Base Integration Guide

Workspace ONE for Android

Android applications can be integrated with the VMware Workspace ONE® platform, by using its mobile software development kit. Complete the tasks below as a base for feature integration.

This document is part of the Workspace ONE Integration Guide for Android set.

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Introduction

The tasks detailed below represent the basic steps in integrating your Android application with the Workspace ONE platform. The tasks you will complete depend on the required integration level of your application.

Integration at the Framework level is necessary if the application will make use of platform features such as authentication, single sign-on, data encryption, or networking.

To integrate at the **Client level**, do the following tasks:

1. Add the Client SDK.
2. Initialize the Client SDK.

To integrate at the **Framework level**, do the following tasks:

1. Add the Client SDK.
2. Add the Framework.
3. Initialize the Framework.

Note that you don't add Client SDK initialization if you are integrating at the Framework level.

Agreement

Before downloading, installing or using the VMware Workspace ONE SDK you must:

- Review the VMware Workspace ONE Software Development Kit License Agreement. By downloading, installing, or using the VMware Workspace ONE SDK you agree to these license terms. If you disagree with any of the terms, then do not use the software.
- Review the VMware Privacy Notice and the Workspace ONE UEM Privacy Disclosure, for information on applicable privacy policies.

That applies however you obtain or integrate the software.

Integration Guides

This document is part of the Workspace ONE Integration Guide for Android set.

See other guides in the set for

- an overview of integration levels and the benefits of each.
- details of the integration preparation tasks, which must be done before the tasks in this document.

An overview that includes links to all the guides is available

- in Markdown format, in the repository that also holds the sample code: https://github.com/vmware-samples/...IntegrationOverview.md

- in Portable Document Format (PDF), on the VMware website: https://developer.vmware.com/...IntegrationOverview.pdf

Compatibility

Instructions in this document have been tested with the following software versions.

Software	Version
Workspace ONE SDK for Android	23.03
Workspace ONE management console	2302
Android Studio integrated development environment	2022.2.1
Gradle plugin for Android	7.2.2
Kotlin language	1.7.21

Integration Paths Diagram

The following diagram shows the tasks involved in base integration and the order in which they can be completed. Integration Preparation is a prerequisite to base integration. Framework integration is a prerequisite to integrating any of the framework features, which are covered by other guides.

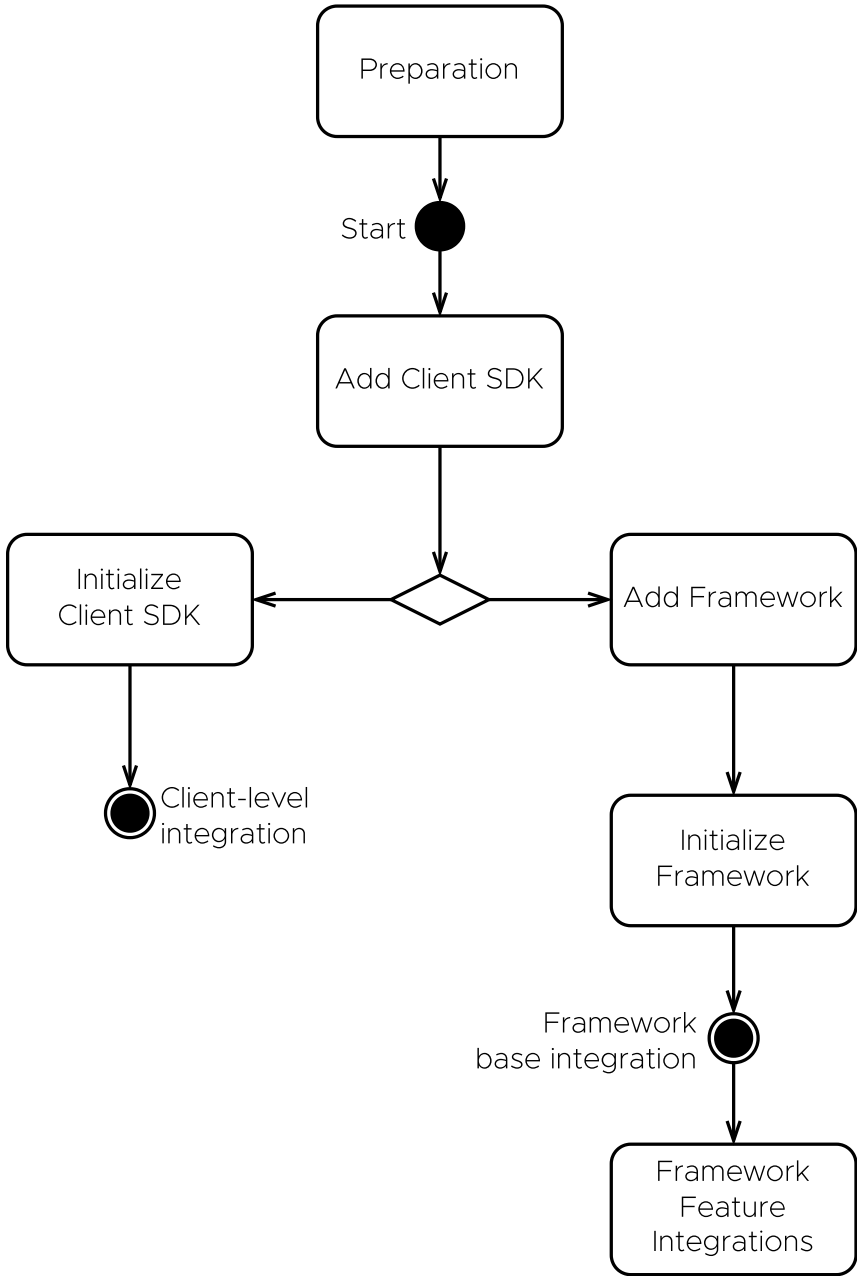


Diagram 1: Base Integration paths

Task: Add Client SDK

Adding the Client SDK is a Workspace ONE platform integration task for Android application developers. It applies to all levels of platform integration.

