

CORE - A PRIMER

The core system explained.

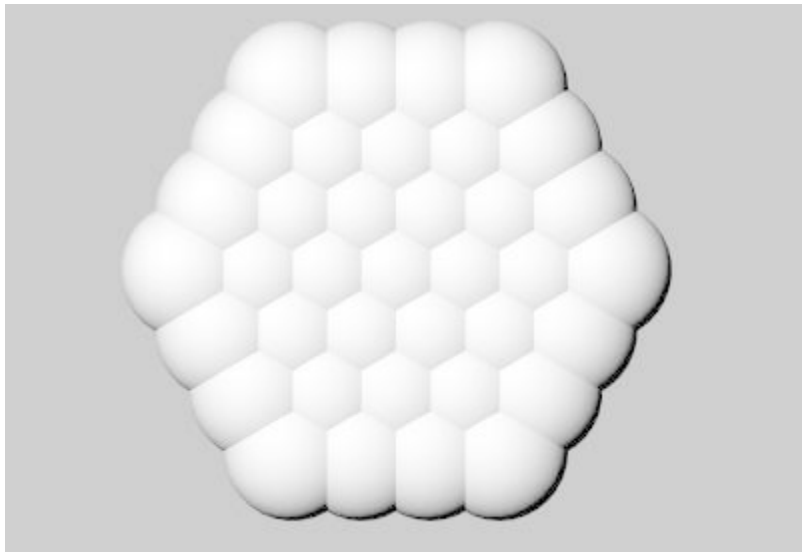


image: Circle of Life

http://i98.photobucket.com/albums/l280/kachina2012/circleoflife3d_1.jpg

By: Willem van Heemstra (willem@vanheemstrapictures.com)
Modified: 08/07/2012
Copyright: 2012 © vanheemstrapictures.com

Table of content

CORE

CLIENT SIDE

User Interface (UI)

Write-Store - Making the ExtJS Store transaction enabled

JSormDB - Database at the client with support of the Server

jsormdb# is a full-featured stand-alone database written entirely in JavaScript.

jsormdb can be used to store data within a client-side or server-side JavaScript application. jsormdb supports full transaction semantics including commit and partial/full rollback, and queries.

jsormdb also supports loading information from and sending information to a remote data source. In this, jsormdb acts as a local representation of remote data, and can fully interact with the data. Commits are sent to the remote data source in one of multiple methods, and the returned data can be entered in the jsormdb in one of multiple methods.

jsormdb was inspired by the write-store extension to ExtJS. The author of write-store saw a general need for a proper data store and built jsormdb from scratch to meet that need.

jsormdb currently supports only one table per instance. A direct result of this limitation is that a join query is not possible. Multi-table is scheduled for a future release.

Persistence ---- NO LONGER REQUIRED, WE NOW USE JSormDB !!!

Browser support

HTML 5 Client-side DatabaseStorage API demo

The Client side of sync-ing using persistence.js

Querying with persistence

SERVER SIDE

Content Management System (CMS)

Request Handling (NodeJS)

Introduction

Installing on Windows

Installing on Mac OS

Installing on Linux (e.g. BlueHost)

Nodejs Files Location within our Core

Connection options

JSormDB - Object Relational Mapper for JavaScript & Database

Persistence A storage solution for Node.JS---- NO LONGER REQUIRED, WE NOW USE JSormDB !!!

Sequelize A multi-dialect Object-Relational-Mapper for Node.JS

Keeping NodeJS servers running with Forever

Forever and Apache

Connect: the Middleware that works with Node

Express: built on top of Connect

After express has created its directories and files in this directory, it will request that you install dependencies, as follows:

NowJS: Middleware for Real-Time connection between Client and Server

N-Ext - Use the non-DOM parts of ExtJS (Ext Core + Ext.data currently) server-side with Node.js

Database(s)

MySQL

[MySQLDumper - Backup for MySQL Database](#)
[Filemaker Pro](#)
[Background](#)
[Asynchronous Programming](#)
[Resources](#)

CORE

1. CLIENT SIDE

1. User Interface (UI)

Follows the ExtJS¹ javascript architecture and uses its libraries to request services (i.e. data) from the server.

...

Folder hierarchy:

| | | | |
|------|-----|------------|--------------|
| core | | | |
| | app | | |
| | | controller | |
| | | model | |
| | | store | |
| | | view | |
| | | | organisation |
| | | | party |
| | | | person |

The core / **app** / **embed.js** file (example):

```
Ext.Loader.setConfig({ enabled: true });
Ext.application({
    name: 'core',
    appFolder: 'core/components/core/apps/core/app',
    autoCreateViewport: true,
    models: ['Station', 'Song'],
    stores: ['Stations', 'RecentSongs', 'SearchResults'],
    controllers: [
        // 'Parties',
        // 'Organisations',
        // 'Persons',
        'Station',
        'Song'
    ],
});
```

The core / app / view / **Viewport.js** file (example):

```
Ext.define('core.view.Viewport', {
    extend: 'Ext.container.Viewport',
    requires: [
        'core.view.NewStation',
    ],
});
```

¹ <http://docs.sencha.com/ext-js>

```

        'core.view.SongControls',
        'core.view.StationsList',
        'core.view.RecentlyPlayedScroller',
        'core.view.SongInfo'
    ],
    // By not defining properties like flex, width, height in the views,
    // we can easily adjust the application's overall layout in one single place (this
    Viewport),
    // adding to the maintainability and flexibility of our architecture.
    initComponents: function() {
        var panel = new Ext.Panel({
            renderTo: 'content',
            layout: 'fit',
            dockedItems: [{
                dock: 'top',
                xtype: 'toolbar',
                height: 80,
                items: [{
                    xtype: 'newstation',
                    width: 150
                }, {
                    xtype: 'songcontrols',
                    flex: 1
                }, {
                    xtype: 'component',
                    html: 'Core<br>Internet Radio'
                }
            ]
        }, {
            layout: {
                type: 'hbox',
                align: 'stretch'
            },
            items: [{
                width: 250,
                xtype: 'panel',
                layout: {
                    type: 'vbox',
                    align: 'stretch'
                },
                items: [{
                    xtype: 'stationslist',
                    flex: 1
                }, {
                    html: 'Ad',
                    height: 50,
                    xtype: 'panel'
                }
            ]
        }, {
            xtype: 'container',
            flex: 1,
            layout: {
                type: 'vbox',
                align: 'stretch'
            },
            items: [{
                xtype: 'recentlyplayedscroller',
                height: 250
            }, {
                xtype: 'songinfo',
                height: 250
            }
        ]
    }
    });

    //pass along browser window resize events to the panel
    Ext.EventManager.onWindowResize(panel.doLayout, panel);

    this.callParent();
}
});

```

Write-Store - Making the ExtJS Store transaction enabled

The **write-store**² is an extension to the excellent [ExtJS](#) library by Jack Slocum. It answers several shortcomings of ExtJS data Stores, which are used to present data:

- ExtJS stores are primarily read-only with respect to the server, rather than read-write. You can change data in the Store, but cannot transmit it back to the server.
- ExtJS stores do not have a full transaction support. If you make several changes and then decide you want to undo them, modern RDBMS systems will let you reject or roll back the transaction; ExtJS stores do not support this.
- ExtJS stores cannot use other Stores as their data source. This becomes important to reduce round-trip requests to/from the server in a time-sensitive Ajax environment. For example, if a single query returns a list of persons, and each person has several telephone numbers, it makes sense from a presentation to the user perspective to have the persons in one Store, perhaps displayed by one grid, and the telephone numbers in another Store, perhaps displayed by a separate grid. ExtJS currently requires you to retrieve the persons in one request and each set of telephone numbers, when desired, in separate requests.

write-store extends ExtJS to resolve these shortcomings.

It is **strongly** recommended that you understand how to use [ExtJS](#) before using write-store.

JSormDB - Database at the client with support of the Server

jsormdb³ is a full-featured stand-alone database written entirely in JavaScript. jsormdb can be used to store data within a client-side or server-side JavaScript application. jsormdb supports full transaction semantics including commit and partial/full rollback, and queries.

jsormdb also supports loading information from and sending information to a remote data source. In this, jsormdb acts as a local representation of remote data, and can fully interact with the data. Commits are sent to the remote data source in one of multiple methods, and the returned data can be entered in the jsormdb in one of multiple methods.

jsormdb was inspired by the [write-store](#) extension to [ExtJS](#). The author of [write-store](#) saw a general need for a proper data store and built jsormdb from scratch to meet that need.

jsormdb currently supports only one table per instance. A direct result of this limitation is that a join query is not possible. Multi-table is scheduled for a future release.

WARNING: An error will be raised if the following has not been fixed:

Inside the javascript file **jsormdb.js** and **jsormdb-src.js** one has to put quotes around the version number, like so: `var JSORM={version:"1.3b"}`

² <http://jsorm.com/wiki/Write-store>

³ <http://jsorm.com/wiki/Jsormdb>

1. Persistence ---- NO LONGER REQUIRED, WE NOW USE JSormDB !!!

Persistence⁴ is a JavaScript framework to persist (i.e. temporarily store) objects in a browser and/or server environment. We use it to store objects in the browser in its database or local storage.

persistence.js utilizes the browser's SQLite database to store and query data.

Browser support

- Modern webkit browsers (Google Chrome and Safari)
- Firefox (through [Google Gears](#)) NOTE: Google Gears is deprecated.
- Opera (10+)
- Android browser (tested on 1.6 and 2.x)
- iPhone browser (iPhone OS 3+)
- Palm WebOS (tested on 1.4.0)

The [in-memory store](#) can be used in other browser (such as Firefox) as a fall-back option. The in-memory store has the ability to write and load the entire database to the browser's window.localStorage.

So, we will detect the web browser and if the web browser does not support Web SQL Database (for example, Firefox and IE), we fall back to using the in-memory store.

