Working with iBeacons

Overview

In this tutorial, the concept, API and usage of Beacon APIs available in IBM MobileFirst Platform Foundation are discussed in the context of native iOS applications.

The following topics are covered:

- Registering Beacons
- Registering Beacon Triggers
- Associating Beacons and Beacon Triggers
- Server side API
- Application configuration steps
- Simplified APIs for ranging/monitoring of iBeacons
- Sample application

Registering Beacons

Beacons are represented as `Beacon` objects in IBM MobileFirst Platform. Beacons are identified using UUID, major and minor values. The UUID in its canonical form is represented by 32 lowercase hexadecimal digits. The major and minor values are positive numbers in range of 0-65535 (inclusive). Beacon objects also contains a field `customData` which is a JSON payload representing customer-specific data representing the beacon. For example, the store/location where the beacon is deployed. Beacons can be registered / updated / deleted using REST APIs. For detailed information on the REST APIs, refer the REST Services API in the IBM MobileFirst user documentation topics.

Register the following beacons using the Beacons (PUT) REST API

```
{
   "uuid": "3d402cf0-3691-4bd9-97ff-0b0a93a160ef"
,
   "major": 1,
   "minor": 4417,
   "customData": {
      "branchName": "Indiranagar, Bangalore"
   }
}
```

```
{
   "uuid": "3d402cf0-3691-4bd9-97ff-0b0a93a160ef"
,
   "major": 2,
   "minor": 4417,
   "customData": {
      "branchName": "Koramangala, Bangalore"
   }
}
```

Registering Beacon Triggers

Beacon triggers are represented as `BeaconTrigger` objects in IBM MobileFirst Platform. Beacon Triggers are identified by a triggerName and contain triggerType, proximityState, dwellingTime (optional) and actionPayload.

triggerType can take any of the following values:

Trigger Type	Description
Enter	The trigger is activated when the device enters the associated beacon region
Exit	The trigger is activated when the device leaves the associated beacon region
DwellInside	The trigger is activated when the device remains inside the associated beacon region for a given time period
DwellOutside	The trigger is activated when the device remains outside the associated beacon region for a given time period

proximityState can take any of the following values (Default value: Far):

Proximity State	Description
Immediate	The proximity of the device to this beacon region should be "immediate" (physically very close) for the trigger to be activated
Near	The proximity of the device to this beacon region should be at least "near" (approximately 1-3 meters) for the trigger to be activated
Far	The proximity of the device to this beacon region should be at least "far" for the trigger to be activated

dwellingTime is applicable only for triggerTypes: "DwellInside" and "DwellOutside". It should be specified in milliseconds and defines how long the device must be inside, or outside a beacon region before the dwellInside or dwellOutside trigger is activated. Mandatory with triggerType of "DwellInside" and "DwellOutside"

actionPayload represents the details of the action to be taken when trigger is activated

Beacon triggers can be registered / updated / deleted using REST APIs. For detailed information on the REST APIs, refer the REST Services API in the IBM MobileFirst user documentation topics.

Register the following beacon triggers using the Beacon Triggers (POST) REST API.

```
{
   "triggerName": "entryIntoBranch",
    "triggerType": "Enter",
    "proximityState": "Near",
    "actionPayload": {
       "alert": "Welcome to $branchName branch of IMF Bank"
    }
 }
```

```
{
   "triggerName": "dwellInsideBank",
    "triggerType": "DwellInside",
    "dwellingTime": 5000,
    "proximityState": "Near",
    "actionPayload": {
       "alert": "You will be assisted soon by our staff."
    }
 }
```

```
{
   "triggerName": "exitFromBranch",
    "triggerType": "Exit",
    "proximityState": "Far",
    "actionPayload": {
       "alert": "Thank you for visiting our $branchName branch. Have a nice day!"
    }
 }
```

Associating Beacons and Beacon Triggers

An association between a beacon and a beacon trigger is represented as `BeaconTriggerAssociation` object in IBM MobileFirst Platform. The association can be created / updated / deleted using REST APIs. For detailed information on the REST APIs, refer the REST Services API in the user documentation topics