If you haven't installed your application via Workspace ONE at least once, then do so now. If you don't, the application under development won't work when installed via the Android Debug Bridge (adb). Instructions for installing via Workspace ONE can be found in the Integration Guides document set, in the Integration Preparation guide.

The first step will be to set up the build configuration and files. These instructions assume that your application has a typical project structure, as follows:

- *Project* files in the root directory.
- *Application* module in a sub-directory.
- Separate `build.gradle` files for the project and application.

Project Structure Diagram

The following diagram illustrates the expected project directory structure, and the locations of changes to be made.

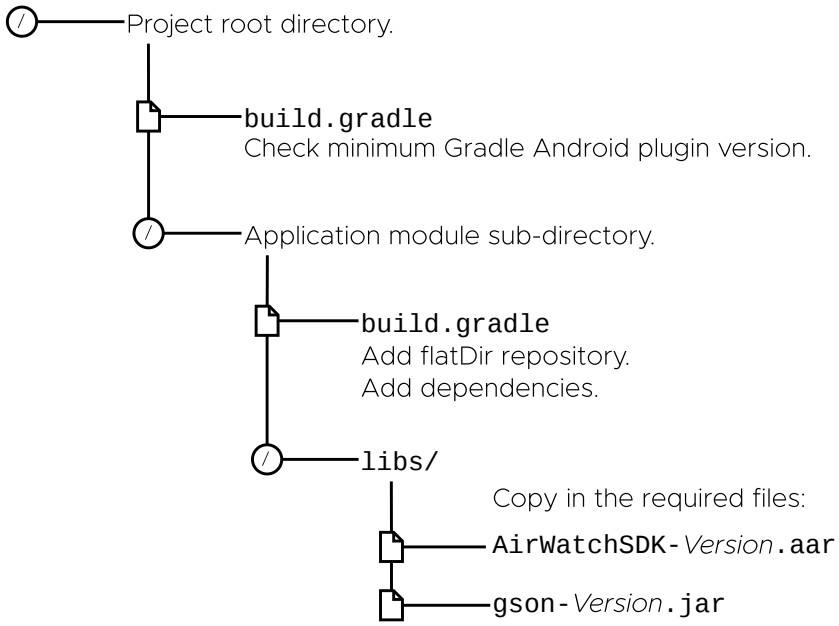


Diagram 2: Project structure and locations of changes

Tip: It might be easier to see the structure, and identify which Gradle file is which, in the Android Studio project navigator if you select the Project view, instead of the Android view.

Software Development Kit Download Structure Diagram

The following diagram illustrates the directory structure of the SDK download.

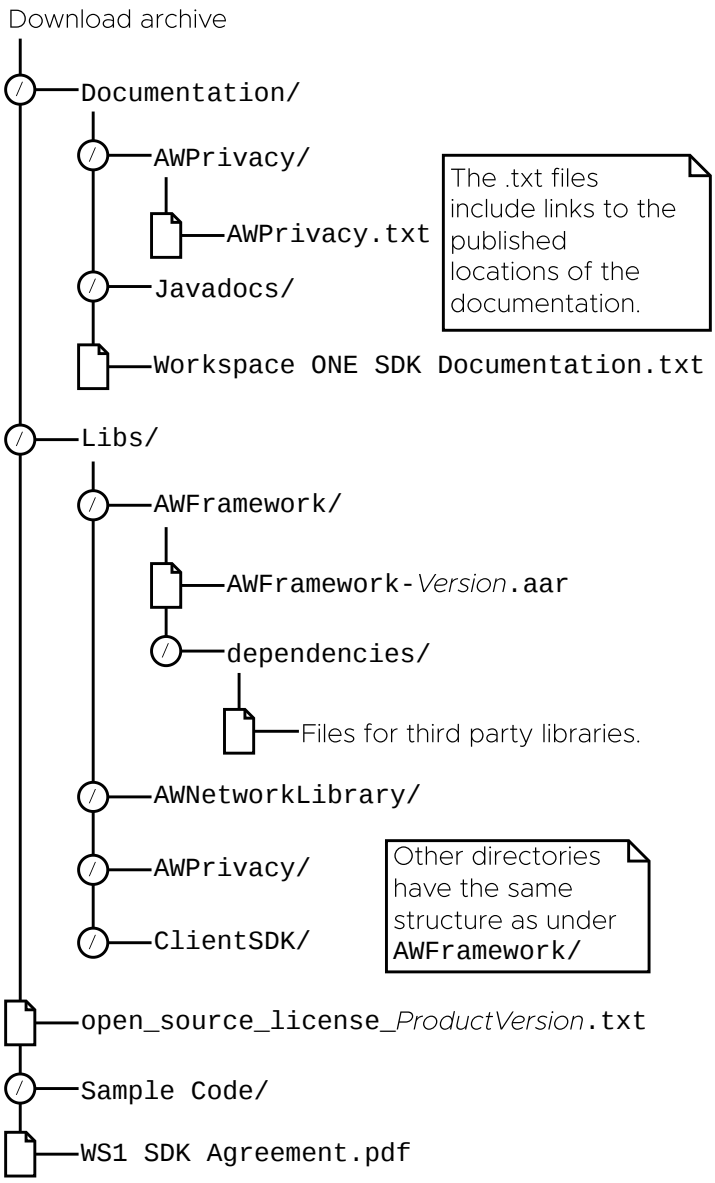


Diagram 3: Download structure of the SDK for Android

Files from within the above structure are copied under your application project in the following instructions.

