



# Adobe AIR SDK Release Notes

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# 1 Release Overview

Release 51.1.3.1 includes a number of feature updates for AIR 51.1, none of which require changes to the ActionScript APIs or the XML application descriptor file format. It also includes some bug fixes to further improve the stability and behaviour of the AIR runtime.

Release 51.1.3.2 is a bug fix release with a small number of updates, displayed here in a dark red font.

Release 51.1.3.3 is another bug fix release with updates displayed in a blue font.

Release 51.1.3.4 is a minor update for Windows and macOS platforms, with changes displayed in a green font.

Release 51.1.3.5 has further bug fixes across all platforms, with changes displayed in a purple font.

Release 51.1.3.6 is a quick patch release to fix some issues found in the .5 build. Changes are displayed in an orange font.

Release 51.1.3.7 includes a number of further updates that are required, with changes displayed in a dark blue font.

## 1.1 Key changes

An additional feature which is targeted at the use of Android on PC-style devices is the support for middle and right mouse events on that platform. Both Android and iOS now have support for UI activity detection via the NativeApplication 'userIdle' and 'userPresent' event mechanism.

To aid in debugging and troubleshooting, we have also added enhanced debug output from the runtime when some activities such as runtime/app installations or platform conversion (for 'bundle' creation) are happening. These can currently only be detected via a separate utility app, but the intention is to add this also into the AIR SDK Manager.

Continuing the troubleshooting approach, another new feature is an internal set of 'diagnostics' capabilities which will allow applications to find out more details about the behaviour of the AIR runtime under certain scenarios. Initially this is focused on helping to find problems with garbage collection and also with ANRs on Android. Further details are found in section 10, and we expect to add further capabilities to this mechanism to help applications to self-report issues.

Bug fixes include a better (and more extensive) fix for the iOS 18 fallback font problems, a problem with navigateToURL on iOS 18, and Android updates to reduce ANRs as well as to remove a CPU usage issue on ARMv7 devices.

Bug fixes in 51.1.3.2 can be found in section 3.5.2.

Bug fixes in 51.1.3.3 can be found in section 3.5.3.

Release 51.1.3.4 includes a fix to handle a video seek within a metadata callback, plus a fix for StageWebView window handling on Windows platforms – see section 3.5.4.

Bug fixes in 51.1.3.5 can be found in section 3.5.5.

Bug fixes in 51.1.3.6 can be found in section 3.5.6.

Bug fixes in 51.1.3.7 can be found in section 3.5.7.

## 1.2 Deployment

To obtain the release, it is recommended that developers install the AIR SDK Manager.

NOTE: it is likely that we will remove the monolithic zip files from the <https://airsdk.harman.com> website at some point, and require all downloads to happen via the AIR SDK Manager. This is to address some misuse of the website and to try to prevent some breaches of the license agreement.

The AIR SDK Manager is helping us publish minor updates/fixes with a quicker cadence without resulting in a large amount of effort and data downloads. It is now 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>

## 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).

## 1.4 Feedback

Any issues found with the SDK should be reported to [adobe.support@harman.com](mailto: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 preferable 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

This release shall be delivered via the AIR SDK website: <https://airsdk.harman.com/download>

The update will also 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	51.1.3.1	51.1.3.2	51.1.3.3	51.1.3.4	51.1.3.5	51.1.3.6	51.1.3.7
Core Tools	3.4.0	3.4.1	3.4.2		3.4.3	3.4.4	3.4.5
AIR Tools	3.1.0						
Windows platform package	3.4.0	3.4.1	3.4.2	3.4.3	3.4.4	3.4.5	3.4.6
MacOS platform package	3.4.0	3.4.1	3.4.2	3.4.3	3.4.4	3.4.5	3.4.6
Linux platform package	3.4.0	3.4.1	3.4.2		3.4.3	3.4.4	3.4.5
Android platform package	3.4.0	3.4.1	3.4.2		3.4.3	3.4.4	3.4.5
iPhone platform package	3.4.0	3.4.1	3.4.2		3.4.3	3.4.4	3.4.5