Creating the association between beacons and triggers for an application can be achieved using the Associate beacons and triggers (PUT) REST API:

```
{
   "beacons": [
      {
         "uuid": "3d402cf0-3691-4bd9-97ff-
0b0a93a160ef",
         "major": 1,
         "minor": 4417
      },
      {
         "uuid": "3d402cf0-3691-4bd9-97ff-
0b0a93a160ef",
         "major": 2,
         "minor": 4417
      }
   ],
   "triggers": [
      {
         "triggerName": "entryIntoBranch",
         "triggerName": "exitFromBranch",
         "triggerName": "dwellInsideBank"
      }
   ]
}
```

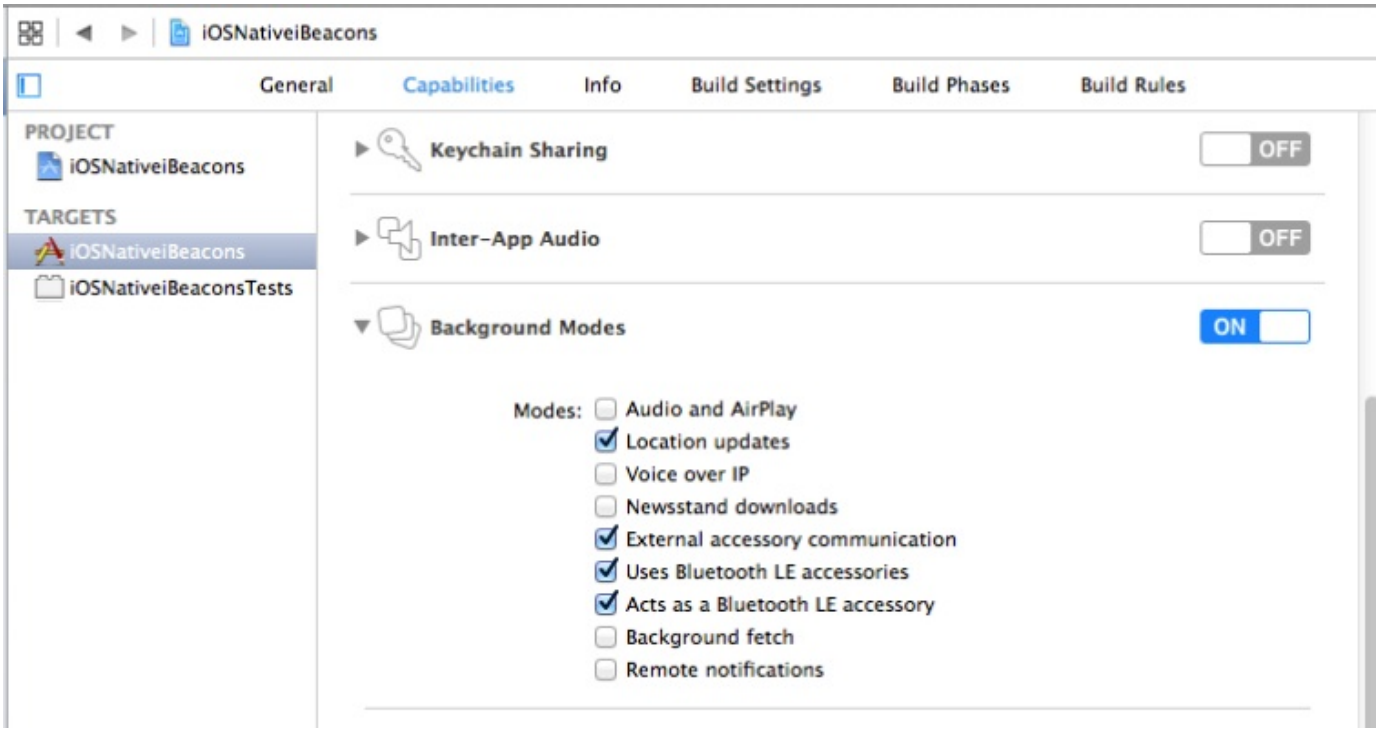
Retrieving beacons and triggers - Server side API

Retrieving beacons, triggers and their associations can be achieved by using `WL.Server.getBeaconsAndTriggers(applicationName, beaconsOfInterest)` API

- `applicationName` – is the name of the MobileFirst application
- `beaconsOfInterest` – is a JSON block or an array of JSON blocks identifying the beacon(s) whose trigger associations have to be fetched.

