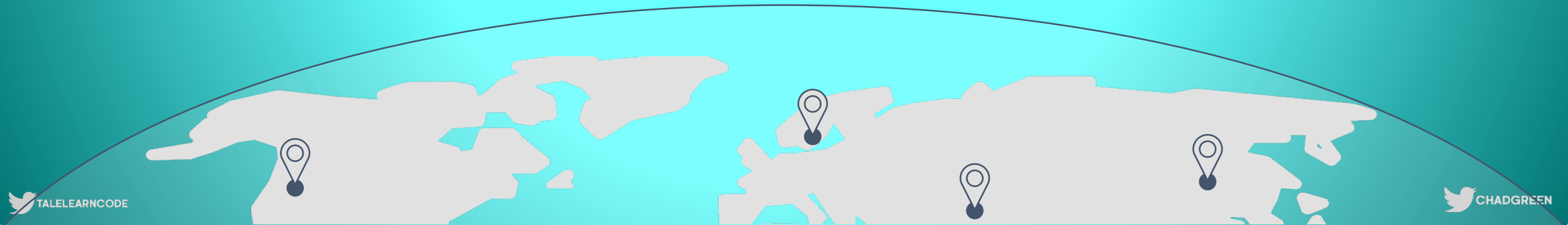
Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

Turnkey global distribution



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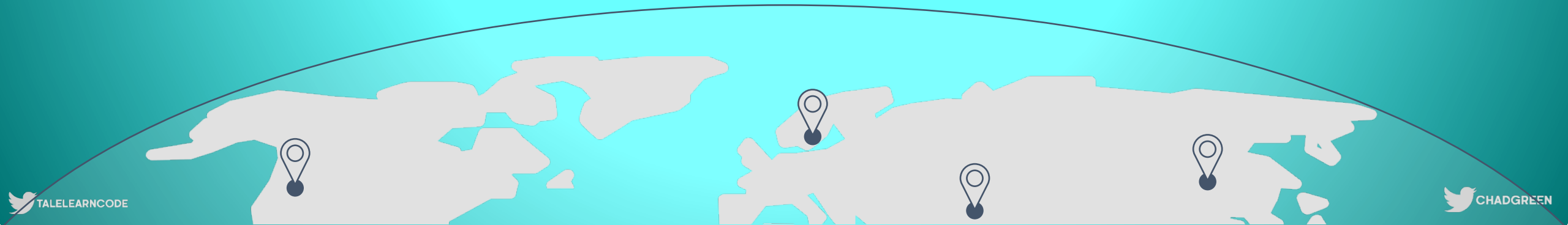

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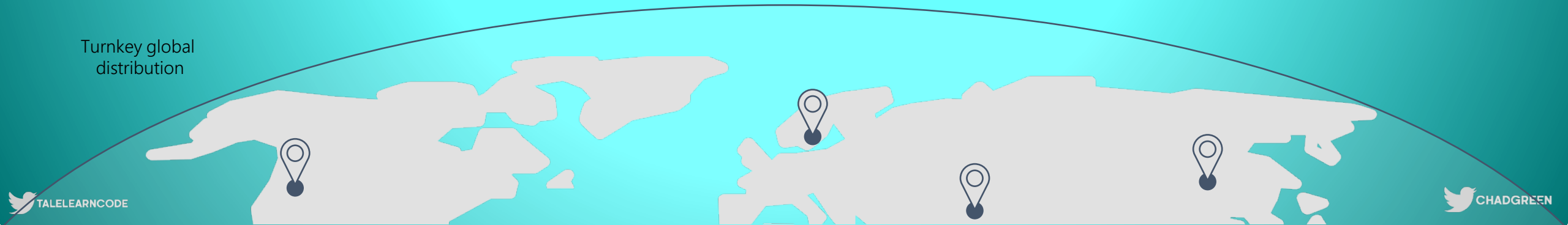

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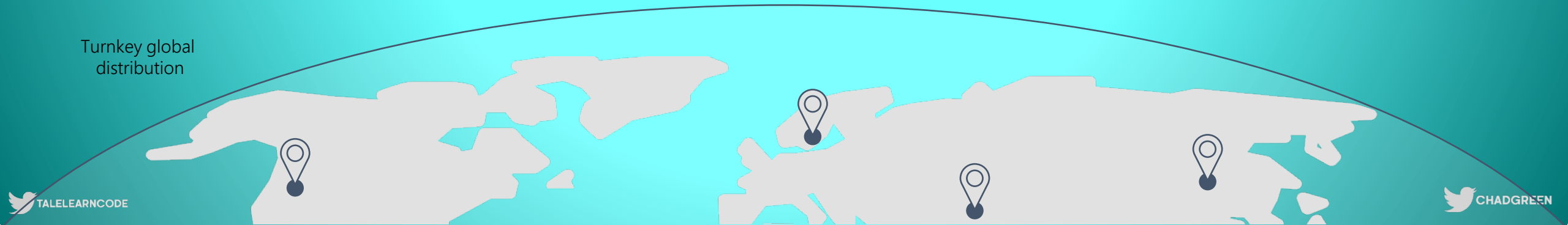

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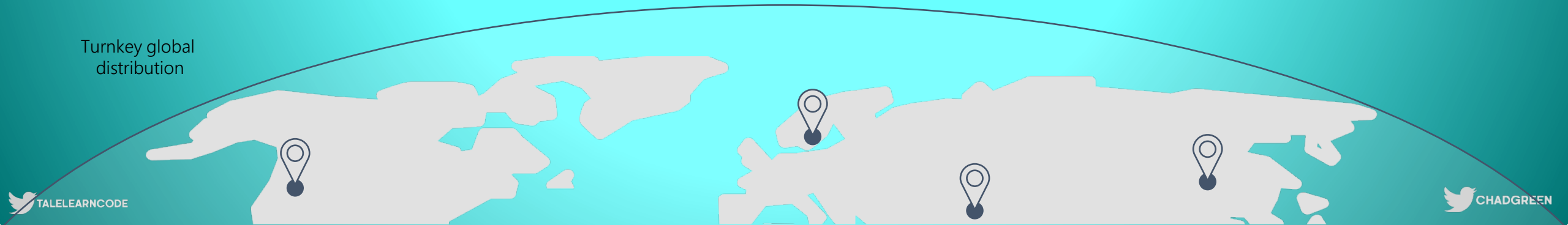

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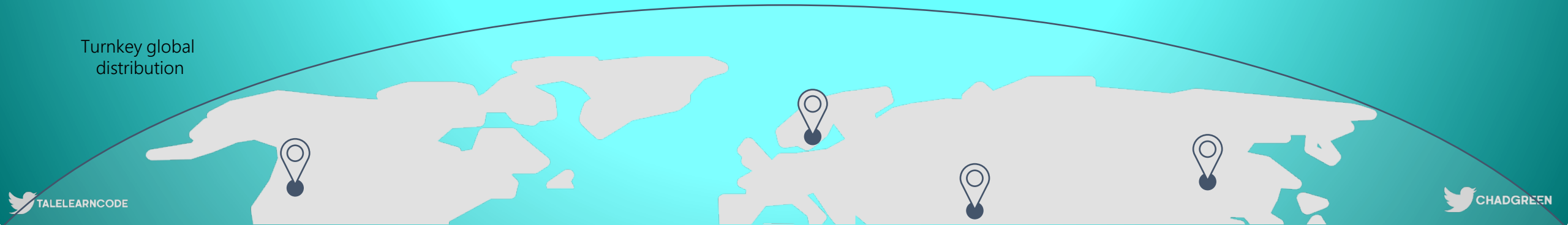

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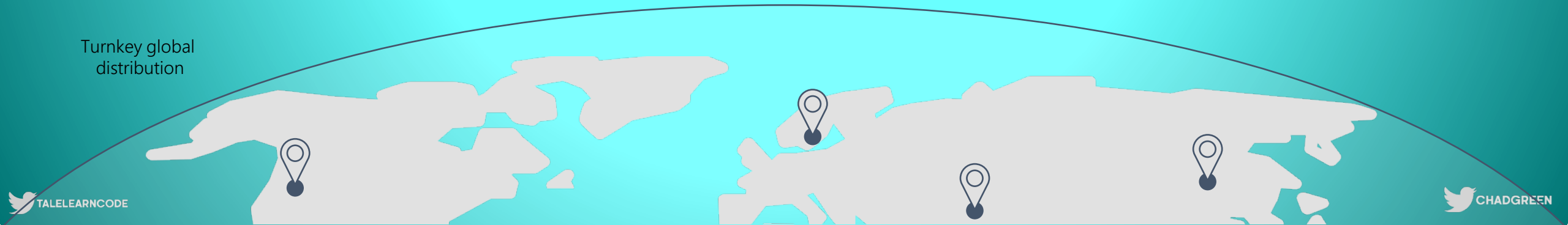

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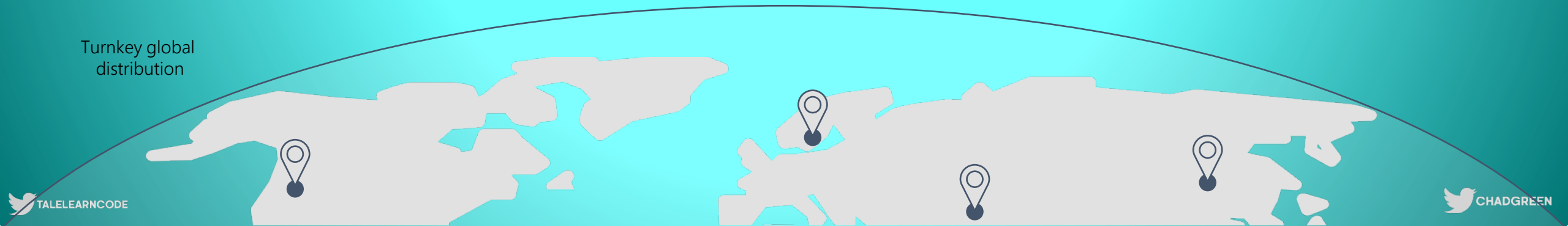

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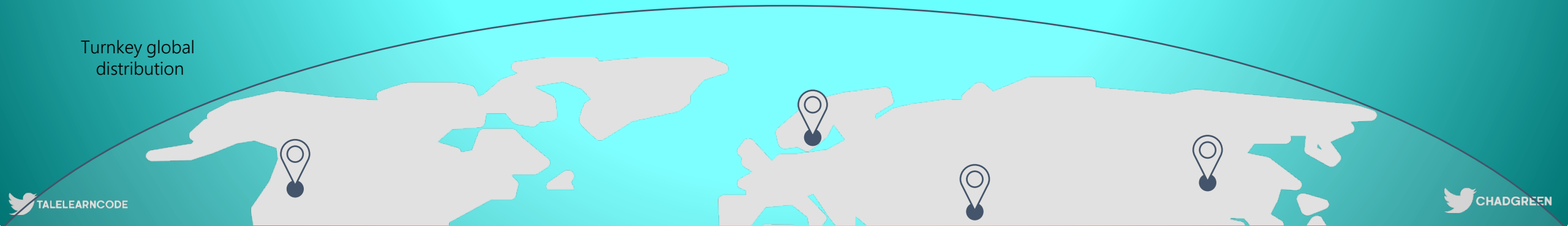

Azure Cosmos DB

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Strong

Bounded Staleness

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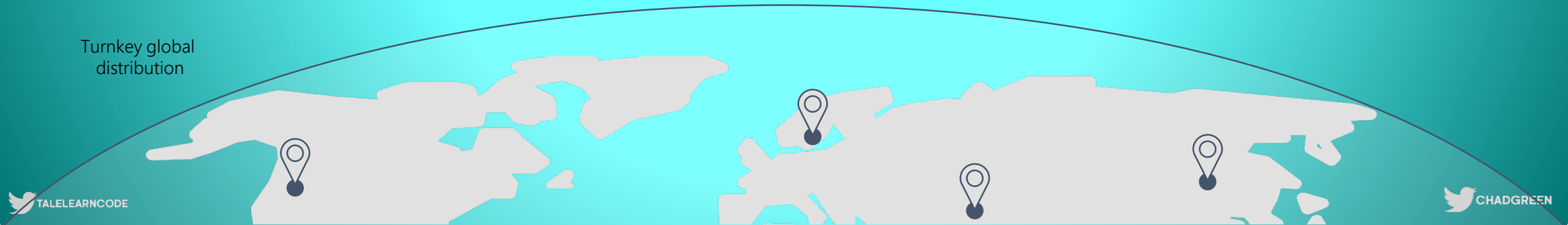

