Spring Data

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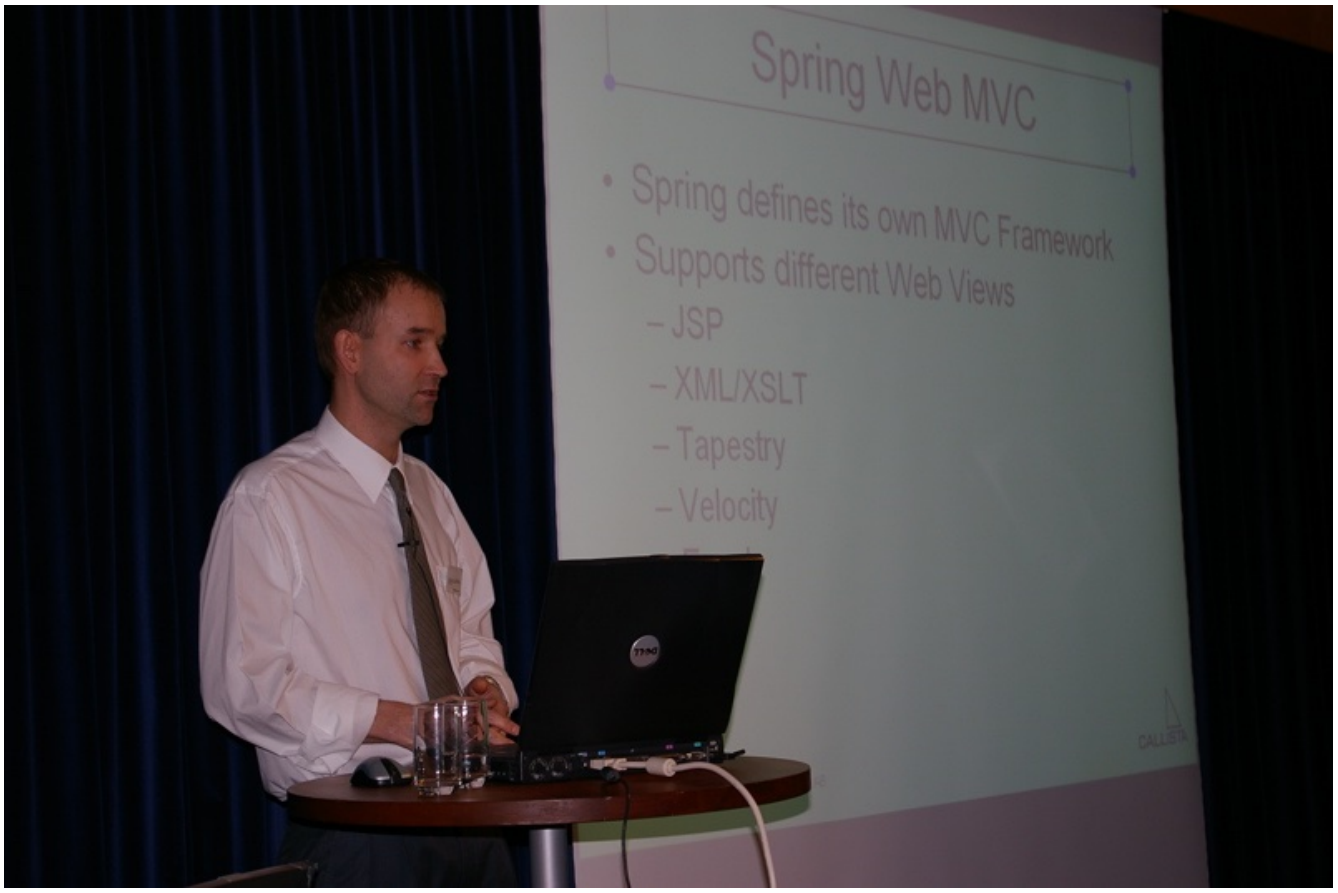
CALLISTA
Enterprise

Cadec 2005



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2005: Spring = Innovation

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Cadec 2010

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2010: Spring = Legacy?

