The Bluetooth® Low Energy Explorer Application for BlackBerry®

Guided Tour

When you launch the Bluetooth Low Energy Explorer app for BlackBerry, it will immediately search for Bluetooth Low Energy devices in range and display those that are found in a carousel which you can slide left or right by touching the screen (with your thumbs is recommended!) to the left of center or to the right of center. The device represented by the icon in the center of the screen has the following information displayed beneath it:

Name

Device address

Relationship with the BlackBerry device (paired/known/unknown) which relates to its status on the Settings-Bluetooth screen of the BlackBerry device.

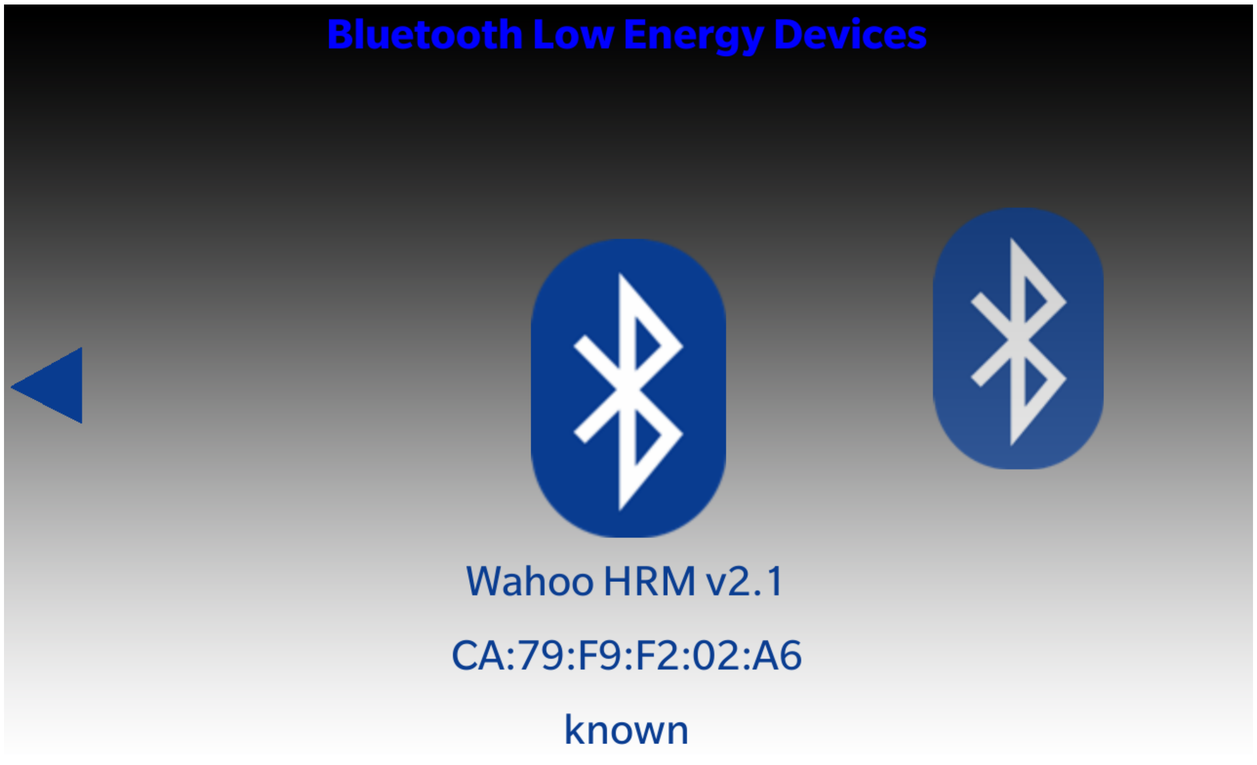


Figure 1 - Devices

Touch the device in the center of the screen to select it and display its services on the services screen.

