DataStax

Developers

Intro to Quarkus and Cassandra

S S T S

Cedrick Lunven | David Dieruf | Rags Srinivas | Artem Chebotko | Stefano Lottini | Aleksandr Volochnev | Aaron Ploetz

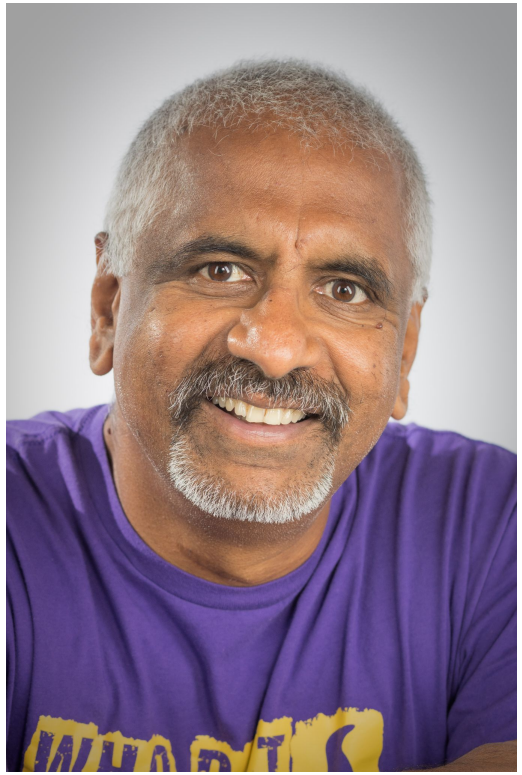
S K S S

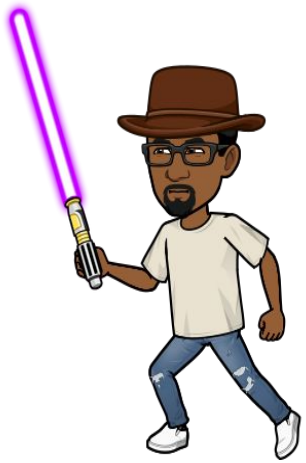
Jack Fryer | Kirsten Hunter | Gary Harvey | Sonia Siganporia | Ryan Welford | David Gilardi

DataStax Developers Crew

DataStax Developers

Developer Advocate





@rags

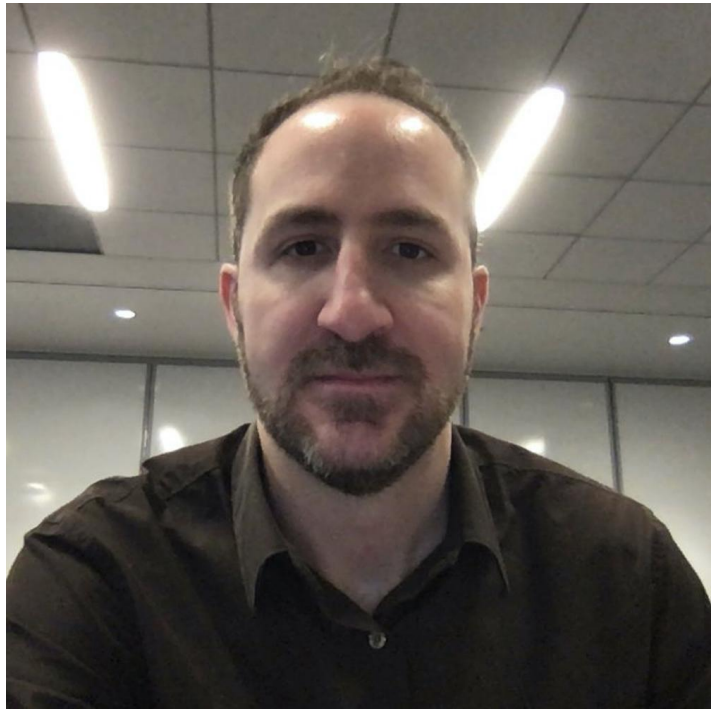
@ragsns

@ragss

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

Raghavan "Rags" Srinivas

Developer Advocate



Red Hat

QUARKUS

@edeandrea

@edeandrea

@edeandrea

- 22+ years Developer/Architect
- 10 years as DevOps Architect
- Contributor to OSS projects
- Love to write, teach, and communicate
- Published author
- Black belt in martial arts

Eric Deandrea

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Cassandra/Astra/
k8ssandra

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Microservices =
Quarkus+Cassandra

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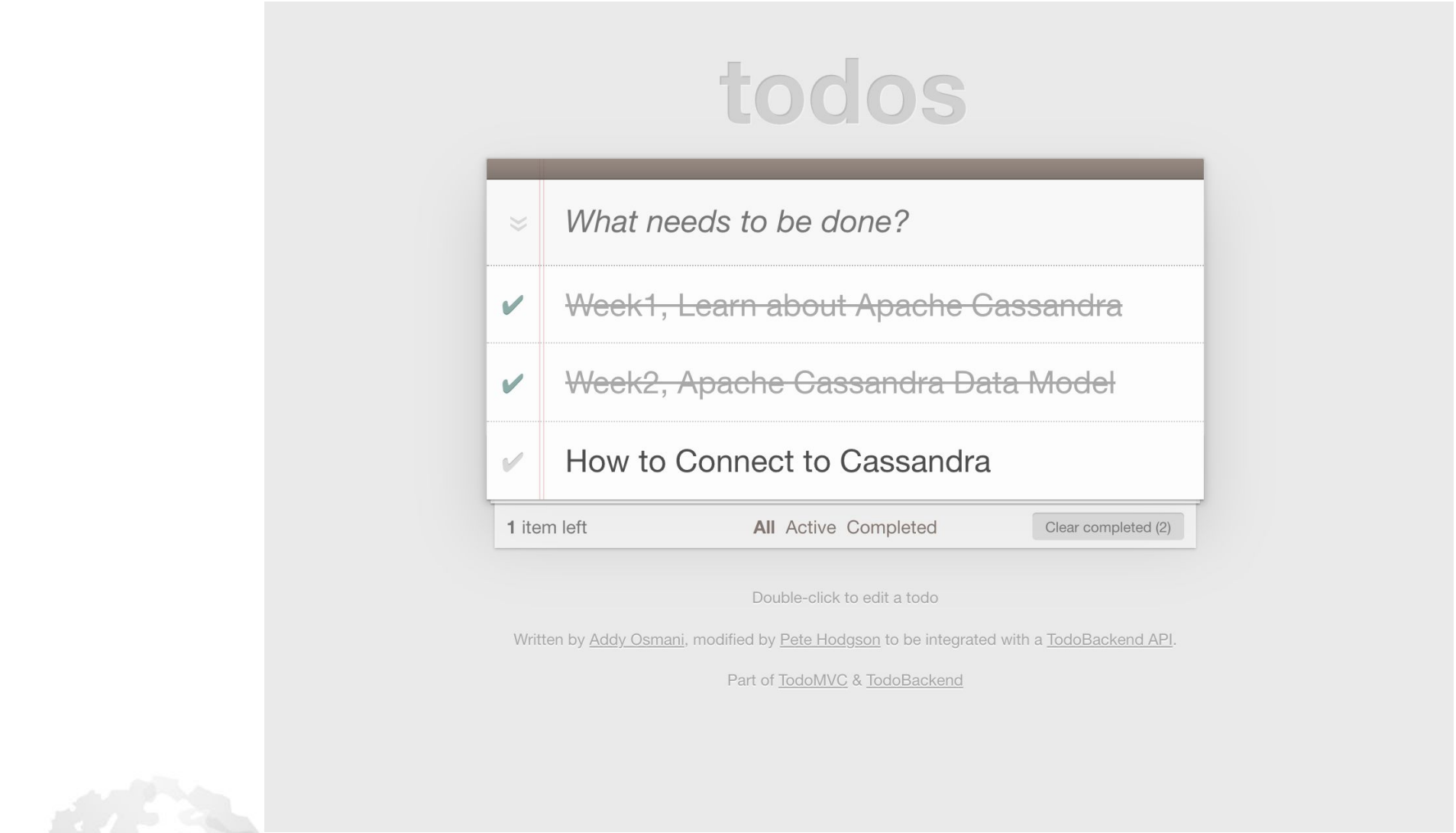
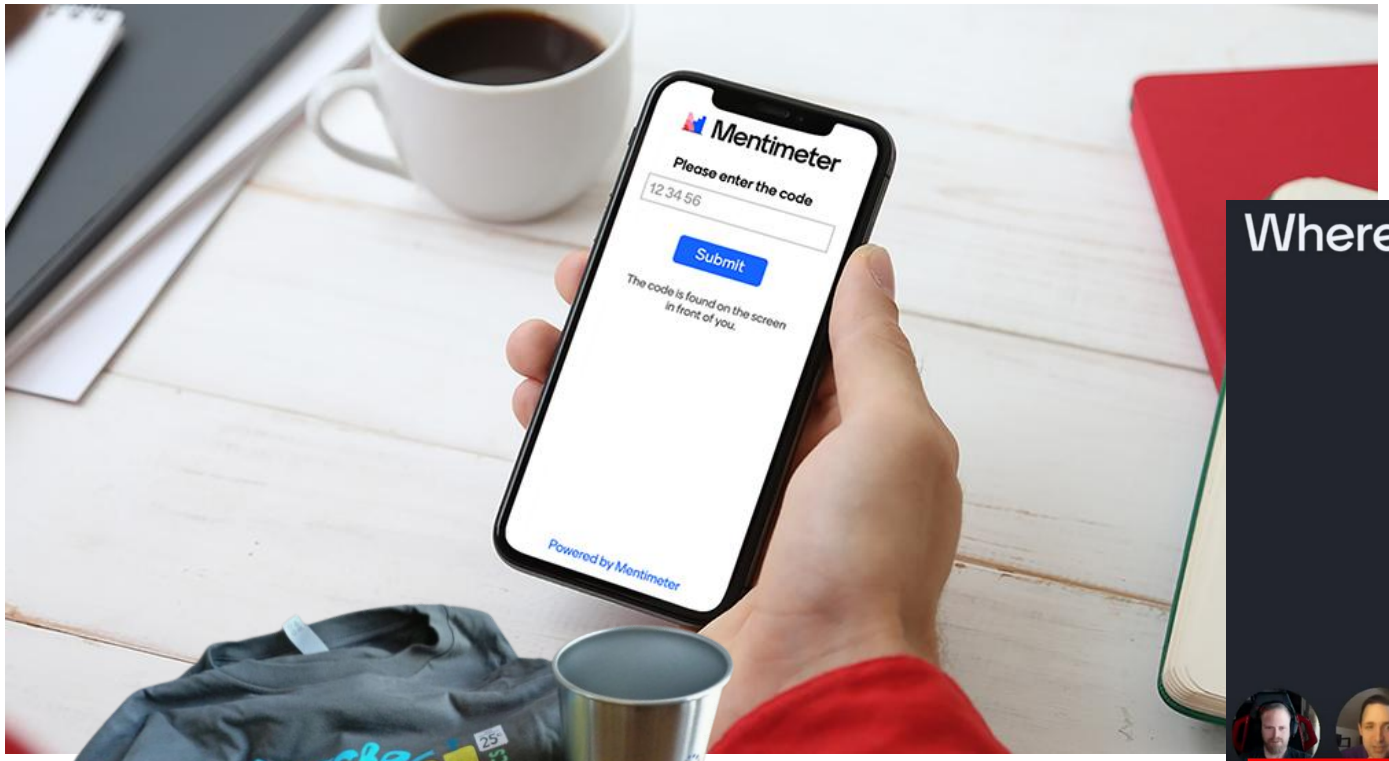


