School of Computer Science
Language Technologies Institute

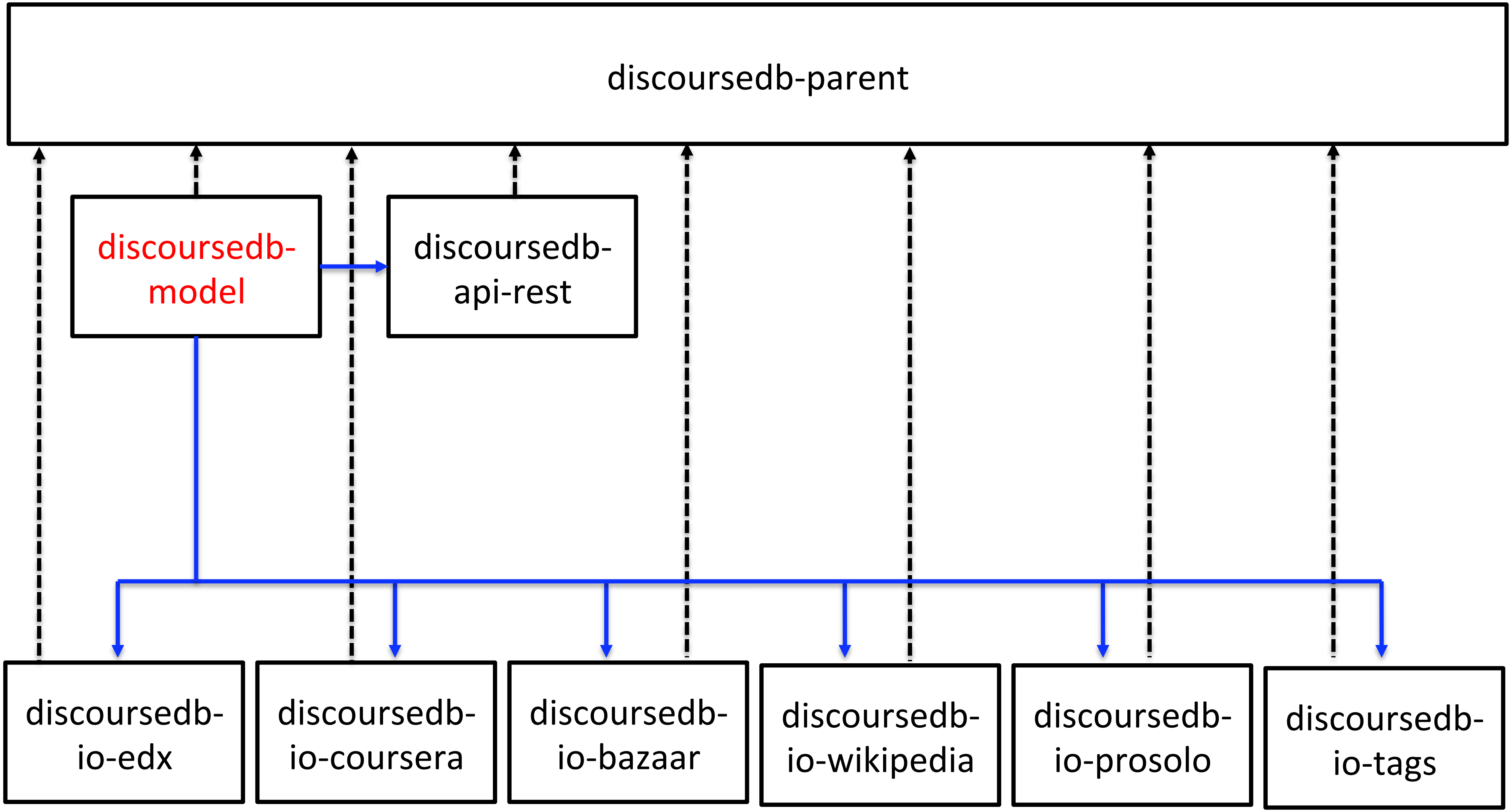
DiscourseDB
Project Structure

Carnegie Mellon University

Maven

- DiscourseDB is a multi-module Maven Project
- Main project properties and central dependency management located in the parent project
- Continuously built by Jenkins build server
- Successful builds automatically deployed to Artifactory

