МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ

РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ

ВЫСШЕГО ОБРАЗОВАНИЯ

«БЕЛГОРОДСКИЙ ГОСУДАРСТВЕННЫЙ

ТЕХНОЛОГИЧЕСКИЙ УНИВЕРСИТЕТ им. В.Г.ШУХОВА»

(БГТУ им. В.Г. Шухова)

Кафедра программного обеспечения вычислительной техники и автоматизированных систем

Дисциплина: Технологии Web-программирования

Лабораторная работа № 4

Разработка и проектирование базы данных

|  |  |
| --- | --- |
|  | Выполнил: ст. группы ПВ-41  Шапаренко А.А  Проверил: Картамышев С. В. |

Белгород

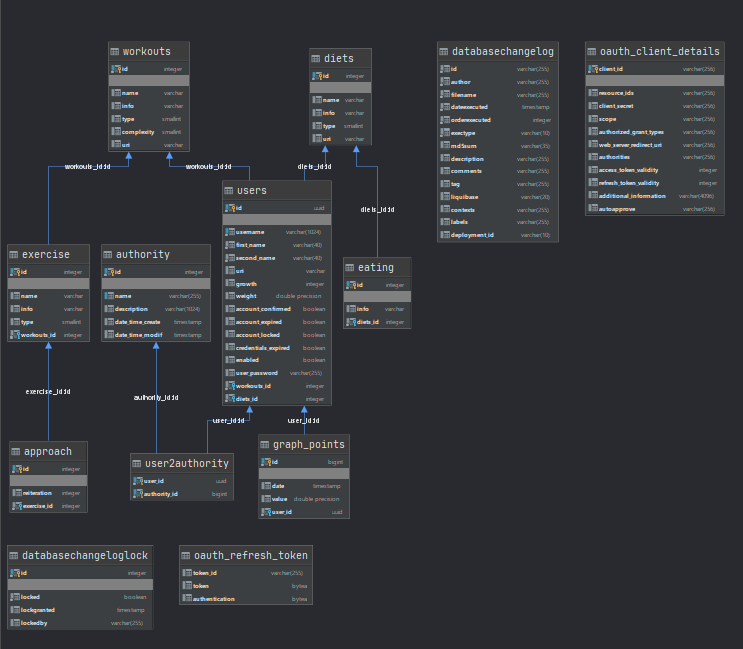
2020

**Цель**: изучить основы взаимодействия web-приложения с базой данных. Спроектировать базу данных для хранения информации приложения (страницы, пользователи и т.п.).

**Задание к лабораторной работе:**

1. Выбрать подходящую СУБД.
2. Изучить методы взаимодействия web-приложения с базой данных (ORM, Active Record).
3. Разработать структуру базы данных.
4. Разработать соответствующие модели в приложении.

В отчёт приложить схему базы данных, а также код одной из моделей (на своё усмотрение).



package com.example.webback.business.entity;  
  
import com.sun.istack.NotNull;  
import javax.persistence.Column;  
import javax.persistence.Entity;  
import javax.persistence.JoinColumn;  
import javax.persistence.ManyToOne;  
import javax.persistence.Table;  
import lombok.AllArgsConstructor;  
import lombok.Data;  
import lombok.EqualsAndHashCode;  
import lombok.NoArgsConstructor;  
  
@Data  
@Entity  
@Table***(***name = "approach"***)***@AllArgsConstructor  
@NoArgsConstructor  
@EqualsAndHashCode***(***callSuper = true***)***public class ApproachEntity extends ParentEntity***<***Integer***> {*** @Column***(***name = "iteration"***)*** private Integer **reiterationCount**;  
  
 @ManyToOne  
 @NotNull  
 @JoinColumn***(***name = "exercise\_id", referencedColumnName = "id"***)*** private ExerciseEntity **exercise**;  
  
***}***

package com.example.webback.business.entity;  
  
import com.fasterxml.jackson.annotation.JsonIgnore;  
import java.time.LocalDateTime;  
import javax.persistence.Column;  
import javax.persistence.Entity;  
import javax.persistence.EntityListeners;  
import javax.persistence.Table;  
import lombok.AllArgsConstructor;  
import lombok.Builder;  
import lombok.Getter;  
import lombok.NoArgsConstructor;  
import lombok.Setter;  
import lombok.ToString;  
import org.springframework.data.annotation.CreatedDate;  
import org.springframework.data.annotation.LastModifiedDate;  
import org.springframework.data.jpa.domain.support.AuditingEntityListener;  
import org.springframework.security.core.GrantedAuthority;  
  
