

The Goal:

Become familiar with advanced data types

- **Review and Questions**
- **Collections**
 - **Set**
 - **List**
 - **Map**
- **User Defined Types (UDT)**
- **Counters**



Cassandra vrs other NoSQL DBs

- Columnar Databases
- Document Databases
- Graph Databases
- In-Memory Key-Value Stores

Comparison - Cassandra

- Columnar Databases
 - HBase/Cassandra
- Document Databases
 - CouchDB/MongoDB
- Graph Databases
 - Neo4J
- In-Memory Key-Value Stores
 - Redis
-

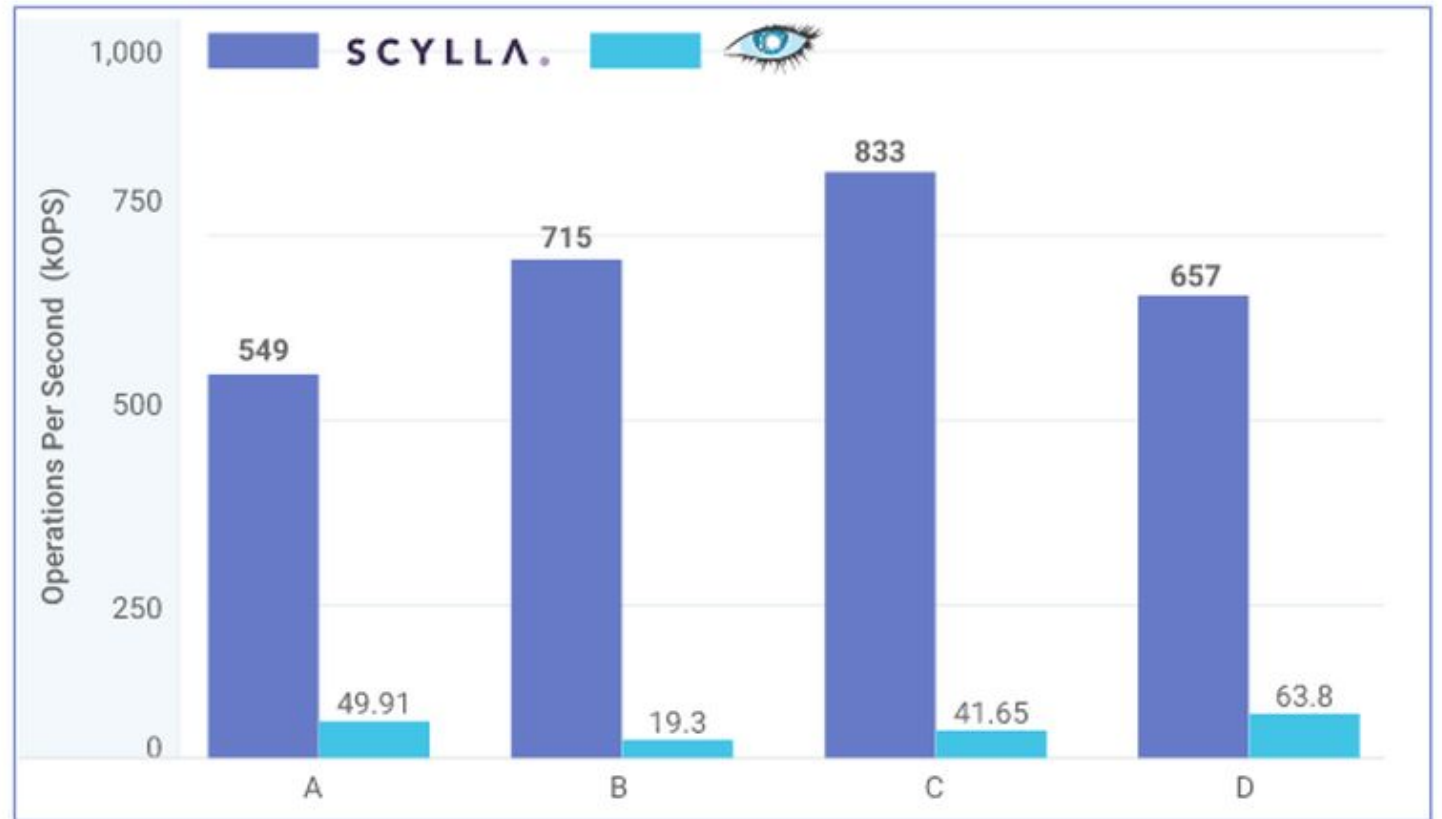
Bottom Line - Cassandra

- SPOF
- Scalable
- Data Compression
- Flexible
- CQL
- Transaction Support
- Flexible

