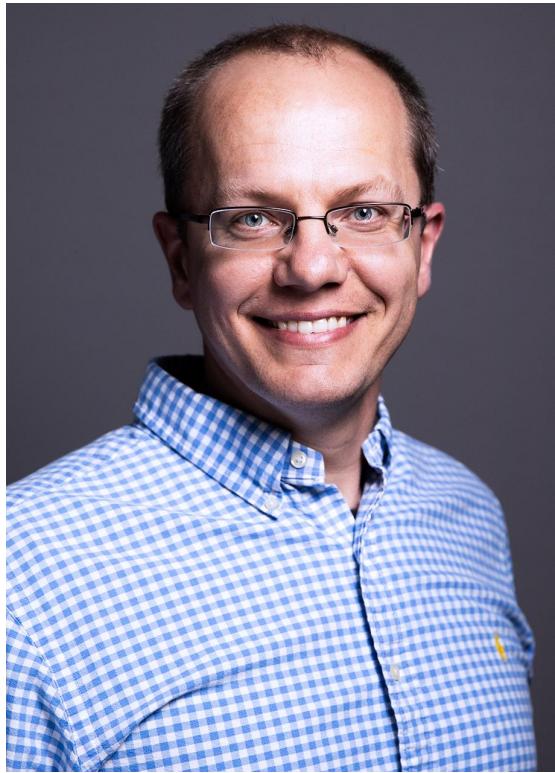


# Developers

## Introduction to NoSQL Databases



# Developer Advocate



@ArtemChebotko

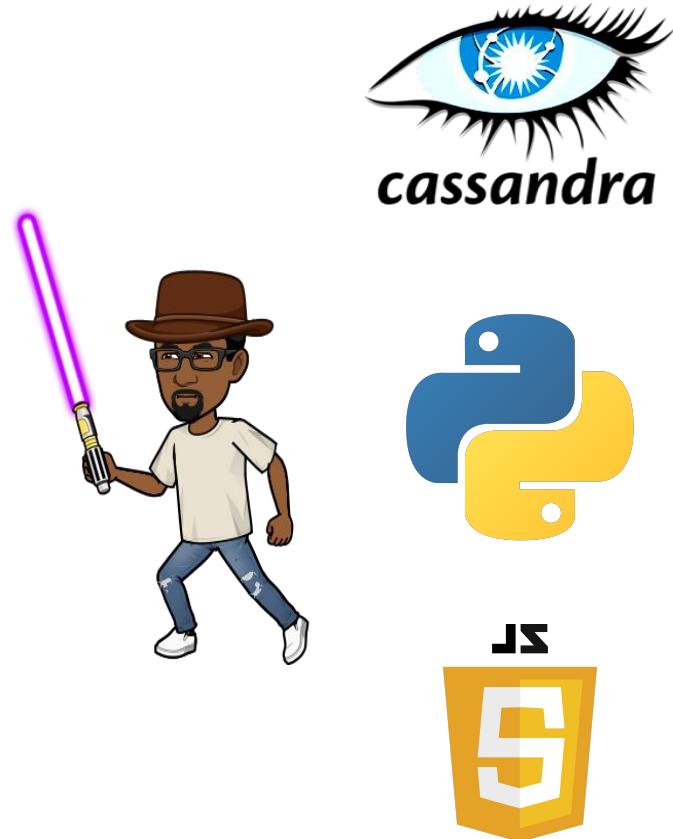
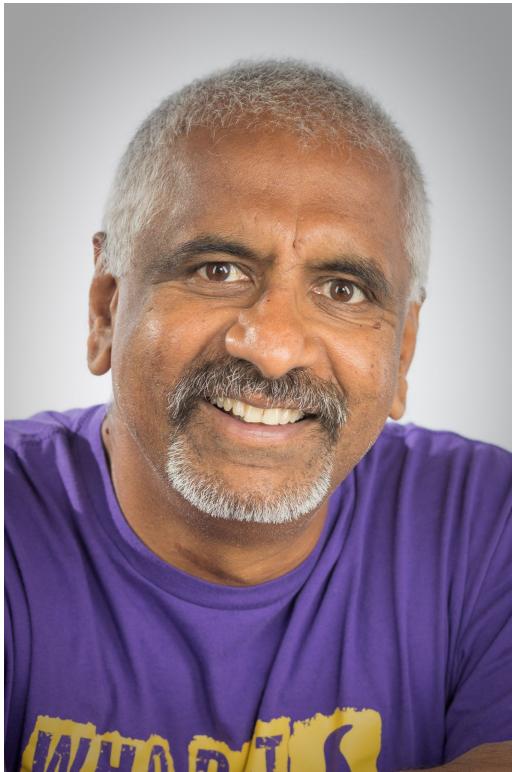


- Data pro, computer scientist by training
- Data modeling, data quality, data management, data analytics
- Author of the Cassandra Data Modeling Methodology
- Database technology developer, designer, user, and educator
- Google Cloud Certified Data Engineer



Artem Chebotko

# Developer Advocate



- Developer/Architect
- Mechanical Engineer (so many moons ago)
- Distributed systems
- Love to teach and communicate
- Inner loop == developer productivity



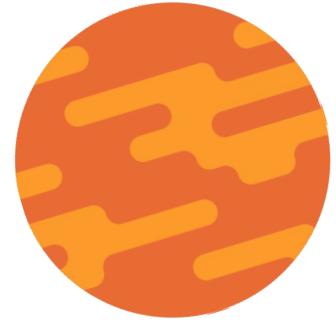
@rags



@ragsns



@ragss



S



Cedrick  
Lunven



David  
Dieruf



Rags  
Srinivas



Artem  
Chebotko



Stefano  
Lottini



Aleksandr  
Volochnev



Aaron  
Ploetz

S



K

S

S



Jack  
Fryer



Kirsten  
Hunter



Gary  
Harvey



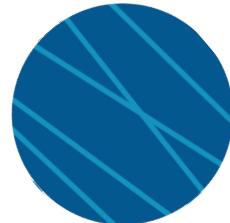
Sonia  
Siganporia



Ryan  
Welford



David  
Gilardi



## DataStax Developers Crew

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Graph Databases

# 07

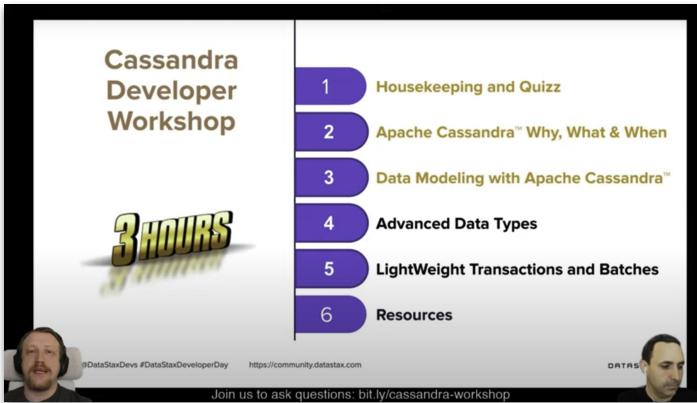
What's next?



Agenda

Live and interactive

## Livestream: [youtube.com/DataStaxDevs](https://youtube.com/DataStaxDevs)

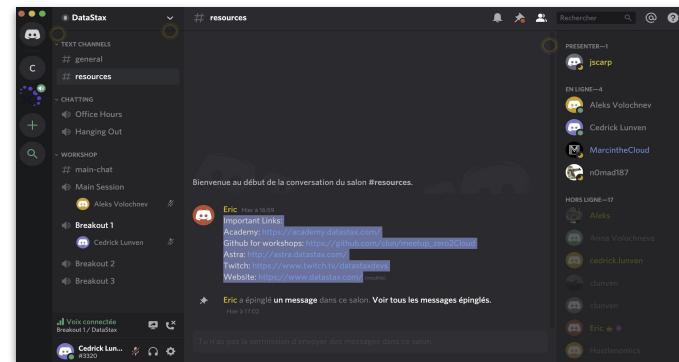


**YouTube**



**Twitch**

## Questions: <https://dtsx.io/discord>



**Discord**

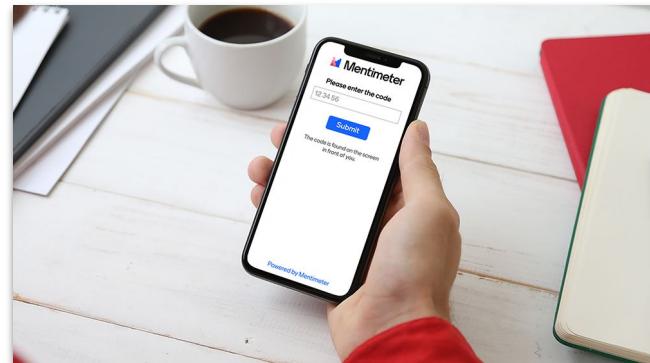


**YouTube**



Available on the iPhone App Store

## Games [menti.com](https://menti.com)



**Mentimeter**

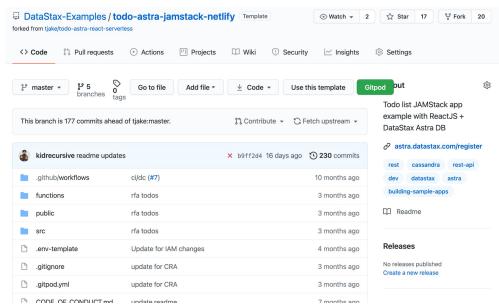


GET IT ON  
Google play

Attend the live sessions

Nothing to install !