Today's challenge: Todo App



`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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Microservices = Quarkus
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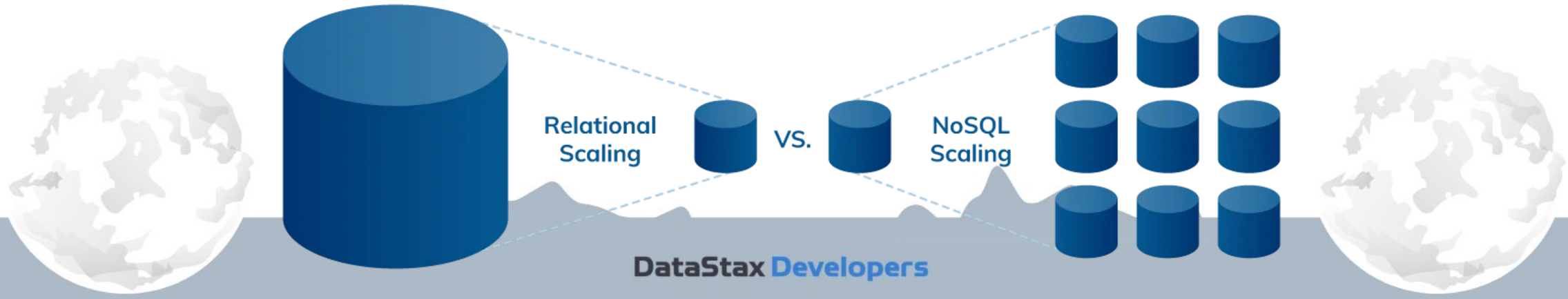
Origin of the term “NoSQL”

- 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 referred to “Not only SQL”


Relational vs. NoSQL

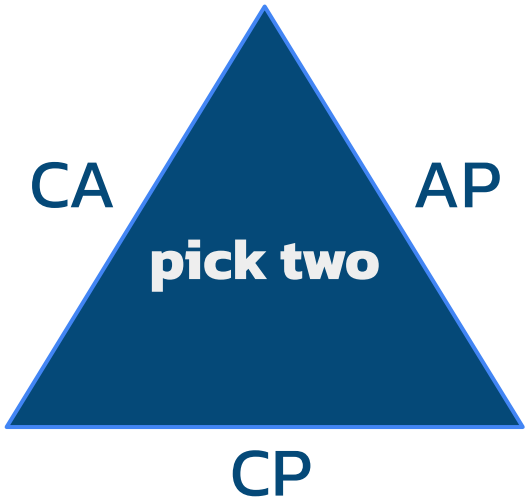
- Relational
  - Standard relational data model and language SQL
  - ACID transactions
  - Integration database
  - Designed for a single machine
  - Hard to scale
  - Impedance mismatch
- NoSQL
  - Variety of data models and languages
  - Lower-guarantee transactions
  - Application database
  - Designed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

DataStax Graph

Astra DB

cassandra

DynamoDB

riak

redis

BigTable

APACHE HBASE

mongoDB.

Couchbase

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Microservices (Quarkus + Cassandra)

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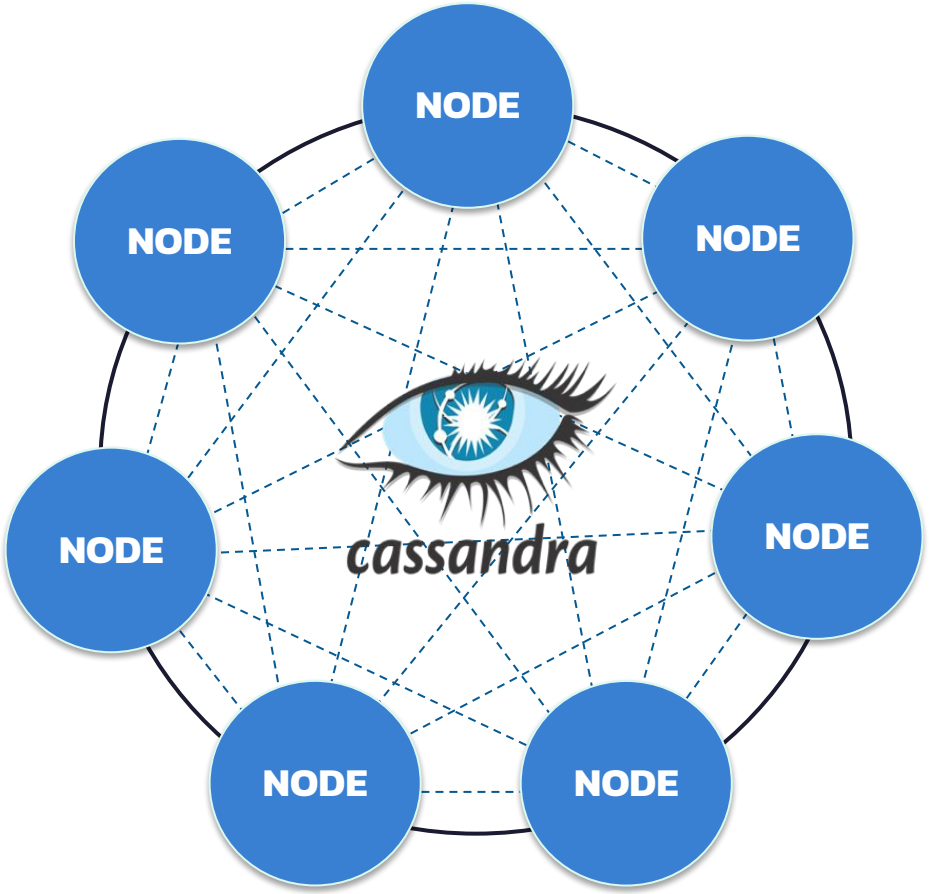


1. **NO** Single Point of Failure
2. Scales for writes and reads
3. Application can contact any node
   (in case of failure - just contact next one)

Master-less (Peer-to-Peer) Architecture

Why partitioning?
Because scaling doesn’t have to be [s]hard!

Big Data doesn’t fit to a single server, splitting it into chunks we can easily spread them over dozens, hundreds or even thousands of servers, adding more if needed.

Cassandra is [configurably consistent.](#) In any moment of the time, for any particular query you can set the Consistency Level you require to have. It defines how many **CONFIRMATIONS** you'll wait before the response is dispatched;

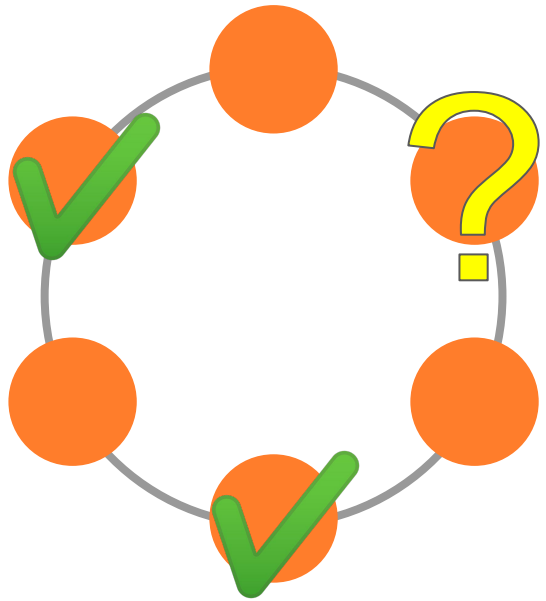
```
PreparedStatement pstmt = session.prepare(
    "INSERT INTO product (sku, description) VALUES (?,
?)"
);
pstmt.setConsistencyLevel(ConsistencyLevel.ONE);
```

```
cqlsh> CONSISTENCY

Current consistency level is QUORUM.

cqlsh> CONSISTENCY ALL

Consistency level set to ALL.
```



Is Cassandra AP or CP?

