Querydsl - Reference Documentation

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3.7.0

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Preface

Querydsl is a framework which enables the construction of statically typed SQL-like queries. Instead of writing queries as inline strings or externalizing them into XML files they can be constructed via a fluent API like Querydsl.

The benefits of using a fluent API in comparison to simple strings are for example

- code completion in IDE
- almost none syntactically invalid queries allowed
- domain types and properties can be referenced safely
- adopts better to refactoring changes in domain types

1. Introduction

1.1. Background

Querydsl was born out of the need to maintain HQL queries in a typesafe way. Incremental construction of HQL queries requires String concatenation and results in hard to read code. Unsafe references to domain types and properties via plain Strings were another issue with String based HQL construction.

With a changing domain model type-safety brings huge benefits in software development. Domain changes are directly reflected in queries and autocomplete in query construction makes query construction faster and safer.

HQL for Hibernate was the first target language for Querydsl, but nowadays it supports JPA, JDO, JDBC, Lucene, Hibernate Search, MongoDB, Collections and RDFBean as backends.

1.2. Principles

Type safety is the core principle of Querydsl. Queries are constructed based on generated query types that reflect the properties of your domain types. Also function/method invocations are constructed in a fully type-safe manner.

Consistency is another important principle. The query paths and operations are the same in all implementations and also the Query interfaces have a common base interface.

To get an impression of the expressivity of the Querydsl query and expression types go to the javadocs and explore `com.mysema.query.Query`, `com.mysema.query.Projectable` and `com.mysema.query.types.Expression`.

2. Tutorials

Instead of a general Getting started guide we provide integration guides for the main backends of Querydsl.

2.1. Querying JPA

Querydsl defines a general statically typed syntax for querying on top of persisted domain model data. JDO and JPA are the primary integration technologies for Querydsl. This guide describes how to use Querydsl in combination with JPA.

Querydsl for JPA is an alternative to both JPQL and Criteria queries. It combines the dynamic nature of Criteria queries with the expressiveness of JPQL and all that in a fully typesafe manner.

Maven integration

Add the following dependencies to your Maven project:

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-apt</artifactId>
  <version>${querydsl.version}</version>
  <scope>provided</scope>
</dependency>

<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-jpa</artifactId>
  <version>${querydsl.version}</version>
</dependency>

<dependency>
  <groupId>org.slf4j</groupId>
  <artifactId>slf4j-log4j12</artifactId>
  <version>1.6.1</version>
</dependency>
```

And now, configure the Maven APT plugin:

```
<project>
  <build>
  <plugins>
    ...
    <plugin>
      <groupId>com.mysema.maven</groupId>
      <artifactId>apt-maven-plugin</artifactId>
      <version>1.1.3</version>
      <executions>
        <execution>
          <goals>
            <goal>process</goal>
          </goals>
          <configuration>
            <outputDirectory>target/generated-sources/java</outputDirectory>
            <processor>com.mysema.query.apt.jpa.JPAAnnotationProcessor</processor>
          </configuration>
        </execution>
      </executions>
    </plugin>
    ...
  </plugins>
  </build>
</project>
```

The JPAAnnotationProcessor finds domain types annotated with the javax.persistence.Entity annotation and generates query types for them.

If you use Hibernate annotations in your domain types you should use the APT processor `com.mysema.query.apt.hibernate.HibernateAnnotationProcessor` instead.

Run clean install and you will get your Query types generated into target/generated-sources/java.

If you use Eclipse, run mvn eclipse:eclipse to update your Eclipse project to include target/generated-sources/java as a source folder.

Now you are able to construct JPA query instances and instances of the query domain model.

Ant integration

Place the jar files from the full-deps bundle on your classpath and use the following tasks for Querydsl code generation:

```
<!-- APT based code generation -->
<javac srcdir="${src}" classpathref="cp">
  <compilerarg value="-proc:only"/>
  <compilerarg value="-processor"/>
  <compilerarg value="com.mysema.query.apt.jpa.JPAAnnotationProcessor"/>
  <compilerarg value="-s"/>
  <compilerarg value="${generated}"/>
</javac>

<!-- compilation -->
<javac classpathref="cp" destdir="${build}">
  <src path="${src}"/>
  <src path="${generated}"/>
</javac>
```

Replace *src* with your main source folder, *generated* with your folder for generated sources and *build* with your target folder.

Using Querydsl JPA in Roo

If you are using Querydsl JPA with Spring Roo you can replace `com.mysema.query.apt.jpa.JPAAnnotationProcessor` with `com.mysema.query.apt.roo.RooAnnotationProcessor` which will handle `@RooJpaEntity` and `@RooJpaActiveRecord` annotated classes instead of `@Entity` annotated classes.

APT based code generation doesn't work well with AspectJ IDTs.

Generating the model from hbm.xml files

If you are using Hibernate with an XML based configuration, you can use the XML metadata to create your Querydsl model.

`com.mysema.query.jpa.codegen.HibernateDomainExporter` provides the functionality for this:

```
HibernateDomainExporter exporter = new HibernateDomainExporter(
  "Q",                     // name prefix
  new File("target/gen3"), // target folder
  configuration);          // instance of org.hibernate.cfg.Configuration

exporter.export();
```

The HibernateDomainExporter needs to be executed within a classpath where the domain types are visible, since the property types are resolved via reflection.

All JPA annotations are ignored, but Querydsl annotations such as @QueryInit and @QueryType are taken into account.

Using query types

To create queries with Querydsl you need to instantiate variables and Query implementations. We will start with the variables.

Let's assume that your project has the following domain type:

```
@Entity
public class Customer {
    private String firstName;
    private String lastName;

    public String getFirstName() {
        return firstName;
    }

    public String getLastName() {
        return lastName;
    }

    public void setFirstName(String fn) {
        firstName = fn;
    }

    public void setLastName(String ln)[
        lastName = ln;
    }
}
```

Querydsl will generate a query type with the simple name QCustomer into the same package as Customer. QCustomer can be used as a statically typed variable in Querydsl queries as a representative for the Customer type.

QCustomer has a default instance variable which can be accessed as a static field:

```
QCustomer customer = QCustomer.customer;
```

Alternatively you can define your own Customer variables like this:

```
QCustomer customer = new QCustomer("myCustomer");
```

Querying

The Querydsl JPA module supports both the JPA and the Hibernate API.

To use the JPA API you use `JPAQuery` instances for your queries like this:

```
// where entityManager is a JPA EntityManager
JPAQuery query = new JPAQuery(entityManager);
```

If you are using the Hibernate API instead, you can instantiate a `HibernateQuery` like this:

```
// where session is a Hibernate session
HibernateQuery query = new HibernateQuery(session);
```

Both JPAQuery and HibernateQuery implement the JPQLQuery interface.

To retrieve the customer with the first name Bob you would construct a query like this:

```
QCustomer customer = QCustomer.customer;
JPAQuery query = new JPAQuery(entityManager);
Customer bob = query.from(customer)
  .where(customer.firstName.eq("Bob"))
  .uniqueResult(customer);
```

The from call defines the query source, the where part defines the filter and uniqueResult defines the projection and tells Querydsl to return a single element. Easy, right?

To create a query with multiple sources you use the query like this:

```
QCustomer customer = QCustomer.customer;
QCompany company = QCompany.company;
query.from(customer, company);
```

And to use multiple filters use it like this

```
query.from(customer)
    .where(customer.firstName.eq("Bob"), customer.lastName.eq("Wilson"));
```

Or like this

```
query.from(customer)
    .where(customer.firstName.eq("Bob").and(customer.lastName.eq("Wilson")));
```

In native JPQL form the query would be written like this:

```
from Customer as customer
    where customer.firstName = "Bob" and customer.lastName = "Wilson"
```

If you want to combine the filters via "or" then use the following pattern

```
query.from(customer)
    .where(customer.firstName.eq("Bob").or(customer.lastName.eq("Wilson")));
```

Using joins

Querydsl supports the following join variants in JPQL: inner join, join, left join and full join. Join usage is typesafe, and follows the following pattern:

```
QCat cat = QCat.cat;
QCat mate = new QCat("mate");
QCate kitten = new QCat("kitten");
query.from(cat)
    .innerJoin(cat.mate, mate)
    .leftJoin(cat.kittens, kitten)
    .list(cat);
```

The native JPQL version of the query would be

```
from Cat as cat
    inner join cat.mate as mate
    left outer join cat.kittens as kitten
```

Another example

```
query.from(cat)
    .leftJoin(cat.kittens, kitten)
    .on(kitten.bodyWeight.gt(10.0))
    .list(cat);
```

With the following JPQL version

```
from Cat as cat
    left join cat.kittens as kitten
    on kitten.bodyWeight > 10.0
```

General usage

Use the the cascading methods of the JPQLQuery interface like this

from: Add the query sources here.

innerJoin, join, leftJoin, fullJoin, on: Add join elements using these constructs. For the join methods the first argument is the join source and the second the target (alias).

where: Add query filters, either in varargs form separated via commas or cascaded via the and-operator.

groupBy: Add group by arguments in varargs form.

having: Add having filters of the "group by" grouping as an varags array of Predicate expressions.

orderBy: Add ordering of the result as an varargs array of order expressions. Use asc() and desc() on numeric, string and other comparable expression to access the OrderSpecifier instances.

limit, offset, restrict: Set the paging of the result. Limit for max results, offset for skipping rows and restrict for defining both in one call.

Ordering

The syntax for declaring ordering is

```
QCustomer customer = QCustomer.customer;
query.from(customer)
    .orderBy(customer.lastName.asc(), customer.firstName.desc())
    .list(customer);
```

which is equivalent to the following native JPQL

```
from Customer as customer
    order by customer.lastName asc, customer.firstName desc
```

Grouping

Grouping can be done in the following form

```
query.from(customer)
    .groupBy(customer.lastName)
    .list(customer.lastName);
```

which is equivalent to the following native JPQL

```
select customer.lastName
    from Customer as customer
    group by customer.lastName
```

Delete clauses

Delete clauses in Querydsl JPA follow a simple delete-where-execute form. Here are some examples:

```
QCustomer customer = QCustomer.customer;
// delete all customers
new JPADeleteClause(entityManager, customer).execute();
// delete all customers with a level less than 3
new JPADeleteClause(entityManager, customer).where(customer.level.lt(3)).execute();
```

The second parameter of the JPADeleteClause constructor is the entity to be deleted. The where call is optional and the execute call performs the deletion and returns the amount of deleted entities.

For Hibernate based Delete usage, use the HibernateDeleteClause instead.

DML clauses in JPA don't take JPA level cascade rules into account and don't provide fine-grained second level cache interaction.

Update clauses

Update clauses in Querydsl JPA follow a simple update-set/where-execute form. Here are some examples:

```
QCustomer customer = QCustomer.customer;
// rename customers named Bob to Bobby
new JPAUpdateClause(session, customer).where(customer.name.eq("Bob"))
    .set(customer.name, "Bobby")
    .execute();
```

The second parameter of the JPAUpdateClause constructor is the entity to be updated. The set invocations define the property updates in SQL-Update-style and the execute call performs the Update and returns the amount of updated entities.

For Hibernate based Update usage, use the HibernateUpdateClause instead.

DML clauses in JPA don't take JPA level cascade rules into account and don't provide fine-grained second level cache interaction.

Subqueries

To create a subquery you create a JPASubQuery instance, define the query parameters via from, where etc and use unique or list to create a subquery, which is just a type-safe Querydsl expression for the query. unique is used for a unique (single) result and list for a list result.

