DATASTAX ACADEMY

DS220

03: Additional Apache Cassandra™ CQL Functionality

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Objectives

Over the next few sections, we will cover:

- Why you should know these other CQL features before you create your data model
- How and why to use collection data types
- How UDTs can be implemented for a more flexible model
- Counter columns and their implications
- How UDFs and UDAs can be used together in your data model

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Introduction

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Other Cool CQL Features

Why do you care? Aren't we talking about data modeling?

- Knowing what other functionality there is can factor into your design
- Apache Cassandra™ has additional data types for flexibility
- These include:
  - Collections
  - Counters
  - UDTs
  - UDFs and UDAs

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Why do I care?

These are tools in your arsenal for modeling data!

- Simplifying table design
- Optimize/streamline table functionality
- Store data more efficiently
- Might change table designs completely

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Collections

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Collection Columns

Group and store data together in a column

- Collection columns are multi-valued columns
- Designed to store a small amount of data
- Retrieved in its entirety
- Cannot nest a collection inside another collection—unless you use FROZEN
  - More on FROZEN to come!

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SET Collection Type

Creating and inserting with SET

- Typed collection of unique values
- Stored unordered, but retrieved in sorted ordered
- SET example:

```
CREATE TABLE users (
   id text PRIMARY KEY,
   fname text,
   lname text,
   emails set<text>
);

INSERT INTO users (id, fname, lname, emails)
   VALUES ('cass123', 'Cassandra', 'Dev', {'cass@dev.com',
'cassd@gmail.net'});
```

LIST Collection Type

Altering a table and updating using LIST

- Like SET—collection of values in same cell
- Do not need to be unique and can be duplicated
- Stored in a particular order
- LIST example:

```
ALTER TABLE users ADD freq_dest list<text>;

UPDATE users SET freq_dest= ['Berlin', 'London',
'Paris']
    WHERE id = 'cass123';
```

Collection Column Syntax, Cont.

Creating and inserting with MAP

- Typed collection of key-value pairs—name and pair of typed values
- Ordered by unique keys
- MAP example:

```
ALTER TABLE users ADD todo map<timestamp, text>;
```

```
UPDATE users SET todo = { '2018-1-1' : 'create database', '2018-1-2' :
'load data and test' : '2018-2-1’ : 'move to production '}
   WHERE id = 'cass123';
```

Using Frozen in a Collection

- If you want to nest datatypes, you have to use FROZEN
- Using FROZEN in a collection will serialize multiple components into a single value
- Values in a FROZEN collection are treated like blobs
- Non-frozen types allow updates to individual fields

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UDTs

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User Defined Types (UDTs)

Attach multiple data fields to a column

- User-defined types group related fields of information
- User-defined types (UDTs) can attach multiple data fields, each named and typed, to a single column
- Can be any datatype including collections and other UDTs
- Allows embedding more complex data within a single column

UDT Example

Creating the Types

```
CREATE TYPE address (
  street text,
  city text,
  zip_code int,
  phones set<text>
);

CREATE TYPE full_name (
  first_name text,
  last_name text
);
```

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Using Created UDTs

Using the newly created types in a table definition

```
CREATE TABLE users (
  id uuid,
 name frozen <full_name>,
 direct_reports set<frozen <full_name>>,
 addresses map<text, frozen <address>>,
 PRIMARY KEY ((id))
);
```

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Exercise 3.1: User Defined Types (UDTs)

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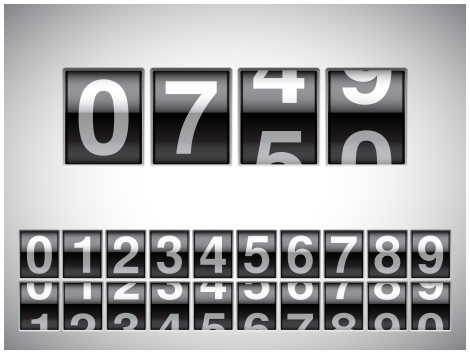
Counters

Counter Datatype

What is a counter?

- Column used to store a 64-bit signed integer
- Changed incrementally—incremented or decremented
- Values are changed using UPDATE
- Need specially dedicated tables—can only have primary key and counter columns
  - Can have more than one counter column



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Counter Example

Allow queries for number of videos there are per tag

```
CREATE TABLE moo_counts (
  cow_name text,
  moo_count counter,
  PRIMARY KEY((cow_name))
);

UPDATE moo_counts
SET moo_count = moo_count + 8
WHERE cow_name = 'Betsy';
```

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Counter Considerations

Some things to be aware of

- Distributed system can cause consistency issues with counters in some cases
- Cannot INSERT or assign values—default value is “0”
- Must be only non-primary key column(s)
- Not idempotent
- Must use UPDATE command—DataStax Enterprise rejects USING TIMESTAMP or USING TTL to update counter columns
- Counter columns cannot be indexed or deleted

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Exercise 3.2: Using Counters in CQL

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UDFs and UDAs

User Defined Functions (UDFs)

Creating UDFs

- Write custom functions using Java and JavaScript
- Use in SELECT, INSERT, and UPDATE statements
- Function are only available within the keyspace where it is defined

Creating UDFs Syntax

- Enabled by changing the following settings in the cassandra.yaml file
  - Java: Set enable_user_defined_functions to true
  - Javascript and other custom languages:
    Set enable_scripted_user_defined_functions to true

User Defined Aggregates (UDAs)

- DataStax Enterprise allows users to define aggregate functions
- Functions are applied to data stored in a table as part of a query result
- The aggregate function must be created prior to its use in a SELECT statement
- Query must only include the aggregate function itself—no additional columns

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Creating UDF Example

```
CREATE OR REPLACE
    FUNCTION avgState ( state tuple<int,float>, val float )
    CALLED ON NULL INPUT
    RETURNS tuple<int,float>
    LANGUAGE java
    AS 'if (val !=null) {
      state.setInt(0, state.getInt(0)+1);
      state.setFloat(1, state.getFloat(1)+val.floatValue());
    }
    return state;';

CREATE OR REPLACE
    FUNCTION avgFinal ( state tuple<int,float> )
    CALLED ON NULL INPUT
    RETURNS float
    LANGUAGE java
    AS 'float r = 0;
    if (state.getInt(0) == 0) return null;
      r = state.getFloat(1);
      r/= state.getInt(0);
    return Float.valueOf(r);';
```

Create UDA Example

```
CREATE AGGREGATE
    IF NOT EXISTS average ( float )
    SFUNC avgState
    STYPE tuple<int,float>
    FINALFUNC avgFinal
    INITCOND (0,0);
```

Querying with a UDF and a UDA

- The state function is called once for each row
- The value returned by the state function becomes the new state
- After all rows are processed, the optional final function is executed with the last state value as its argument
- Aggregation is performed by the coordinator

```
select average(avg_rating) from videos where release_year = 2002 ALLOW FILTERING;
select average(avg_rating) from videos where title = 'Planet of the Apes' ALLOW FILTERING;
select average(avg_rating) from videos where mpaa_rating = 'G' ALLOW FILTERING;
select average(avg_rating) from videos where genres contains 'Romance' ALLOW FILTERING;
```