

BlackBerry Dynamics SDK 3.3: Readiness Release for Android 8 and iOS 11

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Executive summary

This paper is for BlackBerry customer and ISV partner development managers and developers. The paper assesses the impact of on BlackBerry Dynamics applications of iOS 11 with Xcode 9 and Android 8 (code named “O”) operating systems.

The paper includes a release-by-release walkthrough through of the required code changes in reverse chronological order since the SDK updates for iOS 10 and Android 7 (code named “N”) in 2016. In addition, the paper provides analysis, recommendations, and requirements about new features and their effect on the BlackBerry Dynamics Software Development Kit (SDK) version 3.3.

Note: Upgrades to the BlackBerry Dynamics SDK version 3.3 are required for the following reasons:

- **Android 8:** It is *critical* that enterprises and developers update to **BlackBerry Dynamics SDK for Android version 3.3**. Because of a change in Android background services, apps built with earlier versions of the SDK will not run reliably on Android 8.
- **iOS 11:** It is *mandatory* that enterprises and developers update to **BlackBerry Dynamics SDK for iOS version 3.3**. Apps built with earlier versions of the SDK run the risk of data leaks in some use cases.
- The same requirements apply to the **BlackBerry Dynamics SDK for Cordova version 3.3**, which is based on the SDK.
- The same requirements apply to the **BlackBerry Dynamics Bindings for Xamarin.Android and Xamarin.iOS version 3.3**, which is based on the SDK.

To upgrade to the compatibility release, BlackBerry Dynamics SDK version 3.3, no code changes are required.

BlackBerry strongly urges you to upgrade to the latest release of the BlackBerry Dynamics SDK.

Both Apple and Google place *day-one readiness* requirements on app developers.

- Developers must publish versions of their apps that are ready for the new OS *before its release*.
- This is made possible by the release of a *final API SDK* for Android, and a *Gold Master* for iOS before the public OS releases.

Background: BlackBerry Dynamics compatibility program

BlackBerry Dynamics has a general approach to compatibility with new versions of operating systems and app developer tools

The following points describe the program.

- New versions of operating systems generally include:
 - New operating system (OS) binary (for example, kernel, firmware, or other)
 - New versions of build tools, or even new tools
 - New features
- The program recognizes different levels of compatibility:
 1. Readiness
 2. Tool compatibility
 3. Feature utilization. The SDK excludes support for features that are either not possible or of questionable security, in particular Android 8's data leakage prevention (DLP).
- “Readiness compatibility” means:
 - BlackBerry Dynamics apps can be built with the old tools for the OS and run on the new binary. This could be a binary on a simulated device or a binary that has been installed on a physical device.
 - BlackBerry Dynamics apps don't crash on the new OS binary in circumstances in which they didn't crash on the old OS binaries.
 - There are no new security flaws in BlackBerry Dynamics when run on the new OS binary.

Code changes from BlackBerry SDK 3.2 to BlackBerry SDK 3.3 readiness

Here are details of required code changes for upgrades to BlackBerry Dynamics SDK 3.3 release.

Note: No code changes are required to upgrade from version 3.2 to version 3.3.

If you are on an earlier SDK version or have questions, contact the ISV Technical Team at <https://community.blackberry.com/community/gdn/partners/engagement-request>.

Good Control or UEM versions: no upgrade needed

No upgrade of either BlackBerry UEM or standalone Good Control is required.

Required versions of tools, libraries, and IDEs

Android

Required or suggested versions are as follows.

- BlackBerry Dynamics Handheld Library minimum API level: 19
- BlackBerry Dynamics Wearable Library minimum API level: 20
- Supported CPU Architectures
 - ARMv7
 - ARMv8
 - X86
- Android Wearable dependencies
 - Google Play Services 9.1.2
 - Android Wear Emulator API level 22

The following values specified in **/sdk/libs/handheld/gd/build.gradle** are recommended. Other versions of tools will work; however, BlackBerry Dynamics library gradle files might need to be updated accordingly.

- `com.android.tools.build:gradle:2.1.0`
- `compileSdkVersion 24`
- `buildToolsVersion "25.0.3"`
- Suggested Version of Android Studio: 2.2
- Character encoding for project files: UTF-8

iOS

Required versions are as follows.

