Essential Slick

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Slick is...

A database library

NOT an ORM

Functional

Asynchronous

We'll cover...

Tables

Queries

Actions

Joins

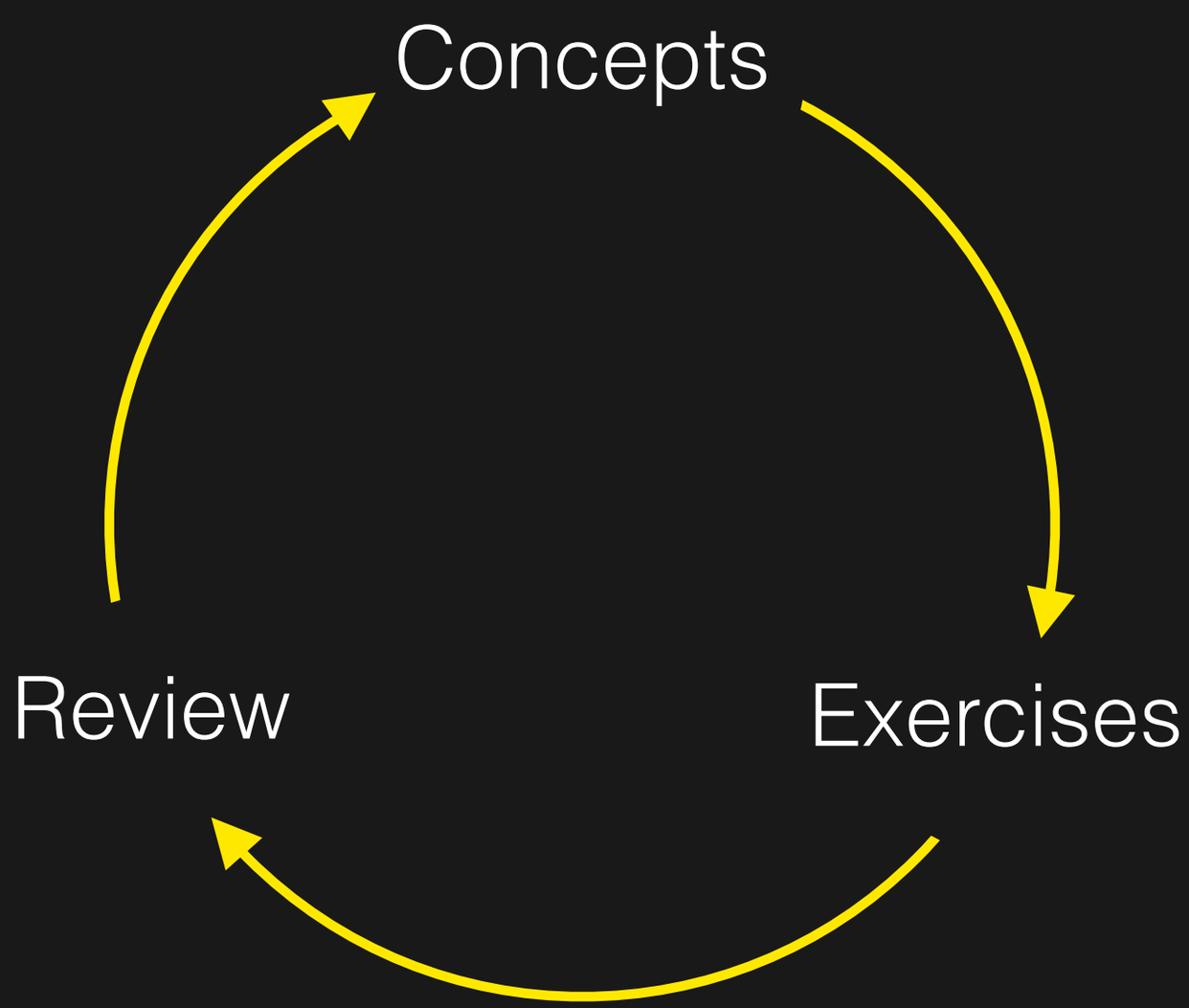
Profiles

https://github.com/underscoreio/

scalax15-slick

https://github.com/underscoreio/
scalax15-slick

https://gitter.im/underscoreio/
scalax15-slick


Concepts
Exercises
