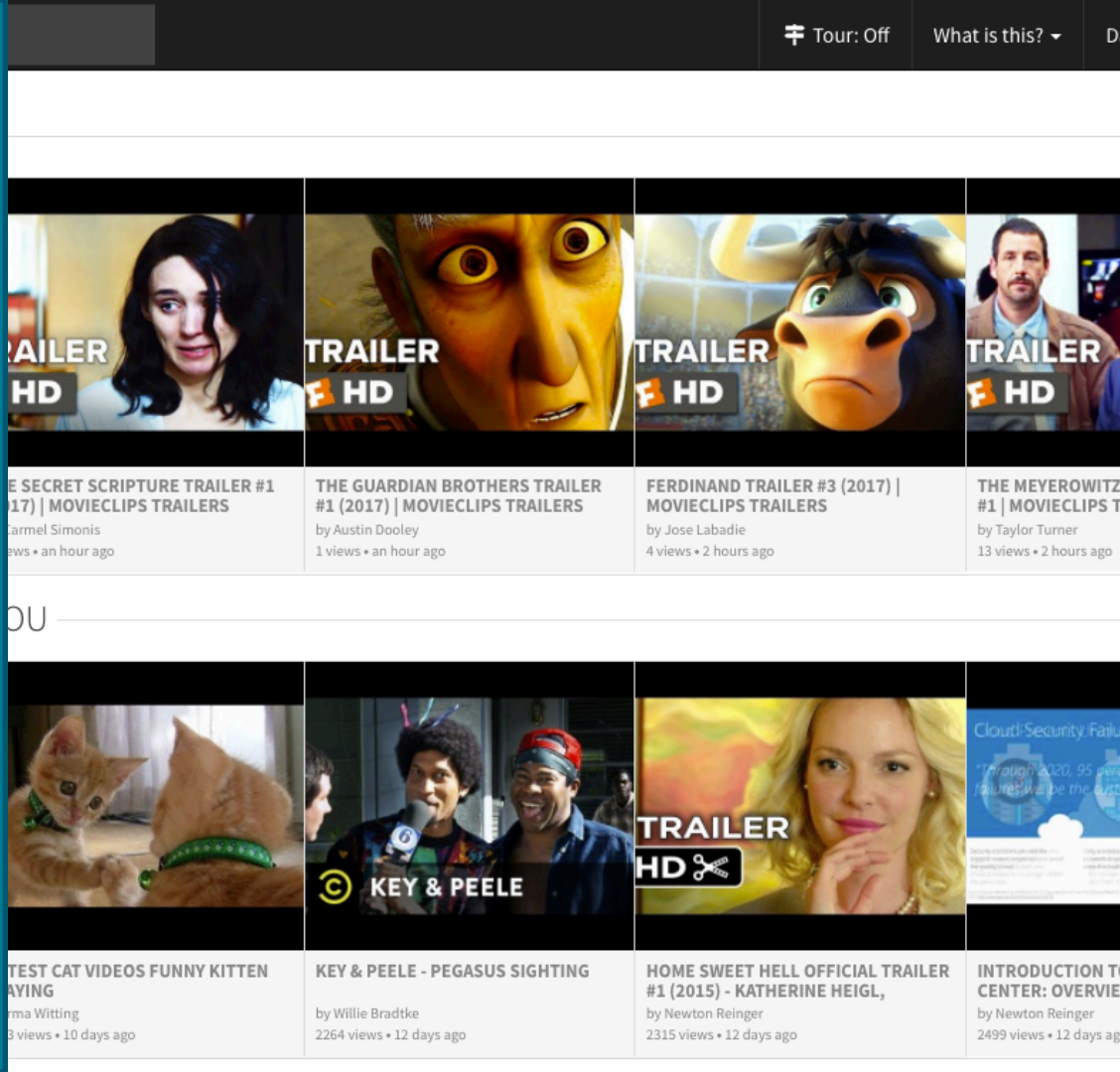
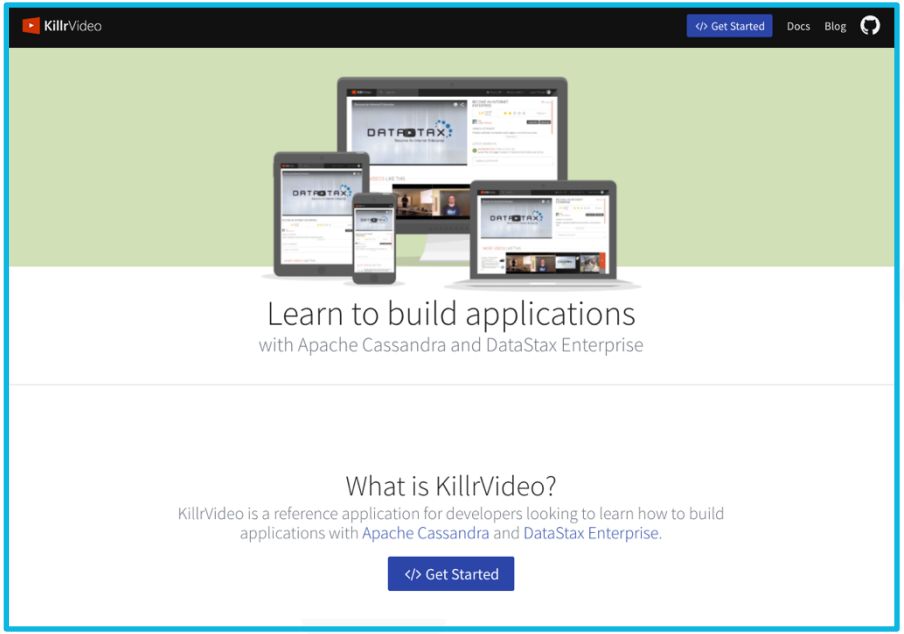
DataStax Developer Days