#### 2.2.2 Delivered Documentation

Title	Document Number	Version
Adobe AIR SDK Release Notes	HCS19-000287	51.1.3

#### 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, we also recommend developers match the same ‘target SDK’ version as here.
iOS	iPhoneOS SDK Version: 18.2 iPhoneSimulator SDK Version: 18.2 XCode Version: 16.2 Minimum iOS Target: 12.0

tvOS	tvOS SDK Version:	18.2
	tvSimulator SDK Version:	18.2
	XCode Version:	16.2
	Minimum tvOS Target:	12.0
MacOS	MacOS SDK Version:	15.2
	XCode Version:	16.2
	Minimum macOS Target:	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: 51.1

SWF version: 51

The namespace and SWF version updates are made across all platforms and may be used to access the updated ActionScript APIs that have been introduced with AIR version 51.0. The namespace update is required for opening any SWF file that's got a SWF version of 51, or when using any of the new XML application descriptor flags.

### 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

<b>Reference:</b>	<b>AIR-7442</b>
<b>Title:</b>	AIR Android support for middle and right mouse button clicks
<b>Applies to:</b>	Android runtime component
<b>Description:</b>	For running Android on devices that support a physical mouse, this change ensures that the <code>MouseEvent.MIDDLE_CLICK</code> and <code>MouseEvent.RIGHT_CLICK</code> events are sent to a listener.

<b>Reference:</b>	<b>AIR-7457, AIR-7469</b>
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Title:	AIR Diagnostics - framework, long funcs, GC activity
Applies to:	All runtime components
Description:	<p>An initial framework has been added into AIR to help in diagnostics, allowing applications to get insights into how their functionality may be working on a device. The initial implementation covers two features: (a) long-running internal functions (i.e. if a frame's AS3 processing or rendering code takes too long, or if particular GC operations take a long time) which is intended to help in particularly with Android ANR issues; and (b) the GC operations so that you can check the timings of different operations, allowing apps to see how frequently GC is triggered, how long is taken in the various phases, and how much memory was cleaned up.</p> <p>More details of this are added into a new section 10 below.</p>

Reference:	Github-108 <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/108">https://github.com/air sdk/Adobe-Runtime-Support/issues/108</a>
Title:	Implementing NativeApplication userIdle/userPresent events for mobile
Applies to:	Mobile runtime components
Description:	<p>The "userIdle" and "userPresent" events were dispatched by the main NativeApplication object only on desktop platforms. This update extends the support to the mobile platforms so that applications can listen out for these events to determine whether the user has interacted with the application within a certain timeout period.</p>

Reference:	Github-3530 <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3530">https://github.com/air sdk/Adobe-Runtime-Support/issues/3530</a>
Title:	Additional debugging during runtime installation and bundle conversion
Applies to:	Desktop runtime components
Description:	<p>A number of issues are sometimes raised regarding failures during the AIR shared runtime installation process, or when installing a .air package, or when creating a native application bundle. To help in debugging these issues, we have added additional output to the runtime code where this is being used, which will be dispatched to a LocalConnection pipe. This will allow us to use the AIR SDK Manager to display troubleshooting details (once this has been suitably updated).</p> <p>As part of this change, an updated Win32 API has been added to perform file operations where the earlier/deprecated API might fail.</p>



<b>Reference:</b>	<b>Github-3558</b> <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3558">https://github.com/air sdk/Adobe-Runtime-Support/issues/3558</a>
<b>Title:</b>	Disabling Android Clipboard access if 'disableSensorAccess' is set
<b>Applies to:</b>	Android runtime component
<b>Description:</b>	<p>An earlier update was required to prevent the AIR runtime from checking for orientation sensors, due to requirements from China regulators. This has now expanded so that access to the system clipboard will also be disabled when the 'disableSensorAccess' flag is set in the app descriptor file.</p> <p>It is expected that the disabling of the clipboard service will move to have its own XML app descriptor flag in the next dot-release i.e. in AIR 51.2.</p>

## 3.5 Bug Fixes

### 3.5.1 Release 51.1.3.1

<b>Reference:</b>	<b>AIR- 7467</b>
<b>Title:</b>	Android AIR ANR caused by key listener in wrong thread
<b>Applies to:</b>	Android runtime component
<b>Description:</b>	<p>Another set of ANR reports showed that a handler for a key listener was being called on the main Android UI thread, but this then conflicted with the AIR runtime when that had been running in a background thread. So the handler calls for this have been shifted so that they are called on the runtime thread.</p>