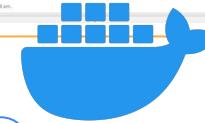
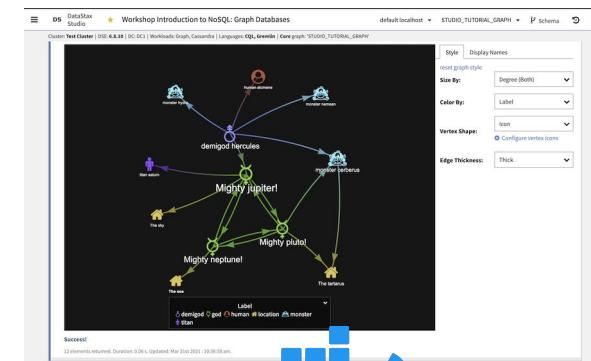
### Source code + exercises + slides



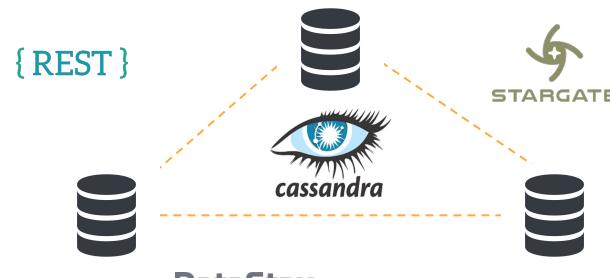
A screenshot of a GitHub repository page for "DataStax-Examples/todo-astra-jamstack-netlify". The repository has 2 stars, 17 forks, and 6 branches. It includes sections for Code, Pull requests, Actions, Projects, Wiki, Security, Insights, and Settings. A "Copilot" button is visible. The repository description mentions a JAMStack app example with ReactJS + DataStax Astra DB. It lists several commits from "kidrecursive" and "cjlidc".



### DataStax Studio



### Database + CQL + APIs



**Astra**

Do the hands-on

515 and counting

# Intro to NoSQL Homework

cedrick.lunven@datastax.com [Switch account](#)

 Draft restored

The name and photo associated with your Google account will be recorded when you upload files and submit this form. Only the email you enter is part of your response.

\* Required

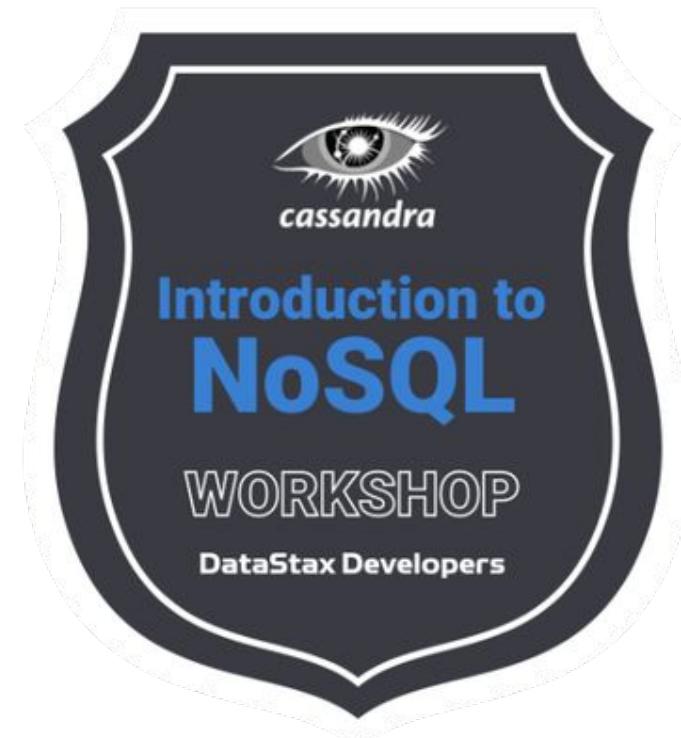
Email \*

cedrick.lunven@datastax.com

Full Name \*

Your full name (to be displayed on the badge)

Cedrick Lunven

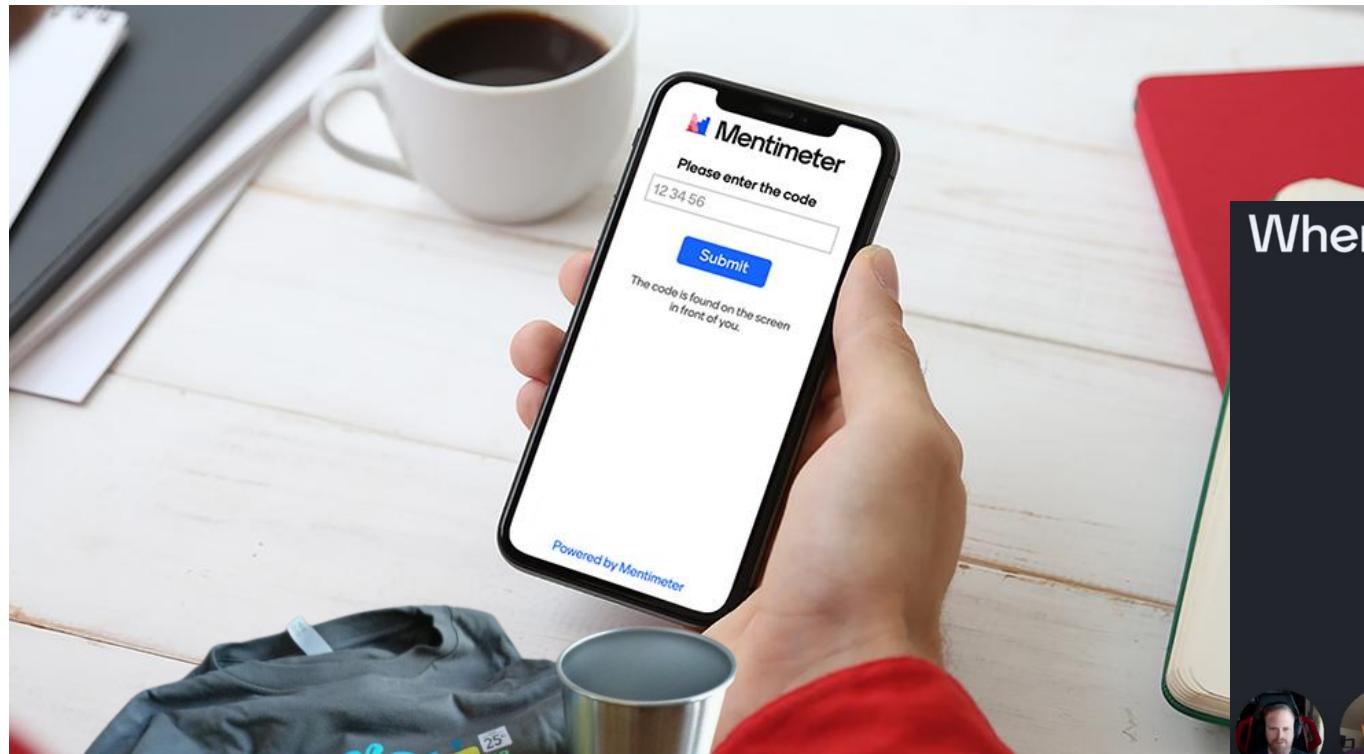


Do homework and earn a badge

# [datastax.com/workshops](http://datastax.com/workshops)



Become a Jedi Master of Astra



Where are you from?

Mentimeter



[menti.com](http://menti.com) ⇒ enter code  
Don't answer in YT chat  
Look at phone (not at YT)  
Keep it open for later

Menti.com for surveys and quizzes

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Workshop Organization

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Introduction to NoSQL



# 04

Document Databases

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Key-Value Databases

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Graph Databases

# 07

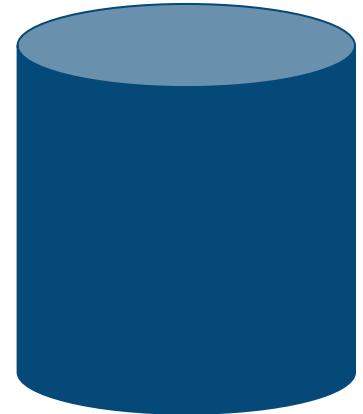
What's next?



