Week 3: App. Development

Creating CRUD backend Services

Cassandra Cloud-Native Workshop Series

Building Cloud-Native apps with Cassandra Expertise

The Crew

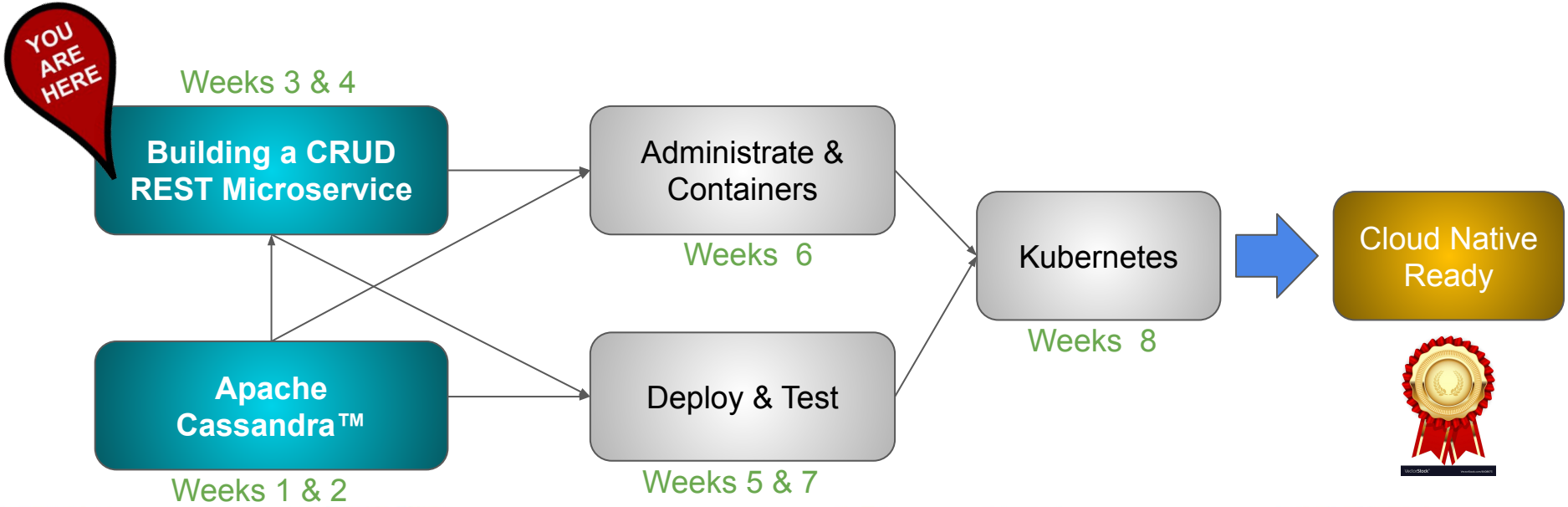
Thank you !

- Registrations as of now : 11k

- Week 1
  - Numbers of views : 17k
  - Numbers of people done with exercises : ~1800

- Week 2
  - Numbers of views : 8.5k
  - Numbers of people done with exercises : ~600

Workshops Series = Not only Cassandra



What we will cover:

Application Development **CRUD**

1. Housekeeping
2. Demo & Use Case Definition
3. Connectivity to Cassandra
4. Execute Queries and Statements
5. Parsing Results and Mappings
6. Spring Framework (Java)

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HouseKeeping

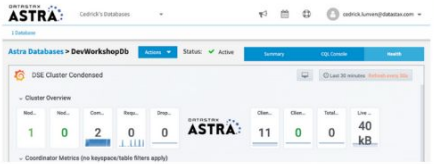
- **Pre-requisites, we expect you:**
  - To have already created an Astra instance (week 1)
  - To have knowledge with Cassandra Data Modelling (week 2)
  - To know basics of **one** of the following languages:

