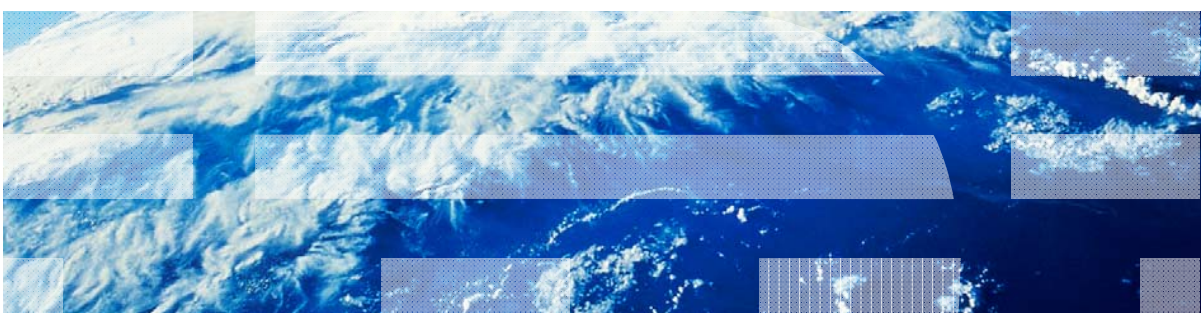
IBM Worklight V5.0.6
Getting Started

JSONStore – Encrypting sensitive data with FIPS 140-2



15 March 2013

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Agenda

- FIPS overview
  - What is FIPS 140-2?
  - JSONStore FIPS compliance
  - Supported Architectures
  - Procedure overview
- Configuration for FIPS on Android
- Configuration for FIPS on iOS
- Enabling FIPS mode in JSONStore
  - Validating FIPS mode

What is it FIPS 140-2?

- Federal Information Processing Standards (FIPS) are standards and guidelines that are issued by the United States National Institute of Standards and Technology (NIST) for federal government computer systems.
- FIPS Publication 140-2 is a security standard that is used to accredit cryptographic modules.
- FIPS 140-2 applies to cryptographic modules that are used to protect sensitive but unclassified information by United States federal government agencies and government contractors.

- **Note**: In this module, **FIPS** refers to the **FIPS Publication 140-2**.

JSON Store FIPS Compliance

- JSONStore uses OpenSSL to securely encrypt data.
- OpenSSL is an open source library that implements various cryptography and utility functions that are used by JSONStore.
- For JSONStore to run in a FIPS-compliant mode, use a version of OpenSSL that is FIPS-compliant.
- **Note**: The sample that accompanies this module uses *OpenSSL FIPS 2.0.2*, which is a version of OpenSSL that is validated as compliant with FIPS 140-2. Then, to ensure that JSONStore runs in a FIPS-compliant mode, you must also follow the instructions in this module.

Supported Architectures

- FIPS-compliant JSONStore is supported only on the following architectures for iOS and Android:
  - iOS:
    - armv7
    - i386
  - Android:
    - armv7
    - x86

Note: Although IBM Worklight® and JSONStore supports armv5 for Android, FIPS compliance mode for armv5 is not supported.

Procedure Overview – Android

- Procedure overview:
  - Copy the FIPS-compliant version of OpenSSL to your IBM Worklight application.
  - Replace the necessary IBM Worklight libraries that are used by JSONStore.
  - Implement functions to load the new libraries.
  - Validate that your application is now running in a FIPS-compliant mode.
- You learn the details of this procedure in later sections of this module.

Procedure Overview – iOS

- Procedure overview:
  - Replace the existing framework with a framework that contains the FIPS-compliant version of OpenSSL.
  - Copy the source file that is necessary for build-time fingerprint validation.
  - Add the binary file and script that are necessary to run the build-time fingerprint validation.
  - Validate that your application is now running in a FIPS-compliant mode.
- FIPS requires a build-time validation check. This check is done automatically on Android. For iOS, more steps are necessary for this check.
- You learn the details of this procedure in later sections of this module.