@Entity  
@Getter  
@Setter  
@Table***(***name = "authority"***)***@AllArgsConstructor  
@NoArgsConstructor  
@Builder  
@EntityListeners***(***AuditingEntityListener.class***)***@ToString  
public class AuthorityEntity extends Model***<***Integer***>*** implements GrantedAuthority ***{*** private String **description**;  
  
 @Column***(***name = "date\_time\_create"***)*** @CreatedDate  
 private LocalDateTime **dateTimeCreate**;  
  
 @Column***(***name = "date\_time\_modif"***)*** @LastModifiedDate  
 private LocalDateTime **dateTimeModif**;  
  
 @Override  
 @JsonIgnore  
 public String getAuthority***() {*** return getName***()***;  
 ***}  
  
}***

package com.example.webback.business.entity;  
  
import com.example.webback.business.enums.DietsTypeEnum;  
import java.util.List;  
import javax.persistence.CascadeType;  
import javax.persistence.Column;  
import javax.persistence.Entity;  
import javax.persistence.OneToMany;  
import javax.persistence.Table;  
import lombok.AllArgsConstructor;  
import lombok.Data;  
import lombok.EqualsAndHashCode;  
import lombok.NoArgsConstructor;  
  
@Data  
@Entity  
@Table***(***name = "diets"***)***@AllArgsConstructor  
@NoArgsConstructor  
@EqualsAndHashCode***(***callSuper = true***)***public class DietsEntity extends Model***<***Integer***>{*** @Column***(***name = "info"***)*** private String **info**;  
  
 @Column***(***name = "type"***)*** private DietsTypeEnum **type**;  
  
 @Column***(***name = "uri"***)*** private String **previewUri**;  
  
 @OneToMany***(***mappedBy = "diets", cascade = CascadeType.***ALL)*** private List***<***EatingEntity***>* eating**;  
  
 @OneToMany***(***mappedBy = "diets", cascade = CascadeType.***ALL)*** private List***<***UserEntity***>* user**;  
  
  
***}***

package com.example.webback.business.entity;  
  
import com.sun.istack.NotNull;  
import javax.persistence.Column;  
import javax.persistence.Entity;  
import javax.persistence.JoinColumn;  
import javax.persistence.ManyToOne;  
import javax.persistence.Table;  
import lombok.AllArgsConstructor;  
import lombok.Data;  
import lombok.EqualsAndHashCode;  
import lombok.NoArgsConstructor;  
  
@Data  
@Entity  
@Table***(***name = "eating"***)***@AllArgsConstructor  
@NoArgsConstructor  
@EqualsAndHashCode***(***callSuper = true***)***public class EatingEntity extends Model***<***Integer***>{*** @Column***(***name = "info"***)*** private String **info**;  
  
 @ManyToOne  
 @NotNull  
 @JoinColumn***(***name = "diets\_id", referencedColumnName = "id"***)*** private DietsEntity **diets**;  
***}***

package com.example.webback.business.entity;  
  
  
import com.example.webback.business.enums.ExerciseTypeEnum;  
import com.sun.istack.NotNull;  
import java.util.List;  
import javax.persistence.CascadeType;  
import javax.persistence.Column;  
import javax.persistence.Entity;  
import javax.persistence.JoinColumn;  
import javax.persistence.ManyToOne;  
import javax.persistence.OneToMany;  
import javax.persistence.Table;  
import lombok.AllArgsConstructor;  
import lombok.Data;  
import lombok.EqualsAndHashCode;  
import lombok.NoArgsConstructor;  
  
@Data  
@Entity  
@Table***(***name = "exercise"***)***@AllArgsConstructor  
@NoArgsConstructor  
@EqualsAndHashCode***(***callSuper = true***)***public class ExerciseEntity extends Model***<***Integer***> {*** @Column***(***name = "info"***)*** private String **info**;  
  
 @Column***(***name = "type"***)*** private ExerciseTypeEnum **type**;  
  
 @OneToMany***(***mappedBy = "exercise", cascade = CascadeType.***ALL)*** private List***<***ApproachEntity***>* approach**;  
  