- **You don't have to install anything**

Livestreams

YouTube

Twitch



Astra.datastax.com

cassandra

Live Questions

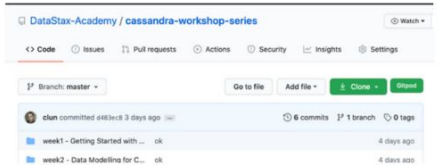
YouTube

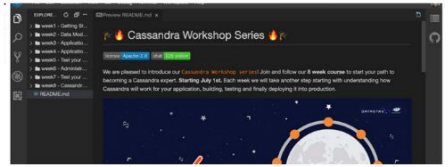
Discord

GitHub

Materials & Help

DATASTAX COMMUNITY





Gitpod

MATERIALS → bit.ly/CassandraWorkshopMaterials

DATASTAX + Apache Cassandra

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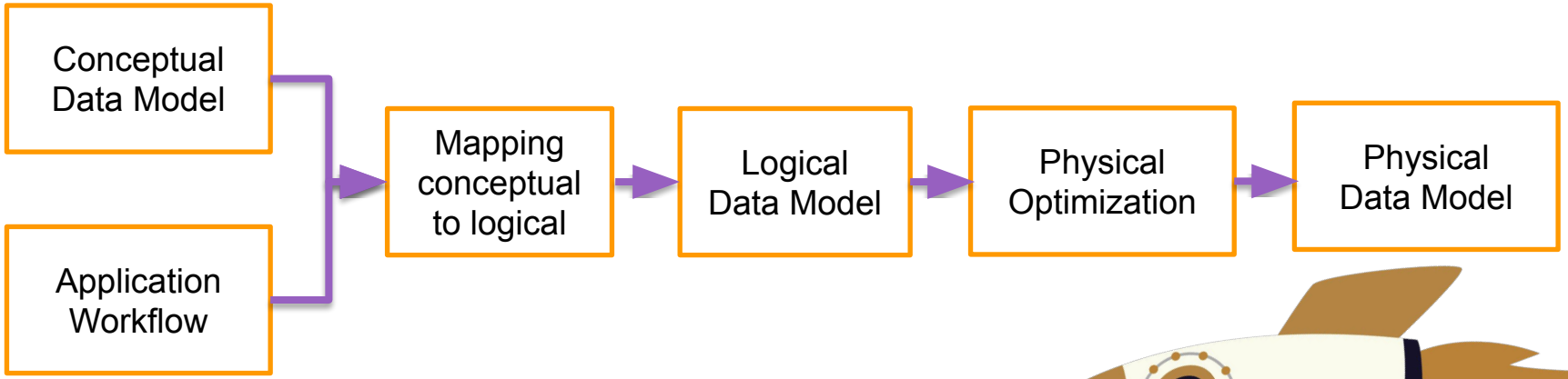
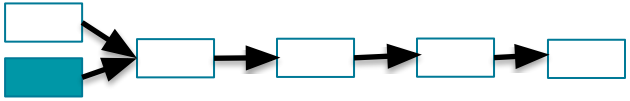
DATASTAX + Apache Cassandra

Designing your data model

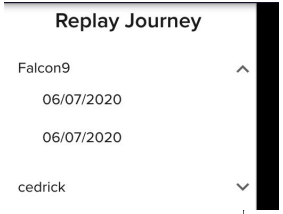


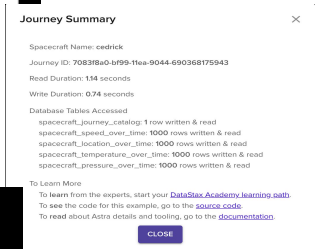
#1 Application Workflow

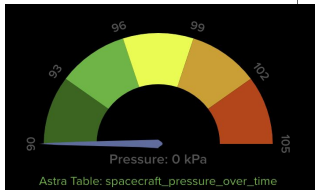


- **Space crafts catalog queries**
  - Look up all of the journeys for a spacecraft
  - Look up the state of a journey
  - Create a new journey

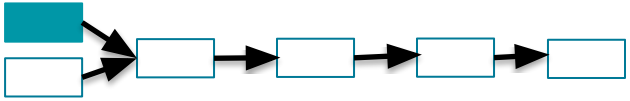
- **Sensor readings queries :** Speed, Pressure, Temperature, Location
  - Save readings over time
  - Analyze each dimension independently
  - Analyze data per journey
  - Less than 100.000 records per journey per dimension