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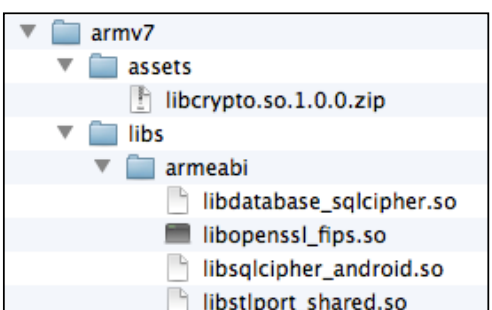
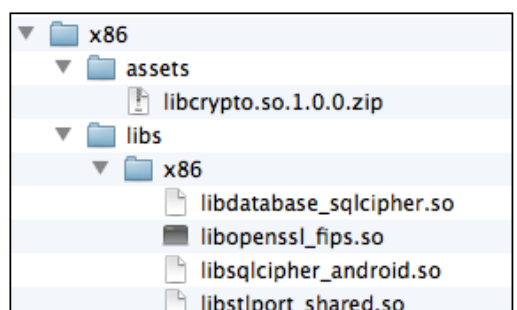
Selecting an architecture

- The necessary files are available in the sample for this module under the **fips-config** folder.
- Both armv7 and x86 are supported for FIPS compliance, however you have to follow the steps for *only* the architecture that you want your application to support.
- This module shows the steps and uses images for armv7. The steps for x86 are identical.

Hierarchy for armv7 in **fips-config/Android**

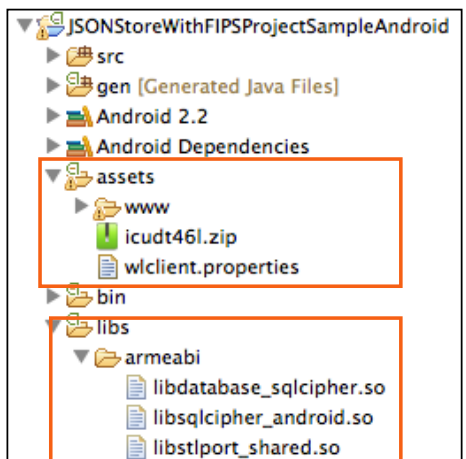


Hierarchy for x86 in **fips-config/Android**



Locating the correct directories

- Import the provided sample project.
- Locate the **assets** folder and the **libs/armeabi** folder of the Android project.



Copy the files

- Copy **fips-config/Android/armv7/assets/libcrypto.so.1.0.0.zip** into the corresponding **assets** folder of your Android project.
- Replace the following library files in your **libs/armeabi** folder with the corresponding files that are in **fips-config/Android/armv7/libs/armeabi**:
  - libdatabase_sqlcipher.so
  - libsqlcipher_android.so
  - libstlport_shared.so
  - libopenssl_fips.so

Add code to load OpenSSL Library

- Locate the **onWLInitCompleted** method in the main source file that is generated with your IBM Worklight Android application.
- Add the following code before the **super.loadUrl(...)** call, as shown here:

```
public void onWLInitCompleted(Bundle savedInstanceState){

    String library = "libcrypto.so.1.0.0";
    try{
            File localStorage = new File(getLocalStorageRoot());
            InputStream pathStream = this.getApplicationContext().getAssets().open(library +
".zip");
            WLUtils.unpack(pathStream, localStorage);
            System.load(super.getLocalStorageRoot() + "/" + library);
    }catch(IOException e){
            // Handle failed loading of files
    }

    super.loadUrl(getWebMainFilePath());
}
```

- This step completes the native configurations that are necessary to configure FIPS-compliant OpenSSL on Android.

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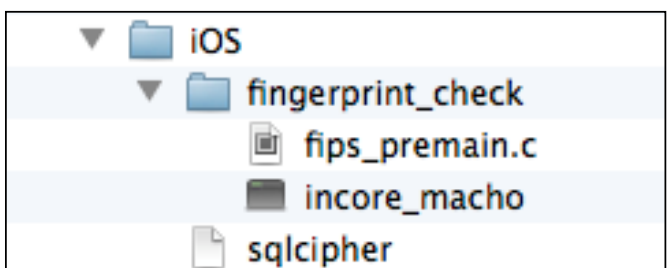
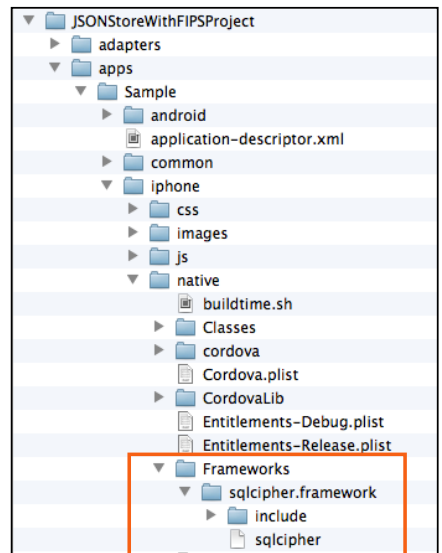
Selecting an architecture