Project Layout



discoursedb-parent

discoursedb-model

discoursedb-api-rest

discoursedb-io-edx

discoursedb-io-coursera

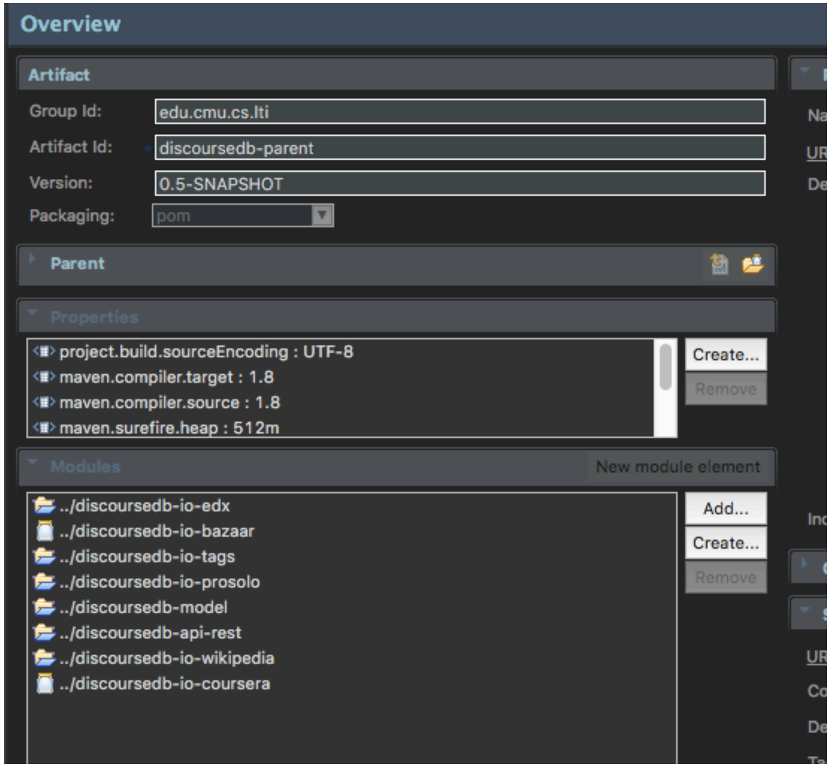
discoursedb-io-bazaar

discoursedb-io-wikipedia

discoursedb-io-prosolo

discoursedb-io-tags

Parent



Artifact

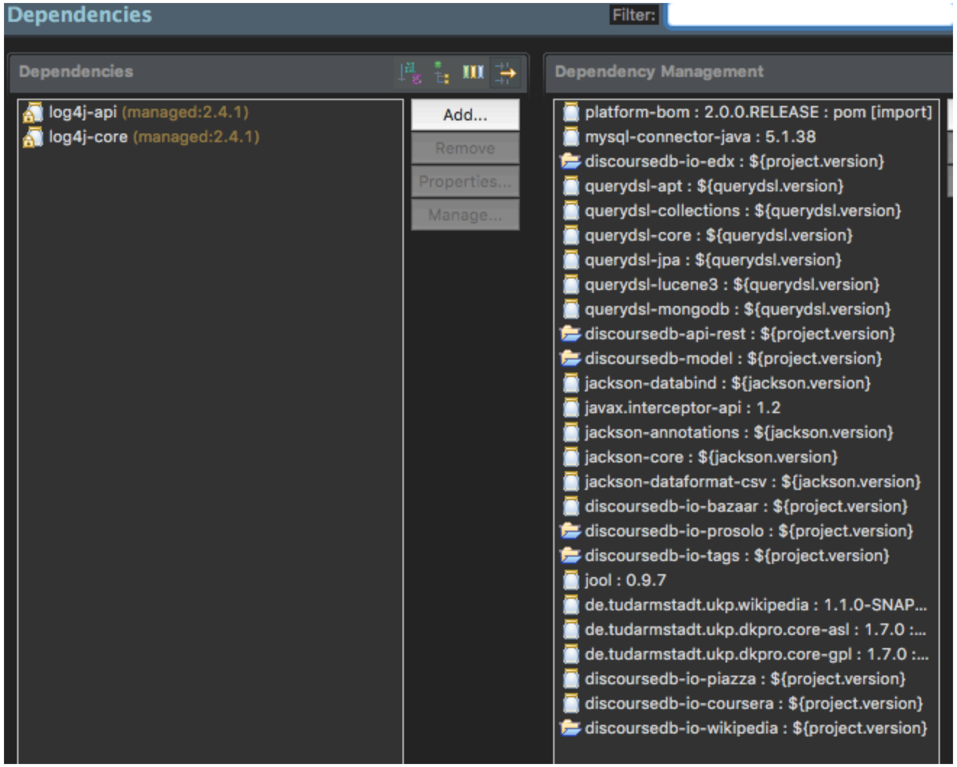
Group Id: edu.cmu.cs.lti
Artifact Id: discoursedb-parent
Version: 0.5-SNAPSHOT
Packaging: pom

Properties

- project.build.sourceEncoding : UTF-8
- maven.compiler.target : 1.8
- maven.compiler.source : 1.8
- maven.surefire.heap : 512m

Modules

- ../discoursedb-io-edx
- ../discoursedb-io-bazaar
- ../discoursedb-io-tags
- ../discoursedb-io-prosolo
- ../discoursedb-model
- ../discoursedb-api-rest
- ../discoursedb-io-wikipedia
- ../discoursedb-io-coursera



Dependencies

- log4j-api (managed:2.4.1)
- log4j-core (managed:2.4.1)