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2014: Spring = Consolidation & Maturity

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Spring Data in the *spring.io* stack

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The Spring Data project family

Java Persistence

mongoDB

QUERY DSL

redis

springdata Neo4j

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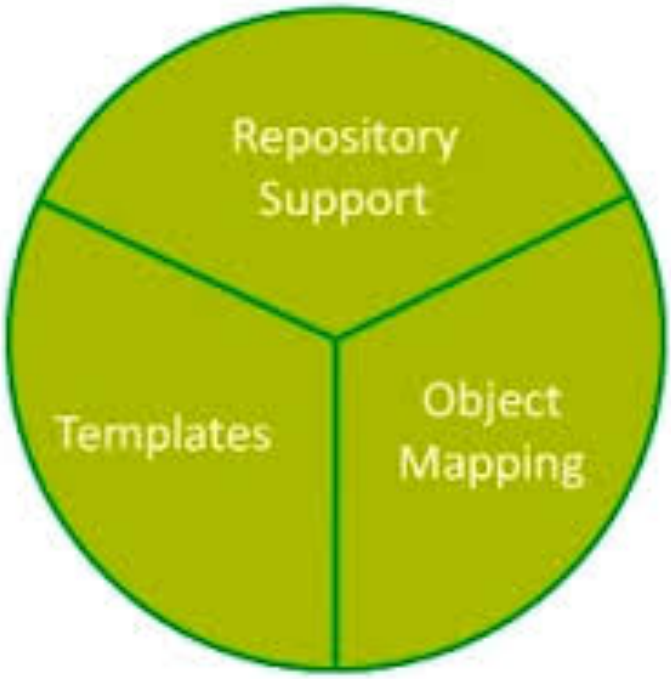
Spring Data Main Abstractions



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Spring Data JPA Repositories: Example

```
@Entity
public class Invoice {

        @Id
        @GeneratedValue
        private int id;

        private String customerName;

        private Date date;

        ...
}
```


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Example: Repository Interface

```
public interface InvoiceRepository {

   void create(Invoice invoice);
   Invoice findById(Integer id);
   Invoice update(Invoice invoice);
   void delete(Invoice invoice);

   List<Invoice> findByCustomerName(String customerName);
   List<Invoice> findInvoicesSubmittedSince(Date date);
   ...
}
```


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Repository Implementation

```
public class InvoiceRepositoryImpl implements InvoiceRepository {

        @PersistenceContext
        protected EntityManager entityManager;

        public void create(Invoice invoice) {
                entityManager.persist(invoice);
        }

        public Invoice findById(Integer id) {
                return entityManager.find(Invoice.class, id);
        }

        public Invoice update(Invoice invoice) {
                return entityManager.merge(invoice);
        }

        public void delete(Invoice invoice) {
                entityManager.merge(invoice);
                entityManager.remove(invoice);
        }

        ...
```


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Repository Implementation (contd.)

```
        ...

        @SuppressWarnings("unchecked")
        public List<Invoice> findByCustomerName(String customerName) {
                Query q = entityManager
          .createQuery("SELECT i FROM Invoice i WHERE customerName >= :customer");
                q.setParameter("customer", customerName);
                return (List<Invoice>) q.getResultList();
        }

        @SuppressWarnings("unchecked")
        public List<Invoice> findInvoicesSubmittedSince(Date date) {
                Query q = entityManager
          .createQuery("SELECT i FROM Invoice i WHERE date >= :date_since");
                q.setParameter("date_since", date);
                return (List<Invoice>) q.getResultList();
        }

}
```


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Generic DAO pattern

```
public interface GenericDao<T, PK extends Serializable> {

   void create(T t);
   T findById(PK pk);
   T update(T t);
   void delete(T t);

}
```


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Generic DAO pattern (contd.)

```
public interface InvoiceRepository extends GenericDao<Invoice, Integer> {

   List<Invoice> findByCustomerName(String customerName);
   List<Invoice> findInvoicesSubmittedSince(Date date);

}
```


