DATENBANKZENTRISCHE
ANWENDUNGEN MIT

SPRING BOOT UND JOOQ

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- Entwickler bei ENERKO INFORMATIK in Aachen
  - Datenbankzentrische Anwendungen im Energiemarkt
- Leiter Euregio JUG
- Bloggt zu Java und Spring Themen unter info.michael-simons.eu
- Co-Autor arc(42) by example
- @rotnroll666 auf Twitter

Agenda

- Spring Boot
- jOOQ
- Oracle JET

```
        <property name="fallbackToSystemLocale" value="false"/>
    </bean>
    <!-- Configure the JPA Adapter -->
    <bean id="jpaDialect" class="org.springframework.orm.jpa.vendor.HibernateJpaDialect"/>
    <bean id="jpaVendorAdapter" class="org.springframework.orm.jpa.vendor.HibernateJpaVendorAdapter">
      <property name="database" value="MYSQL"/>
      <property name="databasePlatform" value="org.hibernate.dialect.MySQLDialect"/>
      <property name="generateDdl" value="false"/>
      <property name="showSql" value="false"/>
    </bean>
    <!-- Configure the local Entity Manager Factory -->
    <bean id="entityManagerFactory"
  class="org.springframework.orm.jpa.LocalContainerEntityManagerFactoryBean">
      <property name="persistenceUnitName" value="theEntities"/>
      <property name="dataSource" ref="theDataSource"/>
      <property name="jpaDialect" ref="jpaDialect"/>
      <property name="jpaVendorAdapter" ref="jpaVendorAdapter"/>
      <property name="loadTimeWeaver">
        <bean class="org.springframework.instrument.classloading.InstrumentationLoadTimeWeaver"/>
      </property>
    </bean>
    <!-- Enable Spring JPA Transactions -->
    <bean id="transactionManager" class="org.springframework.orm.jpa.JpaTransactionManager" p:entity-
manager-factory-ref="entityManagerFactory"/>
    <tx:annotation-driven transaction-manager="transactionManager"/>
    <bean id="exampleBean" class="examples.ExampleBean">
      <!-- setter injection using the nested <ref/> element -->
      <property name="beanOne">
        <ref bean="anotherExampleBean"/>
      </property>
      <!-- setter injection using the neater 'ref' attribute -->
      <property name="beanTwo" ref="yetAnotherBean"/>
      <property name="integerProperty" value="1"/>
    </bean>
    <bean id="anotherExampleBean" class="examples.AnotherBean"/>
    <bean id="yetAnotherBean" class="examples.YetAnotherBean"/>
</beans>
```

A long time ago, in a framework far,
far away

A NEW HOPE...