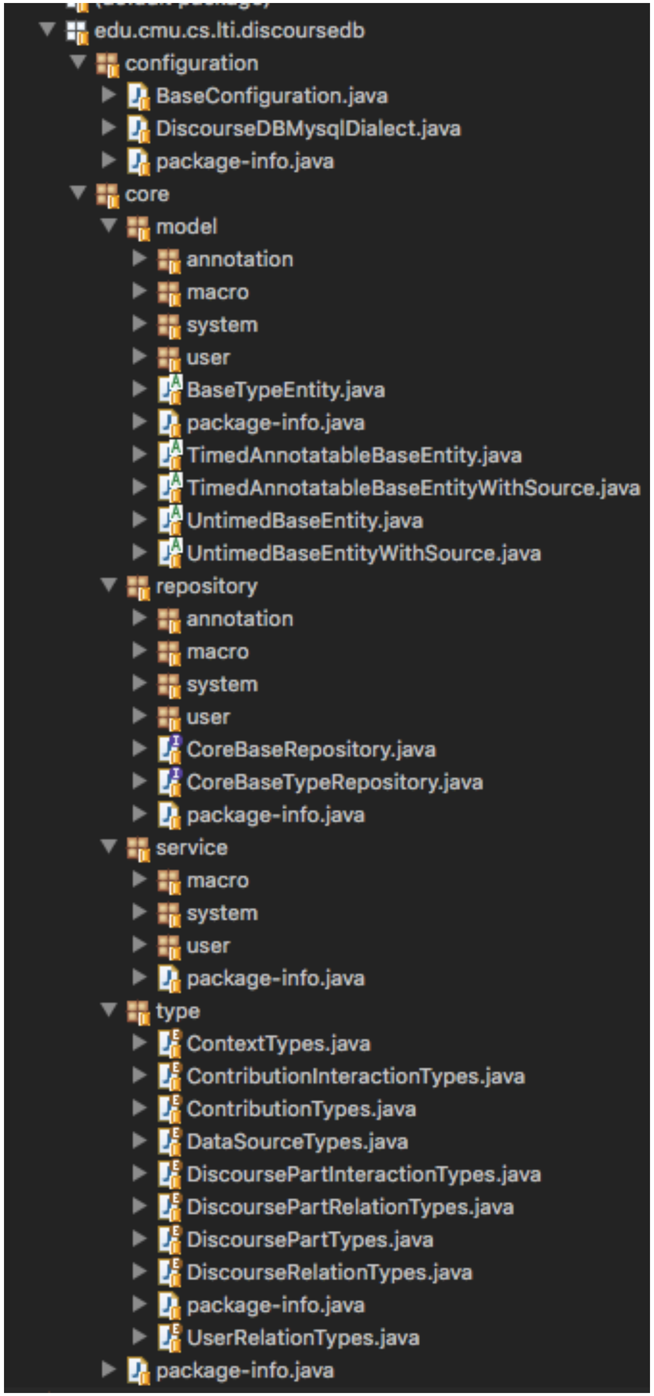
Dependency Management

- platform-bom : 2.0.0.RELEASE : pom [import]
- mysql-connector-java : 5.1.38
- discoursedb-io-edx : ${project.version}
- querydsl-apt : ${querydsl.version}
- querydsl-collections : ${querydsl.version}
- querydsl-core : ${querydsl.version}
- querydsl-jpa : ${querydsl.version}
- querydsl-lucene3 : ${querydsl.version}
- querydsl-mongodb : ${querydsl.version}
- discoursedb-api-rest : ${project.version}
- discoursedb-model : ${project.version}
- jackson-databind : ${jackson.version}
- javax.interceptor-api : 1.2
- jackson-annotations : ${jackson.version}
- jackson-core : ${jackson.version}
- jackson-dataformat-csv : ${jackson.version}
- discoursedb-io-bazaar : ${project.version}
- discoursedb-io-prosolo : ${project.version}
- discoursedb-io-tags : ${project.version}
- jool : 0.9.7
- de.tudarmstadt.ukp.wikipedia : 1.1.0-SNAP...
- de.tudarmstadt.ukp.dkpro.core-asl : 1.7.0 :...
- de.tudarmstadt.ukp.dkpro.core-gpl : 1.7.0 :...
- discoursedb-io-piazza : ${project.version}
- discoursedb-io-coursera : ${project.version}
- discoursedb-io-wikipedia : ${project.version}

- Define library versions to be used by child projects
- Set up project layout

discoursedb-model

- The core module represents
  - The DiscourseDB data model
  - Data Access Layer
  - Default configuration



```
edu.cmu.cs.lti.discoursedb
  configuration
    BaseConfiguration.java
    DiscourseDBMysqlDialect.java
    package-info.java
  core
    model
      annotation
      macro
      system
      user
      BaseTypeEntity.java
      package-info.java
      TimedAnnotatableBaseEntity.java
      TimedAnnotatableBaseEntityWithSource.java
      UntimedBaseEntity.java
      UntimedBaseEntityWithSource.java
    repository
      annotation
      macro
      system
      user
      CoreBaseRepository.java
      CoreBaseTypeRepository.java
      package-info.java
    service
      macro
      system
      user
      package-info.java
    type
      ContextTypes.java
      ContributionInteractionTypes.java
      ContributionTypes.java
      DataSourceTypes.java
      DiscoursePartInteractionTypes.java
      DiscoursePartRelationTypes.java
      DiscoursePartTypes.java
      DiscourseRelationTypes.java
      package-info.java
      UserRelationTypes.java
    package-info.java
```