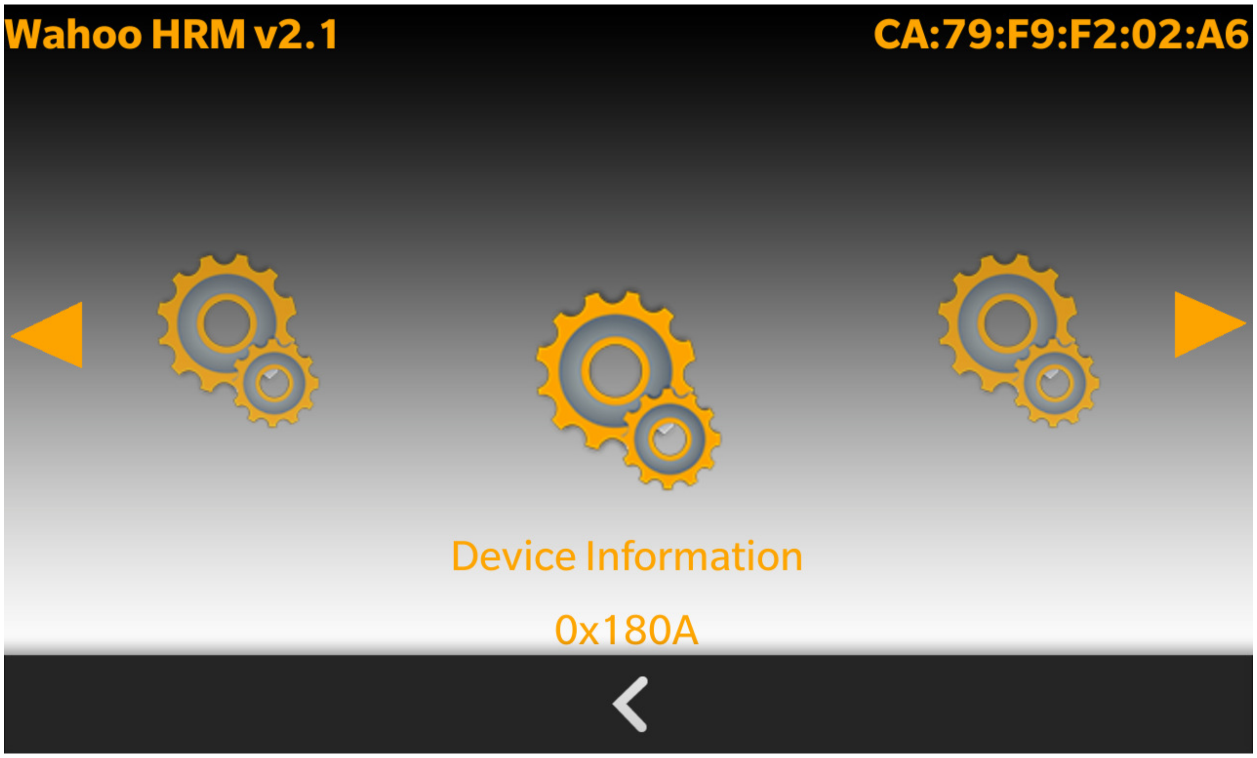
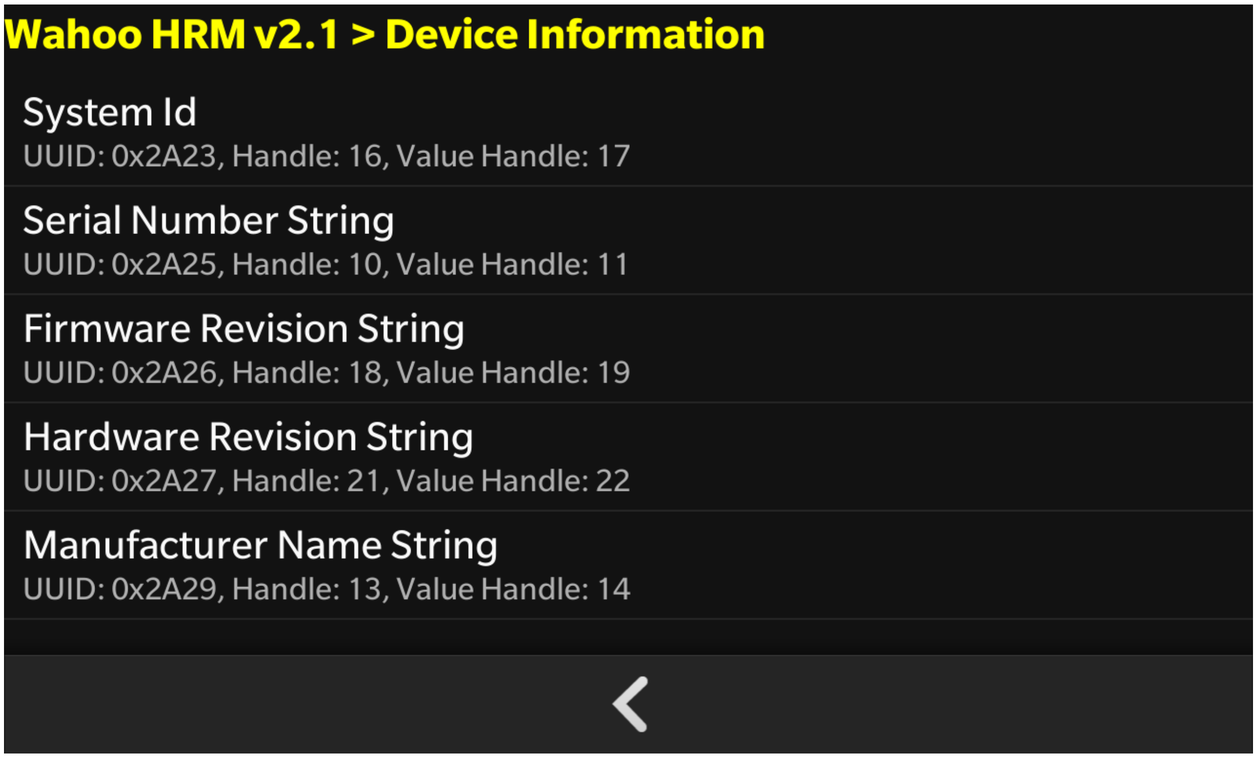