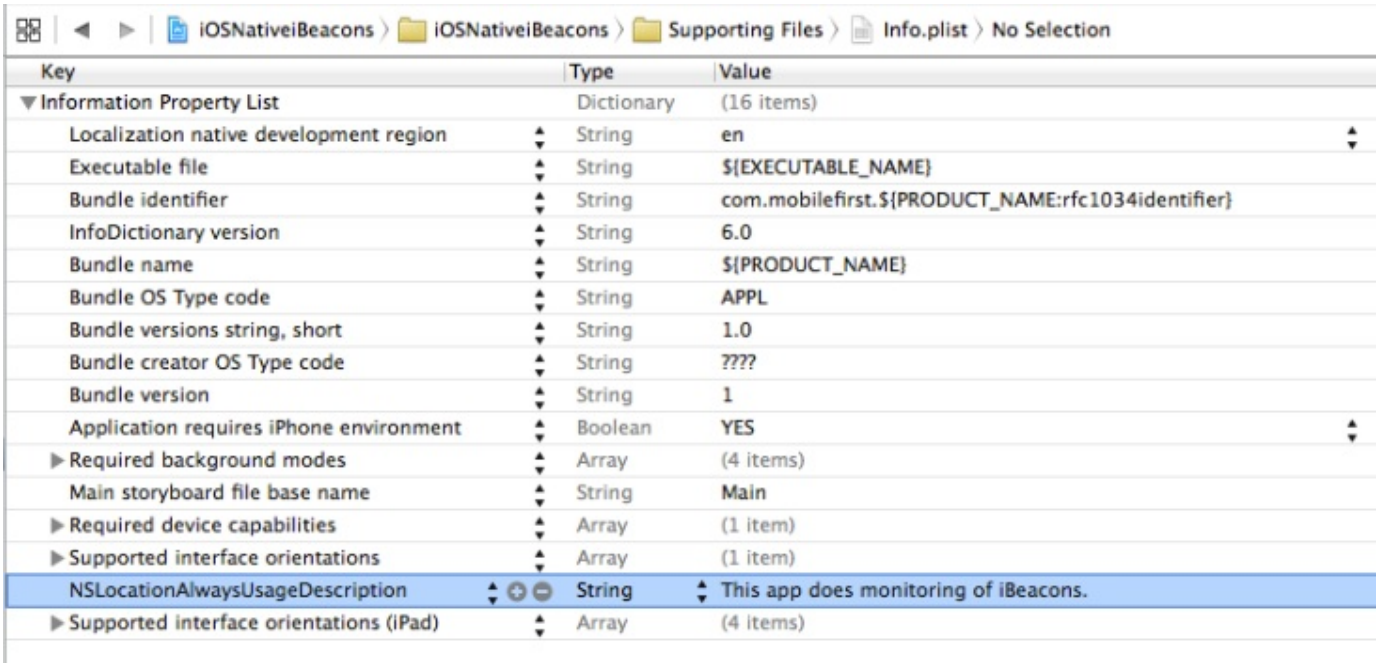
Application configuration steps

Allowing the application to do ranging/monitoring for iBeacon regions can be achieved by selecting the following background modes:



Background modes	Description
Location updates	Ensures the application gets callbacks when device enters/exits iBeacon regions.
Uses Bluetooth LE accesssories	Ensures the application can do ranging for iBeacons
Acts as a Bluetooth LE accessory	Enables the device to act as an iBeacon.
External accessory communication	Enables the application to communicate with accessories attached to the device.

On iOS 8 and above, to enable Location services, add `NSLocationAlwaysUsageDescription` in native iOS project's Info.plist.



Copy the "iOSNativeiBeaconsLibrary" folder in the iOSNativeiBeacons project into your native iOS application. This contains the library that provides the simplified set of APIs for ranging/monitoring of iBeacons.

