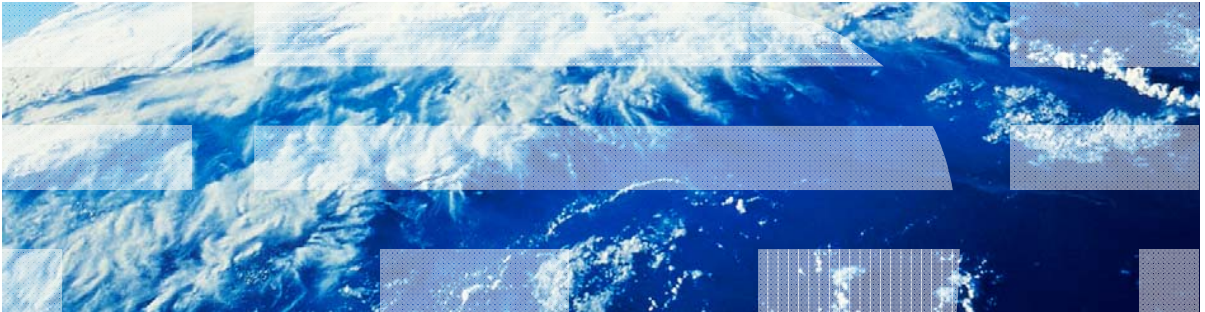


# ***IBM Worklight V6.0.0 Getting Started***

## **JSONStore – Encrypting sensitive data with FIPS 140-2**



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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***

- The following slides describe how to configure FIPS for both Android and iOS environments.
- Perform this configuration to ensure that the JSONStore code sample that goes with this module runs in a FIPS-compliant mode.

## ***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.

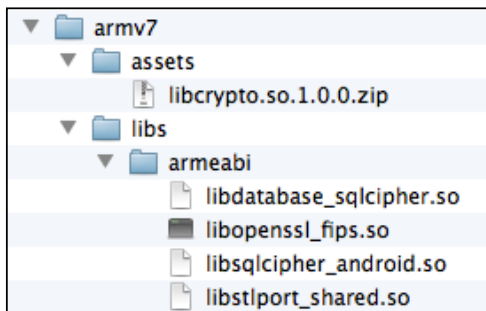
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  - What is FIPS 140-2?
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  - Supported Architectures
  - Procedure overview
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- Configuration for FIPS on iOS
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  - Validating FIPS mode