See <http://persistencejs.org/stores/memory>

```
if (/Firefox[\\\/s] (\d+\.\d+)/.test(navigator.userAgent)) {  
    // FireFox detected  
  
}  
else if (/MSIE (\d+\.\d+)/.test(navigator.userAgent)) {  
    // IE detected  
  
}  
else {  
    // a WebSQL database compatible browser  
  
}
```

HTML 5 Client-side DatabaseStorage API demo

See <http://www.webkit.org/demos/sticky-notes/index.html>

To 'play' with all features of the browser Web SQL Database, go here:

http://playground.html5rocks.com/#async_transactions

//////////////////// STAY WITH PERSISTENCE.JS //////////////////////

-- NO NEED TO DIVERT TO OTHER SOLUTIONS AS PERSISTENCE.JS HAS FALL BACK --

⁴ <http://persistencejs.org>

For compatibility reasons, we should abstract from the Web SQL Database (as neither IE nor FireFox support it) and use an abstraction layer, such as **JStore**⁵ (i.e. JQuery Store).

Or stick with **HTML 5 Local Storage** as it supported in almost all browsers natively:
See here for more info on the use of HTML 5 Local Storage (which uses key/value pairs):
<http://diveintohtml5.info/storage.html>

Or use **PersistJS**⁶, which handles client-side storage seamlessly and transparently to your code. You use a single API and get support for the following backends:

- flash: Flash 8 persistent storage.
- gears: Google Gears-based persistent storage.
- localStorage: HTML5 draft storage.
- whatwg_db: HTML5 draft database storage.
- globalstorage: HTML5 draft storage (old spec).
- ie: Internet Explorer userdata behaviors.
- cookie: Cookie-based persistent storage.

Any of those can be disabled—if, for example, you don't want to use cookies. With this library, you'll get native client-side storage support in IE 5.5+, Firefox 2.0+, Safari 3.1+, and Chrome; and plugin-assisted support if the browser has Flash or Gears. If you enable cookies, it will work in everything (but will be limited to 4 kB).

Each backend exposes the exact same interface, which means you don't have to know or care which backend is being used.

////////////////////////////////////
///

Folder Hierarchy for Persistence for Client (i.e. web pages) usage:

| | | | | | |
|--------|-----------|------|-------------|-------------|------------------------------------|
| assets | | | | | |
| | templates | | | | |
| | | core | | | |
| | | | javascripts | | |
| | | | | persistence | |
| | | | | | <the persistence javascript files> |

Addition to all web pages that use persistence:

```
<html>
...

<script src="assets/templates/core/javascripts/persistence/persistence.js" type="application/
javascript"></script>
<script src="assets/templates/core/javascripts/persistence/persistence.store.sql.js"
type="application/javascript"></script>
```

⁵ <http://code.google.com/p/jquery-jstore/>

⁶ <http://pablotron.org/?cid=1557>


```

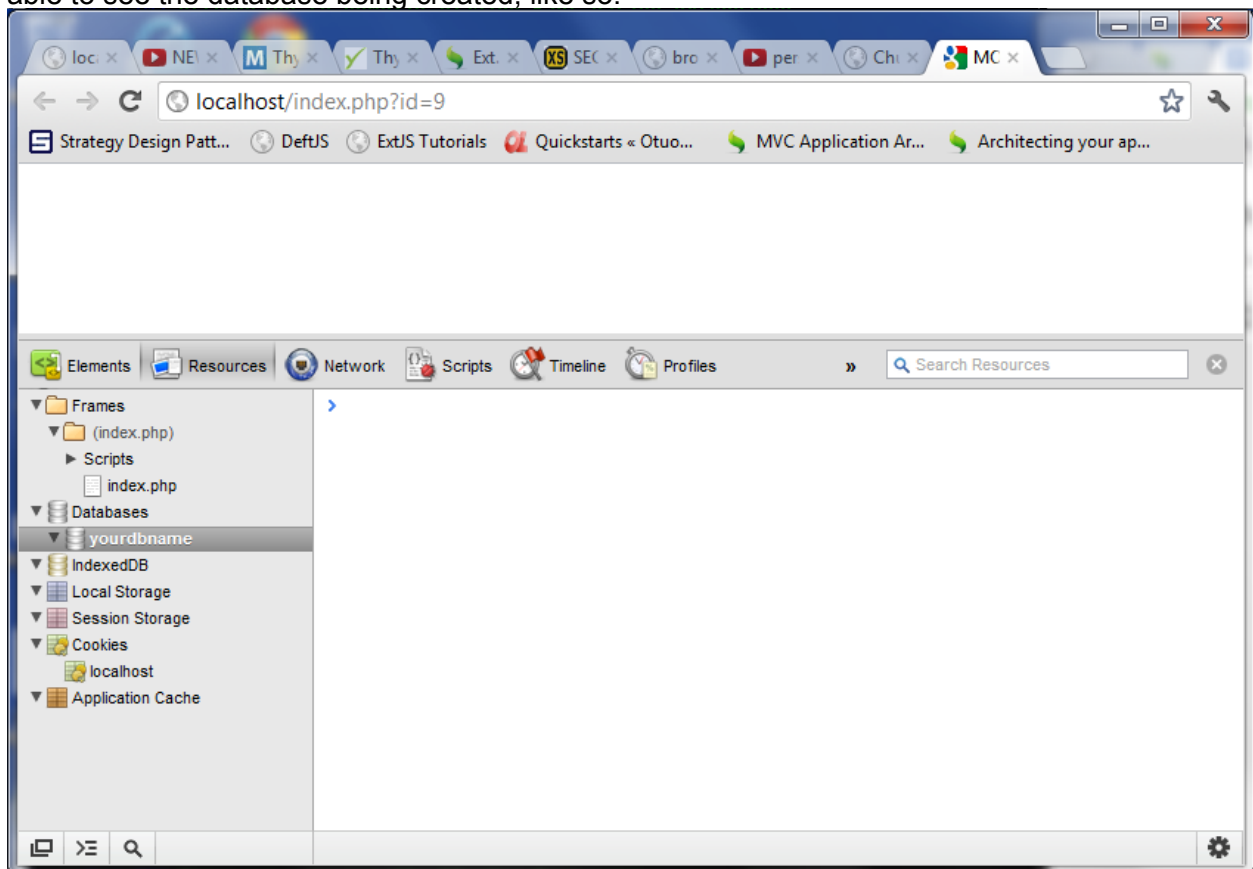
<script src="assets/templates/core/javascripts/persistence/persistence.store.websql.js"
type="application/javascript"></script>
<script type="application/javascript">
  persistence.store.websql.config(persistence, 'yourdbname', 'A database description', 5 * 1024
  * 1024);
</script>

...
</html>

```

NOTE: The above example includes a WebSQL store (which includes Google Gears support). The first argument is always supposed to be persistence. The second in your database name (it will create it if it does not already exist, the third is a description for your database, the last argument is the maximum size of your database in bytes (5MB in this example).

When this web page is loaded in a web browser, using Chrome's Developer Tools you will be able to see the database being created, like so:



We can add tables and relationships to the database on the client like so:

```

<html>
...

<script src="assets/templates/core/javascripts/persistence/persistence.js" type="application/
javascript"></script>
<script src="assets/templates/core/javascripts/persistence/persistence.store.sql.js"
type="application/javascript"></script>
<script src="assets/templates/core/javascripts/persistence/persistence.store.websql.js"
type="application/javascript"></script>
<script type="application/javascript">

```

```

    persistence.store.websql.config(persistence, 'yourdbname', 'A database description', 5 * 1024
    * 1024);

    var Task = persistence.define('Task', {
        name: "TEXT",
        description: "TEXT",
        done: "BOOL"
    });

    var Category = persistence.define('Category', {
        name: "TEXT"
    });

    Category.hasMany('tasks', Task, 'category');

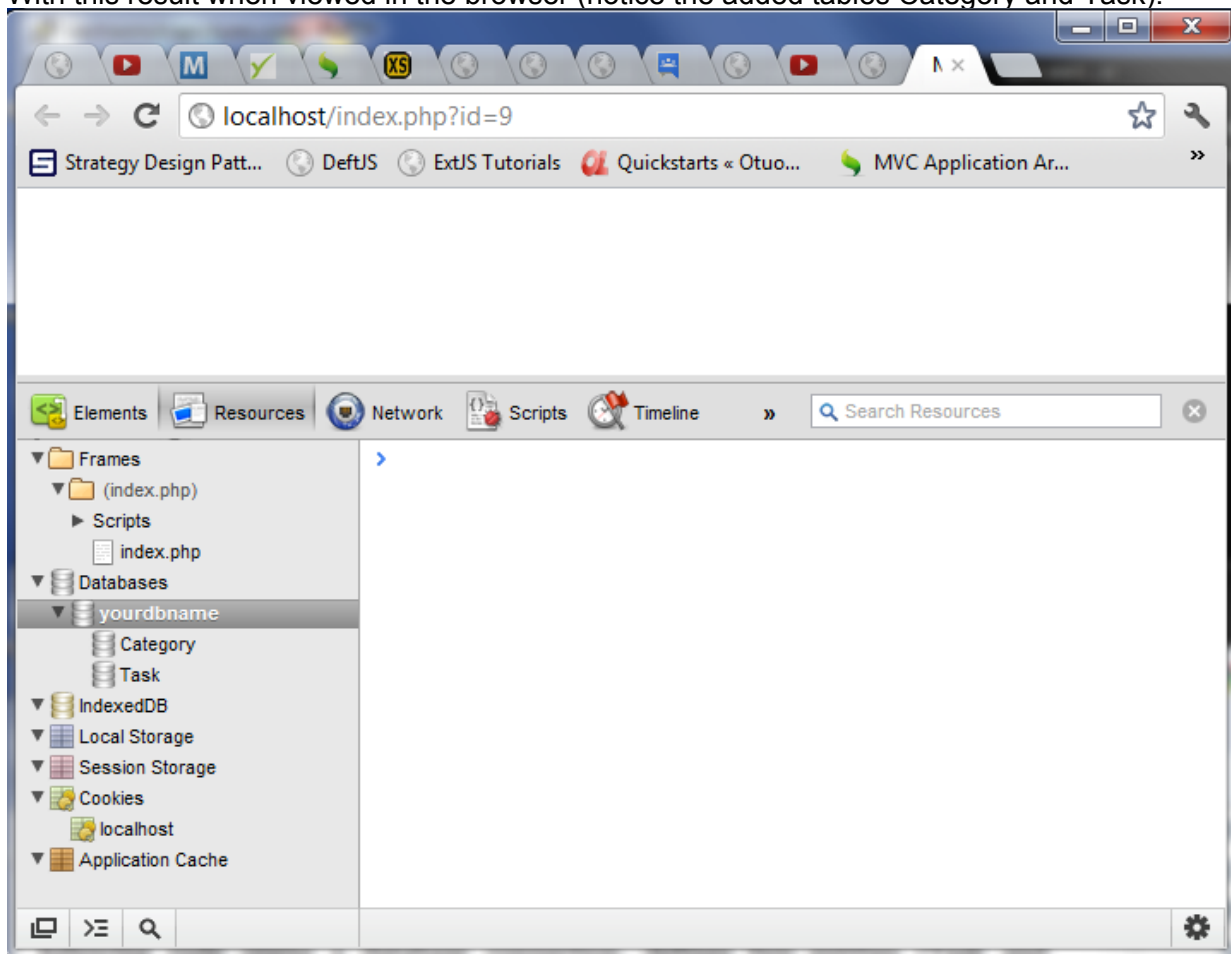
    persistence.schemaSync(null, function(tx) {
        alert('Successfully synchronized the schema!');
    });
</script>

...
</html>

```

NOTE: Schema property types are based on **SQLite** types. Options are: TEXT, INT, BOOL, DATE and JSON.