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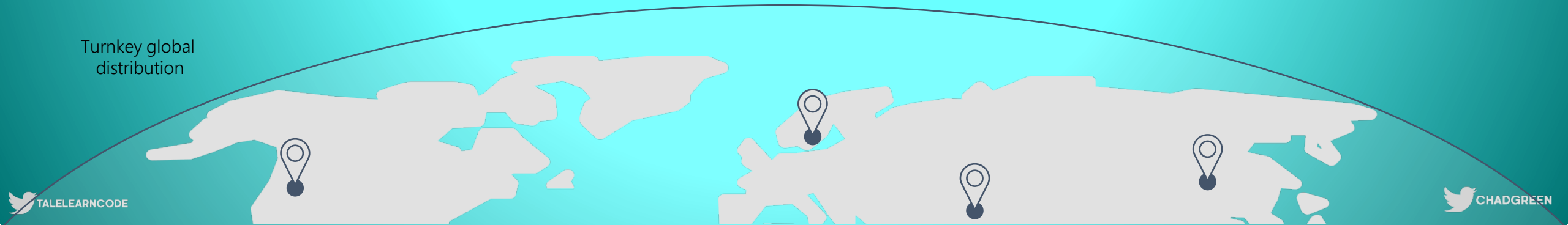

Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

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Session

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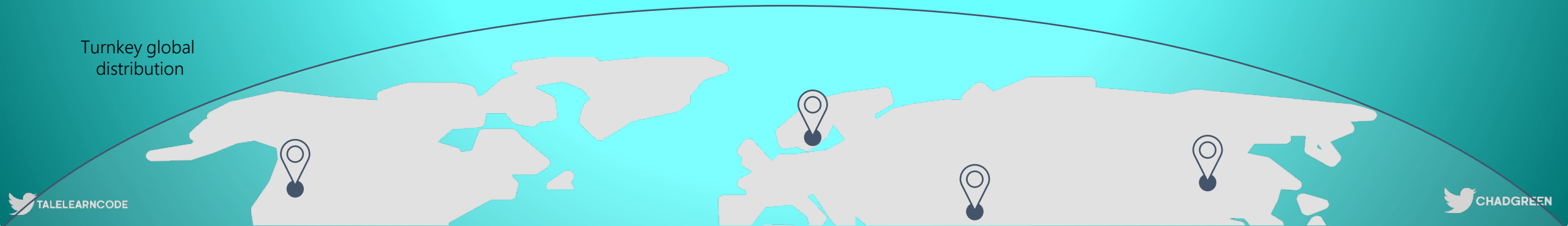

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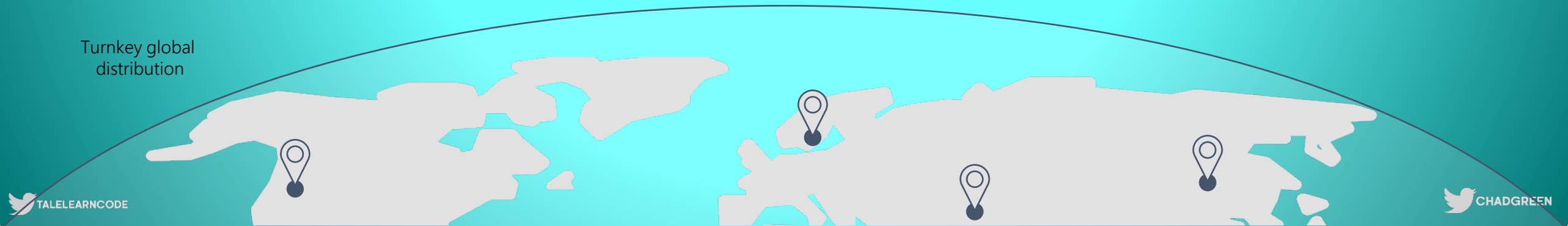

Azure Cosmos DB

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Consistent Prefix

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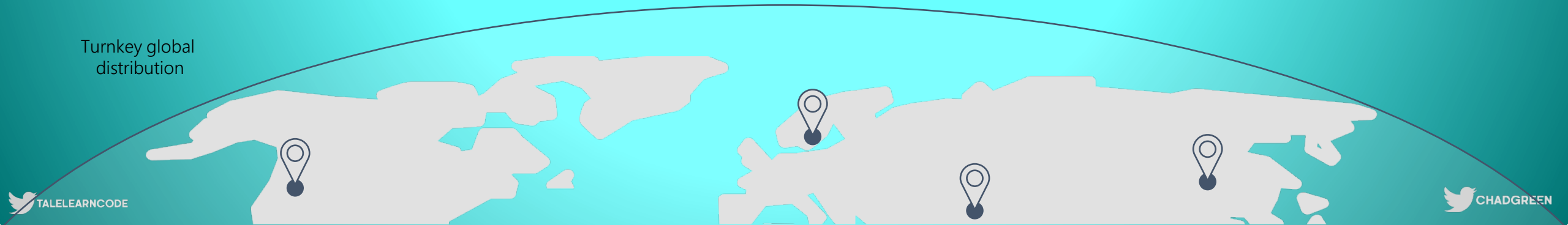

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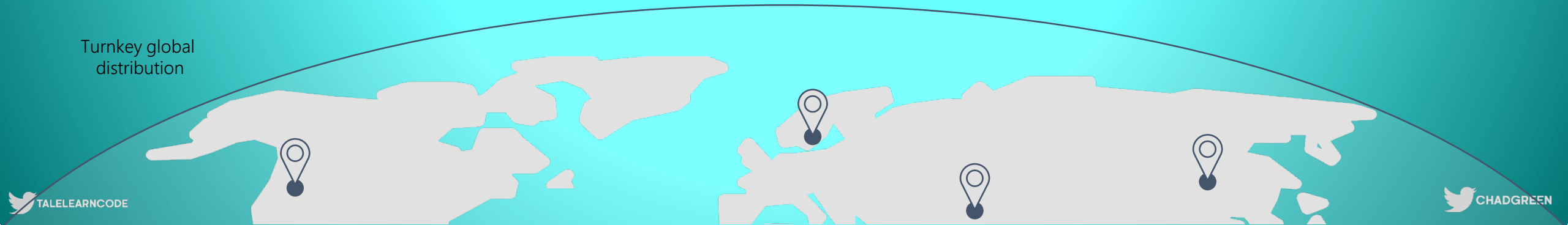

Azure Cosmos DB

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Strong

Eventual

Bounded Staleness

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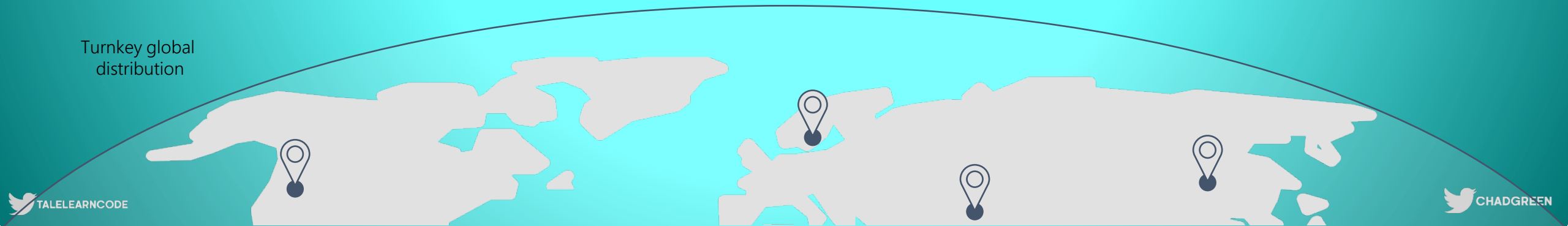

Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

Comprehensive SLAs

Guaranteed low latency
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Elastic scale out
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Five well-defined
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Turnkey global
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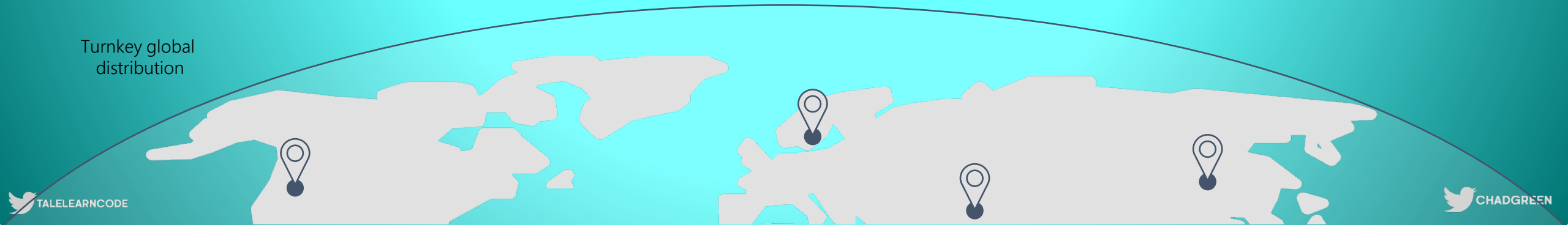

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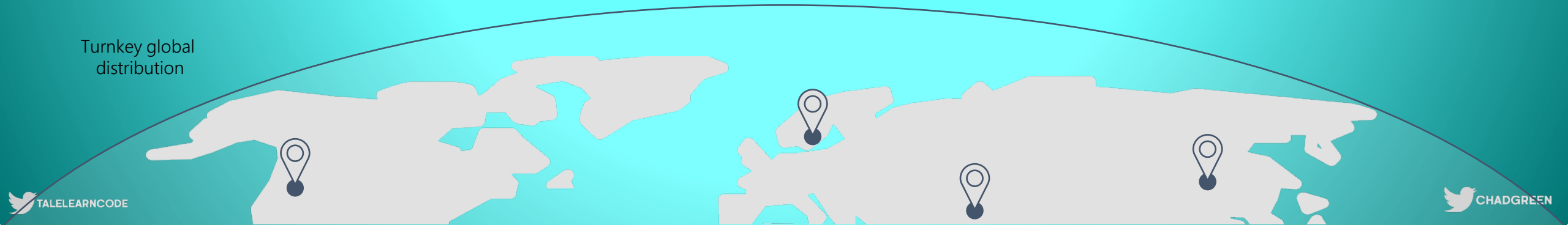
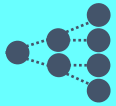


Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

Key-value

Column-family



Document

Graph

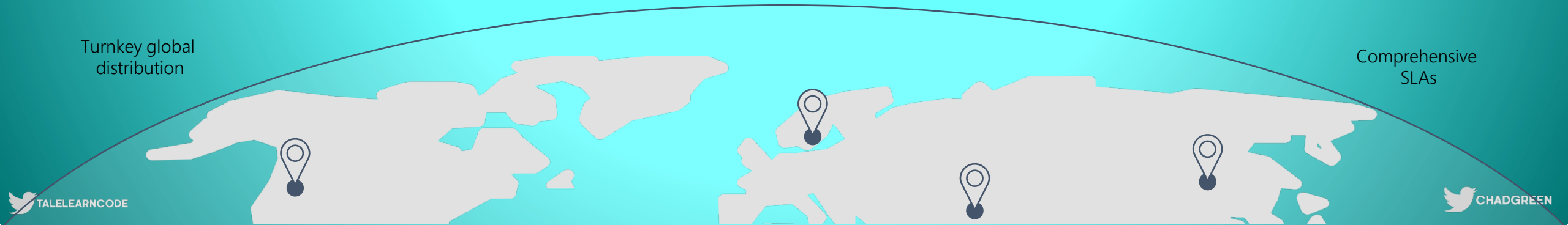
Guaranteed low latency
at the 99th percentile

