HOW SENSOR FRAMEWORKS ENABLE EFFICIENT DEVELOPMENT

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Remote Sensors in an IoT Ecosystem

Cloud Service

NFC Tracker
Smart Wearables
BLE / Thread
Smart Door
Laptop / Tablet / Smartphone
Smart Gadgets

Wi-Fi

Smart Camera
WAN / LTE
Smart Thermostat
Home Gateway

Home Assistant
Monitoring Sensors
Smart Light

Wi-Fi® / Bluetooth®
NFC Tracker
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Smart Door
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Smart Camera
WAN / LTE
Smart Thermostat
Home Gateway

Home Assistant
Monitoring Sensors
Smart Light

Smart Camera
What is a Smart Sensor Node?

A smart sensor node is a remote standalone unit which can sense events like motion, rotation, pressure and sends the measurements to a sensor gateway or host node. It usually includes the following components:

**Hardware components:** (preferably on a small form factor board)

- A low power MCU (with optional inbuilt BLE support)
- A low power digital sensor with interface to the MCU (I2C /SPI)
- An I/O interface to transfer data to a host/gateway over (UART /Bluetooth /BLE /Thread)

**Software components:**

- A SW application like NXP ISSDK which talks to the sensor(s) and forwards samples through the I/O interface
- A remote host/ gateway module to understand the end node message encoding and provide methods to control the sensors, visualize the sensor data and may also provide external web or IP connectivity (e.g. BLE Toolbox app, STB-CE GUI application or ISSDK MQTT adapter)

**Examples:** Key fobs, virtual assistant speakers, patient monitoring systems, climate control thermostats, driving monitoring devices and other devices.

**Reference hardware:**

- **RD-KL25-AGMP01:** Suitable for wired applications, includes a low-power MCU, and includes 10 AXIS sensors and battery.
- **RD-QN9080-AGM01:** Suitable for high data rate applications, includes multiple sensors with 10 AXIS Data, includes Bluetooth UART and battery.
- **RD-QN9080-AGM01:** Includes low power 9 axis sensors, includes battery and switches for BLE.
What is a Sensor Framework?

- It is a collection of SW APIs, tools, scripts and examples provided by sensor manufacturers → easy for users to adopt & develop sensors into their ecosystem
- Out of box examples and sample code makes developing applications fast and easy
- Graphical analysis tools make it easy to understand and visualize the data
- Reduces time to market by speeding up the learning curve
- Helps explore capabilities like interrupts / events to design more robust and power efficient solutions
- Data logging and forwarding is highly useful to benchmark and compute system thresholds.

IoT Sensing SDK (ISSDK) is part of the Sensor Toolbox ecosystem. It is a software framework to enable NXP sensor kits for quick prototyping and development of IoT applications.
UART based IoT Ecosystem
Example With FRDM-K64F MCU Board

console interface - serial emulation

Embedded application

IoT adapter/ bridge - cloud service client

Tool interface- GUI emulation

Sensor demonstration kit – NXP 10 axis digital sensor
FRDM-FXS-MULT2-B

OR

FRDM-FXS-MULT2-B
BLE based IoT Ecosystem
Example With QN908x_DK Wireless MCU Board
The IoT Smart Ball Using FRDM-K64F With FRDM-FXS-MULT2-B

A sports ball containing the FRDM-K64F with FRDM-FXS-MULT2-B ISSDK Embedded Application firmware can be used to publish digital sensor data to any cloud service using Bluetooth UART.

The demo uses an ISSDK IoT adapter from a host PC to obtain cloud connectivity and tunnels samples received over Bluetooth from the board to cloud over MQTT.

A cloud server can be created for receiving samples over MQTT and to host the web server via a public cloud service such as IBM Bluemix®.

Samples can now be visualized on any web enabled device to analyze sensor data, events and also to control the sensor node by sending commands through the cloud and web service.

**Step 1**
Build your application using ISSDK KIT for K64F with MULT2-B examples

**Step 2**
Use ISSDK IoT adapter to establish cloud connectivity

**Step 3** – external implementation
Use a cloud service such as IBM IoT Platform Starter to create a cloud based MQTT server

**Step 4** - external implementation
Use a web service such as IBM Liberty for Java™ to create an interactive web page
The IoT Smart Ball Demo Video
The IoT Smart Shoe
Using QN908x_DK and FRDM-STBC-AGM01

The RD-QN9080-AGM01 ISSDK Embedded Application firmware can be used to publish digital sensor data to any smartphone using Bluetooth Low Energy (BLE 5.0).

The Kinetis BLE Toolbox smartphone app allows configuration of sensors in different modes, with acceleration, rotation, steps and data plotting.

Using the register screen, it as also possible to individually read and write various sensor registers to tune sampling precision and data rates.

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**Step 1**
Build your BLE application using ISSDK KIT for QN908x with AGM01 examples

**Step 2**
Download “Kinetis BLE Toolbox” on your smartphone and launch “ISSDK sensor demo”

**Step 3**
Using “ISSDK Sensor demo”, choose the data mode to display the chosen sensor data

**Step 4**
In “ISSDK sensor demo” tune offsets & thresholds by writing the sensor registers to get accurate measurements
The IoT Smart Shoe Demo Video
The Future

Now that NFC chips are being used for applications other than payment, smart sensor nodes with NFC capability will soon become mainstream.

Concepts like “NXP’s Smart Gym” driven by NFC integration with weights will take fitness tracking to a new level.

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