Adobe AIR SDK Release Notes

Version	**51.2.2.4**
Date	31 August 2025
Document ID	HCS19-000287
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1 Release Overview

Release 51.2.2.1 is an update to the 51.2.1 versions, with changes to the build of the Android runtimes and of the ADT tool in order to support the latest versions of the Android and iOS platforms.

This has been created as an interim update prior to a 51.3 version that will include other functional updates requiring changes in the XML application descriptor schema.

This release can be used for application distribution, however as per 51.2.1, the ANGLE support on Windows is not yet suitable for all ANGLE versions, and the multimedia capabilities on Linux still have several issues.

Release 51.2.2.2 fixes a number of bugs including some critical issues with 51.2.2.1, updates are displayed in a dark red font.

Release 51.2.2.3 is an update primarily for iPhone/AppleTV development which includes updated/additional stub libraries from the Apple 18.2 SDKs, as well as fixes to ensure IPA files can be generated on both macOS and Windows. Updates are displayed in a light blue font.

Release 51.2.2.4 contains a number of bug fixes across the different platforms. Updates are displayed in a green font.

1.1 Key changes

The Android runtime libraries are still built using the same toolchain (prior to our build system updates that will be used for 51.3) but with additional flags to ensure they are compatible with the 16kb virtual memory page size requirements that Android are introducing.

The ADT tool has also been updated to output the appropriate version codes for iOS (in an IPA file's Info.plist entries) and for Android (to use the compatible versions of the Android Gradle Plug-in and of Gradle itself).

See sections 3.4 and 3.5.1.

Bug fixes in 51.2.2.2 can be found in section 3.5.2.

Bug fixes in 51.2.2.3 can be found in section 3.5.3.

Bug fixes in 51.2.2.4 can be found in section 3.5.4.

1.2 Deployment

To obtain the release, developers will need to install the AIR SDK Manager, available from the https://airsdk.dev website, as part of the "getting started" instructions, or directly from github at: https://github.com/airsdk/airsdkmanager-releases

For Flex developers, once an AIR SDK has been downloaded, it can be merged onto an existing Flex (or Flex+AIR) SDK folder using the AIR SDK Manager – click on the cog icon on the right of an installed SDK, and select "Flex SDK Overlay".

1.3 Limitations

For macOS users on 10.15+, the SDK may not work properly unless the quarantine setting is removed from the SDK: `$ xattr -d -r com.apple.quarantine /path/to/SDK`

Please note that there is no longer support for 32-bit IPA files, all IPAs will use just 64-bit binaries now so older iPhones/iPads may not be supported.

Android development should now be performed with an installation of Android Studio and the SDK and build tools, so that the new build mechanism (using Gradle and the Android Gradle Plug-in) can use the same set-up as Android Studio.

Linux runtimes are built using Ubuntu 16 for x86_64 variants in order to provide maximum compatibility; however for arm64, the build environment uses Ubuntu 22 which then restricts usage to similar versions of Linux (i.e. that have glibc version 2.34 or later).

Note that ANGLE support on Windows, and H.264/AAC support on Linux using FFMEG, are both features that are currently causing significant issues and instabilities, and should only be used if a particular app has been tested sufficiently on all the target platforms.

1.4 Feedback

Any issues found with the SDK should be reported to adobe.support@harman.com or preferably raised on https://github.com/airsdk/Adobe-Runtime-Support/issues.

The website for AIR SDK is available at: https://airsdk.harman.com with the developer portal available under https://airsdk.dev

1.5 Notes

Contributors to the https://airsdk.dev website would be very welcomed: this portal is being built up as the repository of knowledge for AIR and will be taking over from Adobe's developer websites

The AS3 documentation for AIR is updated and now also available under this site: https://airsdk.dev/reference/actionscript/3.0/

We will continue to provide the shared AIR runtime for Windows/macOS; however, this is not a recommended deployment mechanism, it is prefereably to create native installers based on the "bundle" deployments.

On MacOS in particular, the use of the shared AIR runtime to 'install' a .air file will not create a signed application, hence new MacOS versions may block these from running. To ensure a properly signed MacOS application is created, the "bundle" option should be used with native code-signing options (i.e. those appearing after the "-target bundle" option) having a KeychainStore type with the alias being the full certificate name.

2 Release Information

2.1 Delivery Method

The 51.2 releases will only be available via the AIR SDK Manager. The latest version of this can be downloaded from https://github.com/airsdk/airsdkmanager-releases/releases.

2.2 The Content of the Release

2.2.1 Detailed SW Content of the Release

Component Name	**51.2.2.1**	**51.2.2.2**	**51.2.2.3**	**51.2.2.4**
Core Tools	3.5.9	3.5.10	3.5.11	3.5.12
AIR Tools	3.1.2			
Windows platform package	3.5.7	3.5.8		3.5.9
MacOS platform package	3.5.7	3.5.8		3.5.9
Linux platform package	3.5.8	3.5.9		3.5.10
Android platform package	3.5.9	3.5.10		3.5.11
iPhone platform package	3.5.6	3.5.7	3.5.8	3.5.9

2.2.2 Delivered Documentation

Title	Document Number	Version
Adobe AIR SDK Release Notes	HCS19-000287	51.2.2

2.2.3 Build Environment

Platform	**Build Details**	
Android	Target SDK Version:	34
	Minimum SDK Version:	21
	Platform Tools:	28.0.3
	Build Tools:	34.0.0
	SDK Platform:	Android-34
	Note – these are the versions we use to build the AIR SDK and runtime, not the versions that will be generated or used by applications created by the AIR Developer Tool.	
iOS	iPhoneOS SDK Version:	18.2
	iPhoneSimulator SDK Version:	18.2
	XCode Version:	16.2
	Minimum iOS Target:	12.0

tvOS	tvOS SDK Version: tvSimulator SDK Version: XCode Version: Minimum tvOS Target:	18.2 18.2 16.2 12.0
MacOS	MacOS SDK Version: XCode Version: Minimum macOS Target:	15.2 16.2 10.13
Windows	Visual Studio Version:	14.0.25431.01 Update 3
Linux	GCC Version	5.4.0 (Ubuntu 16.04.1 – x86_64) 11.4.0 (Ubuntu 22.04.3 – arm64)

2.3 AIR for Linux – Restrictions

The AIR SDK now supports both x86_64 and arm64 based Linux platforms. These are only available to developers with a commercial license to the SDK, and have some restrictions:

- No “shared runtime” support: applications would need to be built as ‘bundle’ packages with the captive runtimes
- Packaging into native installers (“native” target type for .deb or .rpm files) is currently not working: please create a “bundle” target and use Linux tools to distribute these
- No “StageWebView” component.