 @ManyToOne  
 @NotNull  
 @JoinColumn***(***name = "workouts\_id", referencedColumnName = "id"***)*** private WorkoutsEntity **workouts**;  
  
***}***

package com.example.webback.business.entity;  
  
  
import com.sun.istack.NotNull;  
import lombok.AllArgsConstructor;  
import lombok.Data;  
import lombok.EqualsAndHashCode;  
import lombok.NoArgsConstructor;  
  
import javax.persistence.\*;  
import java.time.LocalDate;  
  
@Data  
@Entity  
@Table***(***name = "graph\_points"***)***@AllArgsConstructor  
@NoArgsConstructor  
@EqualsAndHashCode***(***callSuper = true***)***public class GraghPointEntity extends ParentEntity***<***Long***>{*** @Column***(*** name = "date"***)*** LocalDate **date**;  
  
 @Column***(***name = "value"***)*** Double **value**;  
  
 @ManyToOne  
 @NotNull  
 @JoinColumn***(***name = "user\_id", referencedColumnName = "id"***)*** private UserEntity **user**;  
***}***

package com.example.webback.business.entity;  
  
import java.io.Serializable;  
import javax.persistence.MappedSuperclass;  
import lombok.AccessLevel;  
import lombok.Getter;  
import lombok.Setter;  
import lombok.experimental.FieldDefaults;  
  
@Getter  
@Setter  
@MappedSuperclass  
@FieldDefaults***(***level = AccessLevel.***PRIVATE)***public class Model***<***T extends Serializable***>*** extends ParentEntity***<***T***> {*** String **name**;  
***}***

package com.example.webback.business.entity;  
  
import java.io.Serializable;  
import javax.persistence.Column;  
import javax.persistence.GeneratedValue;  
import javax.persistence.GenerationType;  
import javax.persistence.Id;  
import javax.persistence.MappedSuperclass;  
import lombok.AccessLevel;  
import lombok.Getter;  
import lombok.Setter;  
import lombok.experimental.FieldDefaults;  
  
@Getter  
@Setter  
@MappedSuperclass  
@FieldDefaults***(***level = AccessLevel.***PRIVATE)***public class ParentEntity***<***T extends Serializable***> {*** @Id  
 @GeneratedValue***(***strategy = GenerationType.***IDENTITY)*** @Column***(***name = "id"***)*** T **id**;  
***}***

package com.example.webback.business.entity;  
  
  
import com.fasterxml.jackson.annotation.JsonIgnore;  
import com.fasterxml.jackson.annotation.JsonProperty;  
import com.sun.istack.NotNull;  
import lombok.\*;  
import org.hibernate.annotations.GenericGenerator;  
import org.springframework.security.core.GrantedAuthority;  
import org.springframework.security.core.userdetails.UserDetails;  
  
import javax.persistence.\*;  
import javax.validation.constraints.Email;  
import javax.validation.constraints.NotEmpty;  
import java.util.\*;  
  
@Data  
@Getter  
@Setter  
@Entity  
@Table***(***name = "users"***)***@NoArgsConstructor  
@AllArgsConstructor  
public class UserEntity implements UserDetails ***{*** @Id  
 @GeneratedValue***(***generator = "UserUUIDGenerator"***)*** @GenericGenerator***(***name = "UserUUIDGenerator", strategy = "org.hibernate.id.UUIDGenerator"***)*** private UUID **id**;  
  
 @Email  
 @NotEmpty  
 @Column***(***name = "username"***)*** private String **username**;  
  
 @Column***(***name = "second\_name"***)*** private String **secondName**;  
  
 @Column***(***name = "first\_name"***)*** private String **firstName**;  
  
 @Column***(***name = "uri"***)*** private String **photoUri**;  
  
 @Column***(***name = "growth"***)*** private Integer **growth**;  
  
 @Column***(***name = "weight"***)*** private Double **weight**;  
  
 @JsonProperty***(***access = JsonProperty.Access.***WRITE\_ONLY)*** @NotEmpty  
 @Column***(***name = "user\_password"***)*** private String **password**;  
  
 @Column***(***name = "account\_confirmed"***)*** private boolean **accountConfirmed**;  
  
 @Column***(***name = "account\_expired"***)*** private boolean **accountExpired**;  
  