Elastic scale out
of storage & throughput

Five well-defined
consistency models

Turnkey global
distribution

Comprehensive
SLAs



Azure Cosmos DB

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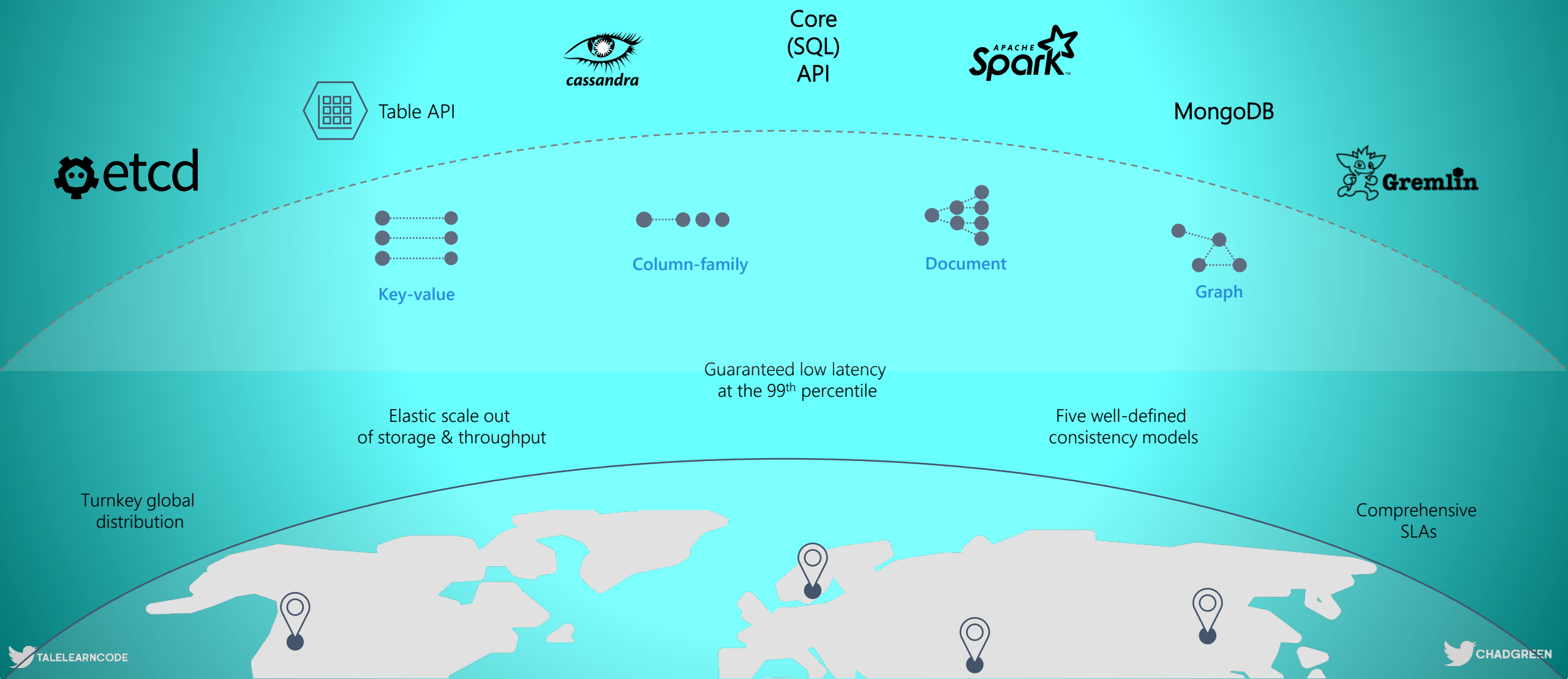

Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

What if we have REALLY large data requirements?

XBOX 360™

skype™

Office 365

Microsoft Azure

Azure Cosmos DB Capabilities

Resource	Default Limit
Maximum RUs per container	1,000,000
Maximum RUs per database	1,000,000
Maximum RUs per (logical) partition key	20-Gb
Maximum number of distinct (logical) partition keys	Unlimited
Maximum storage per container	Unlimited
Maximum storage per database	Unlimited
Maximum size of an item	2-Mb

Cosmos Use Cases

The Hitchhiker’s Guide to the Cosmos

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IoT and Telematics

Azure Cosmos DB Use Cases

Ingest Bursts of Data

Process and Analyze Streaming Data

Archive Data to Cold Storage

IoT and Telematics

Azure Cosmos DB Use Cases

Ingest Bursts of Data

Process and Analyze Streaming Data

Archive Data to Cold Storage

IoT and Telematics

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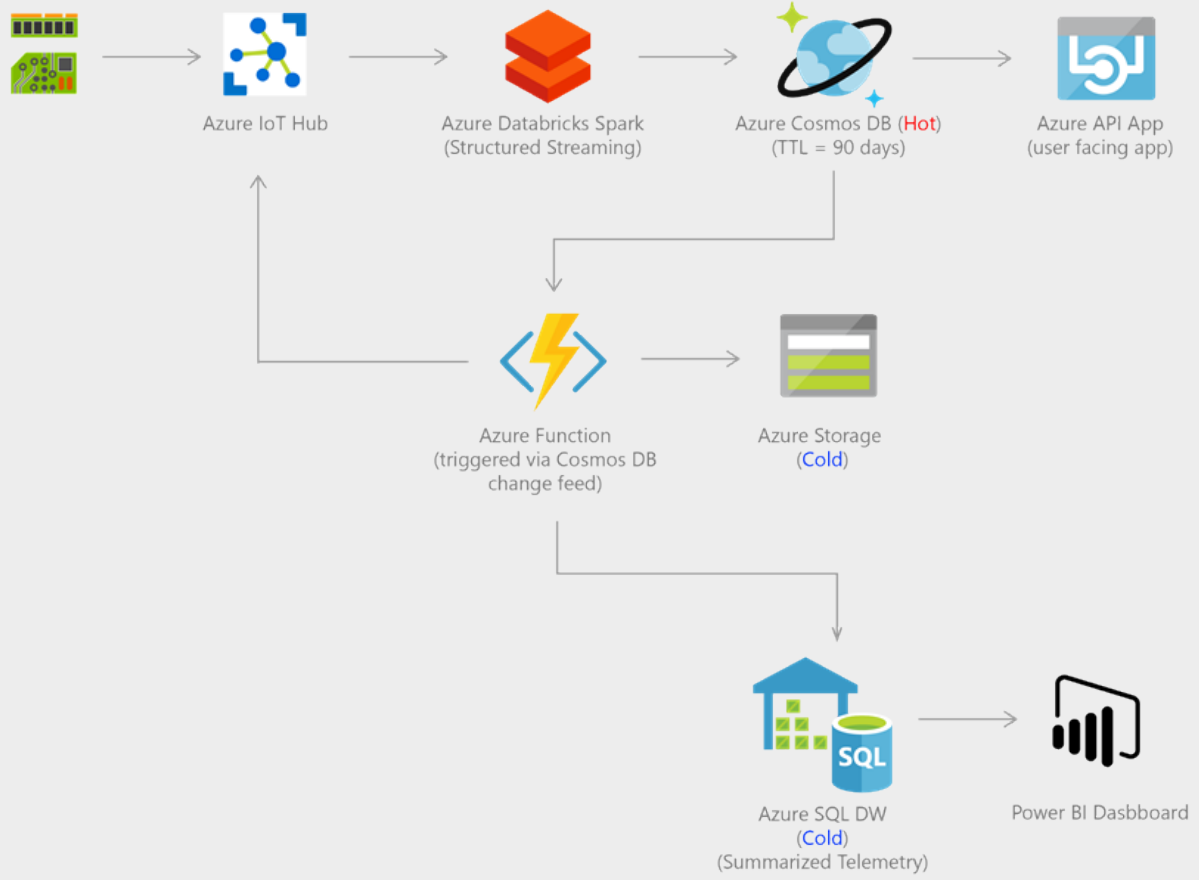

Retail Marketing

Azure Cosmos DB Use Cases

Storing and querying sets of attributes

User Accounts

Product Catalogs

IoT Device Registers

Retail Marketing

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Retail and Marketing

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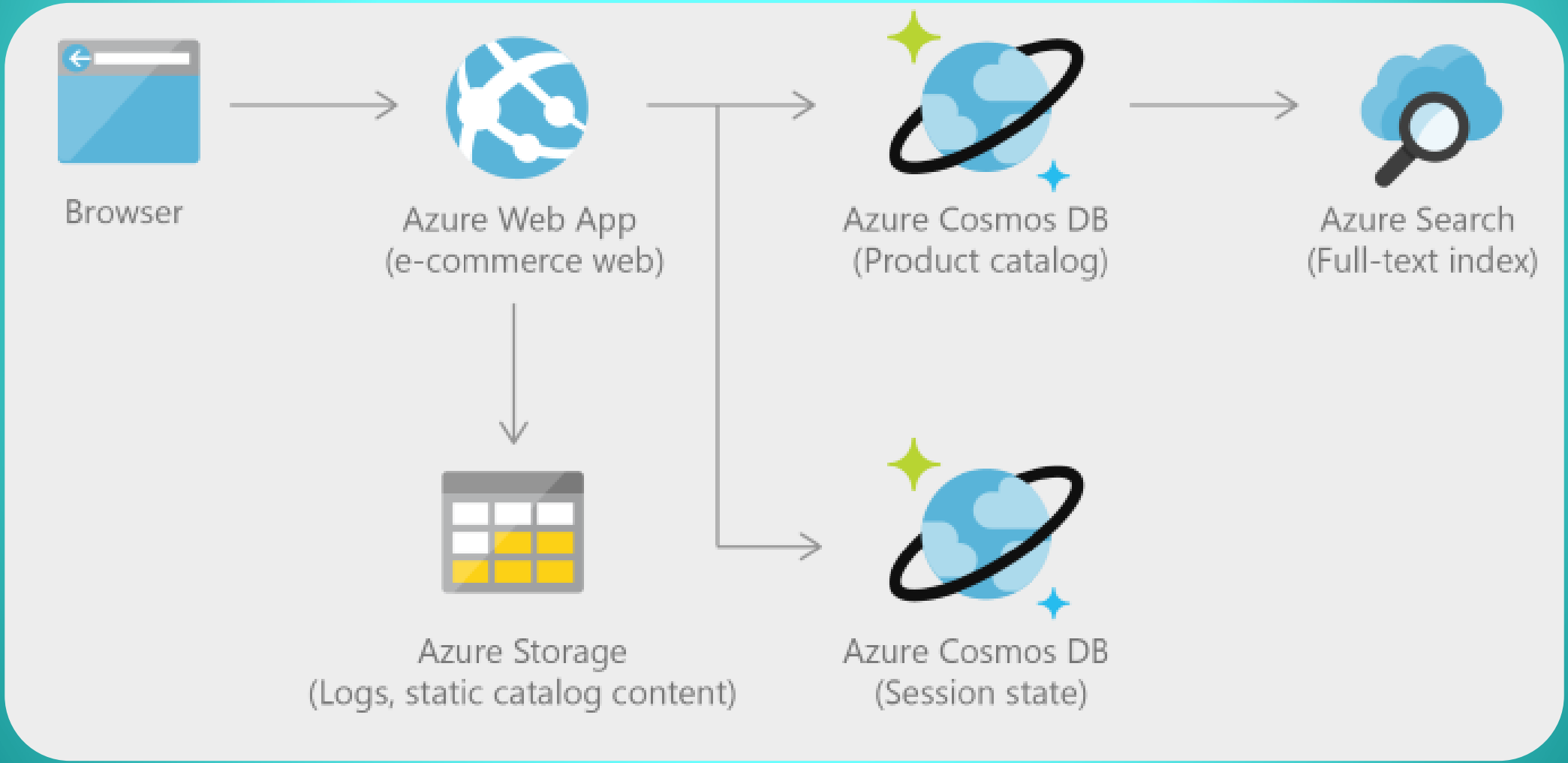
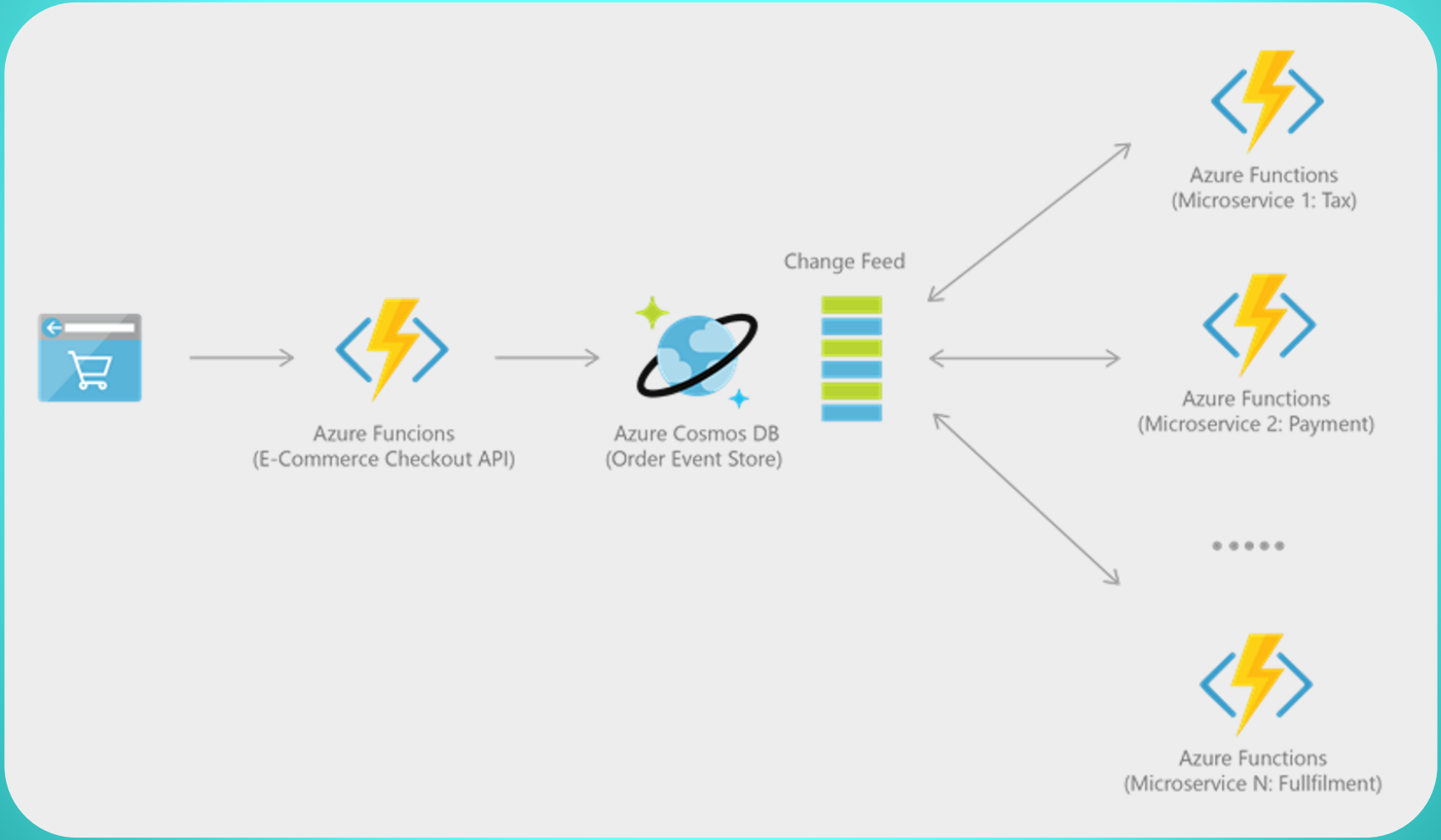