- For iOS, the FIPS-compliant version of OpenSSL for both supported architectures are combined into a single framework file.
  - You do not have to copy files for multiple architectures.



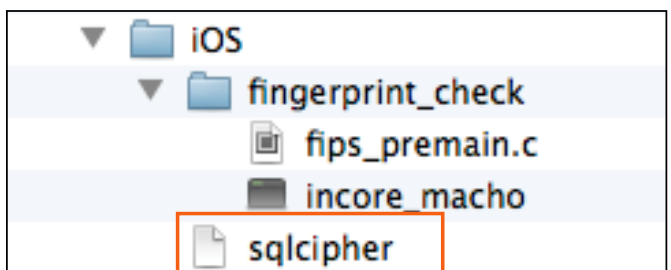
Locating the correct directories

- Import the provided sample project.
- Locate the folder: **{PROJECT_HOME}/apps/{APP_NAME}/iphone/native/Frameworks/sqlcipher.framework**
- The figure shows the location for the provided sample.



Copying the files (1 or 2)

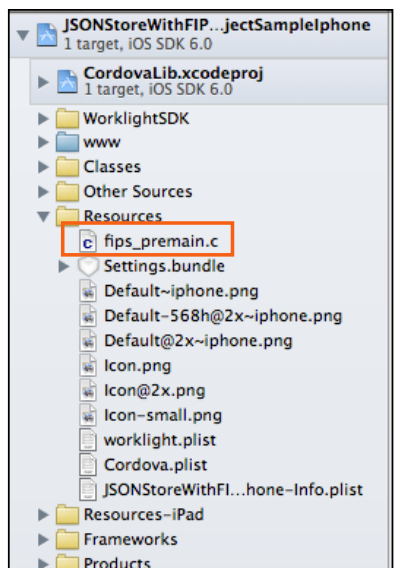
- You must replace only the file that is named **sqlcipher**.
- Replace the existing **sqlcipher** file, as you located it in the previous slide, with the one that is in **config/iOS**.



- Copy the **incore_macho** file to a directory that Xcode can access.
  - Consider copying it in the **/usr/local/bin/** directory.

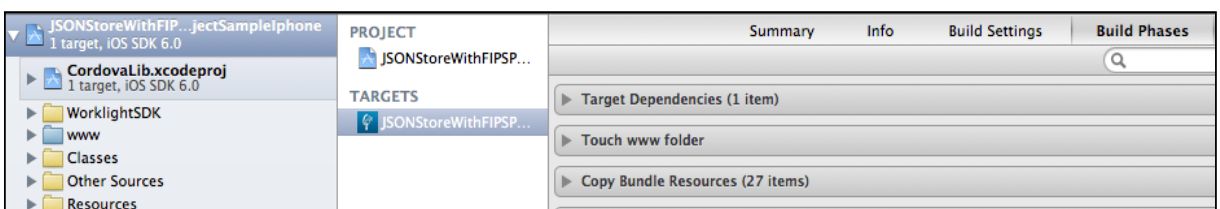
Copying the files (2 of 2)

- Copy the **fips_premain.c** file into your project.
  - Consider copying it in to the **Resources** folder.

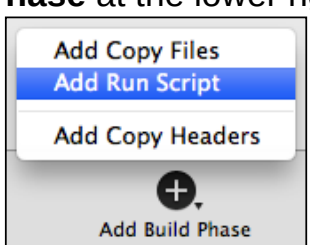


Build-time fingerprint check – Running the script

- Instruct Xcode to run the fingerprint check upon each build:
  - Select the Project and target for your application.
  - Select the **Build Phases** tab.