```
QDepartment department = QDepartment.department;
QDepartment d = new QDepartment("d");
query.from(department)
    .where(department.employees.size().eq(
        new JPASubQuery().from(d).unique(d.employees.size().max())
     )).list(department);
```

Another example

```
QEmployee employee = QEmployee.employee;
QEmployee e = new QEmployee("e");
query.from(employee)
    .where(employee.weeklyhours.gt(
        new JPASubQuery().from(employee.department.employees, e)
        .where(e.manager.eq(employee.manager))
        .unique(e.weeklyhours.avg())
    )).list(employee);
```

For Hibernate based sub query usage, use the HibernateSubQuery instead.

Exposing the original query

If you need to tune the original Query before the execution of the query you can expose it like this:

```
JPAQuery query = new JPAQuery(entityManager);
Query jpaQuery = query.from(employee).createQuery(employee);
// ...
List results = jpaQuery.getResultList();
```

Using Native SQL in JPA queries

Querydsl supports Native SQL in JPA via the JPASQLQuery class.

To use it, you must generate Querydsl query types for your SQL schema. This can be done for example with the following Maven configuration:

```
<project>
  <build>
    <plugins>
      ...
      <plugin>
        <groupId>com.mysema.querydsl</groupId>
        <artifactId>querydsl-maven-plugin</artifactId>
        <version>${querydsl.version}</version>
        <executions>
          <execution>
            <goals>
              <goal>export</goal>
            </goals>
          </execution>
        </executions>
        <configuration>
          <jdbcDriver>org.apache.derby.jdbc.EmbeddedDriver</jdbcDriver>
          <jdbcUrl>jdbc:derby:target/demoDB;create=true</jdbcUrl>
          <packageName>com.mycompany.mydomain</packageName>
          <targetFolder>${project.basedir}/target/generated-sources/java</targetFolder>
        </configuration>
        <dependencies>
          <dependency>
            <groupId>org.apache.derby</groupId>
            <artifactId>derby</artifactId>
            <version>${derby.version}</version>
          </dependency>
        </dependencies>
      </plugin>
      ...
    </plugins>
  </build>
</project>
```

When the query types have successfully been generated into the location of your choice, you can use them in your queries.

Single column query:

```
// serialization templates
SQLTemplates templates = new DerbyTemplates();
// query types (S* for SQL, Q* for domain types)
SAnimal cat = new SAnimal("cat");
SAnimal mate = new SAnimal("mate");
QCat catEntity = QCat.cat;

JPASQLQuery query = new JPASQLQuery(entityManager, templates);
List<String> names = query.from(cat).list(cat.name);
```

If you mix entity (e.g. QCat) and table (e.g. SAnimal) references in your query you need to make sure that they use the same variable names. SAnimal.animal has the variable name "animal", so a new instance (new SAnimal("cat")) was used instead.

An alternative pattern could be

```
QCat catEntity = QCat.cat;
SAnimal cat = new SAnimal(catEntity.getMetadata().getName());
```

Query multiple columns:

```
query = new JPASQLQuery(entityManager, templates);
List<Object[]> rows = query.from(cat).list(cat.id, cat.name);
```

Query all columns:

```
List<Object[]> rows = query.from(cat).list(cat.all());
```

Query in SQL, but project as entity:

```
query = new JPASQLQuery(entityManager, templates);
List<Cat> cats = query.from(cat).orderBy(cat.name.asc()).list(catEntity);
```

Query with joins:

```
query = new JPASQLQuery(entityManager, templates);
cats = query.from(cat)
    .innerJoin(mate).on(cat.mateId.eq(mate.id))
    .where(cat.dtype.eq("Cat"), mate.dtype.eq("Cat"))
    .list(catEntity);
```

Query and project into DTO:

```
query = new JPASQLQuery(entityManager, templates);
List<CatDTO> catDTOs = query.from(cat)
    .orderBy(cat.name.asc())
    .list(ConstructorExpression.create(CatDTO.class, cat.id, cat.name));
```

If you are using the Hibernate API instead of the JPA API, then use HibernateSQLQuery instead.

2.2. Querying JDO

Querydsl defines a general statically typed syntax for querying on top of persisted domain model data. JDO and JPA are the primary integration technologies for Querydsl. This guide describes how to use Querydsl in combination with JDO.

Maven integration

Add the following dependencies to your Maven project:

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-apt</artifactId>
  <version>${querydsl.version}</version>
  <scope>provided</scope>
</dependency>

<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-jdo</artifactId>
  <version>${querydsl.version}</version>
</dependency>

<dependency>
  <groupId>org.slf4j</groupId>
  <artifactId>slf4j-log4j12</artifactId>
  <version>1.6.1</version>
</dependency>
```

And now, configure the Maven APT plugin which generates the query types used by Querydsl:

```
<project>
  <build>
    <plugins>
      ...
      <plugin>
        <groupId>com.mysema.maven</groupId>
        <artifactId>apt-maven-plugin</artifactId>
        <version>1.1.3</version>
        <executions>
          <execution>
            <goals>
              <goal>process</goal>
            </goals>
            <configuration>
              <outputDirectory>target/generated-sources/java</outputDirectory>
              <processor>com.mysema.query.apt.jdo.JDOAnnotationProcessor</processor>
            </configuration>
          </execution>
        </executions>
      </plugin>
    ...
    </plugins>
  </build>
</project>
```

The JDOAnnotationProcessor finds domain types annotated with the `javax.jdo.annotations.PersistenceCapable` annotation and generates query types for them.

Run clean install and you will get your query types generated into target/generated-sources/java.

If you use Eclipse, run mvn eclipse:eclipse to update your Eclipse project to include target/generated-sources/java as a source folder.

Now you are able to construct JDO query instances and instances of the query domain model.

Ant integration

Place the jar files from the full-deps bundle on your classpath and use the following tasks for Querydsl code generation:

```
<!-- APT based code generation -->
<javac srcdir="${src}" classpathref="cp">
  <compilerarg value="-proc:only"/>
  <compilerarg value="-processor"/>
  <compilerarg value="com.mysema.query.apt.jdo.JDOAnnotationProcessor"/>
  <compilerarg value="-s"/>
  <compilerarg value="${generated}"/>
</javac>

<!-- compilation -->
<javac classpathref="cp" destdir="${build}">
  <src path="${src}"/>
  <src path="${generated}"/>
</javac>
```

Replace *src* with your main source folder, *generated* with your folder for generated sources and *build* with your target folder.

Using query types

To create queries with Querydsl you need to instantiate variables and Query implementations. We will start with the variables.

Let's assume that your project has the following domain type:

```
@PersistenceCapable
public class Customer {
  private String firstName;
  private String lastName;

  public String getFirstName() {
    return firstName;
  }

  public String getLastName() {
    return lastName;
  }

  public void setFirstName(String fn) {
    firstName = fn;
  }

  public void setLastName(String ln) {
    lastName = ln;
  }
}
```

Querydsl will generate a query type with the simple name QCustomer into the same package as Customer. QCustomer can be used as a statically typed variable in Querydsl as a representative for the Customer type.

QCustomer has a default instance variable which can be accessed as a static field:

```
QCustomer customer = QCustomer.customer;
```

Alternatively you can define your own Customer variables like this:

```
QCustomer customer = new QCustomer("myCustomer");
```

QCustomer reflects all the properties of the original type Customer as public fields. The firstName field can be accessed like this

```
customer.firstName;
```

Querying with JDO

For the JDO-module JDOQuery is the main Query implementation. It is instantiated like this:

```
PersistenceManager pm = ...;
JDOQuery query = new JDOQuery (pm);
```

To retrieve the customer with the first name Bob you would construct a query like this:

```
QCustomer customer = QCustomer.customer;
JDOQuery query = new JDOQuery (pm);
Customer bob = query.from(customer)
  .where(customer.firstName.eq("Bob"))
  .uniqueResult(customer);
query.close();
```

The from call defines the query source, the where part defines the filter and uniqueResult defines the projection and tells Querydsl to return a single element. Easy, right?

To create a query with multiple sources you just use the JDOQuery class like this:

```
QCustomer customer = QCustomer.customer;
QCompany company = QCompany.company;
query.from(customer, company);
```

And to use multiple filters use it like this

```
query.from(customer)
    .where(customer.firstName.eq("Bob"), customer.lastName.eq("Wilson"));
```

Or like this

```
query.from(customer)
    .where(customer.firstName.eq("Bob").and(customer.lastName.eq("Wilson")));
```

If you want to combine the filters via "or" then use the following pattern

```
query.from(customer)
    .where(customer.firstName.eq("Bob").or(customer.lastName.eq("Wilson")));
```

General usage

Use the the cascading methods of the JDOQuery class like this

from: Add query sources here, the first argument becomes the main source and the others are treated as variables.

where: Add query filters, either in varargs form separated via commas or cascaded via the and-operator.

groupBy: Add group by arguments in varargs form.

having: Add having filters of the "group by" grouping as an varargs array of Predicate expressions.

orderBy: Add ordering of the result as an varargs array of order expressions. Use asc() and desc() on numeric, string and other comparable expression to access the OrderSpecifier instances.

limit, offset, restrict: Set the paging of the result. Limit for max results, offset for skipping rows and restrict for defining both in one call.

Ordering

The syntax for declaring ordering is

```
QCustomer customer = QCustomer.customer;
query.from(customer)
    .orderBy(customer.lastName.asc(), customer.firstName.desc())
    .list(customer);
```

Grouping

Grouping can be done in the following form

```
query.from(customer)
    .groupBy(customer.lastName)
    .list(customer.lastName);
```

Delete clauses

Delete clauses in Querydsl JDO follow a simple delete-where-execute form. Here are some examples:

```
QCustomer customer = QCustomer.customer;
// delete all customers
new JDODeleteClause(pm, customer).execute();
// delete all customers with a level less than 3
new JDODeleteClause(pm, customer).where(customer.level.lt(3)).execute();
```

The second parameter of the JDODeleteClause constructor is the entity to be deleted. The where call is optional and the execute call performs the deletion and returns the amount of deleted entities.

Subqueries

To create a subquery you create a `JDOSubQuery` instance, add the query parameters via from, where etc and use unique or list to create a subquery, which is just a type-safe expression for the query. unique is used for a unique result and list for a list result.

```
QDepartment department = QDepartment.department;
QDepartment d = new QDepartment("d");
query.from(department)
    .where(department.employees.size().eq(
        new JDOSubQuery().from(d).unique(AggregationFunctions.max(d.employees.size()))
     )).list(department);
```

represents the following native JDO query

```
SELECT this FROM com.mysema.query.jdoql.models.company.Department
WHERE this.employees.size() ==
(SELECT max(d.employees.size()) FROM com.mysema.query.jdoql.models.company.Department d)
```

Another example

```
QEmployee employee = QEmployee.employee;
QEmployee e = new QEmployee("e");
query.from(employee)
    .where(employee.weeklyhours.gt(
        new JDOSubQuery().from(employee.department.employees, e)
        .where(e.manager.eq(employee.manager))
        .unique(AggregationFunctions.avg(e.weeklyhours))
    )).list(employee);
```

which represents the following native JDO query

```
SELECT this FROM com.mysema.query.jdoql.models.company.Employee
WHERE this.weeklyhours >
(SELECT avg(e.weeklyhours) FROM this.department.employees e WHERE e.manager == this.manager)
```

Using Native SQL

Querydsl supports Native SQL in JDO via the `JDOSQLQuery` class.

To use it, you must generate Querydsl query types for your SQL schema. This can be done for example with the following Maven configuration:

```
<project>
  <build>
    <plugins>
      ...
      <plugin>
        <groupId>com.mysema.querydsl</groupId>
        <artifactId>querydsl-maven-plugin</artifactId>
        <version>${querydsl.version}</version>
        <executions>
          <execution>
            <goals>
              <goal>export</goal>
            </goals>
          </execution>
        </executions>
        <configuration>
          <jdbcDriver>org.apache.derby.jdbc.EmbeddedDriver</jdbcDriver>
          <jdbcUrl>jdbc:derby:target/demoDB;create=true</jdbcUrl>
          <packageName>com.mycompany.mydomain</packageName>
          <targetFolder>${project.basedir}/target/generated-sources/java</targetFolder>
        </configuration>
        <dependencies>
          <dependency>
            <groupId>org.apache.derby</groupId>
            <artifactId>derby</artifactId>
            <version>${derby.version}</version>
          </dependency>
        </dependencies>
      </plugin>
      ...
    </plugins>
  </build>
</project>
```

When the query types have successfully been generated into the location of your choice, you can use them in your queries.