Instructions

Proceed as follows.

Build Configuration and Files

First, update the build configuration and add the required library files.

1. **Update the Gradle Android plugin version, if necessary.**

   In the project build.gradle file, check the Android plugin version. This is typically near the top of the file, inside the `buildscript` block, in the `dependencies` sub-block. The top of the file might look like this:

   ```
   buildscript {
       ...
       repositories {
           ...
       }
       dependencies {
           classpath 'com.android.tools.build:gradle:7.2.2'
           ...
       }
   }
   ```

   In this example, the Gradle Android plugin version is 7.2.2

   Ensure that the plugin version is at least 7.2.1

   The location of this change is shown in the Project Structure Diagram.

2. **Add the required packaging and compile options.**

   In the application build.gradle file, in the `android` block, add the Java version compatibility declarations shown in the following snippet.

   ```
   ...
   android {
       compileSdk 33

       // Following blocks are added.
       compileOptions {
           sourceCompatibility JavaVersion.VERSION_1_8
           targetCompatibility JavaVersion.VERSION_1_8
       }
       kotlinOptions {
           jvmTarget = "1.8"
       }
       packagingOptions {
          exclude 'META-INF/kotlinx-serialization-runtime.kotlin_module'
       }
       // End of added blocks.

       defaultConfig {
           targetSdk 33
           ...
       }
       buildTypes {
           ...
       }
   }
   ```

3. **Add the required libraries to the build.**

   Still in the application build.gradle file, in the `dependencies` block, add references to the required libraries. For example:

```
repositories {
    maven {
        url 'https://vmwaresaas.jfrog.io/artifactory/Workspace-ONE-Android-SDK/'
    }
}

dependencies {
    // Integrate Workspace ONE at the Client level.
    //
    // Before downloading, installing, or using the VMware Workspace ONE
    // SDK you must:
    //
    // -   Review the VMware Workspace ONE Software Development Kit License
    //     Agreement that is posted here.
    //     https://developer.vmware.com/docs/12215/WorkspaceONE_SDKLicenseAgreement.pdf
    //
    //     By downloading, installing, or using the VMware Workspace ONE SDK you
    //     agree to these license terms. If you disagree with any of the terms, then
    //     do not use the software.
    //
    // -   Review the VMware Privacy Notice and the Workspace ONE UEM Privacy
    //     Disclosure for information on applicable privacy policies.
    //     https://www.vmware.com/help/privacy.html
    //     https://www.vmware.com/help/privacy/uem-privacy-disclosure.html
    implementation "com.airwatch.android:AirWatchSDK:23.03"
}
```

   The location of this change is shown in the Project Structure Diagram.

This completes the required changes to the build configuration. Build the application to confirm that no mistakes have been made. After that, continue with the next step, which is Service Implementation.

In case you encounter an error, check the Early Version Support Build Error first.

If you haven't installed your application via Workspace ONE at least once, then the application under development won't work when installed via the Android Debug Bridge (adb). Instructions for installing via Workspace ONE can be found in the Integration Guides document set, in the Integration Preparation guide.

Service Implementation

The Workspace ONE Client SDK runtime receives various essential notifications from the management console. An implementation of a specific Android broadcast receiver and service must be added to your application to support this.

Proceed as follows.

1. **Implement an AirWatch SDK Service class.**
   - Add a new class to your application.
   - Declare the new class as a subclass of the `AirWatchSDKBaseIntentService` class.
   - Add dummy implementations of the required methods.

   In Java, the class could look like this:

```
public class AirWatchSDKIntentService extends AirWatchSDKBaseIntentService {
    @Override
    protected void onApplicationConfigurationChange(
        Bundle applicationConfiguration) { }

    @Override
    protected void onApplicationProfileReceived(
        Context context,
        String profileId,
        ApplicationProfile awAppProfile) { }

    @Override
    public void onClearAppDataCommandReceived(
        Context context,
        ClearReasonCode reasonCode) { }

    @Override
    protected void onAnchorAppStatusReceived(
        Context context,
        AnchorAppStatus appStatus) { }

    @Override
    protected void onAnchorAppUpgrade(Context context, boolean isUpgrade) { }
}
```

   In Kotlin, the class could look like this:

```
class AirWatchSDKIntentService: AirWatchSDKBaseIntentService() {
    override fun onApplicationConfigurationChange(applicationConfiguration: Bundle) { }

    override fun onApplicationProfileReceived(
        context: Context,
        profileId: String,
        appProfile: ApplicationProfile){ }

    override fun onClearAppDataCommandReceived(context: Context, reasonCode: ClearReasonCode)
    { }

    override fun onAnchorAppStatusReceived(context: Context, appStatus: AnchorAppStatus) { }

    override fun onAnchorAppUpgrade(context: Context, isUpgrade: Boolean) { }
}
```