Columnar DB

Cassandra vrs. Scylla DB

- Cousins
- Language



Does and Dont's of Cassandra

- Understand the Cassandra Features
- Understand the Use Case
- Make sure you get the data modeling right

Bad Use Cases

- Tables have multiple access paths
- Sequences are required
- ACID is a requirement
- Aggregates are a requirement
- Joins are a requirement
- Locks are a requirement
- Updates are a requirement
- Transactions

Good Use Cases

- Distributed
- Scaling
- Global
- Writes over Reads
- P2P
- Partitions preferred

Can you link tables?

- No, Cassandra is not an RDBMS
- No Joins or Derived Tables. Keep these things in mind:
 - Design for queries
 - No Joins
 - Denormalization
 - Sorting is done in the table design

When is Hashing Done?

- Hashing is done on write

Secondary Indexes

- <https://pantheon.io/blog/cassandra-scale-problem-secondary-indexes>

Collections - Three Types

I'm a SET with a bunch of unordered



I'm an ordered LIST

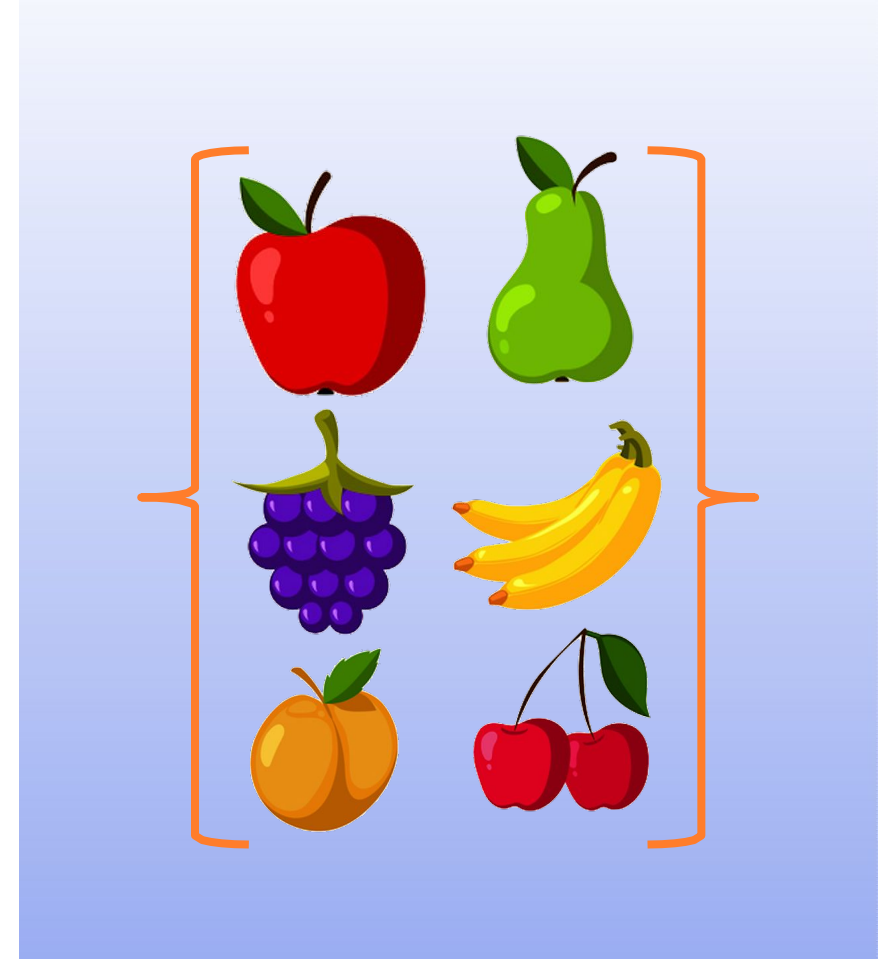
0	1	2	3	4	6
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I'm a MAP of key/value pairs

Key	Value
K1	V1
K2	V2
K3	V3
K4	V4
K5	V5

Example Table with Set

```
CREATE killrvideo.videos (  
  videoid          uuid,  
  userid           uuid,  
  name             text,  
  description       text,  
  location         text,  
  location_type    int,  
  preview_image_location text,  
  tags             set<text>,  
  added_date       timestamp,  
  PRIMARY KEY (videoid)  
);
```



