JSONStore in Native iOS applications

Overview

IBM MobileFirst Platform Foundation's **JSONStore** is an optional client-side API providing a lightweight, document-oriented storage system. JSONStore enables persistent storage of **JSON documents**. Documents in an application are available in JSONStore even when the device that is running the application is offline. This persistent, always-available storage can be useful to give users access to documents when, for example, there is no network connection available in the device.

Key features

- Data indexing for efficient searching
- Data encryption in production environments
- Mechanism for tracking local-only changes to the stored data
- Support for multiple users

> **Note:** Some features such as data encryption are beyond the scope of this tutorial. All features are documented in detail in the IBM MobileFirst Platform Foundation user documentation website.

Prerequisite: Make sure the MobileFirst Native SDK was added to the Xcode project. Follow the tutorial: Adding the MobileFirst Platform Foundation SDK to iOS applications (../../../adding-the-mfpf-sdk/adding-the-mfpf-sdk-to-ios-applications/).

Jump to:

Adding JSONStore

1. Edit the existing `podfile`, located at the root of the Xcode project. Add to the file:

   ```
   pod 'IBMMobileFirstPlatformFoundationJSONStore'
   ```

2. From a **Command-line** window, navigate to the root of the Xcode project and run the command: `pod install` - note that this action may take a while.

Whenever you want to use JSONStore, make sure that you import the JSONStore header:
Objective-C:

```
#import <IBMMobileFirstPlatformFoundation/IBMMobileFirstPlatformFoundationJSONStore.h>
```

Swift:

```
import IBMMobileFirstPlatformFoundationJSONStore
```

Basic Usage

Open

Use `openCollections` to open one or more JSONStore collections.

Starting or provisioning a collections means creating the persistent storage that contains the collection and documents, if it does not exists.
If the persistent storage is encrypted and a correct password is passed, the necessary security procedures to make the data accessible are run.

For optional features that you can enable at initialization time, see **Security, Multiple User Support** and **MobileFirst Adapter Integration** in the second part of this tutorial.

```
NSError *error = nil;

JSONStoreCollection* collection = [[JSONStoreCollection alloc] initWithName:@"people"];
[collection setSearchField:@"name" withType:JSONStore_String];
[collection setSearchField:@"age" withType:JSONStore_Integer];

[[JSONStore sharedInstance] openCollections:@[collection] withOptions:nil error:error];
```

Get

Use `getCollectionWithName` to create an accessor to the collection. You must call `openCollections` before you call `getCollectionWithName`.

```
NSString *collectionName = @"people";
JSONStoreCollection *collection = [[JSONStore sharedInstance] getCollectionWithName:collectionName];
```

The variable `collection` can now be used to perform operations on the `people` collection such as `add`, `find`, and `replace`.

Add

Use `addData` to store data as documents inside a collection.

```
NSError *error = nil;

NSString *collectionName = @"people";
JSONStoreCollection *collection = [[JSONStore sharedInstance] getCollectionWithName:collectionName];

NSDictionary *data = @{@"name" : @"yoel", @"age" : @23};
[[collection addData:@[data] andMarkDirty:YES withOptions:nil error:error] intValue];
```

Find

Use `findWithQueryParts` to locate a document inside a collection by using a query. Use `findAllWithOptions` to retrieve all the documents inside a collection. Use `findWithIds` to search by the document unique identifier.

```
NSError *error = nil;

NSString *collectionName = @"people";
JSONStoreCollection *collection = [[JSONStore sharedInstance] getCollectionWithName:collectionName];
//Build a query part.

JSONStoreQueryPart *query = [[JSONStoreQueryPart alloc] init];
[query searchField:@"name" like:@"yoel"];
JSONStoreQueryOptions *options = [[JSONStoreQueryOptions alloc] init];

// returns a maximum of 10 documents, default: retuns every document
[options setLimit:@10];

// Count using the query part built above.
NSArray *results = [collection findWithQueryParts:@[query] andOptions:options error:error];
```