2.4 AIR for Flex users

HARMAN have continued Adobe’s strategy of issuing two AIR SDKs per platform: the first of these (“`AIRSDK_[os].zip`”) contains the newer ActionScript compiler and is a full, self-contained SDK for compiling and packaging AIR applications. The second of these is for combination with the Flex SDK (“`AIRSDK_Flex_[os].zip`”) which doesn’t include a number of the files necessary for ActionScript/MXML compilation. These SDKs should be extracted over the top of an existing, valid Flex SDK.

The original instructions from Adobe are at https://helpx.adobe.com/uk/x-productkb/multi/how-overlay-air-sdk-flex-sdk.html but a few alterations to this are needed to Step 4 if running on macOS. For this platform, the downloaded AIR SDK zip needs to be expanded to a temporary area and then the copy command needs to copy symbolic links as links rather than resolving them to files. This can be done using a capital ’R’ rather than lowercase, hence:

```
cp -Rf /tmp/AIRSDK_Flex_MacOS/* /path-to-empty-FLEXSDK-directory
```

Please note that the config files (air-config.xml, airmobile-config.xml, flex-config.xml) may need to be updated to support new features and updates in AIR or in dependencies such as ANEs. For example to ensure the correct SWF version is output, the below line would need to be updated (e.g. to ‘50’ for AIR 50.x, or ‘44’ for AIR 33.1, etc):

```
<swf-version>14</swf-version>
```

3 Summary of changes

3.1 Runtime and namespace version

Namespace: 51.2

SWF version: 51

There are no new ActionScript APIs in this update; however, there are changes in the application descriptor file definition which means the namespace version has been updated to 51.2.

3.2 Build Tools

The Android build tools and platform used to create the AIR runtime files has been updated to Android-34 with the default target SDK now set to this level in the generated Android manifest files.

Xcode 16.1 and the latest macOS and iphoneOS/tvOS SDKs are now being used to build the AIR SDK. Please note when the update was made to use Xcode 15.0, the minimum iOS/tvOS target version was increased to 12. Additional note: these are the versions that AIR itself is built with. The versions shown in IPA files are manually injected by ADT and don't (yet) take the version codes from the local build environment. See Issue #3030 (github.com).

The build system for this is on a version of macOS that doesn't support 32-bit processes hence we cannot generate the 32-bit versions of the stub files. This means that we can no longer support older 32-bit iPhone/iPad devices.

3.3 AS3 APIs

No changes.

3.4 Features

Reference:	**AIR-7732**
Title:	`Updating IPA default constants for Xcode 16.4 with 18.5 SDKs`
Applies to:	Core build tools
Description:	IPA files that are created by ADT will now contain the version codes for Xcode 16.4 and the iPhoneOS or AppleTVOS SDK version 18.5.

Reference:	**Github-3800 -** https://github.com/airsdk/Adobe-Runtime-Support/issues/3800
Title:	`Build settings for Android runtime native library for 16kb support`
Applies to:	Android runtime component

Description:	The native libraries for AIR on Android have been recompiled with additional build settings to ensure that they are seen as compatible with the 16kb virtual memory page size requirements.

Reference:	**Github-3800 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3800**
Title:	`Updating ADT to use the correct tools/settings for 16kb Android support`
Applies to:	Core build tools
Description:	When an Android package is created, ADT will now check the proposed target SDK API level (or the available build tools to determine the compile SDK API level) and will then set up the build using the appropriate versions of the Android Gradle Plug-in and of Gradle. This should mean that the generated packages are seen as fully compatible with Android's 16kb packaging/alignment requirements.

3.5 Bug Fixes

3.5.1 Release 51.2.2.1

Reference:	**Github-3880 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3880**
Title:	`Ensuring minimize works on a newly created linux window`
Applies to:	Linux runtime component
Description:	When an AIR window is first created in Linux, a call to minimize() was being overridden by the asynchronous window creation which was restoring the window to display it for the first time. Additional checks have been added to avoid restoring if the minimize request is ongoing at the time of the window activation.

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Reference:	**AIR-7748**
Title:	`AIR Android packaging fails to handle uncompressed extensions`
Applies to:	Core build tools

Description:	As part of the updates for 16kb support, the native library files are now packaged uncompressed into an APK file. However, if there is a list of uncompressed extensions provided in the application descriptor file, this then fails to process properly. This has been corrected so that any existing list is modified appropriately, if necessary.

Reference:	**Github-3804 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3804**
Title:	`Adding protection against a scratch canvas allocation failure`
Applies to:	All runtime components
Description:	An issue had been detected on iOS where a crash had been caused by failing to handle a failure to allocate a scratch canvas for text rendering. Protection has been added around this, so that a failure to allocate the canvas will mean that text is not rendered but the instability should be resolved. However, the likely issue is lack of memory available for the process, so there may still be side effects here.

Reference:	**Github-3804 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3804**
Title:	`Fixing instability in iOS/macOS URL stream failure handling`
Applies to:	iOS runtime component
Description:	Another crash report related to this error thread was found to be caused by a use-after-free issue within a URL stream handler when a failure response was received from iOS. A similar fix has been applied here as had been applied to an authentication challenge failure (ref AIR-7059).

Reference:	**Github-3889 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3889**
Title:	`Workaround for Android JNI failures reading large files`
Applies to:	Android runtime component
Description:	A crash in Android had been found due to JNI failures, which appear to be related to a failure to allocate a large array when reading a file. Workarounds have been added to read/write to large files using chunks where the full array size cannot be allocated.

Reference:	**Github-3903 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3903**
Title:	`Updating mutex usage in save dialog handling`
Applies to:	Windows runtime component
Description:	An instability has been reported around the use of the ‘browse for save’ functionality on Windows. This change may not fix that problem but has been included to ensure debug builds no longer assert due to incorrect usage of mutex locking across calls into the runtime, which might impact situations where an exception is also thrown.

Reference:	**Github-3912 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3912**
Title:	`Ensuring Digest.hash() does not crash on iOS`
Applies to:	iOS runtime component
Description:	The use of the Digesh.hash() method was failing on iOS due to the internal use of a function with optional parameters. The ahead-of-time compilation used in iOS applications was not coping with this (a difference between the AS3 API and internal usage of the function) so these uses have been split out into separate function calls.

Reference:	**Github-3916 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3916**
Title:	`Ensuring Worker bytes contain a SWF header`
Applies to:	All runtime components
Description:	When creating a Worker object, there was not checking of the provided data to ensure it was a valid SWF file. This has been updated so that the data has to include the SWF header in order for the secondary runtime to start.

