

# **Querydsl**

## **Reference Documentation**

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# Querydsl: Reference Documentation

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1.9.5

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# Preface

Querydsl (spell: query diesel) 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 fluentDSL/API like Querydsl.

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

1. code completion in IDE
2. almost none syntactically invalid queries allowed
3. domain types and properties can be referenced safely
4. 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 Collections, JDO, JDBC, Lucene, Hibernate Search 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.

All query instances can be reused multiple times. After the projection the paging data (limit and offset) and the definition of the projection are removed.

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.expr.Expr`.



## 2. Tutorials

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

### 2.1. 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. Support for JDO is in beta phase and still to be considered experimental.

#### Maven integration

Add the following dependencies to your Maven project and make sure that the Maven 2 repo of Mysema Source (<http://source.mysema.com/maven2/releases>) is accessible from your POM if the version cannot yet be found in other public Maven repos :

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-apt</artifactId>
  <version>1.8.2</version>
  <scope>provided</scope>
</dependency>

<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-jdoql</artifactId>
  <version>1.8.2</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>maven-apt-plugin</artifactId>
        <version>0.3.2</version>
        <executions>
          <execution>
            <goals>
              <goal>process</goal>
            </goals>
          </execution>
        </executions>
      </plugin>
    </plugins>
  </build>
</project>
```

```
<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 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 JDOQL 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 JDOQL

For the JDOQL-module JDOQLQueryImpl is the main Query implementation. It is instantiated like this :

```
PersistenceManager pm;
JDOQLQuery query = new JDOQLQueryImpl (pm);
```

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

```
QCustomer customer = QCustomer.customer;
JDOQLQuery query = new JDOQLQueryImpl (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 JDOQLQuery interface like this :

```
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")));
```

## General usage

Use the the cascading methods of the JDOQLQuery interface like this

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

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

*groupBy* : Define the group by arguments in varargs form.

*having* : Define the having filter of the "group by" grouping as an varargs array of EBoolean expressions.

*orderBy* : Define the 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* : Define 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.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 JDOQL follow a simple delete-where-execute form. Here are some examples :

```
QCat cat = QCat.cat;
// delete all cats
new JDOQLDeleteClause(pm, cat).execute();
// delete all cats with kittens
new JDOQLDeleteClause(pm, cat).where(cat.kittens.isNotEmpty()).execute();
```

The second parameter of the `JDOQLDeleteClause` 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 `JDOQLSubQuery` 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 result and list for a list result.

```
query.from(department)
    .where(department.employees.size().eq(
        new JDOQLSubQuery().from(d).unique(AggregationFunctions.max(d.employees.size()))
    )).list(department);
```

represents the following native JDOQL 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

```
query.from(employee)
```

```
.where(employee.weeklyhours.gt(  
    new JDOQLSubQuery().from(employee.department.employees, e)  
    .where(e.manager.eq(employee.manager))  
    .unique(AggregationFunctions.avg(e.weeklyhours))  
)).list(employee);
```

which represents the following native JDOQL 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 :

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

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(EConstructor.create(CatDTO.class, cat.id, cat.name));
```

## 2.2. 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/Hibernate.

Querydsl for JPA/Hibernate 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 and make sure that the Maven 2 repo of Mysema Source (<http://source.mysema.com/maven2/releases>) is accessible from your POM :

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-apt</artifactId>
  <version>1.8.2</version>
  <scope>provided</scope>
</dependency>

<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-hql</artifactId>
  <version>1.8.2</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>maven-apt-plugin</artifactId>
        <version>0.3.2</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 JPQL 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 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

For the HQL-module `HibernateQuery` is the main Query implementation. It is instantiated like this :

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

To use the JPA API instead of the Hibernate API, you can instantiate a `JPAQuery` like this :

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

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

```
QCustomer customer = QCustomer.customer;
HQLQuery query = new HibernateQuery (session);
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 just use the `HQLQuery` interface like this :

```
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"
```

## 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 :

```
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
```

```
with kitten.bodyWeight > 10.0
```

## General usage

Use the the cascading methods of the HQLQuery interface like this

*from* : Define the query sources here.

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

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

*groupBy* : Define the group by arguments in varargs form.

*having* : Define the having filter of the "group by" grouping as an varargs array of EBoolean expressions.

*orderBy* : Define the 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* : Define 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.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 JPQL follow a simple delete-where-execute form. Here are some examples :