- Development environment:
 - Xcode 9.0
 - iOS SDK 9.0 or later
 - Required frameworks:
 - libstdc++.6.0.9
 - libz
 - MessageUI
 - LocalAuthentication
 - SystemConfiguration
 - MobileCoreServices
 - CoreTelephony
 - CoreData
- Deployment target: iOS 8 or later

BlackBerry Dynamics SDK 3.2 to 3.3, August/Sept 2017

Android

Developers of BlackBerry-Dynamics -SDK-based apps for Android must set the project's `buildToolsVersion=25.0.3`.

BlackBerry Dynamics SDK for Android to 3.2, April/July 2017

Android

- **Required:** Minimum API Level 19 As previously announced, Android API Level 19 is now the minimum supported level, replacing API Level 14. If your application relies on any lower minimum API Level, you must update it as part of integrating the latest the BlackBerry Dynamics SDK.
- **Required:** `isUsingDataPlan` and other APIs now removed The following APIs were deprecated in 2016. They have now been removed from the BlackBerry Dynamics SDK: `GDAndroid.isUsingDataPlan` | `GDAppeventType.GDAppeventDataPlanUpdate` | `GDStateListener.onUpdateDataPlan` You must remove any references to these APIs from your application.

iOS

The following APIs were deprecated in an earlier release. They have now been removed from the BlackBerry Dynamics SDK. You must remove any references to these APIs from your application.

- `GDiOS.initializeWithClassNameConformingToUIApplicationDelegate`
- `GDiOS.initializeWithClassConformingToUIApplicationDelegate`
- `GDiOS.isInitialized`
- `GDiOS.isUsingDataPlan`
- `GDiAppEventType`
- `GDiAppEventDataPlanUpdate`

`GDiOS.isUsingDataPlan` - Deprecated API

```
/** Check whether the application is using a data plan for split billing
 * (deprecated).
 * \copydetails ssGDRuntimeIsUsingDataPlan
 */
+ (BOOL)isUsingDataPlan ;
```

`GDiOS.isInitialized` - Deprecated API

Initialization is now automatic and this function is no longer required.

```
/** Get the BlackBerry Dynamics interface object's initialization status
 * (deprecated).
 * @deprecated This function has been deprecated and will be removed in a future
 * release.
 *
 * @return \ss_true always.
 */
+ (BOOL)isInitialized ;
```

`GDiOS.initializeWithClassNameConformingToUIApplicationDelegate` Deprecated API

Resource allocation is now automatic. This function is no longer required.

```
/** Enable early authorization by specifying a class name (deprecated).
 * @deprecated This function has been deprecated and will be removed in a future
 * release.
 *
 * @param applicationDelegate <tt>NSString</tt> containing the name of the
 * application class that conforms to <tt>UIApplicationDelegate</tt>.
 */
+ (void)initializeWithClassNameConformingToUIApplicationDelegate:(NSString*)applicationDelegate;
```

`GDiOS.initializeWithClassConformingToUIApplicationDelegate` - Deprecated API

Resource allocation is now automatic. This function is no longer required.

```
/** Enable early authorization by specifying a class (deprecated).
 * @deprecated This function has been deprecated and will be removed in a future
 * release.
```



```
*
* @param applicationDelegate The application <tt>Class</tt> that conforms to
* <tt>UIApplicationDelegate</tt>.
*/
+ (void) initializeWithClassConformingToUIApplicationDelegate: (Class<UIApplicationDelegate>) applicationDelegate;
```

BlackBerry Dynamics SDK 2.4 to iOS 10 and Android, Aug/Dec 2016

Android and iOS - Deprecated API getGDAuthToken removed

The getGDAuthToken API, which was previously deprecated, has been removed from the BlackBerry Dynamics SDK. Instead, use form of call with server name:

```
getGDAuthToken (final String challenge, final String serverName, final GDAuthTokenCallback callback)
```

Android: Deprecated API

```
public void getGDAuthToken(final String challenge, final GDAuthTokenCallback callback)
```