Retail and Marketing

Azure Cosmos DB Use Cases



Gaming

Azure Cosmos DB Use Cases

Single-Millisecond Latencies

Handle Massive Spikes

Gaming

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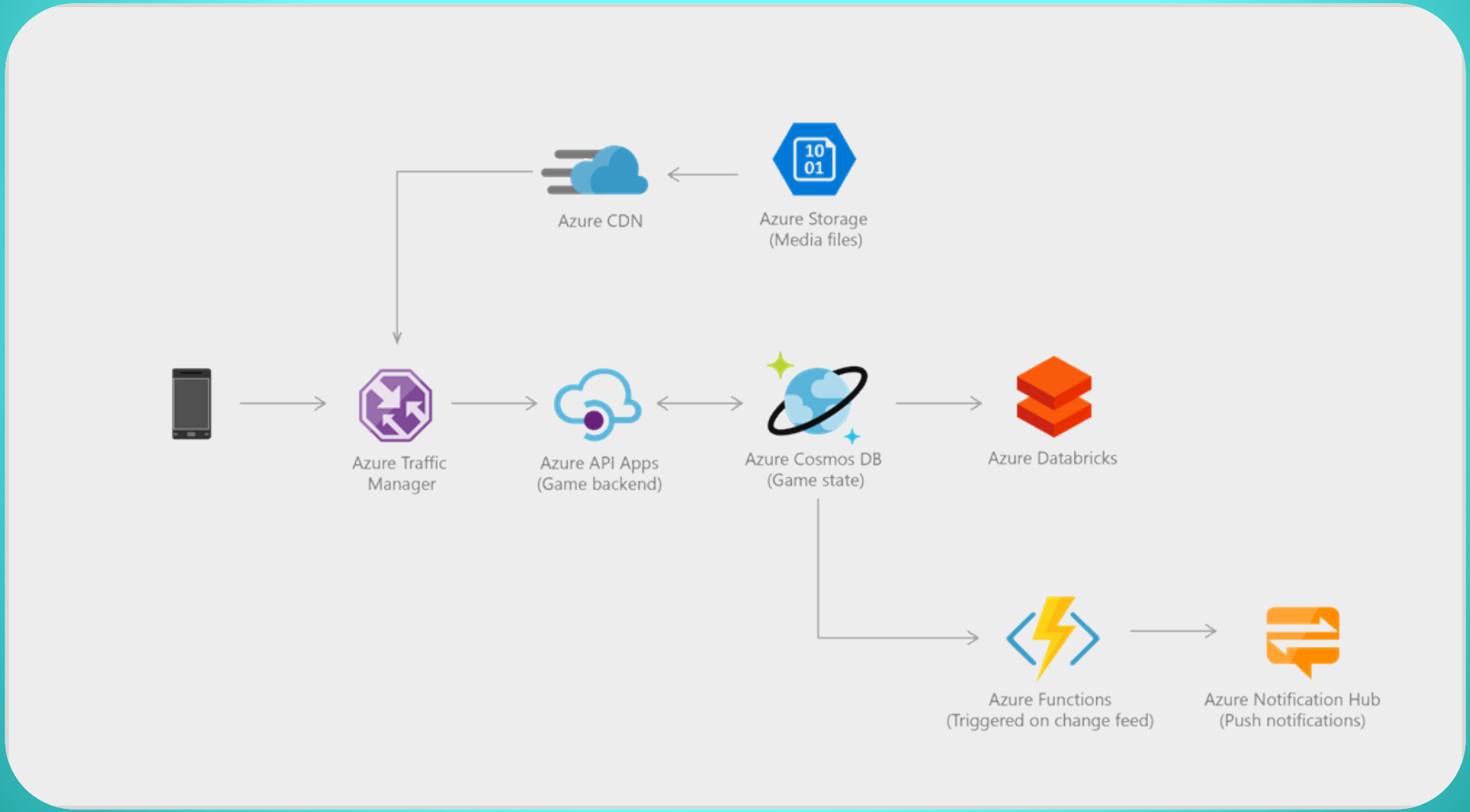
Single-Millisecond Latencies

Handle Massive Spikes

Gaming

Azure Cosmos DB Use Cases



Web & Mobile Applications

Azure Cosmos DB Use Cases

Modeling Social Interactions

Integrating with Third-Party Services

Building Rich Personalized Experiences

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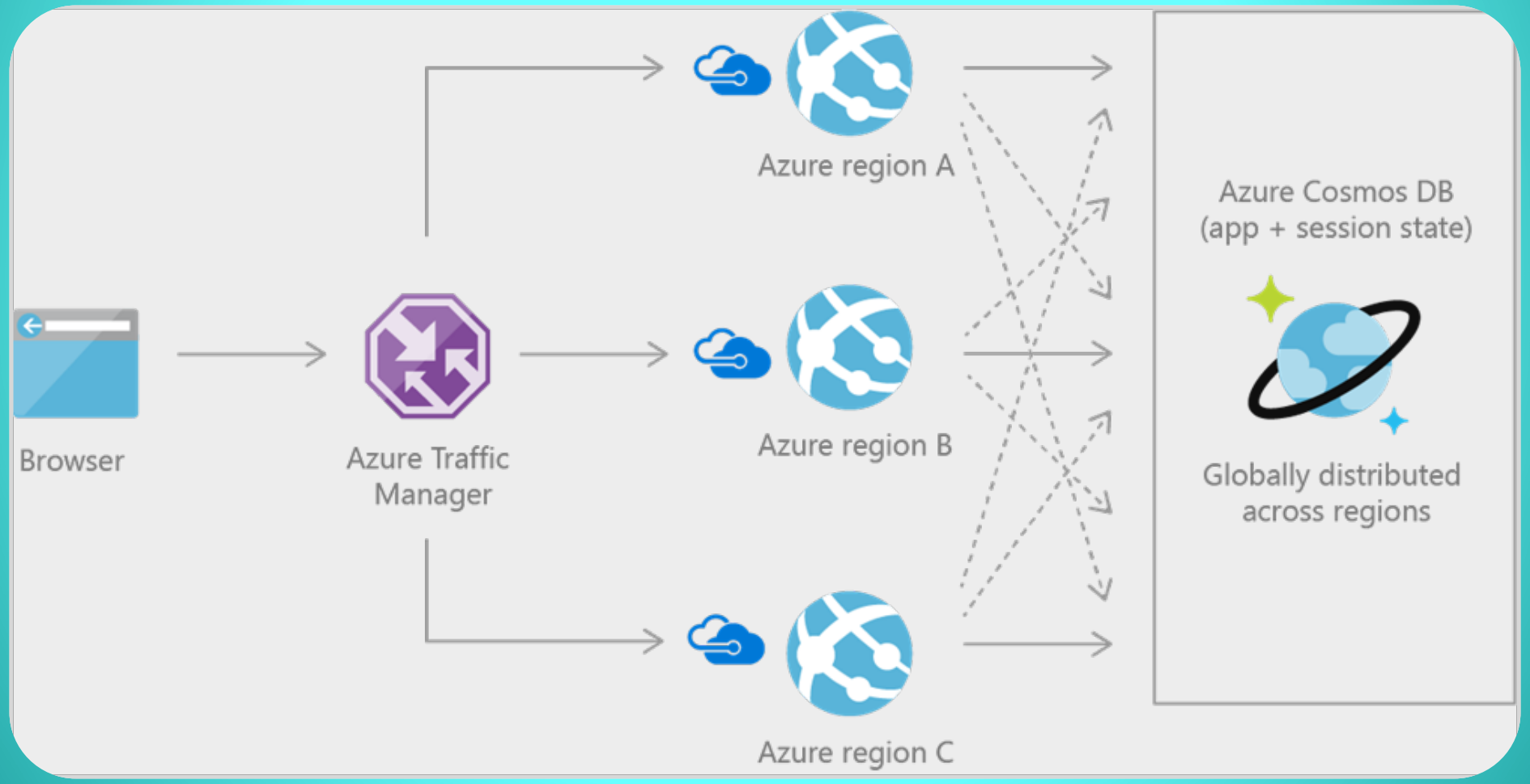

Integrations

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Cosmos DB Integrations

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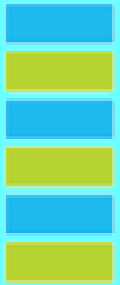

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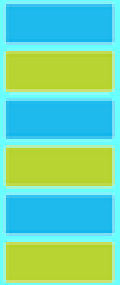

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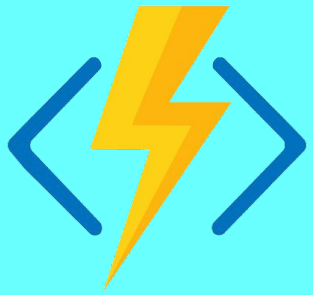

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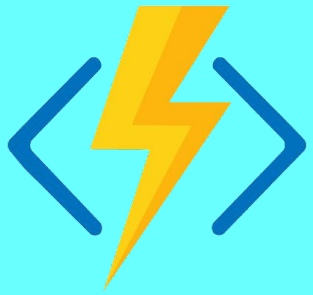