2. **Declare the permission and interaction filter.**

   In the Android manifest file, inside the `manifest` block but outside the `application` block, add declarations like the following.

```
<?xml version="1.0" encoding="utf-8"?>
<manifest ...>

<!-- Following declarations are added -->
<uses-permission android:name="com.airwatch.sdk.BROADCAST" />

<!-- Following tag applies to compileSdkVersion 30 or later. -->
<queries>
    <intent>
        <action android:name="com.airwatch.p2p.intent.action.PULL_DATA" />
    </intent>
</queries>

<!-- End of added declarations.>

<application ...>
...
```

3. **Declare the receiver and service.**

   In the Android manifest file, inside the `application` block, add `receiver` and `service` declarations like the following.

```
<application>

    ...

    <receiver
        android:name="com.airwatch.sdk.AirWatchSDKBroadcastReceiver"
        android:permission="com.airwatch.sdk.BROADCAST" >
        <intent-filter>
            <!--
            Next line uses the initial dot notation as a shorthand for the package name.
            -->
            <action android:name=".airwatchsdk.BROADCAST" />
        </intent-filter>
        <intent-filter>
            <action
                android:name="com.airwatch.intent.action.APPLICATION_CONFIGURATION_CHANGED"
                />

            <!--
            In the host attribute, replace com.your.package with the package name of your
            application.
            -->
            <data android:scheme="app" android:host="com.your.package" />

        </intent-filter>
        <intent-filter>
            <action android:name="android.intent.action.PACKAGE_ADDED" />
            <action android:name="android.intent.action.PACKAGE_REMOVED" />
            <action android:name="android.intent.action.PACKAGE_REPLACED" />
            <action android:name="android.intent.action.PACKAGE_CHANGED" />
            <action android:name="android.intent.action.PACKAGE_RESTARTED" />
            <data android:scheme="package" />
        </intent-filter>
    </receiver>

    <service android:name=".AirWatchSDKIntentService"/>

</application>
```

4. **Apps targeting API level 31 or above, need to implement SDKClientConfig in their Application class and override getEventHandler() and return WS1AnchorEvents Implementation object.**

```
public class AppApplication extends Application implements SDKClientConfig {
   @NonNull
   @Override
   public WS1AnchorEvents getEventHandler() {
      return new WS1AnchorAppEventImpl();
   }
}`
```

This completes the required service implementation. Build the application to confirm that no mistakes have been made.

If you haven't installed your application via Workspace ONE at least once, then the application under development won't work when installed via the Android Debug Bridge (adb). Instructions for installing via Workspace ONE can be found in the Integration Guides document set, in the Integration Preparation guide.

Next Steps

After completing the above, continue with the next task, which could be either of the following.

- Initialize the Client SDK, if your application will use only Client-level integration.
- Add the Framework, otherwise.

Task: Initialize Client SDK

Client SDK initialization is a Workspace ONE platform integration task for Android application developers. It applies only to Client-level integration, not to Framework integration.

The Client SDK initialization task is dependent on the Add the Client SDK task. The following instructions assume that the dependent task is complete already.

SDKManager

The main class of the Client SDK is SDKManager. It must be initialized before use. Initialize it by calling the `init` class method. The call must be on a background thread. An Android Context object is required, which could be an Activity instance for example.

In Java, code for an Activity that initializes the SDKManager could look like this:

```
public class MainActivity extends Activity {
    SDKManager sdkManager = null;

    @Override
    protected void onCreate(@Nullable Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        ...
        startSDK();
    }

    private void startSDK() { new Thread(new Runnable() {
        @Override
        public void run() {
            try {
                final SDKManager initSDKManager = SDKManager.init(MainActivity.this);
                sdkManager = initSDKManager;
                toastHere(
                    "Workspace ONE console version:" + initSDKManager.getConsoleVersion());
            }
            catch (Exception exception) {
                sdkManager = null;
                toastHere(
                    "Workspace ONE failed " + exception + ".");
            }
        }
    }).start(); }

    private void toastHere(final String message) {runOnUiThread(new Runnable() {
        @Override
        public void run() {
            Toast.makeText(MainActivity.this, message, Toast.LENGTH_LONG).show();
        }
    });}

    ...
}
```

In Kotlin, code for an Activity that initializes the SDKManager could look like this:

```
class MainActivity : Activity() {

    private var sdkManager: SDKManager? = null

    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        ...
        startSDK()
    }

    private fun startSDK() { thread {
        try {
            val initSDKManager = SDKManager.init(this)
            sdkManager = initSDKManager
            toastHere("Workspace ONE console version:${initSDKManager.consoleVersion}")
        }
        catch (exception: Exception) {
            sdkManager = null
            toastHere("Workspace ONE failed $exception.")
        }
    } }

    private fun toastHere(message: String) { runOnUiThread {
        Toast.makeText(this, message, Toast.LENGTH_LONG).show()
    } }

    ...
}
```

Calling the `init` method completes SDK Manager initialization. Build and run the application to verify that no mistakes have been made.

Next Steps

After the SDKManager instance has been received from the init call, its other methods can be called. Check the reference documentation for details of the programming interface.

This completes Client-level integration.