```
QCat cat = QCat.cat;
// delete all cats
new HibernateDeleteClause(session, cat).execute();
// delete all cats with kittens
new HibernateDeleteClause(session, cat).where(cat.kittens.isNotEmpty()).execute();
```

The second parameter of the `HibernateDeleteClause` 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 JPA based Delete usage, use the `JPADeleteClause` instead.

## Update clauses

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

```
QCat cat = QCat.cat;
// rename cats named Bob to Bobby
new HibernateUpdateClause(session, cat).where(cat.name.eq("Bob"))
    .set(cat.name, "Bobby")
    .execute();
```

The second parameter of the `HibernateUpdateClause` 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 JPA based Update usage, use the `JPAUpdateClause` instead.

## Subqueries

To create a subquery you create a `HQLSubQuery` 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.

```
query.from(department)
    .where(department.employees.size().eq(
        new HQLSubQuery().from(d).unique(d.employees.size().max())
```

```
)).list(department);
```

Another example

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

## Exposing the original query

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

```
HibernateQuery query = new HibernateQuery(session);
org.hibernate.Query hibQuery = query.from(employee).createQuery(employee);
hibQuery.setResultTransformer(someTransformer);
List results = hibQuery.list();
```

## Using Native SQL in Hibernate queries

Querydsl supports Native SQL in Hibernate via the `HibernateSQLQuery` 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 :

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

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;

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

Query multiple columns :

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

Query with joins :

```
query = new HibernateSQLQuery(session, 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 HibernateSQLQuery(session, templates);
List<CatDTO> catDTOS = query.from(cat)
    .orderBy(cat.name.asc())
    .list(EConstructor.create(CatDTO.class, cat.id, cat.name));
```

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

## 2.3. 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 :

```
import static com.mysema.query.collections.MinApi.*;
import static com.mysema.query.alias.Alias.*; // for alias usage
```

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

The alias instance of type Cat and it's getter invocations are transformed into Querydsl 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-String typed properties of aliases are aliases themselves. So you may cascade method calls until you hit a primitive or String 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.

## Usage with generated query types

The example above can be expressed like this with generated query 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 query types instead of alias instances and use the property paths directly without any dollar-method wrapping.

## Maven integration

If you are not using JPA or JDO you can generate Querydsl query 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>maven-apt-plugin</artifactId>
        <version>0.3.2</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>
```

```
        </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.

## 2.4. Querying SQL/JDBC sources

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

### Creating the Querydsl query types

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

```
java.sql.Connection conn; // connection of database containing the schema to use
// obtain Connection etc.

NamingStrategy namingStrategy = new DefaultNamingStrategy();
MetaDataSerializer serializer = new MetaDataSerializer("Q",namingStrategy);
MetaDataExporter exporter = new MetaDataExporter(
    "Q", // namePrefix
    "com.myproject.mydomain", // target package
    new File("src/main/java"), // target source folder
    namingStrategy, // naming strategy
```

```
        serializer); // serializer
        exporter.export(conn.getMetaData());
```

This declares that the database schema is to be mirrored into the `com.myproject.domain` package in the `src/main/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 ... TODO

## Maven integration

This functionality is also available as a Maven plugin. The presented example can be declared like this in the POM :

```
<plugin>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-maven-plugin</artifactId>
  <version>${querydsl.version}</version>
  <executions>
    <execution>
      <goals>
        <goal>export</goal>
      </goals>
    </execution>
  </executions>
  <configuration>
    <jdbcDriver>org.apache.derby.jdbc.EmbeddedDriver</jdbcDriver>
    <jdbcUrl>jdbc:derby:target/demoDB;create=true</jdbcUrl>
    <!--
      optional elements :
      * namePrefix
      * jdbcUser
      * jdbcPassword
      * schemaPattern
      * tableNamePattern
    -->
    <packageName>com.myproject.domain</packageName>
    <targetFolder>${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>
```

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

## Querying

Querying with Querydsl SQL is as simple as this :

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

SQLTemplates dialect = new HSQLDBTemplates(); // SQL-dialect
SQLQuery query = new SQLQueryImpl(connection, dialect);
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'
```

Internally Querydsl SQL uses PreparedStatements, though.