Reference:	**Github-3924 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3924**
Title:	`Ensuring Android camera functionality copes with lack of device camera`
Applies to:	Andriod runtime component

Description:	The internal usage of the Camera classes on Android has been put behind some additional protection whereby the device capabilities are queried for camera support, as well as the manifest permission settings. Only if both capabilities are available will any of the camera APIs be called, which prevents a hang on devices where the camera service is not available.

Reference:	**Github-3930 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3930**
Title:	`Fixing crash-on-startup for some 51.2 namespace apps`
Applies to:	Core build tools
Description:	An issue with the application packaging in 51.2.2.1 when the AIR namespace was 51.2 had been causing some applications to crash on start-up. This has been fixed across all platforms.

Reference:	**Github-3934 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3934**
Title:	`Ensuring reserved words in Android applicationId are handled`
Applies to:	Core build tools
Description:	Reserved words such as “for” are not allowed in Android package namespaces – however they are allowed in application IDs. Whilst normally these values are the same, this change means that an application ID that contains a reserved word will be preserved whilst the namespace – which is derived from this – will still satisfy the Android requirements.

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Reference:	**AIR-7767**
Title:	`Updating iOS/tvOS stub files for 18.2 SDKs`
Applies to:	iOS runtime component
Description:	The stub files for new libraries that Apple introduced in 18.2 had not been included in the AIR SDK. This change includes an update for all the existing stubs based on the iPhoneOS/AppleTVOS SDK versions 18.2 as well as adding the new libraries needed e.g. for Swift.

Reference:	**AIR-7768**
Title:	`Removing AIR iOS duplicate symbol namespaceURIToAPIVersion`
Applies to:	iOS runtime component
Description:	A function had been moved due to work on another platform, which had resulted in the iOS build including this function twice. The extra function has been removed so that the codebase only includes one instance of this utility method, which resolves an error that recent LLVM linkers were displaying.

Reference:	**Github-3708 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3708**
Title:	`Fixing ADT error output for bad -arch option`
Applies to:	Core build tools
Description:	If an invalid option is provided to ADT for the “-arch” parameter, the error message had omitted the possibility of using “all” as an architecture for APK files. This has been rectified.

Reference:	**Github-3941 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3941**
Title:	`Ensuring IPA linking on Windows includes swift libraries`
Applies to:	Core build tools
Description:	When linking using the “-platformsdk” option, the swift libraries were not being picked up on Windows because the “/usr/lib/swift” link location was only being added when running on macOS. This has been updated so that all platforms will use the same linker options when a platform SDK is specified for the IPA build.

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Reference:	**AIR- 7776**
Title:	`AIR packaging fails if an encrypted SWF is used`
Applies to:	Core build tools

Description:	When using the ‘SWFEncrypt’ utility to encrypt a SWF file, the SWF header is adjusted, but this caused a problem within ADT where it was validating that the content file was actually a SWF. This check has been updated to allow the encrypted file header as a valid SWF file.

Reference:	**AIR-7782**
Title:	`StageWebView.assignFocus() not working on Windows webview2`
Applies to:	Windows runtime component
Description:	The logic for assigning focus within the Microsoft Edge-based WebView2 component was not correctly working, so it was not possible to programmatically direct focus to the web view control or request the first/last item to receive focus. The code has been corrected so that this is now working.

Reference:	**Github-3803 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3804**
Title:	`Further updates to URL handling on iOS to identify instabilities`
Applies to:	iPhone runtime component
Description:	A crash had been reported within objc_msgSend following a URL stream’s response handler. A previous attempt at a fix had not worked so this change has been made to split up the handling within the problematic function so that we can better track what might be happening when we receive another call stack showing this issue.

Reference:	**Github-3825 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3825**
Title:	`Ensuring APK builds include an abiFilter for their architecture`
Applies to:	Core build tools
Description:	When building an APK file, ADT had just been placing the necessary native library files into the package but had not been using Gradle to control this. However, when an ANE gradle dependency includes a native library, all platforms were being packaged into the APK which then caused later problems with packaging and deployment. We now include the abiFilter command for Gradle when packaging an APK to avoid this problem.

Reference:	**Github-3825 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3825**
Title:	`Updating Android start-up code to reduce slow start metric`
Applies to:	Android runtime component
Description:	Changes in 51.2 around the checks for the splash screen had adjusted the timing and order of the application start-up resulting in a longer ‘time to initial display’ metric. This change has switched the order back again allowing the Android system to display the application surface as early as possible prior to loading in the SWF content, which should help with the metrics.

Reference:	**Github-3903 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3903**
Title:	`Adding capability to switch to legacy/XP file dialogs on Windows`
Applies to:	Windows runtime component
Description:	An instability within the file dialogs on some machines was causing issues so a workaround has been added to be able to control these, by providing a switch to use the ‘legacy’ file dialog APIs that were available in Windows XP and earlier. To set this, a local shared object needs to be created within the application with a name of “`WindowsFileDialogs`” and this should then have a Boolean value set called “`UseLegacyDialogs`” This value is read whenever a file open/save dialog or a directory browser dialog is being initialised, to check whether to use the legacy (XP and before) dialog style or to use the new (Vista and later) style.

Reference:	**Github-3931 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3931**
Title:	`Optimising bitmap use when not shared with mediabuffer`
Applies to:	All runtime components
Description:	A performance issue had been found on macOS that was traced to a slight slowdown in bitmap rendering due to some thread-safety locking, which had been added when handling the MediaBuffer rendering code. The logic here has been updated so that the synchronisation code will only be used if the display object has been set up for rendering using a MediaBuffer, leaving the vast majority of the rendering performance back how it used to be.

Reference:	**Github-3940 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3940**

Title:	`Allowing true/false options for PackageValidation config`
Applies to:	Core build tools
Description:	The “PackageValidation” options had been “always” or “never”, which wasn’t immediately obvious, so the values “true” and “false” have been added to represent each of these respectively.”

Reference:	**Github-3942 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3942**
Title:	`Fixing iOS simulator crash on start-up`
Applies to:	iPhone runtime component
Description:	A crash had been detected in the launch code for iOS where the simulator launching (or specifically, an interpreter-based application) differed from the AOT-compiled device targets. This code has been adjusted to correctly handle both cases without the instability.

Reference:	**Github-3949 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3949**
Title:	`Safe area is incorrect on Android 35`
Applies to:	Android runtime component
Description:	The Android APIs for providing cut-out information had been updated to no longer include banner areas, so a new Android API has been used to check for the ‘unsafe’ area of an application which takes into account both the rounded corners and notch cut-outs as well as the banner areas. No changes are needed in ActionScript, these areas are already aggregated to provide the safe area rectangle for the screen.