Single column query:

```
// serialization templates
SQLTemplates templates = new DerbyTemplates();
// query types (S* for SQL, Q* for domain types)
SAnimal cat = new SAnimal("cat");
SAnimal mate = new SAnimal("mate");

JDOSQLQuery query = new JDOSQLQuery(pm, templates);
List<String> names = query.from(cat).list(cat.name);
```

Query multiple columns:

```
query = new JDOSQLQuery(pm, templates);
List<Object[]> rows = query.from(cat).list(cat.id, cat.name);
```

Query all columns:

```
List<Object[]> rows = query.from(cat).list(cat.all());
```

Query with joins:

```
query = new JDOSQLQuery(pm, templates);
cats = query.from(cat)
    .innerJoin(mate).on(cat.mateId.eq(mate.id))
    .where(cat.dtype.eq("Cat"), mate.dtype.eq("Cat"))
    .list(catEntity);
```

Query and project into DTO:

```
query = new JDOSQLQuery(pm, templates);
List<CatDTO> catDTOs = query.from(cat)
    .orderBy(cat.name.asc())
    .list(ConstructorExpression.create(CatDTO.class, cat.id, cat.name));
```

2.3. Querying SQL

This chapter describes the query type generation and querying functionality of the SQL module.

Maven integration

Add the following dependencies to your Maven project:

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-sql</artifactId>
  <version>${querydsl.version}</version>
</dependency>

<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-sql-codegen</artifactId>
  <version>${querydsl.version}</version>
  <scope>provided</scope>
</dependency>

<dependency>
  <groupId>org.slf4j</groupId>
  <artifactId>slf4j-log4j12</artifactId>
  <version>1.6.1</version>
</dependency>
```

The querydsl-sql-codegen dependency can be skipped, if code generation happens via Maven or Ant.

Code generation via Maven

This functionality should be primarily used via the Maven plugin. Here is an example:

```
<project>
  <build>
    <plugins>
      ...
      <plugin>
        <groupId>com.mysema.querydsl</groupId>
        <artifactId>querydsl-maven-plugin</artifactId>
        <version>${querydsl.version}</version>
        <executions>
          <execution>
            <goals>
              <goal>export</goal>
            </goals>
          </execution>
        </executions>
        <configuration>
          <jdbcDriver>org.apache.derby.jdbc.EmbeddedDriver</jdbcDriver>
          <jdbcUrl>jdbc:derby:target/demoDB;create=true</jdbcUrl>
          <packageName>com.myproject.domain</packageName>
          <targetFolder>${project.basedir}/target/generated-sources/java</targetFolder>
        </configuration>
        <dependencies>
          <dependency>
            <groupId>org.apache.derby</groupId>
            <artifactId>derby</artifactId>
            <version>${derby.version}</version>
          </dependency>
        </dependencies>
      </plugin>
      ...
    </plugins>
  </build>
</project>
```

Use the goal *test-export* to add the targetFolder as a test compile source root instead of a compile source root.

Table 2.1. Parameters

Name	Description
jdbcDriver	class name of the JDBC driver
jdbcUrl	JDBC url
jdbcUser	JDBC user
jdbcPassword	JDBC password
namePrefix	name prefix for generated query classes (default: Q)

Name	Description
nameSuffix	name suffix for generated query classes (default:)
beanPrefix	name prefix for generated bean classes
beanSuffix	name suffix for generated bean classes
packageName	package name where source files should be generated
beanPackageName	package name where bean files should be generated, (default: packageName)
beanInterfaces	array of interface classnames to add to the bean classes (default: empty)
beanAddToString	set to true to create a default toString() implementation (default: false)
beanAddFullConstructor	set to true to create a full constructor in addition to public empty (default: false)
beanPrintSupertype	set to true to print the supertype as well (default: false)
schemaPattern	a schema name pattern in LIKE pattern form; must match the schema name as it is stored in the database; (default: null)
tableNamePattern	a table name pattern in LIKE pattern form; must match the table name as it is stored in the database, multiple can be separated by comma (default: null)
targetFolder	target folder where source folder should be generated
namingStrategyClass	class name of the NamingStrategy class (default: DefaultNamingStrategy)
beanSerializerClass	class name of the BeanSerializer class (default: BeanSerializer)
serializerClass	class name of the Serializer class (default: MetaDataSerializer)
exportBeans	set to true to generate beans as well, see section 2.14.13 (default: false)

Name	Description
innerClassesForKeys	set to true to generate inner classes for keys (default: false)
validationAnnotations	set to true to enable serialization of validation annotations (default: false)
columnAnnotations	export column annotations (default: false)
createScalaSources	whether to export Scala sources instead of Java sources, (default: false)
schemaToPackage	append schema name to package (default: false)
lowerCase	lower case transformation of names (default: false)
exportTables	export tables (default: true)
exportViews	export views (default: true)
exportPrimaryKeys	export primary keys (default: true)
tableTypesToExport	Comma-separated list of table types to export (allowable values will depend on JDBC driver). Allows for arbitrary set of types to be exported, e.g.: "TABLE, MATERIALIZED VIEW". The exportTables and exportViews parameters will be ignored if this parameter is set. (default: none)
exportForeignKeys	export foreign keys (default: true)
customTypes	Custom user types (default: none)
typeMappings	Mappings of table.column to Java type (default: none)
numericMappings	Mappings of size/digits to Java type (default: none)
imports	Array of java imports added to generated query classes: *com.bar* for package (without .* notation), *com.bar.Foo* for class (default: empty)

Custom types can be used to register additional Type implementations:

```
<customTypes>
  <customType>com.mysema.query.sql.types.InputStreamType</customType>
</customTypes>
```

Type mappings can be used to register table.column specific java types:

```
<typeMappings>
  <typeMapping>
    <table>IMAGE</table>
    <column>CONTENTS</column>
    <type>java.io.InputStream</type>
  </typeMapping>
</typeMappings>
```

The defaults for the numeric mappings are

Table 2.2. Numeric mappings

Total digits	Decimal digits	Type
> 18	0	BigInteger
> 9	0	Long
> 4	0	Integer
> 2	0	Short
> 0	0	Byte
> 16	> 0	BigDecimal
> 0	> 0	Double

They can be customized for specific total/decimal digits combinations like this:

```
<numericMappings>
  <numericMapping>
    <total>1</total>
    <decimal>0</decimal>
    <javaType>java.lang.Byte</javaType>
  </numericMapping>
</numericMappings>
```

Imports can be used to add cross-schema foreign keys support.

Compared to APT based code generation certain functionality is not available such as QueryDelegate annotation handling.

Code generation via ANT

The ANT task `com.mysema.query.sql.ant.AntMetaDataExporter` of the querydsl-sql module provides the same functionality as an ANT task. The configuration parameters of the task are the same as for the Maven plugin.

Creating the query types

To get started export your schema into Querydsl query types like this:

```
java.sql.Connection conn = ...;
MetaDataExporter exporter = new MetaDataExporter();
exporter.setPackageName("com.myproject.mydomain");
exporter.setTargetFolder(new File("target/generated-sources/java"));
exporter.export(conn.getMetaData());
```

This declares that the database schema is to be mirrored into the com.myproject.domain package in the target/generated-sources/java folder.

The generated types have the table name transformed to mixed case as the class name and a similar mixed case transformation applied to the columns which are available as property paths in the query type.

In addition to this primary key and foreign key constraints are provided as fields which can be used for compact join declarations.

Configuration

The configuration is done via the com.mysema.query.sql.Configuration class which takes the Querydsl SQL dialect as an argument. For H2 you would create it like this

```
SQLTemplates templates = new H2Templates();
Configuration configuration = new Configuration(templates);
```

Querydsl uses SQL dialects to customize the SQL serialization needed for different relational databases. The available dialects are:

- CUBRIDTemplates (tested with CUBRID 8.4)
- DB2Templates (tested with DB2 10.1.2)
- DerbyTemplates (tested with Derby 10.8.2.2)
- FirebirdTemplates (tested with Firebird 2.5)
- HSQLDBTemplates (tested with HSQLDB 2.2.4)
- H2Templates (tested with H2 1.3.164)
- MySQLTemplates (tested with MySQL 5.5)
- OracleTemplates (test with Oracle 10 and 11)
- PostgresTemplates (tested with PostgreSQL 9.1)
- SQLiteTemplates (tested with xerial JDBC 3.7.2)

- SQLServerTemplates (tested with SQL Server)
- SQLServer2005Templates (for SQL Server 2005)
- SQLServer2008Templates (for SQL Server 2008)
- SQLServer2012Templates (for SQL Server 2012 and later)
- TeradataTemplates (tested with Teradata 14)

For customized SQLTemplates instances you can use the builder pattern like this

```
H2Templates.builder()
   .printSchema() // to include the schema in the output
   .quote()       // to quote names
   .newLineToSingleSpace() // to replace new lines with single space in the output
   .escape(ch)    // to set the escape char
   .build();      // to get the customized SQLTemplates instance
```

The methods of the Configuration class can be used to enable direct serialization of literals via setUseLiterals(true), override schema and tables and register custom types. For full details look at the javadocs of Configuration.

Querying

Querying with Querydsl SQL is as simple as this:

```
QCustomer customer = new QCustomer("c");

SQLQuery query = new SQLQuery(connection, configuration);
List<String> lastNames = query.from(customer)
    .where(customer.firstName.eq("Bob"))
    .list(customer.lastName);
```

which is transformed into the following sql query, assuming that the related table name is *customer* and the columns *first_name* and *last_name*:

```
SELECT c.last_name
FROM customer c
WHERE c.first_name = 'Bob'
```

General usage

Use the the cascading methods of the SQLQuery class like this

from: Add the query sources here.

innerJoin, join, leftJoin, fullJoin, on: Add join elements using these constructs. For the join methods the first argument is the join source and the second the target (alias).

where: Add query filters, either in varargs form separated via commas or cascaded via the and-operator.

groupBy: Add group by arguments in varargs form.

having: Add having filter of the "group by" grouping as an varags array of Predicate expressions.

orderBy: Add ordering of the result as an varargs array of order expressions. Use asc() and desc() on numeric, string and other comparable expression to access the OrderSpecifier instances.

limit, offset, restrict: Set the paging of the result. Limit for max results, offset for skipping rows and restrict for defining both in one call.

Joins

Joins are constructed using the following syntax:

```
QCustomer customer = QCustomer.customer;
QCompany company = QCompany.company;
query.from(customer)
    .innerJoin(customer.company, company)
    .list(customer.firstName, customer.lastName, company.name);
```

and for a left join:

```
query.from(customer)
    .leftJoin(customer.company, company)
    .list(customer.firstName, customer.lastName, company.name);
```

Alternatively the join condition can also be written out:

```
query.from(customer)
    .leftJoin(company).on(customer.company.eq(company.id))
    .list(customer.firstName, customer.lastName, company.name);
```

Ordering

The syntax for declaring ordering is

```
query.from(customer)
    .orderBy(customer.lastName.asc(), customer.firstName.asc())
    .list(customer.firstName, customer.lastName);
```

which is equivalent to the following native SQL

```
SELECT c.first_name, c.last_name
FROM customer c
ORDER BY c.last_name ASC, c.first_name ASC
```

Grouping

Grouping can be done in the following form

```
query.from(customer)
    .groupBy(customer.lastName)
    .list(customer.lastName);
```

which is equivalent to the following native SQL

```
SELECT c.last_name
FROM customer c
GROUP BY c.last_name
```

Using Subqueries

To create a subquery you create a SQLSubQuery instance, define the query parameters via from, where etc and use unique or list to create a subquery, which is just a type-safe Querydsl expression for the query. unique is used for a unique (single) result and list for a list result.