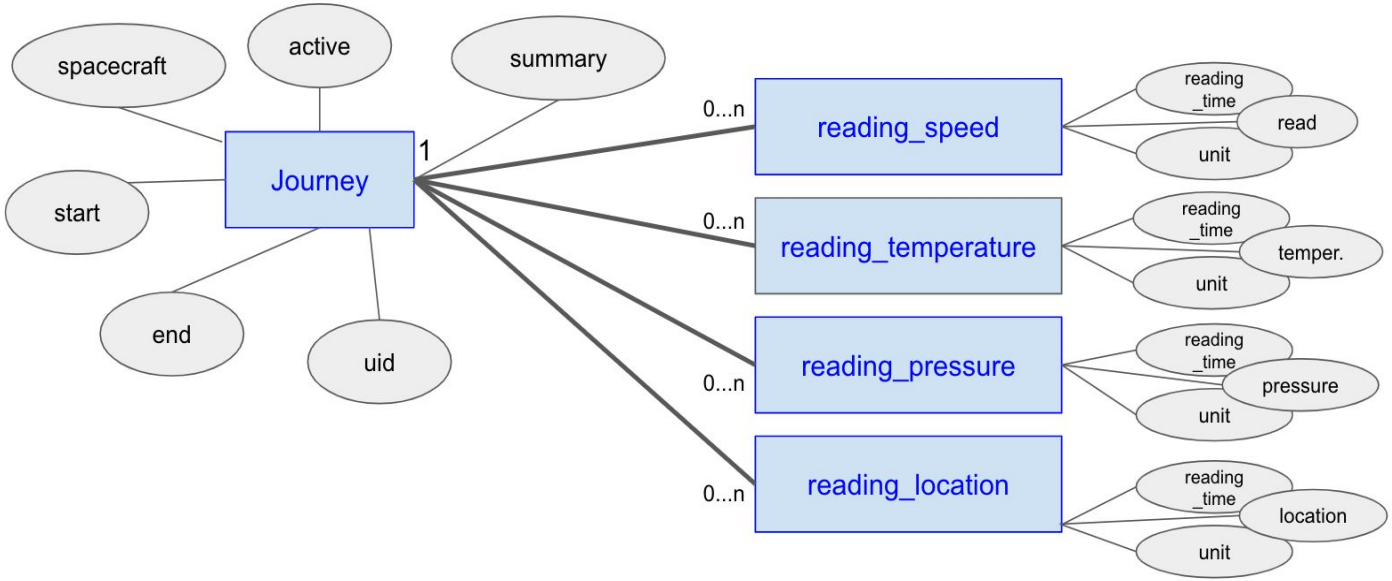




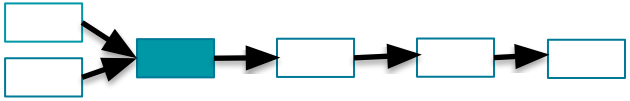


#1 Conceptual Data Model





#2 Map to Logical Data Model



spacecraft_temperature_over_time

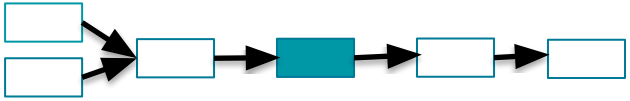
spacecraft_location_over_time

spacecraft_journey_catalog

spacecraft_speed_over_time

spacecraft_pressure_over_time

#3 Logical Data Model

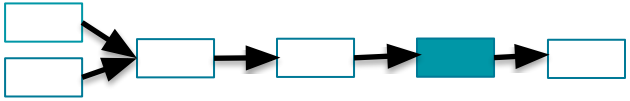


spacecraft_journey_catalog	
spacecraft_name	K
journey_id	C ↓
start	
end	
active	
summary	

spacecraft_temperature_over_time	
spacecraft_speed_over_time	
spacecraft_name	K
journey_id	K
reading_time	C ↓
speed	
speed_unit	

spacecraft_location_over_time	
spacecraft_pressure_over_time	
spacecraft_name	K
journey_id	K
reading_time	C ↓
pressure	
pressure_unit	