Review

Your Turn

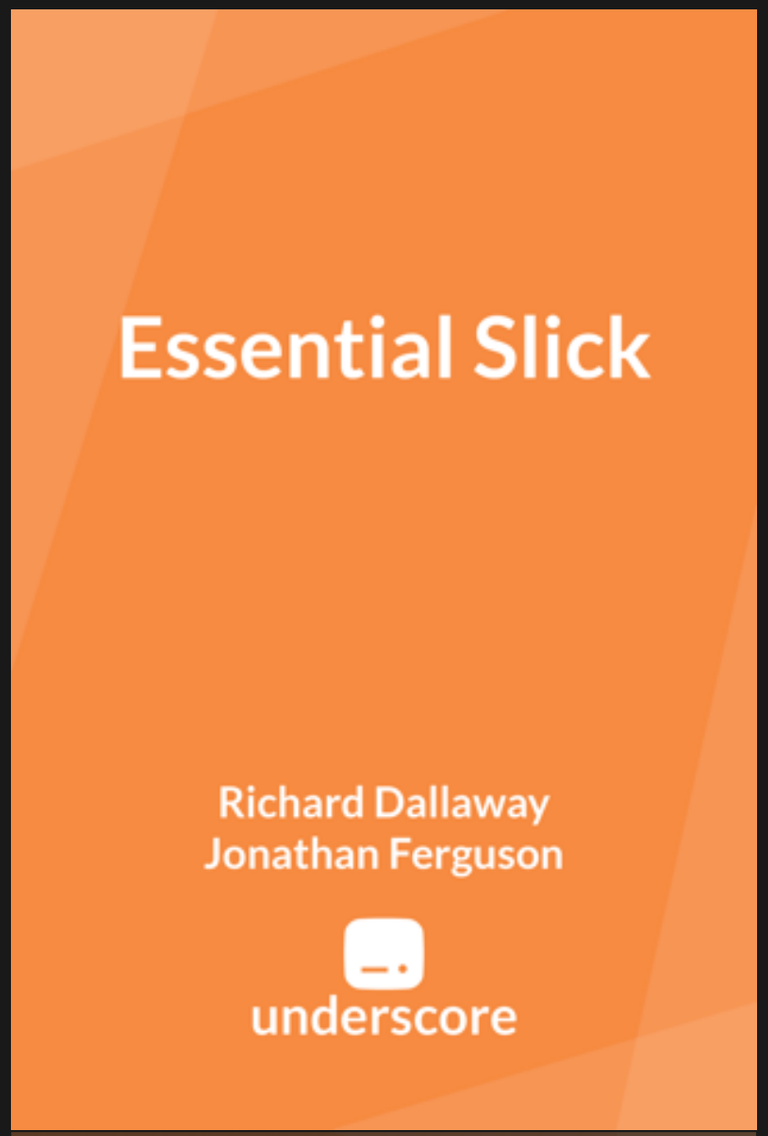
Do some fun programming stuff

Do this bit first

Then this bit

And this bit, just for completeness


Essential Slick
Richard Dallaway
Jonathan Ferguson
underscore



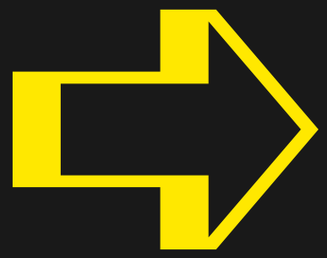
http://underscore.io/books/
essential-slick

Tables

Tables

Basic Construction

tables.Main



Your Turn

Add a “year” column to “Album”

