inBeacon Xamarin SDK guide

Document date	Changelog
2-Dec-2015	Updated for component 1.0.3, with information about BeaconState method.
26-Nov-2015	Updated for component 1.0.2. Added information about Android BeaconEventReceiver and audiofiles on iOS.
23-Nov-2015	Initial version, based on Xamarin component 1.0.0 (iOS sdk 1.3.7 and android sdk1.3.11)

This document describes the latest version of the inBeacon Xamarin SDK

Authors: Mathijs Lagerberg / Ronald van Woensel

Padualaan 8
UtrechtInc Room W129
3584 CH Utrecht
The Netherlands

inBeacon SDK's

Integrating inBeacon is now easier than ever. It's a matter of pasting a few lines of code to integrate our SDK into your project. The inBeacon mobile SDK's are available for the following platforms:

- inBeacon iOS Xcode SDK (available)
- inBeacon Android java SDK (available)
- inBeacon Xamarin SDK (available)
- inBeacon iOS Appcelerator/Titanium SDK (available)

For other environments and platforms, the inBeacon device API can be addressed directly.

Getting Started

Both the Android and the iOS parts of this component can be implemented in a Xamarin project by following the regular instructions for Android and iOS native apps as provided by inBeacon on the SDK documentation page . These instructions assume you already have an account at inBeacon and are in possession of an Client ID and Client Secret. You can find your client-ID and client-Secret in your account overview. See https://console.inbeacon.nl/accmgr

Download the xamarin XAM file from the documentation page. It contains the SDK and samples for Android and iOS.

Implementation example

When using Xamarin.Forms and a shared code library, we suggest the following structure in order to avoid implementing the library with many `#ifdef` statements.

The shared code project

This interface represents a common codebase for the Android and iOS libraries.

```
using System;
using System.Collections.Generic;
namespace Sample {
	public interface IInbeacon {
	    IInbeacon GetInstance ();

	    void Refresh ();

	    void RefreshWithForce (bool force);

	    void CheckCapabilitiesAndRights (Object error);

	    void CheckCapabilitiesAndRightsWithAlert ();

	    void AttachUser (Dictionary<string,string> userInfo);

	    void DetachUser ();

	    object[] GetInRegions ();

	    Dictionary<string,object> GetDeviceInfo ();

	    void ModalClick ();

	    bool OnNotificationReceived (object notification);

	}
}
```

Enhance the App class in the shared code project

Next, you can add an instance of this interface as a parameter to your shared App class:

```
readonly IInbeacon inbeacon;
...

public App (IInbeacon inbeacon)
{
	this.inbeacon = inbeacon;
	...
}

protected override void OnResume ()
{
	if (inbeacon != null)
	{
		inbeacon.Refresh ();
	}
}
```

SDK methods

InbeaconManager.Initialize

Initialize the SDK with your clientID and clientSecret. These credentials are used for communication with the server.

for Android:

```
InbeaconManager.Initialize(context,<your clientid>,<your clientsecret>);
sdk = InbeaconManager.SharedInstance;
```

for iOS:

```
sdk = inBeaconSdk.InBeaconWithClientID (<your clientid>, <your clientsecret>);
```

AttachUser

Attach local userinformation to inbeacon. For instance, the user might enter account information in the app. It is also possible not to attach a user, in that case the device is anonymous.

Note: *User account information is not stored by the SDK so you'll need to call attachUser every time the app starts (after SDK initialization)*

There are a lot of fields available for userinformation, however none of them are required. Supply the necessary information.

field	Description
name	Full user name, both first and family name. Example 'Dwight Schulz'
email	User email. Example: 'dwight@a-team.com'
customerid	This can be any identifier used for identifying your customer, like a CRM client id or a loyalty card number. If the inBeacon backend communicates with a CRM system, this ID can be used to identify the customer. For inBeacon, this ID is a black box.
advertising_id	fill this with the IDFA number. Note: you need to specify the use of the IDFA on app submission. See https://developer.apple.com/news/?id=08282014a
gender	Either 'male' or 'female' is accepted
address	Street address and number
zip	zip / postal code
city	
country	ISO 2 letter country code
birth	Date of birth (string format yyyymmdd)
phone_mobile	
phone_home	
phone_work	
social_facebook_id	Facebook ID of user
social_twitter_id	Twitter ID of user, like @woenz
social_linkedin_id	Linkedin ID of user
avatar	URL to user avatar (png or jpg)

```
sdk.AttachUser (userInfo);
```

Note that attached user info is not stored by the SDK. On app restart, you need to attach the user again.