#4 Physical Data Model



spacecraft_journey_catalog

spacecraft_name	text
journey_id	timeuuid
start	timestamp
end	timestamp
active	boolean
summary	text

spacecraft_temperature_over_time

spacecraft_location_over_time

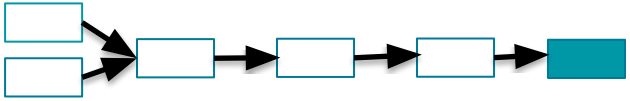
spacecraft_speed_over_time

spacecraft_name	text
journey_id	timeuuid
reading_time	timestamp
speed	double
speed_unit	text

spacecraft_pressure_over_time

spacecraft_name	text
journey_id	timeuuid
reading_time	timestamp
pressure	double
pressure_unit	text

#5 CQL DDL



```
CREATE TABLE IF NOT EXISTS spacecraft_journey_catalog
(
  spacecraft_name  text,
  journey_id       timeuuid,
  start            timestamp,
  end              timestamp,
  active           boolean,
  summary          text,
  PRIMARY KEY ((spacecraft_name), journey_id))
  WITH CLUSTERING ORDER BY (journey_id desc);
```

```
CREATE TABLE IF NOT EXISTS
spacecraft_speed_over_time  (
  spacecraft_name  text,
  journey_id       timeuuid,
  speed            double,
  reading_time     timestamp,
  speed_unit       text,
  PRIMARY KEY ((spacecraft_name,
                  journey_id), reading_time))
  WITH CLUSTERING ORDER BY (reading_time DESC);
```

Exercise 1

NOTEBOOK: "Spacecraft.tar"

DataStax Studio | CCNDW - Week3 | cedrick.lunven@datasta... | Schema

Language: **Markdown**

Welcome to `Cassandra Cloud Native Workshop Series` WEEK 3

This week we start coding.
This notebook will help you create the required tables and data but also make you check that the databases has been updated after coding

Language: **Markdown**

Space Flight Catalog Data Model

In this example, our business requires that we track each spacecraft journey and store the vital signs.
We'll use this data to optimize the onboard conditions and predict when it might be time for a new model.
We know that our data is going to come in at high rates due to the IoT nature of the use case and also grow over time because of the time-series structure of the information.

We'll design five tables to handle the basics:

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DataStax Drivers Features





Connectivity

- Token & Datacenter Aware
- Load Balancing Policies
- Retry Policies
- Reconnection Policies
- Connection Pooling
- Health Checks
- Authentication | Authorization
- SSL

Query

- CQL Support
- Schema Management
- Sync/Async/Reactive API
- Query Builder
- Compression
- Paging

Parsing Results

- Lazy Load
- Object Mapper
- Spring Support
- Paging

Install Drivers

Maven

```
<dependency>
   <groupId>com.datastax.oss</groupId>
   <artifactId>java-driver-core</artifactId>
   <version>4.7.2</version>
</dependency>
```

Java

4.5.2 npm

```
npm install cassandra-driver
```

node js

3.24.0 python Package Index

```
pip install cassandra-driver
```

python

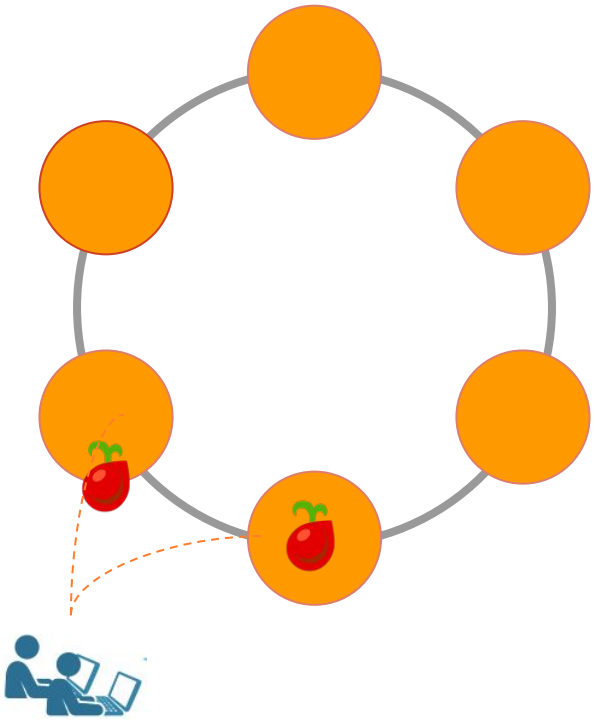
nuget v3.15.0

```
Install-Package CassandraCSharpDriver -Version 3.15.0
```