<b>Reference:</b>	<b>Github-3521</b> <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3521">https://github.com/air sdk/Adobe-Runtime-Support/issues/3521</a>
<b>Title:</b>	Reworking device text output to fix Chinese font issues
<b>Applies to:</b>	iOS runtime component
<b>Description:</b>	<p>The initial fix made for this was to use a different (non-deprecated) API to display the Chinese glyphs. However it was found this does not solve the problem for all use cases, so more extensive change has been made which switched from using CoreGraphics to CoreText to render the characters.</p>

<b>Reference:</b>	<b>Github-3536</b> <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3536">https://github.com/airSDK/Adobe-Runtime-Support/issues/3536</a>
<b>Title:</b>	navigateToURL not working on iOS >= 18
<b>Applies to:</b>	iOS runtime component
<b>Description:</b>	The implementation of navigateToURL functionality on iOS had been using a deprecated function, and in iOS 18 this turned into a no-op i.e. no longer did anything. The code has been changed now to use a currently-supported method.

<b>Reference:</b>	<b>Github-3583</b> <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3583">https://github.com/airSDK/Adobe-Runtime-Support/issues/3583</a>
<b>Title:</b>	Android ARMV7 thread condition variable caused spinning CPU
<b>Applies to:</b>	Android runtime component
<b>Description:</b>	One of the condition variables set up in the thread handling for Android had not been properly set up for 32-bit Android deployments. This issue was introduced when the mechanism changed when updating to a newer compile SDK version, in AIR 51.1, and caused the 'wait' operation to fail hence sometimes resulting in the device ending up with high CPU and power usage. This has been updated so that the variable initialisation is correctly handled the same way as for the 64-bit code.

### 3.5.2 Release 51.1.3.2

<b>Reference:</b>	<b>AIR- 7483</b>
<b>Title:</b>	Android AIR crash in worker initialising sound channel
<b>Applies to:</b>	All runtime components
<b>Description:</b>	A crash log reported by a customer showed an issue with a null pointer dereference within the AIR sound channel initialisation. This fix adds defensive coding to a core (cross-platform) method within the runtime.

<b>Reference:</b>	<b>AIR- 7503</b>
<b>Title:</b>	Fixing crash in AIR iOS 'applicationDidReceiveMemoryWarning' code



Applies to:	iOS runtime component
Description:	An iOS test app crashed on startup, with the report showing an invalid handling of the “memory warning” notification. This again required the addition of some defensive programming to protect against the error condition.

Reference:	<b>Github3530- <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3530">https://github.com/airSDK/Adobe-Runtime-Support/issues/3530</a></b>
Title:	Updating AIR win32 file operations to use IFileOperation with message pump
Applies to:	Windows runtime component
Description:	File operations (move/copy/delete) on Windows had been using a deprecated API which had been failing on some devices. The code has been updated to use the newer APIs as a preference, and with the addition of a message queue within the background thread on which the file operations take place.

Reference:	<b>Github-3562 <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3562">https://github.com/airSDK/Adobe-Runtime-Support/issues/3562</a></b>
Title:	Fixing code-signing of AIR app bundles on macOS
Applies to:	Core build tools
Description:	Native codesign commands had been run via the use of a “find” command to ensure all frameworks within a bundle were signed. However, this could result in problems when a framework contained another framework as these need to be signed from the inside out to be valid. The ADT code has been updated to use Java file methods to recurse into the folders and sign a bundle from the inside out.