DetachUser

Remove current user info connected to the device. From now only anonymous info is send to inBeacon server.

```
sdk.DetachUser ();
```

Refresh

Obtain fresh trigger and region information from the inBeacon platform. Best practice is to call this when the app is

- started AND
- returned to the foreground so info is kept updated. Internally, the SDK automatically refreshes when a beacon area is entered.

```
sdk.Refresh();
```

DidReceiveLocalNotification (iOS only)

For iOS you need to forward localnotifications to the inBeacon SDK by putting an extra method in your appdelegate:

```
public bool OnNotificationReceived (object notification)
{
	return sdk.DidReceiveLocalNotification ((UIKit.UILocalNotification)notification);
}
```

CheckCapabilitiesAndRights

Check to see if the app has the rights to run location and notification services. Returns BOOL NO if there is a problem.

```
sdk.CheckCapabilitiesAndRights (error as NSError); (iOS)
sdk.VerifyCapabilities (); (android)
```

BeaconState

Get an array of all actual beacons within view, including their respective distance and proximity state. This method returns raw data without any filtering.

```
NSArray*beaconState=[[ inBeaconSdkgetInstance] getBeaconState];
```

The returned beaconState array has 1 entry for each beacon in view. Each array item is a dictionary with the following data:

Field	Description
`uuid`	beacon UUID value
`major`	beacon major value
`minor`	beacon minor value
`proxes`	Timestamps of all proximities last seen, format: <proximity>: <time last seen> Proximities are F, N and I.
`rawdist`	raw beacon distance in metres
`rawprox`	raw proximity (F, N, I or U) U = undefined, beacon currently not visible

Because beacon information is updated once per second, it is not useful to obtain the beaconstate more often.

Receiving inBeaconSDK events

The inBeacon event mechanism uses a LocalBroadcastManager and intents with actions. To listen to specific events, you need to create an intentfilter (android) or an observer (iOS)

Android

Event	Description
com.inbeacon.sdk.event.enterregion	*user entered a region*
com.inbeacon.sdk.event.exitregion	*user left a region*
com.inbeacon.sdk.event.enterlocation	*user entered a location*
com.inbeacon.sdk.event.exitlocation	*user left a location*
com.inbeacon.sdk.event.regionsupdate	*region definitions were updated*
com.inbeacon.sdk.event.enterproximity	*user entered a beacon proximity*
com.inbeacon.sdk.event.exitproximity	*user left a beacon proximity*
com.inbeacon.sdk.event.proximity	*low level proximity update, once every second when beacons are around*
com.inbeacon.sdk.event.appevent	*defined in the backend for special*
com.inbeacon.sdk.event.appaction	*defined in the backend to handle your own local notifications*

Android example:

```
using InBeaconAndroid;
...
public class MainActivity : Activity {
...
readonly BeaconEventReceiver receiver = new BeaconEventReceiver();
readonly IntentFilter filter = new IntentFilter();

protected override void OnCreate (Bundle savedInstanceState)
{
	base.OnCreate (savedInstanceState);
	receiver.EnterRegionEvent += delegate {
		Console.WriteLine ("Entered region");
	};
	filter.AddAction (BeaconEventReceiver.EnterRegionAction);
	...
}

protected override void OnResume ()
{
	base.OnResume ();
	LocalBroadcastManager.GetInstance (this).RegisterReceiver (receiver, filter);
}

protected override void OnPause ()
{
	base.OnPause ();
	LocalBroadcastManager.GetInstance (this).UnregisterReceiver (receiver);
}
```

iOS

Event	Description
inb:region	*user entered or left a region*
inb:location	*user entered or left a location*
inb:LocationsUpdate	*region definitions were updated*
inb:proximity	*Fired when proximity to a beacon changes*
inb:AppEvent	*defined in the backend for special application events*
inb:AppAction	*handle your own local notifications*

iOS example

```
public override bool FinishedLaunching (UIApplication app, NSDictionary options)
{
	...

	NSNotificationCenter.DefaultCenter.AddObserver (new NSString ("inb:region"), OnNotification);

	...
}

public void OnNotification (NSNotification notification)
{
	Console.WriteLine ("InBeacon notification: " + notification.Name);
}
```

Android specific details

Note that this component requires the AndroidAltBeaconLibrary component to be included into the project as well. It is available in the Xamarin Component store.