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Generic DAO pattern (contd.)

```
public class GenericDaoImpl<T, PK extends Serializable> implements GenericDao<T, PK> {

        protected Class<T> entityClass;

        @PersistenceContext
        protected EntityManager entityManager;

        @SuppressWarnings("unchecked")
        public GenericDaoImpl() {
                ParameterizedType genericSuperclass = (ParameterizedType) getClass().getGenericSuperclass();
                this.entityClass = (Class<T>) genericSuperclass.getActualTypeArguments()[0];
        }

        public void create(T t) {
                entityManager.persist(t);
        }

        public T findById(PK pk) {
                return entityManager.find(entityClass, pk);
        }

        public T update(T t) {
                return entityManager.merge(t);
        }

        public void delete(T t) {
                entityManager.merge(t);
                entityManager.remove(t);
        }

}
```


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Generic DAO pattern (contd.)

```
public class InvoiceRepositoryImpl extends GenericDaoImpl<Invoice, Integer>
        implements InvoiceRepository {

        @SuppressWarnings("unchecked")
        public List<Invoice> findByCustomerName(String customerName) {
                Query q = entityManager
.createQuery("SELECT i FROM Invoice i WHERE customerName >= :customer");
                q.setParameter("customer", customerName);
                return (List<Invoice>) q.getResultList();
        }

        @SuppressWarnings("unchecked")
        public List<Invoice> findInvoicesSubmittedSince(Date date) {
                Query q = entityManager
.createQuery("SELECT i FROM Invoice i WHERE date >= :date_since");
                q.setParameter("date_since", date);
                return (List<Invoice>) q.getResultList();
        }

}
```


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Spring Data JPA Configuration

```
<beans xmlns=...>
 ...
 <bean id="entityManagerFactory" .../>
 <jpa:repositories base-package="se.callista.cadec.repositories" />
 ...
</beans>
```


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Spring Data JPA Repository

```
import org.springframework.data.repository.CrudRepository;

public interface InvoiceRepository extends CrudRepository<Invoice, Integer> {

   List<Invoice> findByCustomerName(String customerName);

}
```


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Spring Data JPA Repositories

- Interface-based programming model
- No implementation required
  - provided by Spring Data
- Queries derived from method names

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Supported keywords for query methods

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

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Custom JPQL Queries

```
import org.springframework.data.jpa.repository.Query;
import org.springframework.data.repository.CrudRepository;

public interface InvoiceRepository extends CrudRepository<Invoice, Integer> {

   List<Invoice> findByCustomerName(String customerName);

   @Query("SELECT i FROM Invoice i WHERE date >= ?1")
   List<Invoice> findInvoicesSubmittedSince(Date date);

}
```


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Paging and Sorting

```
import org.springframework.data.jpa.repository.Query;
import org.springframework.data.repository.PagingAndSortingRepository;

public interface InvoiceRepository extends PagingAndSortingRepository<Invoice, Integer>
{

   List<Invoice> findByCustomerName(String customerName);

   @Query("SELECT i FROM Invoice i WHERE date >= ?1")
   List<Invoice> findInvoicesSubmittedSince(Date date);

}
```


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Redeclaring CRUD methods

```
import org.springframework.transaction.annotation.Transactional;

public interface InvoiceRepository extends PagingAndSortingRepository<Invoice, Integer>
{

        /*
        * @see org.springframework.data.repository.CrudRepository#save(T)
        */
        @Transactional(timeout = 10)
        <S extends Invoice> S save(S entity);

   List<Invoice> findByCustomerName(String customerName);

   @Query("SELECT i FROM Invoice i WHERE date >= ?1")
   List<Invoice> findInvoicesSubmittedSince(Date date);

}
```


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Spring Data MongoDB Example

```
public class Invoice {

        @Id
        private int id;

        private String customerName;

        private Date date;

        ...
}
```