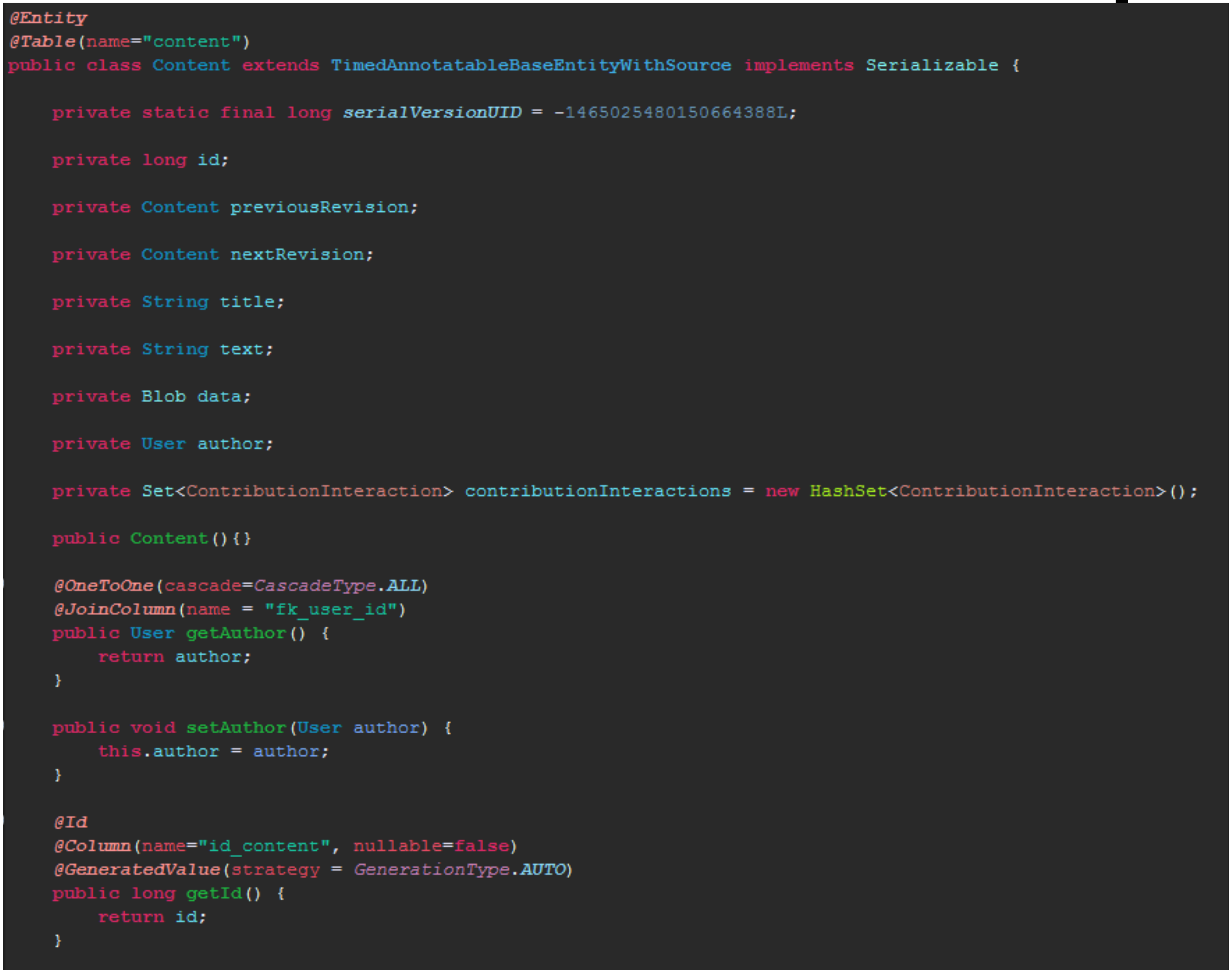
Model Layout

- Model
  - Persistence entities with ORM annotations
- Repository
  - Spring Date repository classes for the core entity beans that provide low-level data access methods
- Service
  - Service-layer classes which use repositories to provide high-level data access methods
- Type
  - Type definition for DiscourseDB type entites

Persistence Entities

- POJO that represents persistent data maintained in database
- Similar concept as EJB Entity Beans
- Instances of such an entity correspond to individual rows in the corresponding table
- Entities have relationships with other entities: expressed through object/ relational metadata → annotations

Persistence Entities Example



```java
@Entity
@Table(name="content")
public class Content extends TimedAnnotatableBaseEntityWithSource implements Serializable {

    private static final long serialVersionUID = -1465025480150664388L;

    private long id;

    private Content previousRevision;

    private Content nextRevision;

    private String title;

    private String text;

    private Blob data;

    private User author;

    private Set<ContributionInteraction> contributionInteractions = new HashSet<ContributionInteraction>();

    public Content(){}

    @OneToOne(cascade=CascadeType.ALL)
    @JoinColumn(name = "fk_user_id")
    public User getAuthor() {
        return author;
    }

    public void setAuthor(User author) {
        this.author = author;
    }

    @Id
    @Column(name="id_content", nullable=false)
    @GeneratedValue(strategy = GenerationType.AUTO)
    public long getId() {
        return id;
    }
```