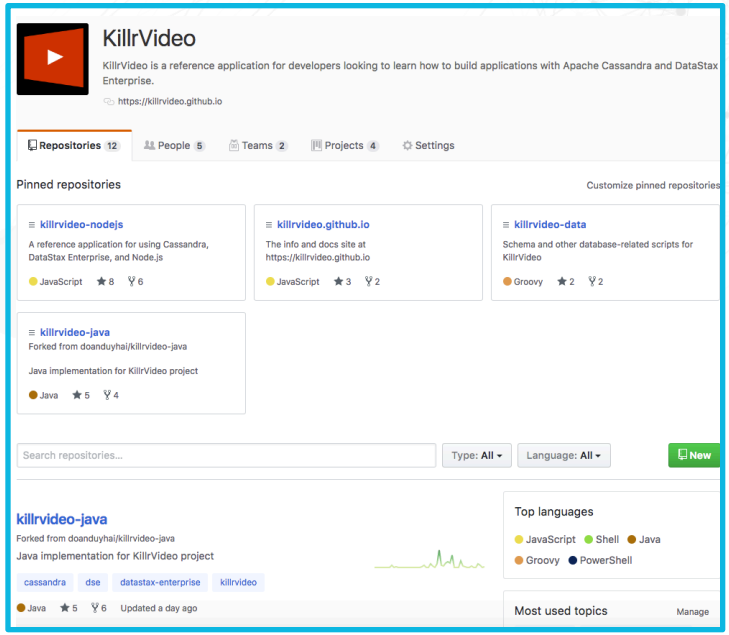
KillrVideo - a video sharing application



KillrVideo-java https://github.com/KillrVideo/killrvideo-java



https://killrvideo.github.io



https://github.com/KillrVideo

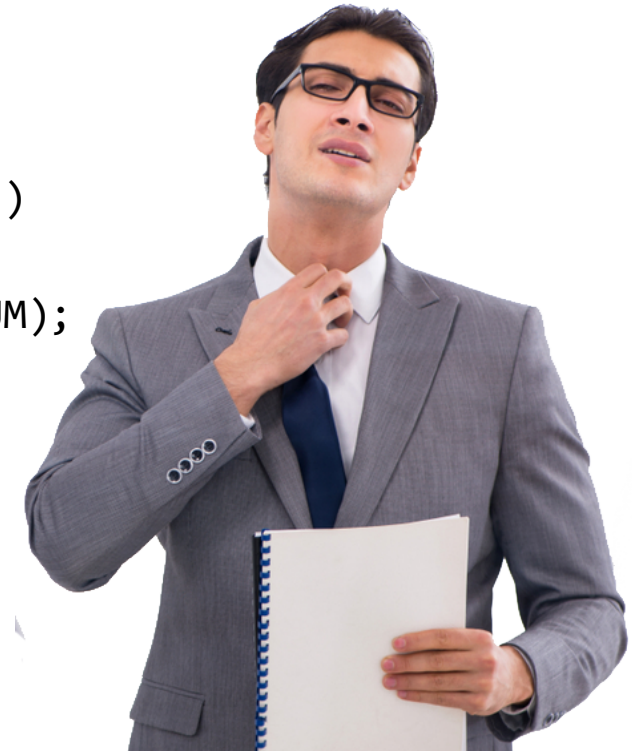
pom.xml
(get the driver)

```
<dependency>
  <groupId>com.datastax.dse</groupId>
  <artifactId>dse-java-driver-core</artifactId>
  <version>1.6.8</version>
</dependency>
```

Maven™

Getting the driver POM Example

```
PreparedStatement createUser = dseSession.prepare(
  QueryBuilder
    .insertInto("killrvideo", usersTableName)
    .value("userid", QueryBuilder.bindMarker())
    .value("firstname", QueryBuilder.bindMarker())
    .value("lastname", QueryBuilder.bindMarker())
    .value("email", QueryBuilder.bindMarker())
    .value("created_date", QueryBuilder.bindMarker())
    .ifNotExists() // use lightweight transaction
  ).setConsistencyLevel(ConsistencyLevel.LOCAL_QUORUM);
```