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

- DerbyTemplates
  - tested with version 10.5.3
- HSQLDBTemplates
  - tested with version 1.8.0.7
- H2Templates
  - tested with H2 1.2.133
- MySQLTemplates
  - tested with MySQL CE 5.1
- OracleTemplates
  - tested with Oracle 10g XE
- PostgresTemplates
  - tested with Postgres 8.4

- SQLServerTemplates
  - tested with SQL Server 2008

## General usage

Use the the cascading methods of the SQLQuery interface like this

*from* : Define the query sources here.

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

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

*groupBy* : Define the group by arguments in varargs form.

*having* : Define the having filter of the "group by" grouping as an varargs array of EBoolean expressions.

*orderBy* : Define the 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* : Define 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.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
```

## Union queries

TODO

## 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.

## Using DDL commands

CREATE TABLE commands can be used in fluent form via the `CreateTableClause`. Here are some examples :

```

new CreateTableClause(conn, templates, "language")
    .column("id", Integer.class).NotNull()
    .column("text", String.class).size(256).NotNull()
    .primaryKey("PK_LANGUAGE", "id")
    .execute();

new CreateTableClause(conn, templates, "symbol")
    .column("id", Long.class).NotNull()
    .column("lexical", String.class).size(1024).NotNull()
    .column("datatype", Long.class)
    .column("lang", Integer.class)
    .column("intval", Long.class)
    .column("floatval", Double.class)
    .column("datetimeval", Timestamp.class)
    .primaryKey("PK_SYMBOL", "id")
    .foreignKey("FK_LANG", "lang").references("language", "id")
    .execute();

new CreateTableClause(conn, templates, "statement")
    .column("model", Long.class)
    .column("subject", Long.class).NotNull()
    .column("predicate", Long.class).NotNull()
    .column("object", Long.class).NotNull()
    .foreignKey("FK_MODEL", "model").references("symbol", "id")
    .foreignKey("FK_SUBJECT", "subject").references("symbol", "id")
    .foreignKey("FK_PREDICATE", "predicate").references("symbol", "id")
    .foreignKey("FK_OBJECT", "object").references("symbol", "id")
    .execute();

```

The constructor of `CreateTableClause` takes the connection, the templates and the table name. The rest is declared via `column`, `primaryKey` and `foreignKey` invocations.

Here are the corresponding CREATE TABLE clauses as they are executed.

```

CREATE TABLE language (
  id INTEGER NOT NULL,
  text VARCHAR(256) NOT NULL,
  CONSTRAINT PK_LANGUAGE PRIMARY KEY(id)
)

CREATE TABLE symbol (
  id BIGINT NOT NULL,
  lexical VARCHAR(1024) NOT NULL,
  datatype BIGINT,
  lang INTEGER,
  intval BIGINT,
  floatval DOUBLE,
  datetimeval TIMESTAMP,
  CONSTRAINT PK_SYMBOL PRIMARY KEY(id),
  CONSTRAINT FK_LANG FOREIGN KEY(lang) REFERENCES language(id)
)

CREATE TABLE statement (
  model BIGINT,

```

```
subject BIGINT NOT NULL,  
predicate BIGINT NOT NULL,  
object BIGINT NOT NULL,  
CONSTRAINT FK_MODEL FOREIGN KEY(model) REFERENCES symbol(id),  
CONSTRAINT FK_SUBJECT FOREIGN KEY(subject) REFERENCES symbol(id),  
CONSTRAINT FK_PREDICATE FOREIGN KEY(predicate) REFERENCES symbol(id),  
CONSTRAINT FK_OBJECT FOREIGN KEY(object) REFERENCES symbol(id)  
)
```

## 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 examples :

```
// with columns  
new SQLInsertClause(conn, dialect, survey)  
    .columns(survey.id, survey.name)  
    .values(3, "Hello").execute();  
  
// without columns  
new SQLInsertClause(conn, dialect, survey)  
    .values(4, "Hello").execute();  
  
// with subquery  
new SQLInsertClause(conn, dialect, 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, dialect, survey)  
    .select(new SQLSubQuery().from(survey2).list(survey2.id.add(10), survey2.name))  
    .execute();
```

Update examples :

```
// update with where  
new SQLUpdateClause(conn, dialect, survey)  
    .where(survey.name.eq("XXX"))  
    .set(survey.name, "S")  
    .execute();  
  