Requesting permission to use location services and local/push notifications can be achieved by:

```
- (void) viewDidLoad {
 [super viewDidLoad];
 ...
 [[WLBeaconsLocationManager sharedInstance] requestPermissionToUseLocationServices];
 [[WLBeaconsLocationManager sharedInstance] requestPermissionToUseNotifications];
}
```

Simplified APIs for ranging/monitoring of iBeacons

Loading beacons and triggers from server

Loading beacons information, triggers and their associations from server and storing it in the application JSONStore can be achieved by:

```
[[WLBeaconsAndTriggersJSONStoreManager sharedInstance]
loadBeaconsAndTriggersFromAdapter:@"iBeaconsAdapter" withProcedure:@"getBeaconsAndTrigg
ers" withCompletionHandler:^(bool success, NSString *error) {
 if (success) {
  [self showBeaconsAndTriggers];
 } else {
  [self updateView:error];
 }
}];
```

Triggering actions

Monitoring/ranging of iBeacons and firing of trigger actions can be achieved using:

```
[[WLBeaconsLocationManager sharedInstance] startMonitoring];
```

If the user wishes to opt out of iBeacon monitoring, it can achieved using:

```
[[WLBeaconsLocationManager sharedInstance] stopMonitoring];
// Optionally reset monioring/ranging state
[[WLBeaconsLocationManager sharedInstance] resetMonitoringRangingState];
```

Turn the device to an iBeacon

Turning the device into an an iBeacon can be achieved using:

```
NSString *uuidString = @"3d402cf0-3691-4bd9-97ff-0b0a93a160ef";
int major = 1;
int minor = 4417;
[[WLBeaconsLocationManager sharedInstance] turnIntoiBeaconWithUuid:uuidString withMajor:majo
r withMinor:minor withStatusHandler:^(NSString *turnIntoiBeaconStatusDetails) {
 [self updateView:turnIntoiBeaconStatusDetails];
}];
```

This is generally for testing /development purpose. The UUID string here should match the UUID of beacons registered on server.

Increasing application running time

Increasing the running time of the application when in background (as part of iBeacon monitoring) can be achieved using:

```
- (BOOL)application:(UIApplication *)application didFinishLaunchingWithOptions:(NSDictionary
*)launchOptions {
 ...
 [[WLBeaconsLocationManager sharedInstance] notifyApplicationDidFinishLaunchingWithOptions];
}</p>
<p>- (void)applicationDidEnterBackground:(UIApplication *)application {
 ...
 [[WLBeaconsLocationManager sharedInstance] notifyApplicationDidEnterBackground];
}</p>
<p>- (void)applicationDidBecomeActive:(UIApplication *)application {
 ...
 [[WLBeaconsLocationManager sharedInstance] notifyApplicationDidBecomeActive];
}
```

This increases the running time of the application up to 3 minutes from the default 10 seconds.

Handling local notifications

Handling local notifications originating from the application can be achieved by:

```
- (BOOL)application:(UIApplication *)application didFinishLaunchingWithOptions:(NSDictionary
*)launchOptions {
 ...
 UILocalNotification *localNotif = [launchOptions objectForKey:UIApplicationLaunchOptionsLocalNotifica
tionKey];
 if (localNotif) {
  application.applicationIconBadgeNumber = application.applicationIconBadgeNumber - 1;
  [self processLocalNotification:localNotif];
 }
 return YES;
}</p>
<p>- (void)application:(UIApplication *)application didReceiveLocalNotification:(UILocalNotification *)notifi
cation
{
 application.applicationIconBadgeNumber = application.applicationIconBadgeNumber - 1;
 [self processLocalNotification:notification];
}</p>
<p>- (void)processLocalNotification:(UILocalNotification *)notification
{
 NSString *alertMessage = [notification.userInfo objectForKey:@"alertMessage"];
 UIAlertView *alert = [[UIAlertView alloc] initWithTitle:@"Received local notification" message:alertMes
sage delegate:nil cancelButtonTitle:@"OK" otherButtonTitles:nil, nil];
 [alert show];
}
```

Sample application

Click to download (http://public.dhe.ibm.com/software/products/en/MobileFirstPlatform/docs/v630/iBeaconsNativeProject.zip) the Studio project. Click to download (http://public.dhe.ibm.com/software/products/en/MobileFirstPlatform/docs/v630/iOSNativeiBeaconsProject.zip) the Native project.