With this result when viewed in the browser (notice the added tables Category and Task):



Instances of the defined entities can then be created in a natural way, and subsequently marked to be persisted (note: below is javascript in the web page):

```
var task = new Task();
task.name = "My new task";
var category =
    new Category({name: "My category"});
persistence.add(task);
persistence.add(category);
```

NOTE: "Important: Changes and new objects will not be persisted until you explicitly call flush()"

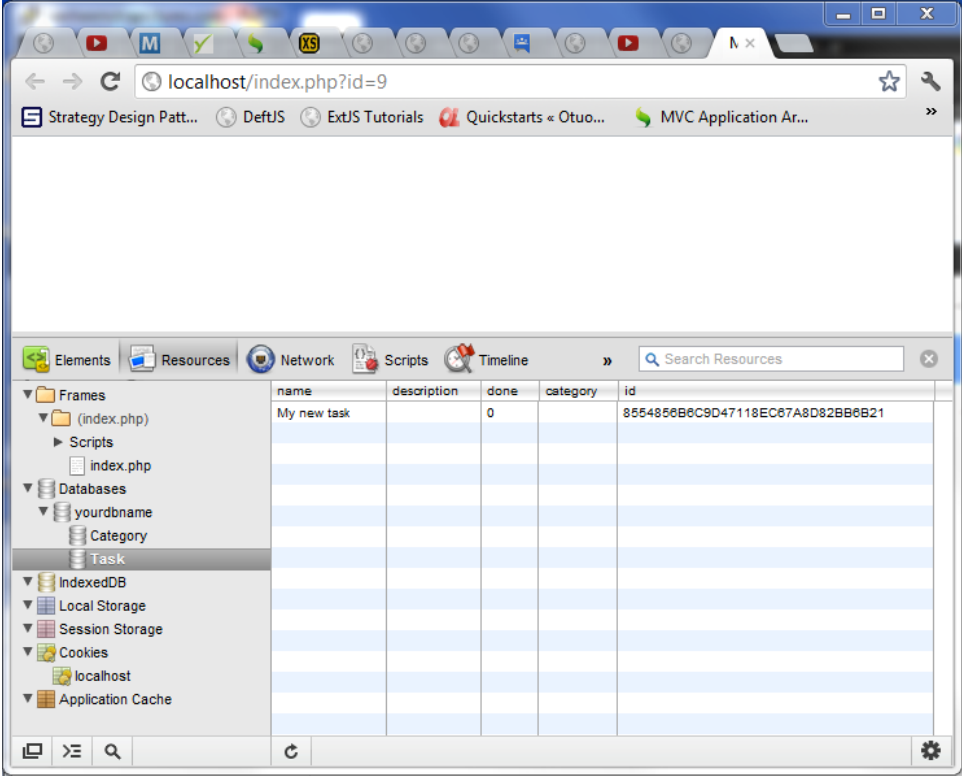
One-to-many and many-to-many relationships can be used as collections (note: below is javascript in the web page):

```
category.tasks.add(task);
```

When modifications to objects have been made, these have to be **flushed** to the database:

```
persistence.flush(null, function() {
    alert('All objects flushed!');
});
```

This is the result of the flushing... records in the tables !!



A nice feature of [persistence.js](#) is QueryCollections, which are virtual collections that can prefetch relations, can easily be filtered and sorted (and in the future paginated):

```
Task.all().filter("done", '=', true)
    .prefetch("category")
    .order("name", false)
    .list(null, function (results) {
        results.forEach(function (t) {
            console.log('[' + t.category.name + ']' +
                + t.name);
        });
    });
```

```
});  
});
```

The creator (Zef Hemel) has add synchronization support to it so that the local database can transparently be synchronized with a (view on) a remote database, which is a typical use case of applications like these.

The Client side of sync-ing using persistence.js

Persistence.js is not limited to the client side, and this is one of its true strengths. On the server side, in a node.js environment, Persistence.js can make use of the node-mysql module to store and retrieve data from a MySQL database. The persistence.sync module allows for synchronization of tables between a browser database and server side MySQL.

See here: <http://persistencejs.org/plugin/sync>

Adding sync capability, requires the web page to contain these script tags:

```
<html>  
...  
<script src="assets/templates/core/javascripts/persistence/persistence.js" type="application/  
javascript"/></script>  
<script src="assets/templates/core/javascripts/persistence/persistence.sync.js"  
type="application/javascript"/></script>  
...  
</html>
```

After including both persistence.js and persistence.sync.js in your page, you can enable syncing on entities individually:

```
var Task = persistence.define("Task", {  
  name: "TEXT",  
  done: "BOOL"  
});  
  
Task.enableSync('/taskChanges');
```

The argument passed to enableSync is the URI of the sync server component.

To initiate a sync, the EntityName.**syncAll(..)** method is used (e.g. Task.syncAll(..)):

```
function conflictHandler(conflicts, updatesToPush, callback) {  
  // Decide what to do with the conflicts here, possibly add to updatesToPush  
  callback();  
}  
  
EntityName.syncAll(conflictHandler, function() {  
  alert('Done!');  
});
```

There are two sample conflict handlers:

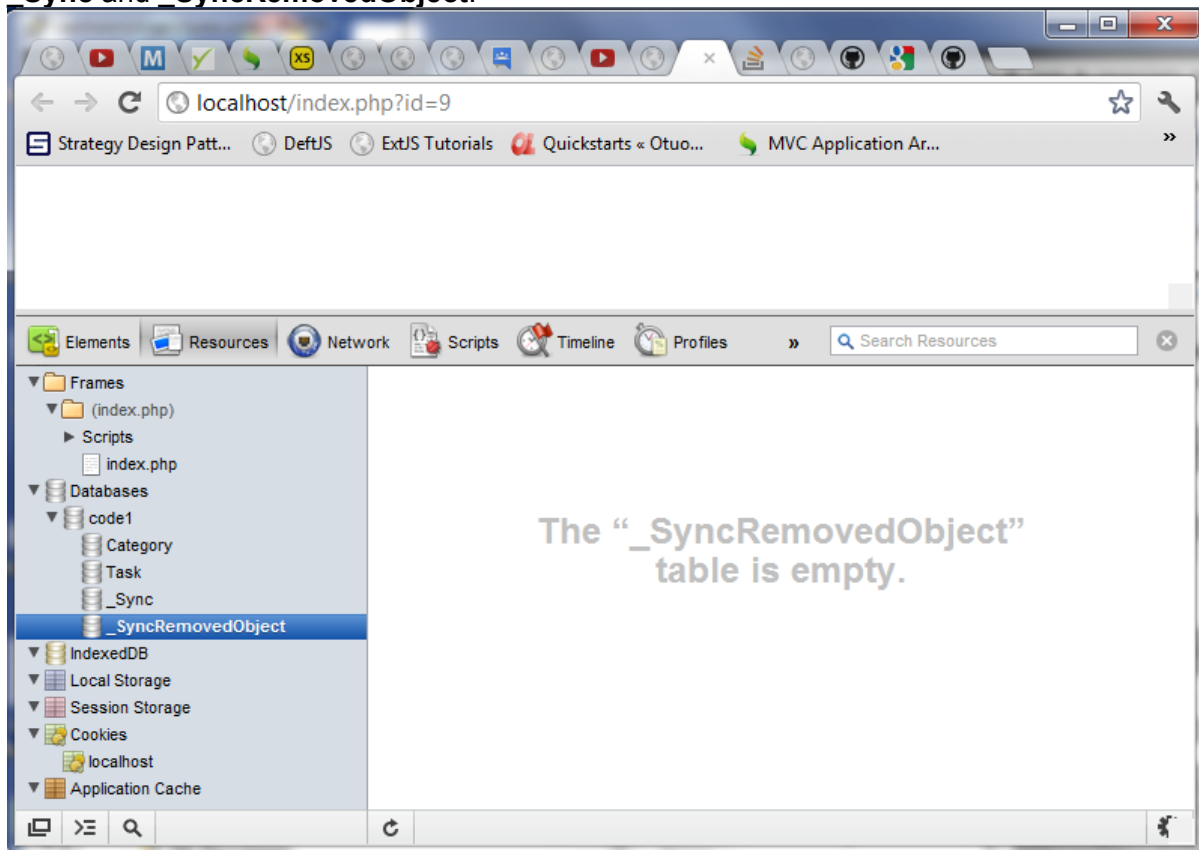
1. persistence.sync.preferLocalConflictHandler, which in case of a data conflict will always pick the local changes.
2. persistence.sync.preferRemoteConflictHandler, which in case of a data conflict will always pick the remote changes.

For instance:

```
EntityName.syncAll(persistence.sync.preferLocalConflictHandler, function() {  
    alert('Done!');  
});
```

Note that you are responsible for syncing all entities and that there are no database consistencies after a sync, e.g. if you only sync Tasks that refer to a Project object and that Project object has not (yet) been synced, the database will be (temporarily) inconsistent.