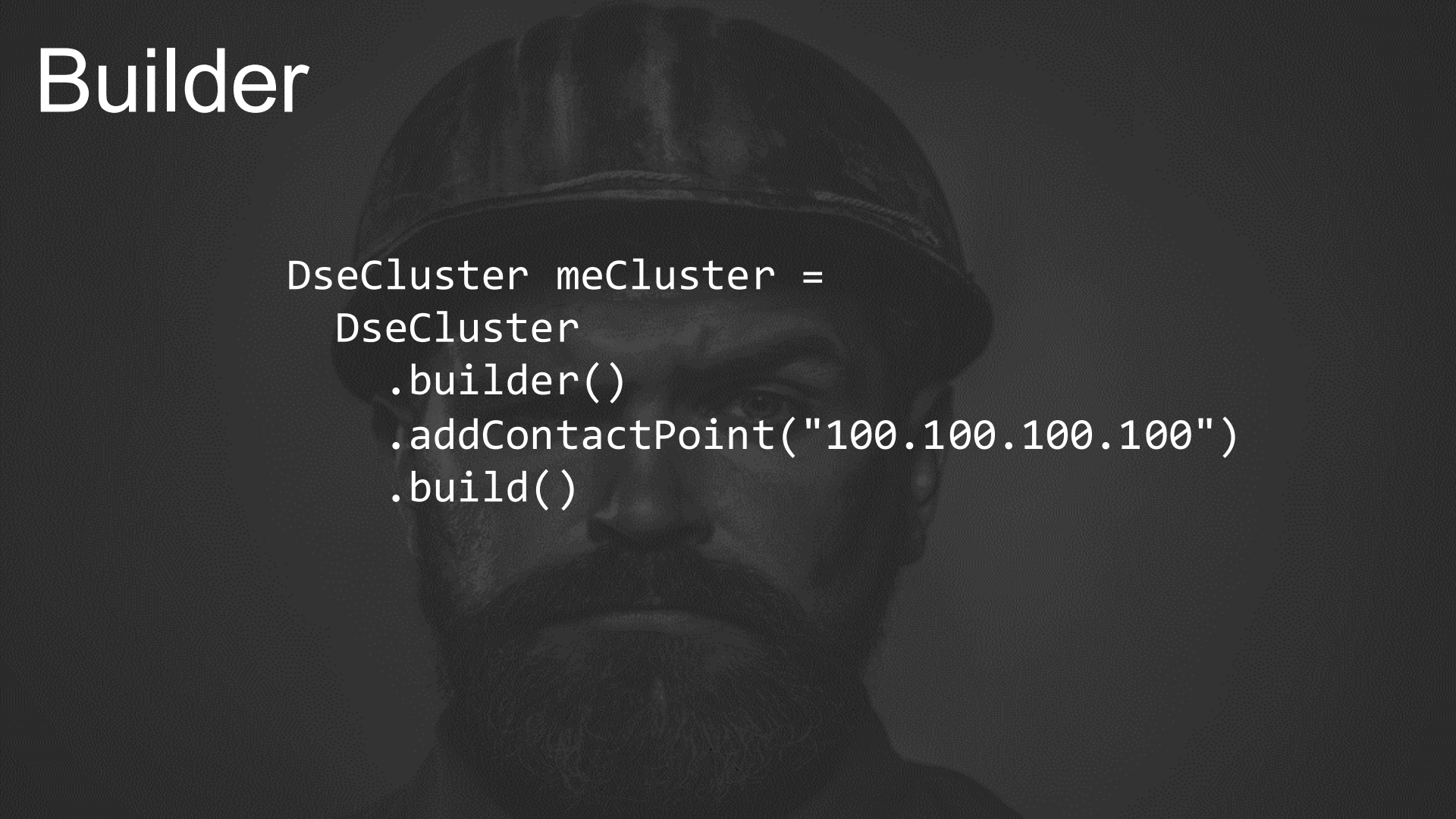
```
BoundStatement insertUser = createUser.bind()
   .setUUID("userid", userIdUUID)
   .setString("firstname", firstName)
   .setString("lastname", lastName)
   .setString("email", email)
   .setTimestamp("created_date", now);

DseSession session = configureAndCreateADseSession()

session.execute(insertUser);
```

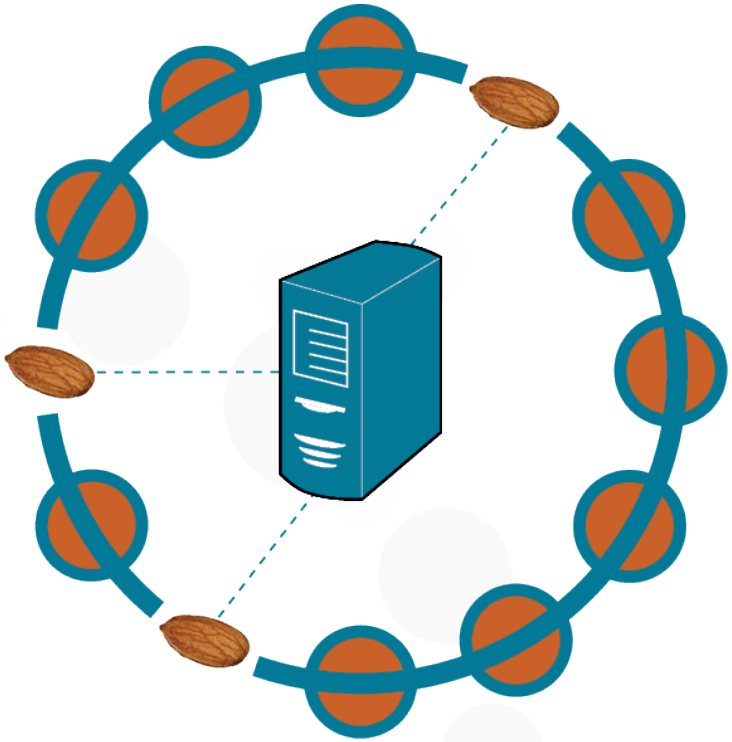
Cluster Builder

Builder



```
DseCluster meCluster =
  DseCluster
    .builder()
    .addContactPoint("100.100.100.100")
    .build()
```

Contact Points



Only one necessary

Unless that node is down

More are good

Seed nodes are good; more "in the know"