In your Droid project, create an Android-specific implementation of the interface:

```
using System;
using Android.Content;
using System.Collections.Generic;
using InBeaconAndroid;

namespace Sample.Droid {
       public class AndroidInbeaconManager : IInbeacon {
           private IInbeaconManagerInterface sdk;

           public AndroidInbeaconManager (Context context)
           {
               InbeaconManager.Initialize (context, Constants.ClientID, Constants.ClientSecret);
               sdk = InbeaconManager.SharedInstance;
           }

           #region IInbeaconManager implementation

           public IInbeacon GetInstance ()
           {
               return this;
           }

           public void Refresh ()
           {
               sdk.Refresh ();
           }

           public void RefreshWithForce (bool force)
           {
               sdk.Refresh ();
           }

           public void CheckCapabilitiesAndRights (object ignored)
           {
               sdk.VerifyCapabilities ();
           }

           public void CheckCapabilitiesAndRightsWithAlert ()
           {
               sdk.VerifyCapabilities ();
           }

           public void AttachUser (Dictionary<string, string> userInfo)
           {
               sdk.AttachUser (userInfo);
           }

           public void DetachUser ()
           {
               sdk.DetachUser ();
           }

           public object[] GetInRegions ()
           {
               throw new NotImplementedException ();
           }

           public Dictionary<string, object> GetDeviceInfo ()
           {
               throw new NotImplementedException ();
           }

           public void ModalClick ()
           {
               throw new NotImplementedException ();
```

```
            }

            public bool OnNotificationReceived (object notification)
            {
                throw new NotImplementedException ();
            }

            #endregion
        }

}
```

Add required permissions to the manifest

In the Properties/AndroidManifest.xml, add the following permissions:

```
        <uses-permission android:name="android.permission.BLUETOOTH" />
        <uses-permission android:name="android.permission.ACCESS_FINE_LOCATION" />
        <uses-permission android:name="android.permission.ACCESS_COARSE_LOCATION" />
        <uses-permission android:name="android.permission.RECEIVE_BOOT_COMPLETED"/>
```

Also add the following inside the <application></application> block:

```
        <receiver android:name="org.altbeacon.beacon.startup.StartupBroadcastReceiver">
                <intent-filter>
                        <action android:name="android.intent.action.BOOT_COMPLETED" />
                        <action android:name="android.intent.action.ACTION_POWER_CONNECTED" />
                        <action android:name="android.intent.action.ACTION_POWER_DISCONNECTED" />
                </intent-filter>
        </receiver>
        <service android:enabled="true" android:exported="false" android:isolatedProcess="false"
        android:label="beacon" android:name="org.altbeacon.beacon.service.BeaconService" />
        <service android:name="org.altbeacon.beacon.BeaconIntentProcessor" android:enabled="true"
        android:exported="false" />
```

Create interface instance in your Application class

In your Application class, create an instance of the AndroidInbeaconManager:

```
#if DEBUG
[Application (Debuggable = true)]
#else
[Application(Debuggable=false)]
#endif
public class SampleApp : Application
{
        AndroidInbeaconManager inbeaconManager;

        public SampleApp ()   {}

        public SampleApp (IntPtr handle, JniHandleOwnership transfer)
                : base (handle, transfer) {  }

        public override void OnCreate ()
        {
                base.OnCreate ();
                // Create new inBeacon instance
                inbeaconManager = new AndroidInbeaconManager (this);
        }

        public AndroidInbeaconManager GetInbeacon ()
        {
                return inbeaconManager;
        }
}
```

Then, in your MainActivity, pass it on to the Xamarin.Forms App class as follows:

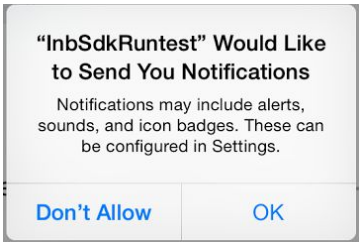
```
protected override void OnCreate (Bundle savedInstanceState)
{
	base.OnCreate (savedInstanceState);
	global::Xamarin.Forms.Forms.Init (this, savedInstanceState);
	// Get inbeacon instance from the Application class and pass it along to the App
	var inbeacon = (Application as SampleApp).GetInbeacon ();
	LoadApplication (new App (inbeacon));
}
```

iOS specific details

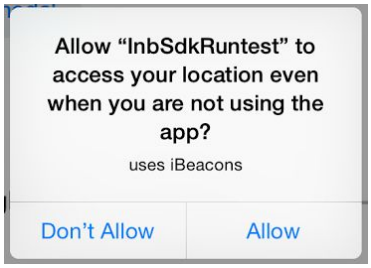
Permissions

When the SDK is integrated, there are a few permissions needed from the user. If the app already needed those permissions before integration of the SDK,, there will be no change (they will not be requested twice). These permissions are requested once after installation when the app is run (and the inBeacon SDK is initialized).