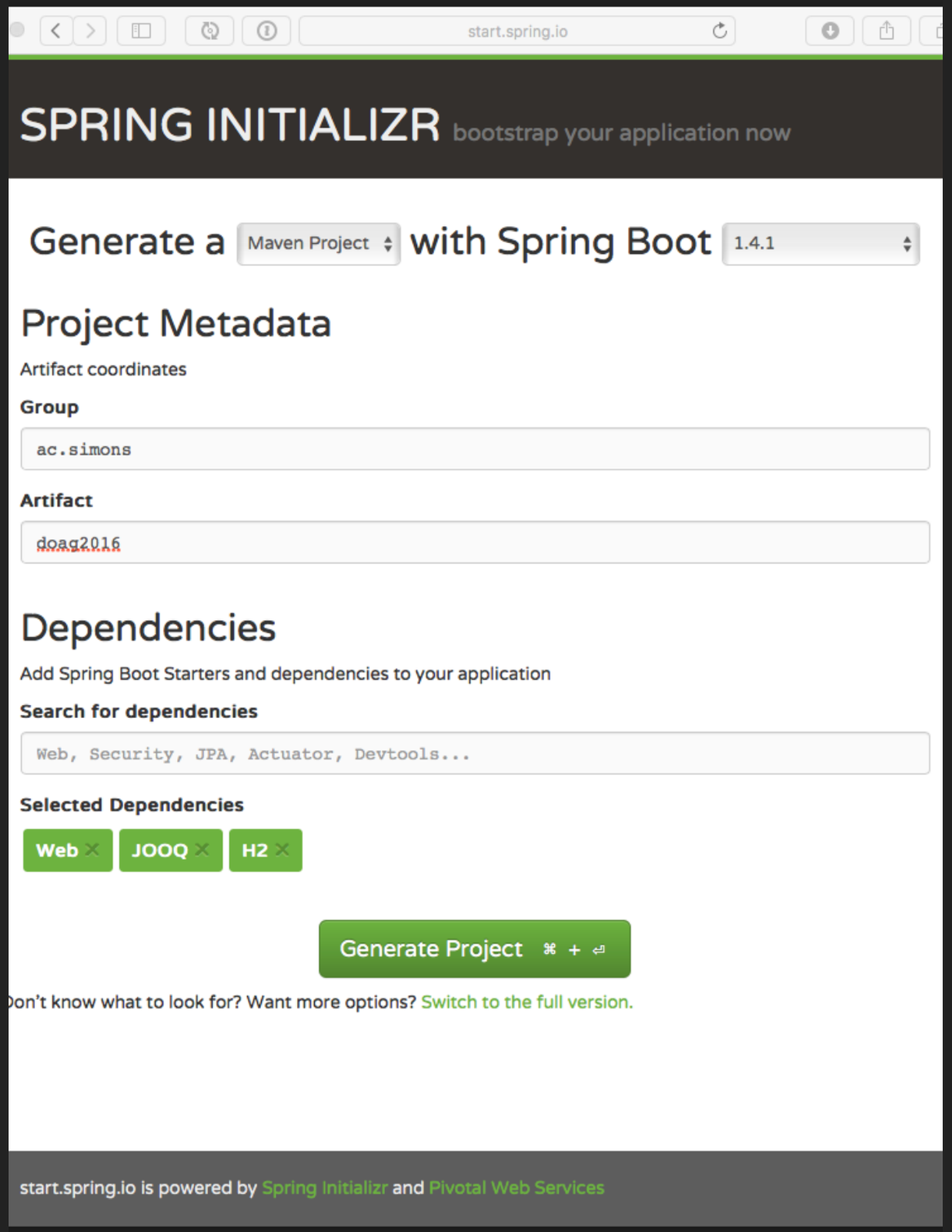
```
package ac.simons.doag2016;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;

@SpringBootApplication
public class Application {

    public static void main(String... args) {
        SpringApplication.run(Application.class, args);
    }
}
```

WAS IST SPRING BOOT?

- „Fertig konfigurierte Instanz des Spring Frameworks“
- *spring-boot-starter-** Jars beinhalten automatische Konfiguration und deklarieren Abhängigkeiten
- *spring-boot-starter-** Jars erlauben gezielte Auswahl von Spring eigenen und unterstützten Technologien
  - unter anderem auch **jOOQ**
- Spring Boot beinhaltet keinen Code Generator!
- XML Konfiguration optional
- Bestmögliche „Out-of-the-box“ Erfahrung mit dem Spring Öko-System