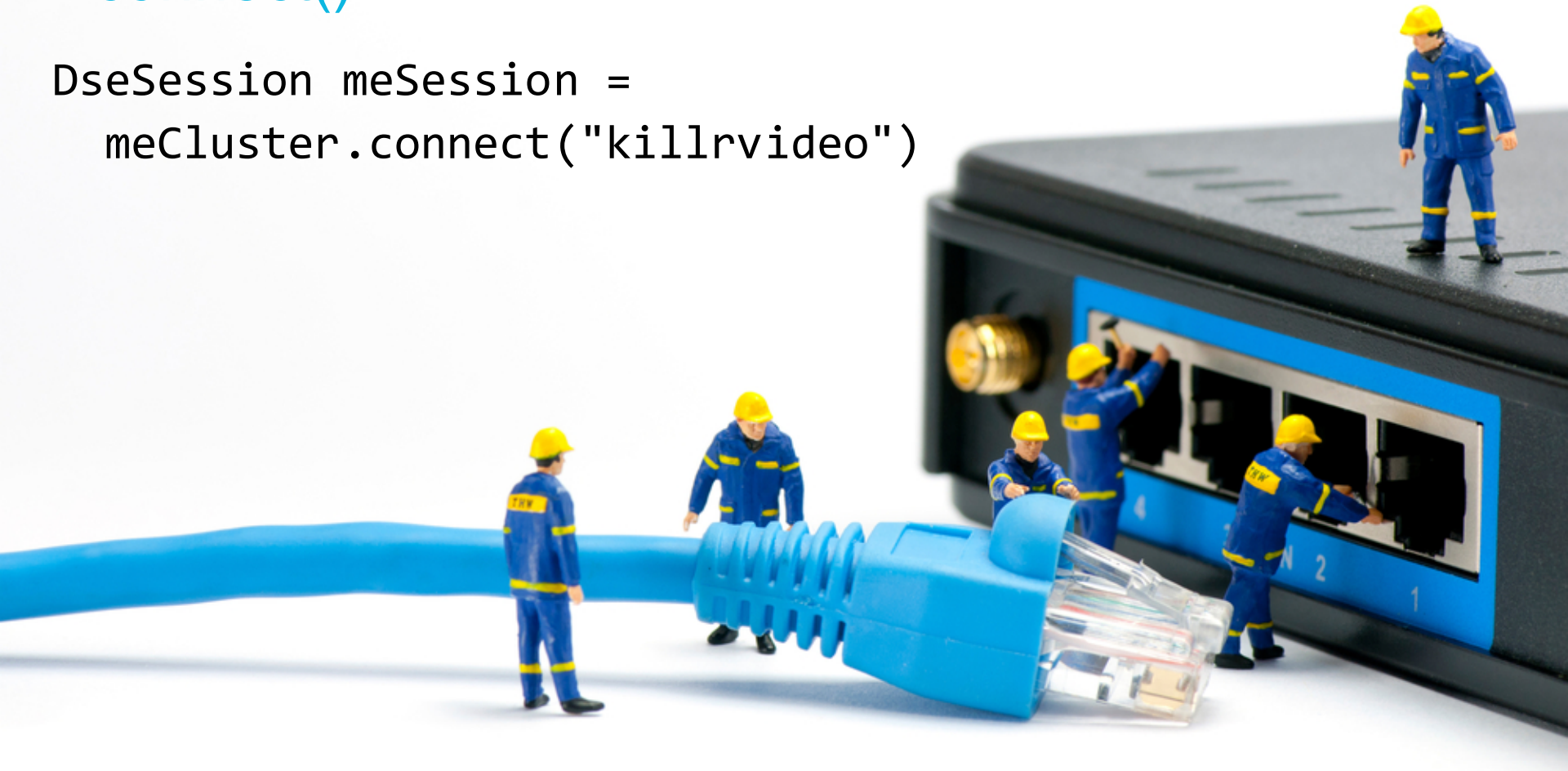
DseSession

- The big dog in town

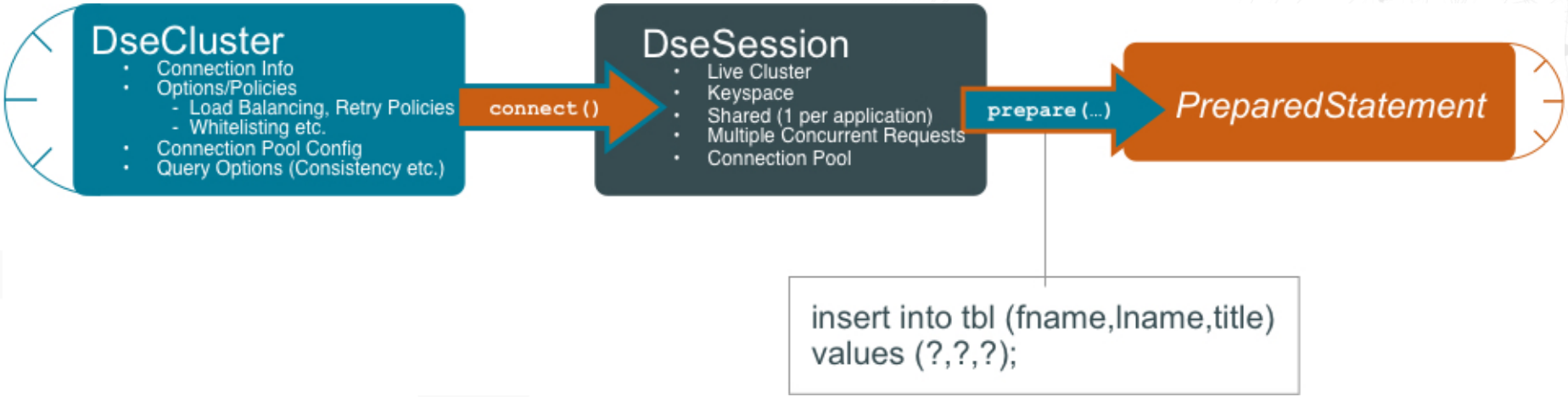
- Main entry point to the cluster
- Maintains metadata about the cluster
- Thread safe

connect()

```
DseSession meSession =
   meCluster.connect("killrvideo")
```



Major Players



Ways to Talk to Your Cluster

- SimpleStatement
- PreparedStatement
- BoundStatement
- QueryBuilder
- Object Mapping
- Accessors