Add a field to the case class

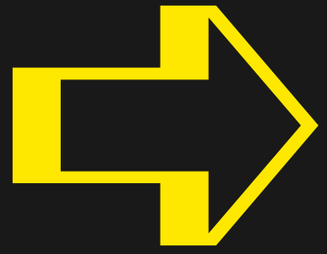
Add a column to the table

Add the column to the projection

Tables

Custom Column Types

tables.Rating



Your Turn

Add a “rating” column of type “Rating”

Add a field to the case class

Add a column to the table

Add the column to the projection

Select Queries

Select Queries

Queries vs Actions

```
db.run(myAction)
```

```
db.run(myAction)
```

```
AlbumTable
.filter(_.artist === “Spice Girls”)
.result
```

```
AlbumTable
  .filter(_.artist === “Spice Girls”)
  .result
```

Create a query

Convert to an action

```
db.run(
  AlbumTable
    .filter(_.artist === “Spice Girls”)
    .result
)
```

Create a query

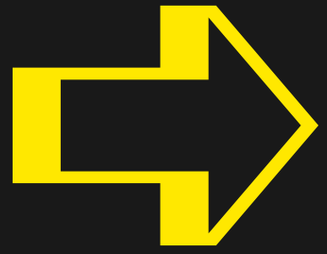
Convert to an action

Run against the DB

Select Queries

Combinators

queries.Main



```
// Select everything
val selectAllQuery =
  AlbumTable
```

```
// Select everything
val selectAllQuery =
  AlbumTable
```

```
SELECT *
FROM albums;
```

```
// Filter results
val selectWhereQuery =
  AlbumTable
    .filter(_.artist === “Spice Girls”)
```

```
SELECT *
FROM albums
WHERE artist = ‘Spice Girls’;
```

```
// Filter results
val selectWhereQuery =
  AlbumTable
    .filter(_.artist === “Spice Girls”)
```

argument is an AlbumTable

```
SELECT *
FROM albums
WHERE artist = ‘Spice Girls’;
```

```
// Sort results
val selectSortedQuery1 =
  AlbumTable
    .sortBy(_.year.asc)
```

argument is an AlbumTable

```
SELECT *
FROM albums
ORDER BY year ASC;
```

```
// Sort results
val selectSortedQuery2 =
  AlbumTable
    .sortBy(a => (a.year.asc, a.rating.asc))
```

```
SELECT *
FROM albums
ORDER BY year ASC, rating ASC;
```

```
// Page results
val selectPagedQuery =
  AlbumTable
    .drop(2).take(1)
```

```
SELECT *
FROM albums
OFFSET 2 LIMIT 1;
```

```
// Project results
val selectColumnsQuery1 =
  AlbumTable
    .map(_.title)
    .result
```

```
SELECT title
FROM albums;
```

```scala
// Project results
val selectColumnsQuery2 =
  AlbumTable
    .map(a => (a.artist, a.title))
    .result
```

```sql
SELECT artist, title
FROM albums;
```

```
// Multiple combinators
val selectCombinedQuery =
  AlbumTable
    .filter(_.artist === “Keyboard Cat”)
    .map(_.title)
```

```
SELECT title
FROM albums
WHERE artist = ‘Keyboard Cat’;
```

Your Turn

Select albums released after 1990
with a rating of “NotBad” or higher
sorted by artist

Select the titles of the albums
in ascending year order

Select Queries

Types

`Query[P, U, C]`

P - “Packed” / query type

U - “Unpacked” / result type

C - Collection type

```
Query[AlbumTable, Album, Seq]
```

P - “Packed” / query type

U - “Unpacked” / result type

C - Collection type

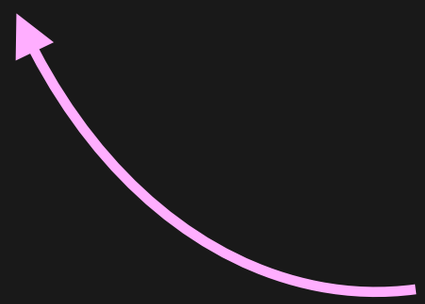
```
val q0: Query[AlbumTable, Album, Seq] =
AlbumTable
```

```
val q0: Query[AlbumTable, Album, Seq] =
  AlbumTable
```

```
val q1: Query[AlbumTable, Album, Seq] =
  q0.filter(_.year === 1987)
```

```
val q0: Query[AlbumTable, Album, Seq] =
  AlbumTable
```

```
val q1: Query[AlbumTable, Album, Seq] =
  q0.filter(_.year === 1987)
```