SPRING INITIALIZR

- Über start.spring.io
- Oder direkt aus einer IDE



DEMO

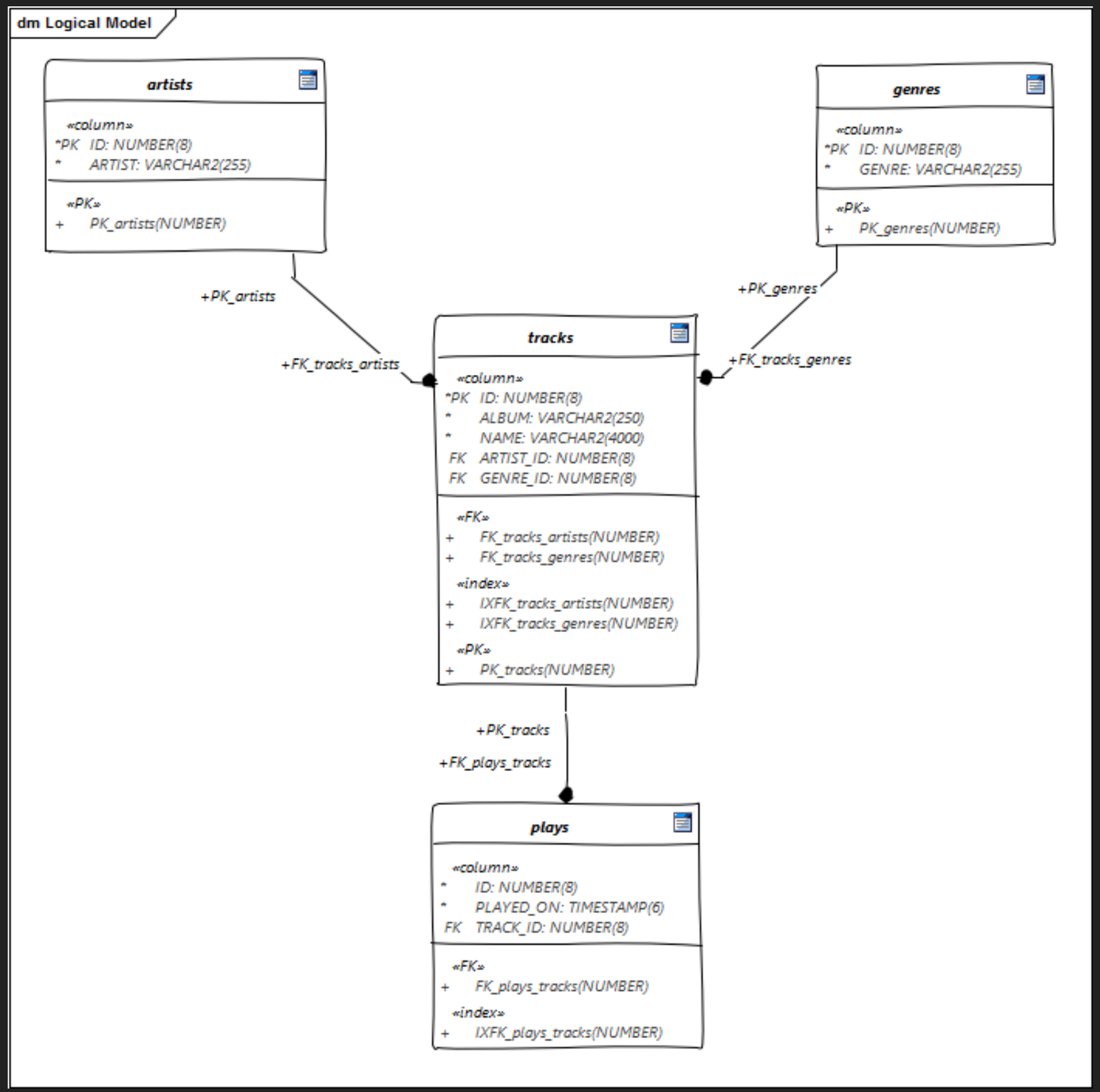
ZUSAMMENFASSUNG

- „Up and running“ in wenigen Augenblicken
- Automatische Konfiguration erfolgt, wenn Abhängigkeiten vorhanden sind
- Kann mit Umgebungsvariablen, Properties oder Konfigurationsservern überschrieben werden

JOOQ

Java und Datenbanken: Plain SQL, ORM oder etwas dazwischen?

DAS BEISPIEL SCHEMA



```sql
-- So?
Select *
  from tracks
 where album = 'True Survivor';
```

UND DAS SQL DAZU?

```java
// oder so?
@Entity
@Table(name = "tracks")
public class TrackEntity implements Serializable {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private Integer id;

    @Column
    private String album;


    public static void main(String...a) {
        final EntityManagerFactory factory = Persistence.createEntityManagerFactory("whatever");
        final EntityManager entityManager = factory.createEntityManager();

        List<Track> tracks = entityManager.createQuery("Select t from tracks where album = :album")
                .setParameter("album", "True Survivor")
                .getResultList();
    }
}
```

```java
// Schon viel besser
public interface TrackRepository extends JpaRepository<TrackEntity, Integer> {

    public List<Track> findAllByAlbum(final String name);

    public static void main(String...a) {
        TrackRepository trackRepository;
        final List<Track> tracks = trackRepository.findAllByAlbum("True Survivor");
    }
}
```