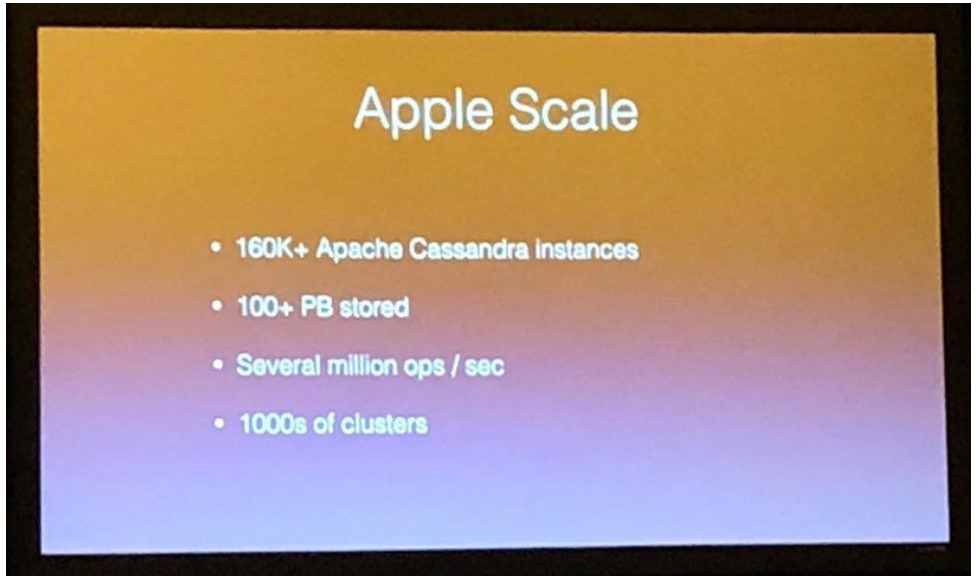
Apache Cassandra @ Netflix

- 98% of streaming data is stored in Apache Cassandra
- Data ranges from customer details to viewing history to billing and payments
- Foundational datastore for serving millions of operations per second

- 30 million ops/sec on most active single cluster
- 500 TB most dense single cluster
- 9216 CPUs in biggest cluster

O(100) Clusters
O(10000) Instances
O(10,000,000) Replications per second
O(100,000,000) Operations per second
O(1,000,000,000,000,000) Petabytes of data

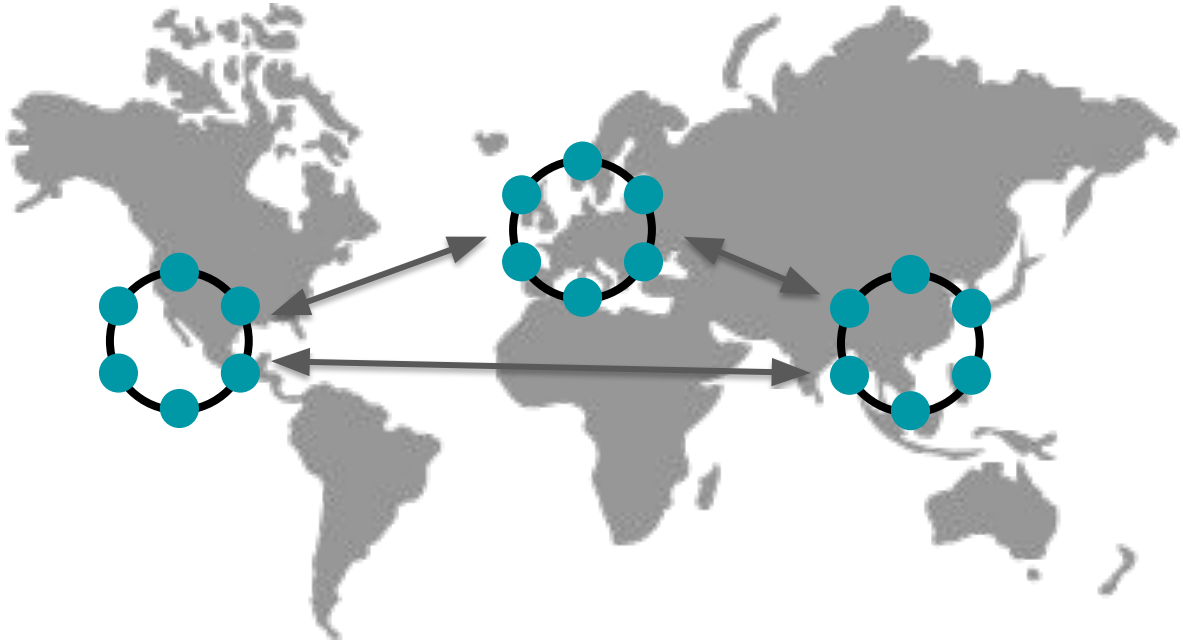
dtsx.io/cassandra-at-netflix



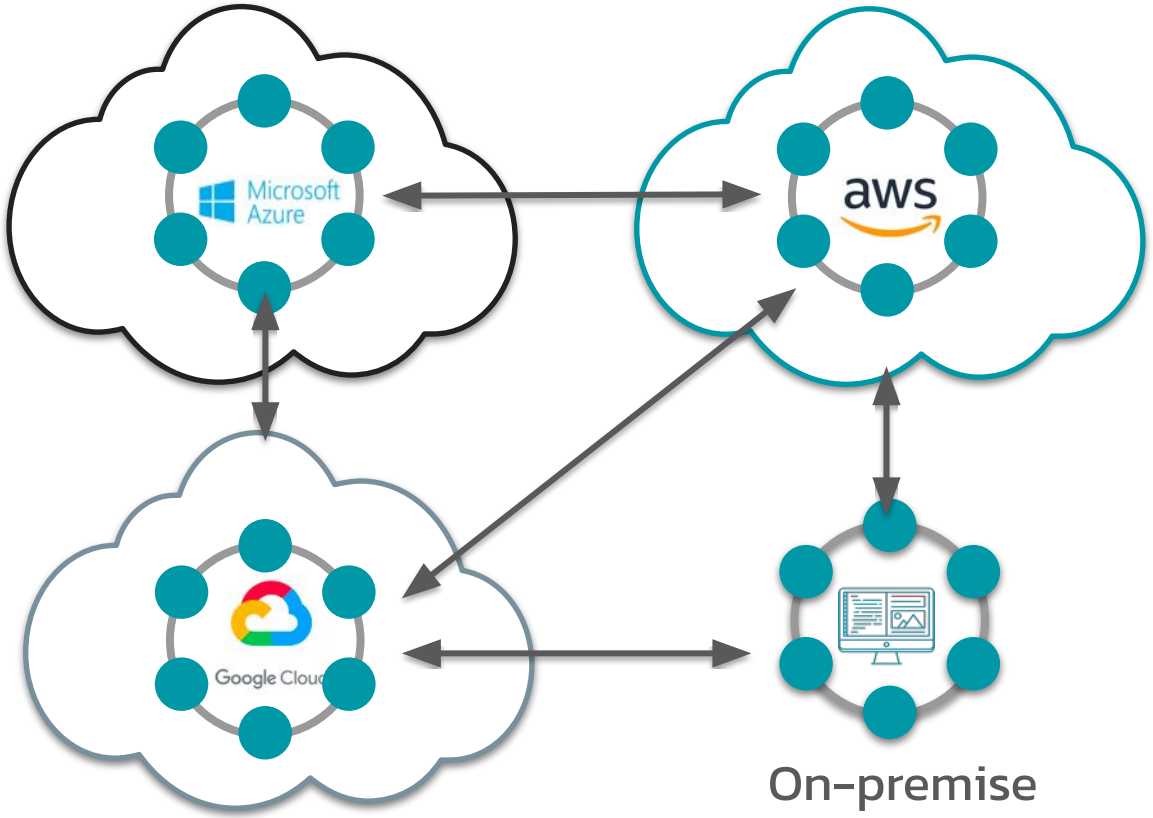
And many others...