The addition of the **persistence.sync.js** code to the **persistence.store.websql.js** code in the web page will automatically create two more tables inside the database in the browser, called **_Sync** and **_SyncRemovedObject**:



NOTE: We have renamed the database to 'code1' in above example.

This is the WebSQL that is executed by `persistence.store.websql.js:78`:

```
CREATE TABLE IF NOT EXISTS `Category` (`name` TEXT, `id` VARCHAR(32) PRIMARY KEY) null  
  
CREATE TABLE IF NOT EXISTS `Task` (`name` TEXT, `description` TEXT, `done` INT, `category`  
VARCHAR(32), `id` VARCHAR(32) PRIMARY KEY) null  
  
CREATE INDEX IF NOT EXISTS `Task__category` ON `Task` (`category`) null  
  
CREATE TABLE IF NOT EXISTS `_SyncRemovedObject` (`entity` VARCHAR(255), `objectId` VARCHAR(32),  
`id` VARCHAR(32) PRIMARY KEY) null  
  
CREATE TABLE IF NOT EXISTS `_Sync` (`entity` VARCHAR(255), `localDate` BIGINT, `serverDate`  
BIGINT, `serverPushDate` BIGINT, `id` VARCHAR(32) PRIMARY KEY) null
```

```
INSERT INTO `Task` (`name`, `description`, `done`, id) VALUES (?, ?, ?, ?) ["My new task", "",
0, "6A38B884845E43B8B15D447D1F468023"]

INSERT INTO `Category` (`name`, id) VALUES (?, ?) ["My
category", "C88CFB677D404FC185301770160EFDD4"]
```

NOTE: It creates an 'id' field by default and creates unique values for each record for this field (e.g. 6A38B884845E43B8B15D447D1F468023).

Here is another code example (with a database called code2), which shows the **creation** (Task 1 through Task 10), **retrieval** (All Tasks), **updating** (by randomly setting 'done' from '0' to '1') and **deletion** of records (whose done field was set to '1' where 1 means true):

```
<script type="application/javascript">
//establish local database
persistence.store.websql.config(persistence, 'code2', 'A database description', 5 * 1024 *
1024);

//define Entity
var Task = persistence.define('Task', {
  name: "TEXT",
  done: "BOOL"
});

//wipe local database clean
persistence.reset(function() {

  //write schema
  persistence.schemaSync(function() {

    //create ten dummy tasks
    for(var i=1;i<=10;i++){
      var task = new Task();
      task.name = "Task " + i;
      task.done = false;
      persistence.add(task);
    }

    //commit dummy tasks to database
    persistence.flush(function() {

      //retrieve all tasks from database
      Task.all().list(function(tasks) {
        //callback counter
        var taskCounter = tasks.length;

        //asynchronously loop through items
        tasks.forEach(function(task) {
          //randomly set items to done
          task.done = Math.round(Math.random());

          //decrement callback counter
          //check if this is last run
          if(--taskCounter == 0) {

            //write all changes back to database
            persistence.flush(function() {

              //call destroyAll on a collection with the filter done=true
              Task.all().filter('done', '=', true).destroyAll();
            });
          }
        });
      });
    });
  });
});
});
```

```
});  
});  
</script>
```

Note: example taken from <http://jacobmumm.com/demos/persistencetask/index.html>

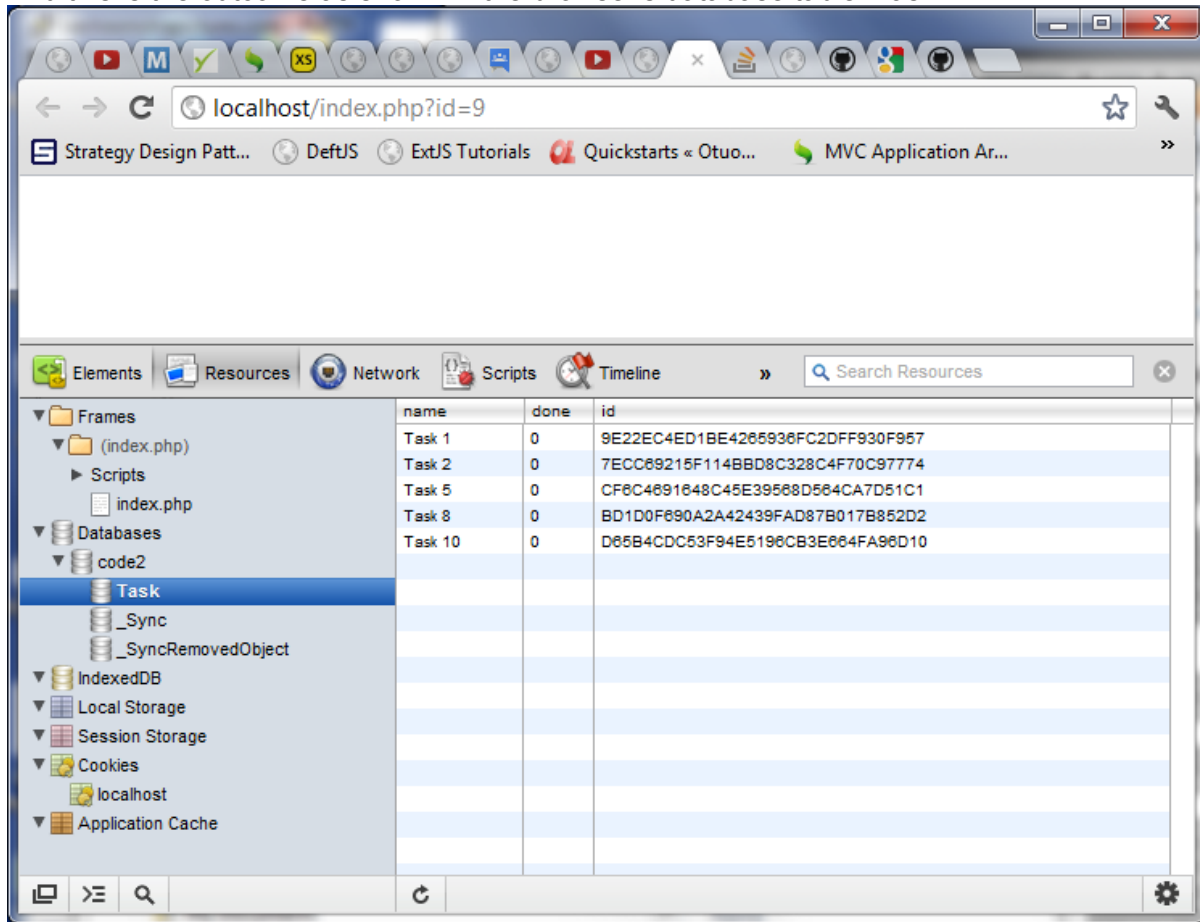
This is the executed WebSQL in the browser by [persistence.store.websql.js:78](#):

```
DROP TABLE IF EXISTS `Task` null  
DROP TABLE IF EXISTS `_SyncRemovedObject` null  
DROP TABLE IF EXISTS `_Sync` null  
CREATE TABLE IF NOT EXISTS `Task` (`name` TEXT, `done` INT, `id` VARCHAR(32) PRIMARY  
KEY) null  
CREATE TABLE IF NOT EXISTS `_SyncRemovedObject` (`entity` VARCHAR(255), `objectId`  
VARCHAR(32), `id` VARCHAR(32) PRIMARY KEY) null  
CREATE TABLE IF NOT EXISTS `_Sync` (`entity` VARCHAR(255), `localDate` BIGINT,  
`serverDate` BIGINT, `serverPushDate` BIGINT, `id` VARCHAR(32) PRIMARY KEY) null  
INSERT INTO `Task` (`name`, `done`, id) VALUES (?, ?, ?) ["Task 1",  
0, "9E22EC4ED1BE4265936FC2DFF930F957"]  
INSERT INTO `Task` (`name`, `done`, id) VALUES (?, ?, ?) ["Task 2",  
0, "7ECC69215F114BBD8C328C4F70C97774"]  
INSERT INTO `Task` (`name`, `done`, id) VALUES (?, ?, ?) ["Task 3",  
0, "A1C34523D1CF4CB5AB4429B60210A463"]  
INSERT INTO `Task` (`name`, `done`, id) VALUES (?, ?, ?) ["Task 4",  
0, "B981EF0315BF480290E6A1A52F0C8E01"]  
INSERT INTO `Task` (`name`, `done`, id) VALUES (?, ?, ?) ["Task 5",  
0, "CF6C4691648C45E39568D564CA7D51C1"]  
INSERT INTO `Task` (`name`, `done`, id) VALUES (?, ?, ?) ["Task 6",  
0, "D34FDB5497C74412ABCD03D87EC42AB4"]  
INSERT INTO `Task` (`name`, `done`, id) VALUES (?, ?, ?) ["Task 7",  
0, "B78A3C7F491A45569471F8AB056AFBCC"]  
INSERT INTO `Task` (`name`, `done`, id) VALUES (?, ?, ?) ["Task 8",  
0, "BD1D0F690A2A42439FAD87B017B852D2"]  
INSERT INTO `Task` (`name`, `done`, id) VALUES (?, ?, ?) ["Task 9",  
0, "639574F31E86496EA022C95A8FA69DCD"]  
INSERT INTO `Task` (`name`, `done`, id) VALUES (?, ?, ?) ["Task 10",  
0, "D65B4CDC53F94E5196CB3E664FA96D10"]  
SELECT `root`.id AS Task_id, `root`.`name` AS `Task_name`, `root`.`done` AS `Task_done`  
FROM `Task` AS `root` WHERE 1=1 []  
UPDATE `Task` SET `done` = ? WHERE id = '9E22EC4ED1BE4265936FC2DFF930F957' [0]  
UPDATE `Task` SET `done` = ? WHERE id = '7ECC69215F114BBD8C328C4F70C97774' [0]  
UPDATE `Task` SET `done` = ? WHERE id = 'A1C34523D1CF4CB5AB4429B60210A463' [1]  
UPDATE `Task` SET `done` = ? WHERE id = 'B981EF0315BF480290E6A1A52F0C8E01' [1] UPDATE  
`Task` SET `done` = ? WHERE id = 'CF6C4691648C45E39568D564CA7D51C1' [0]  
UPDATE `Task` SET `done` = ? WHERE id = 'D34FDB5497C74412ABCD03D87EC42AB4' [1]  
UPDATE `Task` SET `done` = ? WHERE id = 'B78A3C7F491A45569471F8AB056AFBCC' [1]  
UPDATE `Task` SET `done` = ? WHERE id = 'BD1D0F690A2A42439FAD87B017B852D2' [0]  
UPDATE `Task` SET `done` = ? WHERE id = '639574F31E86496EA022C95A8FA69DCD' [1]  
UPDATE `Task` SET `done` = ? WHERE id = 'D65B4CDC53F94E5196CB3E664FA96D10' [0]  
SELECT id FROM `Task` WHERE (1=1 AND `done` = ?) [1]  
DELETE FROM `Task` WHERE (1=1 AND `done` = ?) [1]
```

See above WebSQL making use of **prepared statements**, where the ? is set through the value in the index [0].