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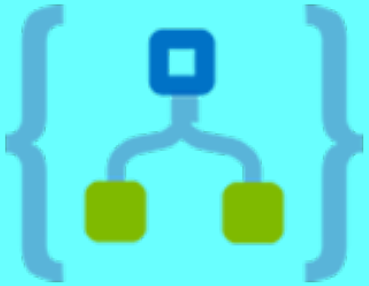

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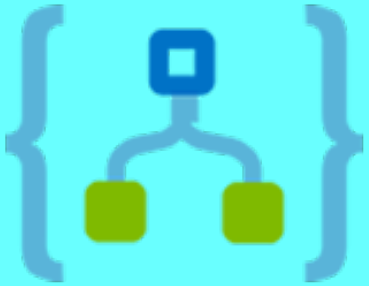

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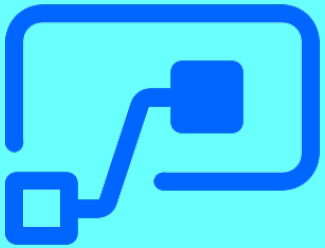
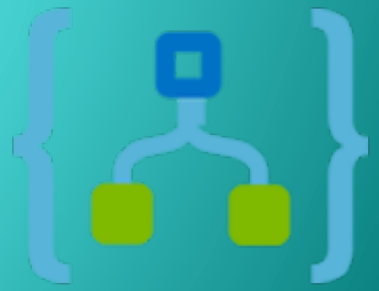


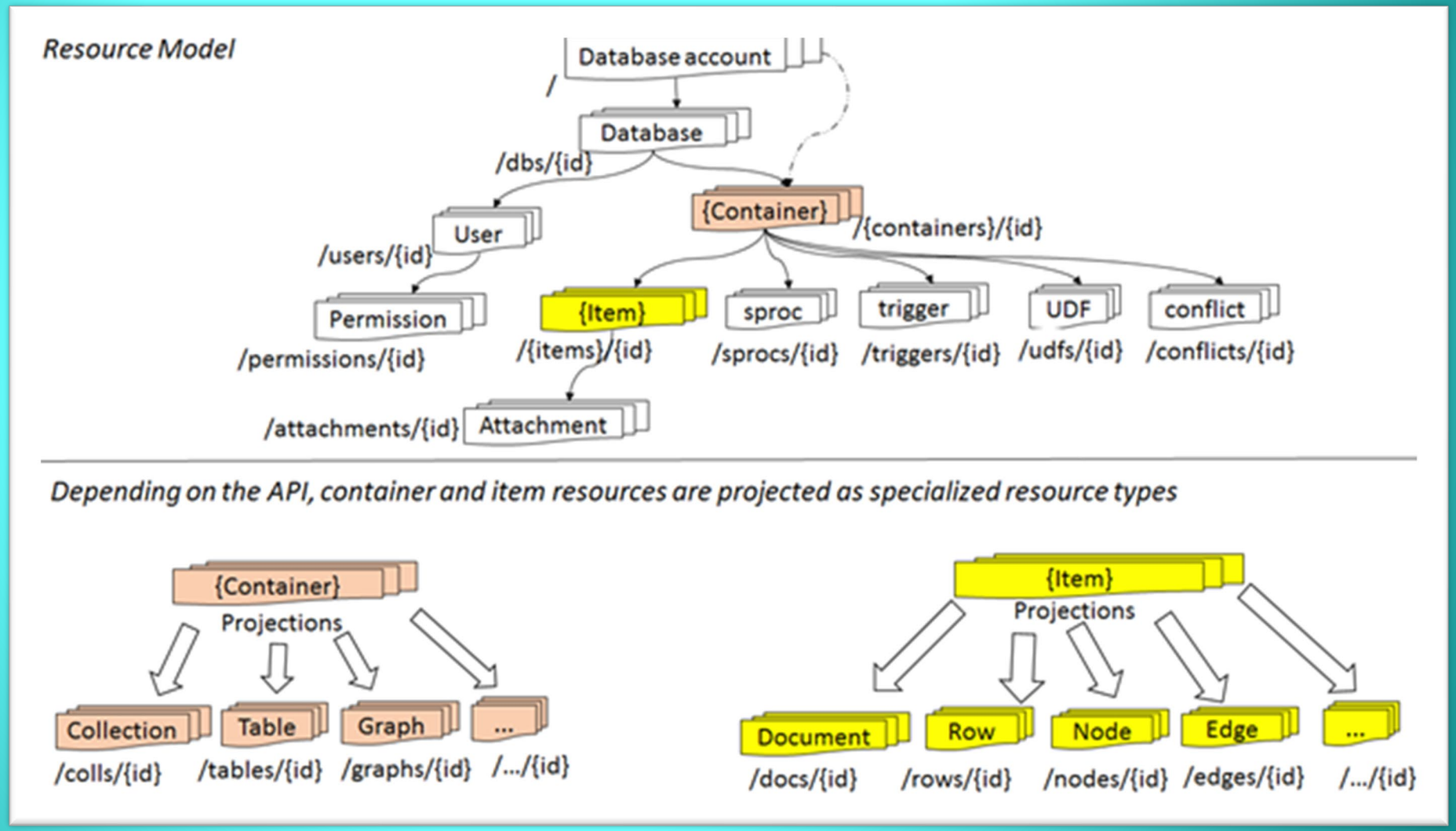


Wide-Range of Data APIs

The Hitchhiker's Guide to the Cosmos

Atom Resource Sequence

Wide-Range of Data APIs



SQL API

Document Database

SQL API – What

Wide-Range of Data APIs

Document Database

SQL to Query JSON Documents

JavaScript Programming Model

SQL API – When

Wide-Range of Data APIs

Building a new non-relational document database and want to query using SQL

SQL API – How: Data Model

Wide-Range of Data APIs

Items

SELECT * FROM c WHERE c.OwnerEmailAddress = 'chadgreen@chadgreen.com' Edit Filter

id	/Ow...
Green.1	chadgree...
Green.2	chadgree...
Green.3	chadgree...

Load more


```
{
    "id": "Green.1",
    "OwnerEmailAddress": "chadgreen@chadgreen.com",
    "Title": "The Hitchhiker's Guide to the Cosoms",
    "Abstract": "<p>Today's applications are required to be highly responsible and always online.  C
    "ElevatorPitcch": "<p>In this session, you will learn what you can do with Cosmos DB, the benefi
    "ImportantDetails": null,
    "LanguageCode": "en",
    "Langauge": "English",
    "LearningObjectives": [
        {
            "Objective": "Learn about the different Azure Cosmos DB data models"
        },
        {
            "Objective": "Learn how to use the benefits of Azure Cosmos DB to build the best data sc
        },
        {
            "Objective": "Learn about some of the common Cosmos DB use cases"
        }
    ],
    "Tags": [
        {
            "Name": "Azure"
        },
        {
            "Name": "Database"
        },
        {
            "Name": "Cosmos DB"
        },
        {
            "Name": "Cloud"
        },
        {
            "Name": "Architecture"
        }
    ],
    "PresentationTypes": [
        {
            "Name": "60-Minute Session",
            "Length": 60
```

SQL API – How: Data Model

Wide-Range of Data APIs

Items

SELECT * FROM c WHERE c.OwnerEmailAddress = 'chadgreen@chadgreen.com' Edit Filter

id	/Ow...
Green.1	chadgree...

```
1  {
2      "id": "Green.1",
3      "OwnerEmailAddress": "chadgreen@chadgreen.com",
34         {
35             "Name": "Architecture"
36         }
37     ],
38     "PresentationTypes": [
39         {
40             "Name": "60-Minute Session",
41             "Length": 60
```

SELECT *
FROM c
WHERE c.OwnerEmailAddress = ‘chadgreen@chadgreen.com’

SQL API – How: Insert

Wide-Range of Data APIs

```
public class Presentation
{
  [JsonProperty(PropertyName = "id")]
  public string Id { get; set; }

  public string OwnerEmailAddress { get; set; }
  public string Title { get; set; }
  public string Abstract { get; set; }
  public string ElevatorPitcch { get; set; }
  public string ImportantDetails { get; set; }
  public string LanguageCode { get; set; }
  public string Langauge { get; set; }
  public LearningObjective[] LearningObjectives { get; set; }
  public Tag[] Tags { get; set; }
  public PresentationType[] PresentationTypes { get; set; }
}
```

SQL API – How: Insert

Wide-Range of Data APIs

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  public Tag[] Tags { get; set; }
  public PresentationType[] PresentationTypes { get; set; }
}
```

SQL API – How: Insert

Wide-Range of Data APIs

```
private async Task AddPresentation(ExistingPresentation existingPresentation)
{
  Presentation presentation = Generate.Presentation(existingPresentation);
  try
  {
    ItemResponse<Presentation> presentationResponse =
        await this.container.ReadItemAsync<Presentation>(presentation.Id,
        new PartitionKey(presentation.OwnerEmailAddress));
    Console.WriteLine("Item in database with id: {0} already exists\n",
        presentationResponse.Resource.Id);
  }
  catch
  (
    CosmosException ex) when (ex.StatusCode == HttpStatusCode.NotFound)
    {
      ItemResponse<Presentation> presentationResponse =
          await this.container.CreateItemAsync<Presentation>(presentation,
          new PartitionKey(presentation.OwnerEmailAddress));
      Console.WriteLine("Created item with id: {0} Using {1} RUs.\n",
      presentationResponse.Resource.Id, presentationResponse.RequestCharge);
    }
  }
}
```

SQL API – How: Insert

Wide-Range of Data APIs

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private async Task AddPresentation(ExistingPresentation existingPresentation)
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      ItemResponse<Presentation> presentationResponse =
          await this.container.CreateItemAsync<Presentation>(presentation,
          new PartitionKey(presentation.OwnerEmailAddress));
      Console.WriteLine("Created item with id: {0} Using {1} RUs.\n",
      presentationResponse.Resource.Id, presentationResponse.RequestCharge);
    }
  }
}
```

SQL API – How: Insert

Wide-Range of Data APIs

```
private async Task AddPresentation(ExistingPresentation existingPresentation)
{
  Presentation presentation = Generate.Presentation(existingPresentation);
  try
  {
    ItemResponse<Presentation> presentationResponse =
        await this.container.ReadItemAsync<Presentation>(presentation.Id,
        new PartitionKey(presentation.OwnerEmailAddress));
    Console.WriteLine("Item in database with id: {0} already exists\n",
        presentationResponse.Resource.Id);
  }
   catch
   (
     CosmosException ex) when (ex.StatusCode == HttpStatusCode.NotFound)
     {
       ItemResponse<Presentation> presentationResponse =
           await this.container.CreateItemAsync<Presentation>(presentation,
           new PartitionKey(presentation.OwnerEmailAddress));
       Console.WriteLine("Created item with id: {0} Using {1} RUs.\n",
       presentationResponse.Resource.Id, presentationResponse.RequestCharge);
     }
   }
}
```

SQL API – How: Query

Wide-Range of Data APIs

```
private async Task QueryPresentationsAsync()
{
  var sqlQueryText = "SELECT * FROM c WHERE c.OwnerEmailAddress = 'chadgreen@chadgreen.com'";
  Console.WriteLine("Running query: {0}\n", sqlQueryText);

  QueryDefinition queryDefinition = new QueryDefinition(sqlQueryText);
  FeedIterator<Presentation> queryResultSetIterator
      = this.container.GetItemQueryIterator<Presentation>(queryDefinition);

  List<Presentation> presentations = new List<Presentation>();
  while (queryResultSetIterator.HasMoreResults)
  {
    FeedResponse<Presentation> currentResultSet = await queryResultSetIterator.ReadNextAsync();
    foreach (Presentation presentation in currentResultSet)
    {
      presentations.Add(presentation);
      Console.WriteLine($"\t{presentation.Title}");
    }
  }
}
```

SQL API – How: Query

Wide-Range of Data APIs

```
private async Task QueryPresentationsAsync()
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  }
}
```

SQL API – How: Query

Wide-Range of Data APIs

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  {
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    {
      presentations.Add(presentation);
      Console.WriteLine($"\t{presentation.Title}");
    }
  }
}
```

SQL API – How: Query

Wide-Range of Data APIs

```
private async Task QueryPresentationsAsync()
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  Console.WriteLine("Running query: {0}\n", sqlQueryText);