 @Column***(***name = "account\_locked"***)*** private boolean **accountLocked**;  
  
 @Column***(***name = "credentials\_expired"***)*** private boolean **credentialsExpired**;  
  
 @Column***(***name = "enabled"***)*** private boolean **enabled**;  
  
 @ManyToOne  
 @NotNull  
 @JoinColumn***(***name = "diets\_id", referencedColumnName = "id"***)*** private DietsEntity **diets**;  
  
 @ManyToOne  
 @NotNull  
 @JoinColumn***(***name = "workouts\_id", referencedColumnName = "id"***)*** private WorkoutsEntity **workouts**;  
  
 @OneToMany***(***mappedBy = "user", cascade = CascadeType.***ALL)*** private List***<***GraghPointEntity***>* pointEntities**;  
  
 @ManyToMany***(***fetch = FetchType.***EAGER)*** @JoinTable***(***name = "user2authority",  
 joinColumns = @JoinColumn***(***name = "user\_id", referencedColumnName = "id"***)***,  
 inverseJoinColumns = @JoinColumn***(***name = "authority\_id",  
 referencedColumnName = "id"***))*** @OrderBy  
 private Set***<***AuthorityEntity***>* userAuthorities**;  
  
 @Override  
 @JsonIgnore  
 public Collection***<***? extends GrantedAuthority***>*** getAuthorities***() {*** return **userAuthorities**;  
 ***}*** @Override  
 public String getUsername***() {*** return **username**;  
 ***}*** @Override  
 @JsonIgnore  
 public boolean isAccountNonExpired***() {*** return !isAccountExpired***()***;  
 ***}*** @Override  
 @JsonIgnore  
 public boolean isAccountNonLocked***() {*** return !isAccountLocked***()***;  
 ***}*** @Override  
 @JsonIgnore  
 public boolean isCredentialsNonExpired***() {*** return !isCredentialsExpired***()***;  
 ***}*** public void addAuthority***(***AuthorityEntity authority***) {*** if ***(*userAuthorities** == null***) {* userAuthorities** = new HashSet***<>()***;  
 ***}* userAuthorities**.add***(***authority***)***;  
 ***}*** public void deleteAuthority***(***AuthorityEntity authority***) {* userAuthorities**.remove***(***authority***)***;  
 ***}  
  
  
}***

package com.example.webback.business.entity;  
  
  
import com.example.webback.business.enums.ComplexityEnum;  
import com.example.webback.business.enums.WorkoutsTypeEnum;  
import java.util.List;  
import javax.persistence.CascadeType;  
import javax.persistence.Column;  
import javax.persistence.Entity;  
import javax.persistence.OneToMany;  
import javax.persistence.Table;  
import lombok.AllArgsConstructor;  
import lombok.Data;  
import lombok.EqualsAndHashCode;  
import lombok.NoArgsConstructor;  
  
@Data  
@Entity  
@Table***(***name = "workouts"***)***@AllArgsConstructor  
@NoArgsConstructor  
@EqualsAndHashCode***(***callSuper = true***)***public class WorkoutsEntity extends Model***<***Integer***> {*** @Column***(***name = "info"***)*** private String **info**;  
  
 @Column***(***name = "type"***)*** private WorkoutsTypeEnum **type**;  
  
 @Column***(***name = "complexity"***)*** private ComplexityEnum **complexity**;  
  
 @Column***(***name = "uri"***)*** private String **previewUri**;  
  
 @OneToMany***(***mappedBy = "workouts", cascade = CascadeType.***ALL)*** private List***<***ExerciseEntity***>* exercise**;  
  
 @OneToMany***(***mappedBy = "workouts", cascade = CascadeType.***ALL)*** private List***<***UserEntity***>* user**;  
***}***

***<***databaseChangeLog **xmlns**="http://www.liquibase.org/xml/ns/dbchangelog"  
 **xmlns:xsi**="http://www.w3.org/2001/XMLSchema-instance"  
 **xsi:schemaLocation**="http://www.liquibase.org/xml/ns/dbchangelog  
 http://www.liquibase.org/xml/ns/dbchangelog/dbchangelog-3.4.xsd"***>  
  