Spring Data Repositories

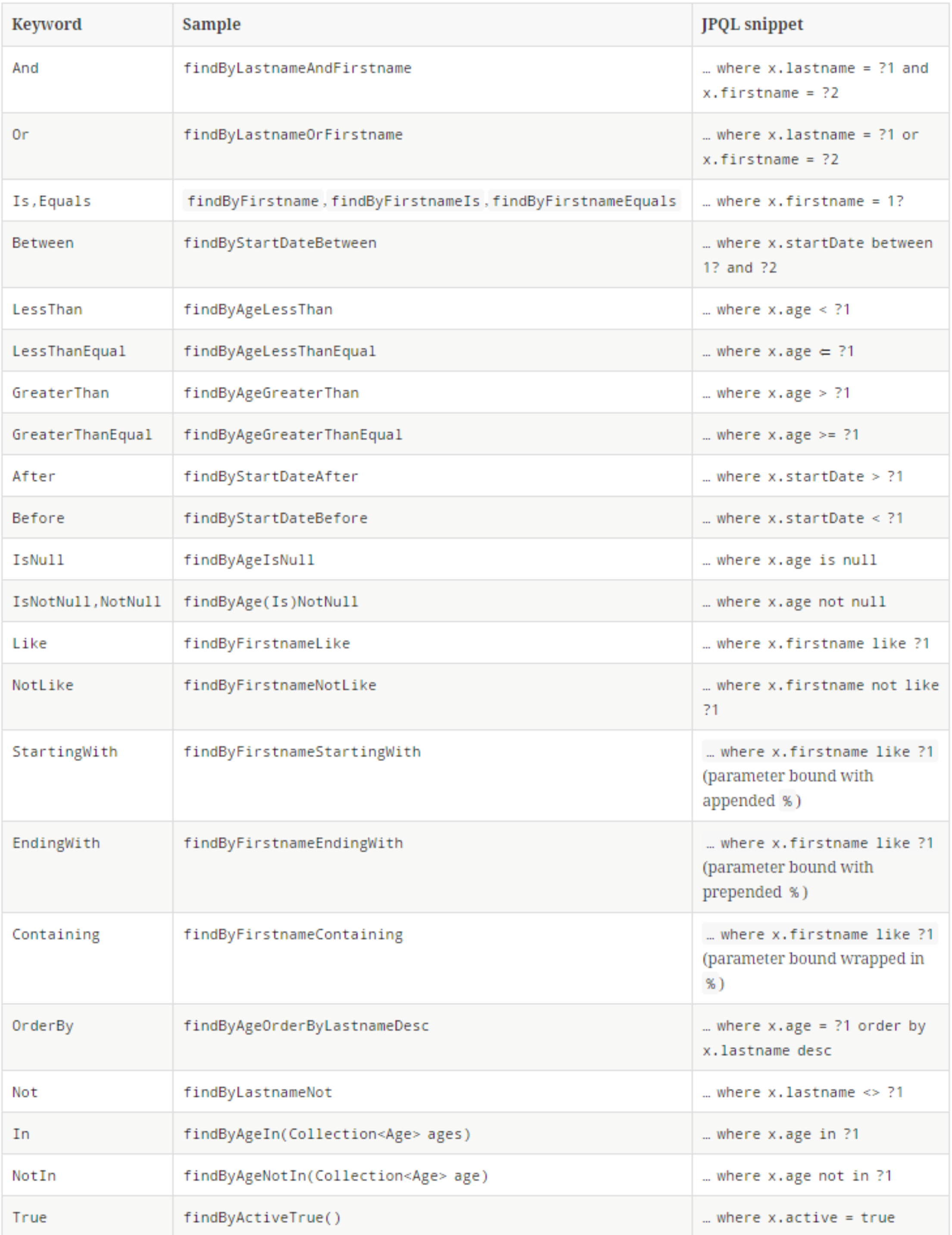
- Reduce the amount of boilerplate code required to implement data access layers for various persistence stores.

  ➔ Avoid the need to write code that creates database queries

- Define repository interfaces without worrying about their implementation

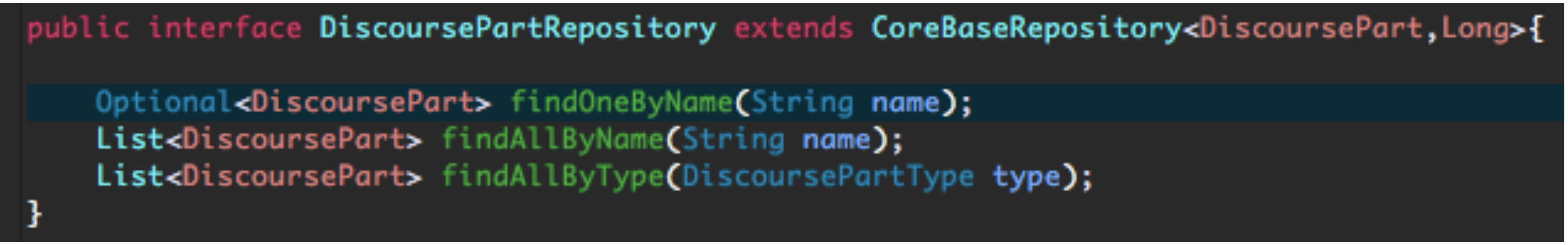
Encode Query in method names

- Define methods in repository interface
- Let Spring Date implement the methods on the fly