Replace

Use `replaceDocuments` to modify documents inside a collection. The field that you use to perform the replacement is `_id,` the document unique identifier.

```
NSError *error = nil;

NSString *collectionName = @"people";
JSONStoreCollection *collection = [[JSONStore sharedInstance] getCollectionWithName:collectionName];

//Replacing name 'carlos' with name 'carlitos'.<br />
NSDictionary *replacement = @{@"_id": @1, @"json" : @{@"name" : @"chevy", @"age" : @23}};
[collection replaceDocuments:@[replacement] andMarkDirty:YES error:error];
```

This examples assumes that the document `{_id: 1, json: {name: 'yoel', age: 23} }` is in the collection.

Remove

Use `removeWithIds` to delete a document from a collection. Documents are not erased from the collection until you call `markDocumentClean`. For more information, see the **MobileFirst Adapter Integration** section later in this tutorial.

```
NSError *error = nil;

NSString *collectionName = @"people";
JSONStoreCollection *collection = [[JSONStore sharedInstance] getCollectionWithName:collectionName];
[collection removeWithIds:@[@1] andMarkDirty:YES error:error];
```

Remove Collection

Use `removeCollectionWithError` to delete all the documents that are stored inside a collection. This operation is similar to dropping a table in database terms.

```
NSError *error = nil;

NSString *collectionName = @"people";
JSONStoreCollection *collection = [[JSONStore sharedInstance] getCollectionWithName:collectionName];
BOOL removeCollectionWorked = [collection removeCollectionWithError:error];
```

Destroy

Use `destroyDataAndReturnError` to remove the following data:

- All documents
- All collections
- All Stores - See **Multiple User Support** later in this tutorial
- All JSONStore metadata and security artifacts - See **Security** later in this tutorial

```
NSError *error = nil;
[[JSONStore sharedInstance] destroyDataAndReturnError:error];
```

Advanced Usage

Security

You can secure all the collections in a store by passing a `JSONStoreOpenOptions` object with a password to the `openCollections` function. If no password is passed, the documents of all the collections in the store are not encrypted.

Some security metadata is stored in the keychain (iOS).
The store is encrypted with a 256-bit Advanced Encryption Standard (AES) key. All keys are strengthened with Password-Based Key Derivation Function 2 (PBKDF2).

Use `closeAllCollectionsAndReturnError` to lock access to all the collections until you call `openCollections` again. If you think of `openCollections` as a login function you can think of `closeAllCollectionsAndReturnError` as the corresponding logout function.

Use `changeCurrentPassword` to change the password.

```
NSError *error = nil;

JSONStoreCollection *collection = [[JSONStoreCollection alloc] initWithName:@"people"];
[collection setSearchField:@"name" withType:JSONStore_String];
[collection setSearchField:@"age" withType:JSONStore_Integer];

JSONStoreOpenOptions *options = [JSONStoreOpenOptions new];
[options setPassword:@"123"];
[[JSONStore sharedInstance] openCollections:@[collection] withOptions:options error:error];
```

Multiple User Support

You can create multiple stores that contain different collections in a single MobileFirst application. The `openCollections` function can take an options object with a username. If no username is given, the default username is "jsonstore".

```
NSError *error = nil;

JSONStoreCollection *collection = [[JSONStoreCollection alloc] initWithName:@"people"];
[collection setSearchField:@"name" withType:JSONStore_String];
[collection setSearchField:@"age" withType:JSONStore_Integer];

JSONStoreOpenOptions *options = [JSONStoreOpenOptions new];
[options setUsername:@"yoel"];
[[JSONStore sharedInstance] openCollections:@[collection] withOptions:options error:error];
```

MobileFirst Adapter Integration

This section assumes that you are familiar with MobileFirst adapters. MobileFirst Adapter Integration is optional and provides ways to send data from a collection to an adapter and get data from an adapter into a collection.

You can achieve these goals by using functions such as `WLClient invokeProcedure` or your own instance of an `NSURLConnection` if you need more flexibility.