// update without where  
new SQLUpdateClause(conn, dialect, survey)  
    .set(survey.name, "S")  
    .execute();
```

Delete examples :



```
// delete with where
new SQLDeleteClause(conn, dialect, survey)
    .where(survey.name.eq("XXX"))
    .execute();

// delete without where
new SQLDeleteClause(conn, dialect, 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`.

```
@Test
public void updateExample() throws SQLException{
    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();
    assertEquals(2, update.execute());
}

@Test
public void deleteExample() throws SQLException{
    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());
}

@Test
public void insertExample(){
    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; // connection of database containing the schema to use
// obtain Connection etc.
```

```
NamingStrategy namingStrategy = new DefaultNamingStrategy();
MetaDataSerializer serializer = new MetaDataSerializer("Q",namingStrategy);
MetaDataExporter exporter = new MetaDataExporter(
    "Q", // namePrefix
    "com.myproject.mydomain", // target package
    new File("src/main/java"), // target source folder
    namingStrategy, // naming strategy
    serializer, // serializer for Q-types
    new BeanSerializer()); // serializer for Bean types
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 :

```
@Test
public void Insert_Update_Query_and_Delete(){
    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(11, 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(11, delete(e).where(e.id.eq(employee.getId())).execute());
}
```

## User types

TODO

## 2.5. Querying Lucene sources

This chapter describes the querying functionality of the Lucene module.

### Creating the Querydsl query types

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

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

```
public QDocument(String var) {  
    super(Document.class, PathMetadataFactory.forVariable(var));  
}  
  
public final PString year = createString("year");  
  
public final PString title = createString("title");  
}
```

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

## 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* : Define 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* : Define the 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* : Define 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.

## 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();
```

## 2.6. Querying Hibernate Search sources

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 = new 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.

## 3. General usage

### 3.1. Expressions

#### Inheritance in Querydsl types

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

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

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

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

    public final QAccount _super = new QAccount(this);

    // ...
}
```

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

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

#### Parameters

TODO

#### Constructor projections

Querydsl provides the possibility to use constructor invocations in projections. To use a constructor in a query projection, you need to annotate it 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;
HQLQuery query = new HibernateQuery(session);
List<CustomerDTO> dtos = qry.from(customer).list(new QCustomerDTO(customer.id, customer.name));
```

While the example is Hibernate specific, this feature is present 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;
HQLQuery query = new HibernateQuery(session);
List<Customer> dtos = qry.from(customer).list(new 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 = qry.from(customer)
    .list(EConstructor.create(Customer.class, customer.id, customer.name));
```

## Complex boolean expressions

To construct complex boolean expressions, use the BooleanBuilder class. It extends EBoolean and can be used in cascaded form :

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

## Case expressions

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

```
QCustomer customer = QCustomer.customer;
Expr<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;
Expr<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.

## Dynamic path usage

For dynamic path generation the `PathBuilder` class can be used. It extends `PEntity` and can be used as an alternative to class generation and alias-usage for path generation.

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 :

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

Map property :

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



## 3.2. Configuration

### Path initialization

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

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

@Entity
class Account{
    Customer customer;
}

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

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 declarative 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.

Declarative path initialization is the preferred initialization strategy, but manual initialization can be activated via the `QuerydslConfig` annotation, which is described below.

### Customization of serialization

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

The serialization options are *entityAccessors* to generate accessor methods for entity paths instead of public final fields (default : false)), *listAccessors* to generate `listProperty(int index)` style methods (default : false), *mapAccessors* to generate `mapProperty(Key key)` style accessor methods (default : false) and *createDefaultVariable* to generate the default variable (default : true).

#### Examples

##### Customization of Entity type serialization

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

### Customization of package content

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

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

If you want to customize the serializer configuration globally, you can do this via the APT options *querydsl.entityAccessors*, *querydsl.listAccessors*, *querydsl.mapAccessors* and *querydsl.createDefaultVariable*.