Reference:	**Github-3951 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3951**
Title:	`Adjusting start-up on Android to avoid reading large SWFs at once`
Applies to:	Android runtime component

Description:	A crash caused by low memory availability, resulting in a JNI failure to allocate a large array, revealed a problem where the application SWF file was being read in one go during start-up. As well as being a problem in Java memory usage, this also had a performance impact. The logic here has been updated to only read as much as is necessary and to break the read down into chunks the same way as other initialisation code is performed.

Reference:	**Github-3961 - https://github.com/airsdk/Adobe-Runtime-Support/issues/3961**
Title:	`Protecting against null reference exception in AndroidIdleState`
Applies to:	Android runtime component
Description:	A crash call stack showed a synchronisation issue where an application being shut down could trigger a crash due to the idle state callback being received after the activity wrapper object was destroyed. This update protects against such an occurrence.

4 Configuration File

ADT uses an optional configuration file to change some of its behaviour. To create a configuration file (there is not one by default within the SDK), create a new text file and save this with the name “adt.cfg” in the SDK’s “lib” folder (i.e. alongside the ‘adt.jar’ file). The configuration file is in the standard ‘ini file’ format with separate lines for each option, written as “setting=value”. Current options are listed below:

Setting	**Explanation**
DefaultArch	Used as a default architecture if there is no “-arch” parameter provided to ADT. Values may be ‘armv8’, ‘armv8’, ‘x86’ or ‘x64’.
OverrideArch	Used where an architecture value is being provided to ADT using the ‘-arch’ parameter, this configuration setting will override such parameter with the value given here. Values may be ‘armv8’, ‘armv8’, ‘x86’ or ‘x64’.
DebugOut	If set to “true”, results in additional output being generated into a local file which can aid in debugging problems within ADT (including the use of third party tools from the Android SDK). Values may be ‘true’ or ‘false’, default is ‘false’.
UncompressedExtensions	A comma-separated list of file extensions that should not be compressed when such files are found in the list of assets to be packaged into the APK file. For example: “UncompressedExtensions=jpg,wav”
AddAirToAppID	Configures whether or not the “air.” prefix is added to an application’s ID when it is packaged into the APK. Values may be ‘true’ or ‘false’, default is ‘true’.
JavaXmx	Adjusts the maximum heap size available to the Java processes used when packaging Android apps (dx/d8, and javac). Default value is 1024m although this is automatically overridden by any environment variable or value passed to the originating application. If this config setting is present, e.g. ‘2048m’, then it takes priority over all other mechanisms.
CreateAndroidAppBundle	Overrides any usage of ADT with an APK target type, and instead generates an Android App Bundle. Note that the output filename is not adjusted so this may result in generation of a file with “.apk” extension even though it contains an App Bundle. Values may be ‘true’ or ‘false’, default is ‘false’.

KeepAndroidStudioOutput	When generating an Android App Bundle, rather than using a temporary folder structure and cleaning this up, this option will generate the Android Studio file structure under the current folder and will leave this in place). Values may be 'true' or 'false', default is 'false'.
AndroidPlatformSDK	A path to the Android SDK, that can be used instead of the "-platformsdk" command line parameter. Note that on Windows, the path should contain either double-backslashes ("c:\\folder") or forwardslashes ("c:/folder").
iOSPlatformSDK	A path to the iOS/iPhone/iPhoneSimulator SDK, that can be used instead of the "-platformsdk" command line parameter.
JAVA_HOME	This can be set as an override or alternative to the system environment variable that is read when ADT needs to use Java (e.g. when creating an Android App Bundle). Note that on Windows, the path should contain either double-backslashes ("c:\\folder") or forwardslashes ("c:/folder").
UseNativeCodesign	On macOS, this will mean that the IPA binary is signed using the "codesign" process rather than using internal Java sun security classes within ADT. This is "false" by default, unless ADT detects that the sun security Java classes are not available.
SignSwiftFiles	By default, any swift libraries that are included in an IPA payload are signed in the normal way. This can be turned off by setting this value to "false".
OnlyIncludeSwiftUsedArchsInSupport	If this is set to "true" then for ipa-app-store builds that include a "SwiftSupport" folder, the swift libraries will be updated via lipo to only include architectures that are used by the application (e.g. armv7 and arm64, omitting armv7s and arm64e).
OnlyIncludeSwiftUsedArchsInPayload	This is similar to the above flag but applies to the versions of the swift libraries that are included in the "Payload" folder within the IPA package. This (and the above) are now defaulting to "false" so that the swift libraries are just copied into position, but to get the legacy behaviour this should be set to "true".
iosSimulator	The name of a simulator to use when installing or running an IPA file on an iPhone simulator on mac. Note that this value will be overridden by any command-line option or by an environment variable should this be set as well (i.e. AIR_IOS_SIMULATOR_DEVICE).

IPASymbolFile	To aid in debugging iPhoneOS/tvOS issues, this setting has been introduced which should give the filename of a symbol file that will be generated as part of the iOS build process. This isn't a human-readable file, but if a crash log is produced from an AIR application on iOS/tvOS, this file can be provided to HARMAN along with the crash log in order for us to investigate the crash location and call stack.
LLVM_HOME	[Windows only, currently] Specifies the installation directory for the LLVM toolchain. If this entry is present, ADT will use the LLVM linker called "ld64.lld.exe" situated in the "bin'" folder of the LLVM_HOME location. When switching to the LLVM implementation of the linker, it is then possible to use the "iOSPlatformSDK" setting (or the "-platformsdk" command-line argument to reference the actual Apple iPhoneOS SDK which means linking will take place against the "TBD" files, and Apple's newer dynamic linking/loading mechanisms should then work across the different iOS versions. This mechanism should result in more stable binaries than when linking against the "stub" SDK files provided in the AIR SDK. These stub files will be removed in the future, with LLVM becoming the standard mechanism for linking on non-macOS platforms.
PackageValidation	Whether or not the application should validate the package contents at start-up. With AIR 51.2, license files include information about the package that is created by ADT, and the runtimes will validate that these have not been significantly tampered with. This check can be disabled if this flag is set to "never" – default is "always". In future we may change how this flag works e.g. for only specific applications, or for only debug-type packages.
VerboseOut	Similar to "DebugOut" but this option will provide a lot more information to the output log / troubleshooting page. If this is set to "true", it will ignore the setting of "DebugOut" which would be set on implicitly.