Simple Command String + execute()

For when you need to do something quick and dirty

```
session.execute("SELECT * FROM users")
```

You know…sometimes you just got to get something done

execute() → ResultSet

```
ResultSet rs = session.execute("SELECT * FROM t1");
Row firstRow = rs.one();
int col1 = firstRow.getInt("c1");
String col2 = firstRow.getString("c2");
```

SimpleStatement

- Simple statements are interpreted at runtime and may include parameter placeholders
- You can set options on a `SimpleStatement` instance

```
Statement statement =
  new SimpleStatement("select * from t1 where c1 = 5");

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

Prepared and Bound Statements

- *Compiled once on each node automatically as needed*
- Prepare each statement only once per application
- Use one of the many bind variations to create a *BoundStatement*

```
PreparedStatement ps = session.prepare("SELECT * from t1 where c1 = ?");
BoundStatement bound = ps.bind(5);
```

QueryBuilder

- Alternative to building CQL string queries manually
- Contains methods to build SELECT, UPDATE, INSERT and DELETE statements
- Generates a `Statement` as per the earlier techniques

Method	Return Type
`QueryBuilder.select()`	`Selection`
`QueryBuilder.insertInto()`	`Insert`
`QueryBuilder.update()`	`Update`
`QueryBuilder.delete()`	`Selection`

QueryBuilder

```
QueryBuilder
  .update("killrvideo", "video_ratings")
  .with(QueryBuilder.incr("rating_counter"))
  .and(QueryBuilder.incr("rating_total", QueryBuilder.bindMarker()))
  .where(QueryBuilder.eq("videoid", QueryBuilder.bindMarker()))
```

Object Mapping

Map Java entity beans to CQL tables

```
CREATE TABLE IF NOT EXISTS users (
  userid uuid,
  firstname text,
  lastname text,
  email text,
  created_date timestamp,
  PRIMARY KEY (userid));
```

```
public class User {
    private UUID userid;
    private String firstname;
    private String lastname;
    private String email;
    private Date createdAt;

    public User() {}
    public User(UUID userid, String firstname,
      String lastname, String email, Date createdAt) {
        this.userid = userid;
        this.firstname = firstname;
        this.lastname = lastname;
        this.email = email;
        this.createdAt = createdAt;
    }
    public UUID getUserid() { return userid; }
    public void setUserid(UUID userid) { this.userid = userid; }
    // Etc.
}
```

```
@Table(keyspace = "killrvideo", name = "users")
public class User {
    @PartitionKey
    private UUID userid;
    @Length(min = 1, message = "firstName must not be empty")
    @Column
    private String firstname;
    @Length(min = 1, message = "lastname must not be empty")
    @Column
    private String lastname;
    @Length(min = 1, message = "email must not be empty")
    @Column
    private String email;
    @NotNull
    @Column(name = "created_date")
    private Date createdAt;
}
```

Mapper


```
MappingManager manager = new MappingManager(meSession);
Mapper<User> userMapper = manager.mapper(User.class);
Result<User> users = userMapper.map(meSession.execute(myQuery));
```

Exercise!

Application Development
Prepared Statements (Notebook)

Accessors

```
@Accessor
public interface VideosAccessor {
  @Query("SELECT * FROM videos_by_genre" +
         "WHERE genre = :genre AND release_year >= :start" +
         " AND release_year <= :end ORDER BY release_year DESC")
  Iterable<Video> getVideosByGenreYearRange(
                                    @Param("genre") String genre,
                                    @Param("start") int yearRangeStart,
                                    @Param("end")   int yearRangeEnd);
  ...
}
```

```
VideosAccessor accessor =
  manager.createAccessor(VideosAccessor.class)

Iterable<Video> videos =
  accessor.getVideosByGenreYearRange("horror", 2013, 2016)
```

Exercise!

Application Development Accessor (Notebook)


Best
Practice
Ahead

Instantiate Less

Single **Cluster** object per physical cluster

Single **Session** object per application

Run Async

```
mapper.map() vs mapper.mapAsync()
execute() vs executeAsync()
get() vs getAsync()
save() vs saveAsync()
```

Returns a ListenableFuture

Maximizes Throughput

Prepare Once – Bind Many

- Server parses/compiles query once
- Cached for lifetime of the application
- Reduces network traffic

Avoid Deletes and Writing Nulls

```
INSERT INTO meTable (primary_key, clustering_key)
VALUES ('pk1', 'ck1');
```

VS