Reference:	<b>Github-3582 <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3582">https://github.com/airSDK/Adobe-Runtime-Support/issues/3582</a></b>
Title:	Updating IPA constants for Xcode 16.2 iOS 18.2
Applies to:	Core build tools

Description:	<p>The constants used for IPA files (the Info.plist values, as well as the default linker setting) have been updated to use Xcode 16.2 and the iPhoneOS / AppleTVOS 18.2 version codes.</p> <p>At the same time, a warning has been added in case a “-platformsdk” argument has been provided for an iPhoneOS SDK during a build for a simulator device, and vice versa.</p>
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Reference:	<p><b>Github-3591</b> <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3591">https://github.com/air sdk/Adobe-Runtime-Support/issues/3591</a></p>
Title:	<p>Ensuring Android StageText can capture a bitmap when running in background mode</p>
Applies to:	<p>Android runtime component</p>
Description:	<p>The use of the AIR runtime in a background thread on Android means that a bitmap of the StageText UI element cannot be captured from this thread. This was causing problems for Starling/Feathers based text editor fields that used StageText. However, it has been possible to add thread synchronisation so that the UI thread can render the text to a bitmap whilst the runtime thread waits for this.</p>

Reference:	<p><b>Github-3595</b> <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3595">https://github.com/air sdk/Adobe-Runtime-Support/issues/3595</a></p>
Title:	<p>Fixing Android ANR in nativeSetVisible</p>
Applies to:	<p>Android runtime component</p>
Description:	<p>Another ANR being caused by the use of the AIR runtime in a background thread, the visibility notifications from the OS were being passed directly into the runtime whereas these should have been queued to be sent into the runtime thread.</p>

Reference:	<p><b>Github-3600</b> <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3600">https://github.com/air sdk/Adobe-Runtime-Support/issues/3600</a></p>
Title:	<p>Fixing alpha setting in text fields for iOS</p>
Applies to:	<p>iOS runtime component</p>
Description:	<p>As a result of the changes for Chinese font rendering, the alpha setting of a TextField object was not being correctly applied to the text characters. This has been fixed, and the alpha transform is also now being applied to any background colour that is set on the TextField object (it was already being applied to the border colour).</p>

<b>Reference:</b>	<b>Github-3604</b> <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3604">https://github.com/airSDK/Adobe-Runtime-Support/issues/3604</a>
<b>Title:</b>	Fixing Android Banner mipmap image validation and location
<b>Applies to:</b>	Core build tools
<b>Description:</b>	Any multi-resolution Android TV banner object was being set up as a mipmap resource, however the generated Android Manifest was referencing a drawable resource with the same name, which resulted in the default AIR banner image being used. This has been fixed, and validation has also been added to ensure that the files that are referenced in the application descriptor file for the banner images are present and correct.

### 3.5.3 Release 51.1.3.3

<b>Reference:</b>	<b>AIR- 7524</b>
<b>Title:</b>	Use of Screen.mainScreen in a worker causes crash on iOS
<b>Applies to:</b>	iOS runtime component
<b>Description:</b>	Found by a customer with a settings class that used Screen.mainScreen metrics within a static initialiser, the crash was caused by the use of this API when running in a background thread; the code already had an execution path that didn't use the UIWindow API for prior iOS versions so this older version is now being used when called from a background thread.

<b>Reference:</b>	<b>Github-2505-</b> <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/2505">https://github.com/airSDK/Adobe-Runtime-Support/issues/2505</a>
<b>Title:</b>	Ensuring windows video pipeline is drained if video finishes before audio
<b>Applies to:</b>	Windows runtime component
<b>Description:</b>	A video file had been provided where a few seconds of audio continued after the video packages had finished (i.e. the final frame stayed valid for 3s) but the video decoder 'drain' request was only sent when AIR approached the end of the overall stream. The code has been updated to also detect separately when the video packet stream has run dry in order to switch the decoder into 'drain' mode so that the last part of the content appears at the correct time.



<b>Reference:</b>	<b>Github-3478</b> <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3478">https://github.com/airSDK/Adobe-Runtime-Support/issues/3478</a>
<b>Title:</b>	Fixing XML transformer exception when older namespace is used
<b>Applies to:</b>	Core build tools
<b>Description:</b>	An exception was thrown when creating an IPA file using the AIR 51.1 build tools on an XML application descriptor file with an earlier namespace. This was due to the inclusion of a new field in the Info.plist file that was then missing from earlier application descriptor variants, resulting in a 'null' string value that the XML transformer objected to. The correct default value has now been implemented for where the namespace is 51.0 or earlier.