5 Android builds

5.1 AAB Target

Google introduced a new format for packaging up the necessary files and resources for an application intended for uploading to the Play Store, called the Android App Bundle. Information on this can be found at https://developer.android.com/guide/app-bundle

AIR now supports the App Bundle by creating an Android Studio project folder structure and using Gradle to build this. It requires an Android SDK to be present and for the path to this to be passed in to ADT via the "-platformsdk" option (or set via a config file – it also checks in the default SDK download location). It also needs to have a JDK present and available, and will attempt to find this either from configuration files or via the JAVA_HOME environment variable (or if there is an Android Studio installation present in the default location, using the JDK provided by that).

To generate an Android App Bundle file, the ADT syntax is similar to the "apk" usage:

```
adt -package -target aab <signing options> output.aab <app descriptor and files> [-extdir
<folder>] -platformsdk <path_to_android_sdk>
```

No "-arch" option can be provided, as the tool will automatically include all of the architecture types. Signing options are optional for an App Bundle.

Note that the creation of an Android App Bundle involves a few steps and can take significantly longer than creating an APK file. We recommend that APK generation is still used during development and testing, and the AAB output can be used when packaging up an application for upload to the Play Store.

ADT allows an AAB file to be installed onto a handset using the "`-installApp`" command, which wraps up the necessary bundletool commands that generate an APKS file (that contains a set of APK files suitable for a particular device) and then installs it. If developers want to do this manually, instructions for this are available at https://developer.android.com/studio/command-line/bundletool#deploy_with_bundletool, essentially the below lines can be used:

```
java -jar bundletool.jar build-apks --bundle output.aab --output output.apks --connected-
device

java -jar bundletool.jar install-apks --apks=output.apks
```

Note that the APK generation here will use a default/debug keystore; additional command-line parameters can be used if the output APK needs to be signed with a particular certificate.

5.2 Play Asset Delivery

As part of an App Bundle, developers can create "asset packs" that are delivered to devices separately from the main application, via the Play Store. For information on these, please refer to the below link:

https://developer.android.com/guide/playcore/asset-delivery

In order to create asset packs, the application XML file needs to be modified within the <android> section, to list the asset packs and their delivery mechanism, and to tell ADT which of the files/folders being packaged should be put into which asset pack.

For example:

```
<assetPacks>
```

```
    <assetPack id="ImageAssetPack" delivery="on-demand"
folder="AP_Images"/>
</assetPacks>
```

This instruction would mean that any file found in the ”AP_Images” folder would be redirected into an asset pack with a name ”ImageAssetPack”. The delivery mechanisms can be ”on-demand”, ”fast-follow” or ”install-time” per the Android specifications.

Note that assets should be placed directly into the asset pack folder as required, rather than adding an additional ”src/main/assets” folder structure that the Android documentation requires. This folder structure is created automatically by ADT during the creation of the Android App Bundle.

The asset pack folder needs to be provided as a normal part of the command line for the files that should be included in a package. So for example if the asset pack folder was ”AP_Images” and this was located in the root folder of your project, the command line would be:

```
adt -package -target aab MyBundle.aab application.xml MyApp.swf AP_Images
[then other files, -platformsdk directive, etc]
```

If there were a number of asset packs and all of the relevant folders were found under an ”AssetPacks” folder in the root of the project, the command line would be:

```
adt -package -target aab MyBundle.aab application.xml MyApp.swf -C
AssetsPacks . [then other files, -platformsdk directive, etc]
```

To access the asset packs via the Android Asset Pack Manager functionality, an ANE is available via the AIR Package Manager tool. See https://github.com/airsdk/ANE-PlayAssetDelivery/wiki

5.3 Android Text Rendering

Previously, the rendering of text on Android had been handled via a native library built into the C++-based AIR runtime file. This had some restrictions and issues with handling fonts, which caused major problems with Android 12 when the font fallback mechanism was changed and the native code no longer coped with this. To resovle this, a new text rendering mechanism has been implemented that uses public Android APIs in order to set up the fonts and to render the text.

The new mechanism uses JNI to communicate between the AIR runtime and the Android graphics classes for this, and has some differences with the legacy version. One of the changes that has been made is to correct the display of non-colorized text elements when rendering to bitmap data: in earlier builds, if some text included an emoji with a fixed color (e.g. ”flames” that are always yellow/orange even if you request a green font color) then these characters appeared blue, due to the different pixel formats used by Android vs the AIR BitmapData objects. With the new mechanism, AIR correctly renders these characters to BitmapData (although the problem still remains when rendering device text to a ’direct’ mode display list).

Some developers may not want to switch to this new mechanism yet, and others may want their applications to always use it. Some would perhaps want it only when absolutely necessary i.e. from Android 12 onwards. To cope with this request, there is a new application descriptor setting that can be used: ”<newFontRenderingFromAPI>” which shoudl be placed within the <android> section of the descriptor XML. The property of this can be used to set the API version on which the new rendering mechanism takes place. The default value is API level 31 which corresponds to Android 12.0 (see https://source.android.com/setup/start/build-numbers). So for example if you always want devices to use the new mechanism, you can add:

```
<newFontRenderingFromAPI>0</newFontRenderingFromAPI>
```

whereas if you never want devices to use this, you could add:

```
<newFontRenderingFromAPI>99999</newFontRenderingFromAPI>
```

5.4 Android File System Access

In the earlier versions of Android, it was possible to use the filesystem in a similar way to a Linux computer, but with a set of restrictions that had a fairly high-level granularity:

- It was possible to read/write to an application's private storage location. AIR exposes this via "`File.applicationStorageDirectory`".
- If the app requested the 'read/write storage' permission, the app could then read and write in the user's shared storage location and to removable storage. The main home folder was accessible via "`File.userDirectory`" or "`File.documentsDirectory`", and later AIR 33.1 added "`File.applicationRemovableStorageDirectory`".
- Later, this was updated such that the user had to also grant permission via a system pop-up message. To trigger this pop-up, AIR developers could use "`File.requestPermission()`"

With the introduction of "scoped storage" however, a lot of this has changed. Android files are treated in a similar way to other resources, with URLs using the "content://" schema which can refer either to filesystem-backed files, or to transient resources, or elements within other storage mechanisms such as databases and libraries. Permission to access each resource depends upon the creator of that resource, and by default it's not possible for an application to open a file that another application had created. Permissions for the top-level internal storage (i.e. "`File.documentsDirectory`") have been changed so that applications cannot create entries here but must use sub-folders of these (a set of standard sub-folders is generally created by the OS).