ERNSTHAFT?

```
@Entity
@SqlResultSetMapping(
        name = "ChartMapping",
        columns = {
            @ColumnResult(name = "label", type = String.class),
            @ColumnResult(name = "cnt", type = Integer.class),
            @ColumnResult(name = "chage", type = Integer.class)
        })
@NamedNativeQueries(
        @NamedNativeQuery(
                name = "ChartQuery",
                resultSetMapping = "ChartMapping",
                query = ""
                + "WITH \n"
                + "  previous_month AS\n"
                + "    (SELECT p.track_id, count(*) as cnt, \n"
                + "            dense_rank() over(order by count(*) desc) as
position  \n"
                + "       FROM plays p \n"
                + "      WHERE trunc(p.played_on, 'DD') between date'2016-04-01'
and date'2016-04-30' GROUP BY p.track_id),\n"
                + "  current_month AS\n"
                + "    (SELECT p.track_id, count(*) as cnt, \n"
                + "            dense_rank() over(order by count(*) desc) as
position \n"
                + "       FROM plays p \n"
                + "     WHERE trunc(p.played_on, 'DD') between date'2016-05-01'
and date'2016-05-31' GROUP BY p.track_id)\n"
                + "SELECT a.artist || ' - ' || t.name || ' (' || t.album || ')'
as label,\n"
                + "       current_month.cnt,  \n"
                + "       previous_month.position - current_month.position as
change\n"
                + "  FROM tracks t\n"
                + "  JOIN artists a on a.id = t.artist_id\n"
                + "  JOIN current_month current_month on current_month.track_id
= t.id\n"
                + "  LEFT OUTER join previous_month on previous_month.track_id
= t.id\n"
                + " ORDER BY current_month.cnt desc, label asc"
        )
)
public class PlayEntity {
    public static void main(String... a) {
        // Don't do this at home
        EntityManager entityManager;
        List<Object[]> results =
entityManager.createNamedQuery("ChartQuery").setMaxResults(20).getResultList();
        results.stream().forEach((record) -> {
            String label = (String) record[0];
            Integer cnt = (Integer) record[1];
            Integer change = (Integer) record[2];
        });
    }
}
```

SQL TRIFFT JAVA

```
this.create
        .with(currentMonth)
        .with(previousMonth)
        .select(label,
                currentMonth.field("cnt"),
                previousMonth.field("position").minus(
                    currentMonth.field("position")
                ).as("change")
        )
        .from(TRACKS)
        .join(ARTISTS).onKey()
        .join(currentMonth)
          .on(currentMonth.field("track_id", BigDecimal.class)
             .eq(TRACKS.ID))
        .leftOuterJoin(previousMonth)
          .on(previousMonth.field("track_id", BigDecimal.class)
             .eq(TRACKS.ID))
        .orderBy(currentMonth.field("cnt").desc(), label.asc())
        .limit(n)
        .fetch()
        .formatJSON(response.getOutputStream());
```

WAS IST JOOQ?

- „Query builder framework“
- Java DSL zur Generierung datenbankspezifischer Statements
- Das Schema ist die „treibende Kraft“
  - Generierung eines Java-Schemas (Optional, aber empfohlen)
- Typsicher
- OpenSource für OpenSource Datenbanken, $ bis $$ für Enterprise Datenbanken

Open Source

CUBRID 8.4
Derby 10.10
Firebird 2.5
H2 1.3
HSQLDB 2.2
MariaDB 5.2
MySQL 5.5
PostgreSQL 9.0
SQLite

Express

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Derby 10.10
Firebird 2.5
H2 1.3
HSQLDB 2.2
MariaDB 5.2
MySQL 5.5
PostgreSQL 9.0
SQLite

Microsoft Access 2013 [1]
Oracle 10g Express
SQL Server 2008 Express

Professional

CUBRID 8.4
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MariaDB 5.2
MySQL 5.5
PostgreSQL 9.0
SQLite

Microsoft Access 2013 [1]
Oracle 10g (All editions)
SQL Server 2008 (All editions)