Figure 2 – Services

Navigate through the list of services the same way you navigate through the device list. Touch the central service icon to select it. The characteristics exposed by the selected service are displayed on the characteristics list screen.



Wahoo HRM v2.1 > Device Information

System Id
UUID: 0x2A23, Handle: 16, Value Handle: 17

Serial Number String
UUID: 0x2A25, Handle: 10, Value Handle: 11

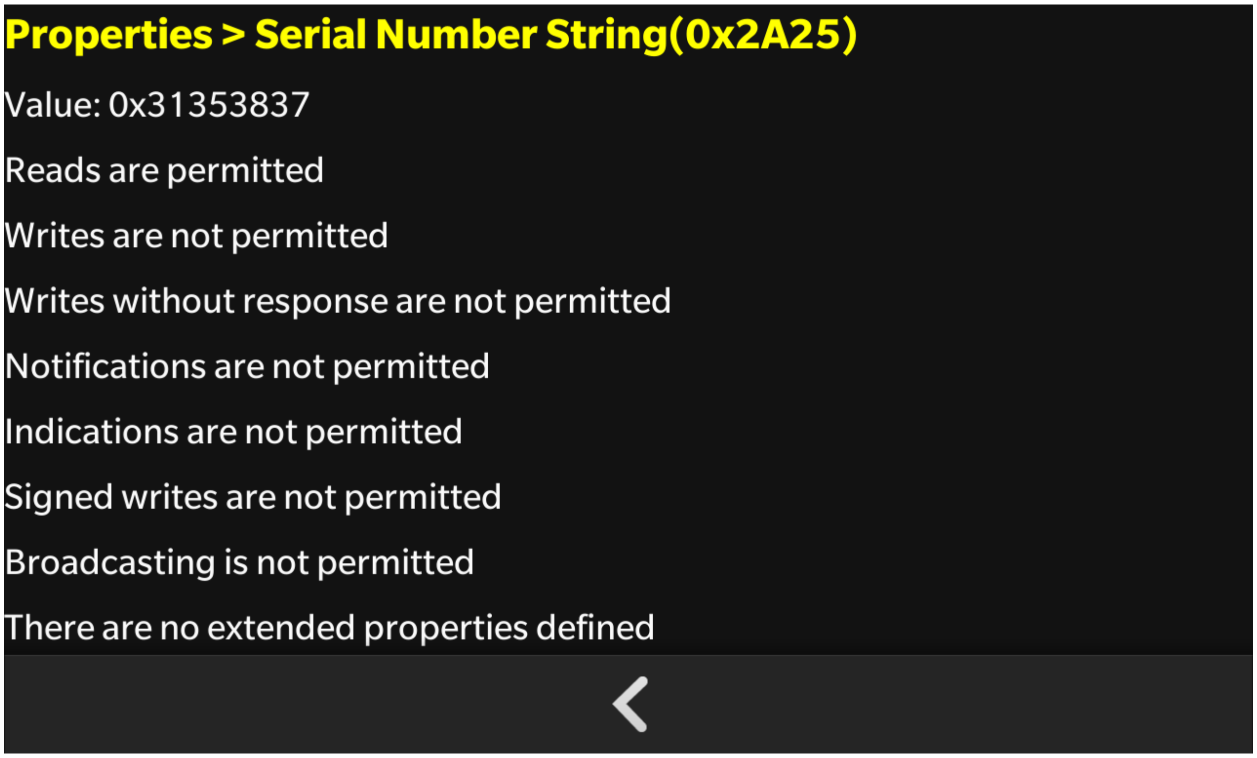
Firmware Revision String
UUID: 0x2A26, Handle: 18, Value Handle: 19