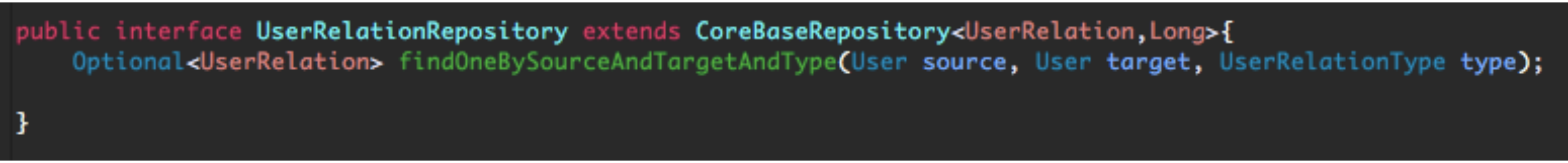


Keyword	Sample	JPQL snippet
And	findByLastnameAndFirstname	… where x.lastname = ?1 and x.firstname = ?2
Or	findByLastnameOrFirstname	… where x.lastname = ?1 or x.firstname = ?2
Is,Equals	findByFirstname,findByFirstnameIs,findByFirstnameEquals	… where x.firstname = 1?
Between	findByStartDateBetween	… where x.startDate between 1? and ?2
LessThan	findByAgeLessThan	… where x.age < ?1
LessThanEqual	findByAgeLessThanEqual	… where x.age ⇐ ?1
GreaterThan	findByAgeGreaterThan	… where x.age > ?1
GreaterThanEqual	findByAgeGreaterThanEqual	… where x.age >= ?1
After	findByStartDateAfter	… where x.startDate > ?1
Before	findByStartDateBefore	… where x.startDate < ?1
IsNull	findByAgeIsNull	… where x.age is null
IsNotNull,NotNull	findByAge(Is)NotNull	… where x.age not null
Like	findByFirstnameLike	… where x.firstname like ?1
NotLike	findByFirstnameNotLike	… where x.firstname not like ?1
StartingWith	findByFirstnameStartingWith	… where x.firstname like ?1 (parameter bound with appended %)
EndingWith	findByFirstnameEndingWith	… where x.firstname like ?1 (parameter bound with prepended %)
Containing	findByFirstnameContaining	… where x.firstname like ?1 (parameter bound wrapped in %)
OrderBy	findByAgeOrderByLastnameDesc	… where x.age = ?1 order by x.lastname desc
Not	findByLastnameNot	… where x.lastname <> ?1
In	findByAgeIn(Collection<Age> ages)	… where x.age in ?1
NotIn	findByAgeNotIn(Collection<Age> age)	… where x.age not in ?1
True	findByActiveTrue()	… where x.active = true

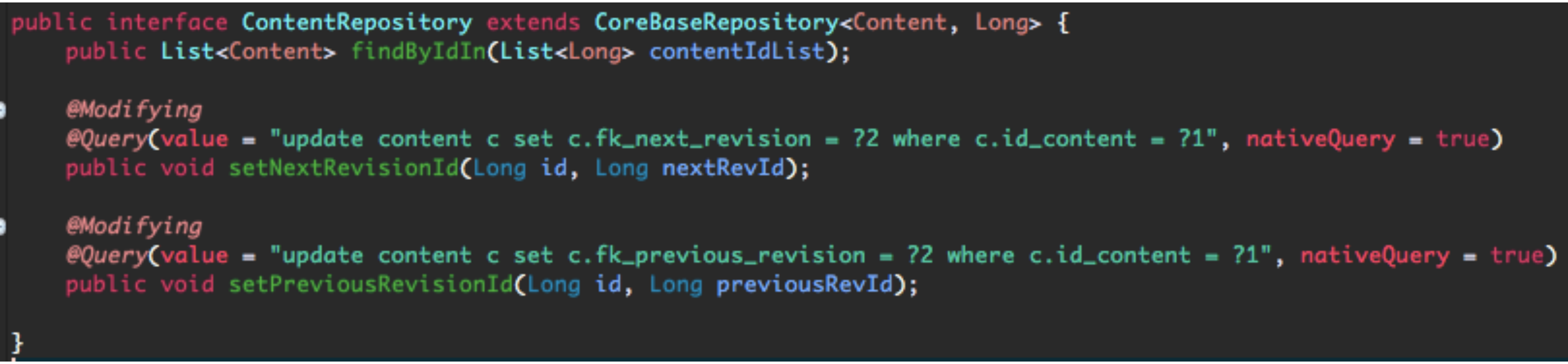
Examples



```
public interface DiscoursePartRepository extends CoreBaseRepository<DiscoursePart,Long>{

    Optional<DiscoursePart> findOneByName(String name);
    List<DiscoursePart> findAllByName(String name);
    List<DiscoursePart> findAllByType(DiscoursePartType type);
}
```