Within AIR, we have been attempting to add support for the "content://" URIs, and to switch the File class "`browseForXXX`" functions so that they use the new intent-based mechanisms for selecting files to open and save, or to select a folder. Within these calls, we are also requesting the appropriate read/write permissions (and persisting these so that they can be used in the future). This means that it should be possible to call "`browseForOpen()`" and allow the user to select a shared file that can then always be opened (for reading). Equally a "`browseForDirectory()`" call should mean that an application then has read/write access into the selected directory and its sub-tree.

Requesting file system permissions has to be handled in a similar way, with permissions either granted for a file or for a folder tree. The "`File.requestPermission()`" function therefore looks at the native path of the File object this is called on, and decides whether to show a file open intent (if there's a normal path or URL in the `nativePath` property), or to show a folder selection intent (if the path ends in a forward-slash), or whether to just ignore the call with a 'granted' response and then wait for later permission requests for individual files (if the File object has not had a `nativePath` set). This last option is intended to allow apps to work across different Android versions and is the recommended option: early in the application lifecycle, create a new File and call `requestPermissions()`: if the app is running on an earlier Android version, the permission pop-up will appear, otherwise the app will need to request specific file access later on via the "`browseForXXX`" functions or by requesting permission for a specific file. Sadly it isn't possible to ensure that the user only gives a yes/no response for these file/folder open intents, they are able to browse for other files, so it may be that the file the user selects is not the one you are trying to open. If this is detected, the permission status event will show as 'denied', so if you are happy for the user to choose a different file, use "`browseForOpen()`" rather than "`requestPermission()`".

There is an exception to having to use scoped storage and the storage access framework, which is if an application has the "MANAGE_EXTERNAL_FILES" permission. This permission is intended for utilities such as file manager apps and anti-virus scanners that have a legitimate need to access all the (shared storage) files on the device, but if an app requests this permission and is submitted to the Play Store, but doesn't justify itself, then the submission is likely to be rejected.

Some applications are not distributed via the Play Store though, at which point this permission can be used to turn the behaviour back to how it used to be in earlier Android versions. The

“`File.requestPermission()`” capability has been overridden in the cases where AIR detects this permission has been requested in the manifest, and it will now display the appropriate dialog to ask the user to turn on the ‘all files’ access for this app. Once this has been granted (asynchronously), it would then be possible to create, read and write files and folders including in the root storage device.

6 Windows builds

The SDK now includes support for Windows platforms, 32-bit and 64-bit. We recommend that developers use the “bundle” option to create an output folder that contains the target application. This needs to be packaged up using a third party installer mechanism, in order to provide something that can be easily distributed to and installed by end users. HARMAN are looking at adapting the previous AIR installer so that it would be possible for the AIR Developer Tool to perform this step, i.e. allowing developers to create installation MSI files for Windows apps in a single step.

Instructions for creating bundle packages are at:

https://help.adobe.com/en_US/air/build/WSfffb011ac560372f709e16db131e43659b9-8000.html

Note that 64-bit applications can be created using the “-arch x64” command-line option, to be added following the “-target bundle” option.

7 MacOS builds

MacOS builds are provided only as 64-bit versions. A limited shared runtime option is being prepared so that existing AIR applications can be used on Catalina, but the expectation for new/updated applications is to also use the “bundle” option to distribute the runtime along with the application, as per the above Windows section.

Note that Adobe’s AIR 32 SDK can be used on Catalina if the SDK is taken out of ‘quarantine’ status. For instructions please see an online guide such as:

https://www.soccertutor.com/tacticsmanager/Resolve-Adobe-AIR-Error-on-MacOS-Catalina.pdf

AIR SDK now supports MacOS Big Sur including on the new ARM-based M1 hardware: applications will be generated with ‘universal binaries’ and most of the SDK tools are now likewise built as universal apps.

8 iOS support

8.1 32-bit vs 64-bit

For deployment of AIR apps on iOS devices, the AIR Developer Tool will use the provided tools to extract the ActionScript Byte Code from the SWF files, and compile this into machine code that is then linked with the AIR runtime and embedded into the IPA file. The process of ahead-of-time compilation depends upon a utility that has to run with the same processor address size as the target architecture: hence to generate a 32-bit output file, it needs to run a 32-bit compilation process. This causes a problem on MacOS Catalina where 32-bit binaries will not run.

Additionally, due to the generation of stub files from the iPhone SDK that are used in the linking process – which are created in a similar, platform-specific way – it is not possible to create armv7-based stub files when using Catalina or later. From release 33.1.1.620, the stub files are based on iOS15 and are purely 64-bit. This means that no 32-bit IPAs can be generated, even when running on older macOS versions or on Windows.

8.2 MacOS remote linking from Windows

Due to a number of updates from Apple around the mach-o linker, and the movement of symbols between different component libraries, it has become increasingly problematic to link Apple binaries on a Windows computer. Originally, Adobe had cross-compiled the “ld64” Apple linker, but without support for the “TBD” format that Apple use for the iPhoneOS/AppleTVOS SDKs. To work around this limitation, the AIR SDK includes “stub” binaries for the SDKs – but it is not then possible to support the movement of symbols i.e. where a particular symbol is found in different frameworks for different iOS versions.

Using LLVM’s linker, which supports the mach-o format, it was also found that Apple restrictions had been preventing some applications from being published via the App Store due to a difference in how symbols were found/stored, and the known/unsupported issues in LLVM meant that this is also not a completely viable solution.

The solution that we will work with now is to use a mac machine to perform the link stage of the build process. The rest of the development and build process can still occur on Windows but linking the AIR application’s object files against the iPhone / AppleTV SDKs should be done on a mac.

There are two ways to achieve this: initially a manual mechanism to allow files to be pushed to a macOS machine, linked via a script, and then the result copied back to the Windows machine where the packaging command needs to be run again to pick up the binary. And with the release of 51.0.1 this is now possible to handle automatically within a single run of ADT, following some initial machine configuration. Details on these two methods follow.

8.2.1 Manual copying and linking

There are a number of steps to the build process in this scenario.

1. Configure ADT to use a specific folder, into which all linker inputs will be placed.

To do this, edit the “adt.cfg” file (in your home folder under an “.airsdk” subfolder) and add a line: “`IPALinkFolder=c:/path/to/link/folder`”. This must be the name of an existing folder, under which subfolders will be created for each run of ADT. Note that you need to use forward-slashes, or escaped backslashes (“\\”), due to how Java reads in property files.

2. Run your normal link command via ADT.

This will then generate a subfolder under your “IPALinkFolder” location, which contains a script file and all the input files needed for the Apple linker.

3. Copy this link folder to your macOS computer.

This can be done with SFTP/SCP or similar tools, or potentially you could have a network shared folder set up.