Use the following API instead:

```
public void getGDAuthToken(final String challenge, final String serverName, final GDAuthTokenCallback callback)
```

iOS: Deprecated API

```
- (void) getGDAuthToken: (NSString*) challenge;
```

Use the following API instead:

```
- (void) getGDAuthToken: (NSString*) challenge serverName: (NSString*) serverName;
```

iOS only

- **Required:** Discovery scheme .sc must be removed The discovery scheme .sc in your Info.plist was formerly needed for certain types of communications but has not been needed for many releases. It is not required. You should remove it from your project definitions
- **Installation directories:**
New location of installation directories and templates: ~/Library/Application Support/BlackBerry/Good.platform/iOS
- Formerly deprecated GDSecureDocs now removed The GDSecureDocs API, which was previously deprecated, has been removed from the BlackBerry Dynamics SDK for iOS.

BlackBerry Dynamics SDK 2.3 to 3.1, Dec 2016: no changes

No changes required.

Reference Documentation

For new APIs replacing deprecated or removed APIs discussed here, see the reference material available as follows:

- Development Guides for all platforms: <http://help.blackberry.com/en/blackberry-dynamics-sdk/current/>
- SDK programming references:
 - Android: <https://community.blackberry.com/view-doc.jsps?fileName=index.html&docType=android>
 - iOS: <https://community.blackberry.com/view-doc.jsps?fileName=index.html>

Analysis: BlackBerry Dynamics SDK version 3.3 readiness for iOS 11

The following changes in iOS 11 have been identified as significant to the BlackBerry Dynamics SDK.

- **Drag and drop interactions between apps**, on iPad devices.
 - Shared data is leaked data, same as it is for Android.
- Changes to the **native pasteboard programming interface**, which could be related to the previous change.
 - The intention is to accommodate these changes in the 3.3 SDK. At time of writing, it isn't clear that this can be delivered. Different iOS beta versions seem to have different implementations.
- **Password AutoFill** with Touch ID.
 - More shared data.
- Updates to **App Transport Security** (ATS) and HTTP session capabilities.
 - This includes changes to supported cyphers and signing algorithms, and changes to the native `NSURLSession` programming interface.
 - Investigation has concluded. A number of possible future features have been defined that would support aspects of ATS in BlackBerry Dynamics. No changes in the 3.3 SDK.

iOS 11 inter-app drag and drop

Here is the documentation of this feature on the Apple developer website:

https://developer.apple.com/documentation/uikit/drag_and_drop?language=objc

The BlackBerry Dynamics version 3.3 for iOS will block this feature because it represents data leakage. Earlier versions won't block it, so enterprise data will be liable to leak if this feature is used.

A future version may secure this feature if a method to do so is discovered. For example, the method might be to intercept and encrypt the data in motion with a key shared only by BlackBerry Dynamics apps activated by the same end user. This is how data on the clipboard is secured. At time of writing, no such method has been discovered.

File drag and drop

A related new feature is File Drag and Drop. One app can receive files from another. The app developer must write code to support File Drag and Drop, which isn't the case for plain Drag and Drop. File Drag and Drop is in a similar area to the Document Extension.

The BlackBerry Dynamics SDK for iOS version 3.3 won't block File Drag and Drop. It is implicitly not possible to utilize the feature directly from the secure file system.

A future version may secure this feature and enforce DLP policies on its use.

iOS 11 password autofill

There is a demonstration of this feature on the Apple WWDC 2017 site here:

<https://developer.apple.com/videos/play/wwdc2017/206/>

The BlackBerry Dynamics SDK for iOS version 3.3 will block this feature because it represents data leakage. Earlier versions won't block it, so enterprise data will be liable to leak if this feature is used.

Use cases and future features

A number of use cases for Password AutoFill can be imagined but not all are supported at time of writing, as follows.

- Credentials entered in Safari then used in an app is supported.
- Credentials entered in an app other than Safari and then used in another app isn't supported.

If the app-to-app use case is supported (for example, in a later version of iOS), and a way can be found to intercept credentials, then it might be possible to make a secure version in BlackBerry Dynamics.

Analysis: BlackBerry Dynamics SDK readiness for Google Android 8

New features in Android 8 are categorized as significant or less significant.

Most significant new Android 8 features

The following changes in Android 8 have been identified as most significant to the BlackBerry Dynamics SDK.