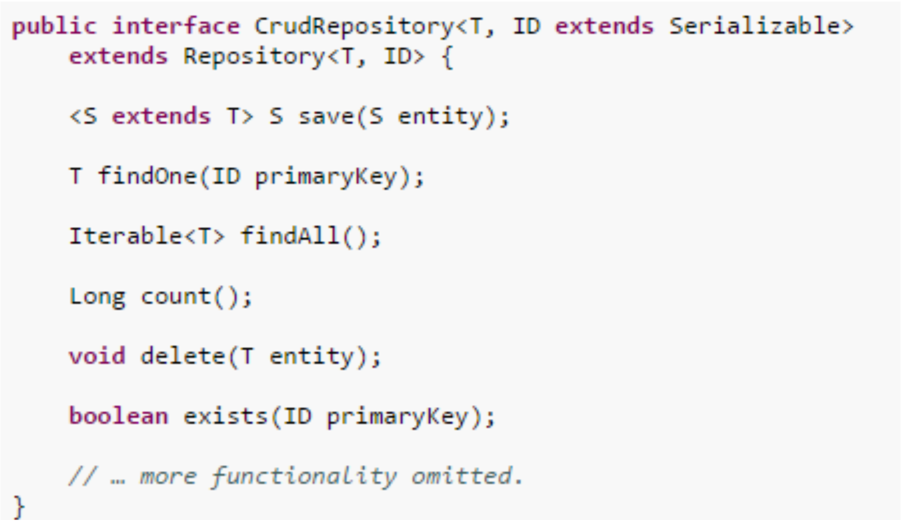
```
public interface UserRelationRepository extends CoreBaseRepository<UserRelation,Long>{
    Optional<UserRelation> findOneBySourceAndTargetAndType(User source, User target, UserRelationType type);

}
```



```
public interface ContentRepository extends CoreBaseRepository<Content, Long> {
    public List<Content> findByIdIn(List<Long> contentIdList);

    @Modifying
    @Query(value = "update content c set c.fk_next_revision = ?2 where c.id_content = ?1", nativeQuery = true)
    public void setNextRevisionId(Long id, Long nextRevId);

    @Modifying
    @Query(value = "update content c set c.fk_previous_revision = ?2 where c.id_content = ?1", nativeQuery = true)
    public void setPreviousRevisionId(Long id, Long previousRevId);

}
```

Basic CRUD capabilities

- Base interface provides low level access capabilities to all entities

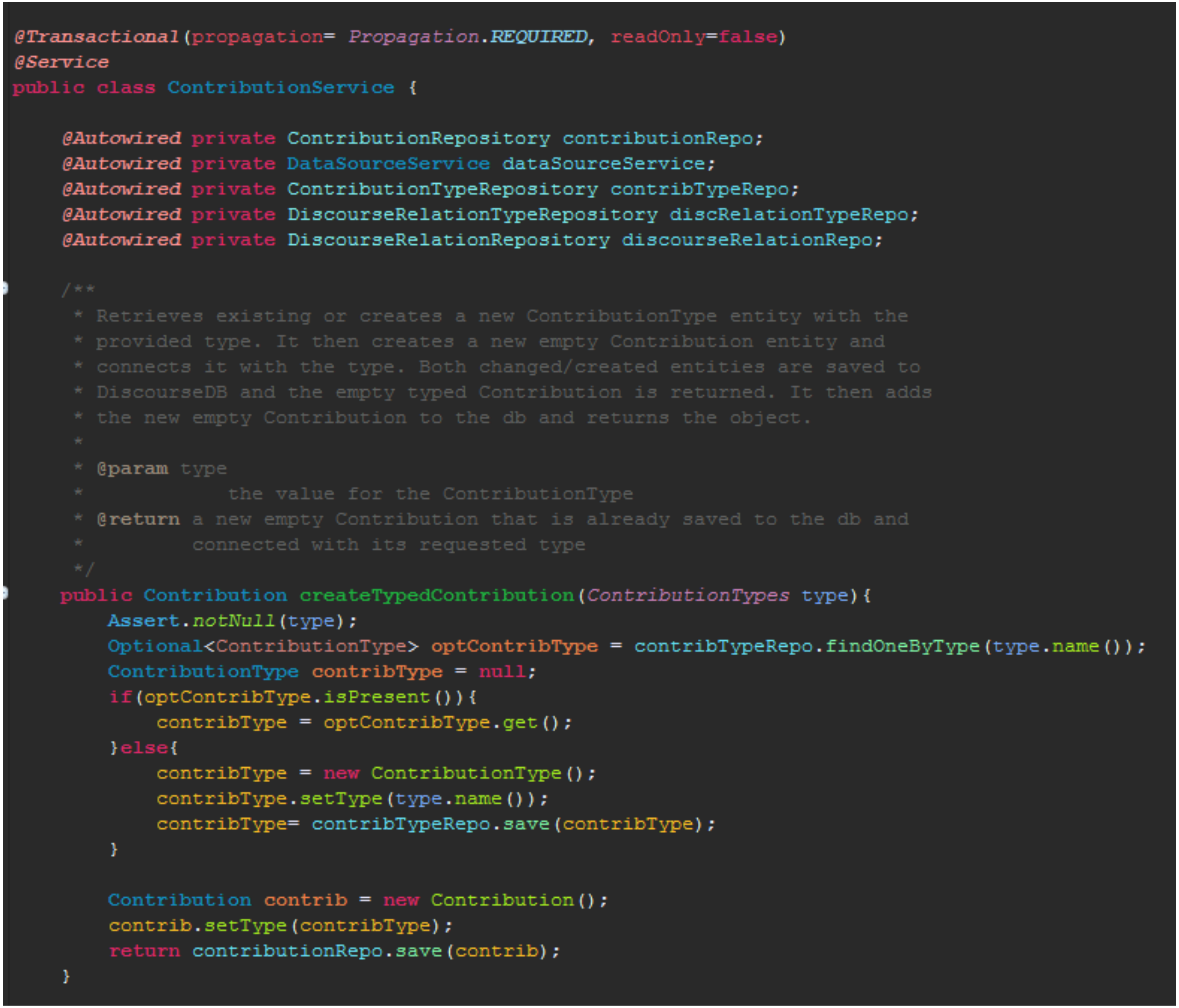


```
public interface CrudRepository<T, ID extends Serializable>
    extends Repository<T, ID> {

    <S extends T> S save(S entity);

    T findOne(ID primaryKey);

    Iterable<T> findAll();

    Long count();

    void delete(T entity);

    boolean exists(ID primaryKey);

    // … more functionality omitted.
}
```

