# CREATE CONNECTED SENSORS IN MINUTES

**IoTize™**
instantly link electronics to mobile devices

## THE HIGH COST OF OCCASIONALLY USED FEATURES

Sensors are rarely very verbose. However, it is often useful that sensors display measured values. Today, those measured values are often viewed on LCD screens.

Sensors also typically require configuration or calibration for their environment. These interventions are often done using a pushbutton interface and an LCD.

Sensors can also require other interventions when they are commissioned such as selecting units of measure, definition of a network address, or a reset. All of these are most often done using a combination of pushbuttons, a potentiometer, or switches, with an LCD or LEDs.

Whether for viewing measures or configuring the sensor, **LCD-based user interfaces are very expensive to design and produce**. They increase the sensor's price even though they are used only very occasionally in the life of the sensor.

### The mobile app solution

**Mobile phones have become our information appliance of choice** because of their user-friendliness and omnipresence. Their role in our lives is only growing. Replacing the LCDs on sensors with mobile apps seems unavoidable because of the many advantages apps offer:

- Reduced development and production costs,
- Increased comfort for users,
- Possibility to authenticate users,
- Possibility of sensor software updates and other remote operations.

A whole realm of possibilities opens to us via mobile apps, but at much lower cost.

## THE SENSOR CHALLENGE

Using LCDs for data display and sensor configuration is an expensive solution that is only used occasionally...

## EASILY SOLVED

Mobiles & apps offer an accessible, affordable, adaptable solution. Plus, adding wireless and apps to sensor designs is much easier with our low code implementation...

## THE IOTIZE WAY

Relying on the pre-implemented features of our wireless devices, and our powerful app generator reduce design effort by a factor of at least 10.

If you need more flexibility, our advanced features let you do anything you want with a little bit of Java...

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## ➤ EASIER TO IMPLEMENT THAN YOU IMAGINE

IoTize provides **a low code wireless solution that connects any sensor to mobile apps or the Cloud with very little design effort**. It comes in the form of IoTize wireless devices: TapNLink modules, Tapioca fieldbus adapters. In these devices, all the common features that are required in connected sensors are pre-implemented including communication protocols, access control and encryption. The solution even goes so far as to automatically generate user interfaces as mobile apps for you.

*Mobile HMI app and $CO_2$ sensor with TapNLink*

## Connecting IoTize devices to sensors

There are several methods for creating a wireless connected sensor using these IoTize devices, including:

- **Connecting a TapNLink module directly to the CPU that drives the sensor(s)**. That CPU executes the application software which controls the sensor. TapNLink connects directly to its debug port [1], or to any two of its pins (GPIOs), or to a UART port.

*Connect TapNLink to CPU that drives sensors*

- **Connecting a TapNLink module directly to a sensor's analog or digital interfaces** (ex. I²C, SPI, UART, counter, etc.). The TapNLink can execute a Java program to communicate with the sensor directly. This Java is run by TapNLink's embedded Java Virtual Machine.

*Connect TapNLink directly to sensors*

- **Connecting a Tapioca adapter to a sensor's fieldbus** port that supports the Modbus-RTU or TCP protocol.