Cassandra Biggest Users (and Developers)

Geographical Distribution



Hybrid-Cloud and Multi-Cloud



Data is globally distributed

State-of-the-art NoSQL Database

Astra DB

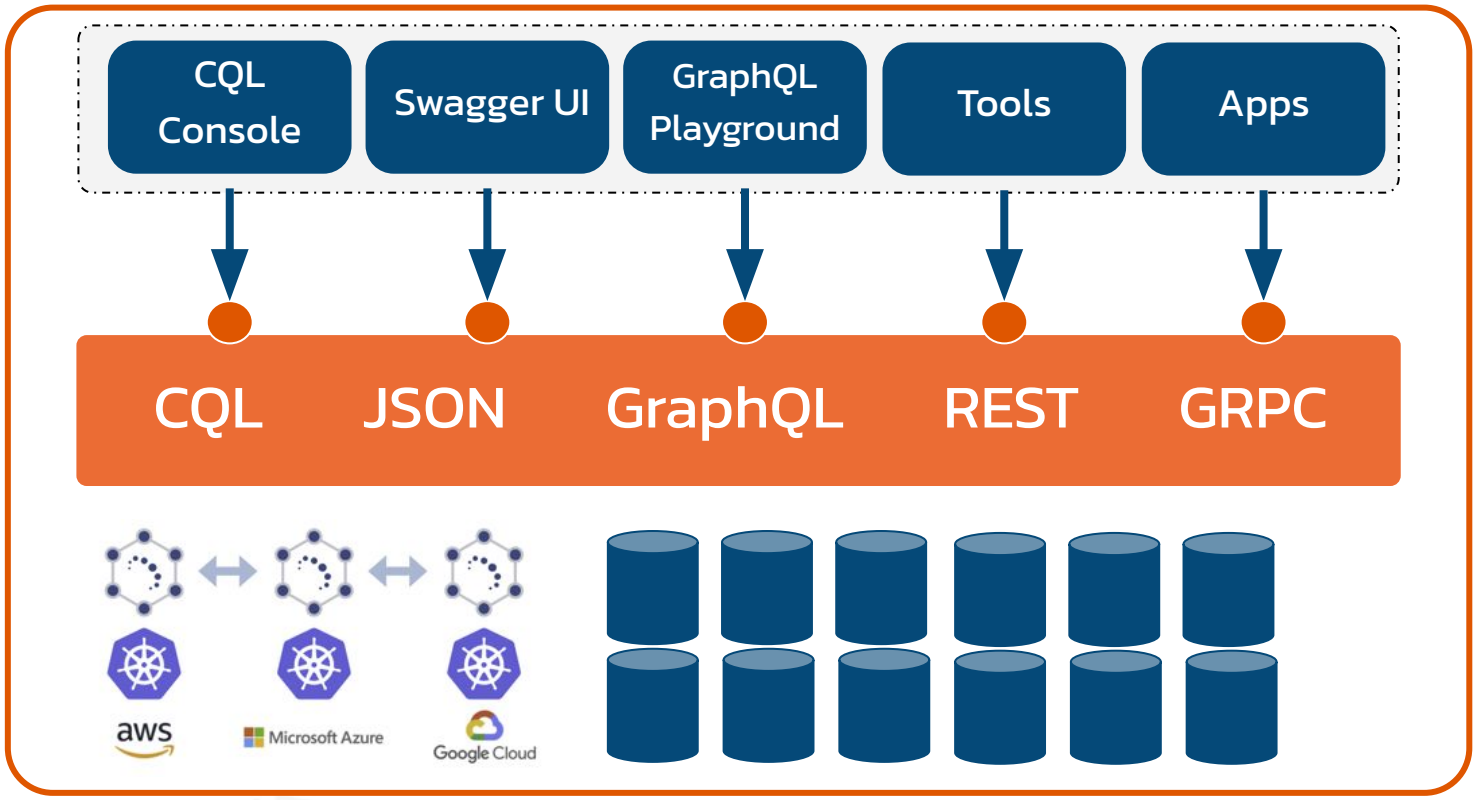
- DBaaS, serverless, auto-scalable
- Multi-cloud, distributed, multi-node cluster
- NoSQL, multi-model
- Tabular, document, key-value
- Based on open-source *Apache cassandra*

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

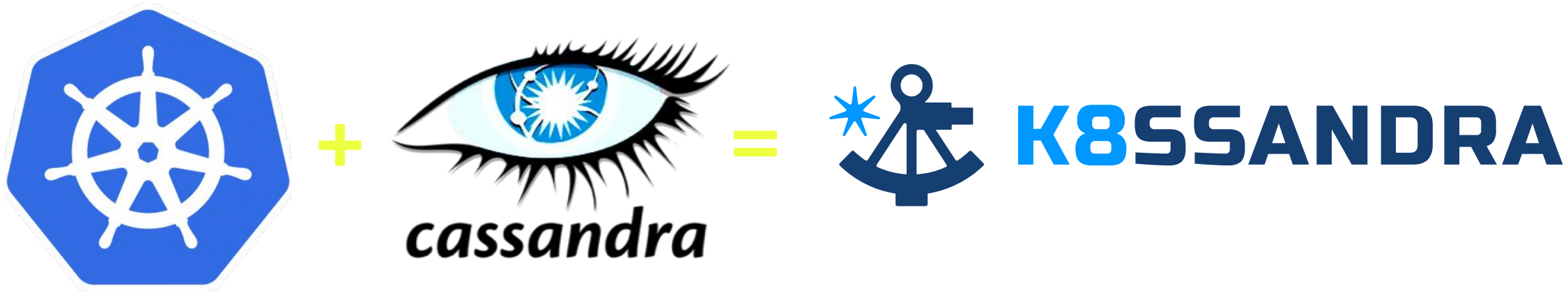
OSS Stargate.io

A data gateway to allow multiple usages

cassandra

OSS Apache Cassandra

A tabular NoSQL database


cassandra
K8SSANDRA

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Microservices = Quarkus
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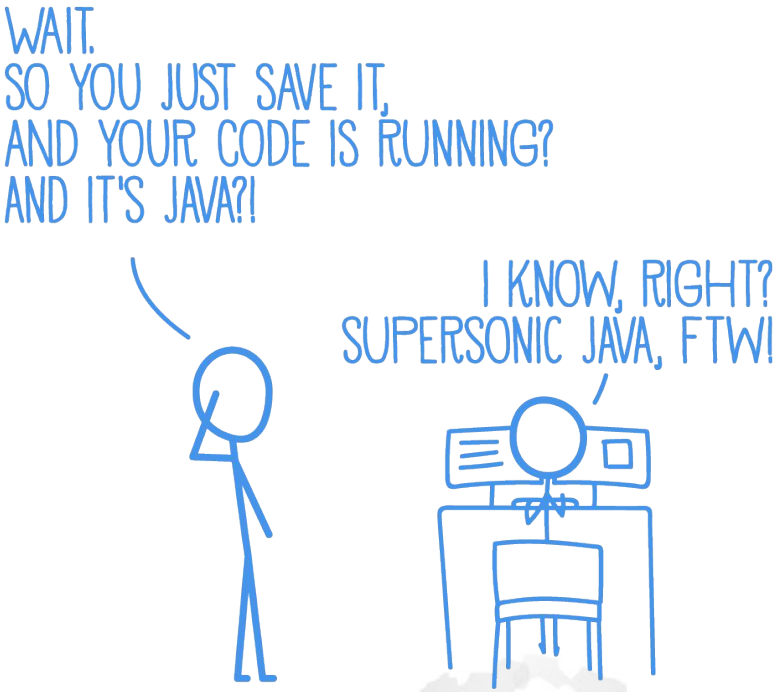
Inner loop == Developer Productivity

"Our developers used to wait **2 to 3 mins** to see their changes. **Live coding** does away with this!"

A cohesive platform for Microservices joy

- Based on standards
- Unified configuration
- Developer productivity
  - Zero-config Live coding
  - Developer services
  - Continuous testing
  - Dev UI
  - CLI
- Live coding
- Streamlined code for the 80% common usages
- No hassle native executable generation

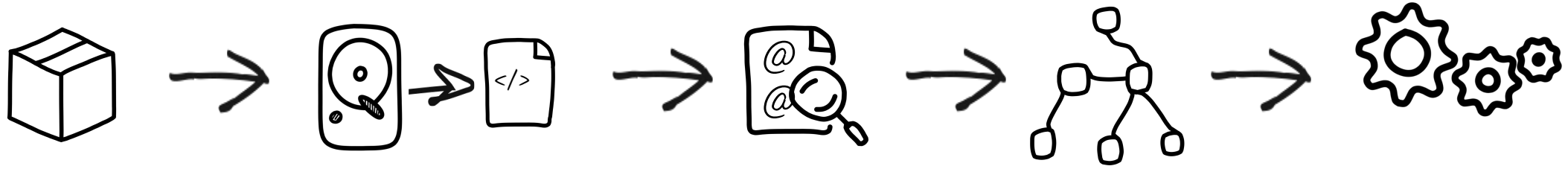


IT'S STILL JAVA!