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  {
    FeedResponse<Presentation> currentResultSet = await queryResultSetIterator.ReadNextAsync();
    foreach (Presentation presentation in currentResultSet)
    {
      presentations.Add(presentation);
      Console.WriteLine($"\t{presentation.Title}");
    }
  }
}
```

SQL API – Querying Options

Wide-Range of Data APIs

API

LINQ to SQL

JavaScript

Entity Framework

MongoDB

Document Database

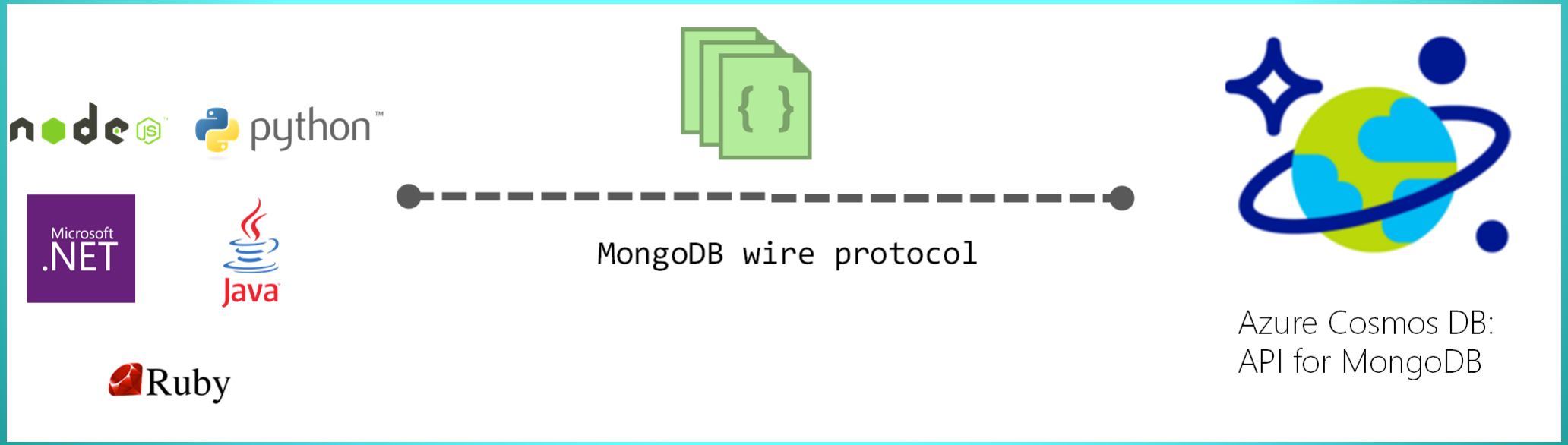
MongoDB – What

Wide-Range of Data APIs

Native Implementation

Interact Transparently

V3.6 Compatibility



MongoDB – When

Wide-Range of Data APIs

Migrating data from a MongoDB database to Azure Cosmos DB's fully managed service

MongoDB – How: Data Model

Wide-Range of Data APIs

Documents

Filter : {"OwnerEmailAddress":"chadgreen@chadgreen.com"} Edit Filter

_id

d8001f2...

ba38503...

6211e93...

Load more


```
{
    "_id" : {
        "$binary" : "KR8A2AkpQk25BKrEADmfEw==",
        "$type" : "03"
    },
    "OwnerEmailAddress" : "chadgreen@chadgreen.com",
    "Title" : "Event-Driven Architecture in the Cloud",
    "Abstract" : "<p>Event-driven architectures is a versatile approach to designing and integrating complex software systems wi
    "ElevatorPitcch" : "<p>Event-driven architectures is a versatile approach to designing and integrating complex software syst
    "ImportantDetails" : null,
    "LanguageCode" : "en",
    "Langauge" : "English",
    "LearningObjectives" : [
        {
            "Objective" : "Learn the basics of event-driven architecture"
        },
        {
            "Objective" : "Learn how to transform your complext systems to become event driven"
        },
        {
            "Objective" : "Learning about the benefits event-driven architecture brings to your business"
        }
    ],
    "Tags" : [
        {
            "Name" : "Architecture"
        },
        {
            "Name" : "Event-Driven Architecture"
        },
        {
            "Name" : "Azure"
        },
        {
            "Name" : "Event Hubs"
        },
        {
            "Name" : "Cosmos DB"
        },
        {
            "Name" : "Azure Functions"
```

MongoDB – How: Data Model

Wide-Range of Data APIs

Documents

Filter : {"OwnerEmailAddress":"chadgreen@chadgreen.com"} Edit Filter

_id

d8001f2...

ba38503...

6211e93...


```
{
    "_id" : {
        "$binary" : "KR8A2AkpQk25BKrEADmfEw==",
        "$type" : "03"
    },
    "OwnerEmailAddress" : "chadgreen@chadgreen.com",
    "Title" : "Event-Driven Architecture in the Cloud",
    "Abstract" : "<p>Event-driven architectures is a versatile approach to designing and integrating complex software systems wi
    "ElevatorPitcch" : "<p>Event-driven architectures is a versatile approach to designing and integrating complex software syst
```


Filter: {"OwnerEmailAddress": "chadgreen@chadgreen.com"}


```
        "Name" : "Architecture"
    },
    {
        "Name" : "Event-Driven Architecture"
    },
    {
        "Name" : "Azure"
    },
    {
        "Name" : "Event Hubs"
    },
    {
        "Name" : "Cosmos DB"
    },
    {
        "Name" : "Azure Functions"
```

MongoDB – How: Insert

Wide-Range of Data APIs

```
public class Presentation
{
  [BsonId(IdGenerator =typeof(CombGuidGenerator))] public Guid Id { get; set; }

  [BsonElement("OwnerEmailAddress")] public string OwnerEmailAddress { get; set; }

  [BsonElement("Title")] public string Title { get; set; }

  [BsonElement("Abstract")] public string Abstract { get; set; }

  [BsonElement("ElevatorPitcch")] public string ElevatorPitcch { get; set; }

  [BsonElement("ImportantDetails")] public string ImportantDetails { get; set; }

  [BsonElement("LanguageCode")] public string LanguageCode { get; set; }

  [BsonElement("Langauge")] public string Langauge { get; set; }

  [BsonElement("LearningObjectives")] public LearningObjective[] LearningObjectives { get; set; }

  [BsonElement("Tags")] public Tag[] Tags { get; set; }

  [BsonElement("PresentationTypes")] public PresentationType[] PresentationTypes { get; set; }
}
```

MongoDB – How: Insert

Wide-Range of Data APIs

```
public void CreatePresentation(Presentation presentation)
{
  var collection = GetPresentationsCollection();
  try
  {
    collection.InsertOne(presentation);
  }
  catch (MongoCommandException ex)
  {
    string msg = ex.Message;
  }
}
```

MongoDB – How: Insert

Wide-Range of Data APIs

```
private IMongoCollection<Presentation> GetPresentationsCollection()
{
  MongoClientSettings settings = new MongoClientSettings();
  settings.Server = new MongoServerAddress(host, 10255);
  settings.UseTls = true;
  settings.SslSettings = new SslSettings();
  settings.SslSettings.EnabledSslProtocols = SslProtocols.Tls12;

  MongoIdentity identity = new MongoInternalIdentity(dbName, userName);
  MongoIdentityEvidence evidence = new PasswordEvidence(password);

  settings.Credential = new MongoCredential("SCRAM-SHA-1", identity, evidence);

  MongoClient client = new MongoClient(settings);
  var database = client.GetDatabase(dbName);
  var presetationCollection = database.GetCollection<Presentation>(collectionName);
  return presetationCollection;
}
```

MongoDB – How: Query

Wide-Range of Data APIs

```
public List<Presentation> GetAllPresentations()
{
  try { var collection = GetPresentationsCollection();
  return collection.Find(new BsonDocument()).ToList();
}
  catch (MongoConnectionException)
  {
    return new List<Presentation>();
  }
}
```

MongoDB – Cosmos or Atlas

Wide-Range of Data APIs

Cosmos DB

- Small documents – the smaller the cheaper
- Read more often than write
- Like idea to start small and pay-as-you-go
- Support included in Azure subscription
- Need a guaranteed latency despite usage

MongoDB Atlas

- Any size documents (only choice for documents over 2-Mb)
- Like to have a fixed budget for storage
- Use Mongo-API features that are not covered by Cosmos DB
- Freedom to create unique indexes
- Write data more often than read
- Want to decide backup policy

https://blog.chudinov.net/azure-cosmosdb-vs-mongodb-atlas/

Graph API

Graph Database

Graph API – What

Wide-Range of Data APIs

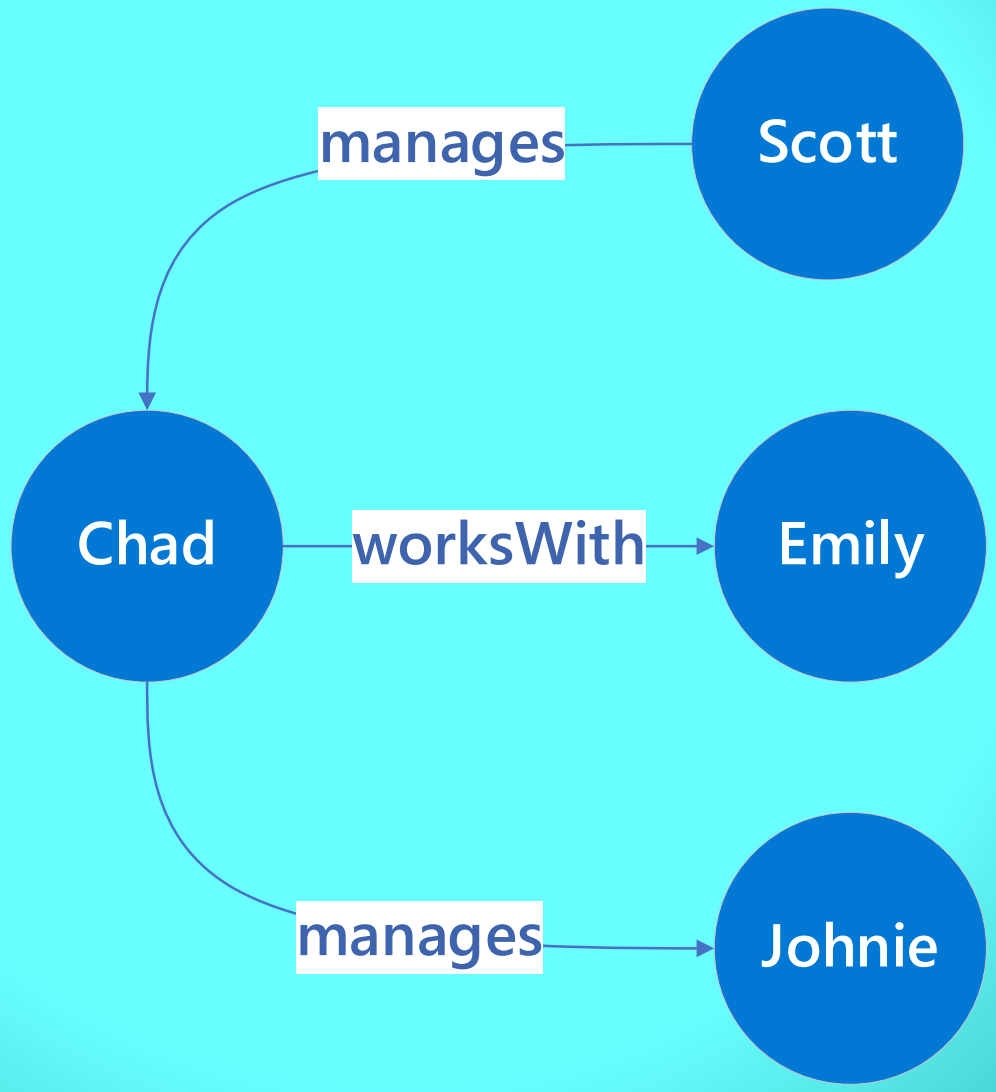
Vertices and Edges

Natural Data Representation

Model All Kinds of Scenarios

What is a Graph

Wide-Range of Data APIs



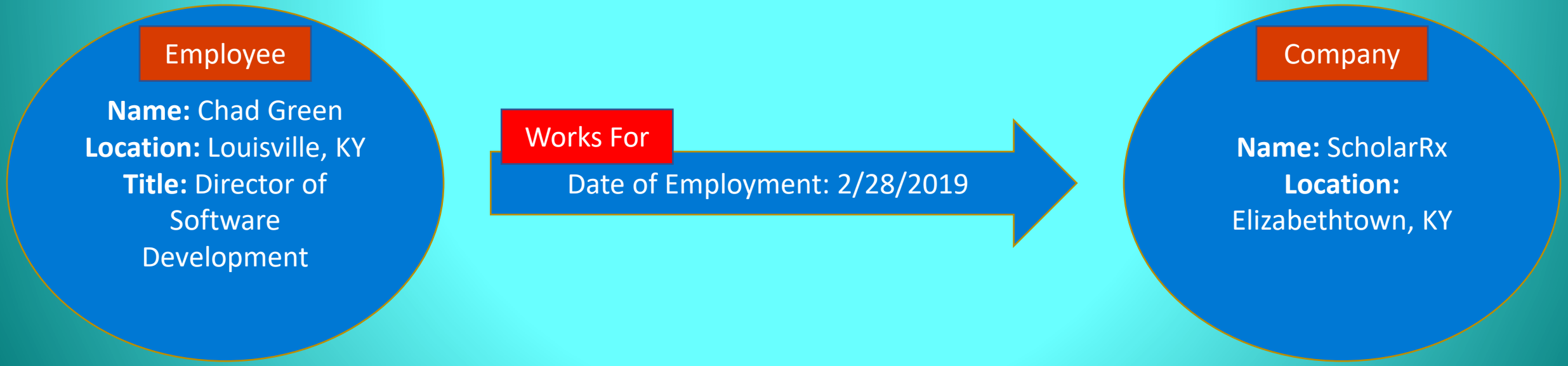
Property Graph Model

Wide-Range of Data APIs

Contains **nodes** (vertices) and **relationships** (edges)

Nodes and relationships contain **properties**

Relationships are **named** and **directed** with a **start** and **end** node



The Power of Graph Databases

Wide-Range of Data APIs

Performance

The Power of Graph Databases

Wide-Range of Data APIs

Performance

Flexibility

The Power of Graph Databases

Wide-Range of Data APIs

Performance

Flexibility

Agility

Graph API – When

Wide-Range of Data APIs

Building a graph database to model and traverse relationships among entities

Graph API – How: Data Model

Wide-Range of Data APIs

Graph

g.V().hasLabel('presentation').has('ownerEmailAddress', 'chadgreen@chadgreen.com')

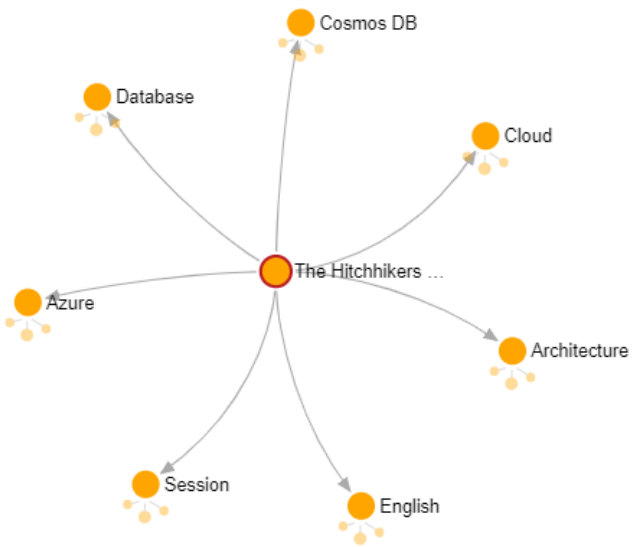
Execute Gremlin Query

JSON | Graph | Query Stats

Results

- The Hitchhikers Guide to t...
- Graphing Your Way Throu...
- Event-Driven Architecture i...

Graph



The Hitchhikers Guide to the Cosoms

Properties

id	2e3619f3-a7e0-4e4f-b6bf-7b8196916a23
label	presentation
ownerEmailAddress	chadgreen@chadgreen.com
name	The Hitchhikers Guide to the Cosoms
abstract	abstract
elevatorPitch	elevator pitch

Sources

No sources found

Targets

Target	Edge label
Azure	taggedAs
Database	taggedAs
Cosmos DB	taggedAs
Cloud	taggedAs
Architecture	taggedAs
English	presentedIn
Session	is

Graph API – How: Data Model

Wide-Range of Data APIs