- **Android background services** are now liable to be terminated by the operating system when the app is running in the background. BlackBerry Dynamics relies on background services not being terminated, which is now a **critical defect**.
 - BlackBerry Dynamics will remove its reliance on background services not being terminated. See below for more details.
- The **scope of the Android ID** value is being reduced from device-level or user-level, to app-level. Different apps running on the same device will receive different Android ID values. Android ID is one of the factors that can be used to generate the BlackBerry Dynamics device identifier.
 - BlackBerry Dynamics will change to generate a device identifier for Android in a different way. This is a **major change**.
- WebView rendering will take place in what is being called an **isolated process**.
 - There is no impact on the general operation of WebView controls in BlackBerry Dynamics apps, including Cordova apps.
 - There is some new diagnostic information that will be useful for the 3.3 SDK runtime to log.
 - Data for rendering (for example, HTML and CSS) is sent in the clear by inter-process communication (IPC) from an app process to the WebView rendering process. IPC goes via the Android kernel. In theory, on a rooted device, an attacker could replace the kernel, intercept IPC, and obtain or modify data rendered in a WebView. BlackBerry Dynamics root detection protects against this attack.

The new diagnostic information will be logged but there are otherwise no changes in the 3.3 SDK for the new WebView. In the future, the protection of IPC data in motion will be improved.

- There are **new user interface features for sharing data** between apps.
 - Shared data is leaked data.
 - Discussed in more detail under Data Leakage, below.

- **Multi-Display** support, which is an advance on multi-window support.
 - Multi-window supports several apps running in foreground at once, for example on a larger display attached via a docking station like Samsung DeX Station.
 - Multi-window doesn't support multiple active displays. In the docking station example, when the device is docked, its display switches off and apps run on the larger display instead.
 - Multi-display supports multiple active displays.
 - Multi-window support was new in Android 7. Multi-display support is new in Android 8 and isn't used by any current products.
 - Google has stated that apps that can run in multi-window mode will also run in multi-display mode.

Less significant Android 8 features

The following changes in Android 8 have been identified as less significant to the BlackBerry Dynamics SDK.

- **Withdrawal of SSLv3.**
 - BlackBerry Dynamics doesn't rely on the native SSL/TLS stack.
- **Picture-in-picture** for all devices, not just Android TV. This means that two apps can run in foreground on a smartphone or tablet at the same time.
 - This has been tested with BlackBerry Dynamics:
 - The idle timer was still applied.
 - The screen capture prevention policy was still applied.
 - It's possible to drag and drop between the two apps that are on-screen, but this isn't a new feature for Android. Secure drag and drop is already supported by BlackBerry Dynamics for Android.
- Updates to **strict mode compilation** checks.
 - The BlackBerry Dynamics runtime library will be updated to pass the new checks.
- **Downloadable Fonts** are not a concern.

Also, the need for a number of **miscellaneous updates** was discovered during testing of BlackBerry Dynamics on Android 8. These are coding changes and aren't detailed further in this briefing.

Limitation in Android background service

The Android operating system supports background and foreground services for apps. This briefing refers to these capabilities only in their relationship to BlackBerry Dynamics and doesn't describe them in detail.

On devices running Android 8, the background services of an app are liable to be terminated by the OS if the app is in the background. The OS may do this to free memory or other run-time resources. This wasn't the case in earlier versions of Android, in which background services would always continue to run until the app was closed.

The BlackBerry Dynamics runtime for Android starts a number of background services. In version 3.2 and some earlier versions, the runtime relies on background services continuing to run. Apps built with these versions will crash when they resume foreground execution if the background services were terminated by the OS during background execution.

The runtime in version 3.3 will still start background services, but it will not be involved in their termination. Apps won't crash when they resume foreground execution.

Also note the following:

- Foreground services don't seem to be treated differently in Android 8 than in earlier versions. A foreground service must display a notification on the device when it is running.
- Apps cannot opt out of this change, for example, by setting a lower target SDK API level in the app's manifest.
- Apps that don't have a foreground service are more likely to be terminated by the OS to free run-time resources.

BlackBerry Dynamics device identifier for Android

The current method for generating the BlackBerry Dynamics device identifier won't always work on Android 8 devices. A new method will be used going forward.