C#

Contact Points

- Only one necessary
- Unless that node is down
- More are good



Connectivity to Cassandra

```java
CqlSession cqlSession = CqlSession.builder()
 .addContactPoint(new InetSocketAddress("127.0.0.1", 9042))
 .withKeyspace("killrvideo")
 .withLocalDatacenter("dc1")
 .withAuthCredentials("U","P")
 .build();
```

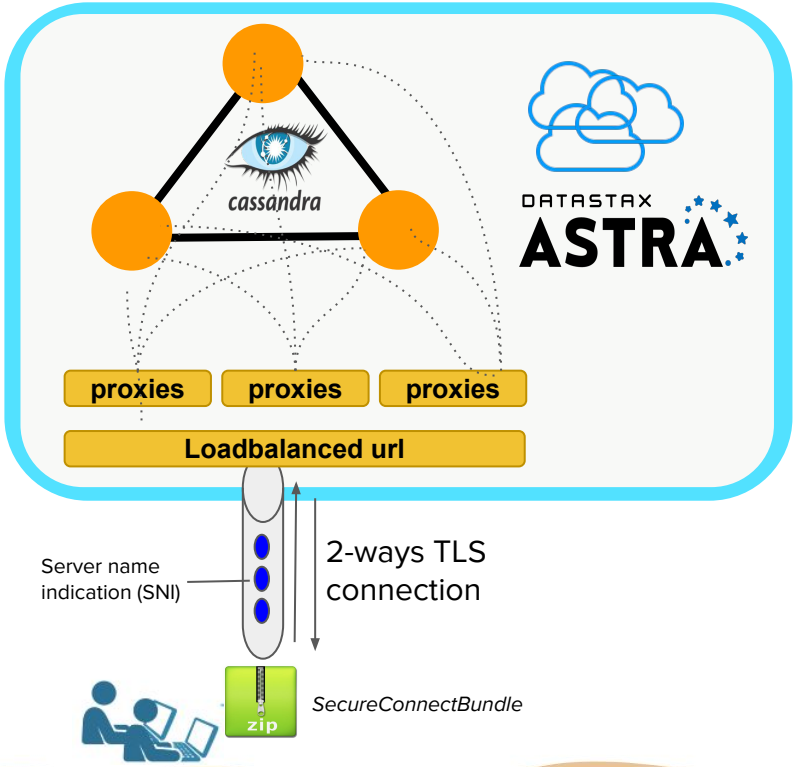
```node.js
const client = new cassandra.Client({
  contactPoints: ['127.0.0.1'],
  localDataCenter: 'dc1',
  keyspace: 'killrvideo',
  credentials: { username: 'U', password: 'P' }
});
```

```python
uth_provider = PlainTextAuthProvider(
   username='U', password='P')
cluster = Cluster(['127.0.0.1'],
  auth_provider=auth_provider, protocol_version=2)
session = cluster.connect('killrvideo')
```

```c#
Cluster cluster = Cluster.Builder()
.AddContactPoint("127.0.0.1")
.WithCredentials("U", "P")
.Build();
session = cluster.Connect("killrvideo");
```

Contact Points...with ASTRA

- ***SecureConnectBundle*** **contains certificate allowing strong auth 2 ways TLS**
- **Same behaviour (retry, healthcheck, load-balancing) using SNI.**
- **<u>No</u> Single point of failure (*spof*)**



Connection to Cassandra ...with ASTRA

```java
CqlSession cqlSession = CqlSession.builder()
 .withCloudSecureConnectBundle(Paths.get("secure.zip"))
 .withAuthCredentials("U","P")
 .withKeyspace("killrvideo")
 .build();
```

```node
const client = new cassandra.Client({
  cloud: { secureConnectBundle: 'secure.zip' },
  credentials: { username: 'u', password: 'p' }
});
```

```python
auth_provider = PlainTextAuthProvider(
   username='U', password='P')
cluster = Cluster(
   Cloud ={ Secure_connect_bundle: 'secure.zip'},
   auth_provider=auth_provider, protocol_version=2)
session= cluster.connect('killrvideo')
```

```dotnet
var cluster = Cluster.Builder()
 .WithCloudSecureConnectionBundle("secure.zip")
 .WithCredentials("u", "p")
 .Build();
var session = cluster.Connect("killrvideo");
```