The sample contains two projects:

- The **iBeaconsNativeProject.zip** file contains a MobileFirst native API that you can deploy to your MobileFirst server.
- The **iOSNativeiBeaconsProject.zip** file contains a native library that provides a simplified set of APIs for ranging/monitoring of iBeacons and a native iOS application that demonstrates the usage of those APIs.

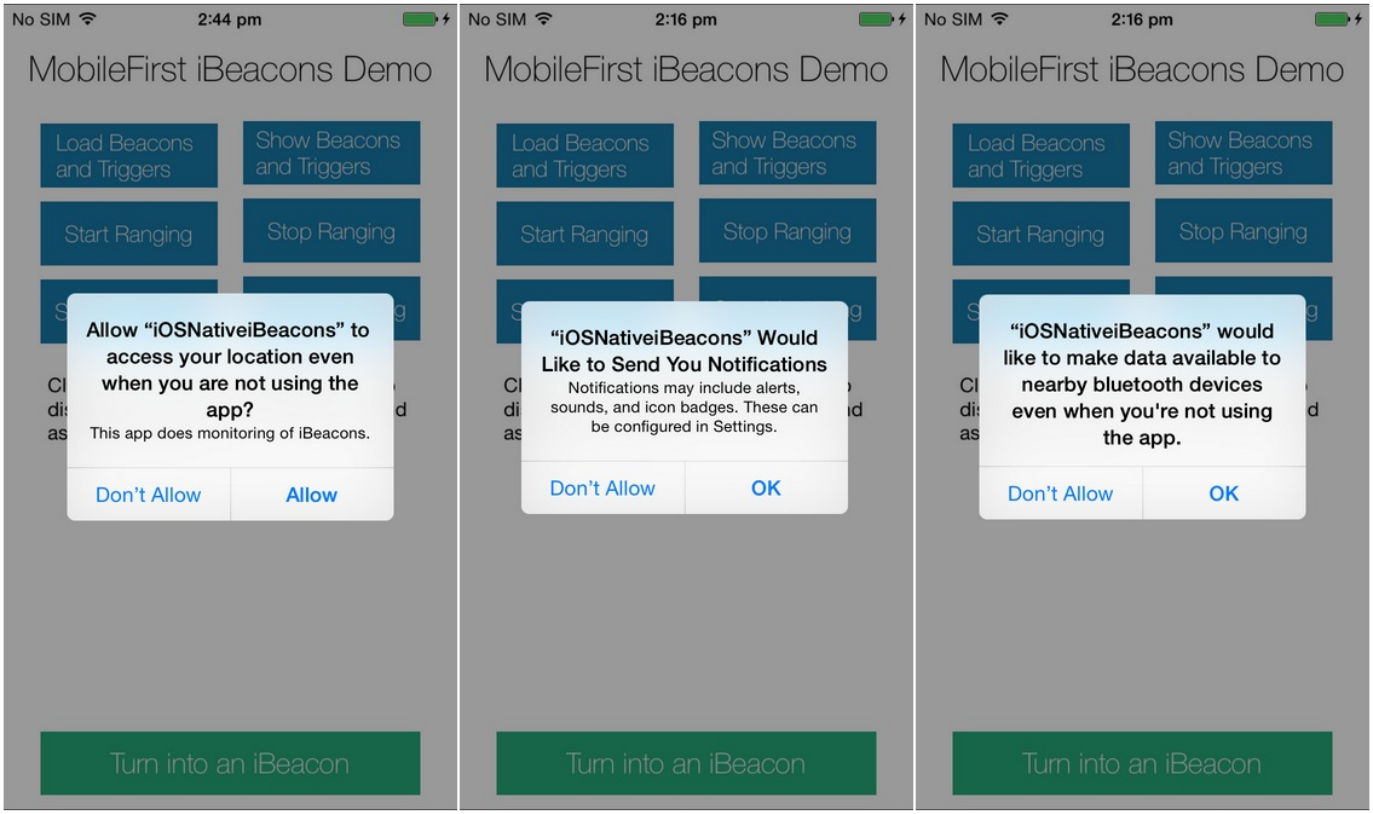
Make sure to update the **worklight.plist** file in iOSNativePush with the relevant server settings.