```
g.V().hasLabel
('presentation')
.has('ownerEmailAddress',
'chadgreen@chadgreen.com')
```

Graph API – How: Insert

Wide-Range of Data APIs

```
g.addV('presentation')
.property('ownerEmailAddress', 'chadgreen@chadgreen.com')
.property('name', 'The Hitchhikers Guide to the Cosmos')
.property('abstract', 'This is a really cool talk!')
.property('elevatorPitch', 'Cool talk!')
```

Graph API – How: Insert

Wide-Range of Data APIs

```
private static Task<ResultSet<dynamic>> SubmitRequest(GremlinClient gremlinClient,
    KeyValuePair<string, string> query)
{
  try
  {
    return gremlinClient.SubmitAsync<dynamic>(query.Value);
  }
  catch (ResponseException e)
  {
    Console.WriteLine("\tRequest Error!");
    Console.WriteLine($"\tStatusCode: {e.StatusCode}");
    PrintStatusAttributes(e.StatusAttributes);
    Console.WriteLine($"\t[\"x-ms-retry-after-ms\"] :
        { GetValueAsString(e.StatusAttributes, "x-ms-retry-after-ms")}");
    Console.WriteLine($"\t[\"x-ms-activity-id\"] :
        { GetValueAsString(e.StatusAttributes, "x-ms-activity-id")}");

    throw;
  }
}
```

Graph API – How: Insert

Wide-Range of Data APIs

```
private static Task<ResultSet<dynamic>> SubmitRequest(GremlinClient gremlinClient,
    KeyValuePair<string, string> query)
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  try
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    throw;
  }
}
```

Graph API – How: Insert

Wide-Range of Data APIs

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private static Task<ResultSet<dynamic>> SubmitRequest(GremlinClient gremlinClient,
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    Console.WriteLine($"\tStatusCode: {e.StatusCode}");
    PrintStatusAttributes(e.StatusAttributes);
    Console.WriteLine($"\t[\"x-ms-retry-after-ms\"] :
        { GetValueAsString(e.StatusAttributes, "x-ms-retry-after-ms")}");
    Console.WriteLine($"\t[\"x-ms-activity-id\"] :
        { GetValueAsString(e.StatusAttributes, "x-ms-activity-id")}");

    throw;
  }
}
```

Graph API – How: Query

Wide-Range of Data APIs

```
g.V()
.hasLabel('tag’)
.has('name’, 'Azure’)
.in('taggedAs’)
.hasLabel('presentation')
```

Gremlin API – Querying Options

Wide-Range of Data APIs

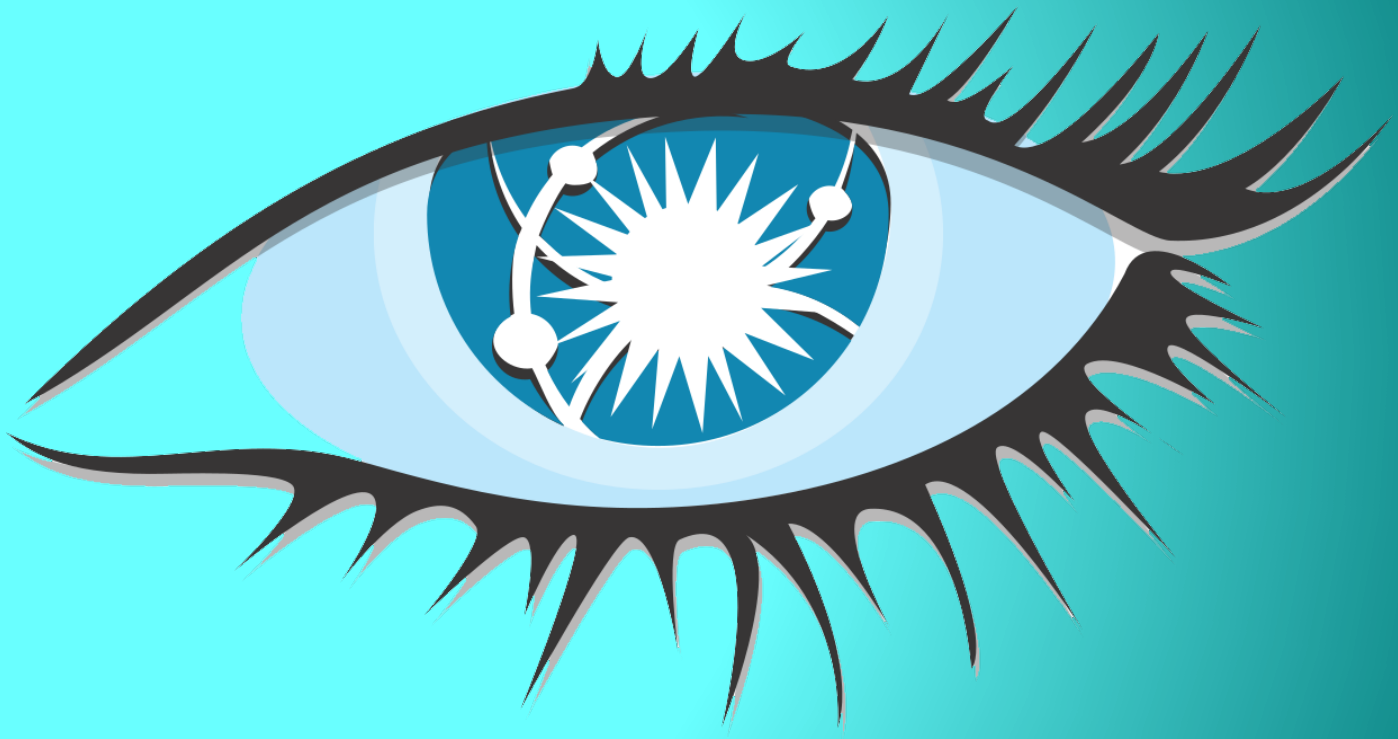
API

JavaScript

SQL API

Cassandra API

Wide Column Store



Cassandra API – What

Wide-Range of Data APIs

Handle Large Amounts of Data

Uses Commodity Servers

Developed by Facebook

Graph API – When

Wide-Range of Data APIs

Migrating data from Cassandra to

Azure Cosmos DB

Cassandra API – How: Data Model

Wide-Range of Data APIs

Rows

Action	And	Field	Type	Operator	Value
+ ×		presentation_owr	Text	=	chadgreen@chadgreen.com

+ Add new clause

Advanced Options

presentation_abstract	presen
<p>Data as it appears in the real world is naturally connected, but traditional data modeling focuses on entities which can cause for c...	<p>Dat
<p>Event-driven architectures is a versatile approach to designing and integrating complex software systems with loosely coupled co...	<p>Eve
<p>Today's applications are required to be highly responsible and always online. Cosmos DB was built from the ground up to provide ...	<p>In t

Cassandra API – How: Insert

Wide-Range of Data APIs

```
public class Presentation
{
  public string presentation_id { get; set; }
  public string presentation_owneremailaddress { get; set; }
  public string presentation_title { get; set; }
  public string presentation_abstract { get; set; }
  public string presentation_elevatorpitch { get; set; }
  public string presentation_importantinformation { get; set; }
  public string presentation_languagecode { get; set; }
  public string presentation_language { get; set; }
}
```

Cassandra API – How: Insert

Wide-Range of Data APIs

```
var options = new Cassandra.SSLOptions(SslProtocols.Tls12,
    true, ValidateServerCertificate);

options.SetHostNameResolver((ipAddress) => CassandraContactPoint);

Cluster cluster = Cluster.Builder()
    .WithCredentials(UserName, Password)
    .WithPort(CassandraPort)
    .AddContactPoint(CassandraContactPoint).WithSSL(options).Build();

ISession session = cluster.Connect();

session = cluster.Connect("speakingengagements");
IMapper mapper = new Mapper(session);

// Inserting Data into presentation table
mapper.Insert<Presentation>(Generate.Presentation(
    ExistingPresentation.EventDrivenArchitectureInTheCloud));
```