<b>Reference:</b>	<b>Github-3614</b> <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3614">https://github.com/airSDK/Adobe-Runtime-Support/issues/3614</a>
<b>Title:</b>	Ensuring NetStream.Play.Complete is triggered from windows H.264 decoder
<b>Applies to:</b>	Windows runtime component
<b>Description:</b>	The newer H.264 decoder mechanism using the Windows media foundation classes had not been properly triggering the "NetStream.Play.Complete" callback method; this has been updated to match the earlier internal decoder logic.

<b>Reference:</b>	<b>Github-3621</b> <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3621">https://github.com/airSDK/Adobe-Runtime-Support/issues/3621</a>
<b>Title:</b>	Fixing crash in win32 HTTP handling of zero-length responses
<b>Applies to:</b>	Windows runtime component
<b>Description:</b>	When an HTTP response was received, the response data was being manually null-terminated in order to check the data format; however if there was no data, the null terminator was being set on an invalid memory buffer hence causing a segmentation fault. This condition is now checked to ensure content handling is only applied when there is some content received.

<b>Reference:</b>	<b>Github-3625</b> <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3625">https://github.com/airSDK/Adobe-Runtime-Support/issues/3625</a>
<b>Title:</b>	Preventing hang/crash in sound closure on Linux
<b>Applies to:</b>	Linux runtime component

Description:	When using sound on Linux with a Worker running, if the application was quit without first closing the worker (so that both workers terminated at the same time) then the sound mechanism was being shut down twice due to a lack of thread synchronisation. The shutdown code has now been put into a critical section and the primordial worker will now close down the audio system with any secondary workers finding that they do no need to do this.
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### 3.5.4 Release 51.1.3.4

Reference:	AIR- 7542
Title:	windows stagewebview fails if main window is destroyed
Applies to:	Windows runtime component
Description:	If a StageWebView object is created but not added to a stage, and the main application window is destroyed, then the StageWebView creation failed. This was due to the parenting of the webview window, which has now been updated so that the parent of non-active StageWebView objects is a separate window that won't be destroyed if any NativeWindow is closed.

Reference:	Github-2505- <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/2505">https://github.com/airSDK/Adobe-Runtime-Support/issues/2505</a>
Title:	Ensuring it's possible to seek(0) from a video metadata callback
Applies to:	Windows and macOS runtime components
Description:	When a "seek(0)" was called from within a metadata callback, there was a process hang which was caused by multiple threads trying to simultaneously call into the same critical section, resulting in a deadlock. This has been fixed along with a change to ensure the calls are not recursive (i.e. a "seek" that's called within a metadata callback should not trigger another metadata event).

### 3.5.5 Release 51.1.3.5

Reference:	AIR-7456
Title:	AIR Diagnostics: extending categories and AS3 framework for diagnostics
Applies to:	All runtime components



Description:	<p>Additional diagnostic categories have been added, in response to specific customer field failures, and the AS3 functionality within the ANE has been extended to provide a better interface for managing the diagnostic data.</p> <p>Further information on this feature will be provided shortly.</p>
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Reference:	<b>AIR-7547</b>
Title:	File.workingDirectory was null on Linux
Applies to:	Linux runtime component
Description:	The ActionScript property File.workingDirectory was not set up properly on the Linux runtimes, resulting in a null value (which should only be the case for the mobile runtimes). This has been updated so that the working directory value is taken from the platform, based on how it was launched.

Reference:	<b>Github-3526</b> - <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3526">https://github.com/air sdk/Adobe-Runtime-Support/issues/3526</a>
Title:	Adding critical sections around iOS URL callback handling
Applies to:	iOS runtime component
Description:	Some crash reports indicated that an iOS callback was using an object from a background thread whilst another thread had been destroying that object. To protect against this, some critical sections have been added in the callbacks and in the functions that result in the object destruction.

Reference:	<b>Github-3638</b> - <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3638">https://github.com/air sdk/Adobe-Runtime-Support/issues/3638</a>
Title:	Fixing Android start-up issue with application file manager crash in debug mode
Applies to:	Android runtime component
Description:	A recent change had resulted in a potential thread conflict, which had only been seen in a debug-mode application but could have impacted a production app. An asynchronous task may not have been completed prior to another call that required the results; this has been updated to add in appropriate thread synchronisation.