Hardware Revision String
UUID: 0x2A27, Handle: 21, Value Handle: 22

Manufacturer Name String
UUID: 0x2A29, Handle: 13, Value Handle: 14

Figure 3 – Characteristics list screen

Touch an individual characteristic to display further details of the characteristic, including its value, if available.


Properties > Serial Number String(0x2A25)

Value: 0x31353837

Reads are permitted

Writes are not permitted

Writes without response are not permitted

Notifications are not permitted

Indications are not permitted

Signed writes are not permitted

Broadcasting is not permitted

There are no extended properties defined

Figure 4 – Characteristic details

Navigate back through the previous screens by touching the left facing chevron icon “<”.

At the devices screen, you can bring down a menu by dragging downwards from the bezel at the top edge of the screen, as you would in other BlackBerry 10 apps.

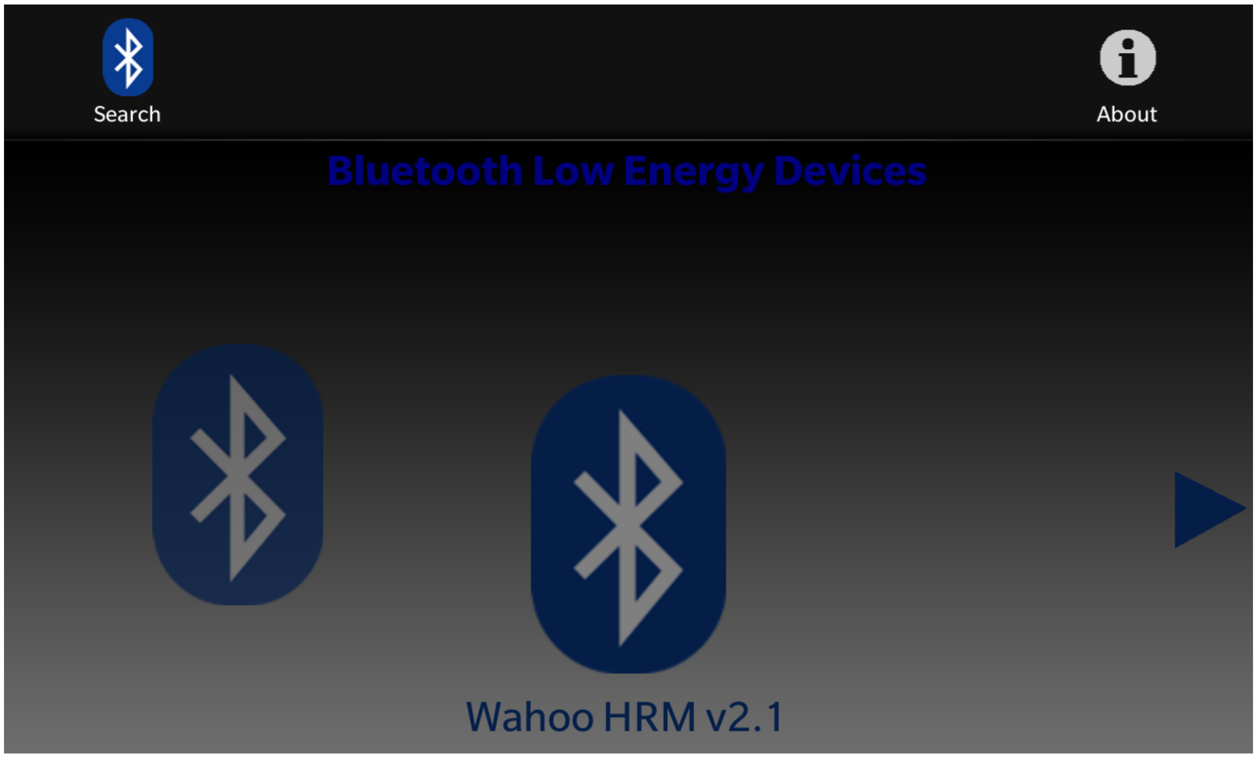
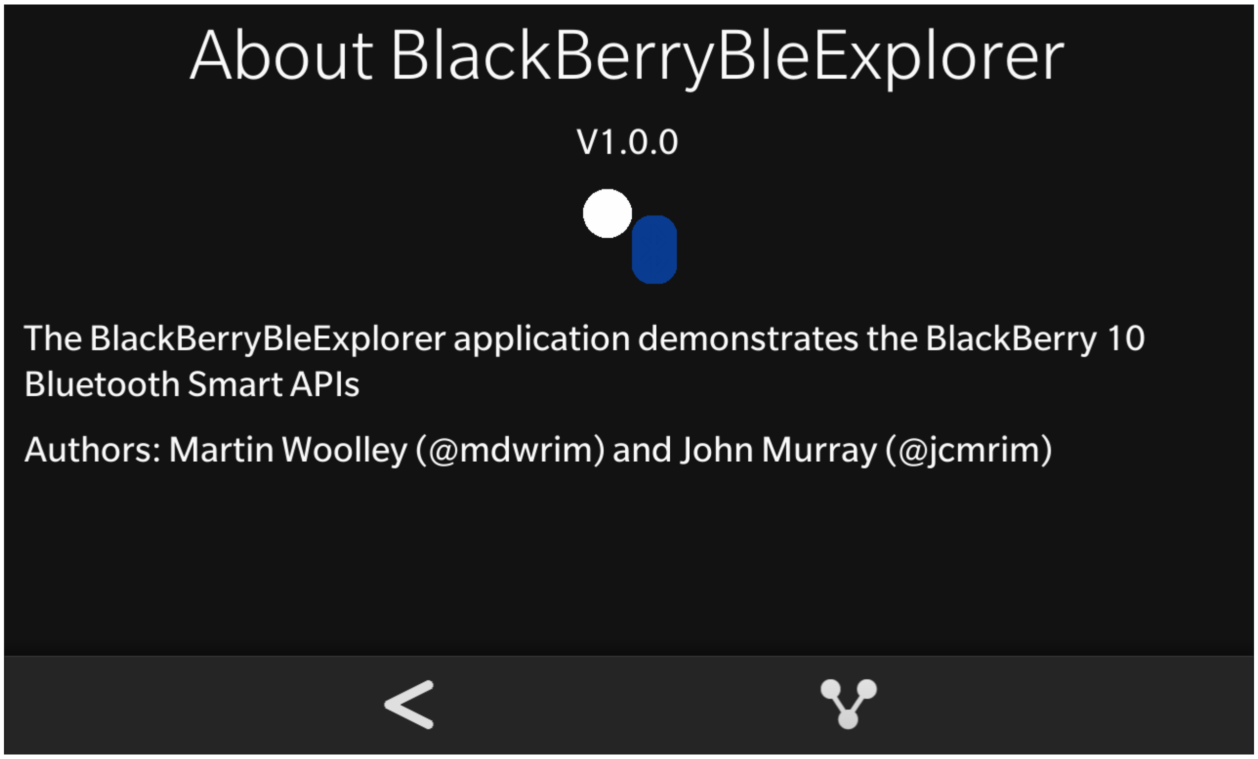


Figure 5 – Menu

This reveals a Search icon and an About icon. Select Search to search for Bluetooth devices again. Select About to display the About page.