Task: Add Framework

Adding the Framework is a Workspace ONE platform integration task for Android application developers. Adding the Framework is necessary if the application will make use of platform features such as authentication, single sign-on, data encryption, or networking.

This task is dependent on the Add the Client SDK task. The following instructions assume that the dependent task is complete already.

Build Configuration and Files

This task involves changing your application project's build configuration and files. These instructions assume that your application has a typical project structure, same as the Add Client SDK task, as shown in the Project Structure Diagram.

A number of libraries will be added to the project. These can be divided into the following categories.

- Workspace ONE libraries that are part of the SDK.
- Third party libraries that are distributed with the SDK.
- Third party libraries that are hosted remotely, for example in a Maven repository, and included via Gradle.

Proceed as follows.

1. **Add the required libraries to the build.**

   In the application build.gradle file, in the `dependencies` block, add references to the required libraries. For example:

```
repositories {
    maven {
        url 'https://vmwaresaas.jfrog.io/artifactory/Workspace-ONE-Android-SDK/'
    }
}

dependencies {
    // Integrate Workspace ONE at the Framework level.
    //
    // Before downloading, installing, or using the VMware Workspace ONE
    // SDK you must:
    //
    // -   Review the VMware Workspace ONE Software Development Kit License
    //     Agreement that is posted here.
    //     https://developer.vmware.com/docs/12215/WorkspaceONE_SDKLicenseAgreement.pdf
    //
    //     By downloading, installing, or using the VMware Workspace ONE SDK you
    //     agree to these license terms. If you disagree with any of the terms, then
    //     do not use the software.
    //
    // -   Review the VMware Privacy Notice and the Workspace ONE UEM Privacy
    //     Disclosure for information on applicable privacy policies.
    //     https://www.vmware.com/help/privacy.html
    //     https://www.vmware.com/help/privacy/uem-privacy-disclosure.html
    implementation "com.airwatch.android:AWFramework:23.03"
}
```

Your application might already require different versions of some of the same libraries required by the SDK. Warning messages will be generated in the build output in that case, for example stating that there are incompatible JAR files in the classpath.

You can resolve this by selecting one or other version, either the SDK requirement or your app's original requirement.
In principle, the SDK isn't supported with versions other than those given in the above. In practice however, problems are unlikely to be encountered with later versions.

2. **Add annotation processor support.**

   In the application build.gradle file, add the `kotlin-kapt` plugin. The plugin can be added in the plugins block at the start of the file, for example as shown in the following snippet.

```
plugins {
    id 'com.android.application'
    id 'kotlin-android'
    id 'kotlin-android-extensions'

    // Following line adds the required plugin.
    id 'kotlin-kapt'
}
...
```

3. **Add the required packaging and compile options.**

   Still in the application build.gradle file, in the `android` block, add the packaging option shown in the following snippet.

```
...
android {
    compileSdk 33

    // Following block is added.
    packagingOptions {
        pickFirst '**/*.so'
    }
    // End of added block.

    defaultConfig {
        targetSdk 33
        ...
    }
    buildTypes {
        ...
    }
}
...
```

   The above assumes that support for earlier Android operating system versions and processor architectures isn't required in the application. If support is required, also follow the instructions in the Appendix: Early Version Support.

4. **App targeting API level 31 or above, override getEventHandler() in App's Application class to return WS1AnchorEvents object.**

```
public class AppApplication extends AWApplication {
   @NonNull
   @Override
   public WS1AnchorEvents getEventHandler() {
      return new WS1AnchorAppEventImpl();
   }
}
```

This completes the required changes to the build configuration. Build the application to confirm that no mistakes have been made. After that, continue with the next task, which is to Initialize the Framework.

In case you encounter an error, check the Early Version Support Build Error first.

Task: Initialize Framework

Framework initialization is a Workspace ONE platform integration task for Android application developers. It applies to Framework-level integration, not to Client-level integration.

The Framework initialization task is dependent on the Add the Framework task. The following instructions assume that the dependent task is complete already.

Select initialization class

Framework initialization can start from either an Android Application subclass, referred to as initialization by *delegation*, or from a Workspace ONE SDK AWApplication subclass, referred to as initialization by *extension*. Choose the better option for your application, as follows.

- If your application has an Android Application subclass, then choose it as the Framework initialization class. Proceed to these instructions: Initialize by delegation from an Android application subclass.
- Otherwise, create a Workspace ONE SDK AWApplication subclass and it will be the Framework initialization class. Proceed to these instructions: Create an initialization subclass by extension.

Initialize by delegation from an Android Application subclass

Follow these instructions to initialize from an Android Application subclass. This is an alternative to creating an AWApplication subclass. See Select initialization class for a discussion of the alternatives.

Update your Android Application subclass as follows.

- Declare that the class implements the AWSDKApplication interface.
- Add an AWSDKApplicationDelegate instance as a property.
- Move the code from the body of your onCreate method, if any, to an override of the AWSDKApplication onPostCreate method.
- Override the AWSDKApplication getMainActivityIntent() method to return an Intent for the application's main Activity.
- Override the following Android Application methods:
  - onCreate
  - getSystemService
  - attachBaseContext

  The required overrides are shown in the code snippets below, in Kotlin and in Java.
- Implement all the other AWSDKApplication methods by calling the same method in the AWSDKApplicationDelegate instance.

  Kotlin delegation-by can be used for the implementation. This is illustrated in the Initialization by delegation in Kotlin code snippet below.