*Connect Tapioca directly to sensors with fieldbus (Modbus)*
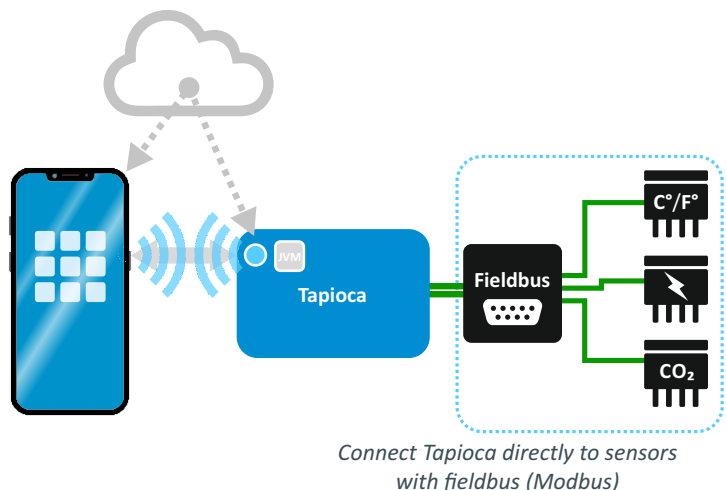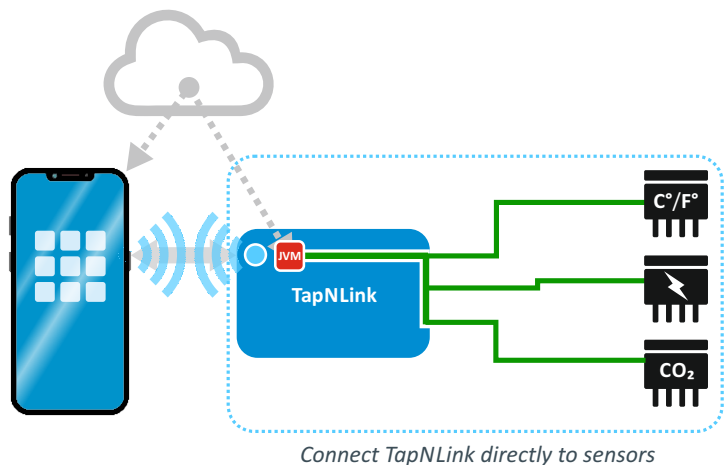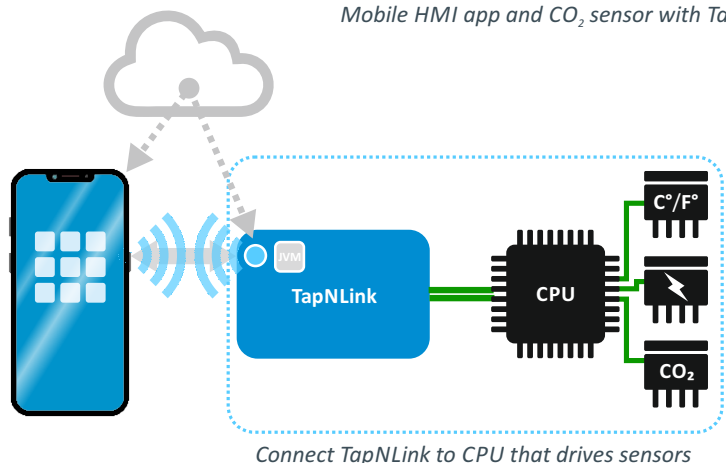
Note 1: Using a Cortex-M microcontroller´s debug port allows extremely rapid creation of proofs-of-concept. However, for added security, it is recommended to use GPIO with S3P protocol, or a UART port.

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# CREATE CONNECTED SENSORS IN MINUTES

## Wireless that connects your sensors to mobiles and more

IoTize devices provide wireless channels for connecting mobiles to sensors such as **Near Field Communication** (NFC), **Bluetooth** (BLE) or **Wi-Fi**. These channels meet a variety requirements for low-power consumption, range, and bandwidth.

In all cases, **NFC is greatly appreciated by users when connecting mobiles to any other device**. NFC simplifies this connection process by automatically:

- Initiating the connection by approaching the mobile to the sensor (no codes or addresses to enter),
- Installing the correct app from the appropriate app store,
- Launching the correct app,
- Executing the security and authentication procedures,
- Pairing the mobile's and the sensor's Bluetooth or Wi-Fi,
- Waking up the sensor from sleep mode.



*NFC for 3-stroke configuration or for device pairing*

All of this is done automatically and virtually instantaneously, making NFC an excellent complement to Bluetooth and Wi-Fi for ease-of-use and security.

**For data transmission, NFC, Bluetooth and Wi-Fi channels each fit distinct needs**:

- **NFC** is used alone in a mode called **'3-stroke configuration'**. The user (1) taps the mobile to the sensor to collect its configuration, (2) modifies it in the app, then (3) taps again to transmit the new configuration to the sensor.