About BlackBerryBleExplorer

V1.0.0

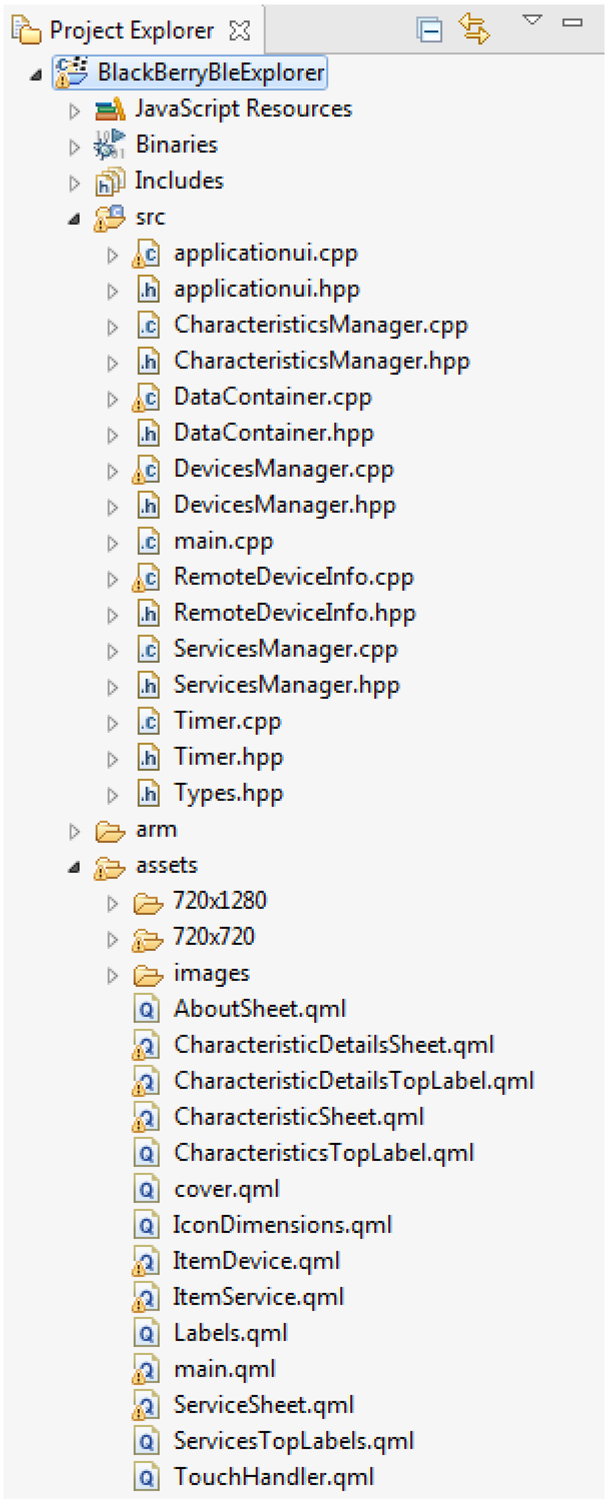
The BlackBerryBleExplorer application demonstrates the BlackBerry 10 Bluetooth Smart APIs

Authors: Martin Woolley (@mdwrim) and John Murray (@jcmrim)

Figure 6 – About page

Touch the icon for some animated fun!

Source Code



Project Explorer

BlackBerryBleExplorer
- JavaScript Resources
- Binaries
- Includes
- src
  - applicationui.cpp
  - applicationui.hpp
  - CharacteristicsManager.cpp
  - CharacteristicsManager.hpp
  - DataContainer.cpp
  - DataContainer.hpp
  - DevicesManager.cpp
  - DevicesManager.hpp
  - main.cpp
  - RemoteDeviceInfo.cpp
  - RemoteDeviceInfo.hpp
  - ServicesManager.cpp
  - ServicesManager.hpp
  - Timer.cpp
  - Timer.hpp
  - Types.hpp
- arm
- assets
  - 720x1280
  - 720x720
  - images
  - AboutSheet.qml
  - CharacteristicDetailsSheet.qml
  - CharacteristicDetailsTopLabel.qml
  - CharacteristicSheet.qml
  - CharacteristicsTopLabel.qml
  - cover.qml
  - IconDimensions.qml
  - ItemDevice.qml
  - ItemService.qml
  - Labels.qml
  - main.qml
  - ServiceSheet.qml
  - ServicesTopLabels.qml
  - TouchHandler.qml

Figure 6 – BlackBerry 10 Momentics® Project Structure

User Interface

The application's user interface is defined using QML. QML files and associated graphics can be found in the assets/ folder. Note that the 720x1280 and 720x720 folders contain resources which will be automatically used when the application runs on BlackBerry devices with those specific screen dimensions (rather than the default of 768x1280). The BlackBerry Z10 is an example model which has the default screen size whilst the Q10 has a square screen 720x720 and the BlackBerry Z30 screen is 720x1280.