Important about a Session/Client

- **S**tateful object handling communications with each node
- **S**hould be **unique** in the Application (*Singleton*)
- **S**hould be **closed** at application shutdown (*shutdown hook*) in order to free opened TCP sockets (*stateful*)

```
Java:       cqlSession.close();
Python:     session.shutdown();
Node:       client.shutdown();
CSharp:     IDisposable
```

Exercise 2

Connect to Cassandra”

✨ Application Development CRUD and Backend Services ✨

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Recording LIVESTREAM APAC, EMEA	July 16th 12:30 IST
Homeworks	here

```java
@Test
@DisplayName("Test connectivity to Astra explicit values")
public void should_connect_to_Astra() {

    // Given interface is properly populated
    Assertions.assertTrue(new File(DBConnection.SECURE_CONNECT_BUNDLE).exists(),
                "File '" + DBConnection.SECURE_CONNECT_BUNDLE + "' has not been found
                + "To run this sample you need to download the secure bundle file fro
                + "More info here:");

    // When connecting to ASTRA
    try (CqlSession cqlSession = CqlSession.builder()
            //.addContactPoint(new InetSocketAddress("127.0.0.1", 9042))
            .withCloudSecureConnectBundle(Paths.get(DBConnection.SECURE_CONNECT_BUNDL
            .withAuthCredentials(DBConnection.USERNAME, DBConnection.PASSWORD)
            .withKeyspace(DBConnection.KEYSPACE)
            .build()) {

        // Then connection is successfull
        LOGGER.info(" + [OK] - Connection Established to Astra with Keyspace {}",
                cqlSession.getKeyspace().get());
    }
}
```

MATERIALS → bit.ly/CassandraWorkshopMaterials

DATASTAX + Apache Cassandra

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Execute statements

```java
Statement statement = SimpleStatement
   .builder("select * from t1 where c1 = ?")
   .addPositionalValue(5)
cqlSession.execute(stmt);
```

```node
client.execute('select * from t1 where c1 = ?', [5]);
```

```python
session.execute("select * from t1 where c1 = %s", 5);
```

```dotnet
var statement = new SimpleStatement("select * from t1
  where c1 = ?"", 5);
session.Execute(statement);
```

Prepared and Bound Statements

TODO

```
Statement statement = SimpleStatement
   .builder("select * from t1 where c1 = ?")
   .addPositionalValue(5)
cqlSession.execute(stmt);
```

TODO

```
client.execute('select * from t1 where c1 = ?', [5]);
```

TODO

```
session.execute("select * from t1 where c1 = %s", 5);
```

TODO

```
var statement = new SimpleStatement("select * from t1
  where c1 = ?""", 5);
session.Execute(statement);
```

CRUD Repository Pattern

```
public interface IRepository<ID, T> {
   T findById(ID id);
    void save(T entity);
    void delete(ID id);
    void update(T entity);
   Iterable<T> list()/findAll();
}
```

Exercise 3

CREATE, READ,UPDATE

a **Create a Journey (create)**

b **Take Off (update)**

c **Telemetry (save, batch)**

d **Landing (update)**

✨ Application Development CRUD and Backend Services ✨

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ResultSet and Rows

- **ResultSet** is the object returned for executing query. It contains **ROWS** (data) and **EXECUTION INFO**.

- **ResultSet** is **iterable** and as such you can navigate from row to row.