 <***property **name**="blob\_type" **value**="bytea" **dbms**="postgresql"***/>  
  
  
 <***changeSet **id**="12122020-2135" **author**="shaparenko"***>  
  
  
 <***createTable **tableName**="diets"***>  
 <***column **name**="id" **type**="int" **autoIncrement**="true"***>  
 <***constraints **primaryKey**="true" **primaryKeyName**="pk\_diets" **unique**="true" **nullable**="false"***/>  
 </***column***>  
 <***column **name**="name" **type**="VARCHAR"***/>  
 <***column **name**="info" **type**="VARCHAR"***/>  
 <***column **name**="type" **type**="smallint"***/>  
 <***column **name**="uri" **type**="VARCHAR"***/>  
 </***createTable***>  
  
 <***createTable **tableName**="eating"***>  
 <***column **name**="id" **type**="int" **autoIncrement**="true"***>  
 <***constraints **primaryKey**="true" **primaryKeyName**="pk\_eating" **unique**="true" **nullable**="false"***/>  
 </***column***>  
 <***column **name**="name" **type**="VARCHAR"***/>  
 <***column **name**="info" **type**="VARCHAR"***/>  
 <***column **name**="diets\_id" **type**="int"***>  
 <***constraints **nullable**="false" **references**="diets(id)" **foreignKeyName**="eating\_diets\_fk"***/>  
 </***column***>  
 </***createTable***>  
  
  
 <***createTable **tableName**="workouts"***>  
 <***column **name**="id" **type**="int" **autoIncrement**="true"***>  
 <***constraints **primaryKey**="true" **primaryKeyName**="pk\_workouts" **unique**="true" **nullable**="false"***/>  
 </***column***>  
 <***column **name**="name" **type**="VARCHAR"***/>  
 <***column **name**="info" **type**="VARCHAR"***/>  
 <***column **name**="type" **type**="smallint"***/>  
 <***column **name**="complexity" **type**="smallint"***/>  
 <***column **name**="uri" **type**="VARCHAR"***/>  
 </***createTable***>  
  
 <***createTable **tableName**="exercise"***>  
 <***column **name**="id" **type**="int" **autoIncrement**="true"***>  
 <***constraints **primaryKey**="true" **primaryKeyName**="pk\_exercise" **unique**="true" **nullable**="false"***/>  
 </***column***>  
 <***column **name**="name" **type**="VARCHAR"***/>  
 <***column **name**="info" **type**="VARCHAR"***/>  
 <***column **name**="type" **type**="smallint"***/>  
 <***column **name**="workouts\_id" **type**="int"***>  
 <***constraints **nullable**="false" **references**="workouts(id)" **foreignKeyName**="exercise\_workouts\_fk"***/>  
 </***column***>  
 </***createTable***>  
  
 <***createTable **tableName**="approach"***>  
 <***column **name**="id" **type**="int" **autoIncrement**="true"***>  
 <***constraints **primaryKey**="true" **primaryKeyName**="pk\_approach" **unique**="true" **nullable**="false"***/>  
 </***column***>  
 <***column **name**="iteration" **type**="int"***/>  
 <***column **name**="exercise\_id" **type**="int"***>  
 <***constraints **nullable**="false" **references**="exercise(id)" **foreignKeyName**="approach\_exercise\_fk"***/>  
 </***column***>  
 </***createTable***>  
  
 <***createTable **tableName**="authority"***>  
 <***column **name**="id" **remarks**="ID" **type**="integer" **autoIncrement**="true"***>  
 <***constraints **primaryKey**="true" **primaryKeyName**="authority\_pkey"***/>  
 </***column***>  
 <***column **name**="name" **type**="varchar(255)"***>  
 <***constraints **unique**="true" **uniqueConstraintName**="authority\_name\_uk"***/>  
 </***column***>  
 <***column **name**="description" **type**="varchar(1024)"***/>  
 <***column **name**="date\_time\_create" **remarks**="Дата время вставки записи" **type**="datetime"***/>  
 <***column **name**="date\_time\_modif" **remarks**="Дата время модификации записи" **type**="datetime"***/>  
 </***createTable***>  
  