Reference:	<b>Github-3645</b> - <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3645">https://github.com/air sdk/Adobe-Runtime-Support/issues/3645</a>
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Title:	Ensuring MethodClosure caching doesn't affect dictionary weak references etc
Applies to:	All runtime components
Description:	A previous performance/memory improvement, to avoid memory churn for MethodClosure objects, had resulted in a problem where a Dictionary object with weak keys would not have a key removed due to this cache. To avoid this, the caching optimisation has been modified so that it only holds open MethodClosure objects that are repeatedly used e.g. methods used each frame.

### 3.5.6 Release 51.1.3.6

Reference:	Github-3648 - <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3648">https://github.com/air sdk/Adobe-Runtime-Support/issues/3648</a>
Title:	AIR Mac preventing crash in clipboard clear-and-reuse
Applies to:	macOS runtime component
Description:	If the clipboard was cleared, and then text was set on this again, a fault could occur in the macOS handling of clipboard data (where a mutable array had been set, but when later retrieving the array, it appears the OS has copied this and returns details in an immutable array that AIR then tried to update).

Reference:	Github-3650 - <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3650">https://github.com/air sdk/Adobe-Runtime-Support/issues/3650</a>
Title:	Ensuring Android 'aspectRatio' setting is used even when sensors are disabled
Applies to:	Android runtime component
Description:	If the <disableSensorAccess> flag was set in the application descriptor file, the orientation processing was completely disabled. However, it should still have been possible to set the application into portrait or landscape mode based solely upon user preference, so the code has been refactored so that this will still be possible, via the <aspectRatio> setting.

Reference:	Github-3654 - <a href="https://github.com/air sdk/Adobe-Runtime-Support/issues/3654">https://github.com/air sdk/Adobe-Runtime-Support/issues/3654</a>
Title:	Runtime stability fixes to ensuring NAIP does not abort when packaging bundles
Applies to:	All runtime components

<p><b>Description:</b></p>	<p>A stability issue had been found as a result of the previous update for caching method closures. This appears to only impact the internal mechanisms used by the Native Application packagers, hence the error currently appears to just prevent native application (bundle) creation. However there is a risk that any runtime could fall foul of this issue, hence distributing an update for all platforms.</p>
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### 3.5.7 Release 51.1.3.7

<p><b>Reference:</b></p>	<p><b>AIR-7457, 7595, 7596</b></p>
<p><b>Title:</b></p>	<p>AIR Diagnostics fixes to ensure folder is created and library.swf is read, with further fixes on Android and macOS</p>
<p><b>Applies to:</b></p>	<p>All runtime components</p>
<p><b>Description:</b></p>	<p>A few problems were found when creating and checking for diagnostics on the different platforms, and when Worker threads were involved. This has required a number of updates and bug fixes but should mean that the diagnostic system can now be used in the field.</p>

<p><b>Reference:</b></p>	<p><b>AIR-7570</b></p>
<p><b>Title:</b></p>	<p>AIR App Installer on macOS needs to use InfoAdditions</p>
<p><b>Applies to:</b></p>	<p>macOS runtime component</p>
<p><b>Description:</b></p>	<p>The installer for AIR applications was ignoring the application descriptor "InfoAdditions" for macOS apps, which meant that e.g. the camera usage description was not being added to an installed apps' Info.plist file.</p>

<p><b>Reference:</b></p>	<p><b>AIR-7574</b></p>
<p><b>Title:</b></p>	<p>Android activity restarts when BT keyboard disconnects</p>
<p><b>Applies to:</b></p>	<p>Android runtime component</p>
<p><b>Description:</b></p>	<p>The set of configuration changes that AIR applications can cope with has been extended to include the "keyboard" change. Without this, when the OS detects that an external (e.g. Bluetooth) keyboard has been added or removed, the activity is requested to restart, which results in a UI glitch within AIR.</p>



<b>Reference:</b>	<b>AIR-7577</b>
<b>Title:</b>	AIR Linux fails to fetch a file from S3 after a redirect
<b>Applies to:</b>	Linux runtime component
<b>Description:</b>	The handling of HTTP redirect response codes on Linux was not being handled properly, with the switch from a POST to a GET request working but with the POST data's content type still being sent as a header, which caused the AWS S3 service to reject the request.