Agenda

# What is a Database?

- An organized collection of related data items
- Database Management System (DBMS)



# Databases by Data Model

- Navigational, hierarchical, network databases
- Relational databases
  - Row-oriented for online transaction processing or OLTP
  - Column-oriented or columnar for online analytical processing or OLAP
- Object databases
- ...
- NoSQL databases
- ...
- Multi-model databases



Tabular or wide-column



Document



Key-value



Graph

# Databases by Deployment Model

- Single-machine database
- Cluster, distributed database
- On-prem databases
- Cloud databases
  - Virtual machines
  - Database-as-a service or DBaaS
    - Managed service
    - Serverless, auto-scalable

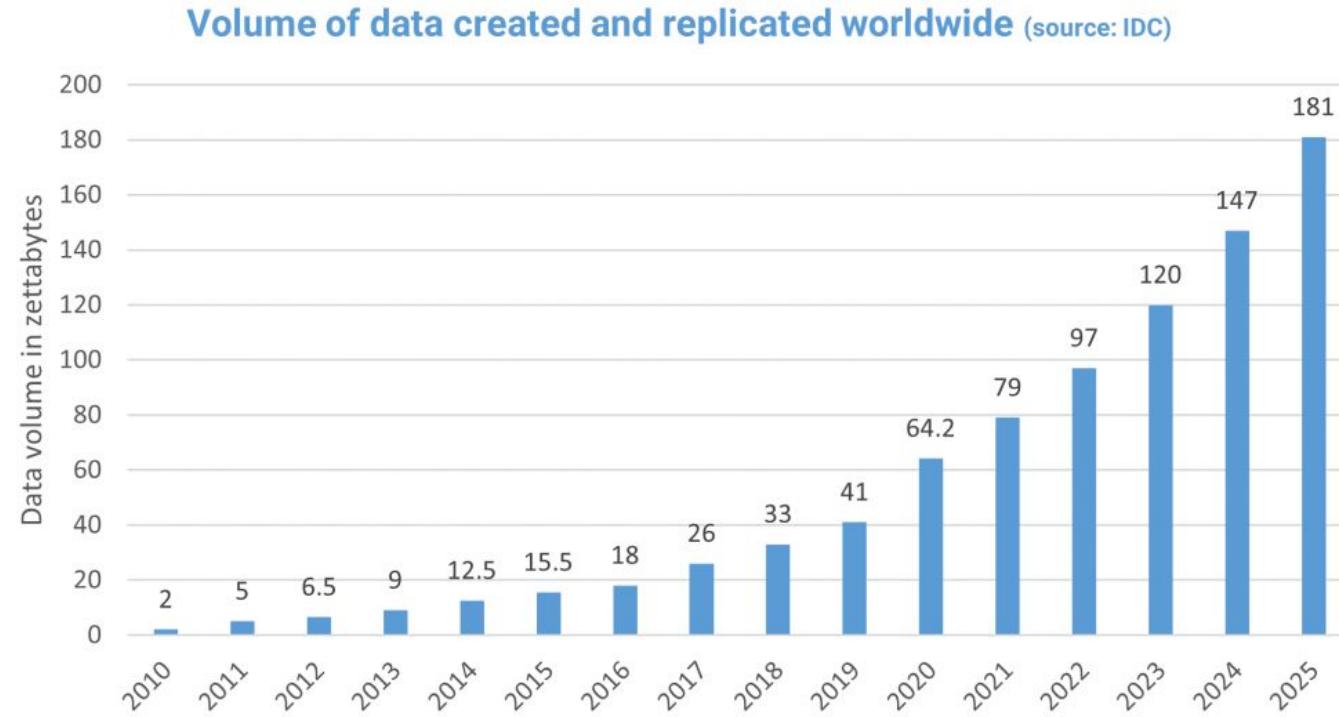


# Why Not Relational?

- **Relational database pros**
  - Standardization and theoretical foundation
    - relational data model
    - relational algebra and calculus
    - normalization theory
    - SQL
  - ACID transactions
  - Integration databases shared by many apps
- **Relational database cons**
  - Designed to run on a single machine and scale vertically
  - Impedance mismatch between the relational data model and app in-memory data structures

# Why NoSQL?

- New high-growth challenges
  - Big data and 3Vs: volume, velocity, variety
  - Performance and scalability
  - Clusters



# Origins of term “NoSQL”

- Meetup name on June 11, 2009 in San Francisco
  - Catchy hashtag intended to refer to databases like BigTable and DynamoDB
  - Meetup presentations: Cassandra, MongoDB, CouchDB, HBase, Voldemort, Dynomite, and Hypertable
- Sometimes we can find the “Not only SQL” interpretation today

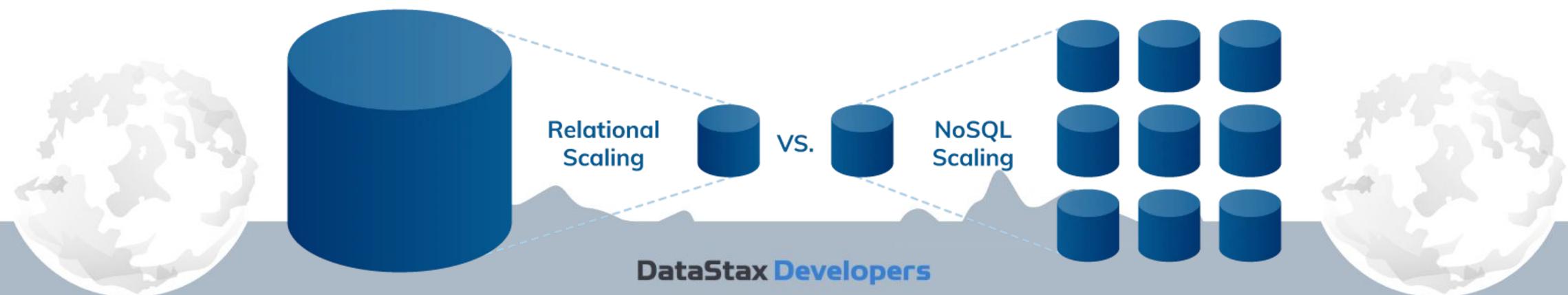


# What is NoSQL?

- A database that can meet high-growth challenges
- Common characteristics
  - Non-relational data model
  - Runs on clusters
  - Globally, geographically distributed
  - High throughput, real-time transactions
  - Horizontal scalability, preferably linear scalability
  - Open source or based on open source
  - Bound by the CAP theorem

# Relational vs. NoSQL

- Relational
  - Standard relational data model and language SQL
  - ACID transactions
  - Integration database
  - Designed for a single machine
  - Hard to scale
  - Impedance mismatch
- NoSQL
  - Variety of data models and languages
  - Lower-guarantee transactions
  - Application database
  - Designed for a cluster
  - Easy to scale
  - Better database-app compatibility