argument is an
AlbumTable

```scala
val q0: Query[AlbumTable, Album, Seq] =
  AlbumTable

val q1: Query[AlbumTable, Album, Seq] =
  q0.filter(_.year === 1987)

val q2: Query[Rep[String], String, Seq] =
  q1.map(_.title)
```

```scala
val q0: Query[AlbumTable, Album, Seq] =
  AlbumTable

val q1: Query[AlbumTable, Album, Seq] =
  q0.filter(_.year === 1987)
```

```scala
val q2: Query[Rep[String], String, Seq] =
  q1.map(_.title)

val q3: Query[???, ???, Seq] =
  q2.map(_.???)
```

Rep[T]

“An SQL expression of type T”

```
val q =
  AlbumTable
  .filter(t => t.artist === “Keyboard Cat”)
  .map(t => t.id)
```

Rep[String]

```
val q =
  AlbumTable
    .filter(t => t.artist === “Keyboard Cat”)
    .map(t => t.id)
```

Rep[String]

```
val q =
  AlbumTable
    .filter(t => t.artist === “Keyboard Cat”)
    .map(t => t.id)
```

Rep[Int]

```
val q =
  AlbumTable
  .filter(t => t.artist === “Keyboard Cat”)
  .map(t => t.id)
```

Rep[String]

Rep[Int]

Rep[String]

```
val q =
  AlbumTable
  .filter(t => t.artist === “Keyboard Cat”)
  .map(t => t.id)
```

Rep[Boolean]

Rep[Int]

Your Turn

Add type annotations to:

selectWhereQuery

selectColumnsQuery1

selectColumnsQuery2

and your answers to the previous exercise

Actions

Actions

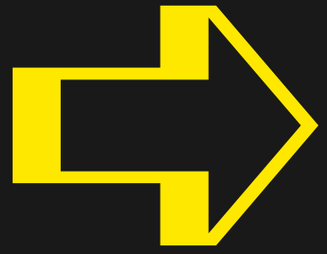
Examples

Select

Insert, update, delete

Create, drop tables

actions.Main



```
val selectAction =
  AlbumTable
    .filter(_.artist === “Keyboard Cat”)
    .result
```

```
SELECT *
FROM albums
WHERE artist = “Keyboard Cat”;
```

```
val updateAction =
  AlbumTable
    .filter(_.artist === “Keyboard Cat”)
    .map(_.title)
    .update(“Even Greater Hits”)
```

```
UPDATE albums
SET title = “Even Greater Hits”
WHERE artist = “Keyboard Cat”;
```

```
val updateAction2 =
  AlbumTable
    .filter(_.artist === “Keyboard Cat”)
    .map(a => (a.title, a.year))
    .update((“Even Greater Hits”, 2010))
```

```
UPDATE albums
SET title = “Even Greater Hits”,
    year  = 2010
WHERE artist = “Keyboard Cat”;
```

```
val deleteAction =
  AlbumTable
    .filter(_.artist === “Keyboard Cat”)
    .delete
```

```
DELETE
FROM albums
WHERE artist = “Keyboard Cat”;
```

```
val insertAction =
  AlbumTable += Album(
    “Pink Floyd”,
    “Dark Side of the Moon”,
    1973,
    Rating.Awesome)
```

```
INSERT INTO albums
  (artist, title, year, rating)
VALUES (“Pink Floyd”,
  “Dark Side of the Moon”, 1973, 5);
```

```
val insertAction2 =
  AlbumTable ++= Seq(
    album1,
    album2,
    album3)
```

```
INSERT INTO albums
(artist, title, year, rating)
VALUES (...), (...), (...);
```

```
val createTableAction =
  AlbumTable.schema.create
```

```
CREATE TABLE albums (
  artist TEXT, title TEXT,
  year INTEGER, rating INTEGER,
  ...);
```

```
val dropTableAction =
  AlbumTable.schema.drop
```

```
DROP TABLE albums;
```