```
QCustomer customer = QCustomer.customer;
QCustomer customer2 = new QCustomer("customer2");
query.from(customer).where(
  customer.status.eq(new SQLSubQuery().from(customer2).unique(customer2.status.max()))
  .list(customer.all())
```

Another example

```
QStatus status = QStatus.status;
query.from(customer).where(
  customer.status.in(new SQLSubQuery().from(status).where(status.level.lt(3)).list(status.id))
  .list(customer.all())
```

Selecting literals

To select literals you need to create constant instances for them like this:

```
query.list(Expressions.constant(1),
           Expressions.constant("abc"));
```

The class `com.mysema.query.support.Expressions` offers also other useful static methods for projections, operation and template creation.

Query extension support

Custom query extensions to support engine specific syntax can be created by subclassing AbstractSQLQuery and adding flagging methods like in the given MySQLQuery example:

```
public class MySQLQuery extends AbstractSQLQuery<MySQLQuery> {

    public MySQLQuery(Connection conn) {
        this(conn, new MySQLTemplates(), new DefaultQueryMetadata());
    }

    public MySQLQuery(Connection conn, SQLTemplates templates) {
        this(conn, templates, new DefaultQueryMetadata());
    }

    protected MySQLQuery(Connection conn, SQLTemplates templates, QueryMetadata metadata) {
        super(conn, new Configuration(templates), metadata);
    }

    public MySQLQuery bigResult() {
        return addFlag(Position.AFTER_SELECT, "SQL_BIG_RESULT ");
    }

    public MySQLQuery bufferResult() {
        return addFlag(Position.AFTER_SELECT, "SQL_BUFFER_RESULT ");
    }


    // ...
}
```

The flags are custom SQL snippets that can be inserted at specific points in the serialization. The supported positions are the enums of the `com.mysema.query.QueryFlag.Position` enum class.

Window functions

Window functions are supported in Querydsl via the methods in the `SQLExpressions` class.

Usage example:

```
query.from(employee)
    .list(SQLExpressions.rowNumber()
        .over()
        .partitionBy(employee.name)
        .orderBy(employee.id));
```

Common table expressions

Common table expressions are supported in Querydsl SQL via two syntax variants

```
QEmployee employee = QEmployee.employee;
query.with(employee, sq().from(employee).where(employee.name.startsWith("A")).list(employee.all()))
     .from(...)
```

And using a column listing

```
QEmployee employee = QEmployee.employee;
query.with(employee, employee.id, employee.name)
     .as(sq().from(employee).where(employee.name.startsWith("A")).list(employee.id, employee.name))
     .from(...)
```

If the columns of the common table expression are a subset of an existing table or view it is advisable to use a generated path type for it, e.g. QEmployee in this case, but if the columns don't fit any existing table PathBuilder can be used instead.

Below is an example for such a case

```
QEmployee employee = QEmployee.employee;
QDepartment department = QDepartment.department;
PathBuilder<Tuple> emp = new PathBuilder<Tuple>(Tuple.class, "emp");
query.with(emp, sq().from(employee).innerJoin(department).on(employee.departmentId.eq(department.id))
                    .list(employee.id, employee.name, employee.departmentId,
                          department.name.as("departmentName")))
     .from(...)
```

Other SQL expressions

Other SQL expressions are also available from the `SQLExpressions` class as static methods.

Using Data manipulation commands

All the DMLClause implementation in the Querydsl SQL module take three parameters, the Connection, the SQLTemplates instance used in the queries and the main entity the DMLClause is bound to.

Insert

With columns

```
QSurvey survey = QSurvey.survey;

new SQLInsertClause(conn, configuration, survey)
    .columns(survey.id, survey.name)
    .values(3, "Hello").execute();
```

Without columns

```
new SQLInsertClause(conn, configuration, survey)
    .values(4, "Hello").execute();
```

With subquery

```
new SQLInsertClause(conn, configuration, survey)
    .columns(survey.id, survey.name)
    .select(new SQLSubQuery().from(survey2).list(survey2.id.add(1), survey2.name))
    .execute();
```

With subquery, without columns

```
new SQLInsertClause(conn, configuration, survey)
    .select(new SQLSubQuery().from(survey2).list(survey2.id.add(10), survey2.name))
    .execute();
```

As an alternative to the columns/values usage, Querydsl provides also a set method which can be used like this

```
QSurvey survey = QSurvey.survey;

new SQLInsertClause(conn, configuration, survey)
    .set(survey.id, 3)
    .set(survey.name, "Hello").execute();
```

which is equivalent to the first example. Usage of the set method always expands internally to columns and values.

Beware that

```
columns(...).select(...)
```

maps the result set of the given query to be inserted whereas

To get the created keys out instead of modified rows count use one of the executeWithKey/s method.

```
set(...)
```

maps single columns and nulls are used for empty subquery results.

To populate a clause instance based on the contents of a bean you can use

```
new SQLInsertClause(conn, configuration, survey)
    .populate(surveyBean).execute();
```

This will exclude null bindings, if you need also null bindings use

```
new SQLInsertClause(conn, configuration, survey)
    .populate(surveyBean, DefaultMapper.WITH_NULL_BINDINGS).execute();
```

Update

With where

```
QSurvey survey = QSurvey.survey;

new SQLUpdateClause(conn, configuration, survey)
    .where(survey.name.eq("XXX"))
    .set(survey.name, "S")
    .execute();
```

Without where

```
new SQLUpdateClause(conn, configuration, survey)
    .set(survey.name, "S")
    .execute();
```

Using bean population

```
new SQLUpdateClause(conn, configuration, survey)
    .populate(surveyBean)
    .execute();
```

Delete

With where

```
QSurvey survey = QSurvey.survey;

new SQLDeleteClause(conn, configuration, survey)
    .where(survey.name.eq("XXX"))
    .execute();
```

Without where

```
new SQLDeleteClause(conn, configuration, survey)
    .execute()
```

Batch support in DML clauses

Querydsl SQL supports usage of JDBC batch updates through the DML APIs. If you have consecutive DML calls with a similar structure, you can bundle the the calls via addBatch() usage into one DMLClause. See the examples how it works for UPDATE, DELETE and INSERT.

Update:

```
QSurvey survey = QSurvey.survey;

insert(survey).values(2, "A").execute();
insert(survey).values(3, "B").execute();

SQLUpdateClause update = update(survey);
update.set(survey.name, "AA").where(survey.name.eq("A")).addBatch();
update.set(survey.name, "BB").where(survey.name.eq("B")).addBatch();
```

Delete:

```
insert(survey).values(2, "A").execute();
insert(survey).values(3, "B").execute();

SQLDeleteClause delete = delete(survey);
delete.where(survey.name.eq("A")).addBatch();
delete.where(survey.name.eq("B")).addBatch();
assertEquals(2, delete.execute());
```

Insert:

```
SQLInsertClause insert = insert(survey);
insert.set(survey.id, 5).set(survey.name, "5").addBatch();
insert.set(survey.id, 6).set(survey.name, "6").addBatch();
assertEquals(2, insert.execute());
```

Bean class generation

To create JavaBean DTO types for the tables of your schema use the MetaDataExporter like this:

```
java.sql.Connection conn = ...;
MetaDataExporter exporter = new MetaDataExporter();
exporter.setPackageName("com.myproject.mydomain");
exporter.setTargetFolder(new File("src/main/java"));
exporter.setBeanSerializer(new BeanSerializer());
exporter.export(conn.getMetaData());
```

Now you can use the bean types as arguments to the populate method in DML clauses and you can project directly to bean types in queries. Here is a simple example in JUnit form:

```
QEmployee e = new QEmployee("e");

// Insert
Employee employee = new Employee();
employee.setFirstname("John");
Integer id = insert(e).populate(employee).executeWithKey(e.id);
employee.setId(id);

// Update
employee.setLastname("Smith");
assertEquals(1l, update(e).populate(employee).where(e.id.eq(employee.getId())).execute());

// Query
Employee smith = query().from(e).where(e.lastname.eq("Smith")).uniqueResult(e);
assertEquals("John", smith.getFirstname());

// Delete
assertEquals(1l, delete(e).where(e.id.eq(employee.getId())).execute());
```

The factory methods used in the previous example are here:

```
protected SQLUpdateClause update(RelationalPath<?> e) {
    return new SQLUpdateClause(Connections.getConnection(), templates, e);
}

protected SQLInsertClause insert(RelationalPath<?> e) {
    return new SQLInsertClause(Connections.getConnection(), templates, e);
}

protected SQLDeleteClause delete(RelationalPath<?> e) {
    return new SQLDeleteClause(Connections.getConnection(), templates, e);
}

protected SQLMergeClause merge(RelationalPath<?> e) {
    return new SQLMergeClause(Connections.getConnection(), templates, e);
}

protected SQLQuery query() {
    return new SQLQuery(Connections.getConnection(), templates);
}
```

Extracting the SQL query and bindings

The SQL query and bindings can be extracted via the getSQL method:

```
SQLBindings bindings = query.getSQL(customer.id, customer.firstname, customer.lastname);
System.out.println(bindings.getSQL());
```

If you need also all literals in the SQL string you can enable literal serialization on the query or configuration level via setUseLiterals(true).

Custom types

Querydsl SQL provides the possibility to declare custom type mappings for ResultSet/Statement interaction. The custom type mappings can be declared in com.mysema.query.sql.Configuration instances, which are supplied as constructor arguments to the actual queries:

```
Configuration configuration = new Configuration(new H2Templates());
// overrides the mapping for Types.DATE
configuration.register(new UtilDateType());
```

And for a table column

```
Configuration configuration = new Configuration(new H2Templates());
// declares a mapping for the gender column in the person table
configuration.register("person", "gender",  new EnumByNameType<Gender>(Gender.class));
```

To customize a numeric mapping you can use the registerNumeric method like this

```
configuration.registerNumeric(5,2,Float.class);
```

This will map the Float type to the NUMERIC(5,2) type.

Listening to queries and clauses

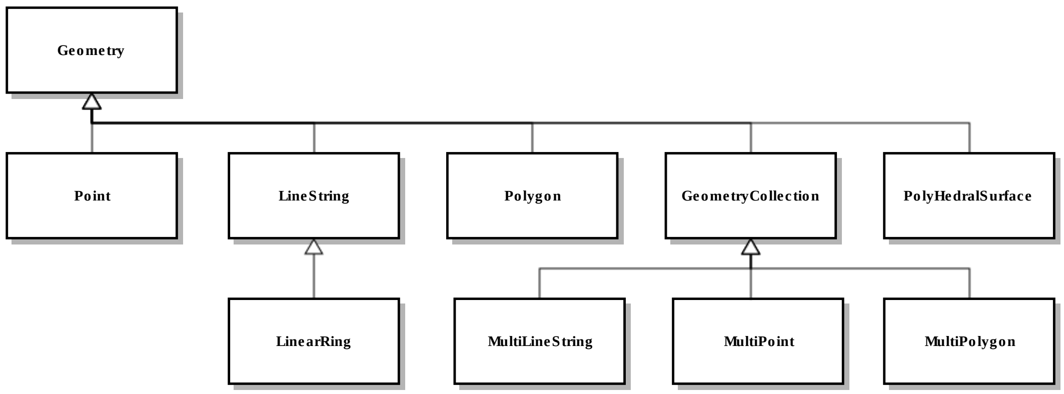
SQLListener is a listener interface that can be used to listen to queries and DML clause. SQLListener instances can be registered either on the configuration and on the query/clause level via the addListener method.

Use cases for listeners are data synchronization, logging, caching and validation.

2.4. Querydsl Spatial

Support for Spatial queries is available via the Querydsl Spatial module, which is an extension module to the SQL module. The Spatial module supports the object model of Simple Feature Access in queries and object binding.

The geolatte project is used for the object model.



Maven integration

Add the following dependency to your Maven project:

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-spatial</artifactId>
  <version>${querydsl.version}</version>
</dependency>
```

Additionally the following database specific extra dependencies:

```
<!-- for PostgreSQL usage -->
<dependency>
  <groupId>org.postgis</groupId>
  <artifactId>postgis-jdbc</artifactId>
  <version>1.3.3</version>
  <scope>provided</scope>
</dependency>

<!-- for Oracle usage -->
<dependency>
  <groupId>oracle</groupId>
  <artifactId>sdoapi</artifactId>
  <version>11.2.0</version>
  <scope>provided</scope>
</dependency>
```

Code generation via Maven

The code generation for Querydsl SQL can be set to detect the usage of spatial types in database schemas and use geolatte types in these case via the spatial property:

```
<project>
  <build>
    <plugins>
      ...
      <plugin>
        <groupId>com.mysema.querydsl</groupId>
        <artifactId>querydsl-maven-plugin</artifactId>
        <version>${querydsl.version}</version>
        ...
        <configuration>
          ...
          <spatial>true</spatial>
        </configuration>
      </plugin>
      ...
    </plugins>
  </build>
</project>
```

Runtime configuration

The runtime configuration aspect of the spatial module is that instead of the normal SQLTemplates instances, spatial enabled instances are used. Below is a list of spatial enabled SQLTemplates classes.