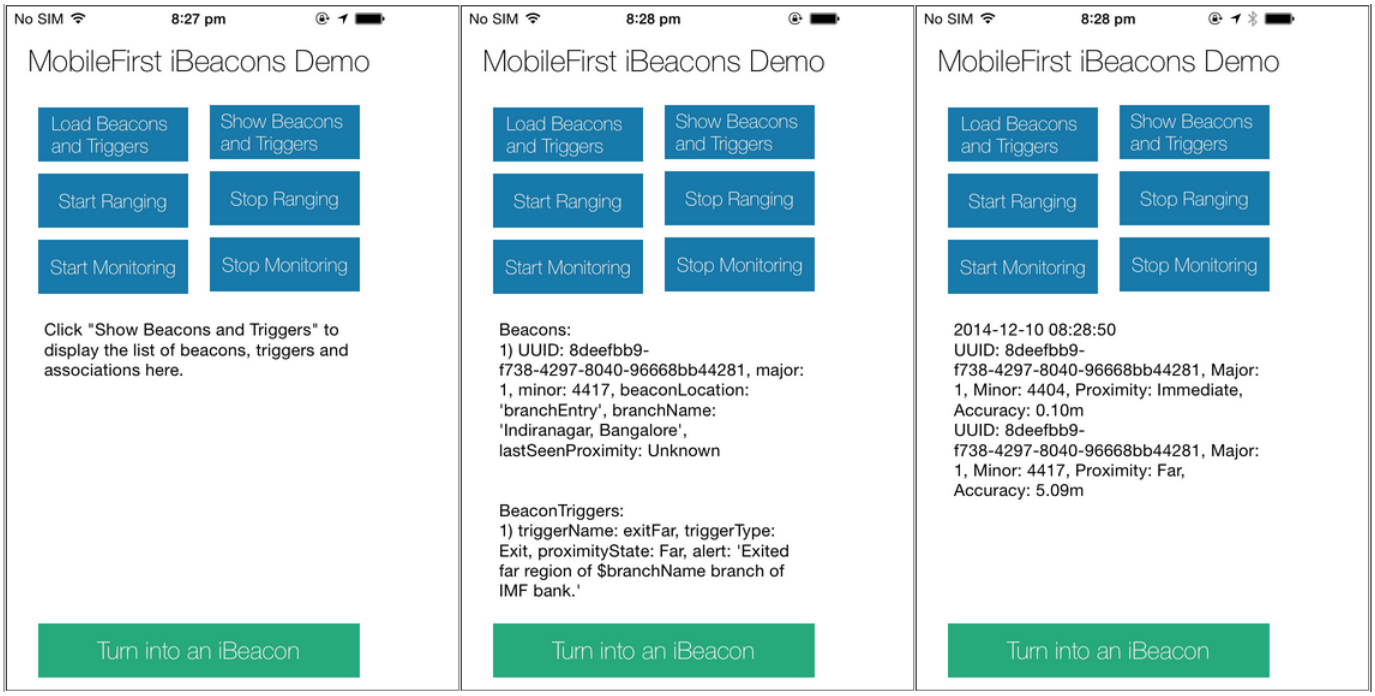
The sample showcases a simple banking scenario where actions are triggered based on proximity:

