Java Development with MongoDB

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http://novus.com

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Outline

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Adding the MongoDB Driver To Your Project

Assuming you're using a dependency manager, make setup simple. . .

Listing 1: Maven Dependency

```
<dependency>
  <groupId>org.mongodb</groupId>
  <artifactId>mongo-java-driver</artifactId>
  <version>1.4</version>
</dependency>
```

Listing 2: Ivy Dependency

```
<dependency org="org.mongodb"
            name="mongo-java-driver"
            rev="1.4"/>
```

Adding the MongoDB Driver To Your Project

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Listing 3: Maven Dependency

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Listing 4: Ivy Dependency

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Simple Connection

Getting connected to MongoDB is simple; Connections are pooled, so you only need one. . .

```java
import com.mongodb.Mongo;
import com.mongodb.DB;
Mongo m = new Mongo();
Mongo m = new Mongo("localhost");
Mongo m = new Mongo("localhost", 27017);
```

Fetch a Database Handle (lazy). . .

```java
DB db = m.getDB("javaDemo");
```

If you need to authenticate. . .

```java
boolean auth = db.authenticate("login", "password");
```

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Working with Collections

Collections are MongoDB "tables"...

- List all of the collections in a database...

```
Set<String> = colls = db.getCollectionNames();
for (String s : colls) {
    System.out.println(s);
}
```

- Get a specific collection (lazy)...

```
DBCollection coll = db.getCollection("testData");
```

- Count the number of documents in a collection...

```
coll.getCount();
```

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MongoDB Documents
BSON

- "Documents" are MongoDB's "rows".
- MongoDB's Internal Document representation is '**BSON**'
  - **BSON** is a binary optimized flavor of **JSON**
  - Corrects **JSON**'s inefficiency in string encoding (Base64)
  - Supports extras including Regular Expressions, Byte Arrays, DateTimes & Timestamps, as well as datatypes for Javascript code blocks & functions.
  - Creative Commons licensed.
  - **BSON** implementation being split into its own package in most drivers.
  - **bsonspec.org**

MongoDB Documents

From Java: BasicDBObject

- Java representation of **BSON** is the map-like **DBObject** (Java 2.0 driver has a new base class of **BSONObject** related to the **BSON** split-off)
- Easiest way to work with Mongo Documents is BasicDBObject. . .
  - ▸ **BasicDBObject** implements **java.util.LinkedHashMap<String, Object>**
  - ▸ Mutable object
  - ▸ Can take a **Map** as a constructor parameter
  - ▸ Example:

    ```java
    DBObject doc = new BasicDBObject();
    doc.put("username", "bwmcadams");
    doc.put("password", "MongoNYC");
    ```

  - ▸ *toString* returns a **JSON** serialization.
- Use **BasicDBList** (implements **java.util.ArrayList<Object>**) to represent Arrays.

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From Java: BasicDBObjectbuilder

For those who prefer immutability. . .

- **BasicDBObjectBuilder** follows the *Builder* pattern.
- *add()* your keys & values:

```java
BasicDBObjectBuilder builder = BasicDBObjectBuilder.start();
builder.add("username", "bwmcadams");
builder.add("password", "MongoNYC");
builder.add("presentation", "Java Development with MongoDB");
```

- A **BasicDBObjectBuilder** is not a **DBObject**.
- Call *get()* to return the built-up **DBObject**.
- *add()* returns itself so you can chain calls instead:

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BasicDBObjectBuilder.start().add("username", "bwmcadams").add(
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Implementation by Extension: DBObject

- If you want to create your own concrete objects, extend & implement **DBObject**
  - ▶ Requires you implement a map-like interface including ability to get & set fields by key (even if you don't use them, required to deserialize)
  - ▶ Instances of **DBObject** can be saved directly to MongoDB.
- Feeling Fancy? Reflect instead. . .
  - ▶ Use **ReflectionDBObject** as a base class for your *Beans*.
  - ▶ **ReflectionDBObject** uses reflection to proxy your getters & setters and behave like a DBObject.
  - ▶ Downside: With Java's single inheritance you are stuck using this as your base class.
- Existing Object Model? ORM-Like Solutions. . .
  - ▶ Morphia (uses JPA-style annotations)
  - ▶ Daybreak (annotation based)
  - ▶ Mungbean (more Java-ey query syntax PoJo Mapping)

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Briefly: Working with DBObjects

Getting data from DBObjects is relatively simple in Java. . .