Initialization by delegation in Java

In Java, the class could look like this:

```
public class Application extends android.app.Application implements AWSDKApplication {
    // SDK Delegate.
    private final AWSDKApplicationDelegate awDelegate = new AWSDKApplicationDelegate();
    @NotNull
    @Override
    public AWSDKApplication getDelegate() { return awDelegate; }

    // Android Application overrides for integration.
    @Override
    public void onCreate() {
        super.onCreate();
        this.onCreate(this);
    }

    @Override
    public Object getSystemService(String name) {
        return this.getAWSystemService(name, super.getSystemService(name));
    }

    @Override
    public void attachBaseContext(@NotNull Context base) {
        super.attachBaseContext(base);
        attachBaseContext(this);
    }

    // Application-specific overrides.
    @Override
    public void onPostCreate() {
        // Code from the application's original onCreate() would go here.
    }

    @NonNull
    @Override
    public Intent getMainActivityIntent() {
        // Replace MainActivity with application's original main activity.
        return new Intent(getApplicationContext(), MainActivity.class);
    }

    // Mechanistic AWSDKApplication abstract method overrides.

    // Methods that return a value could follow this as a template:
    @Nullable
    @Override
    public Object getAWSystemService(@NotNull String name, @Nullable Object systemService) {
        return awDelegate.getAWSystemService(name, systemService);
    }

    // Methods that return void could follow this as a template:
    @Override
    public void attachBaseContext(@NotNull android.app.Application application) {
        awDelegate.attachBaseContext(application);
    }



    // ... Many more overrides here.
}
```

Initialization by delegation in Kotlin

In Kotlin, the class could look like this:

```
// This class uses Kotlin delegation to implement the AWSDKApplication
// interface.
// A new AWSDKApplicationDelegate instance is allocated on the fly as the
// delegate. For background on Kotlin delegation, see:
// https://kotlinlang.org/docs/reference/delegation.html
open class Application:
    android.app.Application(),
    AWSDKApplication by AWSDKApplicationDelegate()
{
    // Android Application overrides for integration.
    override fun onCreate() {
        super.onCreate()
        onCreate(this)
    }

    override fun getSystemService(name: String): Any? {
        return getAWSystemService(name, super.getSystemService(name))
    }

    override fun attachBaseContext(base: Context?) {
        super.attachBaseContext(base)
        attachBaseContext(this)
    }

    // Application-specific overrides.
    override fun onPostCreate() {
        // Code from the application's original onCreate() would go here.
    }

    override fun getMainActivityIntent(): Intent {
        // Replace MainActivity with application's original main activity.
        return Intent(applicationContext, MainActivity::class.java)
    }
}
```

Next

This completes initialization from an Android Application subclass. Now continue with the next step, which is to configure the initialization class in the manifest.

Create an initialization subclass by extension

Follow these instructions to create a Framework initialization AWApplication subclass. This is an alternative to initialising from an Android Application subclass. See Select initialization class for a discussion of the alternatives.

Add to your application code a new class that:

- Is declared as an AWApplication subclass.
- Overrides the getMainActivityIntent() method to return an Intent for the application's main Activity.
- Implements the other required methods with dummies.

In Java, the class could look like this:

```
// Note the fully qualified class name in the extends declaration.
public class AWApplication extends com.airwatch.app.AWApplication {
    @NotNull
    @Override
    public Intent getMainActivityIntent() {
        return new Intent(getApplicationContext(), MainActivity.class);
    }

    @Override
    public void onSSLPinningRequestFailure(
            @NotNull String host, X509Certificate x509Certificate
    ) {
    }

    @Override
    public void onSSLPinningValidationFailure(
            @NotNull String host, X509Certificate x509Certificate
    ) {
    }
}
```

In Kotlin, the class could look like this:

```
// Note the fully qualified base class name.
open class AWApplication: com.airwatch.app.AWApplication() {
    override fun getMainActivityIntent(): Intent {
        return Intent(applicationContext, MainActivity::class.java)
    }

    override fun onSSLPinningRequestFailure(
        host: String,
        serverCACert: X509Certificate?
    ) {
    }

    override fun onSSLPinningValidationFailure(
        host: String,
        serverCACert: X509Certificate?
    ) {
    }

}
```

This completes the creation of an initialization subclass. Now continue with the next step, which is to configure the initialization class in the manifest.

Configure the initialization class in the manifest

Follow these instructions to configure your selected initialization class in the Android manifest. The initialization class will be either the existing Android Application subclass, or a new AWApplication subclass that was just created. See Select initialization class for a discussion of the alternatives.

Proceed as follows.

1. **Add the Android schema tools.**

   The tools can be added at the top of the file, in the manifest tag, for example like this:

```
<manifest
    xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.integrationguide"
    xmlns:tools="http://schemas.android.com/tools"
    >
```

2. **Update the application declaration.**

   The application declaration must be updated to:

   - Declare an application class name, if it wasn't already declared.
   - Replace the label.
   - Override the allowBackup flag with the setting from the SDK manifest.

   These updates can be made in the application tag, for example like this:

```
<application
    android:name=".YourApplicationOrAWApplicationSubClass"
    android:label="@string/app_name"
    ...
    tools:replace="android:label, android:allowBackup, android:networkSecurityConfig"
    >
```

3. **Set the launcher and main Activity to be from the Framework.**

   If the application had a previous declaration for launcher and main Activity, remove it. Instead, declare the Framework SDKSplashActivity as launcher and main.