```
INSERT INTO meTable (primary_key, clustering_key, regular_col)
VALUES ('pk1', 'ck1', null);
```

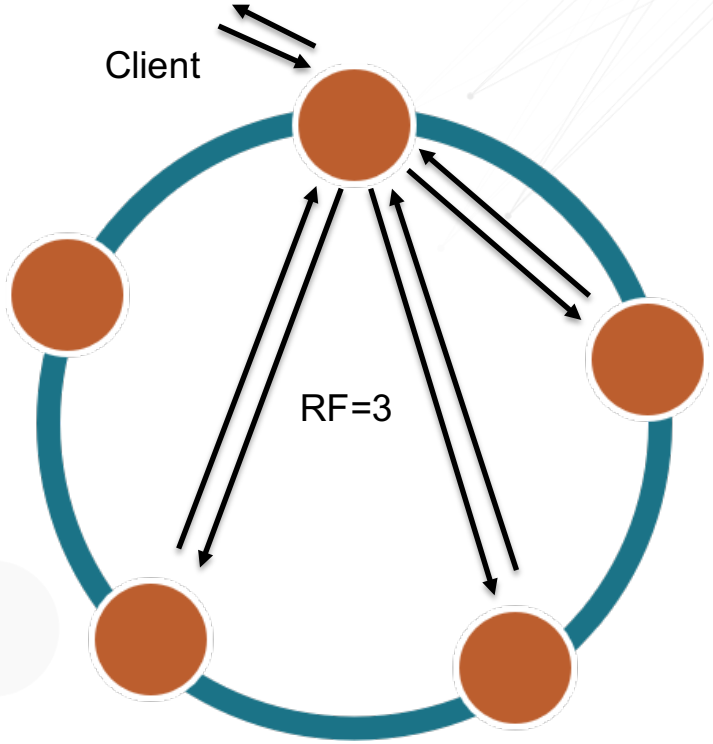
Second version writes a tombstone

Be Datacenter Aware

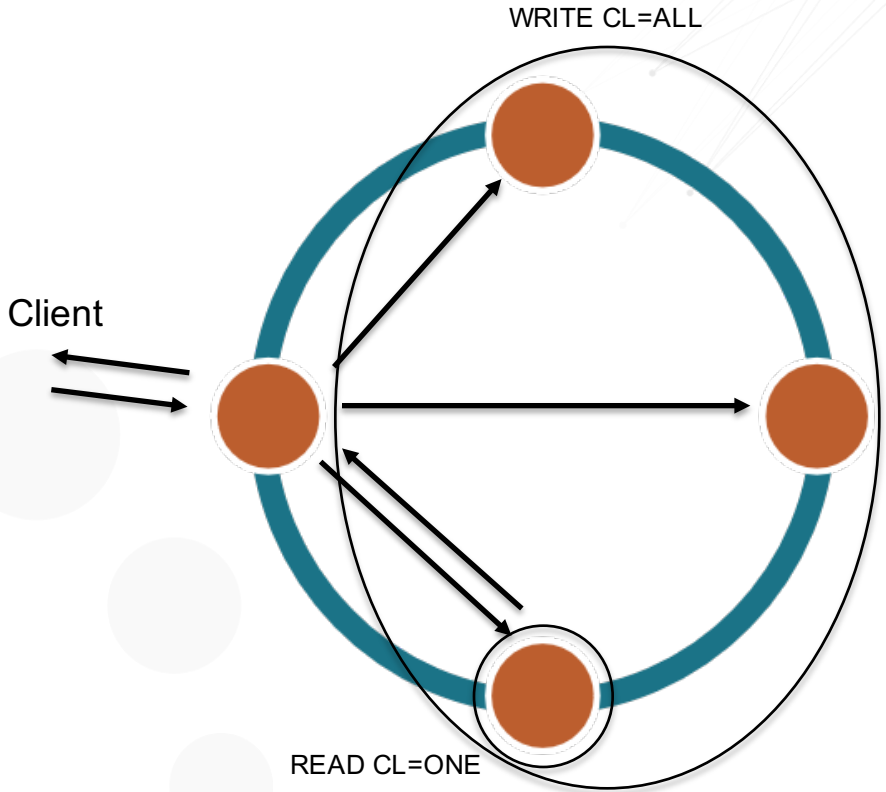
```
DCAwareRoundRobinPolicy
   .builder()
   .withLocalDc("myLocalDC")
```

- More on load balancing policies later

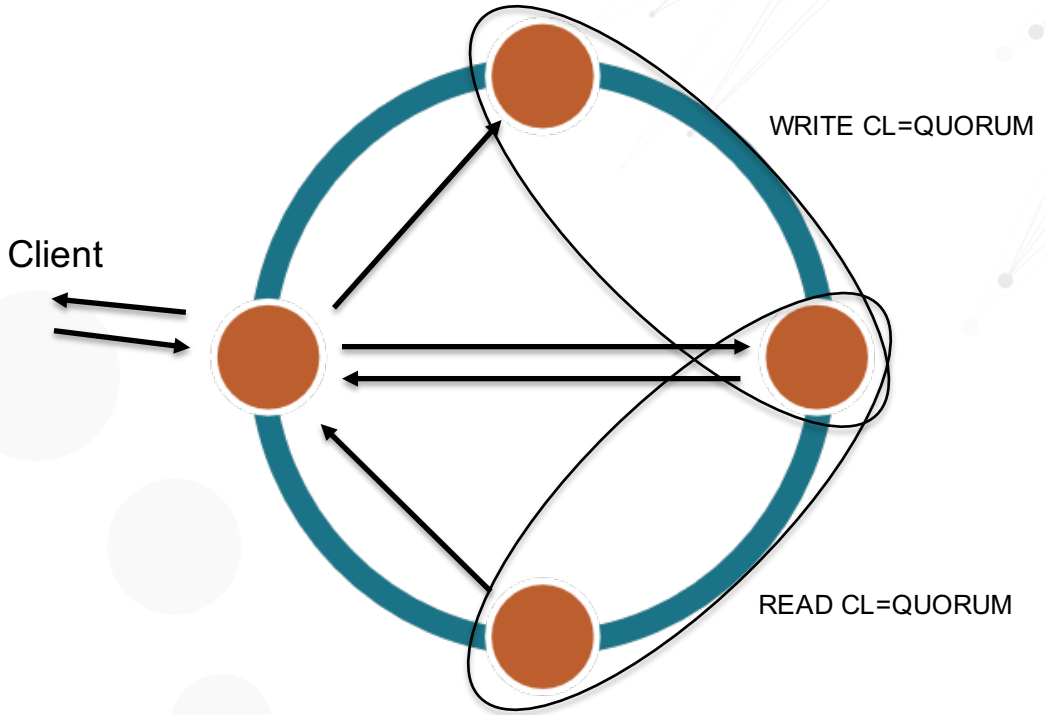
Consistency Levels



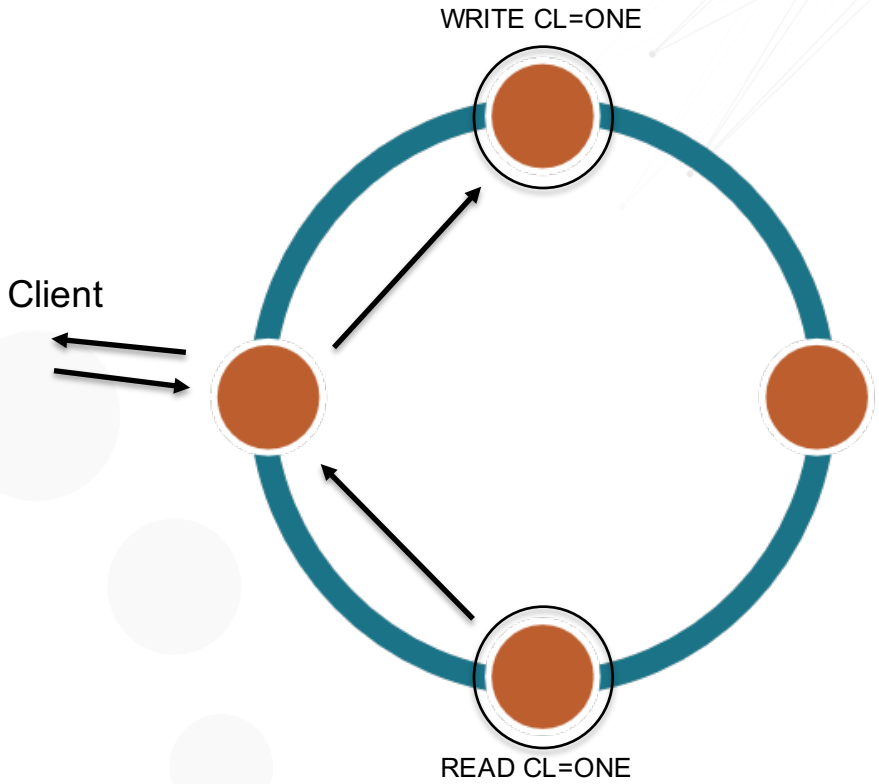
Strong Consistency



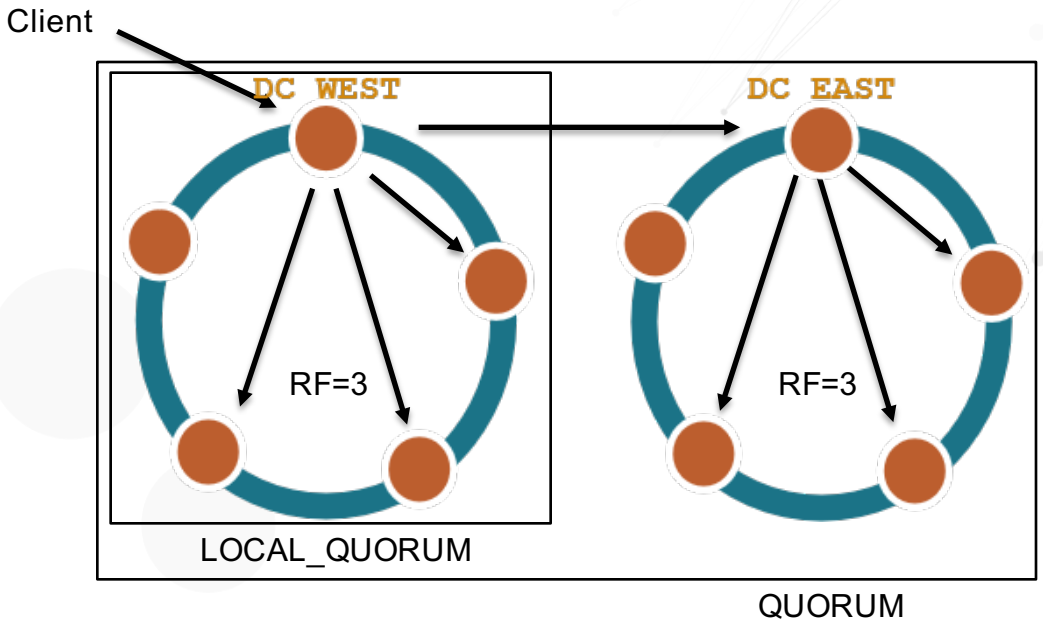
Quorum



CL=ONE



Consistency Across Data Centers



Time to Live (TTL)

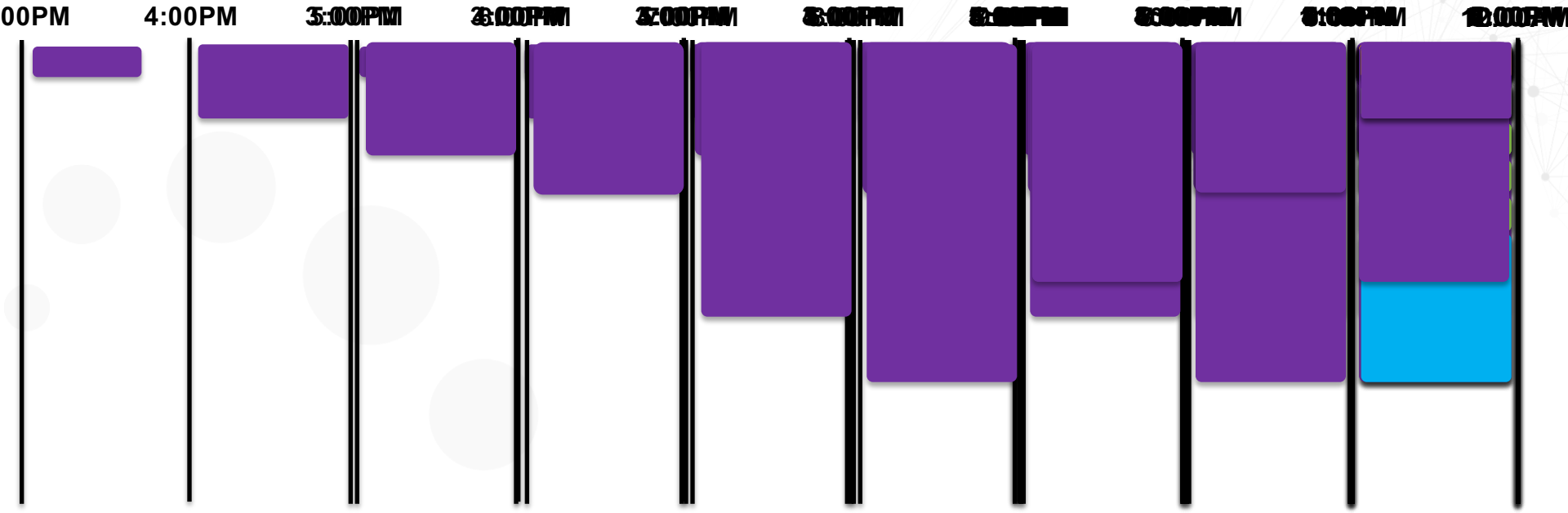
Time-series data

Delete entire partitions when possible

Better type of tombstones

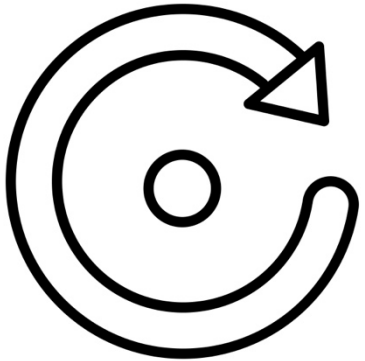
TimeWindowCompactionStrategy
VS
DateTieredCompactionStrategy

Time Windowed Compaction



Retry Policies

- Most are deprecated (long story; don't ask)
- DefaultRetryPolicy
  - Retries once onReadTimeout or onWriteTimeout
  - Enough replicas for your consistency level must be online
- FallthroughRetryPolicy
  - Doesn't retry
  - Sends exception to your client application



retry

Reconnection Policies

Reconnects driver to a downed node

Two options:

- ConstantReconnectionPolicy
  - Check every N milliseconds
- ExponentialReconnectionPolicy (default)
  - Increases every interval
  - Caps out at a max

Batches

- All commands will *eventually* succeed
- Atomicity
- *That's it*