4. On the macOS computer, run the linker.

Using a terminal window, you will first need to set an environment variable, “AIR_SDK_HOME”, and then run the script that was generated by ADT. For example:

> export AIR_SDK_HOME=/Users/username/Downloads/AIR_SDK/AIRSDK_51.0.1
>
> ./linkerscript.sh

5. Copy the resulting file back onto the Windows PC.

The file should be called “linkerOutput” and should be an arm64 macho executable file.

6. Call ADT again, this time providing the linked file.

To do this, add the arguments “`-use-linker-output path_to_linkerOutput`”; this can go within the normal input files list, or at the end of this (similar to “-extdir”).

ADT will then ignore the normal command to link the binary, and will use the provided executable in order to package and sign the IPA file.

7. Clean up.

The folder that’s created under the “IPALinkFolder” location, as well as the linkerOutput file (and of course the files that have been copied to the macOS machine) are not automatically deleted. So these should be periodically cleaned up manually to avoid wasting disk space.

8.2.2 Programmatic remote linking

In order to automatically allow the Windows machine to connect to the macOS machine and to copy files and drive the linker, a password-less mechanism will need to be set up to allow remote access without any user interaction. This requires the use of SSH keys: unless a key-pair is created that doesn’t have a passphrase, it will be necessary to use “ssh-agent” to store the passphrase and associate this with the user’s Windows credentials.

To set this up (one time only):

1. Create a new key-pair (unless you want to use an existing pair).

On Windows, run “`ssh-keygen`” and provide a filename – the default is “id_rsa” but in this walkthrough we shall use “adt_access”. It then prompts for a passphrase: if you leave this blank, you will not need to follow the “ssh agent” steps below, but the recommendation would be to create a suitably secure passphrase for this. You should then have two files, “adt_access” and “adt_access.pub”.

2. Install the public key on the mac machine.

You can use sftp/scp for this. The key should be added into your “.ssh” folder – note that you need the username of the mac machine, which we shall assume is just “user”. You will then need to configure SSH to allow this public key to be used for connections: if you remote in (or just open a terminal) on the mac, go into the “.ssh” folder, and run: “`cat adt_access.pub >> authorized_keys`”. This adds the new key onto the end of the authorized keys list.

3. Set up ssh agent to provide the passphrase.

Firstly you will need to check that ssh-agent is running: open “Services” on the computer, and find an entry with name “OpenSSH Authentication Agent”. This should be changed to “Automatic”, or “Automatic (Delayed Start)” if you prefer, and if necessary, also started manually. The “Status” column should show that this is running.

Then in a Windows console, run “`ssh-add adt_access`” and provide your passphrase.

Note that if you get an error message “Permissions for 'private-key.ppk' are too open”, you will need to ensure that only the current user is able to access the private key file (“adt_access”). This means adjusting the “Security” properties on this file, changing the owner of the file to the current local user account, removing inheritance and inherited permissions, and removing all permissions for users/groups other than the current local user. For more details, see the below link:

Windows SSH: Permissions for 'private-key' are too open - Super User

You can then test the connection by running “`ssh -i adt_access user@mac_ip_address`”, which should then log on automatically without further prompting.

4. Provide the configuration to ADT.

Now that you have the connectivity set up, you need to create a configuration file for AIR. You will need to add two entries into the “adt.cfg” file that is in your “c:\users\username\.airsdk\” folder:

```
IPALinkFolder=c:/path/to/link/folder

RemoteLinkMachine=mac_ip_address
```

The first setting is to provide a location into which the linker will output all of the files. This is not strictly necessary but will aid in debugging problems.

The second provides the network location of the remote machine onto which you’ve put the public ssh key.

You will then need to create a configuration file with the name of this “mac_ip_address” network address, with an “.cfg” extension, and put this into a subfolder “remote_link_configs” under the .airsdk directory. For example:

```
C:\Users\username\.airsdk\remote_link_configs\192.168.1.3.cfg
```

The contents of this file should be:

```
CertPath=C:/path/to/private/key/adt_access

Username=user

SdkFolder=/Users/user/Documents/AIR_SDKs/AIRSDK_51.0.1
```

The “CertPath” value points to the private key that we’ve named “adt_access”, again please note the use of forward-slashes or double-backslashes in the Windows path. “Username” is the user associated with the key from when this was added to “authorized_keys”. And “SdkFolder” is the path on the remote mac machine where an AIR SDK can be found. This path is only used for the runtime libraries i.e. “libRuntimeHMAOT.arm-air.a” and “builtin_abc.arm64-air.o”, the linker won’t use this for the actual link binary (ld64) or the stub files; instead, the remote script picks up your iPhoneOS SDK using the “xcrun” utility.

Once that is all set up, you can use ADT as normal for IPA builds, and the remote linking will happen in the background. If there are issues, please check the adt.log (or use AIR SDK Manager’s “Troubleshooting” tab) and report an issue via Github.

Please do note that the link folders are not (currently) cleaned up with this approach, so the location under the “IPALinkFolder”, and its copy that is pushed to the remote Mac device (with the same name, within the user’s home folder) will still exist after the ADT process has completed. This will help with debugging any issues, but we expect to change this in the future.

9 Splash Screens

For our ‘free tier’ users, a splash screen is injected into the start-up of the AIR process, displaying the HARMAN and AIR logos for around 2 seconds whilst the start-up continues in the background. There are different mechanisms used for this on different platforms, the current systems are described below.

9.1 Desktop (Windows/macOS)

Splash screens are displayed in a separate window centred on the main display, while the start-up continues behind these. The processing of ActionScript is delayed until after the splash screen has been removed.

9.2 Android

The splash screen is displayed during start-up and happens immediately the runtime library has been loaded. After a slight delay the initial SWF file is loaded in and when processing for this starts, the splash screen is removed.

9.3 iOS

The splash screen is implemented as a launch storyboard with the binary storyboard and related assets included in the SDK. This has implications for those who are providing their own storyboards or images in an Assets.car file:

- If you are on the ‘free tier’ then the AIR developer tool will ignore any launch storyboard you have specified within your application descriptor file, or provided within the file set for packaging into the IPA file.
- If you are creating an Assets.car file, then you need to add in the AIR splash images from the SDK which are in the “lib/aot/res” folder. These should be copied and pasted into your “.xcassets” folder in the Xcode project that you are using for creation of your assets.

<u>Troubleshooting:</u>

Message from ADT: “`Warning: free tier version of AIR SDK will use the HARMAN launch storyboard`” – this will be displayed if a <UILaunchStoryboardName> tag has been added via the AIR application descriptor file. The tag will be ignored and the Storyboard from the SDK will be used instead.