- The new method is similar to the one used to generate BlackBerry Dynamics device identifiers for iOS:
 - A random identifier is generated and stored by the first BlackBerry Dynamics app on the device.
 - The stored identifier is shared with subsequent apps, when they are installed and run for the first time.

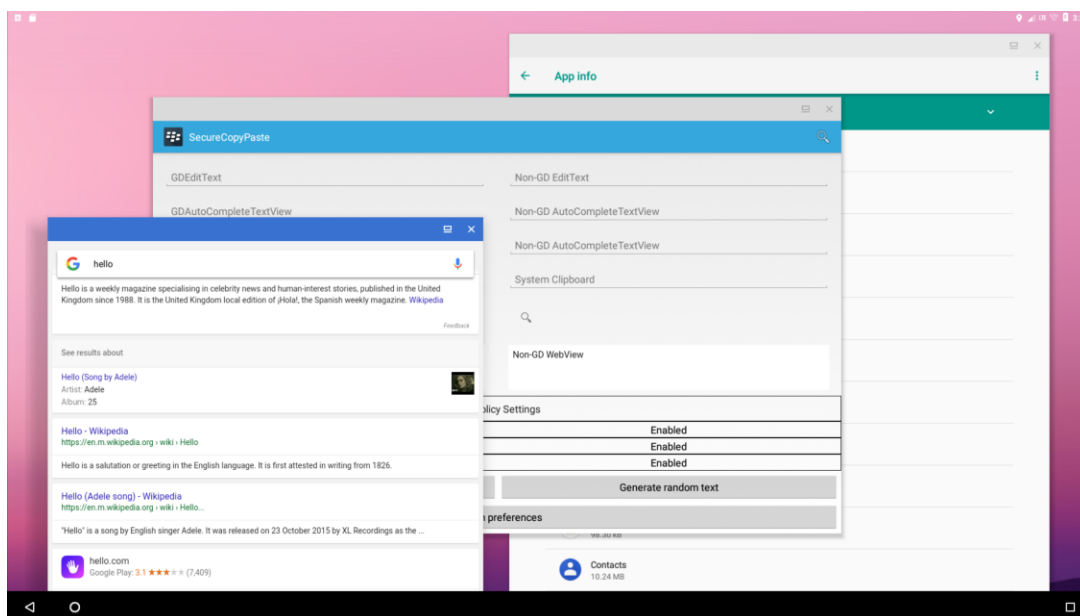
- The new method doesn't include the International Mobile Equipment Identifier (IMEI) number. This means that IMEI will no longer be required by BlackBerry Dynamics.
 - Access to the IMEI is controlled by an Android system permission, which has to be granted by the end user at run time. The permission is the same one that controls the ability to make phone calls.
 - The requirement for the system permission will be phased out of BlackBerry Dynamics. Apps that require the permission for their own use will have to request it.

Android multi-display and multi-window support

Support for free form multi-display screens has been added in Android 8. There are no multi-window products on the market at time of writing. It has been stated that apps that support multi-window operation will work OK in multi-display mode.

Multi-window support allows the user to run several apps in the foreground at once, on a larger display attached via a docking station like Samsung DeX Station. Keyboard and mouse devices can also be attached to the docking station.

The following screen capture shows a BlackBerry Dynamics sample app running on an emulated multi-window device.



The behavior of BlackBerry Dynamics in multi-window mode has been investigated. Initial results were that the BlackBerry Dynamics idle lock wasn't always applied to an app running

in multi-window mode. This seems to have been an Android preview defect, or due to the new background service limitation, see above. The latest preview at time of writing applies the idle lock correctly.

Android smart text selection

There is a demonstration of this feature in the Google IO keynote, which is on YouTube here: <https://www.youtube.com/watch?v=Y2VF8tmLFHw>

Advance to approximately 1hr 20min.

The current BlackBerry Dynamics interception for copy-paste also prevents Smart Text Selection. There are some concerns about the data being stored at an early stage of the interaction, even if final interception is prevented, but investigations found no evidence that this happens:

- Data isn't sent off the device for analysis. The feature works without an Internet connection.
- System databases and files don't have copies of data that was in scope of Smart Text Selection.