Amazon Redshift [4]
SQL Azure

Enterprise

CUBRID 8.4
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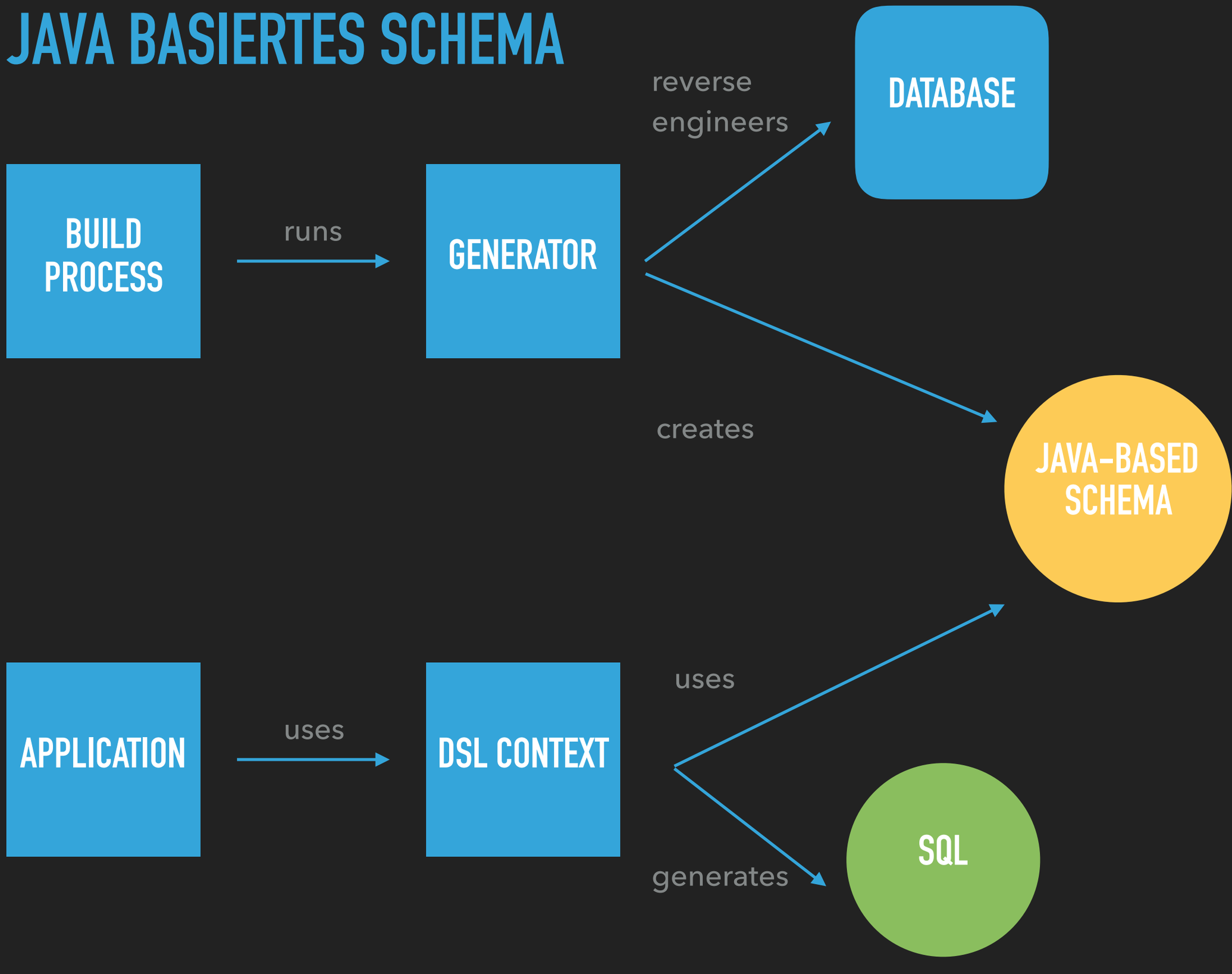
Oracle 10g (All editions)
SQL Server 2008 (All editions)

Amazon Redshift [4]
SQL Azure

DB2 LUW 9.7
HANA (All editions) [3]
Informix 12.10 [2]
Ingres 10.1
Sybase ASE 15.5
Sybase SQL Anywhere 12
Vertica 7.1 [4]

JAVA BASIERTES SCHEMA



DATENBANKMIGRATIONEN SIND ESSENTIELL

- Liquibase
- Flyway

WORKFLOW

- Build gegen Entwicklungsdatenbank
  - startet Migration
  - startet jOOQ Generator
- Anwendung gegen Produktionsdatenbank
  - startet ebenfalls Migration

➡ Java Schema „passt“ immer zur Datenbank

DEMO

ZUSAMMENFASSUNG

- Direkte Abbildung von Abfragen auf URLs
- Von einfach bis kompliziert alles möglich
  - Logging der generierten Queries ist hilfreich
- Einfache Übergabe von Parametern an Queries
- Oft benutzte Fragmente können wiederverwendet werden