Message from ADT: “`Warning: removing user-included storyboard "[name]"`” will be displayed if there was a Storyboardc file that had been included in the list of files to package: this will be removed.

Message from ADT: "`Warning: free tier version of AIR SDK must use the HARMAN launch storyboard`" – this will be displayed if the Storyboardc file in the SDK has been replaced by a user-generated one.

If a white screen is shown during start-up: check that the HARMAN splash images are included in your assets.car file. Note that the runtime may shut down if it doesn’t detect the appropriate splash images.

The runtime may also shut down for customers with a commercial license if a storyboard has been specified within the AIR descriptor file but not added via the list of files to package into the IPA file.

10 AIR Diagnostics

10.1 Purpose

The goal of the AIR diagnostics implementation is to allow both developers and HARMAN to benefit from additional metrics around an appication for debugging purposes. One of the key goals is to allow errors that occur in the field to be detected and reported back, with an initial focus being around the Android ”Application Not Responding” issues that are relatively common and can trigger the ’bad behaviour’ labels from the Google Play Store.

There have also been a number of situations where HARMAN are unable to reproduce issues, and where additional logging has been added to the AIR runtime for developers to then reproduce a problem and report back. With the framework in place for AIR diagnostics, such logging could then start using this mechanism, and could then be left in place and become part of the generic runtimes rather than needing customer-specific builds.

10.2 Mechanism

Implementing a mechanism to capture diagnostics has to also consider the performance of the runtime, as we do not want to significantly impact performance (or memory footprint) of the deployed applications. It is important therefore that any checks as to whether a particular diagnostic should be captured/reported should be as minimal as possible, and no processing of data specific to this should occur if the relevant category of diagnostic has not been enabled.

Internally, we have used ANEs as the basis of the mechanism to enable the diagnostics, to select which categories to enable, and to receive feedback from the runtime. The ANE native implementation is built into the runtime, but needs to be enabled through the inclusion of an ANE, or more accurately a SWC library that provides the API for this and that then communicates with the runtime.

To enable diagnostics then, an application will need to add the extension ID to their application descriptor file: ”`com.harman.air.AIRDiagnostics`”. The application can then configre the diagnostics to specify a reporting folder, or to check for existing reports left from previous runs of the application, or to get more details on a report. It can add listeners for feedback for particular situations and can configure the categories of diagnostics that it wants to listen for.

The standard case for diagnostics should be that the AIR runtime writes relevant information (asynchronously!) to log files, and these can then be interpreted to generate reports of the data. The data shoudl be machine-readable so different structures and schemas will be defined for these as relevant. One of the benefits of using an ANE mechanism is that this can then be adapted and extended more rapidly than if we used a built-in ActionScript API (as well as keeping all of this logic outside of the runtime and only included on-demand).

Typically when the application exits, the diagnostic reports that are being generated are then removed. This obviously helps to limit the size of the storage needed for diagnostics, but also means that an application can check on start-up for the existance of a report: and if it’s found, it implies that the application may have had an uncontrolled exit the last time it was used. If that was, for example, caused by an Android ANR with the OS shutting down the application, it’s possible that the ”long function” diagnostic may contain the clues as to the cause of this behaviour.

10.3 Categories

The number of categories will be expanded as time goes by, so this list will be kept in sync with the availability of each category within the relevant runtime version.

10.3.1 Long-running functions

ANR problems can happen if a call into the AIR runtime blocks the UI thread for too long. To try to find if there are functions that generally run for longer than expected, this category has been added to try to help identify the culprit. The functions that are tracked are:

- Processing a frame (i.e. executing all 'enter frame' type event handlers and normal frame advance behaviours)
- Rendering a frame (i.e. the drawing / graphics code)
- GC: marking non-stack roots
- GC: marking queue and stack
- GC: sweeping

Functions are checked every second to see if they are still running. This is an excessive amount of time and so will be logged. If a function subsequently completes, but takes over 2 seconds, then a notification event is sent out from the diagnostics ANE.

If the runtime is killed by the OS then a report should be available that contains information about which functions have taken a lot of time, to see if this information shows a pattern of a particular function that may have been starting to increase in duration.

10.3.2 Garbage Collection activity

This is often an area that is considered problemmatic particularly in the final phase of collection. AIR runs garbage collection on a frame-by-frame basis (using reference counting) as well as on a mark-and-sweep basis (using roots and finding objects that are not then reachable from these). This category focuses on the mark-and-sweep approach, and will notify of the start of an incremental marking session (meaning that some condition within the runtime has triggered the start of garbage collection), the end of incremental marking, the start and end of the final stack-based marking, and the start and end of the 'sweep' phase where object destructors are called and memory clean-up and consolodation happens. The metrics include memory usage at each stage so this may also help to see whether there had been any benefit in collection at this point, which may help inform any tweaks that may be needed to the garbage collection policy.

Note that if the final stack marking and sweeping takes too long, this will also be notified as a long-running function.

10.4 Diagnostic API and guide

At the time of writing, the API is still being finalised; this will be released shortly and the actual API and documentation will be provided at that time.

In the meantime, there is a sample application that demonsrates how the ANE can be used to request some diagnostics and check the results of this: this will be updated periodically, and the latest ANE can be downloaded from the 'ane' subfolder:

https://github.com/airsdk/Adobe-Runtime-Support/tree/master/samples/air_diagnostics

10.5 FAQs

How do I get information off the device?

Currently this will have to be done by the application logic. The API includes some ways to get at the data and this could be wrapped into calls to a back-end service. HARMAN are considering providing a service here that could receive an application's diagnostics and make this available to both the application developers and to ourselves, to help in remote debugging; however, at this point in time it woudl be up to the application developer to somehow detect the presence of a report and send the information somehow.

What are the privacy concerns?

We are not intending to collect customer data, or any information that could allow a specific customer to be identified. Information should be solely related to the application itself, as well as some general details about the device (OS/version/CPU/etc).

It is expected that developers will be providing a privacy policy to their end users, and this should mention the collection of information in order to improve the application or service, in order to cover the use of this diagnostics mechanism.

Why do we not just extend the capabilities of Adobe Scout?

We had considered adding additional capabilities to Scout, in particular around the memory and GC mechanisms. But the real issue is that we want to collect data from applications deployed in the field, with end users who will not have any development tools or debugging expertise. So the diagnostics system is set up to be self-contained within an application, with the end user not having to do anything themselves.

How can I request different categories for extra debugging?

If there are specific areas of concern or requirements for debugging, please raise a ticket on the Github system: https://github.com/airsdk/Adobe-Runtime-Support/issues

If you have an existing issue open that you believe would benefit from this approach, please add a comment to the ticket and raise this as a possibility.