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Spring Data Mongo Configuration

```
<beans ...>
 ...
 <mongo:mongo id="mongo" />
 <bean id="mongoTemplate" class="org.springframework.data.mongodb.core.MongoTemplate">
   <constructor-arg ref="mongo" />
   <constructor-arg value="databaseName" />
 </bean>
 <mongo:repositories base-package="se.callista.cadec.repositories" />
 ...
</beans>
```


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Spring Data Mongo Repository

```
import org.springframework.data.repository.CrudRepository;

public interface InvoiceRepository extends CrudRepository<Invoice, Integer> {

   List<Invoice> findByCustomerName(String customerName);

}
```


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Supported keywords for query methods

Keyword	Sample	Logical result
GreaterThan	findByAgeGreaterThan(int age)	{"age" : {"$gt" : age}}
LessThan	findByAgeLessThan(int age)	{"age" : {"$lt" : age}}
Between	findByAgeBetween(int from, int to)	{"age" : {"$gt" : from, "$lt" : to}}
IsNotNull, NotNull	findByFirstnameNotNull()	{"age" : {"$ne" : null}}
IsNull, Null	findByFirstnameNull()	{"age" : null}
Like	findByFirstnameLike(String name)	{"age" : age} (age as regex)
Regex	findByFirstnameRegex(String firstname)	{"firstname" : {"$regex" : firstname }}
(No keyword)	findByFirstname(String name)	{"age" : name}
Not	findByFirstnameNot(String name)	{"age" : {"$ne" : name}}
Near	findByLocationNear(Point point)	{"location" : {"$near" : [x,y]}}
Within	findByLocationWithin(Circle circle)	{"location" : {"$within" : {"$center" : [[x, y], distance]}}}
Within	findByLocationWithin(Box box)	{"location" : {"$within" : {"$box" : [[x1, y1], x2, y2]}}}True
IsTrue, True	findByActiveIsTrue()	{"active" : true}
IsFalse, False	findByActiveIsFalse()	{"active" : false}
Exists	findByLocationExists(boolean exists)	{"location" : {"$exists" : exists }}

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Mongo-specific Queries

```
import org.springframework.data.mongodb.repository.MongoRepository;
import org.springframework.data.mongodb.repository.Query;

public interface InvoiceRepository extends MongoRepository<Invoice, Integer> {

   List<Invoice> findByDealerNear(Point location, Distance distance);

   @Query("{'customerName': ?0}")
   List<Invoice> findInvoicesByCustomerName(String name);

}
```


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Type-safe Queries

```
@Query("SELECT i FROM Invoice i " +
      "WHERE customerName like ?1 AND date >= ?2 " +
      "ORDER BY date DESC")
```


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Criteria API Woe

```
// SELECT i FROM Invoice i WHERE customerName like ?1 AND date >= ?2 ORDER BY date DESC
        public List<Invoice> findInvoicesByCustomerSince(String customer, Date date) {
                CriteriaBuilder cb = entityManager.getCriteriaBuilder();
                CriteriaQuery<Invoice> cq = cb.createQuery(Invoice.class);
                Root<Invoice> c = cq.from(Invoice.class);
                ParameterExpression<String> cust = cb.parameter(String.class);
                ParameterExpression<Date> since = cb.parameter(Date.class);
                cq.select(c).where(
                                cb.and(cb.like(c.<String> get("customerName"), cust)),
                                      cb.greaterThanOrEqualTo(c.<Date> get("date"),
since));
                cq.select(c).orderBy(cb.desc(c.get("date")));
                TypedQuery<Invoice> q = entityManager.createQuery(cq);
                q.setParameter(cust, customer);
                q.setParameter(since, date);
                return q.getResultList();
        }
```


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Open Source alternative: Querydsl

- Querydsl is a framework which enables the construction of type-safe SQL-like queries for multiple backends including JPA, Hibernate, MongoDB and SQL.
- Querydsl provides a type-safe, fluent API that is compact, elegant and easy to learn.

```
QInvoice invoice = QInvoice.invoice;
List<Invoice> result = query.from(invoice)
.where(invoice.customerName.like(customer).and(invoice.date.goe(date))
.orderBy(invoice.date.desc());
```