1. Application would like to send you notifications



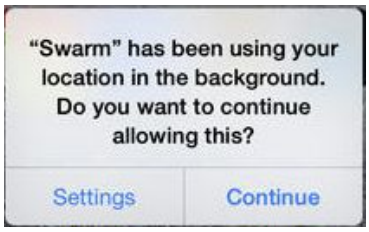
2. Application would like to access your location even when you are not using the app.



It is also possible to run the SDK in "Geofenced Location Authorisation" mode (SDK 1.3.5). In this case the SDK asks for "when in use" access only, and asks for "even when you are not using the app" mode at the moment the user enters one of the predefined Geofences.

3. When bluetooth is turned off:

4. After running a few days, the user gets a notification that the app is looking for beacons or geofences (even when no beacons or geofences are actually found). We found out that this message is always given in combination with message 2), and is not related to the actual location or iBeacon features used in the app.



When the SDK is running in "Geofenced Location Authorisation" mode, this message is not send until after the user has crossed one of the Geofences and has accepted "even when you are not using" location scanning.

Background mode

There are three fundamentally different ways to run the inBeacon SDK:

Mode	Description
full background mode (special cases only)	For iOS, full background mode requires extra location background settings so the app is able to run continuously in the background during iBeacon ranging. **Advantages:** When users approach an iBeacon in Near or Immediate proximity, all inBeacon triggers and other functionality is fully supported. During the complete stay of the user in the iBeacon location, the app will monitor the range to all defined iBeacons. **Disadvantages:** ● the app description in the app-store needs to include the following: *"Note: Continued use of GPS and <app name> running in the background can dramatically decrease battery life. <app name> will automatically shut down if you run it in the background and leave <description of location where ibeacons are used>."* ● Possibility of initial app rejection by iTunes connect (apple appstore). However in the past we were able to get all apps approved, even with full background mode ON. ● The app uses a bit more battery power when inside beacon regions. Because location monitoring is set for least-accurate, GPS is not used by the SDK. We found that the decrease of battery life is negligible.
Restricted background mode (recommended)	If you don't specify background modes, the app runs in restricted background mode. Restricted background mode notices ALL beacon regions enter/exit, even when the app is terminated or suspended (just like full background mode), but stops checking beacon proximity in the background 3 minutes after entering the region (location) This means that if a user is approaching an iBeacon within a region more than 3 minutes after entering the region, triggers will no longer work when the app is in the background. **Advantages:** ● App submission to the app store is without issues about background location scanning ● Battery power use is limited even more. ● **Disadvantages:** This limits the app to a maximum of 3 minutes background processing when the app enters or leaves a beacon region.
Geofenced Location Authorisation mode	In this mode the app starts by only asking for "when in use" location permissions. Only when the user enters a predefined geofenced region, the app will ask for full (background) location permissions. Geofenced Location Authorisation is defined on the inBeacon backend. **Advantages:** ● all advantages of restricted background mode ● only ask full permissions to the subset of your users that are within the geografic region where beacons are used. **Disadvantages** ● all disadvantages of restricted background mode

Using full, restricted background mode or Geofenced Location Autorisation mode depends on your specific situation.

App store submission

Full background mode submission notes

Only for full background mode special app store submission rules apply:

iTunes application notes

Because we use iBeacon ranging in the background you need to include a note in your app description:

> Please include the following battery use disclaimer in your Application Description:
> *"Continued use of GPS running in the background can dramatically decrease battery life."*

We were able to get applications approved with the following text:

in English:

> *Note: Continued use of GPS and <app name> running in the background can dramatically decrease battery life. <app name> will automatically shut down if you run it in the background and leave <description of location where ibeacons are used>*

in Dutch:

> *Opmerking: Langdurig gebruik van GPS en <app naam> kan de levensduur van de accu drastisch verminderen. <app naam> zal automatisch afsluiten zodra u <omschrijving van de locatie waar de ibeacons worden gebruikt> verlaat.*