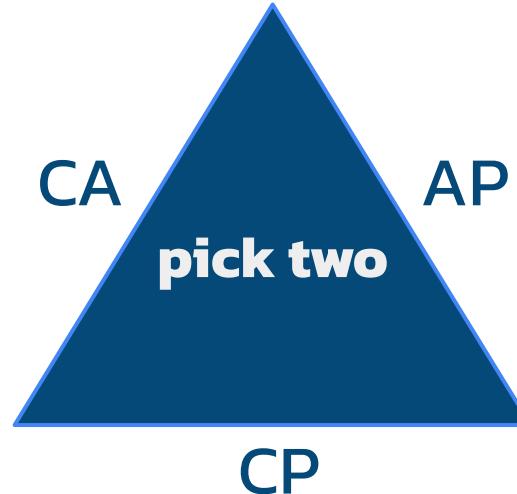
# The CAP Theorem

Always responds,  
may not always return  
the most recent write

## Availability

## Consistency

Every read receives  
the most recent write  
or an error

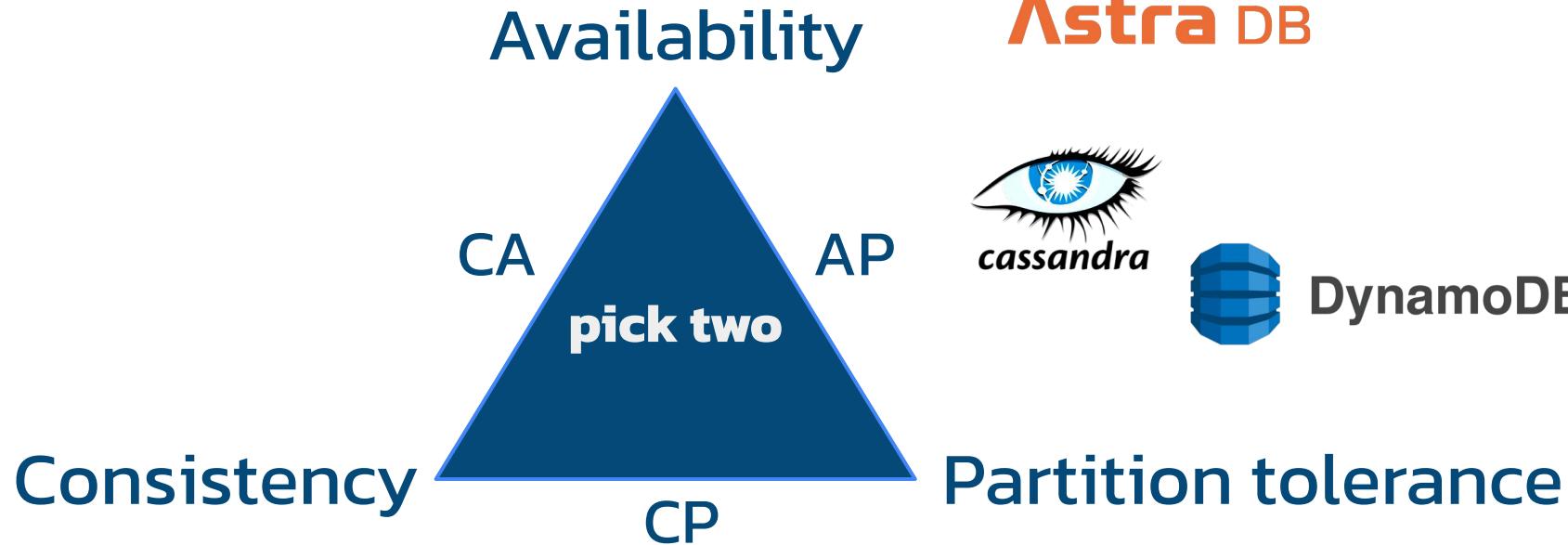


## Partition tolerance

Operates in the  
presence of network  
partition failures



# The CAP Theorem



Astra DB



cassandra



DynamoDB



Partition tolerance



DataStax Developers

# State-of-the-art NoSQL Database YOU will be Using Today

# Astra DB

- DBaaS, serverless, auto-scalable
- Multi-cloud, distributed, multi-node cluster
- NoSQL, multi-model
- Tabular, document, key-value
- Based on open-source *Apache cassandra*

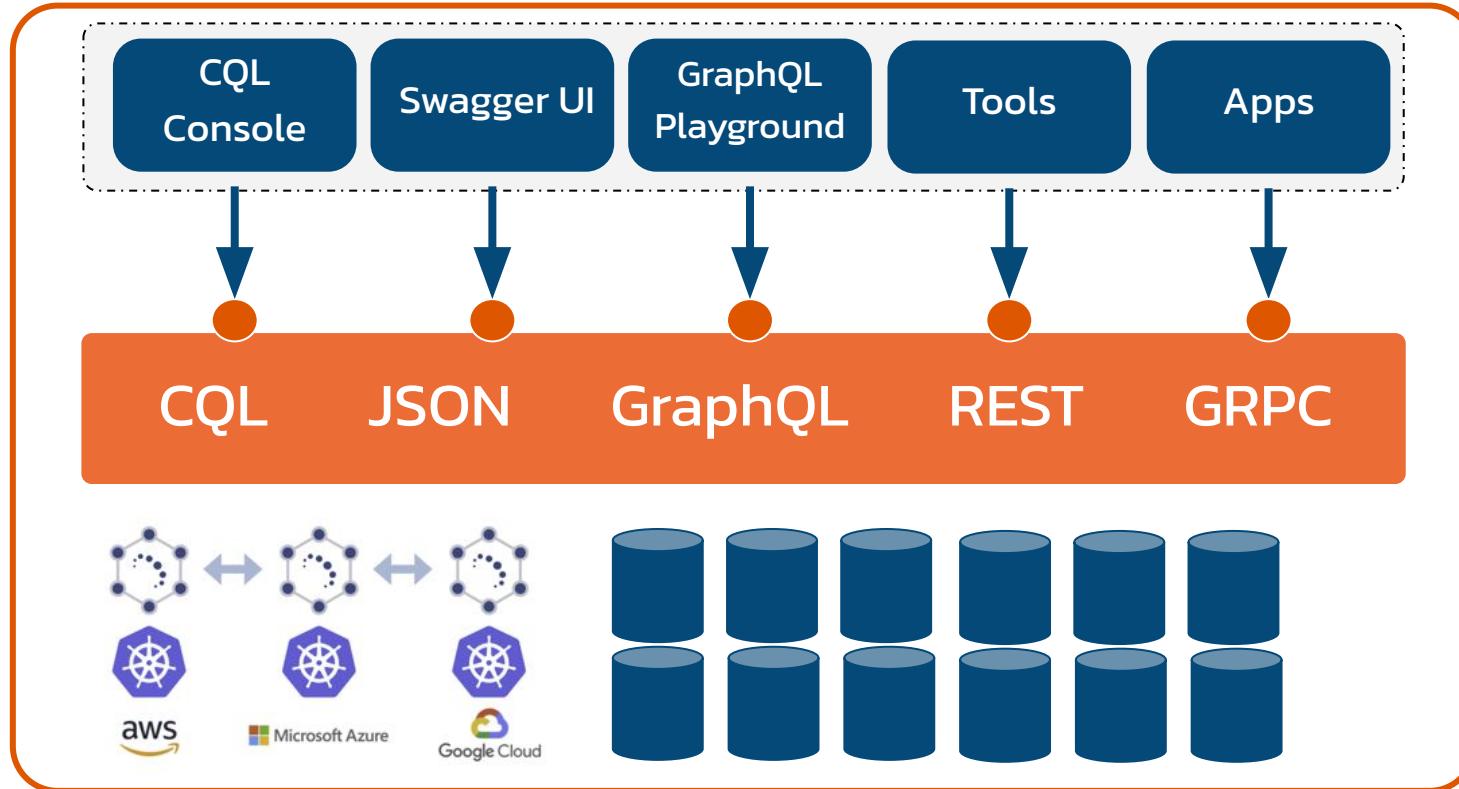


DataStax

# Astra DB

**\$25/month credit**

Launch a database in the cloud with a few clicks, no credit card required.