<b>Reference:</b>	<b>AIR-7583</b>
<b>Title:</b>	AIR Android not dispatching key events with control/alt modifiers
<b>Applies to:</b>	Android runtime component
<b>Description:</b>	When using a separate Android keyboard, key events that resulted in non-ASCII character codes were being ignored – typically this meant when using a “control” or “alt” modifier. These are now updated to ensure the events are passed in with the appropriate KeyboardEvent modifier and keycode values.

<b>Reference:</b>	<b>AIR-7591</b>
<b>Title:</b>	Preventing ANE dispatching events after disposal
<b>Applies to:</b>	All runtime components
<b>Description:</b>	It was possible to crash the AIR runtime if a status event was dispatched by an ANE in a background thread, after the ANE disposal had been triggered (and whilst the runtime is being shut down). Some extra protection has been added here to try to prevent this, although it may still be possible to cause instabilities if the context object is used after it's been destroyed by the runtime.

<b>Reference:</b>	<b>AIR-7593</b>
<b>Title:</b>	AIR iOS dispatching incorrect key events with control/alt modifiers
<b>Applies to:</b>	iOS runtime component



Description:	Similarly to the Android problems, with iOS the use of the control, option and command modifiers were either blocking the key events from dispatching, or causing incorrect values due to how the iOS events are set up. These cases have been updated so they are correctly handled and send into the AS3 code as KeyboardEvent values with modifiers and appropriate keycodes.
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Reference:	<b>Github-3014</b> - <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3014">https://github.com/airSDK/Adobe-Runtime-Support/issues/3014</a>
Title:	Android proxy server settings are not used for url requests
Applies to:	Android runtime component
Description:	The code that detected Android proxy server values was not coping with an update in how the Java system classes reported the proxy server, in recent Android versions. To work around this, a new Android API is being used instead to pick up the provided proxy host name.

Reference:	<b>Github-3328</b> - <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3328">https://github.com/airSDK/Adobe-Runtime-Support/issues/3328</a>
Title:	Don't activate Linux windows as 'always on top'
Applies to:	Linux runtime component
Description:	Some versions of Linux resulted in a window appearing with the “always on top” style. This was caused by incorrect handling of the “_NET_WM_STATE” event, and has been updated to correctly handle empty events.

Reference:	<b>Github-3671</b> - <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3671">https://github.com/airSDK/Adobe-Runtime-Support/issues/3671</a>
Title:	Ensuring Recycle Bin capability is possible again for windows File.moveToTrash
Applies to:	Windows runtime component
Description:	The recent updates to alter the API used for file operations on Windows had omitted a flag that could be set to mark a file deletion as “can undo” i.e. when the file should be moved to the recycle bin rather than permanently deleted.

Reference:	<b>Github-3673</b> - <a href="https://github.com/airSDK/Adobe-Runtime-Support/issues/3673">https://github.com/airSDK/Adobe-Runtime-Support/issues/3673</a>
Title:	Correcting screen.contentsScaleFactor value on macOS



Applies to:	macOS runtime component
Description:	Whilst the Stage value of 'contentsScaleFactor' was returning the right value for a macOS display, the Screen value was always returning 1.0. This was an oversight in the arguments being passed in to the Screen object constructor from the OS object and has now been fixed.

## 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	<p>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).</p> <p>Values may be 'true' or 'false', default is 'false'.</p>
AndroidPlatformSDK	<p>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").</p>
iOSPlatformSDK	<p>A path to the iOS/iPhone/iPhoneSimulator SDK, that can be used instead of the "-platformsdk" command line parameter.</p>
JAVA_HOME	<p>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").</p>
UseNativeCodesign	<p>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.</p>
SignSwiftFiles	<p>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".</p>
OnlyIncludeSwiftUsedArchsInSupport	<p>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).</p>
OnlyIncludeSwiftUsedArchsInPayload	<p>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".</p>
iosSimulator	<p>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).</p>

## 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 APK 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](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/air sdk/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 resolve 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-colored 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 should 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://" URLs, 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](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\.air sdk\” 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 .air sdk directory. For example:

```
C:\Users\username\.air sdk\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.

#### Troubleshooting:

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 application 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 configure 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 should 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 existence 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 problematic 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 consolidation 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.

## 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 would 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.