Adapter Implementation

Create a MobileFirst adapter and name it "**People**". Define it's procedures `addPerson`, `getPeople`, `pushPeople`, `removePerson`, and `replacePerson`.

```
function getPeople() {
    var data = { peopleList : [{name: 'chevy', age: 23}, {name: 'yoel', age: 23}] };
    WL.Logger.debug('Adapter: people, procedure: getPeople called.');
    WL.Logger.debug('Sending data: ' + JSON.stringify(data));
    return data;
}
function pushPeople(data) {
    WL.Logger.debug('Adapter: people, procedure: pushPeople called.');
    WL.Logger.debug('Got data from JSONStore to ADD: ' + data);
    return;
}
function addPerson(data) {
    WL.Logger.debug('Adapter: people, procedure: addPerson called.');
    WL.Logger.debug('Got data from JSONStore to ADD: ' + data);
    return;
}
function removePerson(data) {
    WL.Logger.debug('Adapter: people, procedure: removePerson called.');
    WL.Logger.debug('Got data from JSONStore to REMOVE: ' + data);
    return;
}
function replacePerson(data) {
    WL.Logger.debug('Adapter: people, procedure: replacePerson called.');
    WL.Logger.debug('Got data from JSONStore to REPLACE: ' + data);
    return;
}
```

Load data from MobileFirst Adapter

To load data from a MobileFirst Adapter use `WLClient invokeProcedure`.

```
// Start - LoadFromAdapter
@interface LoadFromAdapter : NSObject<WLDelegate>
@end

@implementation LoadFromAdapter
-(void)onSuccess:(WLResponse *)response {
  NSArray *loadedDocuments = [[response getResponseJson]  objectForKey:@"peopleList"];
  // handle success
}

-(void)onFailure:(WLFailResponse *)response {
  // handle success
}
@end
// End - LoadFromAdapter

NSError *error = nil;
WLProcedureInvocationData *invocationData = [[WLProcedureInvocationData alloc] initWithAdapterName:
@"People" procedureName:@"getPeople"];

LoadFromAdapter *loadDelegate =  [[LoadFromAdapter alloc] init];
WLClient *client = [[WLClient sharedInstance] init];
[client invokeProcedure:invocationData withDelegate:loadDelegate];
```

Get Push Required (Dirty Documents)

Calling `allDirtyAndReturnError` returns and array of so called "dirty documents", which are documents that have local modifications that do not exist on the back-end system.

```
NSError* error = nil;
NSString *collectionName = @"people";
JSONStoreCollection *collection = [[JSONStore sharedInstance] getCollectionWithName:collectionName];
NSArray *dirtyDocs = [collection allDirtyAndReturnError:error];
```

To prevent JSONStore from marking the documents as "dirty", pass the option `andMarkDirty:NO` to `add`, `replace`, and `remove`.