**User Interface**  
Web-based developer tools and apps



**STARGATE**

**OSS Stargate.io**  
A data gateway to allow multiple usages



**OSS Apache Cassandra**  
A tabular NoSQL database

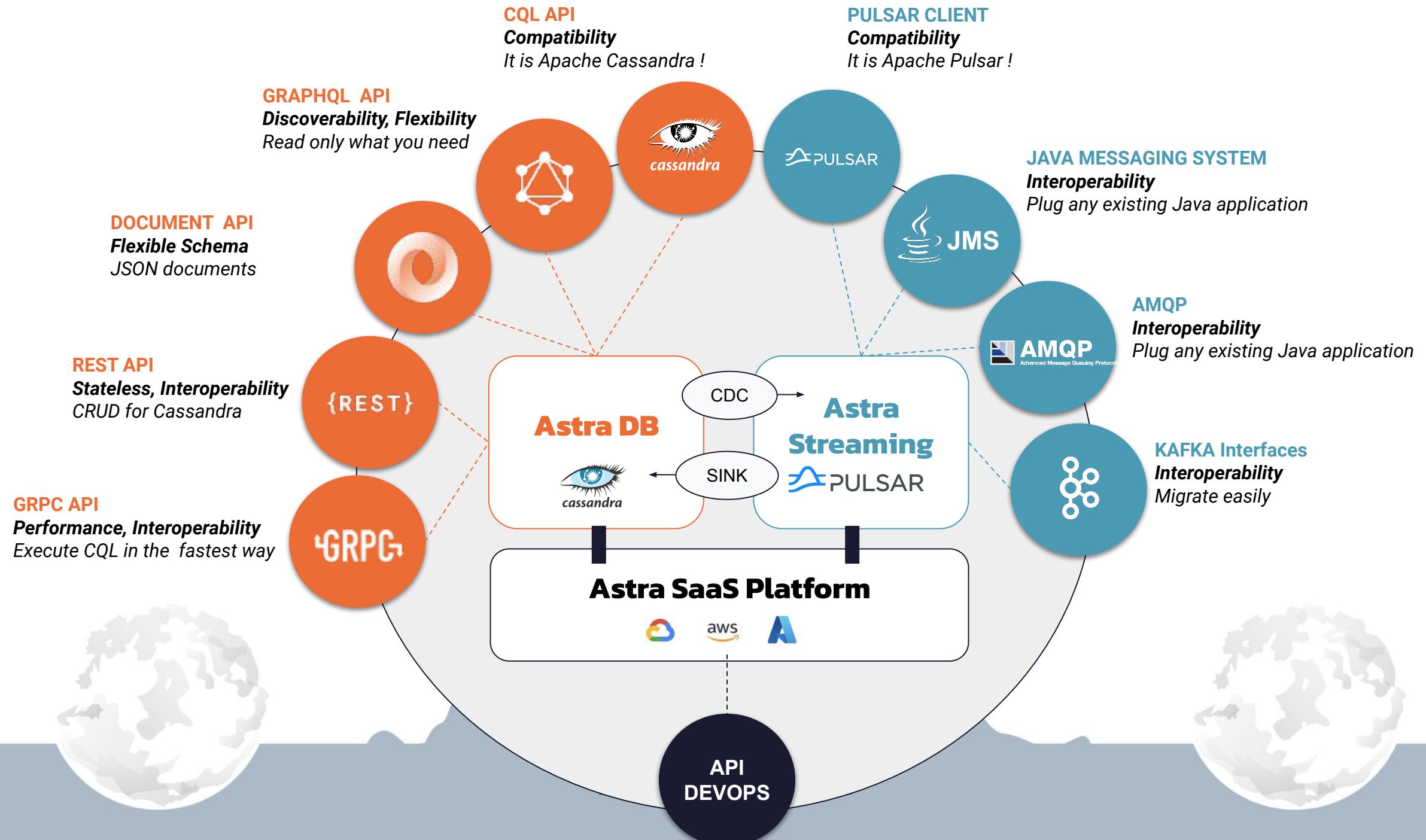
DataStax Developers

# Hands-on (!github)

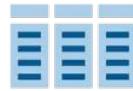
## #1 Database Setup

[github.com/datastaxdevs/workshop-introduction-to-nosql](https://github.com/datastaxdevs/workshop-introduction-to-nosql)

- ✓ Create a new database
- ✓ Wake up an existing hibernated database



# 4 Types of NoSQL Databases



Tabular or wide-column database

Astra DB



Document database

Astra DB



Key-value database

Astra DB



Graph database



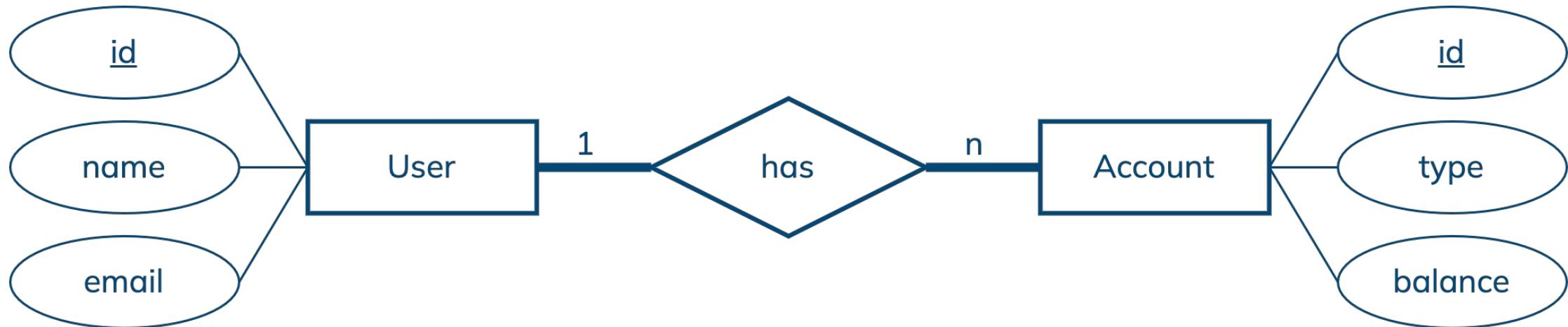
DataStax Graph



DataStax Developers



# Running Example: Entity-Relationship Model

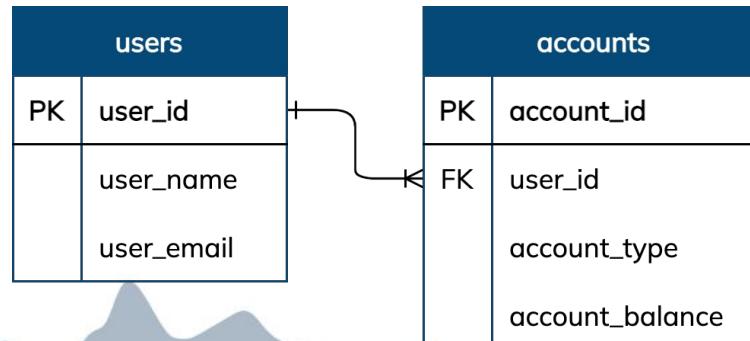


- Meet Alice  `alice@example.org` and Bob  `bob@example.org`
-  **has Checking and Savings accounts with balances 2500 and 1500**
-  **has one Checking account with balance 1000**

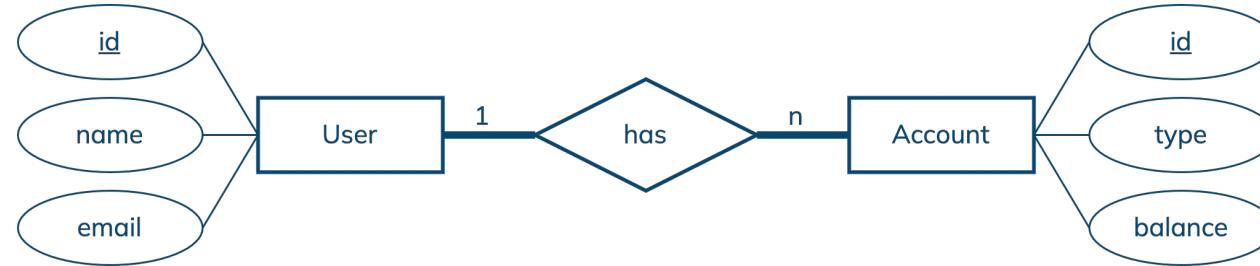
# Running Example: Relational Data Model

| users                                |           |                   |
|--------------------------------------|-----------|-------------------|
| user_id                              | user_name | user_email        |
| 1cafb6a4-396c-4da1-8180-83531b6a41e3 | Alice     | alice@example.org |
| 0d2b2319-9c0b-4ecb-8953-98687f6a99ce | Bob       | bob@example.org   |

| accounts                             |              |                 |                                      |
|--------------------------------------|--------------|-----------------|--------------------------------------|
| account_id                           | account_type | account_balance | user_id                              |
| 83428a85-5c8f-4398-8019-918d6e1d3a93 | Checking     | 2500            | 1cafb6a4-396c-4da1-8180-83531b6a41e3 |
| 811b56c3-cead-40d9-9a3d-e230dc64f2f  | Savings      | 1500            | 1cafb6a4-396c-4da1-8180-83531b6a41e3 |
| 81def5e2-84f4-4885-a920-1c14d2be3c20 | Checking     | 1000            | 0d2b2319-9c0b-4ecb-8953-98687f6a99ce |



# Running Example: What about NoSQL?



?

?

?

?



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What's next?



Agenda

# Tabular Databases



Astra DB



## Data

- Tables with columns and rows; denormalized tables
- Primary, partition, clustering (sorting) keys
- Secondary indexes, materialized views

## Query

- Retrieving one, some or all rows from a partition
- SQL-like, no joins, indexed columns, lightweight transactions

## Use Cases

- General-purpose; many similarities to relational databases
- Transaction Processing, IoT, Time Series, Messaging, Activity Tracking, Content Management, eCommerce, Retail, Finance



Astra DB

```
SELECT account_type,  
       account_balance  
  FROM accounts_by_users  
 WHERE user_id = ?;
```

| user_id                              | account_id                           | user_name | account_balance | account_type |
|--------------------------------------|--------------------------------------|-----------|-----------------|--------------|
| 0d2b2319-9c0b-4ecb-8953-98687f6a99ce | 81def5e2-84f4-4885-a920-1c14d2be3c20 | Bob       | 1000            | Checking     |
| 1cafb6a4-396c-4da1-8180-83531b6a41e3 | 811b56c3-cead-40d9-9a3d-e230dc64f2f  | Alice     | 1500            | Savings      |
| 1cafb6a4-396c-4da1-8180-83531b6a41e3 | 83428a85-5c8f-4398-8019-918d6e1d3a93 | Alice     | 2500            | Checking     |

# Running Example: Tabular / Wide-Column Data Model

| accounts_by_user |    |
|------------------|----|
| user_id          | K  |
| account_id       | C↑ |
| account_type     | S  |
| account_balance  | S  |
| use_name         | S  |
| use_email        | S  |

| accounts_by_user   |                                      |              |                 |           |                   |
|--|--------------------------------------|--------------|-----------------|-----------|-------------------|
| user_id  | account_id                           | account_type | account_balance | user_name | user_email        |
|  1cafb6a4-396c-4da1-8180-83531b6a41e3 | 811b56c3-cead-40d9-9a3d-e230dcd64f2f | Savings      | 1500            | Alice     | alice@example.org |
|  | 83428a85-5c8f-4398-8019-918d6e1d3a93 | Checking     | 2500            |           |                   |
| 0d2b2319-9c0b-4ecb-8953-98687f6a99ce   | 81def5e2-84f4-4885-a920-1c14d2be3c20 | Checking     | 1000            | Bob       | bob@example.org   |

# Hands-on (!github)

## #2 Tabular Databases

[github.com/datastaxdevs/workshop-introduction-to-nosql](https://github.com/datastaxdevs/workshop-introduction-to-nosql)



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What's next?