Note how by setting '**WHERE 1=1**' all records are retrieved.

And this is the outcome as shown in the browser's database table 'Task':



NOTE: We have renamed the database to 'code2' in above example.

Date handling can be deceptive. Make sure that any fields defined as date objects are being sent as an epoch rather than any other format. This can silently fail, or succeed in certain Web SQL implementations and not others.

- This synchronization library synchronizes on a per-object granularity. It does not keep exact changes on a per-property basis, therefore conflicts may be introduced that need to be resolved.
- It does not synchronize many-to-many relationships at this point
- Error handling is not really implemented, e.g. there's no way to deal with a return from the server other than "status: ok" at this point.

Querying with persistence

Here is an example of an efficient way to query for a Person object and its related Person object (i.e. the father). It will print the person's name and the name of his/her father from 1 query !!!

```
Person.all().prefetch("father").each(tx, function(p) {  
    println(p.name);  
    println(p.father.name);  
});
```

Adding full text search capability, requires the web page to contain these script tags:

```
<html>  
...  
<script src="assets/templates/core/javascripts/persistence/persistence.js" type="application/  
javascript"/></script>  
<script src="assets/templates/core/javascripts/persistence/persistence.search.js"  
type="application/javascript"/></script>  
...  
</html>
```

Declare the data model (example):

```
var Task = persistence.define('Task', {  
    name: "TEXT",  
    description: "TEXT",  
    done: "BOOL"  
});  
  
var Category = persistence.define('Category', {  
    name: "TEXT"  
});
```

Define which columns should be indexed:

```
Task.textIndex('name');  
Task.textIndex('description');  
Category.textIndex('name');
```

Indexing will be enabled and any new entity instances and changes to them will automatically be (re)indexed. You can then search as follows:

```
Task.search('important').list(null, function(results) {  
    console.log("All tasks including the word 'important'");  
    console.log(results);  
});
```

Note that `Task.search(...)` returns a query collection, so the usual things such as `filter`, `limit` and `skip` (but not `order`, because results are always sorted by number of occurrences) can be used, e.g.:

```
Task.search('important')
  .limit(10)
  .skip(currentPage * 10)
  .list(null, function(results) {
    ...
  });
```

ORDER in PERSISTENCE: `schemaSync()` first, then add entities, then `persistence.flush()`;

2. SERVER SIDE

2. Content Management System (CMS)

Uses the MODx⁷ content management system.

2. Request Handling (NodeJS)

Introduction

Follows the NodeJS⁸ javascript architecture and uses its libraries for handling requests from the client.

Installing on Windows

Download the binary from nodejs.org and follow the installation instructions.

- Windows (64 bit) will install Node.exe in C:\Program Files (x86) and in C:\Users\{user_name}\AppData\Roaming\ it will place npm (within which the node_modules are stored) and npm-cache.
- Make sure to run all commands from the Console as root/Administrator by starting the Console with CTRL+SHIFT

Installing on Mac OS

Download the binary from nodejs.org and follow the installation instructions.

- Mac OS X will install in /usr/local/bin/node and /usr/local/bin/npm
- Make sure that /usr/local/bin is in your \$PATH
- Make sure to run all command from the Terminal as root/Administrator by starting them with (you will be asked to provide the root password the first time):

```
sudo
```

Installing on Linux (e.g. BlueHost)

NOTE: to be able to access the port that is set by the NodeJS server(s), when using a hosted solution like Bluehost you will have to have extended your subscription to a **Dedicated IP Address**. See the Control Panel on the Bluehost site to order a Dedicated IP Address (ca \$2.50 per month extra).

<http://www.vanheemstrapictures.com> Dedicated IP address is:

```
http://69.195.104.126
```

Inside the \$HOME/downloads/git directory type:

```
git clone http://github.com/joyent/node.git
```

A new directory will be created by git called 'node'.

Inside this node directory type (so it installs it in the node directory of our home directory):

⁷ <http://www.modxcms.com>

⁸ <http://nodejs.org>

```
./configure --prefix=$HOME/node
```

Next, type:

```
make
```

Followed by:

```
make install
```

Now we need to make the node command usable so do the following commands:

Go back to the HOME directory like so:

```
cd $HOME
```

Followed by:

```
nano .bashrc
```

Now add the following line to the bottom of the file.

```
export PATH=$HOME/node/bin:$PATH
```

Save the edited file, by using this combination of keys:

```
ctrl+x
```

and confirm by Y, then ENTER and ENTER again.

You will need to reload bash, like so:

```
source .bashrc
```

Enter into the directory where nodejs has been installed and then into the bin directory to type:

```
node --version
```

This should echo the version of the newly installed nodejs (here v0.8.2).

It is recommended to also **update** NodeJS with all its dependencies, by going into the directory where nodejs has been installed and type:

```
npm update
```

Nodejs Files Location within our Core

Folder hierarchy within our MODx installation under public_html/core/components/core/apps/

| | | | | |
|------|-----|------------|-------------------------------|--|
| core | | | | |
| | app | | | |
| | | controller | < all entity controller js | |

| | | | | |
|--|-------------|---|---|---------------------------------|
| | | | files > | |
| | | model | < all entity model js files > | |
| | | store | < all entity store js files > | |
| | | view | | |
| | | | < all entity sub- folders > | |
| | | | | < all entity view js files > |
| | | | < all viewport js files > | |
| | data | < all static JSON files > | | |
| | lib | | | |
| | | Ext | < all Ext src files for server use, see N-Ext > | |
| | persistence | | | |
| | | < all the persistence javascript files > | | |
| < all app_embed.js, app.js, server.js, database.js, etc files > | | | | |

The core / **server3.js** file (example):

```
// see http://www.youtube.com/watch?v=qws6LOvDQRE
var sys = require('sys'),
    http = require('http');

/* call this file as a URL
/with adding the options below.
/e.g. localhost:3000/add/2/2
/will return 4
/add/2/2 => 4
/sub/103/42 => 61
/mul/3/2 => 6
/div/100/25 =>4
*/
var operations = {
  add: function(a,b){return a + b},
  sub: function(a,b){return a - b},
  mul: function(a,b){return a * b},
  div: function(a,b){return a / b}
}

http.createServer(function(req, res) {
```

```
var parts = req.url.split("/"),
    op = operations[parts[1]],
    a = parseInt(parts[2], 10),
    b = parseInt(parts[3], 10);
//sys.puts(sys.inspect(parts));
var result = op ? op(a,b) : "Error";
res.writeHead(200, {
  'Content-type': 'text/plain'
});
res.end("" + result);
}).listen(3000, "127.0.0.1");

sys.puts('Server running at http://127.0.0.1:3000/');
```

To start this server, type the command from within its directory:

```
node server3.js
```

Opening a browser and following the following URL should allow you to interact with this server:

```
http://localhost:3000
```

To stop (i.e. kill) the server, push this combination of keys in the active console window from where you started the server:

```
CTRL+C
```

Uses Node-MySQL⁹ for connecting to the MySQL database. Use Node Package Manager (NPM)¹⁰ to install, which comes with NodeJS.

NOTE: On Windows you want to be running the console as Administrator. To do so, type this into the Run box from the Start menu:

```
cmd -d
```

Now instead of hitting the Enter key, use **Ctrl+Shift + Enter**. You will be prompted with the obnoxious User Account Control dialog... but it will then open up a command prompt in Administrator mode.

NOTE: On Windows npm by default places the node_modules folder in C:\Users\<myname>\AppData\Roaming\npm\node_modules

On Windows this means adding the mysql folder to the node_modules folder. If the module(s) cannot be found, add this to the Environment Variables:

NODE_PATH=/path/to/node_modules

e.g.

NODE_PATH=C:\Users\Willem van Heemstra\AppData\Roaming\npm\node_modules

A quick check to see which modules have been installed for nodejs is by executing this command within the nodejs program folder:

```
npm ls
```

⁹ <https://github.com/felixge/node-mysql>

¹⁰ <http://npmjs.org>

For node-mysql this should list:

```
...mysql (followed by its version, e.g. @2.0.0-alpha3)
```

To install modules (e.g. forever) using the g for global reference, type this:

```
npm install forever -g
```

To update npm use this command from within the specific module dir inside the node_modules:

```
npm -g update npm
```

To find outdated modules use this command from within the specific module dir inside the node_modules:

```
npm outdated
```

See <http://npmjs.org/doc/install.html> for its use.