   New declarations could look like this, for example:

```
<activity
    android:name=".MainActivity"
    >
    <!-- Original launcher and main declarations removed. -->
</activity>
<activity
    android:name="com.airwatch.login.ui.activity.SDKSplashActivity"
    android:label="@string/app_name"
    >
    <intent-filter>
        <action android:name="android.intent.action.MAIN" />
        <category android:name="android.intent.category.LAUNCHER" />
    </intent-filter>
</activity>
```

4. **Update the AirWatch SDK service declaration.**

   The AirWatch SDK service was declared and implemented in the Service Implementation task. The declaration will be inside the application block, perhaps after the receiver block for the service. It must now be updated to have the bind-job permission, for example like this:

```
<application>
    ...
    <receiver>
        ...
    </receiver>
    <service
        android:name=".AirWatchSDKIntentService"
        android:permission="android.permission.BIND_JOB_SERVICE"
        />
</application>
```

5. **Declare the required permission.**

If your app targets Android 13 or higher, then in order to see notifications declare the below permission in your app's manifest file if not present already. developer.android.com/...13/...#notification-permission

```
<uses-permission android:name="android.permission.POST_NOTIFICATIONS"/>
```

This completes the initialization class configuration.

Request the required Permissions

If your app targets Android 13 or higher, request the new notification permission from your app's MainActivity if not requested already. developer.android.com/...13/...#notification-permission

Below is the code snippet, for example:

```
    private void setupPermissions() {
        if(Build.VERSION.SDK_INT >= Build.VERSION_CODES.TIRAMISU) {
            int permission = ContextCompat.checkSelfPermission(
                this,
                Manifest.permission.POST_NOTIFICATIONS
            );

            if (permission != PackageManager.PERMISSION_GRANTED) {
                ActivityCompat.requestPermissions(
                    this,
                    new String[]{Manifest.permission.POST_NOTIFICATIONS},
                    NOTIFICATION_REQ_CODE
                );
            }
        }
    }

    @Override
    public void onRequestPermissionsResult(int requestCode, @NonNull String[] permissions, @NonNull int[] grantResults) {
        super.onRequestPermissionsResult(requestCode, permissions, grantResults);

        if (requestCode == NOTIFICATION_REQ_CODE){
            if (grantResults.length == 0 || grantResults[0] != PackageManager.PERMISSION_GRANTED) {
            toastHere("Notification Permission has been denied by user");
            } else {
            toastHere("Notification Permission has been granted by user");
            }
        }
    }
```

This completes requesting the required permissions.

Next Steps

Build and run the application to confirm that no mistakes have been made.

The Workspace ONE splash screen should be shown at launch, Other SDK screens might also be shown depending on the configuration in the management console. See the Appendix: User Interface Screen Capture Images.

After completing the above, you can proceed to:

- Networking integration.
- Branding integration.
- Integration of other framework features.

See the respective documents in the Workspace ONE Integration Guide for Android set. An overview that includes links to all the guides in the set is available

- in Markdown format, in the repository that also holds the sample code: https://github.com/vmware-samples/...IntegrationOverview.md
- in Portable Document Format (PDF), on the VMware website: https://developer.vmware.com/...IntegrationOverview.pdf

Appendix: Early Version Support

The Workspace ONE SDK can be integrated with early versions of Android, by following some additional steps. Early versions here means back to 5.0 Android, which is API level 21. If your application won't support devices running early Android versions, skip the instructions in this section.

To support early versions, change the build configuration to:

- Enable Multidex explicitly.

To make the changes, proceed as follows.

1. **Configure the build.**

   In the application build.gradle file, in the `android` block, within the `defaultConfig` block, add the required settings, for example:

```
...
android {
    ...
    defaultConfig {
        ...
        multiDexEnabled true
        ...
    }
    ...
}
...
```

This concludes the required changes to support early Android versions. Build the application to confirm that no mistakes have been made.

In case the above changes don't seem to work, you can instead try the changes in the Alternative Early Version Support section, below.

All being well, continue with other integration tasks.

Alternative Early Version Support

The following code snippet shows an alternative approach to early version support to the above build configuration change. The alternative is to specify a conditional minimum SDK version, dependent on the build type.

Use this approach in case the first approach doesn't work or isn't suitable for your app.

```
ext {
    minSdkVersion = 21
}
android {
    defaultConfig {
        minSdkVersion getMinSDK()
    }
}
buildTypes {
    release {
        minifyEnabled true
        signingConfig signingConfigs.debug
    }
}
def getMinSDK() {
    if (gradle.startParameter.taskNames.toString().contains("Debug")) {
        return 23
    } else {
        return minSdkVersion
    }
}
```

Early Version Support Build Error

If early version support is required but hasn't been implemented, error messages like the following will be shown at build time.

```
Caused by: com.android.tools.r8.utils.AbortException: Error: null,
Cannot fit requested classes in the main-dex file (# methods: 66121 > 65536)
Caused by: java.lang.RuntimeException:
com.android.builder.dexing.DexArchiveMergerException: Error while merging dex archives
```

To resolve the error, make the build configuration changes at the start of this Appendix: Early Version Support.

Background Reading for Early Version Support

For background, see these pages on the Android developer website.