THE PROBLEM WITH INTERNET QUOTES IS THAT YOU CANT ALWAYS DEPEND ON THEIR ACCURACY" - ABRAHAM LINCOLN, 1864

THE SQL... IT'S ALWAYS BEEN THERE, IT WILL GUIDE YOU

Lukas Skyeder

ANWENDUNGSFALL ANALYTISCHE FUNKTIONEN

```
WITH
  previous_month AS
   (SELECT p.track_id, count(*) as cnt,
           dense_rank() over(order by count(*) desc) as position
      FROM plays p
     WHERE trunc(p.played_on, 'DD') BETWEEN
           date'2016-04-01' and date'2016-04-30' GROUP BY p.track_id),
  current_month AS
   (SELECT p.track_id, count(*) as cnt,
           dense_rank() over(order by count(*) desc) as position
      FROM plays p
     WHERE trunc(p.played_on, 'DD') BETWEEN
          date'2016-05-01' and date'2016-05-31' GROUP BY p.track_id)
SELECT a.artist || ' - ' || t.name || ' (' || t.album || ')' as label,
       current_month.cnt,
       previous_month.position - current_month.position as change
  FROM tracks t
  JOIN artists a on a.id = t.artist_id
  JOIN current_month current_month on current_month.track_id = t.id
  LEFT OUTER join previous_month on previous_month.track_id = t.id
 ORDER BY current_month.cnt desc, label asc
 FETCH FIRST 20 ROWS ONLY;
```

ANWENDUNGSFALL „UPSERT“ / MERGE STATEMENT

```
MERGE INTO tablename USING table_reference ON (condition)
  WHEN MATCHED THEN
  UPDATE SET column1 = value1 [, column2 = value2 ...]
  WHEN NOT MATCHED THEN
  INSERT (column1 [, column2 ...]) VALUES (value1 [, value2 ...]);
```

„JUST BECAUSE YOU'RE USING HIBERNATE, DOESN'T MEAN YOU HAVE TO USE IT FOR EVERYTHING.“ GAVIN KING

- Automatische Datenbankmigration (z.B. Flyway)
- JPA / Hibernate zusammen mit Spring Data JPA
- JPQL Queries falls nötig
  - Keine nativen Queries in Annotationen oder ähnlichem verstecken
- Komplexe Abfragen und Projektionen mit jOOQ erstellen
  - Als SQL an Hibernate übergeben oder
  - **den DSL Context direkt nutzen**

KENNT EURE WERKZEUGE!

- https://modern-sql.com
- https://blog.jooq.org
- https://vladmihalcea.com/tutorials/hibernate/
- http://www.thoughts-on-java.org/persistence/
- Und natürlich die jeweilige Referenzdokumentation

WAS IST ORACLE JET?

- Free and Open Source
- Kein neues Framework, vielmehr Bill Of Materials (BOM)
  - RequireJS, Knockout., jQuery UI
- Entwicklung von modernen *Enterprise* Anwendungen für
  - Desktop Browser
  - Mobile

FEATURES

- Große Auswahl an UI Components
- Accessibility support
- Internationalisierung (I18N)
- Unterstützung für hybride, mobile Anwendungen (Cordova)

BEISPIEL MODEL UND VIEW

```
define(['ojs/ojcore', 'knockout', 'jquery', 'moment', 'ojs/ojselectcombobox', 'ojs/ojchart', 'ojs/ojdatetimepicker'],
        function (oj, ko, $, moment) {
            function artistsContentViewModel() {
                    var self = this;
                    self.areaSeriesValue = ko.observableArray([]);
                    self.areaGroupsValue = ko.observableArray([]);
                    var updateCharts = function () {
                        // Fill model
                    }
                };

                self.optionChanged = function (event, data) {
                    updateCharts();
                };
            }
            return new artistsContentViewModel();
        });
```

```
<h2>Cumulative plays per artist and day</h2>
<div id='chart-container'>
    <div id="lineAreaChart" style="max-width:1024px;width:100%;height:320px;" data-bind="ojComponent: {
        component: 'ojChart',
        type: 'lineWithArea',
        series: areaSeriesValue,
        groups: areaGroupsValue,
        timeAxisType: 'enabled',
        animationOnDisplay: 'on',
        animationOnDataChange: 'on',
        stack: 'on',
        hoverBehavior: 'dim',
        zoomAndScroll: 'live',
        overview: {rendered: 'off'},
        dataCursor: dataCursorValue
     }"></div>
</div>
```

DEMO

FAZIT

- Leicht verteilbare Anwendungen / Mikroservices
  - Datenbankzentrisch, aber nicht datenbankabhängig!
- Nutzen von Datenbanktechnik und Wissen
- Wartbares, modernes UI
  - basierend auf offenen „Standards“

DANKE FÜR IHRE AUFMERKSAMKEIT!

- Dieser Vortrag:
  github.com/michael-simons/DOAG2016
- Mehr zum Einstieg in Spring Boot:
  github.com/michael-simons/NetBeansEveningCologne
- Kontakt: michael-simons.eu
- Twitter: @rotnroll666
- Gutschein für **arc42 by example**
  http://leanpub.com/arc42byexample/c/DOAG2016