ST Smart Parking Application based on Sigfox protocol

ST Smart Parking Demo
S2-LP & Eval Kit Overview
ST Sigfox compliant tools offering
Communication Scenario

IPv6/6LoWPAN Network

Payment Gateway

Internet

Application Server
(https://smartparkingdemo.azurewebsites.net/)

SigFox AP

SigFox Callback
Sub-1GHz / BLE IoT Node

Features Overview

• IoT Node with BLE/LPWAN Dual-Radio
• No need for a local gateway or access point
• IEEE 802.15.4g MAC
• Parking payment with mobile device over Bluetooth low energy connection
• Based on STM32 Nucleo board and proximity sensor to detect the car
• Designed for STM32ODE including stackable HW, Drivers, Middleware libraries and implementation examples

Application scenarios:
Wireless Sensor Nodes, Asset Trackers, Remote diagnostic, Finder/Tags, SmartParking, Smart Objects
SmartParking Demo – Hardware

Additional requirements

- **Mobile device**
  - Android Phone/Tablet

- **Router**
  - Hotspot WiFi for Internet connection

Smart Parking Sensor Node

- STEVAL-IDB007V1
- STEVAL-FK915V1 (SPI Interface)
- X-NUCLEO-6180XA1 (I2C Interface)
RF Features Overview

- Frequency bands: 430-470 MHz, 860-940MHz
- Modulation schemes: (2G) FSK, (4G) FSK, OOK and ASK
- Air data rate from 0.3 to 500 kbps
- Programmable output power: -30dBm to +16dBm
- RX sensitivity: -124dBm @1.2kbps / -130dBm @ 300bps
- SigFox modulation compliance
- Built-in SMPS block for optimum current consumption

MAC Features

- Embedded packet handler, LDC/Sniff mode, CSMA/CA…
- Advanced packet handler flexibility:
  - Bit granularity for preamble (up to 256Bytes) and sync (up to 64bytes)
  - Configurable pattern recognition down to bit granularity
  - Manchester encoding/decoding
- IEEE 802.15.4g MAC for Home Energy Management System

Protocol Support

- SIGFOX
- 6LowPAN, Wireless M-BUS, SIGFOX and 802.15.4g

Top-Notch Low-Power figures

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>RX Power (peak)</td>
<td>6.7 mA</td>
</tr>
<tr>
<td>Tx Power</td>
<td>10 mA @ +10dBm</td>
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<tr>
<td>Sleep/Shutdown</td>
<td>300 nA /2.5nA</td>
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Kits Hardware details

STEVAL-FKI868V1

- Embedded ST-Link and USB2Serial conv
- E2PROM w manufacturing data
- S2-LP
- RF SMA connector
- Arduino connectors

STEVAL-FKI915V1

- Embedded ST-Link and USB2Serial conv
- E2PROM w manufacturing data
- RF SMA connector
- External FEM Skyworks
- Arduino connectors
- S2-LP
BlueNRG-1
Bluetooth® SMART 4.2 SoC

- Single mode Bluetooth® SMART 4.2 System on Chip
- ST Bluetooth Low Energy Stack, Profiles and Application
- SMART power management: DC-DC / Linear Voltage regulator Operating supply voltage from **1.7 up to 3.6V**
- Extended Temperature Range: **up to 105°C**
- 16MHz or 32MHz Crystal Oscillator
- Low Frequency Crystal Oscillator or Integrated Ring Oscillator Up to **32 MHz ARM Cortex M0 Core**
- **24 kB Ultra Low Leakage**
- **160 kB Flash memory**
- SPI M/S, I2C M/S, UART, PDM Input I/F PWM GPIOs 15
- Package WCSP34 2.65x2.65mm, QFN32 5x5 mm.
  - QFN32 for Automotive Grade qualification
- **BlueNRG based radio**
  - RX 7.7 mA
  - TX 8.3 mA @ 0 dBm
  - Sleep 1µA
  - Best in Class Output Power Level: **+8dBm**
  - Receiver sensitivity -88dBm

- Development kit:
  - STEVAL-IDB007V1
Sigfox certified tools
STEVAL-FKI868V1 / FKI915V1

Sigfox-ready sub-1GHz RF kits
accelerate sensor-to-cloud IoT applications

- Development kit:
  - Region AME: STEVAL-FKI915V1
  - Region EMEA: STEVAL-FKI868V1
- Sigfox SDK:
  - STSW-S2LP-SFX-DK
- Based on STM32 Nucleo board
- no need for a local gateway or access point.
- Read more

Development Kit for Out-of-the-box Sensor-to-Cloud Connectivity

Sigfox End Product certified
Development kit
Ready-to-go Sigfox offering

• Evaluation kits for worldwide coverage
  • STEVAL-FKI868V1 – 868MHz
    • RCZ1 (Europe)
  • STEVAL-FKI915V1 - 915MHz + PA
    • RCZ2 (US, Canada, Mexico, Brazil)
    • RCZ4 (New Zealand, Colombia, Peru’, Singapore)

• S2-LP Sigfox SW package for developers (STSW-S2LP-SFX-DK)

• Available SIGFOX SW libraries for:
  • ARM Cortex M0, M0+ and M3

• SDK for Dual-Radio BLE + SIGFOX upcoming
  • BlueNRG-1 + S2-LP evaluation kit
Combo-radio IoT Node
Dual-Radio turn-key solution

SMARTPHONE
• User Interface
• Configurability
• Local monitoring
• Diagnostic
• Firmware upgrade

IoT Node
BLE/LPWAN Dual-Radio

CLOUD
• Remote monitoring
• Tracking and Positioning
• Notifications of events
• Data aggregation
• Diagnostic and assistance

Application scenarios:
Wireless Sensor Nodes, Asset Trackers, Remote diagnostic, Finder/Tags, Smart Parking, Smart Objects
Security features

- STSAFE-A1SX is CC EAL5+ AVA_VAN5 certified
- Data integrity over the Sigfox network:
  - Signature of payloads before uplink
  - Verification of downlink payloads
- **Optional** data confidentiality over the Sigfox network:
  - Encryption of payloads before uplink
  - Decryption of downlink
- **Optional** Secure channel using AES-128

Availability: Sample in April, Production end Q2’17