 <***createTable **tableName**="oauth\_client\_details"***>  
 <***column **name**="client\_id" **type**="varchar(256)"***>  
 <***constraints **primaryKey**="true" **primaryKeyName**="pk\_oauth\_client\_details"***/>  
 </***column***>  
 <***column **name**="resource\_ids" **type**="varchar(256)"***/>  
 <***column **name**="client\_secret" **type**="varchar(256)"***/>  
 <***column **name**="scope" **type**="varchar(256)"***/>  
 <***column **name**="authorized\_grant\_types" **type**="varchar(256)"***/>  
 <***column **name**="web\_server\_redirect\_uri" **type**="varchar(256)"***/>  
 <***column **name**="authorities" **type**="varchar(256)"***/>  
 <***column **name**="access\_token\_validity" **type**="int"***/>  
 <***column **name**="refresh\_token\_validity" **type**="int"***/>  
 <***column **name**="additional\_information" **type**="varchar(4096)"***/>  
 <***column **name**="autoapprove" **type**="varchar(256)"***/>  
 </***createTable***>  
  
 <***createTable **tableName**="oauth\_refresh\_token"***>  
 <***column **name**="token\_id" **type**="varchar(255)"***/>  
 <***column **name**="token" **type**="${blob\_type}"***/>  
 <***column **name**="authentication" **type**="${blob\_type}"***/>  
 </***createTable***>  
  
  
 <***createTable **tableName**="users"***>  
 <***column **name**="id" **type**="uuid"***>  
 <***constraints **primaryKey**="true" **primaryKeyName**="user\_data\_pkey" **unique**="true" **nullable**="false"***/>  
 </***column***>  
 <***column **name**="username" **type**="varchar(1024)"***>  
 <***constraints **unique**="true" **nullable**="false"***/>  
 </***column***>  
 <***column **name**="first\_name" **type**="varchar(40)"***>  
 <***constraints **nullable**="false"***/>  
 </***column***>  
 <***column **name**="second\_name" **type**="varchar(40)"***>  
 <***constraints **nullable**="false"***/>  
 </***column***>  
 <***column **name**="uri" **type**="varchar"***/>  
 <***column **name**="growth" **type**="integer"***/>  
 <***column **name**="weight" **type**="double"***/>  
 <***column **name**="account\_confirmed" **type**="boolean"***/>  
 <***column **name**="account\_expired" **type**="boolean"***/>  
 <***column **name**="account\_locked" **type**="boolean"***/>  
 <***column **name**="credentials\_expired" **type**="boolean"***/>  
 <***column **name**="enabled" **type**="boolean"***/>  
 <***column **name**="user\_password" **type**="varchar(255)"***/>  
 <***column **name**="workouts\_id" **type**="int"***>  
 <***constraints **nullable**="true" **references**="workouts(id)" **foreignKeyName**="user\_workouts\_fk"***/>  
 </***column***>  
 <***column **name**="diets\_id" **type**="int"***>  
 <***constraints **nullable**="true" **references**="diets(id)" **foreignKeyName**="user\_diets\_fk"***/>  
 </***column***>  
  
 </***createTable***>  
  
  
 <***createTable **tableName**="graph\_points"***>  
 <***column **name**="id" **remarks**="ID" **type**="bigint" **autoIncrement**="true"***>  
 <***constraints **primaryKey**="true" **primaryKeyName**="graph\_points\_pkey"***/>  
 </***column***>  
 <***column **name**="date" **type**="datetime"***/>  
 <***column **name**="value" **type**="double"***/>  
 <***column **name**="user\_id" **type**="uuid"***>  
 <***constraints **nullable**="false" **references**="users(id)" **foreignKeyName**="graph\_points\_user\_fk"***/>  
 </***column***>  
 </***createTable***>  
  
  
 <***createTable **tableName**="user2authority"***>  
 <***column **name**="user\_id" **type**="uuid"***>  
 <***constraints **nullable**="false" **primaryKey**="true" **primaryKeyName**="user2authority\_pkey"  
 **references**="users(id)" **foreignKeyName**="user2authority\_user\_fk"  
 ***/>  
 </***column***>  
 <***column **name**="authority\_id" **type**="bigint"***>  
 <***constraints **nullable**="false" **primaryKey**="true" **primaryKeyName**="user2authority\_pkey"  
 **references**="authority(id)" **foreignKeyName**="user2authority\_authority\_fk"***/>  
 </***column***>  
 </***createTable***>  
  
  
 </***changeSet***>  
  
  
  
</***databaseChangeLog***>***