Future implementation

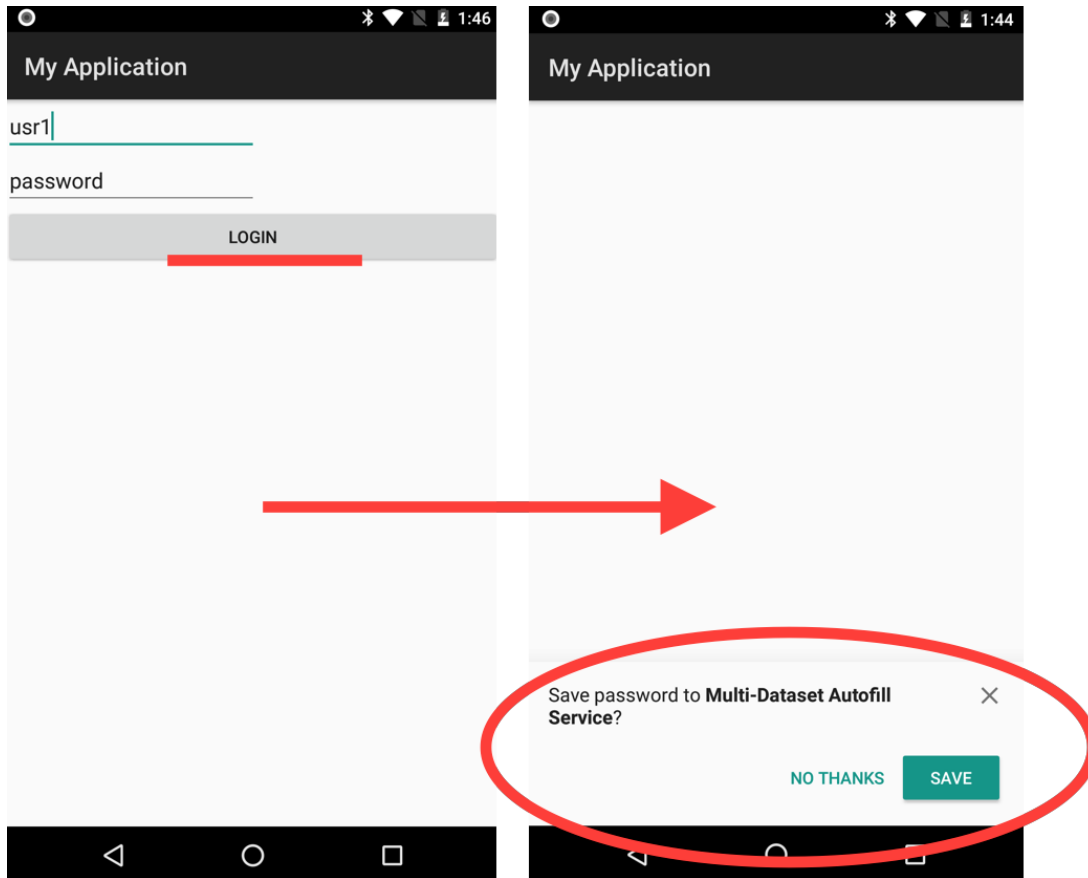
The code used by Android to recognize patterns for Smart Text Selection comes from the TensorFlow project. The specific code, TensorFlow Lite, is due to be published as Open Source. It could then be used by BlackBerry Dynamics to implement a secure enterprise version of this feature.

Another possible feature development could be to secure the inter-app communication in Smart Text Selection user interactions, for example by embedding them in AppKinetics service requests.

Android autofill framework

There is a demonstration of this feature in the Google IO keynote, at the same place and time as the Smart Text Selection demonstration (see above).

The Autofill Framework can store user names and passwords, as shown, but also credit card numbers, postal address fields, and other details.



The BlackBerry Dynamics SDK for Android version 3.3 will block this feature because it represents data leakage. Earlier versions won't block it, so enterprise data will be liable to leak if this feature is used.

Future implementation

A future version of BlackBerry Dynamics might block and unblock the Autofill Framework at run time, in accordance with enterprise DLP policy settings. At time of writing, it appears that blocking at run time doesn't work. If a control that isn't blocked from Autofill is later set to be blocked, it doesn't get blocked. This is a known Android issue. It might to be a low priority to fix. Typical user interfaces won't change the Autofill accessibility of their controls.