  NFC is a great low-cost, low-energy solution to use when the need to connect to the sensor is rare. NFC can also operate in **'energy harvesting'** mode. This uses energy from the mobile for battery-free wireless. The harvested power can even be used to power the sensor itself.

- **Bluetooth** offers local connection with low-energy consumption when the user needs to maintain the connection with the sensor (ex. to monitor sensor readings). NFC can be used as a complement to automate and secure connection and pairing.

- **Wi-Fi** allows connection to the internet via a local network, or via the user's mobile phone. It enables features like data logging to a cloud platform and remote alarm monitoring. NFC can be used as a complement to automate and secure the pairing with mobiles, or for configuring the sensor and network settings at commissioning.



*With Bluetooth or Wi-Fi, sensors can maintain a connection with mobiles or the cloud for monitoring.*

# CREATE CONNECTED SENSORS IN MINUTES

## Free software environment for device configuration

Each device´s default communication protocols and security features are pre-implemented to be operational off-the-shelf. However, **modifying device configuration is a simple process of selecting and setting options** in our free IoTize Studio PC software. No coding is required.

When connecting the IoTize device to a sensor via an extension port (I2C, SPI, ADC, etc.), writing a few lines of Java allows you to retrieve measured values and store them as 'Intap' variables. Intap variables are available for access by the mobile app. Just add them in the configuration and send that configuration to the IoTize device.

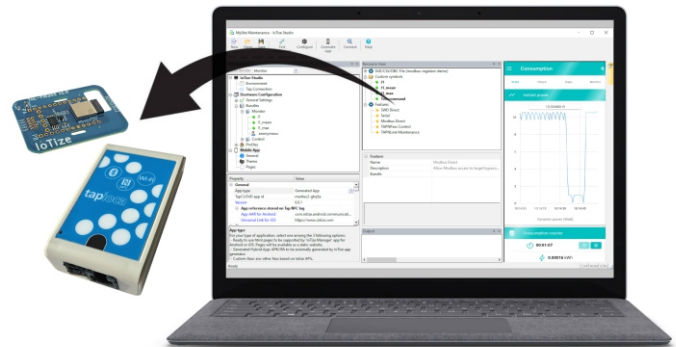You can even test the configuration and the Java code directly in IoTize Studio.



*IoTize Studio free PC software for wireless device configuration*

## Create a mobile app from the configuration

After your IoTize Device has been configured, IoTize Studio lets you **set the options that control the graphical representation of data in the app**. Choose to view data as gauges or graphs. Create buttons and sliders to control your sensor's parameters. Then just click a button to generate the app and the app project. You'll receive an app in just seconds which you can install on a mobile for testing.
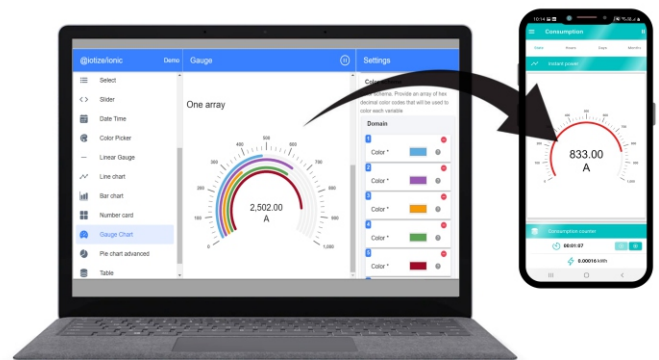
With the generated project, you can easily personalize and brand your app. It allows you full control of all visual aspects of your app (colors, fonts, images, graphical controls). You can also get the full sources for your app, and adapt them to meet the most specific or unique cases imaginable.

Apps can be generated for iOS, Android, or for web applications that run on internet browsers.

The generated mobile application can be run locally installed on the mobile, or can be run remotely and accessed by mobiles when an internet connection is available (i.e. with IoTize Wi-Fi, LTE-M, NB-IoT devices).