Animation, such as the sliding of the carousel style device and services list is, achieved using "implicit animation". Changes to the x position of icons are made in JavaScript® functions and the BlackBerry 10 Cascades™ UI framework automatically interpolates between the former and new values and animates the transition between them. To learn about implicit animation, review main.qml for example.

Bluetooth Functions and the Model Layer

C/C++ is used to implement the Bluetooth functions and model layer of the application and this code can be found in the src/ folder.

Devices, services, and characteristics are accessed via BlackBerry 10 Bluetooth GATT API calls from C++ classes DevicesManager, ServicesManager, and CharacteristicsManager. Data collected by these classes gets stored in a singleton class, DataContainer. Instances of these classes are exposed to QML by registering them in a QML context using the calls shown here:

```
    DevicesManager *dm = DevicesManager::getInstance(this);
    ServicesManager *sm = ServicesManager::getInstance(this);
    CharacteristicsManager *cm = CharacteristicsManager::getInstance(this);
    DataContainer *dc = DataContainer::getInstance();

    // Create scene document from main.qml asset, the parent is set
    // to ensure the document gets destroyed properly at shut down.
    QmlDocument *qml = QmlDocument::create("asset:///main.qml").parent(this);

    QmlDocument::defaultDeclarativeEngine()->rootContext()->setContextProperty("app", this);
    QmlDocument::defaultDeclarativeEngine()->rootContext()->setContextProperty("data", dc);
    QmlDocument::defaultDeclarativeEngine()->rootContext()->setContextProperty("smgr", sm);
    QmlDocument::defaultDeclarativeEngine()->rootContext()->setContextProperty("cmgr", cm);
    QmlDocument::defaultDeclarativeEngine()->rootContext()->setContextProperty("cmgrModel", cm->model());
```

Figure 7 – registering C++ objects in QML context

An example of QML calling methods on the DataContainer object exposed as an item called “data” appears in Figure 8:

```
        onCentral_item_inxChanged: {
            if (device_count > 0) {
                labels.attr1_text = data.getDeviceName(mainPage.central_item_inx);
                labels.attr2_text = data.getDeviceAddr(mainPage.central_item_inx);
                labels.attr3_text = deviceRelationship();
            } else {
                labels.attr1_text = "No items in list";
                labels.attr2_text = "Drag down for menu";
                labels.attr3_text = "";
                attr2_timer.start();
            }
        }
```

Figure 8 – making calls to the DataContainer methods from C++

Qt Signals and Slots are also used to allow communication from C++ to the QML layer. See Figure 9 and 10 below.

```
        QObject::connect(dm, SIGNAL(setDeviceCount(QVariant)), mainPage, SLOT(setDeviceCount(QVariant)),
Qt::QueuedConnection);
        QObject::connect(dm, SIGNAL(setDeviceCount(QVariant)), coverContainer,
SLOT(setDeviceCount(QVariant)), Qt::QueuedConnection);
        QObject::connect(dm, SIGNAL(finishedScanningForDevices()), mainPage,
SLOT(stopActivityIndicator()), Qt::QueuedConnection);
        QObject::connect(dm, SIGNAL(startedScanningForDevices()), mainPage,
SLOT(startActivityIndicator()), Qt::QueuedConnection);
```

Figure 9 – connecting signals and slots

```
void ApplicationUI::deviceSelected(int index) {
    QString selected_addr = DataContainer::getInstance()->getDeviceAddr(index);
    qDebug() << "XXXX deviceSelected:" << selected_addr;
    emit deviceSelected(QVariant(index), QVariant(selected_addr));
}
```

Figure 10 – emitting a signal

Resources

The following web pages contain useful resources relating to BlackBerry 10 native application development in general and to Bluetooth on BlackBerry 10 in particular.

For all things related to developing on BlackBerry:

https://developer.blackberry.com/

Native application development on BlackBerry 10:

https://developer.blackberry.com/native/

Bluetooth APIs on BlackBerry 10:

https://developer.blackberry.com/native/reference/core/bluetooth_libref/topic/manual/c_stub_bluetooth_lib_intro.html?f=bluetooth

An index of code samples, knowledge base articles, blog posts and videos aimed at BlackBerry 10 Bluetooth applications developers:

http://supportforums.blackberry.com/t5/Native-Development-Knowledge/BlackBerry-10-Bluetooth-LE-resource-index/ta-p/2326147

BlackBerry Contacts

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