Your Turn

Insert three albums
by your favourite band

Update albums released after a specified year
set their rating to “Meh”

Delete all albums
by a user-specified artist

Actions

Types

DBIOAction[R, S, E]

```
DBIOAction[R, S, E]
```

R - Result type

S - Streaming or not streaming

E - Effect (read / write / etc ...)

```
DBIOAction[Seq[Album], NoStream, Effect.All]
```

R - Result type

S - Streaming or not streaming

E - Effect (read / write / etc ...)

```
DBIOAction[Seq[Album], NoStream, Effect.All]
```

```
DBIO[Seq[Album]]
```

```
DBIO[Seq[Album]]
```

```
DBIO[Seq[Album]]
```

```
db.run(myAction)
```

```
DBIO[Seq[Album]]
```

```
db.run(myAction)
```

```
Future[Seq[Album]]
```

```
SqlAction[R, S, E]
```

```
SqlAction[R, S, E] extends DBIOAction[R, S, E]
```

```
SqlAction[R, S, E]
```

```
myAction.statements
```

```
Seq[String]
```

Your Turn

Add type annotations to:

selectAction

insertAction

updateAction

and your answers to the previous exercise

Actions

Combinators

```
// Sequencing independent actions
def runManyActions() = {
  exec(action1)
  exec(action2)
  exec(action3)
  exec(action4)
}

runManyActions()
```

```
// Sequencing independent actions
val oneBigAction =
  action1 andThen
  action2 andThen
  action3 andThen
  action4

exec(oneBigAction)
```

```
// Chaining interdependent actions
def runChainOfActions(a: SomeInput) = {
  val b = exec(createAction1(a))
  val c = exec(createAction2(b))
  val d = exec(createAction3(c))
  val e = exec(createAction4(d))
  e
}


runChainOfActions()
```

```scala
// Chaining interdependent actions
def chainOfActions(a: SomeInput) = for {
  b <- createAction1(a)
  c <- createAction2(b)
  d <- createAction3(c)
  e <- createAction4(d)
} yield e


exec(chainOfActions(someInput))
```

```
// Transactions!
exec(action.transactionally)
```

Your Turn

Create a single action that:

Accepts an artist, title, and year of release

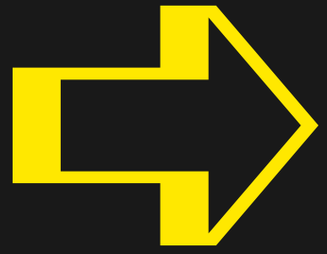
Inserts them into the database

Rate it “Awesome” if it’s their first album

Rate it “Meh” otherwise

Joins

joins.Main



Joins

“Implicit” Joins

```sql
SELECT *
FROM album, artist
WHERE album.id = artist.albumId;
```

```
val query = for {
  album  <- AlbumTable
  artist <- ArtistTable
  if album.id === artist.albumId
} yield (album, artist)
```

```
SELECT *
FROM album, artist
WHERE album.id = artist.albumId;
```

Your Turn

Rewrite the main method
as one big action

Create an implicit join that finds:
artists who have released albums
and the albums they released
sorted by artist name

Joins

“Explicit” Joins

```sql
SELECT *
  FROM artist INNER JOIN album
    ON artist.id = album.artistId;
```

```
val query =
  ArtistTable join AlbumTable
  on { (artist, album) =>
    artist.id === album.artistId
  }
```

```
SELECT *
FROM artist INNER JOIN album
  ON artist.id = album.artistId;
```

Your Turn

Create an *explicit* join that finds:
artists who have released albums
and the albums they released
sorted by artist name