*Automatic App Generator to create mobile HMI without coding*

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## Types of mobile apps

The IoTize solution allows you to create several types of generated apps including:

- **Static apps** designed for a single sensor type,

- **Static apps with interfaces for several sensor types**, where the first exchanges with the app define the type of sensor and the correct interface to display,

- **Dynamic apps for several sensor types**, where the first exchanges with the app define the type of sensor and the correct interface is retrieved from a server. [2]

**any server**
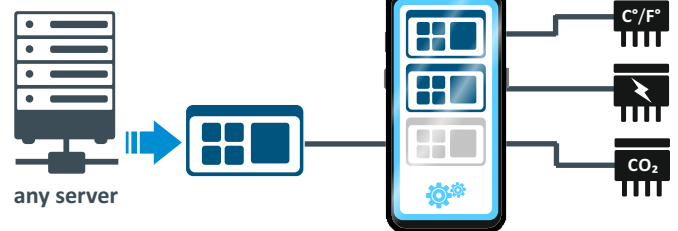
## Advanced features

### Edge computing

IoTize devices have a Java Virtual Machine which can be used to format data from a sensor. For example, the Java class 'math' is provided to allow any type of calculation. The JVM makes it possible to manipulate data locally and display only the results in the mobile app, or when datalogging to a cloud platform.

### Alarms and data logging

Similarly, the JVM provides JSON or String classes that make it easy to format messages to be sent to a cloud platform when transmitting alarms or storing the history of measured values.

## RESOURCES TO GET YOU STARTED

IoTize provides complete examples including sample hardware, device configuration and Java code. These demonstrate common implementations of IoTize device features with off-the-shelf sensors including:

- **TapCO2**:      Implementation with CO2 / hygrometry rate sensor.
- **TapWatt**:      Implementation with an electrical energy metering sensor

Examples available at:      **support.iotize.com**

Note 2: Dynamic apps are typically for companies that offer a large range of sensors, or for companies offering configurable sensors that may have different uses from one installation to another.

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**www.iotize.com**

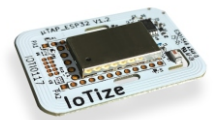# CREATE CONNECTED SENSORS IN MINUTES

## ASSOCIATED PRODUCTS

### TapNLink wireless modules

TapNLink integrates fully into any electronic design allowing connections to mobiles or the cloud. It connects to microcontrollers to allow external access to system data, or can be used as the system's CPU and drive external sensors. For sensors, it offers:

- Pre-implemented NFC, Bluetooth (BLE) and Wi-Fi
- Dynamic, per-session encryption and configurable access control
- No-code integration and smartphone app generation
- Java Virtual Machine for low-code system design and cloud integration.

TapNLink products online:  **iotize.com/tapnlink**

Wi-Fi

NFC

*TapNLink wireless modules*

### Tapioca fieldbus-wireless adapters

Tapioca implements on any equipment that has a serial fieldbus. It allows external access to equipment data and configurable features from mobile apps or the cloud. For sensors, it offers:

- Pre-implemented NFC, Bluetooth (BLE), Wi-Fi, Wi-Fi and LTE-M
- Pre-implemented RS232, RS485, USB, CAN, Ethernet, and Modbus protocol
- No-code integration and smartphone app generation
- Java Virtual Machine for low-code system design and cloud integration.
- Standard DIN rail or IP67 casings

Tapioca products online:  **iotize.com/tapioca**

*Tapioca fieldbus-wireless adapters*

### Software Ecosystem

All IoTize wireless devices are based on our embedded Duetware which pre-implements the features required for any connected device (communication protocols, security, data handling, etc). Devices benefit from a complete software ecosystem that includes:

Just Connect & Configure...

...to Create Your App!

#### Free device configuration environment

IoTize Studio provides a single, free PC **software environment for configuring all pre-implemented features**, writing Java code and managing other software tools.

#### Automatic App Generator

Our server-based tool **automatically generates graphical interfaces as iOS and Android apps**. It outputs test apps, and app projects for creating your final publishable app. It provides a wide range of display elements including buttons graphs, sliders, charts, and more. Advanced users can create static and dynamic multi-target apps. No expertise in app development and no coding are required.

For more information visit:  **iotize-apps.com**