# Document Databases



## Data

- JSON, semi-structured documents
- Schemaless is a marketing term
- Schema-on-read, schema embedded into the document

## Query

- Search using document IDs and JSON internal field values

## Use Cases

- Flexible schema
- Excellent mapping between database and app data models
- Content Management, Catalogs, Mobile Apps

## users

{ JSON<sub>A</sub> }

{ JSON<sub>B</sub> }

mongoDB db.users.find( { name: "Alice" } )

Astra DB

GET namespaces/banking/collections/users?  
where={"name": { "\$eq": "Alice" } }

# Running Example: Document Data Model

```
{  
  "id": "0d2b2319-9c0b-4ecb-8953-98687f6a99ce",  
  "name": "Bob",  
  "email": "bob@example.org",  
  "accounts": [  
    {  
      "id": "81def5e2-84f4-4885-a920-1c14d2be3c20",  
      "type": "Checking",  
      "balance": "1000"  
    }  
  ]  
}
```



```
{  
  "id": "1cafb6a4-396c-4da1-8180-83531b6a41e3",  
  "name": "Alice",  
  "email": "alice@example.org",  
  "accounts": [  
    {  
      "id": "83428a85-5c8f-4398-8019-918d6e1d3a93",  
      "type": "Checking",  
      "balance": "2500"  
    },  
    {  
      "id": "811b56c3-cead-40d9-9a3d-e230dc64f2f",  
      "type": "Savings",  
      "balance": "1500"  
    }  
  ]  
}
```



# Hands-on (!github)

## #3 Document Databases

[github.com/datastaxdevs/workshop-introduction-to-nosql](https://github.com/datastaxdevs/workshop-introduction-to-nosql)



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What's next?

# Key-Value Databases



DynamoDB

Astra DB

## Data

- Key-value pairs
- Values can be blobs, strings, sets, maps, JSON docs, etc

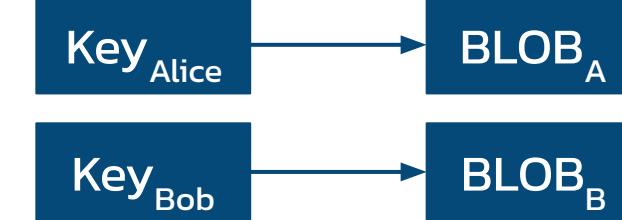
## Query

- GET/PUT/DELETE key lookups, limited SQL-like support

## Use Cases

- Best for simple primary key lookups
- Caching, User Sessions, Serving Content by Key

users



GET /buckets/users/keys/Alice



Astra DB

SELECT value FROM users  
WHERE key = 'Alice';



DataStax Developers



# Running Example: Key-Value Data Model

| KV   |  |
|--|--|
| key  | value  |
| user:1cafb6a4-396c-4da1-8180-83531b6a41e3:name       | Alice  |
| user:1cafb6a4-396c-4da1-8180-83531b6a41e3:email      | alice@example.org  |
| user:1cafb6a4-396c-4da1-8180-83531b6a41e3:accounts   | { 83428a85-5c8f-4398-8019-918d6e1d3a93, 811b56c3-cead-40d9-9a3d-e230dcd64f2f } |
| user:0d2b2319-9c0b-4ecb-8953-98687f6a99ce:name       | Bob  |
| user:0d2b2319-9c0b-4ecb-8953-98687f6a99ce:email      | bob@example.org  |
| user:0d2b2319-9c0b-4ecb-8953-98687f6a99ce:accounts   | { 81def5e2-84f4-4885-a920-1c14d2be3c20 }                                       |
| account:83428a85-5c8f-4398-8019-918d6e1d3a93:type    | Checking   |
| account:83428a85-5c8f-4398-8019-918d6e1d3a93:balance | 2500   |
| account:811b56c3-cead-40d9-9a3d-e230dcd64f2f:type    | Savings  |
| account:811b56c3-cead-40d9-9a3d-e230dcd64f2f:balance | 1500   |
| account:81def5e2-84f4-4885-a920-1c14d2be3c20:type    | Checking   |
| account:81def5e2-84f4-4885-a920-1c14d2be3c20:balance | 1000   |

# Hands-on (!github)

## #4 Key-Value Databases



[github.com/datastaxdevs/workshop-introduction-to-nosql](https://github.com/datastaxdevs/workshop-introduction-to-nosql)

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What's next?

# Graph Databases



DataStax Graph



neo4j



AllegroGraph

## Data

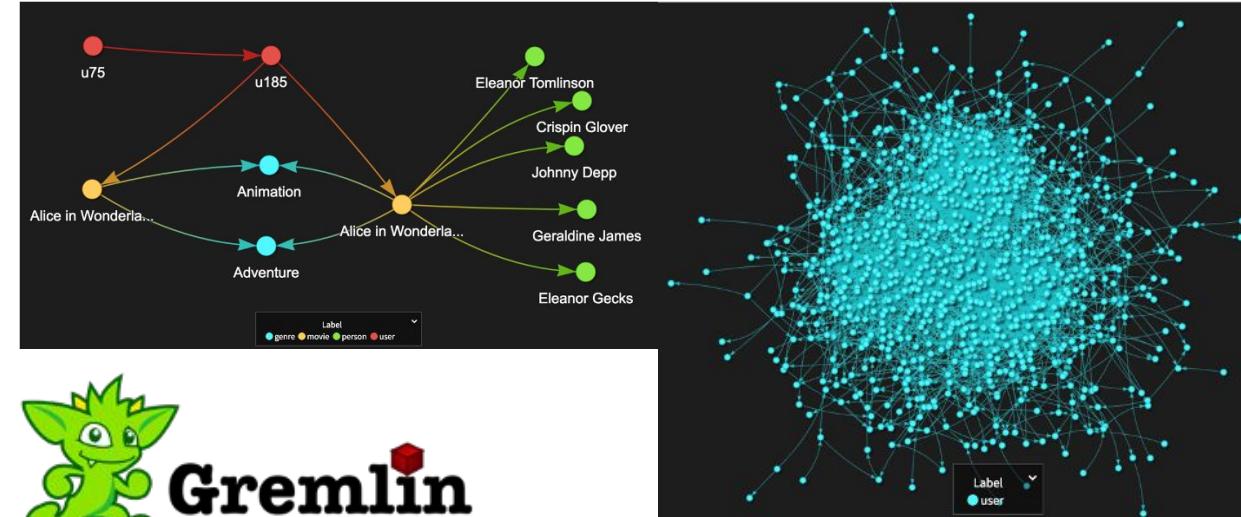
- Vertices, edges, properties
- Property graphs, RDF graphs, knowledge graphs