Profiles

Profiles

Getting Database Profiles

Shipped With Slick

Derby, H2, HyperSQL, MySQL, PostgreSQL, SQLite

Commercially Available

Oracle, DB2, MSSQL

Shipped With Slick

Derby, H2, HyperSQL, MySQL, PostgreSQL, SQLite

Part of Freeslick

Oracle, DB2, MSSQL

Shipped With Slick

Derby, H2, HyperSQL, MySQL, PostgreSQL, SQLite

Part of Freeslick

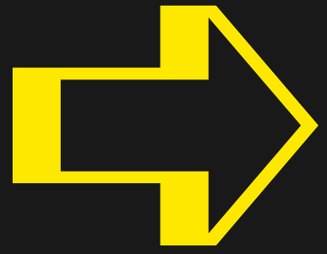
Oracle, DB2, MSSQL

https://github.com/smootoo/freeslick

Profiles

Supporting Multiple Databases

profiles.Main



Summary

Defining Tables

Running Single Queries

Sequencing Queries

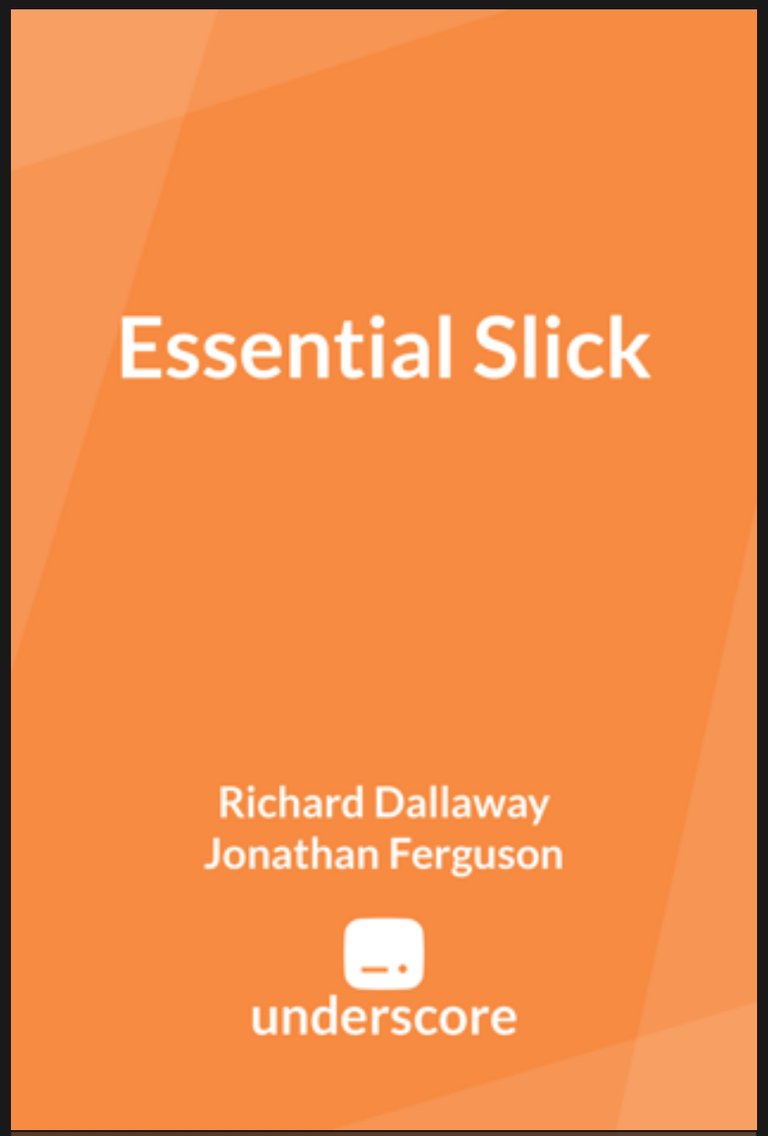
Joins

~~Aggregate Functions~~

~~Streaming Queries~~

~~Plain SQL Queries~~

~~Query Compilation~~



http://underscore.io/books/
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https://gitter.im/underscoreio/

scalax15-slick

Thanks!

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