- GeoDBTemplates (for H2)
- MySQLSpatialTemplates
- OracleSpatialTemplates (alpha stage)
- PostGISTemplates
- SQLServer2008SpatialTemplates
- TeradataSpatialTemplates

Querying

With code generation and runtime configuration set for spatial types we can now try queries with it.

Filter by Distance

```
Geometry point = Wkt.fromWkt("Point(2 2)");
query.where(table.geo.distance(point).lt(5.0));
```

In addition to straight distance between geometries spherical and spheroidal distance are provided via distanceSphere and distanceSpheroid.

Contains

```
Geometry point = Wkt.fromWkt("Point(2 2)");
query.where(table.geo.contains(point));
```

Intersection

```
Geometry geo = query.uniqueResult(table.geo1.intersection(table.geo2));
```

Access to the SPATIAL_REF_SYS table

Unified access to the SPATIAL_REF_SYS standard table is provided via the QSpatialRefSys and SpatialRefSys classes. SPATIAL_REF_SYS contains data about the supported spatial reference systems.

```
QSpatialRefSys spatialRefSys = QSpatialRefSys.spatialRefSys;
List<SpatialRefSys> referenceSystems = query.from(spatialRefSys).list(spatialRefSys);
```

Inheritance

In case you use only generic geometry types in your database schema you can use conversion methods in the object model to convert to more specific types.

```
GeometryPath<Geometry> geometry = shapes.geometry;
PointPath<Point> point = geometry.asPoint();
NumberExpression<Double> pointX = point.x(); // x() is not available on GeometryExpression/GeometryPath
```

2.5. Querying Lucene

This chapter describes the querying functionality of the Lucene module.

Maven integration

Querydsl Lucene can be used via the querydsl-lucene3 module for Lucene 3 and querydsl-lucene4 for Lucene 4

Lucene 3:

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-lucene3</artifactId>
  <version>${querydsl.version}</version>
</dependency>

<dependency>
  <groupId>org.slf4j</groupId>
  <artifactId>slf4j-log4j12</artifactId>
  <version>1.6.1</version>
</dependency>
```

Lucene 4:

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-lucene4</artifactId>
  <version>${querydsl.version}</version>
</dependency>

<dependency>
  <groupId>org.slf4j</groupId>
  <artifactId>slf4j-log4j12</artifactId>
  <version>1.6.1</version>
</dependency>
```

Creating the query types

With fields year and title a manually created query type could look something like this:

```
public class QDocument extends EntityPathBase<Document> {
    private static final long serialVersionUID = -4872833626508344081L;

    public QDocument(String var) {
        super(Document.class, PathMetadataFactory.forVariable(var));
    }

    public final StringPath year = createString("year");

    public final StringPath title = createString("title");
}
```

QDocument represents a Lucene document with the fields year and title.

Code generation is not available for Lucene, since no schema data is available.

Querying

Querying with Querydsl Lucene is as simple as this:

```
QDocument doc = new QDocument("doc");

IndexSearcher searcher = new IndexSearcher(index);
LuceneQuery query = new LuceneQuery(true, searcher);
List<Document> documents = query
    .where(doc.year.between("1800", "2000").and(doc.title.startsWith("Huckle"))
    .list();
```

which is transformed into the following Lucene query:

```
+year:[1800 TO 2000] +title:huckle*
```

General usage

Use the the cascading methods of the LuceneQuery class like this

where: Add the query filters, either in varargs form separated via commas or cascaded via the and-operator. Supported operations are operations performed on PStrings except *matches* , *indexOf* , *charAt* . Currently *in* is not supported, but will be in the future.

orderBy: Add ordering of the result as an varargs array of order expressions. Use asc() and desc() on numeric, string and other comparable expression to access the OrderSpecifier instances.

limit, offset, restrict: Set the paging of the result. Limit for max results, offset for skipping rows and restrict for defining both in one call.

Ordering

The syntax for declaring ordering is

```
query
    .where(doc.title.like("*"))
    .orderBy(doc.title.asc(), doc.year.desc())
    .list();
```

which is equivalent to the following Lucene query

```
title:*
```

The results are sorted ascending based on title and year.

Alternatively a sort method call can be used to declare the sort logic as a Sort instance instead

```
Sort sort = ...;
query
    .where(doc.title.like("*"))
    .sort(sort)
    .list();
```

Limit

The syntax for declaring a limit is

```
query
    .where(doc.title.like("*"))
    .limit(10)
    .list();
```

Offset

The syntax for declaring an offset is

```
query
    .where(doc.title.like("*"))
    .offset(3)
    .list();
```

Fuzzy searches

Fuzzy searches can be expressed via fuzzyLike methods in the `com.mysema.query.lucene.LuceneExpressions` class:

```
query
    .where(LuceneExpressions.fuzzyLike(doc.title, "Hello"))
    .list();
```

Applying Lucene filters to queries

It is possible to apply a single Lucene filter to the query like this:

```
query
    .where(doc.title.like("*"))
    .filter(filter)
    .list();
```

A shortcut for distinct filtering is provided via the distinct(Path) method:

```
query
    .where(doc.title.like("*"))
    .distinct(doc.title)
    .list();
```

2.6. Querying Hibernate Search

This chapter describes the querying functionality of the Hibernate Search module.

Creating the Querydsl query types

See Querying JPA/Hibernate sources for instructions on how to create query types.

Querying

Querying with Querydsl Hibernate Search is as simple as this:

```
QUser user = QUser.user;
SearchQuery<User> query = new SearchQuery<User>(session, user);
List<User> list = query
    .where(user.firstName.eq("Bob"))
    .list();
```

General usage

For general usage instructions see Querying Lucene sources .

In the query serialization the only difference to the Querydsl Lucene module is that paths are treated differently. For `org.hibernate.search.annotations.Field` annotated properties the name attribute is used with the property name as fallback for the field name.

2.7. Querying Mongodb

This chapter describes the querying functionality of the Mongodb module.

Maven integration

Add the following dependencies to your Maven project:

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-apt</artifactId>
  <version>${querydsl.version}</version>
  <scope>provided</scope>
</dependency>

<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-mongodb</artifactId>
  <version>${querydsl.version}</version>
</dependency>

<dependency>
  <groupId>org.slf4j</groupId>
  <artifactId>slf4j-log4j12</artifactId>
  <version>1.6.1</version>
</dependency>
```

And now, configure the Maven APT plugin which generates the query types used by Querydsl:

```
<project>
  <build>
    <plugins>
      ...
      <plugin>
        <groupId>com.mysema.maven</groupId>
        <artifactId>apt-maven-plugin</artifactId>
        <version>1.1.3</version>
        <executions>
          <execution>
            <goals>
              <goal>process</goal>
            </goals>
            <configuration>
              <outputDirectory>target/generated-sources/java</outputDirectory>
              <processor>com.mysema.query.apt.morphia.MorphiaAnnotationProcessor</processor>
            </configuration>
          </execution>
        </executions>
      </plugin>
    ...
    </plugins>
  </build>
</project>
```

The MorphiaAnnotationProcessor finds domain types annotated with the `com.google.code.morphia.annotations.Entity` annotation and generates Querydsl query types for them.

Run clean install and you will get your Query types generated into target/generated-sources/java.

If you use Eclipse, run mvn eclipse:eclipse to update your Eclipse project to include target/generated-sources/java as a source folder.

Now you are able to construct Mongodb queries and instances of the query domain model.

Querying

Querying with Querydsl Mongodb with Morphia is as simple as this:

```
Morphia morphia;
Datastore datastore;
// ...
QUser user = new QUser("user");
MorphiaQuery<User> query = new MorphiaQuery<User>(morphia, datastore, user);
List<User> list = query
    .where(user.firstName.eq("Bob"))
    .list();
```

General usage

Use the the cascading methods of the MongodbQuery class like this

where: Add the query filters, either in varargs form separated via commas or cascaded via the and-operator. Supported operations are operations performed on PStrings except *matches* , *indexOf* , *charAt* . Currently *in* is not supported, but will be in the future.

orderBy: Add ordering of the result as an varargs array of order expressions. Use asc() and desc() on numeric, string and other comparable expression to access the OrderSpecifier instances.

limit, offset, restrict: Set the paging of the result. Limit for max results, offset for skipping rows and restrict for defining both in one call.

Ordering

The syntax for declaring ordering is

```
query
    .where(doc.title.like("*"))
    .orderBy(doc.title.asc(), doc.year.desc())
    .list();
```

The results are sorted ascending based on title and year.

Limit

The syntax for declaring a limit is

```
query
    .where(doc.title.like("*"))
    .limit(10)
    .list();
```

Offset

The syntax for declaring an offset is

```
query
    .where(doc.title.like("*"))
    .offset(3)
    .list();
```

Geospatial queries

Support for geospatial queries is available for Double typed arrays (Double[]) via the near-method:

```
query
    .where(geoEntity.location.near(50.0, 50.0))
    .list();
```

Select only relevant fields

To select only relevant fields you can use the overloaded projection methods list, iterate, uniqueResult and singleResult methods like this

```
query
    .where(doc.title.like("*"))
    .list(doc.title, doc.path);
```

This query will load only the title and path fields of the documents.

2.8. Querying Collections

The querydsl-collections module can be used with generated query types and without. The first section describes the usage without generated query types:

Usage without generated query types

To use querydsl-collections without generated query types you need to use the Querydsl alias feature. Here are some examples.

To get started, add the following static imports:

```
// needed for access of the Querydsl Collections API
import static com.mysema.query.collections.CollQueryFactory.*;
// needed, if you use the $-invocations
import static com.mysema.query.alias.Alias.*;
```

And now create an alias instance for the Cat class. Alias instances can only be created for non-final classes with an empty constructor. Make sure your class has one.

The alias instance of type Cat and its getter invocations are transformed into paths by wrapping them into dollar method invocations. The call `c.getKittens()` for example is internally transformed into the property path `c.kittens` inside the dollar method.

```
Cat c = alias(Cat.class, "cat");
for (String name : from($(c),cats)
  .where($(c.getKittens()).size().gt(0))
  .list($(c.getName()))) {
    System.out.println(name);
}
```

The following example is a variation of the previous, where the access to the list size happens inside the dollar-method invocation.

```
Cat c = alias(Cat.class, "cat");
for (String name : from($(c),cats)
  .where($(c.getKittens().size()).gt(0))
  .list($(c.getName()))) {
    System.out.println(name);
}
```

All non-primitive and non-final typed properties of aliases are aliases themselves. So you may cascade method calls until you hit a primitive or non-final type (e.g. java.lang.String) in the dollar-method scope.

e.g.