## Query

- Gremlin, Cypher, GSQL, SPARQL

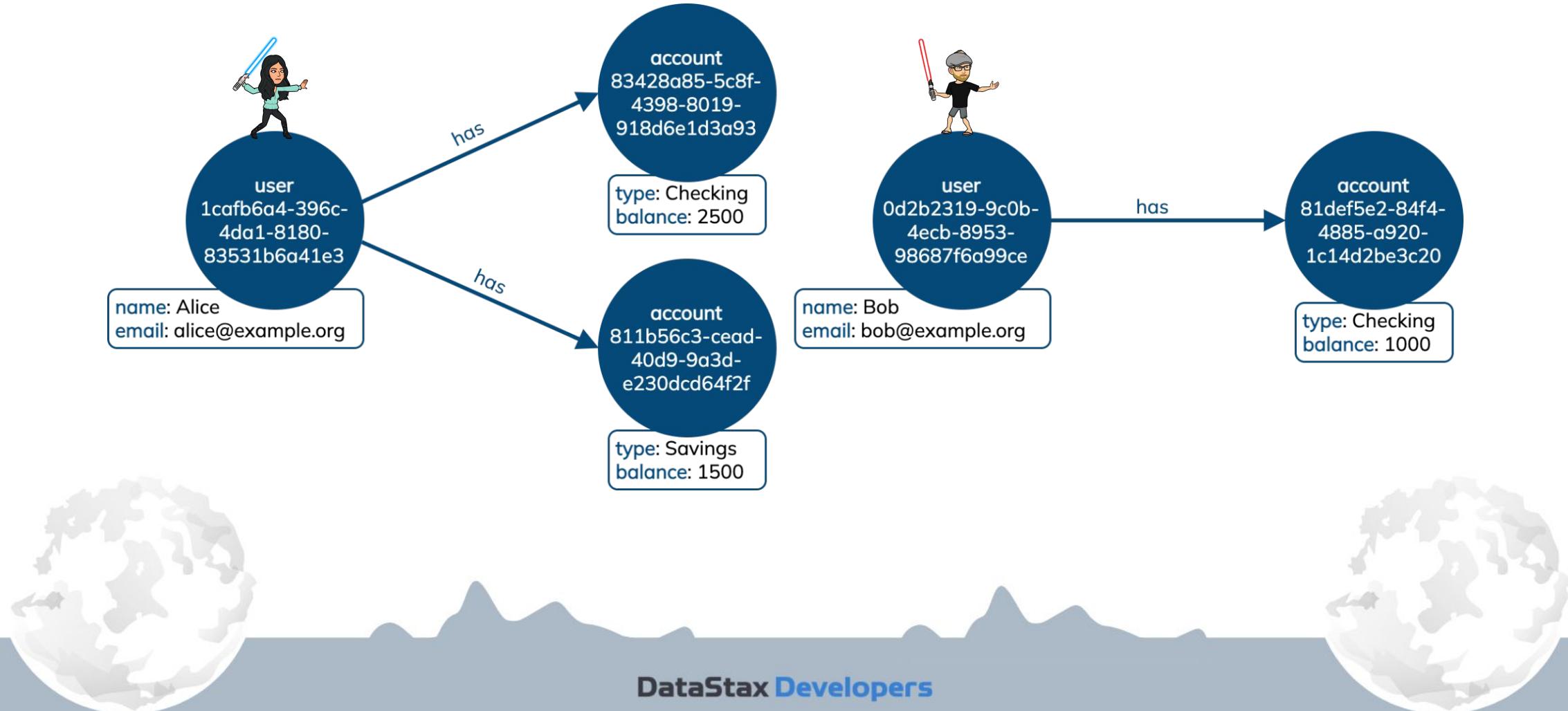
## Use Cases

- Focus on exploring connections, links and relationships
- Customer 360, Personalization, Fraud detection, Recommendations, Internet of Things, Asset management, Data integration



```
g.V().has("user", "name", "Alice").  
repeat(both().simplePath().timeLimit(800)).  
until(has("user", "name", "Bob")).path().limit(1)
```

# Running Example: Graph Data Model



# Hands-on (!github)

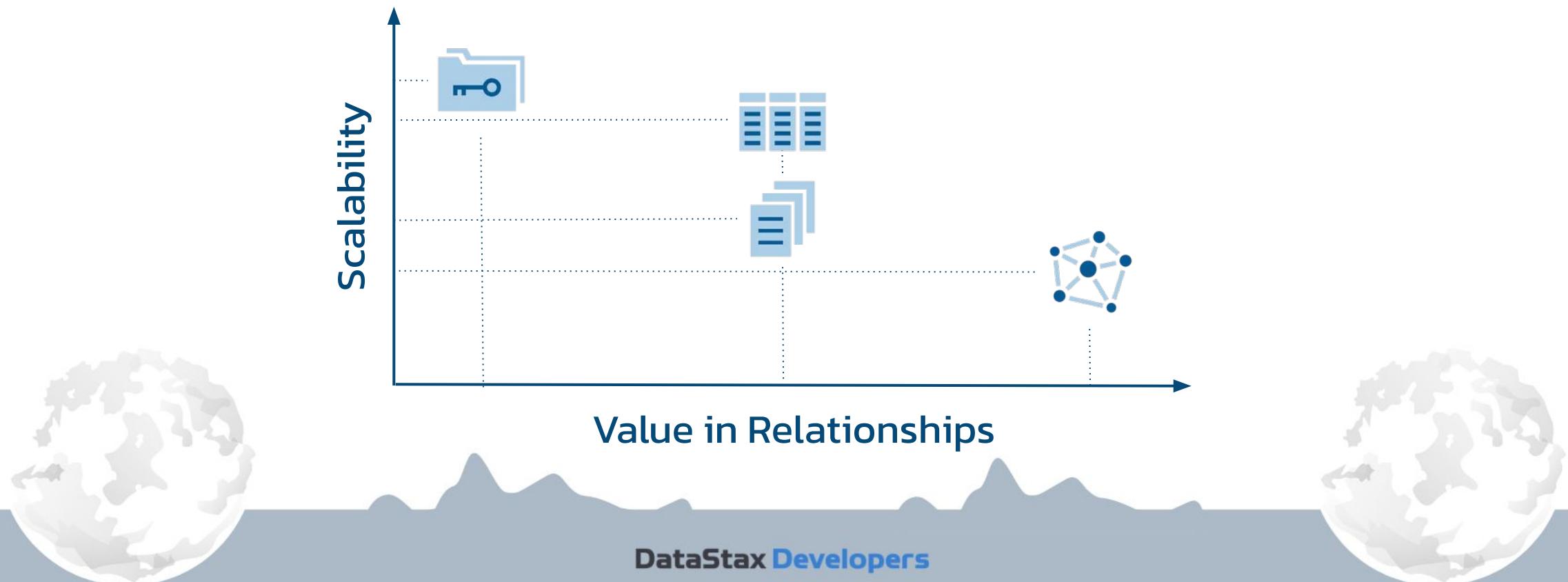
## #5 Graph Databases

[github.com/datastaxdevs/workshop-introduction-to-nosql](https://github.com/datastaxdevs/workshop-introduction-to-nosql)



# Should You Choose database?

- Consider a multi-model database, data model is only one aspect
- Use case, performance, scalability, availability, DBaaS, multi-cloud, ...



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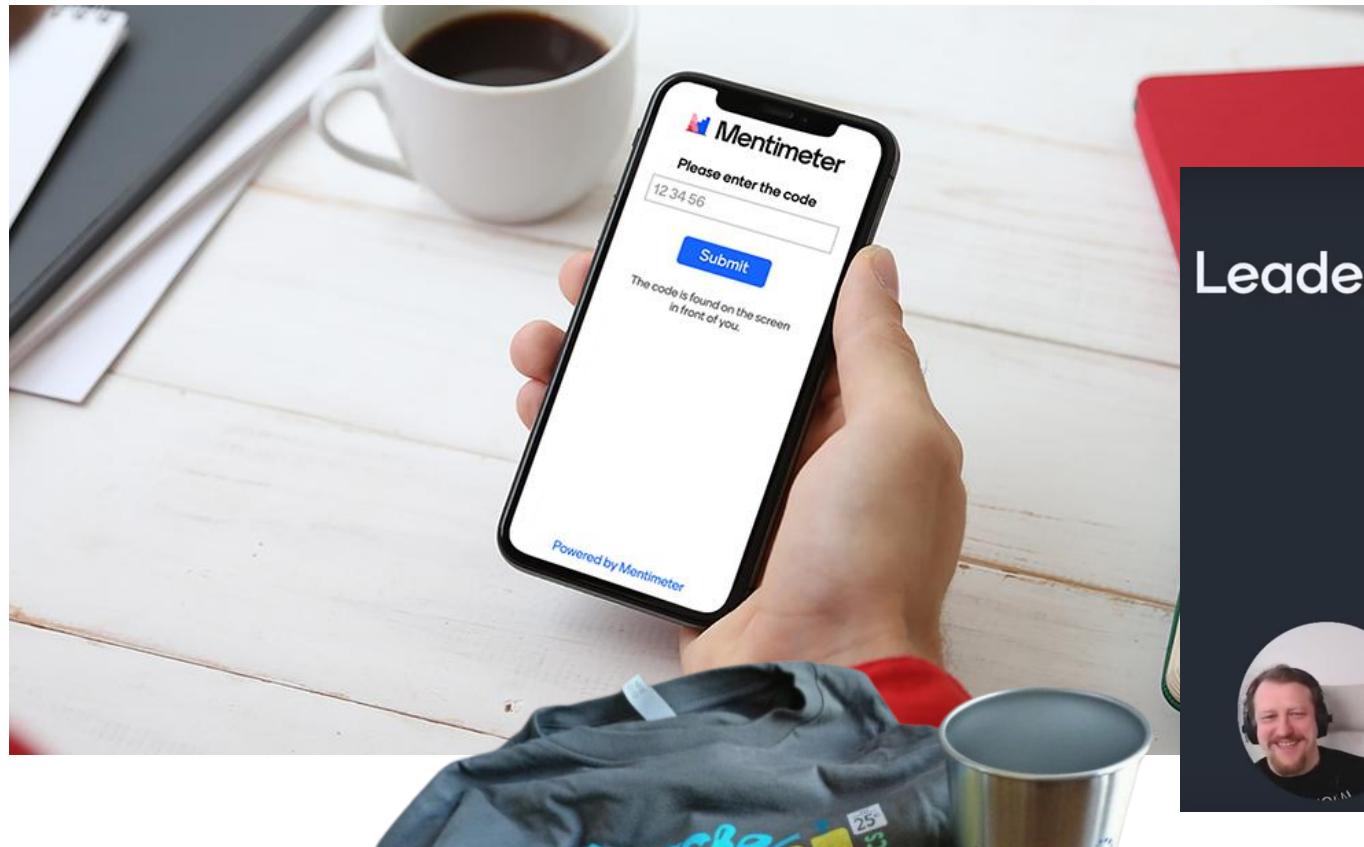
Graph Databases

# 07

What's next?