- Check if a field (a.k.a. Key) exists with *containsField()*
- Get a **Set<String>** of a **DBObject**'s field names with *keySet()*
- Get a specific field with *get(String key)*. This returns *Object* so you will need to cast to an expected value.
- Call *toMap()* to get back a **Map** (String, Object) instead.

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Inserting Documents

- One at a time:

```
DBObject doc =
    BasicDBOBjectBuilder.start().
        add("username", "bwmcadams").
        add("password", "MongoNYC").
        add("presentation", "Java Development with MongoDB").
        get();
// DBCollection coll
coll.insert(doc);
```

- Got multiple documents? Call *insert()* in a loop, or pass
  DBObject[] or **List<DBObject>**
- Three ways to store your documents:
    - INSERT (*insert()*) always attempts to add a new row.
    - SAVE (*save()*) only attempts to insert unless *_id* is defined.
      Otherwise, it will attempt to update the identified document.
    - UPDATE (*update()*) Allows you to pass a query to filter by and the
      fields to change. Boolean option "multi" specifies if multiple
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MongoDB Querying
Basics

- Find a single row with *findOne()*. Takes the first row returned.
- Getting a cursor of all documents (*find()* with no query):

```
DBCursor cur = coll.find();
while (DBObject doc : cur) {
    System.out.println(doc);
}
```

- Query for a specific value. . .

```
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DBObject doc = coll.findOne(q);
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MongoDB Querying
Basics

- You can pass an optional second **DBObject** parameter to *find()* and *findOne()* which specifies the fields to return.
- If you have an embedded object (for example, an address object) you can retrieve it with dot notation in the fields list (e.g. *"address.city"* retrieves just the city value)
- Use *limit()*, *skip()* and *sort()* on **DBCursor** to adjust your results. These all return a new **DBCursor**.
- *distinct()* can be used (on **DBCollection** to find all distinct values for a given key; it returns a list:

```java
List values = coll.distinct("postedBy"); // contains all distinct
    values in "postedBy"
/** Or, limit what you're looking for with a query */
DBObject q = new BasicDBObject("postedBy",
            new BasicDBObject("$ne", "bwmcadams")
        );
List values = coll.distinct("postedBy", q);
```

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MongoDB Querying
Query Operators

MongoDB is no mere Key-value store. There are myriad powerful operators to enhance your MongoDB queries. . .

- Conditional Operators: **$gt** (>), **$lt** (<), **$gte (>=)**, **$lte (<=)**
- Negative Equality: **$ne** (!=)
- Array Operators: **$in** (SQL "IN" clause. . . takes an array), **$nin** (Opposite of "IN"), **$all** (Requires all values in the array match), **$size** (Match the size of an array)
- Field Defined: **$exists** (boolean argument)(Great in a schemaless world)
- Regular Expressions (Language dependent - most drivers support it)
- Pass Arbitrary Javascript with **$where** (No OR statements, so use WHERE for complex range filters)
- Negate any operator with **$not**

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MongoDB Querying

Putting Operators to Work

Using a query operator requires nested objects...

- All posts since a particular date:

```java
DBObject q = new BasicDBObject("postDate",
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DBCursor posts = coll.find(q);
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- Find all posts NOT by me:

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- No syntactic sugar in Java to make it easier...

- *Mungbean* provides a more fluid query syntax (but isn't very Mongo-ey), if you use it's PoJo mapping.

- You might also consider evaluating other JVM languages for querying....