Cassandra API – How: Query

Wide-Range of Data APIs

```
Presentation presentationId3 = mapper.FirstOrDefault<Presentation>
    ("Select * from presentation where presentation_owneremailaddress = ?",
    "chadgreen@chadgreen.com");
Console.WriteLine(presentationId3.presentation_title);
```

Cassandra API – Query Options

Wide-Range of Data APIs

API

CQL

Cassandra-Based Tools

Table API

Table Storage

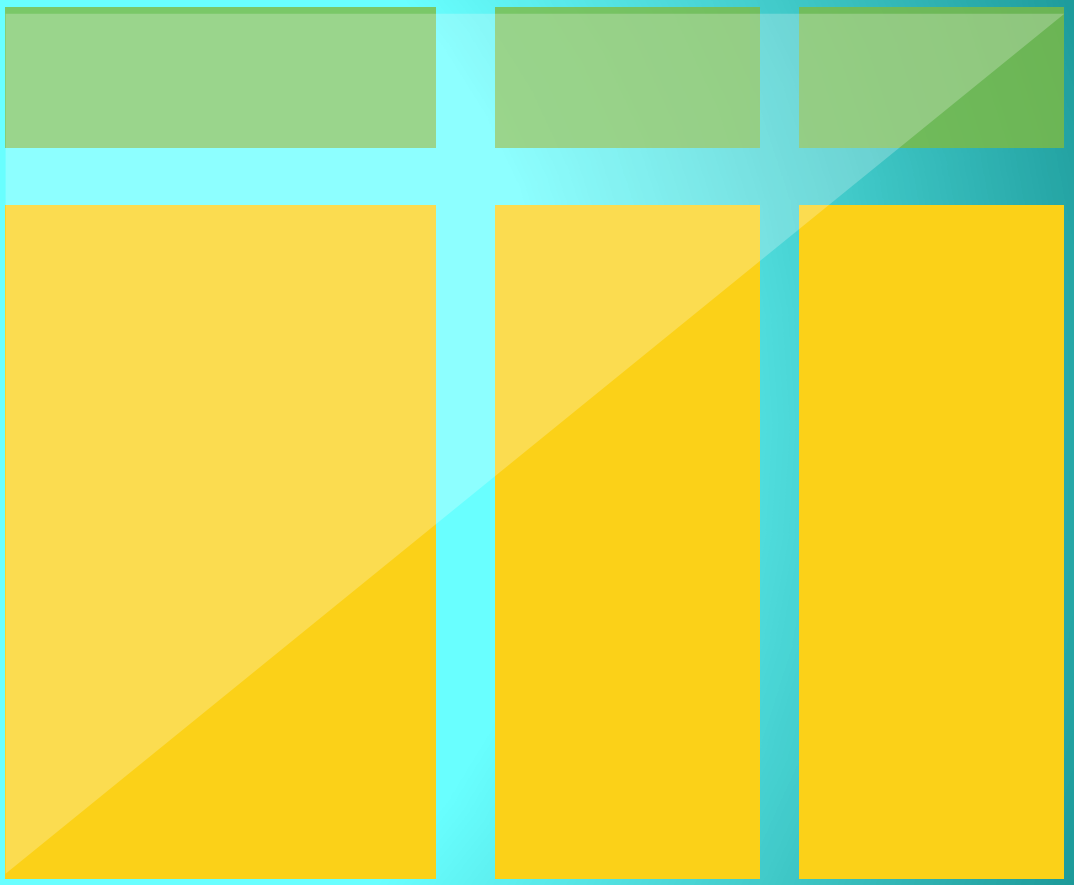


Table API – What

Wide-Range of Data APIs

Store Large Amounts of Data

Storing Structured Non-Related Data

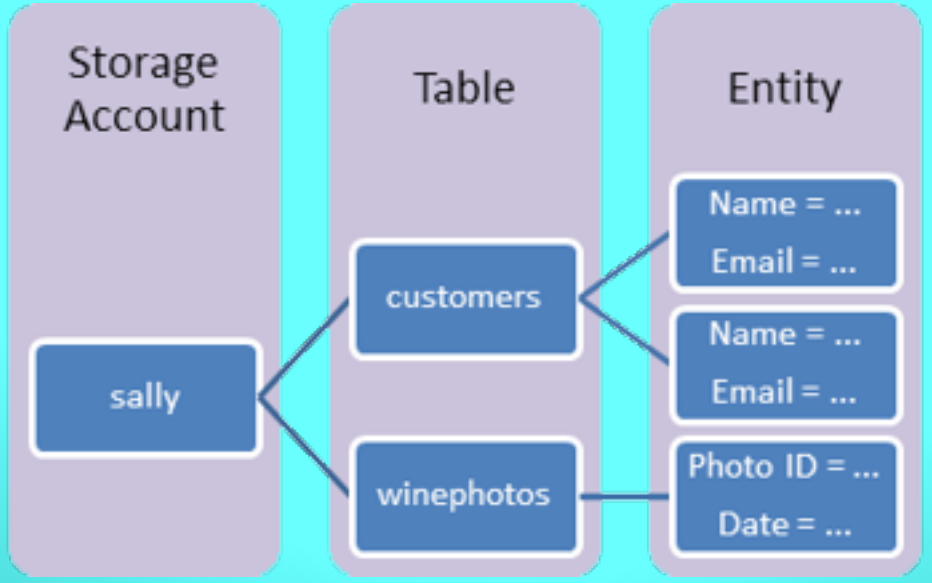


Table API – When

Wide-Range of Data APIs

Migrating data from Azure Table storage to Cosmos DB

Table API – How: Data Model

Wide-Range of Data APIs

Entities

Action	And/Or	Field	Type	Operator	Value
+ ×		PartitionKey	String	=	chadgreen@chadgreen.com
+ ×	And	RowKey	String	=	Green.3

+ Add new clause

Advanced Options

PartitionKey	RowKey	Timestamp	Abstract
chadgreen@chadgreen.com	Green.3	Tue, 10 Sep 2019 04:11:29 GMT	<p>Event-driven architectures is a versatile approach to designing a

Table API – How: Insert

Wide-Range of Data APIs

```
public class Presentation : TableEntity
{
  public Presentation() { }

  public Presentation(string id, string ownerEmailAddress)
  {
    PartitionKey = ownerEmailAddress;
    RowKey = id;
  }

  public string Title { get; set; }
  public string Abstract { get; set; }
  public string ElevatorPitcch { get; set; }
  public string ImportantDetails { get; set; }
  public string LanguageCode { get; set; }
  public string Langauge { get; set; }
}
```

Table API – How: Insert

Wide-Range of Data APIs

```
public class Presentation : TableEntity
{
  public Presentation() { }

  public Presentation(string id, string ownerEmailAddress)
  {
    PartitionKey = ownerEmailAddress;
    RowKey = id;
  }

  public string Title { get; set; }
  public string Abstract { get; set; }
  public string ElevatorPitcch { get; set; }
  public string ImportantDetails { get; set; }
  public string LanguageCode { get; set; }
  public string Langauge { get; set; }
}
```

Table API – How: Insert

Wid

```
public static async Task<Presentation> InsertOrMergeEntityAsync(CloudTable table, Presentation entity)
{
  if (entity == null)
  {
    throw new ArgumentNullException("entity");
  }

  try
  {
    // Create the InsertOrReplace table operation
    TableOperation insertOrMergeOperation = TableOperation.InsertOrMerge(entity);

    // Execute the operation.
    TableResult result = await table.ExecuteAsync(insertOrMergeOperation);
    Presentation insertedCustomer = result.Result as Presentation;

    if (result.RequestCharge.HasValue)
    {
      Console.WriteLine("Request Charge of InsertOrMerge Operation: " + result.RequestCharge);
    }

    return insertedCustomer;
  }
  catch (StorageException e)
  {
    Console.WriteLine(e.Message);
    Console.ReadLine();
    throw;
  }
}
```

Table API – How: Insert

Wid

```
public static async Task<Presentation> InsertOrMergeEntityAsync(CloudTable table, Presentation entity)
{
  if (entity == null)
  {
    throw new ArgumentNullException("entity");
  }

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    if (result.RequestCharge.HasValue)
    {
      Console.WriteLine("Request Charge of InsertOrMerge Operation: " + result.RequestCharge);
    }

    return insertedCustomer;
  }
  catch (StorageException e)
  {
    Console.WriteLine(e.Message);
    Console.ReadLine();
    throw;
  }
}
```

Table API – How: Query

Wic

```
public static async Task<Presentation> RetrieveEntityUsingPointQueryAsync(CloudTable table,
    string partitionKey, string rowKey)
{
  try
  {
    TableOperation retrieveOperation
        = TableOperation.Retrieve<Presentation>(partitionKey, rowKey);
    TableResult result = await table.ExecuteAsync(retrieveOperation);
    Presentation presentation = result.Result as Presentation;
    if (presentation != null)
    {
      Console.WriteLine("\t{0}\t{1}\t{2}", presentation.PartitionKey,
          presentation.RowKey, presentation.Title);
    }

    if (result.RequestCharge.HasValue)
    {
      Console.WriteLine("Request Charge of Retrieve Operation: " + result.RequestCharge);
    }

    return presentation;
  }
  catch (StorageException e)
  {
    Console.WriteLine(e.Message);
    Console.ReadLine();
    throw;
  }
}
```

Table API – How: Query

Wide Range of Data APIs

```
public static async Task<Presentation> RetrieveEntityUsingPointQueryAsync(CloudTable table,
    string partitionKey, string rowKey)
{
  try
  {
      TableOperation retrieveOperation
          = TableOperation.Retrieve<Presentation>(partitionKey, rowKey);
      TableResult result = await table.ExecuteAsync(retrieveOperation);
      Presentation presentation = result.Result as Presentation;
    if (presentation != null)
    {
      Console.WriteLine("\t{0}\t{1}\t{2}", presentation.PartitionKey,
          presentation.RowKey, presentation.Title);
    }

    if (result.RequestCharge.HasValue)
    {
      Console.WriteLine("Request Charge of Retrieve Operation: " + result.RequestCharge);
    }

    return presentation;
  }
  catch (StorageException e)
  {
    Console.WriteLine(e.Message);
    Console.ReadLine();
    throw;
  }
}
```

etcd API

Key-Value Storge

etcd API – What

Wide-Range of Data APIs

Simple

Secure

kubernetes

Fast

Reliable

etcd API – Why

Wide-Range of Data APIs

No etcd Operations Management

etcd API – Why

Wide-Range of Data APIs

No etcd Operations Management

etcd API – Why

Wide-Range of Data APIs

No etcd Operations Management

Global distribution & high availability

etcd API – Why

Wide-Range of Data APIs

No etcd Operations Management

Global distribution & high availability

etcd API – Why

Wide-Range of Data APIs

No etcd Operations Management

Elastic scalability

Global distribution & high availability

etcd API – Why

Wide-Range of Data APIs

No etcd Operations Management

Elastic scalability

Global distribution & high availability

etcd API – Why

Wide-Range of Data APIs

No etcd Operations Management

Elastic scalability

Security & enterprise readiness

Global distribution & high availability

etcd API – When

Wide-Range of Data APIs

Allows developers to scale Kubernetes state management on a fully managed cloud native PaaS service

Call to Action

The Hitchhiker’s Guide to the Cosmos

TALELEARNCODE

azure.Microsoft.com/en-us/try/cosmosdb

Try Azure Cosmos DB for free

Take your database worldwide in one click and get fast, uninterrupted access with Azure Cosmos DB, a globally distributed, multi-model database service.

Try it for a limited time with no subscription or credit-card number required.

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Select an API and data model to create a database

Once you create a database, you'll have 30 days of free access.

SQL

Azure Cosmos DB natively supports document data model with familiar SQL API.

Create >

MongoDB

Azure Cosmos DB offers MongoDB API as a service at the protocol level.

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Table

Azure Cosmos DB offers native support for key-value pairs data with Azure Table API.

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Graph

Azure Cosmos DB offers native support for graphs with Apache Gremlin API.

Create >

Cassandra

Azure Cosmos DB offers Cassandra API as a service at the protocol level.

Create >

Free Database

Free Database

Free Database

400 RU/s

5-Gb

Serverless

Thank You!

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