Push changes

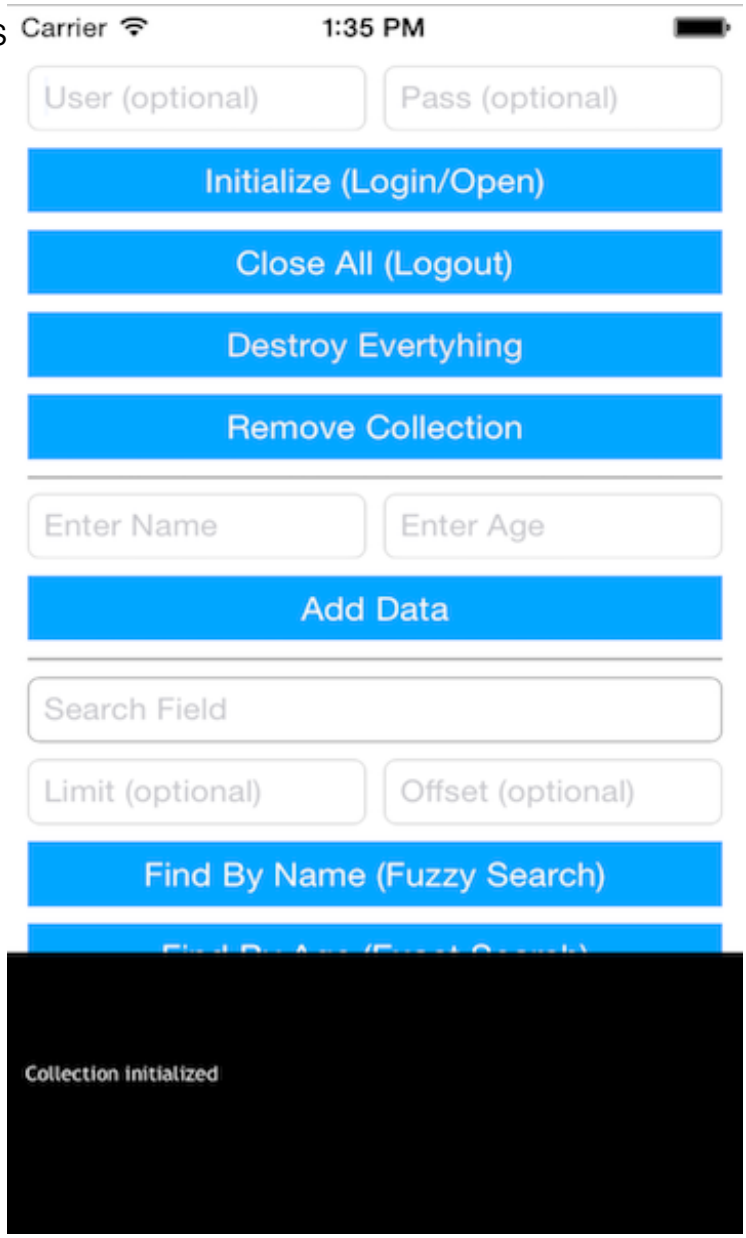
To push changes to a MobileFirst adapter, call the `findAllDirtyDocuments` to get a list of documents with modifications and then use `WLClient invokeProcedure`. After the data is sent and a successful response is received make sure you call `markDocumentsClean`.

```
// Start - PushToAdapter
@interface PushToAdapter :NSObject<WLDelegate>
@end

@implementation PushToAdapter
-(void)onSuccess:(WLResponse *)response {
  // handle success
}

-(void)onFailure:(WLFailResponse *)response {
  // handle faiure
}
@end
// End - PushToAdapter

NSError* error = nil;
NSString *collectionName = @"people";

JSONStoreCollection *collection = [[JSONStore sharedInstance] getCollectionWithName:collectionName];
NSArray *dirtyDocs = [collection allDirtyAndReturnError:error];

WLProcedureInvocationData *invocationData = [[WLProcedureInvocationData alloc] initWithAdapterName:
@"People" procedureName:@"pushPeople"];
[invocationData setParameters:@[dirtyDocs]];

PushToAdapter *pushDelegate =  [[PushToAdapter alloc] init];
WLClient *client = [[WLClient sharedInstance] init];
[client invokeProcedure:invocationData withDelegate:pushDelegate];
```

Sample application

The JSONStoreSwift project contains a native iOS Swift application that utilizes the JSONStore API set.
Included is a JavaScript adapter Maven project.

Click to download (https://github.com/MobileFirst-Platform-Developer-Center/JSONStoreSwift/tree/release80) the Native iOS project.
Click to download (https://github.com/MobileFirst-Platform-Developer-Center/JSONStoreAdapter/tree/release80) the adapter Maven project.



Sample usage

1. From the command line, navigate to the Xcode project.
2. Ensure the sample is registered in the MobileFirst Server by running the command: `mfpdev app register`.
3. The sample uses the `JSONStoreAdapter` contained in the Adapters Maven project. Use either Maven or MobileFirst Developer CLI to build and deploy the adapter (../../adapters/creating-adapters/).
4. Import the project to Xcode, and run the sample by clicking the **Run** button.