```
$(c.getMate().getName())
```

is transformed into *c.mate.name* internally, but

```
$(c.getMate().getName().toLowerCase())
```

is not transformed properly, since the toLowerCase() invocation is not tracked.

Note also that you may only invoke getters, size(), contains(Object) and get(int) on alias types. All other invocations throw exceptions.

Usage with generated query types

The example above can be expressed like this with generated expression types

```
QCat cat = new QCat("cat");
for (String name : from(cat,cats)
  .where(cat.kittens.size().gt(0))
  .list(cat.name)) {
    System.out.println(name);
}
```

When you use generated query types, you instantiate expressions instead of alias instances and use the property paths directly without any dollar-method wrapping.

Maven integration

Add the following dependencies to your Maven project:

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-apt</artifactId>
  <version>${querydsl.version}</version>
  <scope>provided</scope>
</dependency>

<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-collections</artifactId>
  <version>${querydsl.version}</version>
</dependency>

<dependency>
  <groupId>org.slf4j</groupId>
  <artifactId>slf4j-log4j12</artifactId>
  <version>1.6.1</version>
</dependency>
```

If you are not using JPA or JDO you can generate expression types for your domain types by annotating them with the `com.mysema.query.annotations.QueryEntity` annotation and adding the following plugin configuration into your Maven configuration (pom.xml):

```
<project>
  <build>
  <plugins>
    ...
    <plugin>
      <groupId>com.mysema.maven</groupId>
      <artifactId>apt-maven-plugin</artifactId>
      <version>1.1.3</version>
      <executions>
        <execution>
          <goals>
            <goal>process</goal>
          </goals>
          <configuration>
            <outputDirectory>target/generated-sources/java</outputDirectory>
            <processor>com.mysema.query.apt.QuerydslAnnotationProcessor</processor>
          </configuration>
        </execution>
      </executions>
    </plugin>
    ...
  </plugins>
  </build>
</project>
```

Ant integration

Place the jar files from the full-deps bundle on your classpath and use the following tasks for Querydsl code generation:

```
    <!-- APT based code generation -->
    <javac srcdir="${src}" classpathref="cp">
      <compilerarg value="-proc:only"/>
      <compilerarg value="-processor"/>
      <compilerarg value="com.mysema.query.apt.QuerydslAnnotationProcessor"/>
      <compilerarg value="-s"/>
      <compilerarg value="${generated}"/>
    </javac>

    <!-- compilation -->
    <javac classpathref="cp" destdir="${build}">
      <src path="${src}"/>
      <src path="${generated}"/>
    </javac>
```

Replace *src* with your main source folder, *generated* with your folder for generated sources and *build* with your target folder.

Hamcrest matchers

Querydsl Collections provides Hamcrest matchers. With these imports

```
import static org.hamcrest.core.IsEqual.equalTo;
import static com.mysema.query.collections.PathMatcher.hasValue;
import static org.junit.Assert.assertEquals;
import static org.junit.Assert.assertThat;
```

they can be used like this:

```
Car car = new Car();
car.setHorsePower(123);

assertThat(car, hasValue($.horsePower));
assertThat(car, hasValue($.horsePower, equalTo(123)));
```

The Hamcrest matchers have been contributed by Jeroen van Schagen .

Usage with the Eclipse Compiler for Java

If Querydsl Collections is used with a JRE where the system compiler is not available, CollQuery instances can also be configured to use the Eclipse Compiler for Java (ECJ) instead:

```
DefaultEvaluatorFactory evaluatorFactory = new DefaultEvaluatorFactory(
    CollQueryTemplates.DEFAULT,
    new ECJEvaluatorFactory(getClass().getClassLoader()));
QueryEngine queryEngine = new DefaultQueryEngine(evaluatorFactory);
CollQuery query = new CollQuery(queryEngine);
```

2.9. Querying in Scala

Generic support for Querydsl usage in Scala is available via querydsl-scala module. To add it to your Maven build, use the following snippet:

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-scala</artifactId>
  <version>${querydsl.version}</version>
</dependency>
```

DSL expressions for Scala

Querydsl for Scala provides an alternative DSL for expression construction. The Scala DSL utilizes language features such as operator overloading, function pointers and implicit imports for enhanced readability and conciseness.

Here is an overview of the main alternatives :

```
//Standard               Alternative

expr isNotNull           expr is not(null)
expr isNull              expr is null
expr eq "Ben"            expr === "Ben"
expr ne "Ben"            expr !== "Ben"
expr append "X"          expr + "X"
expr isEmpty             expr is empty
expr isNotEmpty          expr not empty

// boolean
left and right           left && right
left or right            left || right
expr not                 !expr

// comparison
expr lt 5                expr < 5
expr loe 5               expr <= 5
expr gt 5                expr > 5
expr goe 5               expr >= 5
expr notBetween(2,6)     expr not between (2,6)
expr negate              -expr

// numeric
expr add 3               expr + 3
expr subtract 3          expr - 3
expr divide 3            expr / 3
expr multiply 3          expr * 3
expr mod 5               expr % 5

// collection
list.get(0)              list(0)
map.get("X")             map("X")
```

Improved projections

The Querydsl Scala module offers a few implicit conversion to make Querydsl query projections more Scala compatible.

The `RichProjectable` and `RichSimpleProjectable` wrappers should be used to enable Scala projections for Querydsl queries. By importing the contents of `com.mysema.query.scala.Helpers` the needed implicit conversions become available.

For example the following query with the standard API would return a `java.util.List` of type `Object[]`.

```
query.from(person).list(person.firstName, person.lastName, person.age)
```

With the added conversions you can use select instead of list for Scala list typed results, unique instead of uniqueResult for Option typed results and single instead of singleResult for Option typed results.

The previous query could be expressed like this with the implicit conversions:

```
import com.mysema.query.scala.Helpers._

query.from(person).select(person.firstName, person.lastName, person.age)
```

In this case the result type would be List[(String,String,Integer)] or in other words List of Tuple3[String,String,Integer].

Querying with SQL

Like with Querydsl SQL for Java you need to generate Query types to be able to construct your queries. The following code examples show how this is done:

Generation without Bean types :

```
val directory = new java.io.File("target/jdbcgen1")
val namingStrategy = new DefaultNamingStrategy()
val exporter = new MetaDataExporter()
exporter.setNamePrefix("Q")
exporter.setPackageName("com.mysema")
exporter.setSchemaPattern("PUBLIC")
exporter.setTargetFolder(directory)
exporter.setSerializerClass(classOf[ScalaMetaDataSerializer])
exporter.setCreateScalaSources(true)
exporter.setTypeMappings(ScalaTypeMappings.create)
exporter.export(connection.getMetaData)
```

Generation with Bean types :

```
val directory = new java.io.File("target/jdbcgen2")
val namingStrategy = new DefaultNamingStrategy()
val exporter = new MetaDataExporter()
exporter.setNamePrefix("Q")
exporter.setPackageName("com.mysema")
exporter.setSchemaPattern("PUBLIC")
exporter.setTargetFolder(directory)
exporter.setSerializerClass(classOf[ScalaMetaDataSerializer])
exporter.setBeanSerializerClass(classOf[ScalaBeanSerializer])
exporter.setCreateScalaSources(true)
exporter.setTypeMappings(ScalaTypeMappings.create)
exporter.export(connection.getMetaData)
```

Compact queries

Querydsl Scala provides a compact query syntax for Querydsl SQL. The syntax is inspired by domain oriented query syntaxes like that from the Rogue framework.

The domain oriented queries are implemented as implicit conversions from `RelationalPath` instances into queries. This functionality can be made available by implementing the `com.mysema.query.scala.sql.SQLHelpers` trait in your service or DAO classes.

Using this compact syntax you can use your meta model classes as a starting point for queries.

Instead of the following normal syntax

```
query().from(employee).select(employee.firstName, employee.lastName)
```

you could use the companion object of Employee or QEmployee and write it like this

```
Employee.select(_.firstName, _.lastName)
```

Instead of giving expressions to orderBy, where, select, single and unique you can give functions which take the root expression of the query and return another expression. The expanded form of the previous example would be

```
Employee.select({ e => e.firstName }, { e => e.lastName })
```

See the signature of the `com.mysema.query.scala.sql.RichSimpleQuery` class for details.

Code generation

Scala sources for SQL metatypes and projections can be generated with querydsl-maven-plugin. Here is an example configuration

```
<project>
  <build>
    <plugins>
      ...
      <plugin>
        <groupId>com.mysema.querydsl</groupId>
        <artifactId>querydsl-maven-plugin</artifactId>
        <version>${querydsl.version}</version>
        <configuration>
          <jdbcDriver>com.mysql.jdbc.Driver</jdbcDriver>
          <jdbcUrl>jdbc:mysql://localhost:3306/test</jdbcUrl>
          <jdbcUser>matko</jdbcUser>
          <jdbcPassword>matko</jdbcPassword>
          <packageName>com.example.schema</packageName>
          <targetFolder>${project.basedir}/src/main/scala</targetFolder>
          <exportBeans>true</exportBeans>
          <createScalaSources>true</createScalaSources>
        </configuration>
        <dependencies>
          <dependency>
            <groupId>mysql</groupId>
            <artifactId>mysql-connector-java</artifactId>
            <version>5.1.16</version>
          </dependency>
          <dependency>
            <groupId>com.mysema.querydsl</groupId>
            <artifactId>querydsl-scala</artifactId>
            <version>${querydsl.version}</version>
          </dependency>
          <dependency>
            <groupId>org.scala-lang</groupId>
            <artifactId>scala-library</artifactId>
            <version>${scala.version}</version>
          </dependency>
        </dependencies>
      </plugin>
      ...
    </plugins>
  </build>
</project>
```

The maven goal to execute is querydsl:export.

Querying with other backends

When querying with other backends the Expression model has to be created manually or alternatively the alias functionality can be used.

Here is a minimal example with JPA :

```
@Entity
class User {
  @BeanProperty
  @Id
  var id: Integer = _;
  @BeanProperty
  var userName: String = _;
  @BeanProperty
  @ManyToOne
  var department: Department = _;
}

@Entity
class Department {
  @BeanProperty
  @Id
  var id: Integer = _;
  @BeanProperty
  var name: String = _;
}
```

And here are some query examples

List

```
val person = Person as "person"

query.from(person).where(person.firstName like "Rob%").list(person)
```

Unique result

```
query.from(person).where(person.firstName like "Rob%").unique(person)
```

Long where

```
query.from(person)
  .where(person.firstName like "Rob%", person.lastName like "An%")
  .list(person)
```

Order

```
query.from(person).orderBy(person.firstName asc).list(person)
```

Not null

```
query.from(person)
  .where(person.firstName isEmpty, person.lastName isNotNull)
  .list(person)
```

The factory method for query creation is

```
def query() = new JPAQuery(entityManager)
```

In addition to queries you need variables which can be created like this

```
val person = Person as "person"
```

Note: the Scala support is not yet available if you use Hibernate with an XML based configuration. HibernateDomainExporter currently only outputs Java source files.

3. General usage

The General usage section covers aspects that are not covered in the tutorial section of the reference documentation. It follows a use case oriented structure.

3.1. Creating queries

Query construction in Querydsl involves calling query methods with expression arguments. Since query methods are mostly module specific and have already been presented in the tutorial section, this part will focus on expressions.

Expressions are normally constructed by accessing fields and calling methods on the generated expression types of your domain module. For cases where code generation is not applicable generic ways to construct expressions can be used instead.

Complex predicates

To construct complex boolean expressions, use the `com.mysema.query.BooleanBuilder` class. It implements Predicate and can be used in cascaded form:

```
public List<Customer> getCustomer(String... names) {
    QCustomer customer = QCustomer.customer;
    JPAQuery query = new JPAQuery(entityManager).from(customer);
    BooleanBuilder builder = new BooleanBuilder();
    for (String name : names) {
        builder.or(customer.name.eq(name));
    }
    query.where(builder); // customer.name eq name1 OR customer.name eq name2 OR ...
    return query.list(customer);
}
```

`BooleanBuilder` is mutable and represents initially null and after each `and` or `or` call the result of the operation.

Dynamic expressions

The `com.mysema.query.support.Expressions` class is a static factory class for dynamic expression construction. The factory methods are named by the returned type and are mostly self-documenting.

In general the `Expressions` class should be used only in cases where fluent DSL forms can't be used, such as dynamic paths, custom syntax or custom operations.

The following expression

```
QPerson person = QPerson.person;
person.firstName.startsWith("P");
```

could be constructed like this if Q-types wouldn't be available