- Results are **always paged** for you (avoiding memory and response time issues)

Parsing ResultSet

TODO

```
// We know there is a single row (eg: count)
Row singleRow = resultSet.one();

// We know there are not so many results we can get all (fetch all pages)
List<Row> allRows = resultSet.all();

// Browse iterable
for(Row myRow : resultSet.iterator()) {
   // .. Parsing rows
}

// Use Lambda
rs.forEach(row -> { row.getColumnDefinitions(); });

// Use for LWT
boolean isQueryExecuted = rs.wasApplied();
```

ResultSet

TODO

```
Statement statement = SimpleStatement
   .builder("select * from t1 where c1 = ?")
   .addPositionalValue(5)
cqlSession.execute(stmt);
```

TODO

```
client.execute('select * from t1 where c1 = ?', [5]);
```

TODO

```
session.execute("select * from t1 where c1 = %s", 5);
```

TODO

```
var statement = new SimpleStatement("select * from t1
  where c1 = ?"", 5);
session.Execute(statement);
```

Parsing Rows

TODO

```
// Sample row
Row row = resultSet.one();

// Check null before read
Boolean isUsernNameNull = row.isNull("userName");

// Reading Values from row
String userName1 = row.get("username", String.class);
String userName2 = row.getString("username");
String userName3 = row.getString(CqlIdentifier.fromCql("username"));

// Tons of types available
row.getUuid("userid");
row.getBoolean(”register");
row.getCqlDuration(”elapsed");
…
```

Parsing Rows

TODO

```
Statement statement = SimpleStatement
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cqlSession.execute(stmt);
```

TODO

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```

TODO

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```

TODO

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var statement = new SimpleStatement("select * from t1
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Object Mapping

TODO

Exercise 4

Read and Parse Results

✨ Application Development CRUD and Backend Services ✨

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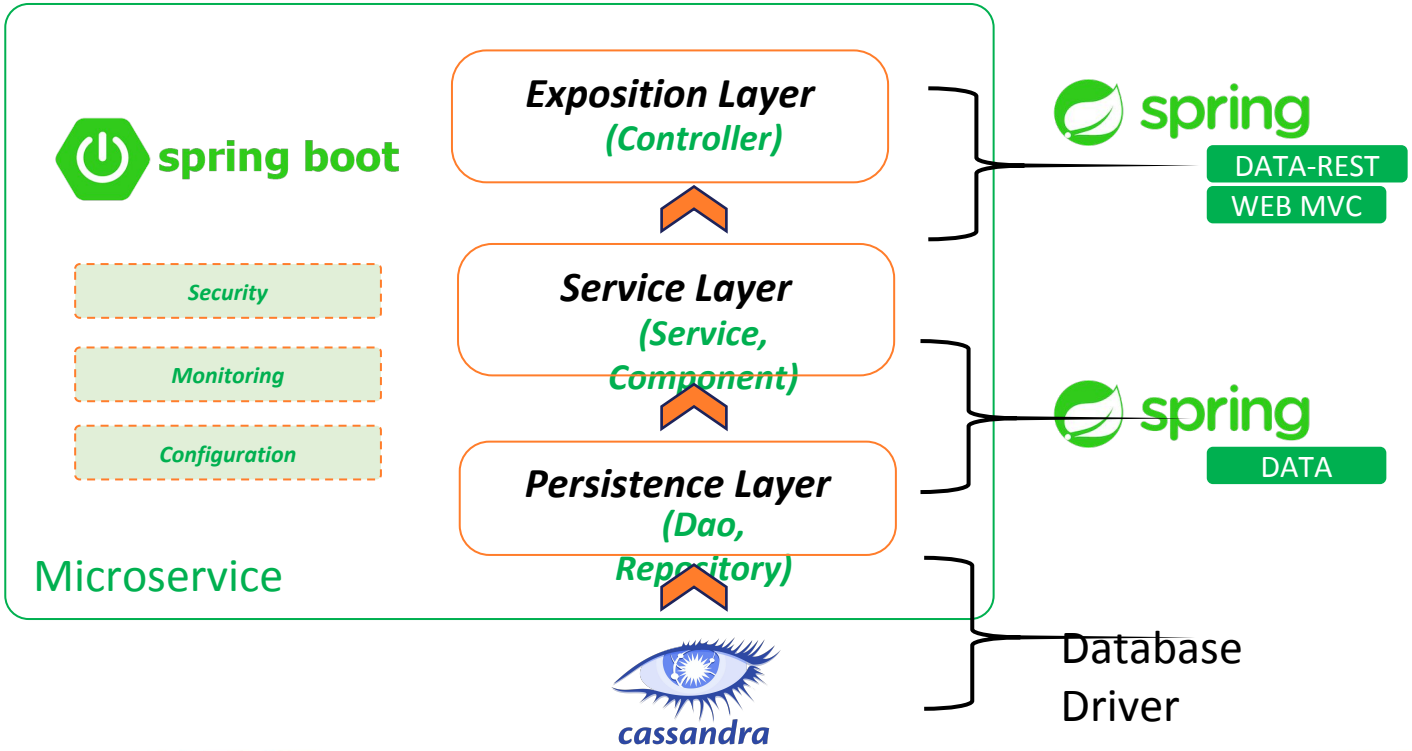
3. Connectivity to Cassandra
4. Execute Queries and Statements
5. Parsing Results and Mappings
6. Spring Framework (Java)