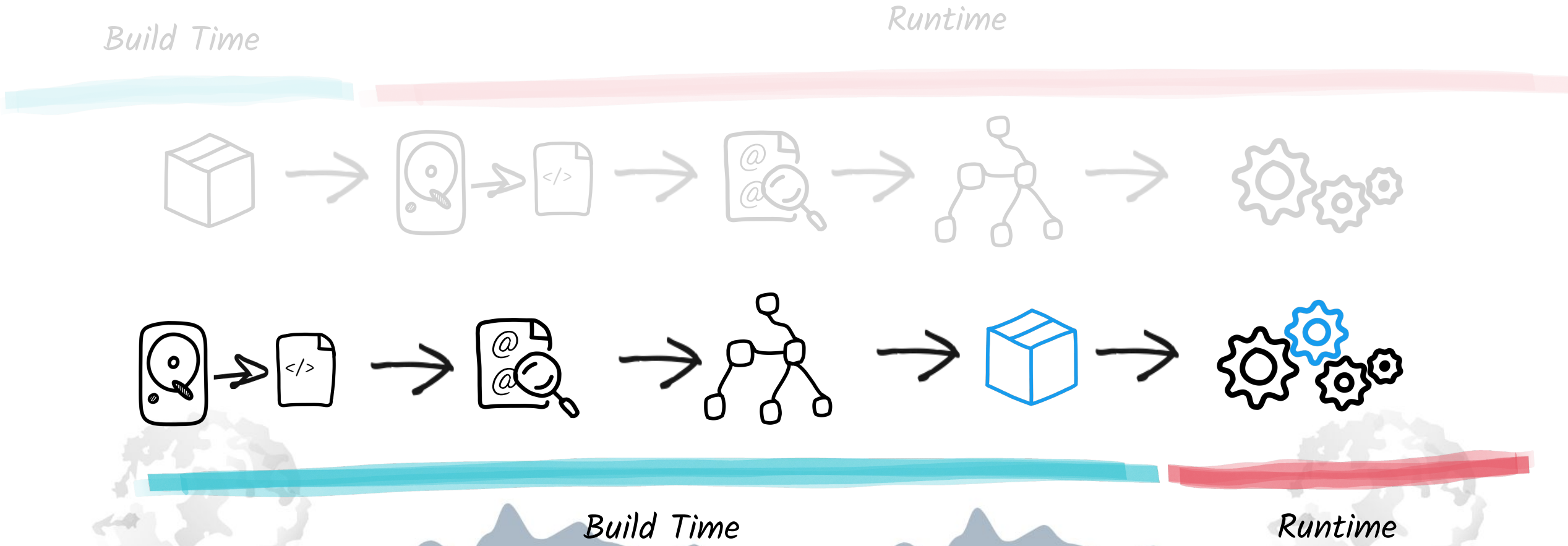
How does a Typical Java Framework Work?

Build Time

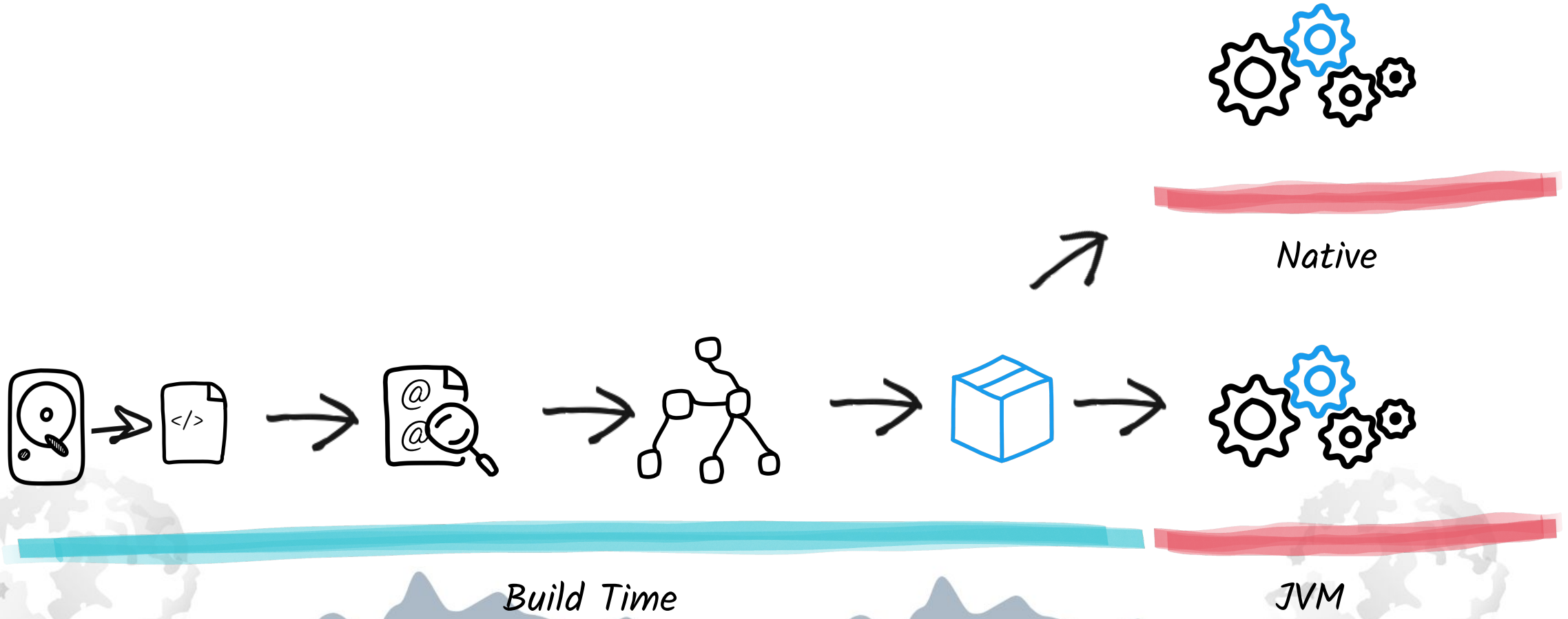
Runtime



The Quarkus Way



The Quarkus Way Enables Native Compilation



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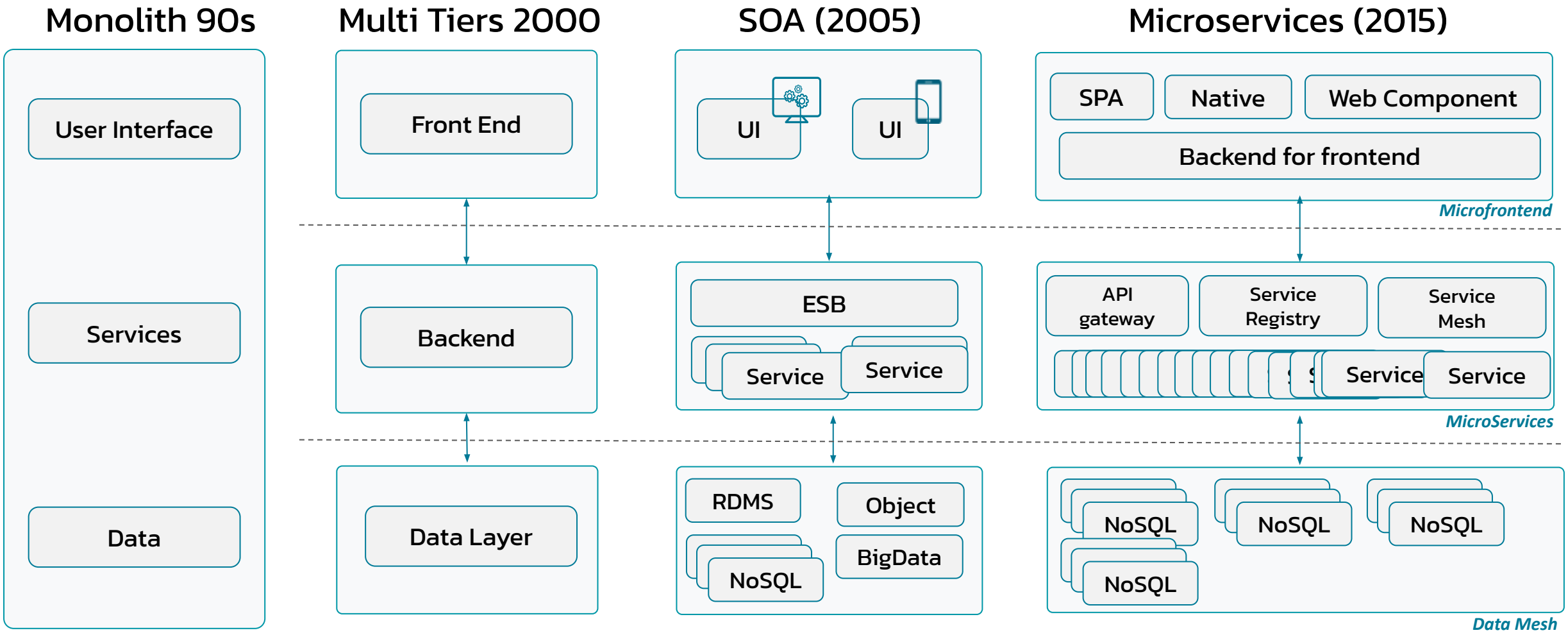
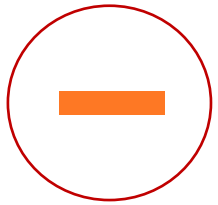


Microservices Architecture evolution

ADVANTAGES

- Reduce Cost (Scaling, Design)
- Reduce Risk (resilience)
- Increase Release Speed
- Enable Visibility (security, monitoring)

DISADVANTAGES



- Complexity (Security, Transaction, Orchestration)
- Cultural Changes
- Bigger RUN footprint

Quarkus Cassandra Extension

- Native Quarkus Config
- Cassandra Driver Session Support
- Cassandra Driver Object Mapper Support
- Support for Mutiny Types (Reactive Types)
- Native Image Support
- Support for DataStax Astra (Cassandra DBaaS)

Native Quarkus Config

```
quarkus.cassandra.cloud.secure-connect-bundle=/path/to/astra/bundle.zip
quarkus.cassandra.keyspace=ks1

quarkus.cassandra.auth.username=alice
quarkus.cassandra.auth.password=s3cr3t

quarkus.cassandra.request.timeout=5 seconds
quarkus.cassandra.request.consistency-level=LOCAL_ONE
quarkus.cassandra.request.page-size=1000

quarkus.cassandra.metrics.enabled=true
quarkus.cassandra.health.enabled=true
```

