Node Program

MongoDB

Node.js version: 5.1
Last updated: Feb 2016

C.A.P. theorem

- **C**onsistency (strong vs. eventual-delay)
- **A**vailability
- **P**artition tolerance (on cluster)

SQL: C+A

No SQL!

- A+P from C.A.P.
- No relationships in the database.
- Redundancy is good.

NoSQL Databases

There are many types of NoSQL databases:

- Key-value stores (Redis, think hash tables)
- Document stores (mongoDB, think JSON)
- Columnar stores (hbase, average age)
- Graphs stores (neo4j)

SQL vs. NoSQL

Relation DB->normilized for any query, no biases

NoSQL->biases to specific query patterns that we have

MongoDB

MongoDB is a document store NoSQL database. It's great at distributed and scaling.

Launching MongoDB

Launch the `mongod` service with:

```
$ mongod
```

You should be able to see information in your terminal. The default port is 27017.

MongoDB Shell (mongo)

For the MongoDB shell, or mongo, launch in a new terminal window (let the server run), this command:

```
$ mongo
```

MongoDB Shell (mongo)

To test the database, use the JavaScript-like interface and commands save and find:

```
> db.test.save({a:1})
> db.test.find()
```

MongoDB uses JavaScript!

MongoDB Shell (mongo)

Useful MongoDB Shell commands:

- `> help`
- `> show dbs`
- `> use board`
- `> show collections`
- `> db.messages.remove();`

MongoDB Shell (mongo)

Useful MongoDB Shell commands:

- `> var a=db.messages.findOne();`
- `> print json(a);`
- `> a.message="hi";`
- `> db.messages.save(a);`
- `> db.messages.find({});`

MongoDB Shell (mongo)

Useful MongoDB Shell commands:

- `> db.messages.update({name:"John"},{$set:{message:"bye"}});`
- `> db.messages.find({name:"John"});`
- `> db.messages.remove({name:"John"});`

DEMO

MongoDB native driver vs. MongoDB Shell

MongoDB Native Driver (mongodb)

Node.js Native Driver for MongoDB (https://github.com/christkv/node-mongodb-native)

```
$ npm install mongodb --save
```

Establishing Connection

```
var MongoClient = require('mongodb').MongoClient
  , assert = require('assert');

// Connection URL
var url = 'mongodb://localhost:27017/myproject';
// Use connect method to connect to the Server
MongoClient.connect(url, function(err, db) {
  assert.equal(null, err);
  console.log("Connected correctly to server");

  db.close();
});
```

Creating insertDocuments

```
var insertDocuments = function(db, callback) {
  // Get the documents collection
  var collection = db.collection('documents');
  // Insert some documents
  collection.insert([
    {a : 1}, {a : 2}, {a : 3}
  ], function(err, result) {
    assert.equal(err, null);
    assert.equal(3, result.result.n);
    assert.equal(3, result.ops.length);
    console.log("Inserted 3 documents into the document collection");
    callback(result);
  });
}
```

Applying IntertDocuments

```
var MongoClient = require('mongodb').MongoClient
  , assert = require('assert');

// Connection URL
var url = 'mongodb://localhost:27017/myproject';
// Use connect method to connect to the Server
MongoClient.connect(url, function(err, db) {
  assert.equal(null, err);
  console.log("Connected correctly to server");

  insertDocuments(db, function() {
    db.close();
  });
});
```

Updating Documents

```
var updateDocument = function(db, callback) {
  // Get the documents collection
  var collection = db.collection('documents');
  // Update document where a is 2, set b equal to 1
  collection.update({ a : 2 }
    , { $set: { b : 1 } }, function(err, result) {
    assert.equal(err, null);
    assert.equal(1, result.result.n);
    console.log("Updated the document with the field a equal to 2");
    callback(result);
  });
}
```

Applying updateDocument

```
insertDocuments(db, function() {
  updateDocument(db, function() {
    db.close();
  });
});
```

Removing Documents

```
var removeDocument = function(db, callback) {
  // Get the documents collection
  var collection = db.collection('documents');
  // Insert some documents
  collection.remove({ a : 3 }, function(err, result) {
    assert.equal(err, null);
    assert.equal(1, result.result.n);
    console.log("Removed the document with the field a equal to 3");
    callback(result);
  });
}
```

Applying removeDocument

```
var MongoClient = require('mongodb').MongoClient
  , assert = require('assert');

// Connection URL
var url = 'mongodb://localhost:27017/myproject';
// Use connect method to connect to the Server
MongoClient.connect(url, function(err, db) {
  assert.equal(null, err);
  console.log("Connected correctly to server");

  insertDocuments(db, function() {
    updateDocument(db, function() {
      removeDocument(db, function() {
        db.close();
      });
    });
  });
});
```

Finding Documents

```
var findDocuments = function(db, callback) {
  // Get the documents collection
  var collection = db.collection('documents');
  // Find some documents
  collection.find({}).toArray(function(err, docs) {
    assert.equal(err, null);
    assert.equal(2, docs.length);
    console.log("Found the following records");
    console.dir(docs);
    callback(docs);
  });
}
```

Applying findDocuments

```
var MongoClient = require('mongodb').MongoClient
  , assert = require('assert');

// Connection URL
var url = 'mongodb://localhost:27017/myproject';
// Use connect method to connect to the Server
MongoClient.connect(url, function(err, db) {
  assert.equal(null, err);
  console.log("Connected correctly to server");

  insertDocuments(db, function() {
    updateDocument(db, function() {
      removeDocument(db, function() {
        findDocuments(db, function() {
          db.close();
        });
      });
    });
  });
})
```

Native Driver Alternatives

Alternatively, for your own development you could use other mappers, which are available as an extension of the Native Driver:

- Mongoskin: the future layer for node-mongodb-native
- Mongoose: asynchronous JavaScript driver with optional support for modeling
- Mongolia: lightweight MongoDB ORM/driver wrapper
- Monk: Monk is a tiny layer that provides simple yet substantial usability improvements for MongoDB
usage within Node.js

MongoDB BSON Data Types

Binary JSON, or BSON, it is a special data type which MongoDB utilizes. It is like to JSON in notation, but has support for additional more sophisticated data types.

http://bsonspec.org

Binary: the base64 representation of a binary string
Date: a 64-bit integer of the ISO-8601 date format with a mandatory time zone field following the template YYYY-MM-DDTHH:mm:ss.mmm<+/-Offset>

MongoDB BSON Data Types

Timestamp: a 64 bit value
OID: a 24-character hexadecimal string
DB Reference
MinKey
MaxKey
NumberLong: a 64 bit signed integer

Questions and Exercises

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Workshop

```
$ [sudo] npm install -g learnyoumongo
```