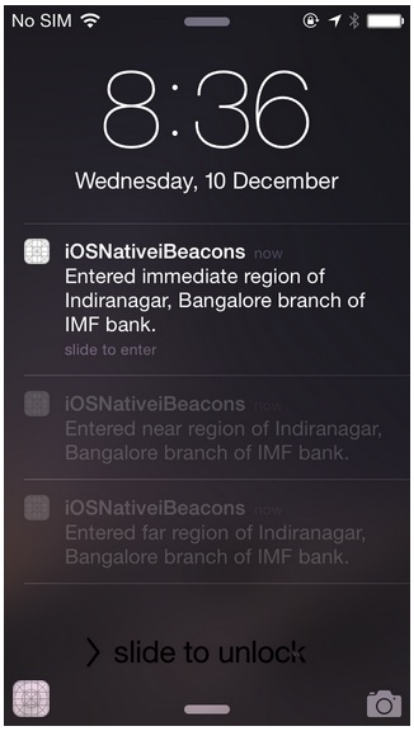
- When the user enters a Bank branch, a notification action is triggered with a Welcome message
- When the user stays in the Bank branch, an alert is triggered with a message stating that a bank

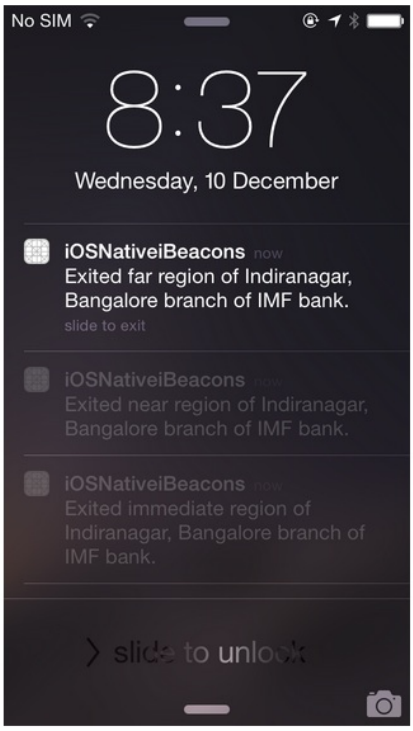
personnel will assist the user soon

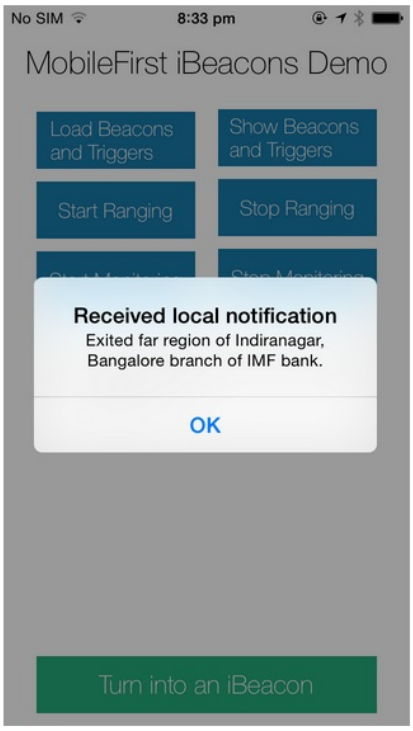
- When the user exits the Bank branch, a notification action is triggered with a message






No SIM
8:36
Wednesday, 10 December
iOSNativeiBeacons now
Entered immediate region of Indiranagar, Bangalore branch of IMF bank.
slide to enter
iOSNativeiBeacons now
Entered near region of Indiranagar, Bangalore branch of IMF bank.
iOSNativeiBeacons now
Entered far region of Indiranagar, Bangalore branch of IMF bank.
slide to unlock


No SIM
8:37
Wednesday, 10 December
iOSNativeiBeacons now
Exited far region of Indiranagar, Bangalore branch of IMF bank.
slide to exit
iOSNativeiBeacons now
Exited near region of Indiranagar, Bangalore branch of IMF bank.
iOSNativeiBeacons now
Exited immediate region of Indiranagar, Bangalore branch of IMF bank.
slide to unlock


No SIM
8:33 pm
MobileFirst iBeacons Demo
Load Beacons and Triggers
Show Beacons and Triggers
Start Ranging
Stop Ranging
Received local notification
Exited far region of Indiranagar, Bangalore branch of IMF bank.
OK
Turn into an iBeacon