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

```
<project>
  <build>
    <plugins>
      ...
      <plugin>
        <groupId>com.mysema.maven</groupId>
        <artifactId>maven-apt-plugin</artifactId>
        <version>0.3.2</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>
              </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 Querydsl 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.

## Custom methods in query types

Querydsl provides the possibility to annotate methods for mirroring in query types. Methods can either be annotated directly in the context of the class where they belong or in query extension interfaces, if the target class is only available for annotation.

### Example 1

```
public class Point{
    // ...
}

@QueryExtensions(Point.class)
public interface PointOperations {

    @QueryMethod("geo_distance({0}, {1})")
    int geoDistance(Point otherPoint);

}
```

The first example describes indirect annotation via `QueryExtensions` usage. Let's assume that `Point` is a class of an external library which has to be used as such without the possibility of customization in source form.

To make a `geoDistance(Point)` method available in the Querydsl query type for `Point`, a query extension interface is used. Via the `QueryExtensions` annotation the interface is bound to the `Point` class and via the `QueryMethod` annotation the `geoDistance` method is declared to be mirrored into the `Point` query type with a serialization pattern of `"geo_distance({0}, {1})"`.

The serialization patterns of query methods have the host object itself always as the first argument and the method parameters as further arguments.

### Example 2

```
public class Point{

    @QueryMethod("geo_distance({0}, {1})")
    int geoDistance(Point otherPoint){
        // dummy implementation
        return 0;
    }

}
```

The second example features the same use case as in the first example, but this time the Point class is annotated directly. This approach is feasible, if the related domain type is available for annotation and APT post processing.

## Delegate methods

Instead of custom methods with serialization templates, static delegates can be used.

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 EBoolean isManagedBy(QUser user, User other){
    return user.manager.eq(other);
}
```

And the generated methods in the QUser query type :

```
public EBoolean isManagedBy(Qser 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 EBoolean inPeriod(PDate<Date> date, Pair<Date,Date> period){
        return date.goe(period.getFirst()).and(date.loe(period.getSecond()));
    }

    @QueryDelegate(Timestamp.class)
    public static EBoolean inDatePeriod(PDateTime<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 PDate<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 EBoolean inPeriod(com.mysema.commons.lang.Pair<java.sql.Date, java.sql.Date> period) {
        return QueryExtensions.inPeriod(this, period);
    }

}

public class QTimestamp extends PDateTime<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 EBoolean inDatePeriod(com.mysema.commons.lang.Pair<java.sql.Date, java.sql.Date> period) {
        return QueryExtensions.inDatePeriod(this, period);
    }

}
```

```
}
```

## Query type generation for not annotated types

It is possible to create Querydsl query types for not 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>maven-apt-plugin</artifactId>
  <version>0.3.2</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>
```

## 3.3. Best practices

### Use default variable of the Query types

Use the default variables of the query types as much as possible. The default variables are available as static final fields in the query types. The name is always the decapitalized version of the simple type name. For the type `Account` this would be `account` :

```
public class QAccount extends PEntity<Account>{

    public static final QAccount account = new QAccount("account");
```

```
}
```

Querydsl query types are safe to re-use, and by using Querydsl default variables you save initialization time and memory.

## Interface based usage

Whenever possible, use interface based query references : e.g. JDOQLQuery for JDO and HQLQuery for HQL

## Custom query extensions

TODO

## DAO integration

A practice which we have found to be very easy to use is to provide factory methods for Query instances in DAO implementations in the following form.

For HQL usage :

```
protected HQLQuery from(PEntity<?>... o) {  
    return new HqlQueryImpl(session).from(o);  
}
```

For JDO usage :

```
protected JDOQLQuery from(PEntity<?>... o) {  
    return new JDOQLQueryImpl(persistenceManager).from(o);  
}
```

## 3.4. Alias usage

In cases where code generation is not an option, alias objects can be used as path references for expression construction.

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

At first an example query with APT generated domain types :

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

All non-primitive and non-String typed properties of aliases are aliases themselves. So you may cascade method calls until you hit a primitive or String 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. 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.

To use Querydsl with JDK 5.0 you also need to exclude querydsl-hql-apt and include querydsl-apt-jdk5 like this :

```
<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-hql</artifactId>
  <version>0.4.4</version>
  <exclusions>
    <exclusion>
      <groupId>com.mysema.querydsl</groupId>
      <artifactId>querydsl-hql-apt</artifactId>
    </exclusion>
  </exclusions>
</dependency>

<dependency>
  <groupId>com.mysema.querydsl</groupId>
  <artifactId>querydsl-apt-jdk5</artifactId>
  <version>0.4.4</version>
  <scope>provided</scope>
</dependency>
```