Cassandra Driver Session Support

```
@Inject QuarkusCqlSession session;
```


Cassandra Driver Object Mapper Support

```
@Dao interface ProductDao {
  @Insert Uni<Void> create(Product product);
  @Select Uni<Product> findById(String id);
  @Select Multi<Product> findAll();
}

class ProductDaoProducer {
  @Produces @ApplicationScoped
  public ProductDao produceProductDao() { ... }
}

@ApplicationScoped class ProductService {
  @Inject ProductDao dao;
}
```

Support for Mutiny Types

```
@GET
@Produces(MediaType.APPLICATION_JSON)
@Path(“/product/{id}”)
public Uni<Response> findProduct(@PathParam(“id”) String id) {
  return dao.findById(id)
    .map(todo -> Response.ok(todo).build())
    .ifNoItem().after(Duration.ofSeconds(5))
    .recoverWithItem(Response.status(Status.NOT_FOUND).build());
}
```

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Microservices = Quarkus
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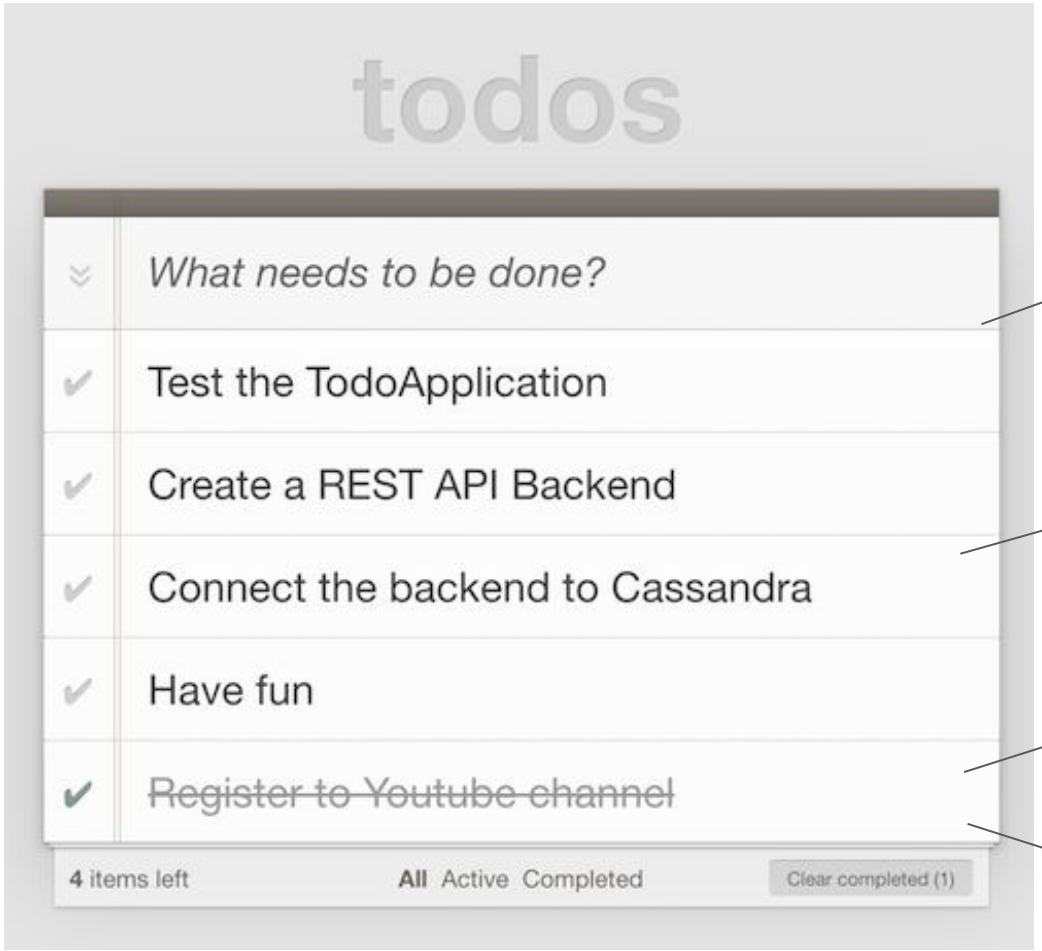


List all tasks

Create a new Task

Mark a task as completed

Delete a task

Specification of Service layer

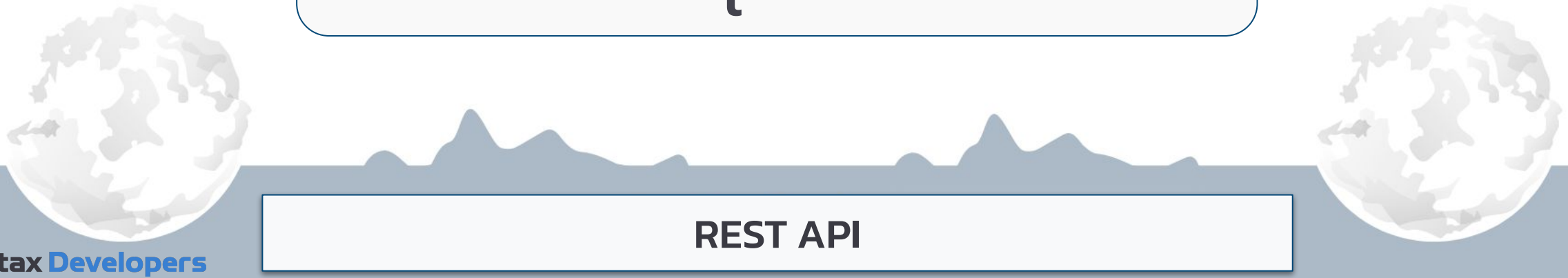
todoitems		
user_id	**TEXT**	**K**
item_id	TIMEUUID	C↑
completed	BOOLEAN	
title	TEXT	
offset	INT	

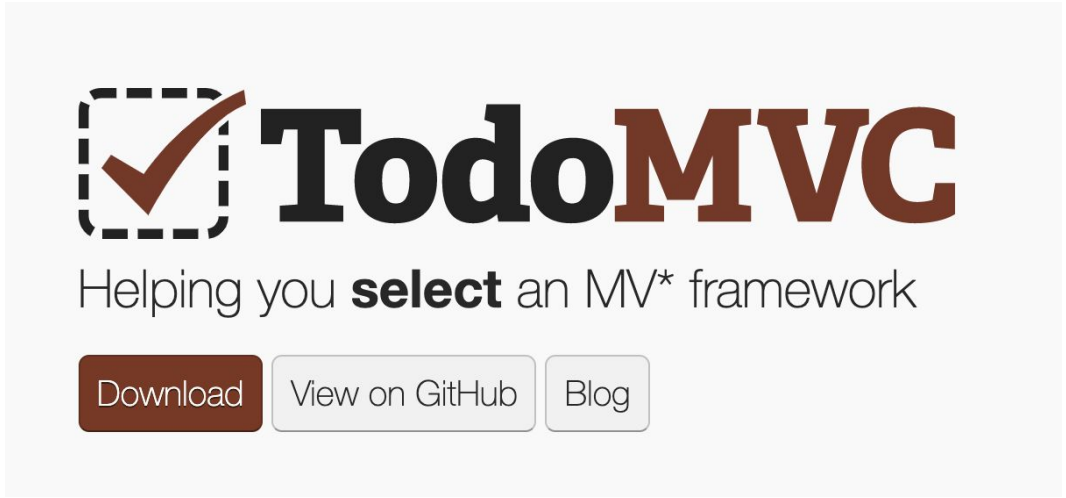
```
CREATE TABLE todos.todoitems (
    user_id    text,
    item_id    timeuuid,
    completed  boolean,
    title      text,
    PRIMARY KEY ((user_id),item_id)
);
```

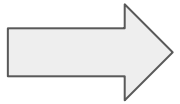
Data Model

- Our Partition key is user_id
  - We chose to have one todo list per user (avoiding any select * from table)
- Service
  - findTodos() for user
  - createTodo() for user
  - deleteTodo() from its id (userid + itemid)
  - updateTodo() from its id (both to mark it as complete and update title)
- REST API
  - The userid will appear in the URL
  - Provide major version (best practice)

/q/dev







http://todomvc.com/examples/angularjs/

TodoMVC.com

Todo-Backend

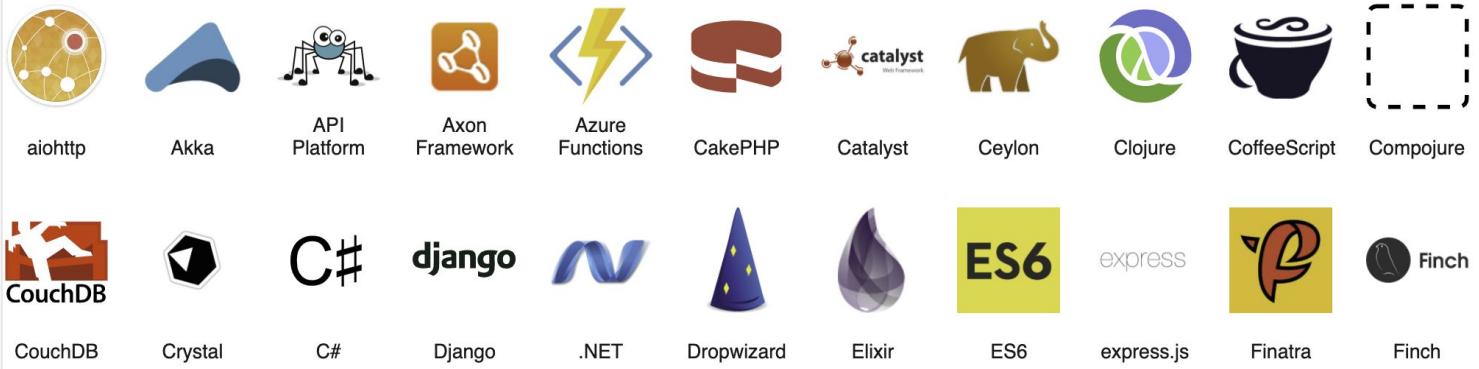
a shared example to showcase backend tech stacks

The Todo-Backend project defines a simple web API spec - for managing a todo list. Contributors implement that spec using various tech stacks. Those implementations are cataloged below. A spec runner verifies that each contribution implements the exact same API, by running an automated test suite which defines the API.