Example Set Operations

```
INSERT INTO killrvideo.videos (videoid, tags)
VALUES(12345678-1234-1234-1234-123456789012,
{'Side-splitter', 'Short'});
```

Insert

```
UPDATE killrvideo.videos
SET tags = {'Dark', 'Sad'}
WHERE videoid = 12345678-1234-1234-1234-123456789012;
```

**Replace
entire set**

```
UPDATE killrvideo.videos
SET tags = tags + {'Enthralling'}
WHERE videoid = 12345678-1234-1234-1234-123456789012;
```

**Add to
set**

Example Table with List

```
CREATE killrvideo.actors_by_video (  
  videoid  uuid,  
  actors   list<text>, // alphabetical list of actors  
  PRIMARY KEY (videoid)  
);
```



Example List Operations

```
INSERT INTO killrvideo.actors_by_video (videoid, actors)
VALUES(12345678-1234-1234-1234-123456789012,
['Adams', 'Baker', 'Cox']);
```

Insert

```
UPDATE killrvideo.actors_by_video
SET actors = ['Arthur', 'Beverly']
WHERE videoid = 12345678-1234-1234-1234-123456789012;
```

Replace entire list

```
UPDATE killrvideo.actors_by_video
SET tags = tags + ['Crawford']
WHERE videoid = 12345678-1234-1234-1234-123456789012;
```

Append

Another Example List Operation

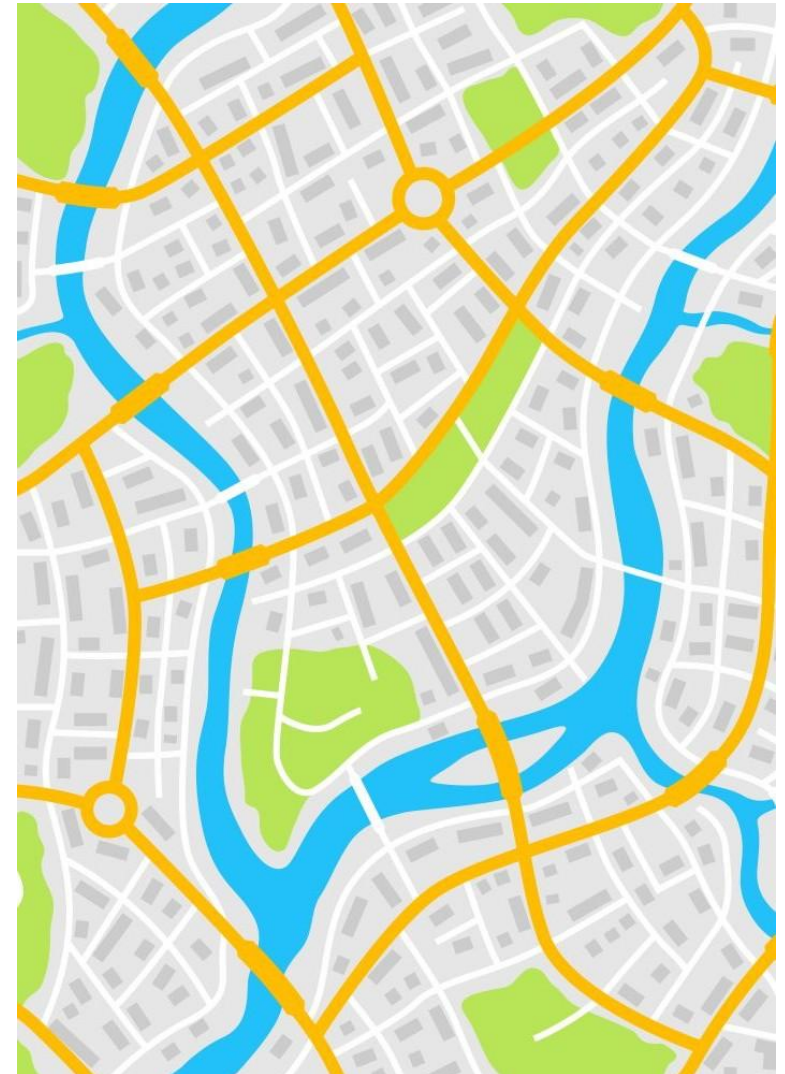
```
UPDATE killrvideo.actors_by_video  
SET actors[1] = 'Brown'  
WHERE videoid = 12345678-1234-1234-1234-123456789012;
```

Replace an element

Note: replacing an element requires a read-before-write, which implies performance penalty.