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            new BasicDBObject("$ne", "bwmcadams")
        );
DBCursor posts = coll.find(q);
```

- No syntactic sugar in Java to make it easier. . .
- *Mungbean* provides a more fluid query syntax (but isn't very Mongo-ey), if you use it's PoJo mapping.
- You might also consider evaluating other JVM languages for querying....

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MongoDB Querying

Putting Operators to Work

Using a query operator requires nested objects...

- All posts since a particular date:

```java
DBObject q = new BasicDBObject("postDate",
            new BasicDBObject("$gte", new java.util.Date())
        );
DBCursor posts = coll.find(q);
```

- Find all posts NOT by me:

```java
DBObject q = new BasicDBObject("postedBy",
            new BasicDBObject("$ne", "bwmcadams")
        );
DBCursor posts = coll.find(q);
```

- No syntactic sugar in Java to make it easier...
- *Mungbean* provides a more fluid query syntax (but isn't very Mongo-ey), if you use it's PoJo mapping.
- You might also consider evaluating other JVM languages for querying....

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Outline

MongoDB Querying

AltJVM Languages - Syntactic Sugar

Listing 5: Groovy Sample

```groovy
def q = [postDate: ["$gte:" new java.util.Date()]
        ] as BasicDBObject
def q = [postedBy: ["$ne": "bwmcadams"]
        ] as BasicDBObject

def posts = coll.find(q)
```

MongoDB Querying

AltJVM Languages - Syntactic Sugar

Listing 6: Scala Sample

```scala
val q = "postDate" $gte new java.util.Date()
val q = "postedBy" $ne "bwmcadams"

val posts = coll.find(q)
```

MongoDB Querying

AltJVM Languages - Syntactic Sugar

Listing 7: Jython Sample

```python
q = {"postDate": {"$gte": datetime.datetime.now()}}
q = {"postedBy": {"$ne": "bwmcadams"}}

posts = coll.find(q)
```

Indexes

MongoDB Indexes work much like RDBMS indexes. . .

- Create a single-key index:
  ```
  DBObject idx = new BasicDBObject("postedBy", 1);
  coll.createIndex(idx);
  ```

  This defaults to ascending order (-1 = descending), with a system generated name.

- For a multi-key/compound-key index:
  ```
  DBObject idx = new BasicDBObjectBuilder.start().
                     add("postedBy", 1).
                     add("postDate", -1).
                     get();
  coll.createIndex(idx);
  ```

  This sorts postedBy ascending, but postDate descending.

- If you want to index an embedded field, simply use the query dot notation (e.g. "address.city")

Indexes
Options

MongoDB Indexes work much like RDBMS indexes. . .

- You can pass a second DBObject of options to change the type of index, name, etc:

```java
DBObject idx = new BasicDBObject("slug", 1);
DBObject opts = new BasicDBObject("unique": true);
coll.createIndex(idx, opts);
```

  This will ensure that the "slug" field is unique across all entries. (A list of complete options is available in the MongoDB Documentation)

- Consider using *ensureIndex()* instead of *createIndex*.

Things We Didn't Cover

Things we didn't cover, but you should spend some time exploring. . .

- Map/Reduce (great for more complex aggregation)
- Geospatial indexes and queries
- Aggregation queries such as Group (Which use JavaScript functions)
- Lots more at MongoDB.org . . .

Contact Info + Where To Learn More

- Contact Me
  - twitter: **@rit**
  - email: **bwmcadams@gmail.com**
- Pressing Questions?
  - IRC - freenode.net **#mongodb**
  - MongoDB Users List - http://groups.google.com/group/mongodb-user
- Mongo Java Language Center - http://mongodb.org/display/DOCS/Java+Language+Center
  (Links to Java driver docs, and many of the third party libraries)
- Morphia - http://code.google.com/p/morphia/
- Mungbean - http://github.com/jannehietamaki/mungbean
- Experimental JDBC Driver - http://github.com/erh/mongo-jdbc

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