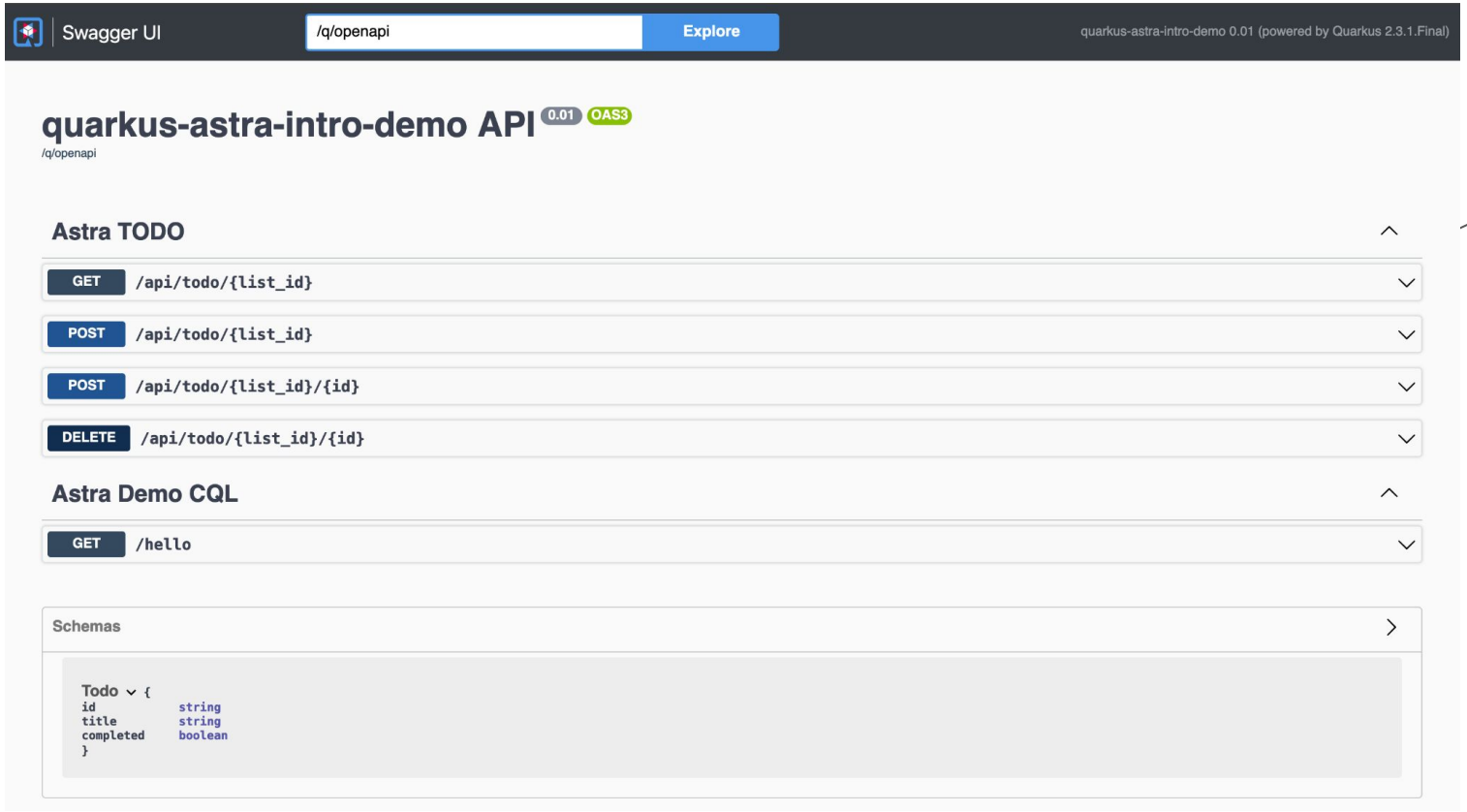
The Todo-Backend project was inspired by the TodoMVC project, and some code (specifically the todo client app) was borrowed directly from TodoMVC.

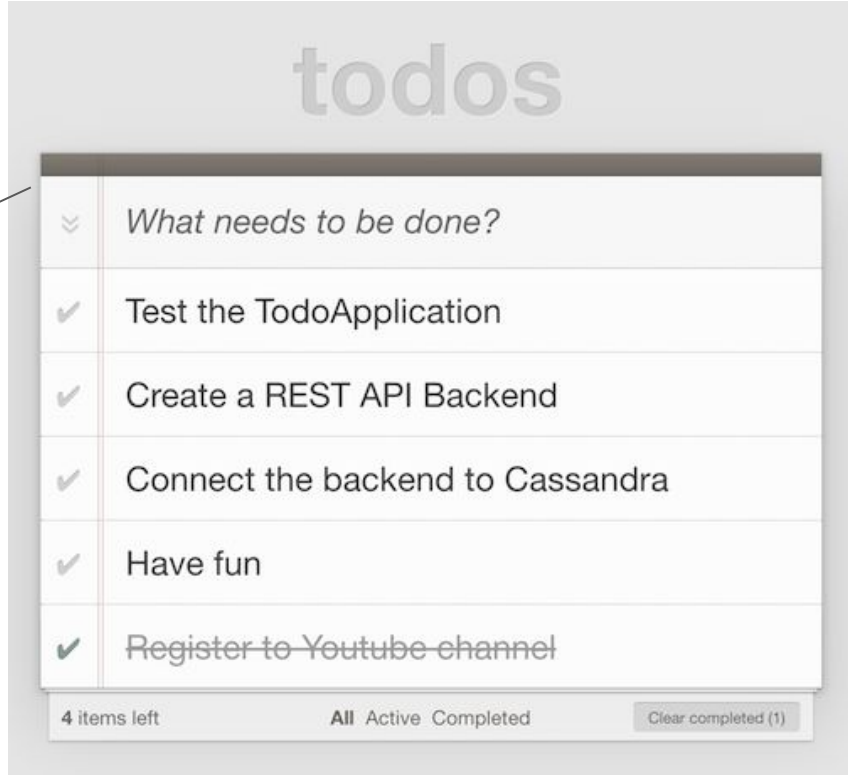
Created and curated by Pete Hodgson.

featuring HTTP APIs built with:



Todo Backend.com



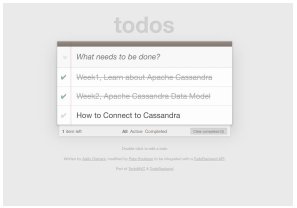


Rest API Specifications (specs)

FrontEnd
Presentation Tier

TODOBACKEND

/client/index.html



/specs/index.html

Backend
Application Tier

REST API

Databases
Data Tier

Database

cassandra

DataStax
Astra DB

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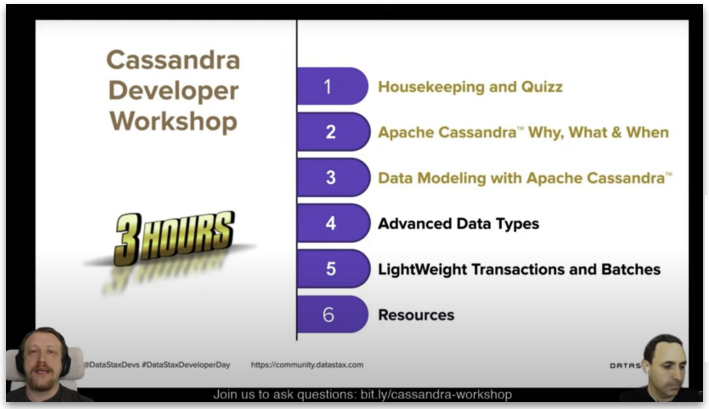
Live and interactive