Example Table with Map

```
CREATE TABLE killrvideo.users(  
  userid      uuid,  
  phone_nos   map<text, text>,  
  PRIMARY KEY (userid)  
);
```



Example Map Operations

```
INSERT INTO killrvideo.users (userid, phone_nos)
VALUES(12345678-1234-1234-1234-123456789012,
{'cell':'867-5309', 'home':'555-1212',
'busi':'800-555-1212'});
```

Insert

```
UPDATE killrvideo.users
SET phone_nos = {'cell':'867-5310', 'office':'555-1212'}
WHERE userid = 12345678-1234-1234-1234-123456789012;
```

Replace entire
map

```
UPDATE killrvideo.users
SET phone_nos = phone_nos + {'desk': '270-555-1213'}
WHERE userid = 12345678-1234-1234-1234-123456789012;
```

Add to map

Example User Defined Type (UDT)

```
CREATE TYPE killrvideo.address(  
  street text,  
  city   text,  
  state  text,  
);
```

```
CREATE TABLE killrvideo.users(  
  userid      uuid,  
  location    address,  
  PRIMARY KEY (userid)  
);
```

Example UDT Operations

```
INSERT INTO killrvideo.users (userid, location)  
VALUES(12345678-1234-1234-1234-123456789012,  
{street:'123 Main', city:'Metropolis', state:'CA'});
```

Insert

```
UPDATE killrvideo.users  
SET location = {street:'234 Elm', city:'NYC', state:'NY'}  
WHERE userid = 12345678-1234-1234-1234-123456789012;
```

Replace entire UDT

```
UPDATE killrvideo.users  
SET location.city = 'Albany'  
WHERE userid = 12345678-1234-1234-1234-123456789012;
```

Replace one UDT field

Another Example UDT Operation

```
SELECT location.city FROM killrvideo.users  
WHERE userid = 12345678-1234-1234-1234-123456789012;
```

Select field

Counters

- **64-bit signed integer**
- **Use-case:**
 - **Imprecise values such as likes, views, etc.**
- **Two operations:**
 - **Increment**
 - **Decrement**
 - **First op assumes the value is zero**

Counter Limitations

- **Cannot be part of primary key**
- **Counters not mixed with other types in table**
- **Value cannot be set**
- **Rows with counters cannot be inserted**
- **Updates are not idempotent**
 - **Counters should *not* be used for precise values**

Example Table with Counter

```
CREATE TABLE killrvideo.video_playback_stats (  
  videoid uuid,  
  views counter,  
  PRIMARY KEY (videoid)  
);
```

Counter Updates

Incrementing a counter:

This format must be
observed

```
UPDATE killrvideo.videos SET views = views + 1  
WHERE videoid = 12345678-1234-1234-1234-123456789012;
```

This can be an
integer value

Decrementing a counter:

Just change the sign

```
UPDATE killrvideo.videos SET views = views - 1  
WHERE videoid = 12345678-1234-1234-1234-123456789012;
```

Counter
Insert
Example?



Pay Attention!
We already said, you
can't INSERT into
counter tables

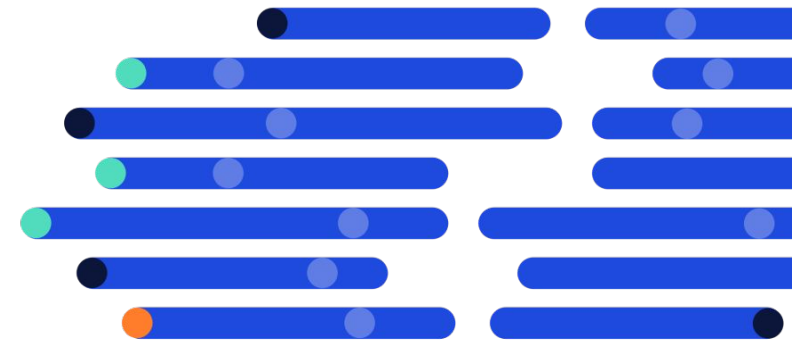
Here's What We Just Did

Used a Collection

- **We saw the** Set **data type in action in KillrVideo**

Used a Counter

- **We incremented a** views **counter in the** video_playback_stats **table**



Now You Know...

Advanced Data Types

- **Collections**
 - **Set**
 - **List**
 - **Map**
- **User Defined Types (UDT)**
- **Counters**