Similar to Android, create an iOS-specific implementation of the interface in your iOS project:

```
using System;
using InBeaconIOS;
using System.Collections.Generic;
using Foundation;
using InBeaconIOS;

namespace Sample.iOS
{
	public class iOSInbeaconManager : IInbeacon
	{
		private readonly inBeaconSdk sdk;

		public iOSInbeaconManager ()
		{
			sdk = inBeaconSdk.InBeaconWithClientID (Constants.ClientID, Constants.ClientSecret);
		}

		#region IInbeacon implementation

		public IInbeacon GetInstance ()
		{
			return (IInbeacon)sdk;
		}

		public void Refresh ()
		{
			sdk.Refresh ();
		}

		public void RefreshWithForce (bool force)
		{
			sdk.RefreshWithForce (force);
		}

		public void CheckCapabilitiesAndRights (object error)
		{
			sdk.CheckCapabilitiesAndRights (error as NSError);
		}

		public void CheckCapabilitiesAndRightsWithAlert ()
		{
			sdk.CheckCapabilitiesAndRightsWithAlert ();
		}

		public void AttachUser (Dictionary<string, string> userInfo)
		{
			if (userInfo == null)
				throw new ArgumentNullException ("userInfo");

			var nativeDict = new NSMutableDictionary ();
			foreach (var item in userInfo) {
				nativeDict.Add ((NSString)item.Key, (NSString)item.Value);
			}

			sdk.AttachUser (nativeDict);
		}

		public void DetachUser ()
		{
			sdk.DetachUser ();
		}

		public object[] GetInRegions ()
		{
			NSArray nativeArray = sdk.InRegions;
			var arr = new object[nativeArray.Count];
			for (nuint i = 0; i < nativeArray.Count; i++) {
				NSObject obj = nativeArray.GetItem<NSObject> (i);
				arr [i] = obj;
			}
```

```
                return arr;
        }

        public Dictionary<string, object> GetDeviceInfo ()
        {
                var dict = new Dictionary<string, object> ();
                foreach (var item in sdk.DeviceInfo) {
                        dict.Add (item.Key.ToString (), item.Value.ToString ());
                }
                return dict;
        }

        public void ModalClick ()
        {
                sdk.Modalclick ();
        }

        public bool OnNotificationReceived (object notification)
        {
                return sdk.DidReceiveLocalNotification ((UIKit.UILocalNotification)notification);
        }

        #endregion
    }
}
```

Update Info.plist

iOS requires a text that explain why the app should be allowed to use the location services. Add the following keys to the Info.plist file and supply a string value with an explanation:

```
<key>NSLocationAlwaysUsageDescription</key>
<string>To detect iBeacons</string>
<key>NSLocationWhenInUseUsageDescription</key>
<string>To detect iBeacons</string>
```

If you want the inBeacon platform to run in continuous background mode see above), go to the bottom of the Info.plist file editor (section 'Background modes'), enable 'Enable Background Modes' and check 'Location updates'.

```
<key>UIBackgroundModes</key>
<array>
        <string>location</string>
</array>
```

Create interface instance in your AppDelegate

In your AppDelegate class, you can now instantiate this class and pass it on to the Xamarin.Forms App class as follows:

```
public override bool FinishedLaunching (UIApplication uiApplication, NSDictionary launchOptions)
{
        global::Xamarin.Forms.Forms.Init ();
        // Initialize InBeacon SDK
        var inbeacon = new iOSInbeaconManager ();
        LoadApplication (new App (inbeacon));
        return base.FinishedLaunching (uiApplication, launchOptions);
}

public override void ReceivedLocalNotification (UIApplication application, UILocalNotification
notification)
{
        var inbeacon = iOSInbeaconManager.GetInstance ();
        inbeacon.OnNotificationReceived (notification);
}
```

Include audio resources

When using customized sounds with notifications, make sure to copy the audio files from the iOS SDK into your app. To do that, find the `./resources/*.caf` files in the iOS SDK and copy those files to the `./Resources` folder in your iOS project. Next, right-click on the files in Xamarin and make sure that 'Build Action' is set to 'BundleResource'. The audio files can also be found in the sample project included in the component.

Changelog

SDK version 1.0.3

Updated with iOS SDK 1.3.8 (BeaconState toegevoegd)

SDK version 1.0.2

Fixed manifest issues

SDK version 1.0.0

initial