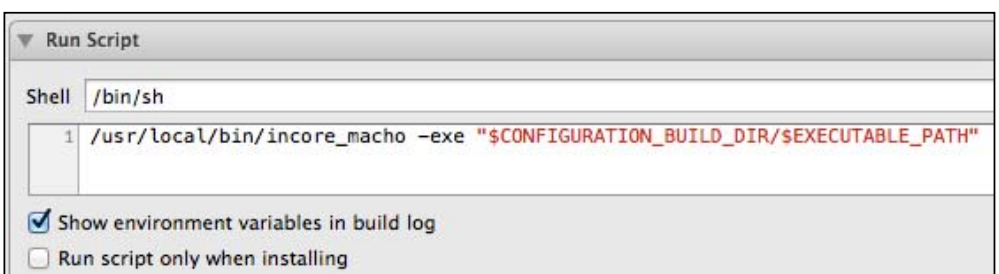


  - Click **Add Build Phase** at the lower right, and then select **Add Run Script**.



Running the fingerprint check script

- In the space that is provided for the script, add the following line:
  - **{INSTALL_PATH}/incore_macho -exe "$CONFIGURATION_BUILD_DIR/$EXECUTABLE_PATH"**
    - *where **{INSTALL_PATH}** is the location where you installed the **incore_macho** file*
- For example, if **{INSTALL_PATH}** is **/usr/local/bin**, the line to add is as shown here:



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Enabling FIPS mode in JSONStore

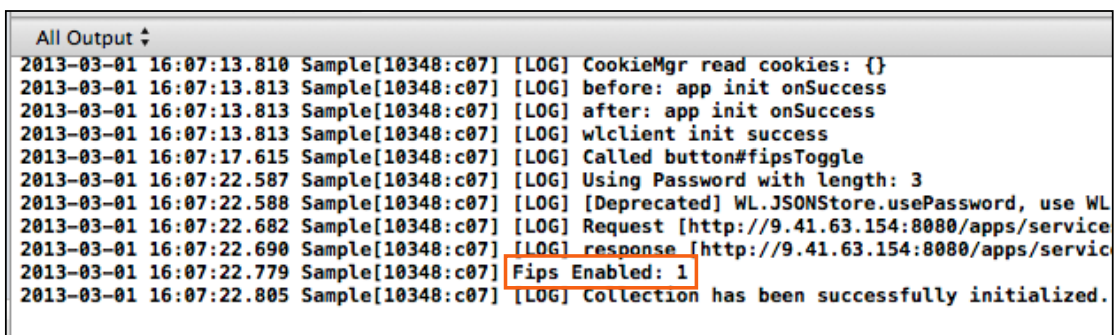
- After you completed the steps in the previous slides, your application can now run by using a FIPS-**capable** version of OpenSSL, meaning that it can now enable or disable FIPS mode for OpenSSL.
- To enable FIPS mode for JSONStore, add the **fipsEnabled** flag with the value **true** to your **initCollection** call:

```
usersCollection = WL.JSONStore.initCollection(
  "users",
  usersSearchFields,
   {
    adapter: usersAdapterOptions,
    fipsEnabled: true,
    onSuccess: initCollectionSuccessCallback,
    onFailure: genericFailureCallback,
    load:true
  })
```

- To ensure that your program is using FIPS-compliant OpenSSL, you **must** pass this flag with a value of **true** for each **initCollection** call that you make.

Verifying FIPS mode

- When you run your project and a call to **initCollection** with the **fipsEnabled** flag set to **true** is done, the standard log (logcat for Android, built-in log for Xcode) displays whether you are running with FIPS mode enabled:



- The trace "**Fips mode: 0**" means that, although the program is running correctly, FIPS mode is not properly enabled. Check to make sure that all files are properly copied to the correct locations.

Check yourself questions

- FIPS mode **cannot** be enabled for the architecture:
  - i386
  - armv5
  - x86
  - armv7
- The name of the flag that is needed to enable FIPS 140-2 in JSONStore is:
  - fipsFlag
  - enhanceSecurity
  - No flag is necessary
  - fipsEnabled
- The purpose of the fingerprint check in iOS is:
  - To let the application know that you are enabling FIPS mode
  - To protect the application from any future security tampering
  - To validate that the FIPS-compliant OpenSSL was not tampered with
  - There is no purpose; it is not necessary

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