Agenda



**menti . com** ⇒ enter code  
Don't answer in YT chat  
Look at phone (not at YT)

Quiz on Menti.com !

# SWAG WINNERS



**Congratulations to 1st, 2nd and 3rd place on the Menti quiz!**

**To claim your prize, please send an email to:**

**[gary.harvey@datastax.com](mailto:gary.harvey@datastax.com)**

**\*\* Include a screenshot of your Menti screen**



DataStax Developers



# Intro to NoSQL Homework

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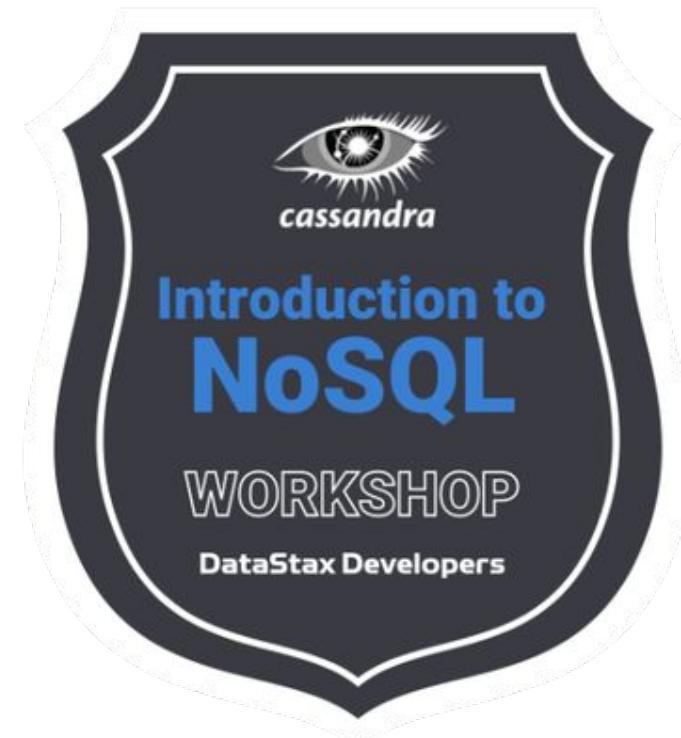
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Cedrick Lunven



Do homework and earn a badge

# Homework (!github)

## Instructions are on GitHub

[github.com/datastaxdevs/workshop-introduction-to-nosql](https://github.com/datastaxdevs/workshop-introduction-to-nosql)

- ✓ Complete hands-on exercises
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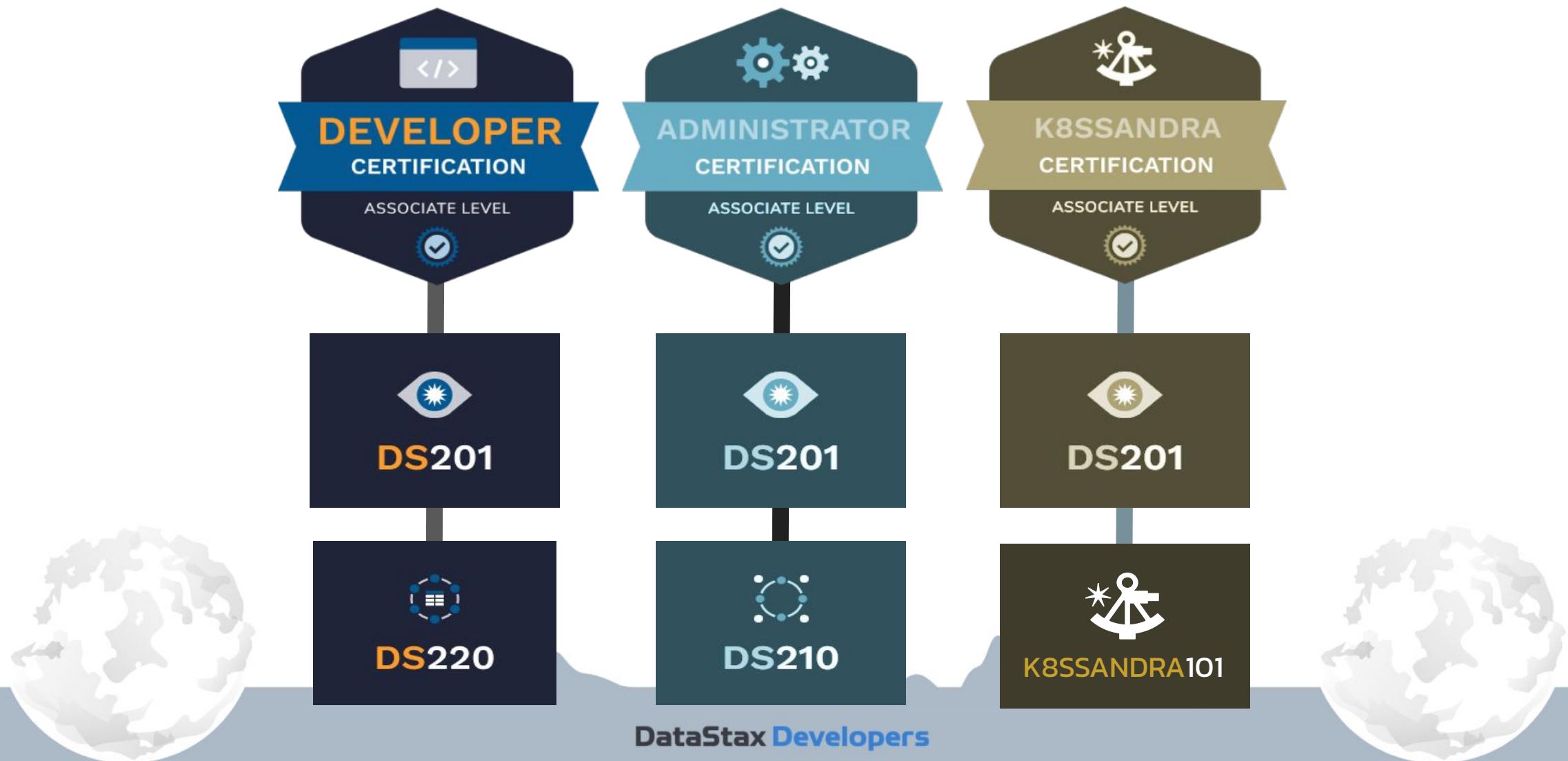
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DataStax Developers



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# ASTRA DB'S BUILD-A-THON

MAKING SIDE-HUSTLES A REALITY

21 February - 28 May 2022



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DataStax Developers

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EN LIGNE — 560  
-samu-  
6304-42J8  
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# getting-started

# astra-apis

# astra-development

# sample-applications

APACHE CASSANDRA

Cedrick Lun...

RIGGITYREKT Hier à 21:14  
I have a 5 node datacenter, 4 nodes are on dse version 5.1.20, one is on dse5.0.15. I am doing some mixed version testing for a class and the one node that is 5.0.15 is coming up as an analytics workload. I dont have /etc/default/dse, instead I am using /etc/init.d/dse-cassandra. how do i make that node start in cassandra workload, not in analytics?

RIGGITYREKT Hier à 23:39  
Okay I found out my issue, when I started DSE 5.0.15 it had endpointSnitch set to DseSimpleSnitch, the rest of my cluster is using PropertyFileSnitch, when I change it to PropertyFileSnitch, it still uses the simple snitch config. looking at the docs I see there is a way to go to GossipingPropertyFileSnitch, but I need the property file one. I can wipe this dbs, do anything with this node to get this done. how do I fix this?  
@here

19 novembre 2021

@RIGGITYREKT Okay I found out my issue, when I started DSE 5.0.15 it had endpointSnitch set to DseSimpleSnitch, the rest...  
Erick Ramirez Aujourd'hui à 02:19  
mixed versions isn't supported and you're guaranteed to run into weird issues that will cause further problems down the track

@RIGGITYREKT I have a 5 node datacenter, 4 nodes are on dse version 5.1.20, one is on dse5.0.15. I am doing some mixed v...  
Cedrick Lunven Aujourd'hui à 09:01  
When you start a node you have parameters -k for analytics, -g for graph and -s for search. To remove analytics check and remove -k

Envoyer un message dans #workshop-chat

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# Thank You!