To install the latest version of mysql type:

```
npm install mysql@2.0.0-alpha3 -g
```

The core / **database1.js** file (example)

```
var mysql      = require('mysql');
var connection = mysql.createConnection({
  host : 'localhost',
  user  : 'root',
  password : '',
  database : 'core'
});

connection.connect();

connection.query('SELECT * from PERSON', function(err, rows, fields) {
  if (err) throw err;

  console.log('Query result: ', rows);
});

connection.end();

// Output is returned in JSON by default.
```

This requires that you have installed the mysql for node.

```
npm install mysql@ -g
```

To do a general test after having installed mysql for node, from within the 'test' directory under node_modules / mysql type this command (note: mysql should be running):

```
npm run.js
```

Connection options

When establishing a connection, you can set the following options:

host: The hostname of the database you are connecting to. (Default: localhost)
port: The port number to connect to. (Default: 3306)
socketPath: The path to a unix domain socket to connect to. When used host and port are ignored.
user: The MySQL user to authenticate as.
password: The password of that MySQL user.
database: Name of the database to use for this connection (Optional).
charset: The charset for the connection. (Default: 'UTF8_GENERAL_CI')
insecureAuth: Allow connecting to MySQL instances that ask for the old (insecure) authentication method. (Default: false)
typeCast: Determines if column values should be converted to native JavaScript types. (Default: true)
debug: Prints protocol details to stdout. (Default: false)
multipleStatements: Allow multiple mysql statements per query. Be careful with this, it exposes you to SQL injection attacks. (Default: `false`)

JSormDB - Object Relational Mapper for JavaScript & Database

Install JSormDB:

Get a clone from the repository:

```
git://github.com/deitch/jsormdb.git
```

Or by typing inside the directory where you want the clone (e.g \$HOME/downloads/git/):

```
git clone https://github.com/deitch/jsormdb.git
```

Inside the downloaded project directory (here: jsormdb) type:

```
npm install -g
```

Install JSorm Utilities:

Get a clone from the repository:

git://github.com/deitch/jsorm-utilities.git

Or by typing inside the directory where you want the clone (e.g \$HOME/downloads/git/):

```
git clone https://github.com/deitch/jsorm-utilities.git
```

Inside the downloaded project directory (here: jsorm-utilities) type:

```
npm install -g
```

Sample HTML page code:

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 TRANSITIONAL//EN">
<html>
  <!-- Copyright (c) Atomic Inc. 2009 http://jsorm.com -->
  <head>
    <title>jsormdb Sample</title>
    <style>
      #content {
        position: absolute;
        left: 5%;
        top: 10%;
        width: 75%;
        height: 300px;
      }
      .grid-cell {
        float: left;
        width: 45%;
```

```

        height: 100%;
        border: 1px solid;
        margin: 5px;
        padding: 5px;
    }
    .output {
        padding: 5px;
    }
    .output-data {
        display:inline;
    }

</style>
<script type="text/javascript" src="assets/templates/core/javascripts/jquery/
jquery-1.3.2.min.js"></script>
<script type="text/javascript" src="assets/templates/core/javascripts/json2/
json2.js"></script>
<script type="text/javascript" src="assets/templates/core/javascripts/jsorm-
utilities/jsorm.js"></script>
<script type="text/javascript" src="assets/templates/core/javascripts/jsormdb/
jsormdb-src.js"></script>
<script type="text/javascript" src="assets/templates/core/javascripts/jsormdb/
jsormdb-sample.js"></script>
<script type="text/javascript">
    $(document).ready(function(){
        var buttons = ['load', 'change', 'commit', 'reject'];
        var i,len;
        var enable = function(db,enabled) {
            var i,len;
            for (i=0,len=buttons.length;i<len;i++) {
                if (enabled[buttons[i]]) {
                    $('#'+buttons[i]
+db).removeAttr('disabled');

                    $('#'+buttons[i]+db).show();
                } else {
                    $('#'+buttons[i]
+db).attr('disabled',true);

                    $('#'+buttons[i]+db).hide();
                }
            }
        };
        var display = function(id) {
            var db = SAMPLE["getDb"+id]();
            $("#db"+id+ " .output-
data").html(JSON.stringify(db.find()));
        };

        for (i=1;i<=2;i++) {
            (function(db){
                // handlers for the buttons
                $("#load"+db).click(function(event)
{SAMPLE["loadDb"+db]();event.preventDefault();});

```

```

        $("#change"+db).click(function(event){
            SAMPLE["changeDb"+db]();
            enable(db,{'commit':true,'reject':true});
            display(db);
            event.preventDefault();
        });
        $("#commit"+db).click(function(event){
            SAMPLE["commitDb"+db]();
            enable(db,{'load':true});
            display(db);
            event.preventDefault();
        });
        $("#reject"+db).click(function(event){
            SAMPLE["rejectDb"+db]();
            enable(db,{'change':true});
            display(db);
            event.preventDefault();
        });

        // handlers for load functions
        SAMPLE["getDb"+db]().on('load',function(){
            enable(db,{'change':true});
            display(db);
        });

        // start with only Load
        enable(db,{load: true});
    })(i);
}

});
</script>
</head>
<body>
    <div id="content">
        <div id="instructions">
            This is the sample page for jsormdb. Be sure to examine the
            source code, which is unminified. All JavaScript is in
            <a href="jsormdb-sample.js">jsormdb-sample.js</a>, except for
            UI controls, which are in this file. <p/>

            Note that this sample page includes jquery. This is needed for
            manipulating this sample page <u>only</u>
            and has nothing to do with jsormdb itself. jsormdb has <b>no</b>
            dependencies (other than JavaScript, of
            course).<p/>

            In this sample page, two databases are created. The first is
            loaded from raw data.

            The second is loaded from a remote server,
            using http, and processed via a JsonParser.
            To each database, data is then added, removed and changed, and

```

a

```

        commit or reject can be performed.
    </div>
    <div id="db1" class="grid-cell">
        <h2>Raw database</h2>
        <div class="controls">
            <input type="button" id="load1" value="Load"></
input><br/>
            <input type="button" id="change1" value="Change"></
input><br/>
            <input type="button" id="commit1" value="Commit"></
input>
            <input type="button" id="reject1" value="Reject"></
input>
        </div>
        <div class="output">
            <h4>Database Contents</h4>
            <div class="output-data"></div>
        </div>
    </div>
    <div id="db2" class="grid-cell">
        <h2>Remote database</h2>
        <div class="controls">
            <input type="button" id="load2" value="Load"></
input><br/>
            <input type="button" id="change2" value="Change"></
input><br/>
            <input type="button" id="commit2" value="Commit"></
input>
            <input type="button" id="reject2" value="Reject"></
input>
        </div>
        <div class="output">
            <h4>Database Contents</h4>
            <div class="output-data"></div>
        </div>
    </div>
</div>
<div>
</body>
</html>
```

***Persistence* A storage solution for Node.JS----** NO LONGER REQUIRED, WE NOW USE **JSormDB !!!**

Install **Persistence**¹¹ by running this command (**TIP**: install from GIT as this prevents a deprecated node-waf dependency):

```
npm install https://github.com/zefhemel/persistencejs.git -g
```

On Linux (e.g. Bluehost):

Inside the \$HOME/downloads/git directory type:

```
git clone https://github.com/zefhemel/persistencejs.git
```

Inside the \$HOME/downloads/git/persistencejs directory type:

```
npm install -g
```

Now you will find that npm has successfully installed persistencejs in the following directory: \$HOME/node/lib/node_modules/persistencejs as it shows you this response.

```
persistencejs@0.2.5 /home2/vanheems/node/lib/node_modules/persistencejs
```

Here 0.2.5 is the version of persistence that it has installed. And /home2/vanheems is the equivalent of \$HOME.

To use the **latest version** of any modules, from now on you just go inside the specific git sub-directory (e.g. \$HOME/downloads/git/persistencejs/) and type:

```
git pull
```

Followed by this:

```
npm install -g
```

That's all there is to it!!

NOTE: Persistence requires that MySQL (or if used SQLite) for Node.JS has is installed.

SQLite¹² should thus be asynchronous to work with Persistence. Hence - if you will be needing SQLite - install SQLite for Node.JS like so:

```
npm install node-sqlite -g
```

NOTE: This is different from the default sqlite, which is synchronous.

The Server side of sync-ing with persistence using Node.JS

Persistence will try to create tables in the database that it synchronizes to on the server (i.e. MySQL):

Sync table:

```
CREATE TABLE IF NOT EXISTS `_Sync` (`entity` VARCHAR(255), `localDate` BIGINT, `serverDate`
```

¹¹ <http://persistencejs.org>

¹² <https://github.com/orlandov/node-sqlite>

```
BIGINT, `serverPushDate` BIGINT ENGINE=InnoDB DEFAULT CHARSET=utf8
```

This above SQL is related to the below code from `persistence.sync.js`:

```
...
  persistence.sync.Sync = persistence.define('_Sync', {
    entity: "VARCHAR(255)",
    localDate: "BIGINT",
    serverDate: "BIGINT",
    serverPushDate: "BIGINT"
  });
...
```

SyncRemovedObject table:

```
CREATE TABLE IF NOT EXISTS `SyncRemovedObject` (`entity` VARCHAR(255), `objectId` VARCHAR(32),
`date` BIGINT, `id` VARCHAR(32) PRIMARY KEY) ENGINE=InnoDB DEFAULT CHARSET=utf8
```

This above SQL is related to the below code from `persistence.sync.js`:

```
...
  persistence.sync.RemovedObject = persistence.define('_SyncRemovedObject', {
    entity: "VARCHAR(255)",
    objectId: "VARCHAR(32)"
  });
...
```

The way persistence sync's objects (`persistence.sync.js`) at the web browser end:

Step 1: Look at local versions of remotely updated entities.

Step 2: Remove all remotely removed objects.

Step 3: Store new remote items locally.

Step 4: Find local new/updated/removed items (not part of the remote change set).

Task table (per example, not part of the default tables):