```
INSERT INTO videos...
INSERT INTO videos_by_user...
INSERT INTO videos_by_genre...
INSERT INTO latest_videos...
```

Batches and the Driver

```
BatchStatement insertVideoBatch = new BatchStatement();

insertVideoBatch.add(insertToVideos);
insertVideoBatch.add(insertToVideosByUser);
insertVideoBatch.add(insertToVideosByGenre);
insertVideoBatch.add(insertToLatestVideos);

session.execute(insertVideoBatch);
```

Batch Details

- One message to coordinator node
- Coordinator writes a batch log and replicates it to other nodes
- All affected nodes must ack the batch before coordinator removes batch log

Batches != Data Loading

Batches about data integrity between tables

All three inserts must succeed for batch to succeed

```
batchStatement.add(insertVideo);
batchStatement.add(insertUserVideo);
batchStatement.add(insertLatestVideo);
```

Paging

- Pulling large result sets all at once may not make sense
- Retrieve sections or (pages)
- Retrieve more…if necessary
- Default of 5,000

Paging

setFetchSize() → Page Size

- Global

```
Cluster cluster = Cluster.builder()
  .addContactPoint("127.0.0.1")
  .withQueryOptions(new QueryOptions().setFetchSize(2000))
  .build()

// Or at runtime:
cluster.getConfiguration().getQueryOptions().setFetchSize(2000)
```

- Single statement

```
Statement statement = new SimpleStatement("your query");
statement.setFetchSize(2000);
```

Paging State

- Tracks location in a ResultSet
- “Continue where you left off…”
- Query + parameters must match

```
ResultSet resultSet = session.execute("your query");
// iterate the result set...
PagingState pagingState = resultSet.getExecutionInfo().getPagingState();
```

- Save that state

```
String meState = pagingState.toString()
```

- Later…

```
PagingState pagingState = PagingState.fromString(string);
Statement st = new SimpleStatement("your query");
st.setPagingState(pagingState);
ResultSet rs = session.execute(st);
```

Load balancing

```
new TokenAwarePolicy(
  new DCAwareRoundRobinPolicy("local-dc-name"))
```