spring boot
Exposition Layer
(Controller)
Service Layer
(Service, Component)
Persistence Layer
(Dao, Repository)
Security
Monitoring
Configuration
Microservice
cassandra
spring
DATA-REST
WEB MVC
spring
DATA
Database
Driver

Convention over configuration

```yaml
# ---------------------------------------------------
# Full Convention
# ---------------------------------------------------
spring:
  data:
    cassandra:
      contact-points: localhost
      port: 9042
      local-datacenter: dc1
      keyspace-name: betterbotz
      schema-action: create-if-not-exists
```

```java
@Configuration
public class SpringDataCassandraJavaConfig
                extends AbstractCassandraConfiguration
                implements CqlSessionBuilderCustomizer {

    @Override
    protected String getKeyspaceName() {
        return keyspaceName;
    }

    @Override
    protected String getLocalDataCenter() {
        return localDataCenter;
    }
```

Entity and Repository

```
@Entity
public class Task {

@Id
@PrimaryKeyColumn(
    name = "uid", ordinal = 0,
    type = PrimaryKeyType.PARTITIONED)
private UUID uid;

private String title;

private boolean complete;

private int offset;

private Task() {}

//...
```

```
public interface TaskRepository extends
CassandraRepository<Task, UUID> {

@Query("SELECT * FROM todos_tasks WHERE uid=?0" )
Optional<TaskSpringData> findByTaskByIdO(UUID
taskid);


}
```

Homework Week 3

1. **Learn**
    a. Keep working on DS220 (this is long)
    b. Visit https://github.com/datastax-examples = tons of sample.

2. **Practice**
    a. Finish workshop exercises if needed following github.
    b. Try to run it on your laptop
    c. Bonus with docker-compose make it connect to local instance

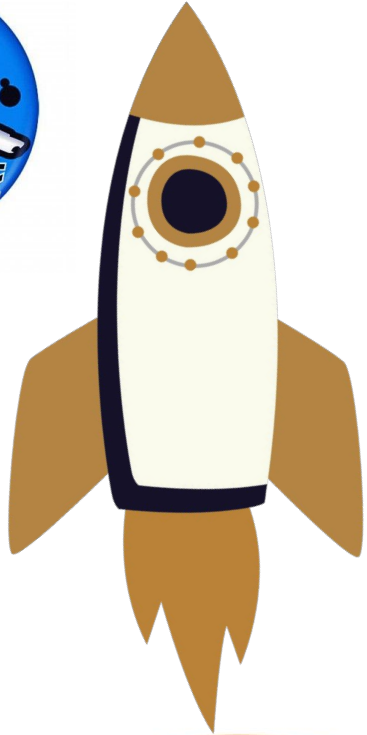
3. **Validation form of the week :** https://forms.gle/mtdzFoVGSoZ2vYa36

Engage !

Share with us you Cassandra use cases !

Share with your vision and future of Cloud Native

Share what you need to succeed with Cassandra.



Developer Resources

LEARN

- Join academy.datastax.com
- Browse www.datastax.com/dev

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Join community.datastax.com

Ask/answer community user questions - share your expertise

CONNECT

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We are on Youtube - Twitter - Twitch!

MATERIALS

Slides and code for this course are available at https://github.com/DataStax-Academy/cassandra-workshop-series

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Thank You