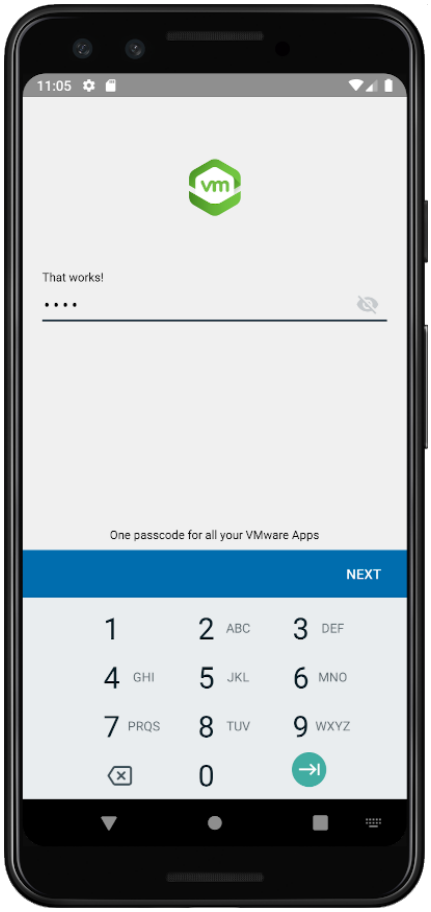
- Multidex: https://developer.android.com/...multidex#mdex-on-l

(Some PDF viewers incorrectly escape the hash anchor marker in the above links. If that happens, edit the link in the browser address bar.)

Appendix: User Interface Screen Capture Images

The following images show screens that are part of the Workspace ONE SDK user interface.

Screen capture 1: Splash screen



Screen capture 2: Login screen

The splash screen should be shown during every launch of an application that is integrated to the Framework level. The login screen might be shown afterwards, depending on the application state and the configuration in the management console.

Appendix: Troubleshooting

Kotlin Compatibility

Occasionally, one may encounter an exception containing the message “Class ‘kotlin.Unit’ was compiled with an incompatible version of Kotlin. The binary version of its metadata is 1.7.1, expected version is 1.5.1.” during compilation. This exception is due to incompatible versions of your app with the Workspace One SDK. As of Release 23.03, all apps consuming WS1 will be required to use Kotlin v1.7.1 or higher.

Empty Response from AirWatch MDM Service

Occasionally, one may encounter the message “Empty Response from Airwatch MDM Service” in the adb log during app integration into Workspace ONE. This error message is triggered when the app was not installed via Intelligent Hub.

To resolve this error, it is recommended to upload the APK to the UEM once, then install the app through Intelligent Hub.

For detailed instructions please refer to the Integration Preperation Guide, specifically

Appendix: How to upload an Android application to the management console

- as Markdown: Preperation Guide - Appendix: How to upload an Android application to the management console
- as PDF: Preperation Guide - Appendix: How to upload an Android application to the management console

and

Task: Install application via Workspace ONE

- as Markdown: Preparation Guide - Task: Install application via Workspace ONE
- as PDF: Preparation Guide - Task: Install application via Workspace ONE

Once the APK has been uploaded to the UEM and installed via Workspace ONE, the app can then be subsequently side-loaded by the ABD provided the side load is signed by the same developer key as the original upload. To ensure your APK is signed on every build please refer to the Preperation Guide, specifically

Appendix: How to generate a signed Android package every build

- as Markdown Preparation Guide - How to generate a signed Android package every build
- as PDF: Preparation Guide - How to generate a signed Android package every build

Document Information

Published Locations

This document is available

- in Markdown format, in the repository that also holds the sample code: https://github.com/vmware-samples/...BaseIntegration.md
- in Portable Document Format (PDF), on the VMware website: https://developer.vmware.com/...BaseIntegration.pdf

Revision History

03jul2020	First publication, for 20.4 SDK for Android.
31jul2020	Update for 20.7 SDK for Android.
30aug2020	Update for 20.8 SDK for Android.
03sep2020	Post-release update.
01oct2020	Update for 20.9 SDK for Android.
11oct2020	Post-release update.
03nov2020	Update for 20.10 SDK for Android.
06nov2020	Post-release update.
15dec2020	Update for 20.11 SDK for Android.
18feb2021	Update for 21.1 SDK for Android.
10mar2021	Update for 21.2 SDK for Android.
07apr2021	Update for 21.3 SDK for Android.
17jun2021	Update for 21.5.1 SDK for Android.
13jul2021	Update for 21.6 SDK for Android.
29jul2021	Update for 21.6.1 SDK for Android.
18aug2021	Update for 21.7 SDK for Android.
15sep2021	Update for 21.8 SDK for Android.
26oct2021	Update for 21.10 SDK for Android.
09Dec2021	Update for 21.11 SDK for Android.
26Jan2022	Update for 22.1 SDK for Android.
28Feb2022	Update for 22.2 SDK for Android.
04Apr2022	Updated for 22.3 SDK for Android.
29Apr2022	Updated for 22.4 SDK for Android.
06Jun2022	Updated for 22.5 SDK for Android.
05Jul2022	Updated for 22.6 SDK for Android.
23Aug2022	Updated for 22.8 SDK for Android.
04Nov2022	Updated for 22.10 SDK for Android.
13Dec2022	Updated for 22.11 SDK for Android.
25Jan2023	Updated for 23.01 SDK for Android.
15Mar2023	Updated for 23.03 SDK for Android.

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