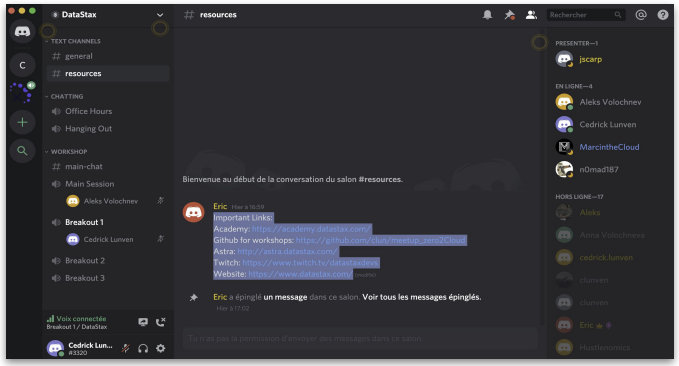
Livestream: youtube.com/DataStaxDevs



YouTube

Twitch

Questions: https://dtsx.io/discord

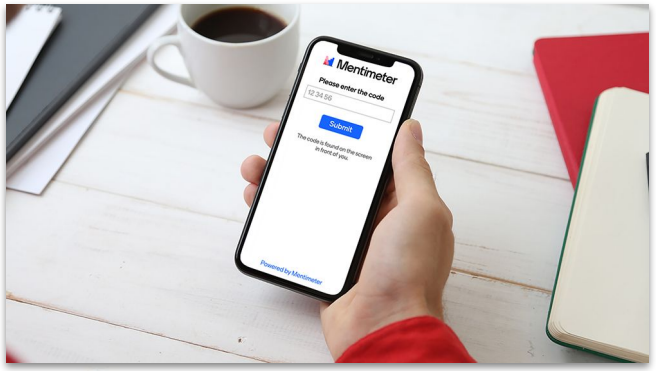


Discord

YouTube

Available on the iPhone App Store

Games menti.com



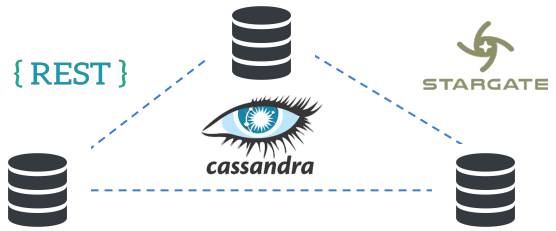
Mentimeter

GET IT ON Google play

1 Attend the sessions

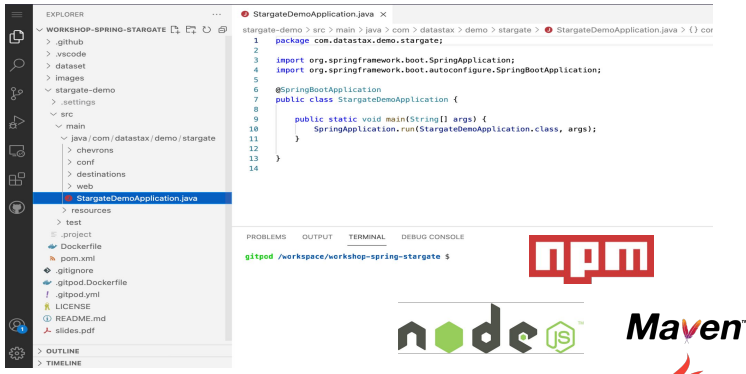
AstraDB astra.datastax.com

Database + GraphQL + PlayGround



DataStax Astra DB

Gitpod IDE: https://gitpod.io



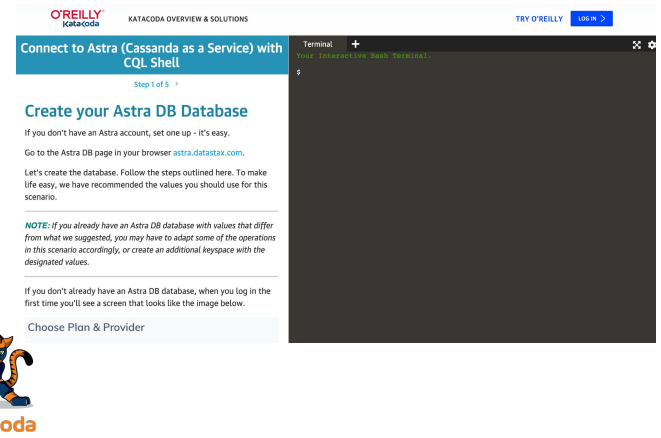
Gitpod

npm

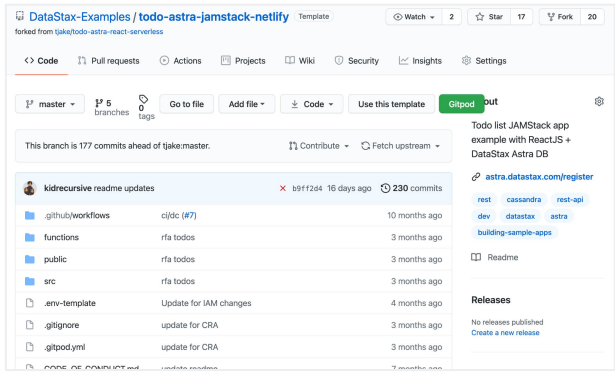
node

Maven

Katacoda katacoda.com/datastax



Katacoda



GitHub

2 Complete Workshops Labs

datastax.com/workshops

3 Become a Jedi Master of Astra

JOIN OUR ASTRA DB BUILD-A-THON HACK!

📍 3 months, 3 rounds of challenges. 📍
Join 1 month, 2 months or all 3

Each month, we'll reveal a fresh new set of challenges you can partake in.

All you have to do is have Astra DB as your backend.

USD$41,000 worth of prizes

➡️ **REGISTER – buildathonhack.com**

- Showcase & explain Quarkus, how it enables modern Java development & the Kubernetes-native experience
- Introduce familiar Spring concepts, constructs, & conventions and how they map to Quarkus
- Equivalent code examples between Quarkus and Spring as well as emphasis on testing patterns & practices
- Chapters devoted to
  - Why the need for Quarkus in the first place?
  - Getting started
  - RESTful applications
  - Persistence
  - Event-driven services
  - Cloud environments, containers, and Kubernetes

https://red.ht/quarkus-spring-devs

- Create a Quarkus Serverless Project
  - Run Serverless Functions Locally
  - Test Serverless Functions Continuously
  - Deploy Functions to a Knative Service on OpenShift
- Make Serverless Functions Run Faster With GraalVM
- Make Portable Functions Across Serverless Platforms
  - Deploy a Quarkus Funqy Application to AWS Lambda
- Bind CloudEvents on Knative With Quarkus Serverless Functions

https://dzone.com/refcardz/getting-started-with-quarkus-serverless-functions

Try Cassandra+Quarkus

- Create your quarkus + cassandra app (code.quarkus.io or running the following):

```
$ mvn io.quarkus:quarkus-maven-plugin:2.7.5.Final:create \
  -DprojectGroupId=io.quarkus.astra \
  -DprojectArtifactId=quarkus-astra-demo \
  -DprojectVersion=1.0.0 \
  -DclassName="io.quarkus.astra" \
  -Dextensions="resteasy-reactive, resteasy-reactive-jackson, micrometer-registry-prometheus, smallrye-openapi,
smallrye-health, cassandra-quarkus-client"

$ cd quarkus-astra-demo
$ ./mvnw clean quarkus:dev
```

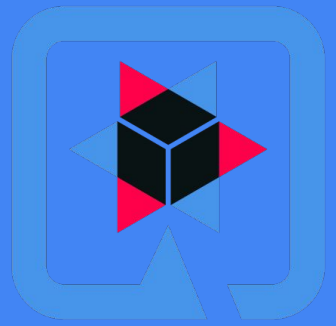
- Stand up your Astra free database (astra.datastax.com)
- Check out https://k8ssandra.io

```
quarkus.cassandra.cloud.secure-connect-bundle=<path>/secure-connect-bundle.zip
quarkus.cassandra.auth.username=<user>
quarkus.cassandra.auth.password=<pw>
```

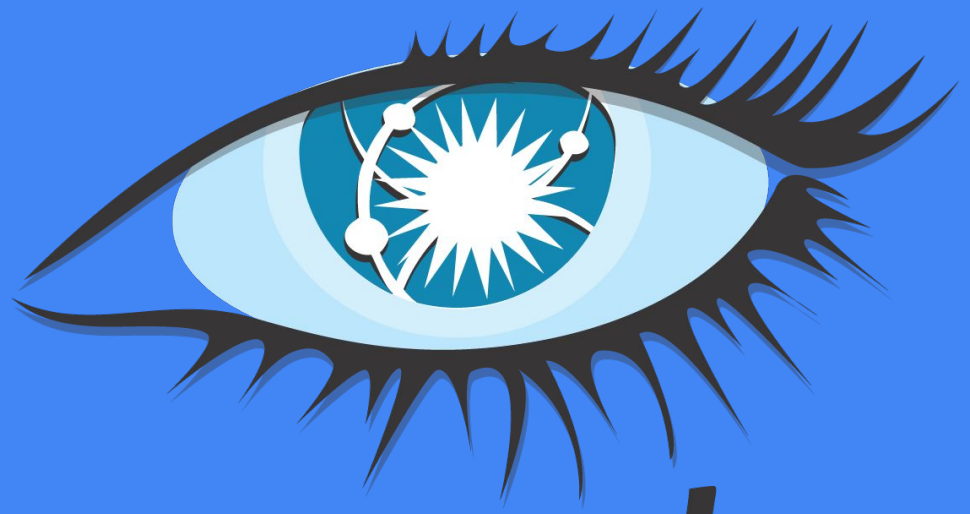
- Get coding + see docs for more info and try the Quarkus + Cassandra workshop

https://quarkus.io/guides/cassandra
https://github.com/datastaxdevs/workshop-intro-quarkus-cassandra/

DataStax



QUARKUS



cassandra

Thank You!

Try Astra + Quarkus!