```
Path<Person> person = Expressions.path(Person.class, "person");
Path<String> personFirstName = Expressions.path(String.class, person, "firstName");
Constant<String> constant = Expressions.constant("P");
Expressions.predicate(Ops.STARTS_WITH, personFirstName, constant);
```

Path instances represent variables and properties, Constants are constants, Operations are operations and TemplateExpression instances can be used to express expressions as String templates.

Dynamic paths

In addition to the `Expressions` based expression creation Querydsl provides also a more fluent API for dynamic path creation.

For dynamic path generation the `com.mysema.query.types.path.PathBuilder` class can be used. It extends `EntityPathBase` and can be used as an alternative to class generation and alias-usage for path generation.

Compared to the Expressions API PathBuilder doesn't provide direct support for unknown operations or custom syntax, but the syntax is closer to the normal DSL.

String property:

```
PathBuilder<User> entityPath = new
PathBuilder<User>(User.class, "entity");
// fully generic access
entityPath.get("userName");
// .. or with supplied type
entityPath.get("userName", String.class);
// .. and correct signature
entityPath.getString("userName").lower();
```

List property with component type:

```
entityPath.getList("list", String.class).get(0);
```

Using a component expression type:

```
entityPath.getList("list", String.class, StringPath.class).get(0).lower();
```

Map property with key and value type:

```
entityPath.getMap("map", String.class, String.class).get("key");
```

Using a component expression type:

```
entityPath.getMap("map", String.class, String.class, StringPath.class).get("key").lower();
```

For PathBuilder validation a PathBuilderValidator can be used. It can be injected in the constructor and will be used transitively for the new PathBuilder

```
PathBuilder<Customer> customer = new PathBuilder<Customer>(Customer.class, "customer", validator);
```

PathBuilderValidator.FIELDS will verify field existence, PathBuilderValidator.PROPERTIES validates Bean properties and JPAPathBuilderValidator validates using a JPA metamodel.

Case expressions

To construct case-when-then-else expressions use the `CaseBuilder` class like this:

```
QCustomer customer = QCustomer.customer;
Expression<String> cases = new CaseBuilder()
    .when(customer.annualSpending.gt(10000)).then("Premier")
    .when(customer.annualSpending.gt(5000)).then("Gold")
    .when(customer.annualSpending.gt(2000)).then("Silver")
    .otherwise("Bronze");
// The cases expression can now be used in a projection or condition
```

For case expressions with equals-operations use the following simpler form instead:

```
QCustomer customer = QCustomer.customer;
Expression<String> cases = customer.annualSpending
    .when(10000).then("Premier")
    .when(5000).then("Gold")
    .when(2000).then("Silver")
    .otherwise("Bronze");
// The cases expression can now be used in a projection or condition
```

Case expressions are not yet supported in JDOQL.

Casting expressions

To avoid a generic signature in expression types the type hierarchies are flattened. The result is that all generated query types are direct subclasses of `com.mysema.query.types.path.EntityPathBase` or `com.mysema.query.types.path.BeanPath` and cannot be directly cast to their logical supertypes.

Instead of a direct Java cast, the supertype reference is accessible via the `_super` field. A _super-field is available in all generated query types with a single supertype:

```
// from Account
QAccount extends EntityPathBase<Account> {
    // ...
}

// from BankAccount extends Account
QBankAccount extends EntityPathBase<BankAccount> {

    public final QAccount _super = new QAccount(this);

    // ...
}
```

To cast from a supertype to a subtype you can use the as-method of the EntityPathBase class:

```
QAccount account = new QAccount("account");
QBankAccount bankAccount = account.as(QBankAccount.class);
```

Select literals

Literals can be selected by referring to them via Constant expressions. Here is a simple example

```
query.list(Expressions.constant(1),
           Expressions.constant("abc"));
```

Constant expressions are often used in subqueries.

3.2. Result handling

Querydsl provides two ways to customize results, FactoryExpressions for row based transformation and ResultTransformer for aggregation.

The `com.mysema.query.types.FactoryExpression` interface is used for Bean creation, constructor invocation and for the creation of more complex objects. The functionality of the FactoryExpression implementations of Querydsl can be accessed via the `com.mysema.query.types.Projections` class.

For the `com.mysema.query.ResultTransformer` interface `GroupBy` is the main implementation.

Returning multiple columns

Since Querydsl 3.0 the default type for multi-column results is `com.mysema.query.Tuple`. Tuple provides provides a typesafe Map like interface to access column data from a Tuple row object.

```
List<Tuple> result = query.from(employee).list(employee.firstName, employee.lastName);
for (Tuple row : result) {
     System.out.println("firstName " + row.get(employee.firstName));
     System.out.println("lastName " + row.get(employee.lastName));
}}
```

This example could also have been written via the QTuple expression class like this

```
List<Tuple> result = query.from(employee).list(new QTuple(employee.firstName, employee.lastName));
for (Tuple row : result) {
     System.out.println("firstName " + row.get(employee.firstName));
     System.out.println("lastName " + row.get(employee.lastName));
}}
```

Bean population

In cases where Beans need to be populated based on the results of the query, Bean projections can be used like this

```
List<UserDTO> dtos = query.list(
    Projections.bean(UserDTO.class, user.firstName, user.lastName));
```

When fields should be directly used instead of setters the following variant can be used instead

```
List<UserDTO> dtos = query.list(
    Projections.fields(UserDTO.class, user.firstName, user.lastName));
```

Constructor usage

Constructor based row transformation can be used like this

```
List<UserDTO> dtos = query.list(
    Projections.bean(UserDTO.class, user.firstName, user.lastName));
```

As an alternative to the generic Constructor expression usage constructors can also be annotated with the `QueryProjection` annotation:

```
class CustomerDTO {

  @QueryProjection
  public CustomerDTO(long id, String name) {
     ...
  }

}
```

And then you can use it like this in the query

```
QCustomer customer = QCustomer.customer;
JPQLQuery query = new HibernateQuery(session);
List<CustomerDTO> dtos = query.from(customer).list(new QCustomerDTO(customer.id, customer.name));
```

While the example is Hibernate specific, this feature is available in all modules.

If the type with the QueryProjection annotation is not an annotated entity type, you can use the constructor projection like in the example, but if the annotated type would be an entity type, then the constructor projection would need to be created via a call to the static create method of the query type:

```
@Entity
class Customer {

  @QueryProjection
  public Customer(long id, String name) {
     ...
  }

}
```

```
QCustomer customer = QCustomer.customer;
JPQLQuery query = new HibernateQuery(session);
List<Customer> dtos = query.from(customer).list(QCustomer.create(customer.id, customer.name));
```

Alternatively, if code generation is not an option, you can create a constructor projection like this:

```
List<Customer> dtos = query.from(customer)
    .list(ConstructorExpression.create(Customer.class, customer.id, customer.name));
```

Result aggregation

The `com.mysema.query.group.GroupBy` class provides aggregation functionality which can be used to aggregate query results in memory. Below are some usage examples.

Aggregating parent child relations

```
import static com.mysema.query.group.GroupBy.*;

Map<Integer, List<Comment>> results = query.from(post, comment)
    .where(comment.post.id.eq(post.id))
    .transform(groupBy(post.id).as(list(comment)));
```

This will return a map of post ids to related comments.

Multiple result columns

```
Map<Integer, Group> results = query.from(post, comment)
    .where(comment.post.id.eq(post.id))
    .transform(groupBy(post.id).as(post.name, set(comment.id)));
```

This will return a map of post ids to Group instances with access to post name and comment ids.

Group is the GroupBy equivalent to the Tuple interface.

More examples can be found here .

3.3. Code generation

The Java 6 APT annotation processing functionality is used in Querydsl for code generation in the JPA, JDO and Mongodb modules. This section describes various configuration options for the code generation and an alternative to APT usage.

Path initialization

By default Querydsl initializes only reference properties of the first two levels. In cases where longer initialization paths are required, these have to be annotated in the domain types via `com.mysema.query.annotations.QueryInit` annotations. QueryInit is used on properties where deep initializations are needed. The following example demonstrates the usage.

```
@Entity
class Event {
    @QueryInit("customer.address")
    Account account;
}

@Entity
class Account {
    Customer customer;
}

@Entity
class Customer {
    String name;
    Address address;
    // ...
}
```

This example enforces the initialization of the account.customer path, when an Event path is initialized as a root path / variable. The path initialization format supports wildcards as well, e.g. "customer.*" or just "*".

The automatic path initialization replaces the manual one, which required the entity fields to be non-final. The declarative format has the benefit to be applied to all top level instances of a Query type and to enable the usage of final entity fields.

Automatic path initialization is the preferred initialization strategy, but manual initialization can be activated via the Config annotation, which is described below.

Customization

The serialization of Querydsl can be customized via Config annotations on packages and types. They customize the serialization of the annotated package or type.

The serialization options are

Table 3.1. Config options

Name	Description
entityAccessors	accessor methods for entity paths instead of public final fields (default: false)
listAccessors	listProperty(int index) style methods (default: false)
mapAccessors	mapProperty(Key key) style accessor methods (default: false)
createDefaultVariable	generate the default variable (default: true)
defaultVariableName	name of the default variable

Below are some examples.

Customization of Entity type serialization:

```
@Config(entityAccessors=true)
@Entity
public class User {
    //...
}
```

Customization of package content:

```
@Config(listAccessors=true)
package com.mysema.query.domain.rel;

import com.mysema.query.annotations.Config;
```

If you want to customize the serializer configuration globally, you can do this via the following APT options

Table 3.2. APT options

Name	**Description**
querydsl.entityAccessors	enable reference field accessors
querydsl.listAccessors	enable accessors for direct indexed list access
querydsl.mapAccessors	enable accessors for direct key based map access
querydsl.prefix	override the prefix for query types(default: Q)
querydsl.suffix	set a suffix for query types
querydsl.packageSuffix	set a suffix for query type packages
querydsl.createDefaultVariable	set whether default variables are created
querydsl.unknownAsEmbeddable	set where unknown non-annotated classes should be treated as embeddable (default: false)
querydsl.includedPackages	comma separated list of packages to be included into code generation (default: all)
querydsl.includedClasses	comma separated list of class names to be included into code generation (default: all)
querydsl.excludedPackages	comma separated list of packages to be excluded from code generation (default: none)
querydsl.excludedClasses	comma separated list of class names to be excluded from code generation (default: none)
querydsl.useFields	set whether fields are used as metadata source (default: true)
querydsl.useGetters	set whether accessors are used as metadata source (default: true)

Using the Maven APT plugin this works for example like this:

```
<project>
  <build>
  <plugins>
    ...
    <plugin>
      <groupId>com.mysema.maven</groupId>
      <artifactId>apt-maven-plugin</artifactId>
      <version>1.1.3</version>
      <executions>
        <execution>
          <goals>
            <goal>process</goal>
          </goals>
          <configuration>
            <outputDirectory>target/generated-sources/java</outputDirectory>
            <processor>com.mysema.query.apt.jpa.JPAAnnotationProcessor</processor>
            <options>
              <querydsl.entityAccessors>true</querydsl.entityAccessors>
              <querydsl.useFields>false</querydsl.useFields>
            </options>
          </configuration>
        </execution>
      </executions>
    </plugin>
    ...
  </plugins>
  </build>
</project>
```

Custom type mappings

Custom type mappings can be used on properties to override the derived Path type. This can be useful for example in cases where comparison and String operations should be blocked on certain String paths or Date / Time support for custom types needs to be added. Support for Date / Time types of the Joda time API and JDK (java.util.Date, Calendar and subtypes) is built in, but other APIs might need to be supported using this feature.

The following example demonstrates the usage:

```
@Entity
public class MyEntity {
    @QueryType(PropertyType.SIMPLE)
    public String stringAsSimple;

    @QueryType(PropertyType.COMPARABLE)
    public String stringAsComparable;

    @QueryType(PropertyType.NONE)
    public String stringNotInQuerydsl;
}
```

The value `PropertyType.NONE` can be used to skip a property in the query type generation. This case is different from @Transient or @QueryTransient annotated properties, where properties are not persisted. PropertyType.NONE just omits the property from the Querydsl query type.

Delegate methods

To declare a static method as a delegate method add the QueryDelegate annotation with the corresponding domain type as a value and provide a method signature that takes the corresponding Querydsl query type as the first argument.

Here is a simple example from a unit test:

```
@QueryEntity
public static class User {

    String name;

    User manager;

}
```

```
@QueryDelegate(User.class)
public static BooleanPath isManagedBy(QUser user, User other) {
    return user.manager.eq(other);
}
```

And the generated methods in the QUser query type:

```
public BooleanPath isManagedBy(QUser other) {
    return com.mysema.query.domain.DelegateTest.isManagedBy(this, other);
}
```

Delegate methods can also be used to extend built-in types. Here are some examples

```
public class QueryExtensions {

    @QueryDelegate(Date.class)
    public static BooleanExpression inPeriod(DatePath<Date> date, Pair<Date,Date> period) {
        return date.goe(period.getFirst()).and(date.loe(period.getSecond()));
    }

    @QueryDelegate(Timestamp.class)
    public static BooleanExpression inDatePeriod(DateTimePath<Timestamp> timestamp, Pair<Date,Date> period) {
        Timestamp first = new Timestamp(DateUtils.truncate(period.getFirst(), Calendar.DAY_OF_MONTH).getTime())
        Calendar second = Calendar.getInstance();
        second.setTime(DateUtils.truncate(period.getSecond(), Calendar.DAY_OF_MONTH));
        second.add(1, Calendar.DAY_OF_MONTH);
        return timestamp.goe(first).and(timestamp.lt(new Timestamp(second.getTimeInMillis())));
    }

}
```

When delegate methods are declared for builtin types then subclasses with the proper delegate method usages are created:

```
public class QDate extends DatePath<java.sql.Date> {

    public QDate(BeanPath<? extends java.sql.Date> entity) {
        super(entity.getType(), entity.getMetadata());
    }

    public QDate(PathMetadata<?> metadata) {
        super(java.sql.Date.class, metadata);
    }

    public BooleanExpression inPeriod(com.mysema.commons.lang.Pair<java.sql.Date, java.sql.Date> period) {
        return QueryExtensions.inPeriod(this, period);
    }

}

public class QTimestamp extends DateTimePath<java.sql.Timestamp> {

    public QTimestamp(BeanPath<? extends java.sql.Timestamp> entity) {
        super(entity.getType(), entity.getMetadata());
    }

    public QTimestamp(PathMetadata<?> metadata) {
        super(java.sql.Timestamp.class, metadata);
    }

    public BooleanExpression inDatePeriod(com.mysema.commons.lang.Pair<java.sql.Date, java.sql.Date> period) {
        return QueryExtensions.inDatePeriod(this, period);
    }

}
```

Non-annotated types

It is possible to create Querydsl query types for non annotated types by creating `@QueryEntities` annotations. Just place a QueryEntities annotation into a package of your choice and the classes to mirrored in the value attribute.

To actually create the types use the `com.mysema.query.apt.QuerydslAnnotationProcessor`. In Maven you do it like this:

```
<project>
  <build>
  <plugins>
    ...
    <plugin>
      <groupId>com.mysema.maven</groupId>
      <artifactId>apt-maven-plugin</artifactId>
      <version>1.1.3</version>
      <executions>
        <execution>
          <goals>
            <goal>process</goal>
          </goals>
          <configuration>
            <outputDirectory>target/generated-sources/java</outputDirectory>
            <processor>com.mysema.query.apt.QuerydslAnnotationProcessor</processor>
          </configuration>
        </execution>
      </executions>
    </plugin>
    ...
  </plugins>
  </build>
</project>
```

Classpath based code generation

For cases where annotated Java sources are not available, such as the usage of a different JVM language such as Scala or Groovy or annotation addition via bytecode manipulation the `GenericExporter` class can be used to scan the classpath for annotated classes and generate query types for them.

To make GenericExporter available add a dependency to the querydsl-codegen module to your project, or to be more precise `com.mysema.querydsl:querydsl-codegen:${querydsl.version}`.

Below is an example for JPA

```
GenericExporter exporter = new GenericExporter();
exporter.setKeywords(Keywords.JPA);
exporter.setEntityAnnotation(Entity.class);
exporter.setEmbeddableAnnotation(Embeddable.class);
exporter.setEmbeddedAnnotation(Embedded.class);
exporter.setSupertypeAnnotation(MappedSuperclass.class);
exporter.setSkipAnnotation(Transient.class);
exporter.setTargetFolder(new File("target/generated-sources/java"));
exporter.export(DomainClass.class.getPackage());
```

This will export all the JPA annotated classes in the package of the DomainClass class and subpackages to the target/generated-sources/java directory.

Usage via Maven

The goals generic-export, jpa-export and jdo-export of the querydsl-maven-plugin can be used for GenericExporter usage via Maven.

The different goals are mapped to the Querydsl, JPA and JDO annotations.

The configuration elements are

Table 3.3. Maven configuration

Type	Element	Description
File	targetFolder	target folder for generated sources
boolean	scala	true, if Scala sources should be generated instead (default: false)
String[]	packages	packages to be introspected for entity classes
boolean	handleFields	true, if fields should be treated as properties (default: true)
boolean	handleMethods	true, if getters should be treated as properties (default: true)
String	sourceEncoding	charset encoding for the generated source files
boolean	testClasspath	true, if the test classpath should be used instead

Here is an example for JPA annotated classes

```
<project>
  <build>
    <plugins>
      ...
      <plugin>
        <groupId>com.mysema.querydsl</groupId>
        <artifactId>querydsl-maven-plugin</artifactId>
        <version>${querydsl.version}</version>
        <executions>
          <execution>
            <phase>process-classes</phase>
            <goals>
              <goal>jpa-export</goal>
            </goals>
            <configuration>
              <targetFolder>target/generated-sources/java</targetFolder>
              <packages>
                <package>com.example.domain</package>
              </packages>
            </configuration>
          </execution>
        </executions>
      </plugin>
      ...
    </plugins>
  </build>
</project>
```

This will export the JPA annotated classes of the `com.example.domain` package and subpackages to the target/generated-sources/java directory.

If you need to compile the generated sources directly after that, then you can use the `compile` goal for that.

```
<execution>
  <goals>
    <goal>compile</goal>
  </goals>
  <configuration>
    <sourceFolder>target/generated-sources/scala</targetFolder>
  </configuration>
</execution>
```

The `compile` goal has the following configuration elements

Table 3.4. Maven configuration

Type	Element	Description
File	sourceFolder	source folder with generated sources
String	sourceEncoding	charset encoding of sources

Type	Element	Description
String	source	-source option for the compiler
String	target	-target option for the compiler
boolean	testClasspath	true, if the test classpath should be used instead
Map	compilerOptions	options for the compiler

All options except `sourceFolder` are optional.

Scala support

If you need Scala output of the classes, use a variant of the following configuration

```
<project>
  <build>
    <plugins>
      ...
      <plugin>
        <groupId>com.mysema.querydsl</groupId>
        <artifactId>querydsl-maven-plugin</artifactId>
        <version>${querydsl.version}</version>
        <dependencies>
          <dependency>
            <groupId>com.mysema.querydsl</groupId>
            <artifactId>querydsl-scala</artifactId>
            <version>${querydsl.version}</version>
          </dependency>
          <dependency>
            <groupId>org.scala-lang</groupId>
            <artifactId>scala-library</artifactId>
            <version>${scala.version}</version>
          </dependency>
        </dependencies>
        <executions>
          <execution>
            <goals>
              <goal>jpa-export</goal>
            </goals>
            <configuration>
              <targetFolder>target/generated-sources/scala</targetFolder>
              <scala>true</scala>
              <packages>
                <package>com.example.domain</package>
              </packages>
            </configuration>
          </execution>
        </executions>
      </plugin>
      ...
    </plugins>
  </build>
</project>
```

3.4. Alias usage

In cases where code generation is not an option, alias objects can be used as path references for expression construction. They can be used via proxied Java Bean objects through getter method invocations.

The following examples demonstrate how alias objects can be used as replacements for expression creation based on generated types.

At first an example query with APT generated domain types:

```
QCat cat = new QCat("cat");
for (String name : query.from(cat,cats)
    .where(cat.kittens.size().gt(0))
    .list(cat.name)) {
    System.out.println(name);
}
```

And now with an alias instance for the Cat class. The call `c.getKittens()` inside the dollar-method is internally transformed into the property path `c.kittens`.

```
Cat c = alias(Cat.class, "cat");
for (String name : query.from($(c),cats)
    .where($(c.getKittens()).size().gt(0))
    .list($(c.getName()))) {
    System.out.println(name);
}
```

To use the alias functionality in your code, add the following two imports

```
import static com.mysema.query.alias.Alias.$;
import static com.mysema.query.alias.Alias.alias;
```

The following example is a variation of the previous, where the access to the list size happens inside the dollar-method invocation.

```
Cat c = alias(Cat.class, "cat");
for (String name : query.from($(c),cats)
    .where($(c.getKittens().size()).gt(0))
    .list($(c.getName()))) {
    System.out.println(name);
}
```

All non-primitive and non-final typed properties of aliases are aliases themselves. So you may cascade method calls until you hit a primitive or final type in the dollar-method scope. e.g.

```
$(c.getMate().getName())
```

is transformed into *c.mate.name* internally, but

```
$(c.getMate().getName().toLowerCase())
```

is not transformed properly, since the `toLowerCase()` invocation is not tracked.

Note also that you may only invoke getters, size(), contains(Object) and get(int) on alias types. All other invocations throw exceptions.

4. Troubleshooting

4.1. Insufficient type arguments

Querydsl needs properly encoded List Set, Collection and Map properties in all code generation scenarios.

When using improperly encoded fields or getters you might the following stacktrace:

```
java.lang.RuntimeException: Caught exception for field com.mysema.query.jdoql.testdomain.Store#products
  at com.mysema.query.apt.Processor$2.visitType(Processor.java:117)
  at com.mysema.query.apt.Processor$2.visitType(Processor.java:80)
  at com.sun.tools.javac.code.Symbol$ClassSymbol.accept(Symbol.java:827)
  at com.mysema.query.apt.Processor.getClassModel(Processor.java:154)
  at com.mysema.query.apt.Processor.process(Processor.java:191)
  ...
Caused by: java.lang.IllegalArgumentException: Insufficient type arguments for List
  at com.mysema.query.apt.APTTypeModel.visitDeclared(APTTypeModel.java:112)
  at com.mysema.query.apt.APTTypeModel.visitDeclared(APTTypeModel.java:40)
  at com.sun.tools.javac.code.Type$ClassType.accept(Type.java:696)
  at com.mysema.query.apt.APTTypeModel.<init>(APTTypeModel.java:55)
  at com.mysema.query.apt.APTTypeModel.get(APTTypeModel.java:48)
  at com.mysema.query.apt.Processor$2.visitType(Processor.java:114)
  ... 35 more
```

Examples of problematic field declarations and their corrections:

```
    private Collection names; // WRONG

    private Collection<String> names; // RIGHT

    private Map employeesByName; // WRONG

    private Map<String,Employee> employeesByName; // RIGHT
```

4.2. Multithreaded initialization of Querydsl Q-types

When Querydsl Q-types are initialized from multiple threads, deadlocks can occur, if the Q-types have circular dependencies.

An easy to use solution is to initialize the classes in a single thread before they are used in different threads.

The com.mysema.util.ClassPathUtils class can be used for that like this:

```
    ClassPathUtils.scanPackage(Thread.currentThread().getContextClassLoader(), packageToLoad);
```

Replace packageToLoad with the package of the classes you want to initialize.

4.3. JDK5 usage

When compiling your project with JDK 5, you might get the following compilation failure:

```
[INFO] ------------------------------------------------------------------------
[ERROR] BUILD FAILURE
[INFO] ------------------------------------------------------------------------
[INFO] Compilation failure
...
class file has wrong version 50.0, should be 49.0
```

The class file version 50.0 is used by Java 6.0, and 49.0 is used by Java 5.0.

Querydsl is tested against JDK 6.0 only, as we use APT extensively, which is available only since JDK 6.0.

If you want to use it with JDK 5.0 you might want to try to compile Querydsl yourself.