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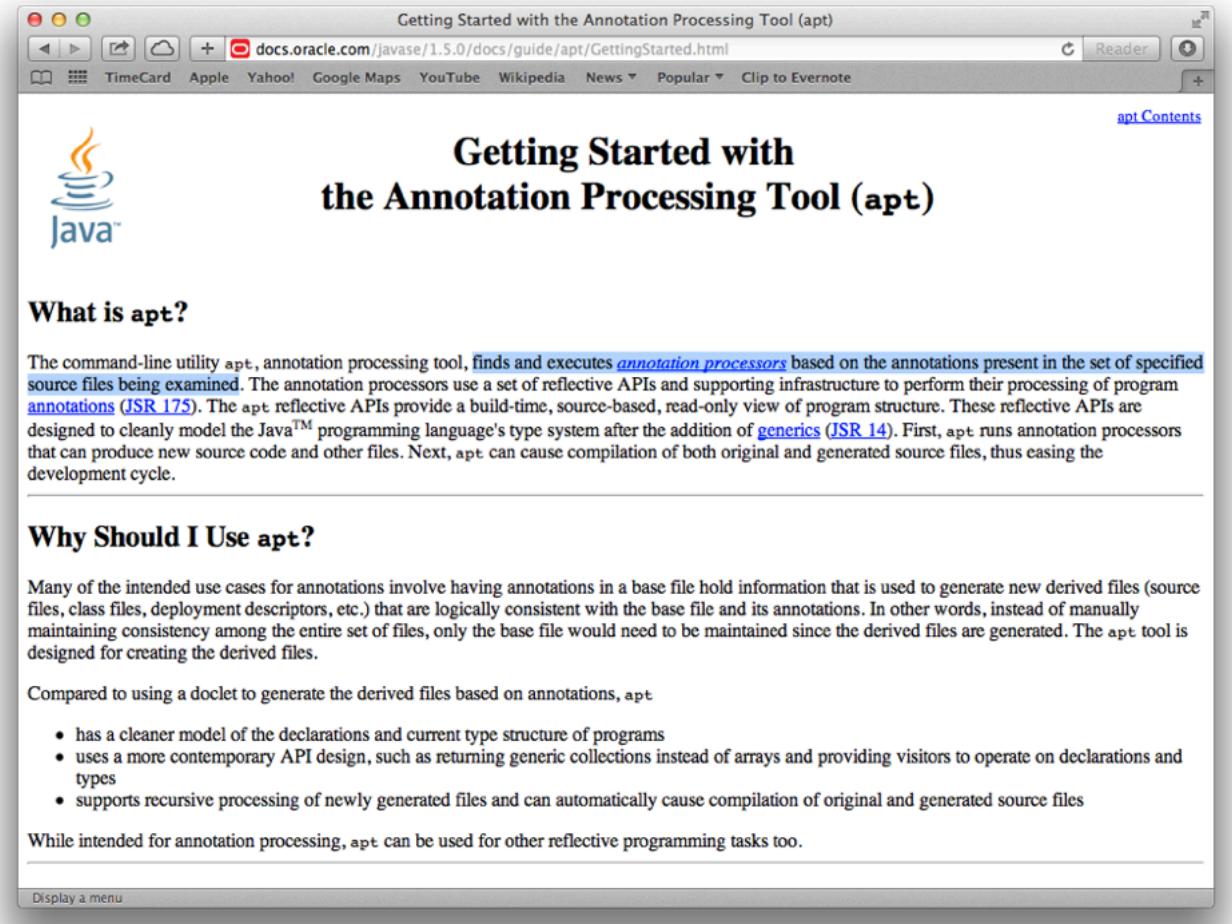
QueryDSL meta-data generation: APT