```
CREATE TABLE IF NOT EXISTS 'Task' ('name' TEXT, 'done' INT, 'id' VARCHAR(32) PRIMARY KEY)
ENGINE=InnoDB DEFAULT CHARSET=utf8
```

The server must expose a resource located at the given URI that responds to:

| | |
|-----|--|
| GET | <p>requests with a <code>since=<UNIX MS TIMESTAMP></code> GET parameter that will return a JSON object with two properties:</p> <ul style="list-style-type: none">• <code>now</code>, the timestamp of the current time at the server (in ms since 1/1/1970)• <code>updates</code>, an array of objects updated since the timestamp <code>since</code>. Each object has at least an <code>id</code> and <code>_lastChange</code> field (in the same timestamp format). <p>For instance: <code>/taskChanges?since=1279888110373</code></p> <p>Which returns:</p> |
|-----|--|

| | |
|------|---|
| | <pre>{ "now": 1279888110421, "updates": [{ "id": "F89F99F7B887423FB4B9C961C3883C0A", "name": "Main project", "_lastChange": 1279888110370 }] }</pre> |
| POST | <p>requests with as its body a JSON array of new/updated objects. Every object needs to have at least an id property.</p> <p>Example, posting to: /taskChanges</p> <p>with body: [{"id": "BDDF85807155497490C12D6DA3A833F1", "name": "Locally created project"}]</p> <p>The server is supposed to persist these changes (if valid). Internally the items must be assigned a _lastChange timestamp TS. If OK, the server will return a JSON object with "ok" as status and TS as now.</p> <p><i>Note:</i> it is important that the timestamp of all items and the one returned are the same.</p> <pre>{ "status": "ok", "now": 1279888110797 }</pre> |

Sequelize A multi-dialect Object-Relational-Mapper for Node.JS

The Sequelize¹³ library provides easy access to a MySQL database by mapping database entries to objects and vice versa. To put it in a nutshell... it's an ORM (Object-Relational-Mapper). The library is written entirely in JavaScript and can be used in the Node.JS environment.

Keeping NodeJS servers running with Forever

The purpose of **Forever**¹⁴ is to keep a child process (such as your node.js web server) running continuously and automatically restart it when it exits unexpectedly.

Install Forever by running this command:

```
npm install forever -g
```

See for an explanation of setting up Forever with NodeJS:

<http://www.exratione.com/2011/07/running-a-nodejs-server-as-a-service-using-forever/>

On Windows, make sure that there is a directory C:\root and that this directory is writeable. Forever uses this directory to write its log files to.

To **start** a server through forever (so it stays alive at all times), type this command in the directory of the server file (e.g. server4.js):

```
forever start server4.js
```

¹³ <http://sequelizejs.com/>

¹⁴ <http://blog.nodejitsu.com/keep-a-nodejs-server-up-with-forever>

You will notice that now when you open a browser window, the server can be contacted on its port. It has been started implicitly through forever.

To **list** all processes (i.e. node files) that forever is keeping alive, type this command:

```
forever list
```

This should return a list of each node files that is running prepended with an index number (e.g. 0 server4.js [24611, 24596])

To **stop** a server through forever, type this command (using the process index number, here 0):

```
forever stop 0
```

For **help** with forever, simply type this command:

```
forever --help
```

See for all commands with forever, <http://blog.nodejitsu.com/keep-a-nodejs-server-up-with-forever>

To see the **logs** of forever, on Windows look inside C:\root\forever directory.

Also in the C:\root\forever\pids directory you find the process identifier (pid) of each node file that is running.

To **kill** a process/processes on Windows (using the pid, for example 6568 and 5759) type:

```
Taskkill /PID 6568 5759 /F
```

Forever and Apache

The way it's usually setup is setting up a proxy in apache to redirect traffic to whatever port node is running on. There are tons of examples online. It's useful when you are running other apps (rails for example) on the same box.

Connect: the Middleware that works with Node

[Connect](#) adds one new unique aspect to node's HTTP server and that's the idea of layers. An app is structured like an onion. Every request enters the onion at the outside and traverses layer by layer till it hits something that handles it and generates a response. In [Connect](#) terms, these are called filters and providers. Once a layer provides a response, the path happens in reverse.

The [Connect](#) framework simply takes the initial request and response objects that come from node's http callback and pass them layer by layer to the configured middleware modules in an application.

Install Connect by running this command from the Node program directory:

```
npm install connect -g
```

The core / `connect-http.js` file

```
var Connect = require('connect');

Connect.createServer(function (req, res, next) {
  // Every request gets the same "Hello Connect" response.
  res.simpleBody(200, "Hello Connect");
}).listen(8080);
```

Express: built on top of Connect

Express¹⁵ contains Connect and has added features to it.

A tip for Express: when you create a project, you may be shown some errors about missing folders, re-execute the command again to create the project successfully.

Install a clone from the Github for express like so:

```
git clone https://github.com/visionmedia/express.git
```

Enter into the newly created directory 'express' and type following command:

```
npm install -g
```

This will have installed express for Node.js. Check it with the following command:

```
express --version
```

This should return the version of the newly installed module.

To have Express as a service for our core app, we have to step inside the core app's directory:

```
cd $HOME/public_html/core/components/core/apps/core
```

or if we are on Windows and use wamp server do this:

```
cd C:\wamp\www\core\components\core\apps\core
```

Now that we are in the core app's directory use the call for express, here with support of sessions and using *less* for styling:

```
express --sessions --css less
```

It will ask for confirmation if (and as) the directory is not empty. You can accept with Y for yes as the directories and files it will create are not effecting our directories and files already in there.

| | | | |
|------|------|---------------|--|
| apps | | | |
| | core | | |
| | | app | |
| | | data | |
| | | lib | |
| | | persistence | |
| | | app1_embed.js | |
| | | public | |

¹⁵ <http://expressjs.com>

| | | | |
|--|--|---------------------|--|
| | | routes | |
| | | views | |
| | | app.js | |
| | | package.json | |

NOTE: the directories and files newly created by express are in **bold**

After express has created its directories and files in this directory, it will request that you install dependencies, as follows:

```
cd . && npm install
```

That will install a bunch of modules used by the app, which are stored in the newly created directory *node_modules*:

| | |
|--------------|-----------------|
| node_modules | |
| | .bin |
| | express |
| | jade |
| | less-middleware |

With that the base of the app is ready. It is already a working app. Let's see what it outputs.

Start the app:

```
node app
```

It will prompt you with something like:

```
Express server listening on port 3000 in development mode
```

Stop the app with the combined keys: CTRL +C

To assist in not having to restart this server every time we edit the file(s), this is a good moment to install **nodemon**, which will reload our application each time it changes so you don't need to restart it:

```
npm install nodemon -g
```

From now on we will be using nodemon instead of node as a command.

Start the app again using nodemon:

```
nodemon app
```

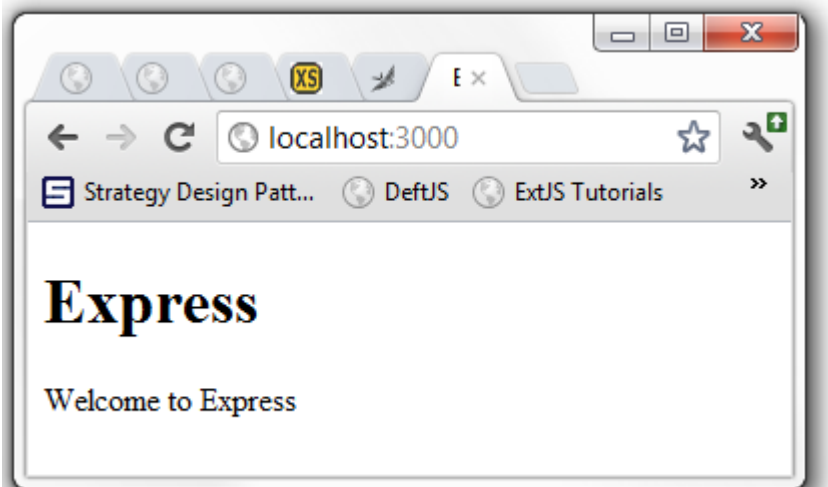
NOTE: you may be better off typing the file's full name, like so: `nodemon app.js`

It will prompt you with something like:

```
16 Jul 21:20:25 - [nodemon] v0.6.23
16 Jul 21:20:25 - [nodemon] watching: C:\wamp\www\core\components\core\apps\core
16 Jul 21:20:25 - [nodemon] starting 'node app'
Express server listening on port 3000 in development mode
```

Great!!

Then load <http://localhost:3000/> in your browser. You will see a simple webpage with the title "Express", and the webpage says:



NOTE: This page is being loaded and a reference to the stylesheet '**style.css**' is made which resides in the folder:

public\stylesheets

You will find a '**style.less**' file there as well, as we had indicated to prefer less as our style code language.

So looks like the app is working. Time to find out how it works.

Request flow in Express

This is how a request to an Express server flows:

Route → Route Handler → Template → HTML

The route defines the URL schema. It captures the matching request and passed on control to the corresponding route handler.

The route handler processes the request and passes the control to a template. The template constructs the HTML for the response and sends it to the browser.

The route handler need not always pass the control to a template, it can optionally send the response to a request directly.

Templates here are made with the use of **jade**. These jade files are inside the *views* folder:

| | | |
|------|--------|---------------------------|
| core | | |
| | routes | index.js |
| | views | index.jade layout.jade |

Routes are URL schema for a website. In Express you define them using `app.get()`, `app.post()`, `app.delete()` etc. The get, post, delete methods are derived from their corresponding **HTTP verbs**.

The **routes** directory is a convention, not a compulsion. In the **routes** directory we create appropriately named files which will handle the routes we define in the `app.js` file. We will import these files into our app and assign the functions defined in them to handle various routes. The imported file becomes sort of like an instance of the class of the route handler file.

Again as a recommended convention, we create an appropriately named variable for the imported file from the **routes** directory (here: `index`). Then we pass one of its functions as the second parameter for the route (here: `index`) from the **views** directory.

For example:

```
app.get('/', index.index);
```

Rendering Views

You have seen `res.render()` and `res.send()` in action already and probably have a fair idea about what they do. `res.send()` will directly send a string of text to the browser and `res.render()` will render a **Jade template**.

While it is possible to create a website entirely using `res.send()`, it is certainly not recommended to do so, because you will only end up with a complex and dirty looking codebase. Jade is the default templating engine for Express. Let's find out the basics of `res.render()` and the Jade templates.

Open the file named `layout.jade` in the **views** directory. Let's examine its content:

```
!!!
html
  head
    title= title
    link(rel='stylesheet', href='/stylesheets/style.css')
  body!= body
```

This is Jade code.

The very basics of Jade is this:

- HTML tag names to create tags, but without the angular brackets
- Spaces or tabs for indentation, but **don't mix them**
- #** to assign an **id** to a tag
- .** to assign a class to a tag, or create a div with a class if not already created
- (property='value') to create attributes and assign values to a tag

The `!!!` you see in `layout.jade` is doing a doctype declaration of HTML5. Also notice the relatively 'cryptic' `title= title` and `body!= body`. This is what they are doing:

The following is an explanation of two pieces of code that might intrigue you.

`title= title`: The template expects a variable called `title` from the route handler. The variable will be set as the content of the `title` tag AFTER escaping special characters.

`body!= body`: The template expects a variable called `body` from the route handler which called the `res.render()` method. The variable will be set as the content of the `body` tag WITHOUT escaping special characters. If special characters like `<` and `>` are escaped, we won't have any HTML code within the `body` tag, hence we don't want the contents of the `body` variable to be escaped.

Our renderer code looks for a Jade template named `index.jade` in the `views` folder and passes an object to it. In our case it is `{ title: 'Express' }`. The properties of the object will be available as variable names in the template with their respective name. In our case, we will have a variable named `title` in `index.jade`.

Invisible to the naked eye, another property is 'sent' to the template - `layout` with a default value of `layout.jade`. So the 'actual' renderer code can be understood as `res.render('index', { layout: 'layout', title: 'Express' })`.

When a template gets the `layout` variable. It makes all its variables available to the layout with their respective names, and itself in a variable named `body`.

Since `layout` has a default value, probably it might make you wonder if you could specify a layout of your own choice, or maybe even not use one. Your guesses are right.

To specify a custom layout do this:

```
{ layout: 'layout-ie', title: 'Express' }
```

If you don't want to use a layout do this:

```
{ layout: false, title: 'Express' }
```

NowJS: Middleware for Real-Time connection between Client and Server

NowJS¹⁶ maintains a shared namespace (called “now”) between javascript code on the client (i.e. in the web page) and the server. This allows for direct calling of remote javascript functions (e.g. for a chat application).

On Windows: download the binary from here: <https://github.com/Flotype/now/zipball/windows>
Unzip and place it inside the node_modules directory.

See a nice tutorial here:

<http://nodegames.blogspot.co.uk/2011/12/install-nowjs-in-windows.html>

Others:

NOTE: NowJS requires **Socket.IO**. (get it here <https://github.com/LearnBoost/socket.io>) and **Node-Gyp** and **Node-Proxy** and **Hiredis-Node**.

```
git clone https://github.com/LearnBoost/socket.io.git
```

```
git clone https://github.com/TooTallNate/node-gyp.git
```

```
git clone https://github.com/samshull/node-proxy.git
```

```
git clone https://github.com/pietern/hiredis-node.git
```

If any of the above install give an error on redis, see below warning:

WARNING: Install this version of redis (0.7.1), not the newer one (0.7.2).

```
npm install redis@0.7.1
```

Get a clone from the repository:

```
git://github.com/Flotype/now.git
```

Or by typing inside the directory where you want the clone (e.g \$HOME/downloads/git/):

```
git clone https://github.com/Flotype/now.git
```

Inside the downloaded project directory (here: now) type:

```
npm install -g
```

¹⁶ <http://nowjs.com>

N-Ext - Use the non-DOM parts of ExtJS (Ext Core + Ext.data currently) server-side with Node.js

N-Ext¹⁷ is the compression of [Node](#) and [Ext](#). Its purpose is to allow developers to use the ExtJS 4 Javascript framework in a server-side environment using Node.js.

Install N-Ext:

Get a clone from the repository:

```
git://github.com/xcambar/n-ext.git
```

Or by typing inside the directory where you want the clone (e.g \$HOME/downloads/git/):

```
git clone https://github.com/xcambar/n-ext.git
```

Inside the downloaded project directory (here: n-ext) type:

```
npm install -g
```

Set up N-Ext:

1. Download the latest version of [ExtJS 4](#)
2. Unzip the src folder in %PROJECT_ROOT%/lib/Ext (this can be changed with a single line of code)
3. In the main file (it can be any file) of your application, type the following:
4.

```
var sencha = require('n-ext');  
    sencha.setExtPath('./lib/Ext/');  
    sencha.bootstrapCore();
```

The variable `sencha` above is an instance of the `nExtLoader` prototype, which API can be found here. The 'setExtPath' method can take either an absolute or relative path. Write it as you would declare a path for node modules, as it is Node's `require()` that runs under the hood.

And that's it! You now have the beloved Ext namespace available application-wide.

....

n-ext_server1.js (for example):

```
var sencha = require('n-ext');  
sencha.setExtPath('./lib/Ext/');  
sencha.bootstrapCore();
```

More info in the wiki at <https://github.com/xcambar/n-ext/wiki>

Note on Ext.Loader

All the namespaces which roots are located on the same folder that the Ext namespace are available directly to the Dynamic class loading package of ExtJS 4.

Example: Consider the following file structure

| | | | | |
|------|--|--|--|--|
| apps | | | | |
|------|--|--|--|--|

¹⁷ <https://github.com/xcambar/n-ext#readme>

| | | | | |
|--|------|------|----------|--|
| | core | | | |
| | | app | | |
| | | data | | |
| | | lib | | |
| | | | Ext | |
| | | | Package1 | |
| | | | Package2 | |
| | | | | |

If you bootstrap your application as above, you can write the following code without having to configure Ext.Loader:

```
Ext.require('Package1.model.Awesome');
```

Declare another location for custom namespaces ?

ExtJS requires that you declare each and every namespace wherein you want to use the autoloader they provide. So, if you want to use a namespace `Foo`, which contains classes you want to have dynamically loaded in your app, you have to do the following:

```
Ext.Loader.setPath('Foo', './lib/Foo');
```

With *N-Ext*, you can use another mechanism, taking advantages of the capabilities of NodeJS' `require` function. Let's say you have a bunch of namespaces (NS1, NS2 and so on) located in a single folder (a priori another folder than the one containing the Ext library) called `vendor`. Using the line of code below, you won't be required to run `Ext.Loader.setPath(..)` anymore for those namespaces.

```
var sencha = require('n-ext');
sencha.addLibPath('./vendor/'); // <-- This one!
sencha.bootstrapCore();

Ext.require('NS1.model.Foo'); // It Works!
```

Of course, you can add as many paths as you want.

3. Database(s)

3. MySQL

Uses MySQL¹⁸ relational database.

MySQLDumper - Backup for MySQL Database

MySQLDumper¹⁹ is a PHP and Perl based tool for backing up MySQL databases. You can easily dump your data into a backup file and - if needed - restore it. It is especially suited for shared hosting web spaces, where you don't have shell access. MySQLDumper is an open source project and released under the GNU-license.

Notes about MySQLDumper (see also the FAQ here <http://www.mysqlumper.net/faq/>)

- MySQLDumper is running under any operating system. Just start the script in your browser under "http://www.yourDomain.com/path_to_mysqlumper/"
- Your server is running in Safe-Mode and so mysqldumper is not allowed to create directories. You need to create the following directories manually (Don't forget to chmod all directories to 0777.):
 - work
 - work/backup
 - work/config
 - work/log
 - work/structure

Folder hierarchy with MySQLDumper:

| | | | |
|-------------|-------------|---------------------------------|-----------|
| public_html | | | |
| | mysqldumper | | |
| | | < all folders other than work > | |
| | | work | |
| | | | backup |
| | | | config |
| | | | log |
| | | | structure |

3. Filemaker Pro

Uses FileMaker Pro²⁰ relational database.

¹⁸ <http://www.mysql.com>

¹⁹ <http://www.mysqlumper.net/>

²⁰ <http://www.filemaker.com>

Background

Asynchronous Programming

In browsers, Javascript and the web page's rendering engine share a single thread. The result of this is that only one thing can happen at a time. If a database query would be performed *synchronously*, like in many other programming environments like Java and PHP the browser would freeze from the moment the query was issued until the results came back. Therefore, many APIs in Javascript are defined as *asynchronous* APIs, which mean that they do not block when an "expensive" computation is performed, but instead provide the call with a function that will be invoked once the result is known. In the meantime, the browser can perform other duties.

(Source: <http://persistencejs.org/async>)

The big thing to be aware of is that much of persistence.js is **async** and you need to handle that. So you want code like:

```
persistence.schemaSync( function( err, tx ) {
  if ( err ){
    console.log( "schemaSync: err:", err );
  }
  else{
    var item = new Item();
    item.ItemId = "123";
    item.Name = "Test";
    persistence.add(item);
    persistence.flush( function( err ) {
      if ( err ){
        console.log( "flush err:", err );
      }
      else{
        //... ok
      }
    });
  }
});
```

NOTE: This snippet uses the code at: <https://github.com/zefhemel/persistencejs/tree/new>

Resources

Ext & ExtJS

- <http://prezi.com/odwelgo7wdue/t3con11-sfo-typo3-and-extdirect/>
- <http://prezi.com/akbjh19yylqy/data-modeling-and-extdirect/>

Node.JS

- NodeManual.org
- <http://nodebits.org/>
- <http://howtonode.org/>
- <http://www.w3resource.com/node.js/installing-node.js-windows-and-linux.php>
- <http://ninjadeveloper.net/blog/2011/12/12/the-road-to-node-setting-up-node-js-on-bluehost/>

NPM

- <http://blog.nodejitsu.com/npm-cheatsheet>

Connect

- <http://project70.com/nodejs/understanding-connect-and-middleware/>
- http://stephensugden.com/middleware_guide/
- <http://howtonode.org/connect-it>
- <https://github.com/senchalabs/connect>

Express.JS

- <http://expressjs.com/guide.html#Middleware>
- <http://www.hacksparrow.com/express-js-tutorial.html>
- <http://www.hacksparrow.com/running-express-js-in-production-mode.html>

N-Ext

-

JSormDB

- <http://jsorm.com/wiki/Jsormdb>

Persistence.JS --- NO LONGER REQUIRED, WE USE JSormDB

- <http://zef.me/2774/persistence-js-an-asynchronous-javascript-orm-for-html5gears>
- <http://zef.me/tag/persistence-js>
- <http://jacobmumm.com/2011/09/20/asynchronous-javascript-with-persistencejs/>
- <http://jacobmumm.com/demos/persistencetask/index.html>
- <http://persistencejs.org/objects?do=index>

Persist.JS--- NO LONGER REQUIRED, WE USE JSormDB

- <https://github.com/jeremydurham/persist-js>

MySQLDumper

- <http://sourceforge.net/projects/mysqldumper/>
- <http://www.mysqldumper.net/>