The Service Layer

- provides a higher level of abstraction for data access.
- services encapsulate whole processes and allow to perform additional consistency and validity checks
- **repositories** define access methods for single entities while **services** can interact with multiple entities
- services use repositories (and potentially also other services)

Service Examples

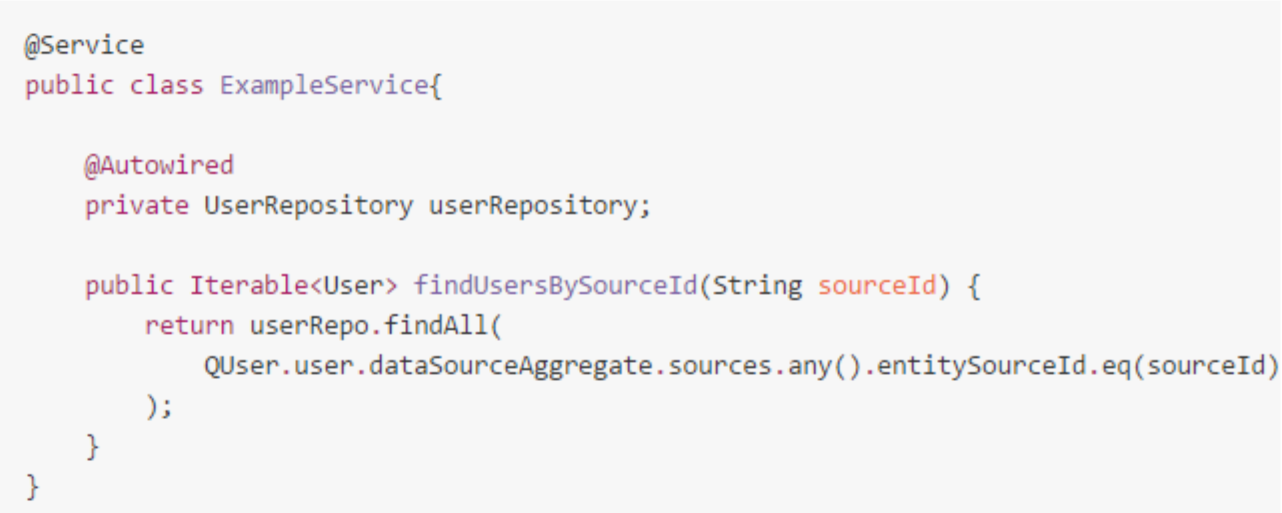


```
@Transactional(propagation= Propagation.REQUIRED, readOnly=false)
@Service
public class ContributionService {

    @Autowired private ContributionRepository contributionRepo;
    @Autowired private DataSourceService dataSourceService;
    @Autowired private ContributionTypeRepository contribTypeRepo;
    @Autowired private DiscourseRelationTypeRepository discRelationTypeRepo;
    @Autowired private DiscourseRelationRepository discourseRelationRepo;

    /**
     * Retrieves existing or creates a new ContributionType entity with the
     * provided type. It then creates a new empty Contribution entity and
     * connects it with the type. Both changed/created entities are saved to
     * DiscourseDB and the empty typed Contribution is returned. It then adds
     * the new empty Contribution to the db and returns the object.
     *
     * @param type
     *            the value for the ContributionType
     * @return a new empty Contribution that is already saved to the db and
     *         connected with its requested type
     */
    public Contribution createTypedContribution(ContributionTypes type){
        Assert.notNull(type);
        Optional<ContributionType> optContribType = contribTypeRepo.findOneByType(type.name());
        ContributionType contribType = null;
        if(optContribType.isPresent()){
            contribType = optContribType.get();
        }else{
            contribType = new ContributionType();
            contribType.setType(type.name());
            contribType= contribTypeRepo.save(contribType);
        }

        Contribution contrib = new Contribution();
        contrib.setType(contribType);
        return contributionRepo.save(contrib);
    }
```

QueryDSL

- It is very hard to implement complex queries and even harder to read them.
- Defining repository queries is fast and easy for single entities, but verbose
- If joins are involved, repository-style queries are not ideal
- QueryDSL
  - abstraction layer for queries
  - allows to define reusable predicates that can be passed to repository methods

QueryDSL Example



```
@Service
public class ExampleService{

    @Autowired
    private UserRepository userRepository;

    public Iterable<User> findUsersBySourceId(String sourceId) {
        return userRepo.findAll(
            QUser.user.dataSourceAggregate.sources.any().entitySourceId.eq(sourceId)
        );
    }
}
```

- **Retrieves all User entities that have an associated DataSourceInstance which contains the provided sourceId**
- The QUser class is autogenerated by QueryDSL
- Predicates (the argument of the findAll() method) can be stores in a separate Predicate class so it can be re-used in multiple queries