Another future feature could be a secure version of this feature. This might work by intercepting credentials prior to making them available to the Autofill Framework, and decrypting them when the are retrieved.

Android downloadable fonts

Downloadable Fonts is a mechanism for sharing font data between apps on the same device. The feature is described on the Android developer preview site here:

<https://developer.android.com/preview/features/downloadable-fonts.html>

The Downloadable Fonts feature works as follows.

- An app can be a font *provider*.

Providers hold font data, which they can obtain by any mechanism, including as build-time resources, or by run-time download. It seems that providers would typically be written by Google or by device vendors.

- An app can also be a font *consumer*.

Consumer apps can request font data from provider apps, by using a new programming interface, the *font request*.

The value of this feature is that consumer apps don't have to include the font resources at build-time or download them.

BlackBerry Dynamics impact

The impact on BlackBerry Dynamics apps is as follows.

A font request, sent from a consumer to a provider, is a form of inter-app communication. It can't be secured or authenticated by current BlackBerry Dynamics software, even if both consumer and provider are BlackBerry Dynamics apps.

BlackBerry will recommend that app developers **don't use** this feature in apps built with any current version of the SDK. BlackBerry might seek to secure font requests in a future version, if there is demand.

Data leakage in Android 8 and iOS 11

Data leakage can take place at any point that data enters or leaves a BlackBerry Dynamics app. For example:

- Cut-copy-paste interactions by the end user.
- Programmatic cut-copy-paste operations.
- Drag and drop interactions.
- Reading from, or writing to, the native file system on the device.
- Native inter-app communication mechanisms, such as Intent broadcast on Android or Open URL on iOS.

There are different types of leakage:

- If the destination of the data leaving an app isn't secure and authenticated, then *outbound* data leakage could take place.
- If the source of the data entering an app isn't secure and authenticated, then *inbound* data leakage could take place.
- Even if both source and destination are secured and authenticated, data leakage could still take place if the *transfer* mechanism can't be made secure.

BlackBerry Dynamics data leakage prevention (DLP)

BlackBerry Dynamics has a number of capabilities for data leakage prevention (DLP). Not every customer is concerned about every possible leak, so these capabilities are controlled by enterprise policy settings.

In general, the BlackBerry Dynamics runtime seeks to prevent data leakage by doing one of the following:

- Intercepting and encrypting outbound data, and decrypting inbound data

The runtime can encrypt data before writing it to the clipboard, and then decrypt it after reading it back. BlackBerry Dynamics apps that were activated by the same end user in the same deployment have shared keys for this purpose.

- Enabling the app to encrypt and decrypt outbound and inbound data

Android drag and drop implementation by the app can utilize the BlackBerry Dynamics runtime to encrypt and decrypt the payload data. This uses the same keys as cut-copy-paste encryption, above.

Another example is the use of AppKinetics, for Shared Services.

- Blocking user interactions and native programming interfaces that could cause leakage

Some operating system features cannot be intercepted. In these cases, blocking usage of the feature within a BlackBerry Dynamics app is a fallback option.

There are operating system features to which none of the above can be applied (for example Apple SiriKit). These cases are handled by advising our customers and Partners not to use that operating system feature.

BlackBerry Dynamics apps can implement their own additional controls. For example, BlackBerry Work can be allowed to communicate natively with particular apps. The feature is controlled by an app policy.

New features that risk data leakage

There is a general trend towards adding more inter-app communication mechanisms, on both Android and iOS, and making them easier to implement. Every inter-app communication mechanism represents potential data leakage. There are a number of these features in scope of the readiness release:

- Android 8 features:
 - Smart Text Selection: “On-device machine learning” recognizes patterns in text content, like addresses or phone numbers, and facilitates sending the content between apps.
 - Autofill Framework: Credentials, credit card numbers, and other details entered in one app can be re-used in other apps.
- iOS 11 features:
 - Inter-app drag and drop on iPad devices
 - Password AutoFill: Credentials used to log in to a website, in Safari, can be used to authenticate in an app, if the end user chooses.

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