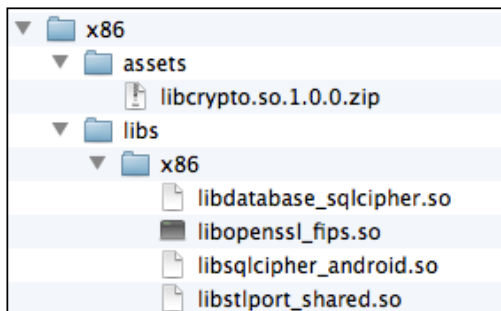
## Selecting an architecture

- 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**

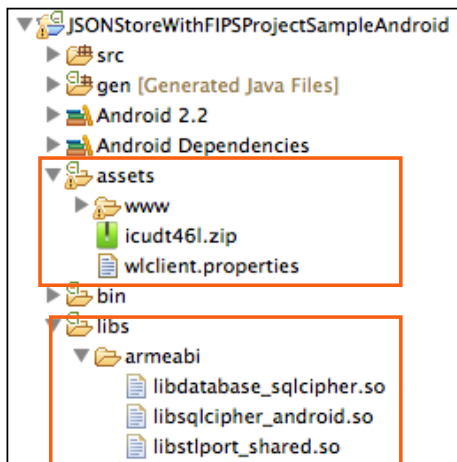


Hierarchy for x86 in **fips-config/Android**



## 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());  
}
```

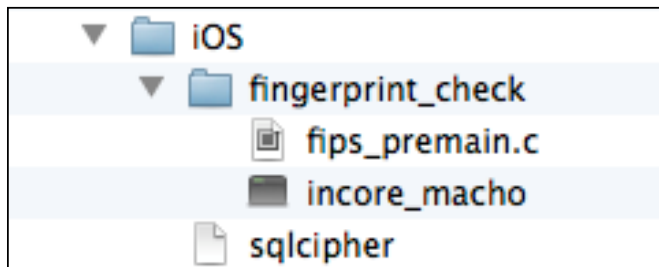
- If you have build errors when using these lines, make sure you included the necessary import statements that the additional code requires.
- This step completes the native configurations that are necessary to configure FIPS-compliant OpenSSL on Android.

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## Selecting an architecture

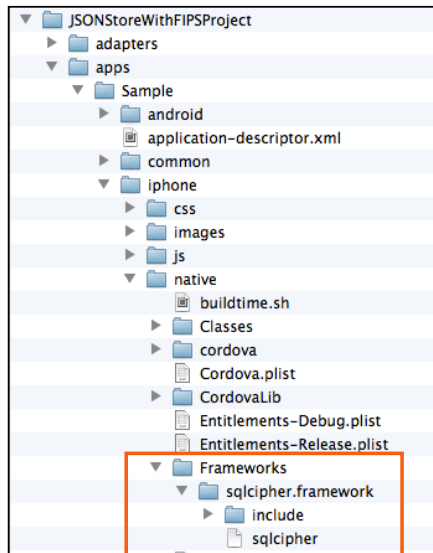
- For iOS, the FIPS-compliant version of OpenSSL for both supported architectures are combined into a single framework file.
  - You do not have to copy files for multiple architectures.





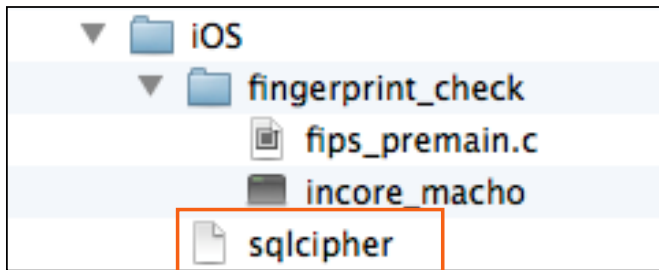
## Locating the correct directories

- 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)

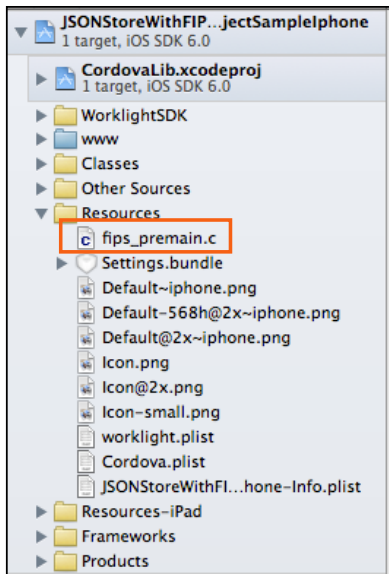
- You must replace only the file that is named **sqlcipher**.
- Replace the existing **sqlcipher** file, as you located it in the previous slide, with the one that is in **config/iOS**.



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

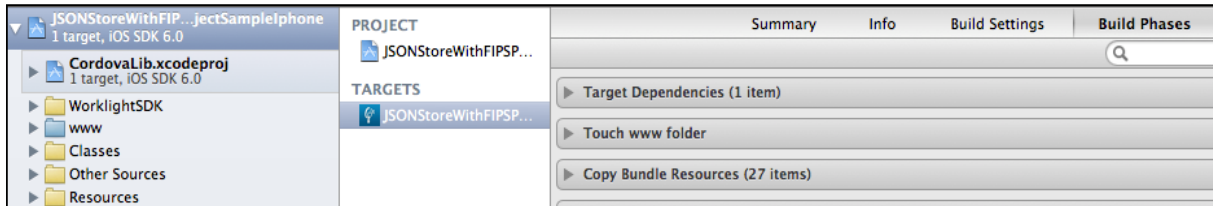
## Copying the files (2 of 2)

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

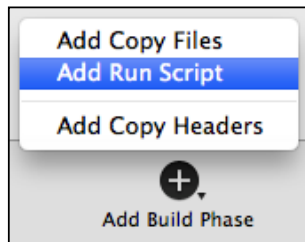


## Build-time fingerprint check – Running the script

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

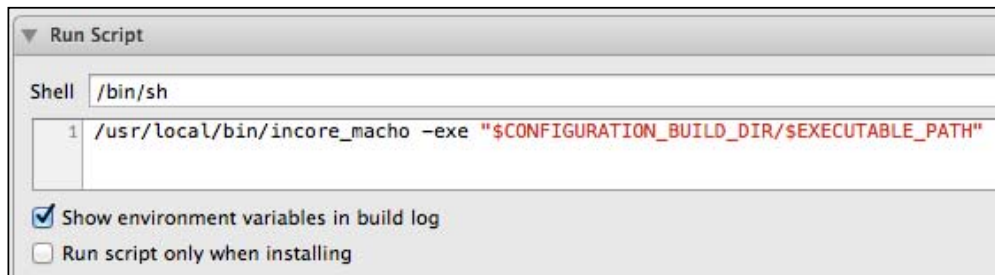


- Click **Add Build Phase** at the lower right, and then select **Add Run Script**.



## 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:

```
All Output ↓
2013-03-01 16:07:13.810 Sample[10348:c07] [LOG] CookieMgr read cookies: {}
2013-03-01 16:07:13.813 Sample[10348:c07] [LOG] before: app init onSuccess
2013-03-01 16:07:13.813 Sample[10348:c07] [LOG] after: app init onSuccess
2013-03-01 16:07:13.813 Sample[10348:c07] [LOG] wlclient init success
2013-03-01 16:07:17.615 Sample[10348:c07] [LOG] Called button#fipsToggle
2013-03-01 16:07:22.587 Sample[10348:c07] [LOG] Using Password with length: 3
2013-03-01 16:07:22.588 Sample[10348:c07] [LOG] [Deprecated] WL.JSONStore.usePassword, use WL
2013-03-01 16:07:22.682 Sample[10348:c07] [LOG] Request [http://9.41.63.154:8080/apps/service
2013-03-01 16:07:22.690 Sample[10348:c07] [LOG] response [http://9.41.63.154:8080/apps/service
2013-03-01 16:07:22.779 Sample[10348:c07] [LOG] Fips Enabled: 1
2013-03-01 16:07:22.805 Sample[10348:c07] [LOG] Collection has been successfully initialized.
```

- 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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