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APT Config example: Maven

```
<plugin>
	<groupId>com.mysema.maven</groupId>
	<artifactId>apt-maven-plugin</artifactId>
	<version>1.1.0</version>
	<configuration>
		<processor>com.mysema.query.apt.jpa.JPAAnnotationProcessor</processor>
	</configuration>
	<dependencies>
		<dependency>
			<groupId>com.mysema.querydsl</groupId>
			<artifactId>querydsl-apt</artifactId>
			<version>3.2.4</version>
		</dependency>
	</dependencies>
	<executions>
		<execution>
			<phase>generate-sources</phase>
			<goals>
				<goal>process</goal>
			</goals>
			<configuration>
				<outputDirectory>target/generated-
sources</outputDirectory>
			</configuration>
		</execution>
	</executions>
</plugin>
```

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Adding QueryDSL execution: JPA

```
import org.springframework.data.querydsl.QueryDslPredicateExecutor;

public interface InvoiceRepository extends PagingAndSortingRepository<Invoice, Integer>,
        QueryDslPredicateExecutor<Invoice> {

        ...

}
```

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Adding QueryDSL execution: MongoDB

```
import org.springframework.data.querydsl.QueryDslPredicateExecutor;

public interface InvoiceRepository extends MongoRepository<Invoice, Integer>,
        QueryDslPredicateExecutor<Invoice> {

        ...

}
```

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Criteria API Example

```
public class InvoiceRepositoryImpl implements InvoiceRepository {

// SELECT i FROM Invoice i WHERE customerName like ?1 AND date >= ?2 ORDER BY date DESC
        public List<Invoice> findInvoicesByCustomerSince(String customer, Date date) {
                CriteriaBuilder cb = entityManager.getCriteriaBuilder();
                CriteriaQuery<Invoice> cq = cb.createQuery(Invoice.class);
                Root<Invoice> c = cq.from(Invoice.class);
                ParameterExpression<String> cust = cb.parameter(String.class);
                ParameterExpression<Date> since = cb.parameter(Date.class);
                cq.select(c).where(
                                cb.and(cb.like(c.<String> get("customerName"), cust)),
                                      cb.greaterThanOrEqualTo(c.<Date> get("date"),
since));
                cq.select(c).orderBy(cb.desc(c.get("date")));
                TypedQuery<Invoice> q = entityManager.createQuery(cq);
                q.setParameter(cust, customer);
                q.setParameter(since, date);
                return q.getResultList();
        }
}
```


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QueryDSL query example

```
public class InvoiceService {

	@Autowired
	private InvoiceRepository invoiceRepository;

	// SELECT i FROM Invoice i WHERE customerName >= ?1 AND date >= ?2 ORDER BY date
DESC
	public List<Invoice> findInvoicesByCustomerSince(String customer, Date date) {
		QInvoice invoice = QInvoice.invoice;
		Predicate where =
invoice.customerName.like(customer).and(invoice.date.goe(date));
		OrderSpecifier<Date> orderBy = invoice.date.desc();
		return (List<Invoice>) invoiceRepository.findAll(where, orderBy);
	}

}
```

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Spring Data: Consolidation & Maturity

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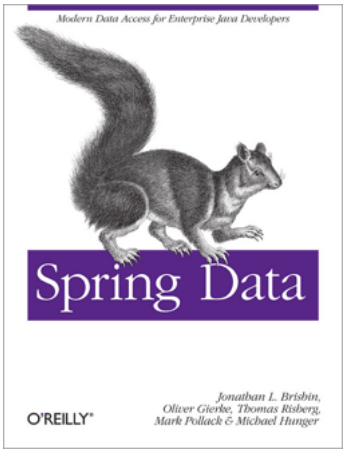
References



- http://projects.spring.io/spring-data/
- http://projects.spring.io/spring-data-jpa/
- http://projects.spring.io/spring-data-mongodb/
- http://www.querydsl.com/
- https://github.com/spring-projects/spring-data-jpa-examples
- http://www.amazon.com/Spring-Data-Mark-Pollack/dp/1449323952

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Questions

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