

CONFIGURE APPLIANCES SECURELY & EFFICIENTLY

NEAR FIELD COMMUNICATION & MOBILE HMI WITH IOTIZE | SEPTEMBER 2022



THE CHALLENGE OF UNUSED FEATURES

Using LCD & push button interfaces to configure appliances are at best inconvenient, at the worst they so inefficient to use that they are rapidly disregarded...



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...



UNFRIENDLY INTERFACES RESULT IN UNUSED FEATURES

Not every consumer appliance requires configuration. However, many systems such as space heaters, heat pumps and water heaters, require set up at installation and periodic re-configuration or programming. Until recently, this was done using an LCD screen and push buttons on the product.

These LCD and push button interfaces, however, are often very difficult to navigate and control. The navigation and symbols are always specific to the manufacturer and difficult to understand at first glance. Users have to kneel next to the appliances with a user manual to make settings. At best these interfaces are inconvenient, at worst they are so inefficient that they are rapidly disregarded. IoTize customers in home heating appliances discover exactly this - that even though owners could save up to 15% on their home heating bills, fewer than 20% of them programmed their products because it was just too complicated.

For appliance manufacturers, these **LCD-based user interfaces are very expensive to design and produce**. They increase the appliances price even though they are most often disregarded by the owner!

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 appliances with mobile apps seems unavoidable in many cases because of the many advantages apps offer:

- Reduced development and production costs,
- Increased comfort and efficiency for users,

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- Increased flexibility in user interface design for manufacturers,
- Possibility to provide software updates and other remote operations.

In addition, Near Field Communication (NFC) on today's mobiles offers a secure, intuitive and efficient interface to automatically connecting to any appliance. Plus, NFC when compared to other wireless technologies is remarkably lower in cost and offers lower power consumption.

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



Mobile HMI app for NFC-enabled appliances

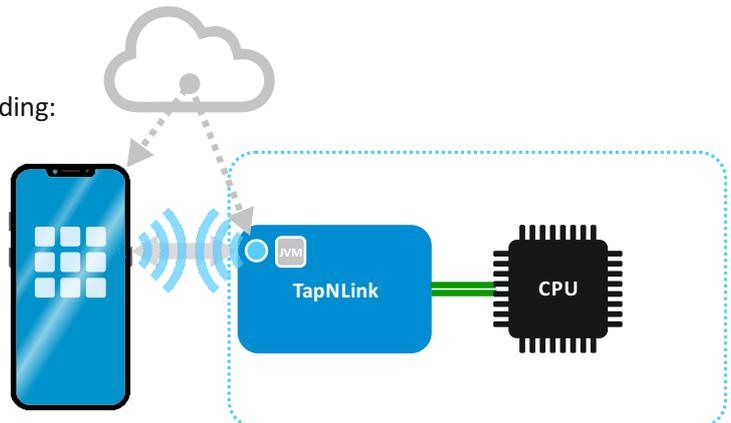
➤ EASIER TO IMPLEMENT THAN YOU IMAGINE

IoTize provides a **low code wireless solution that connects electronics to mobile apps, or even to 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 appliances 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.

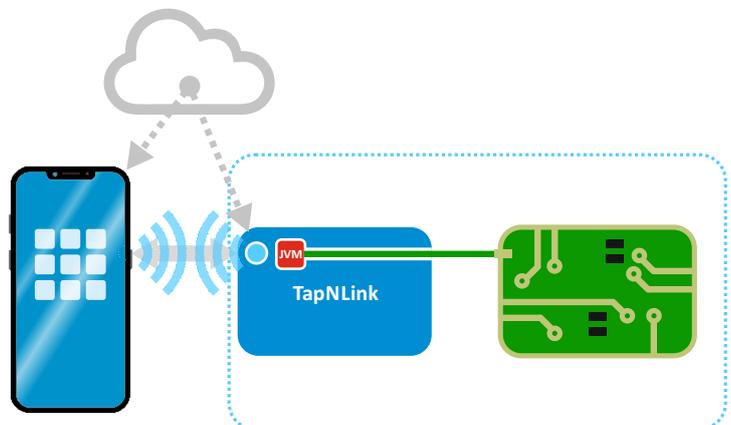
Connecting IoTize devices to appliances

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

- **Connecting a TapNLink module directly to the appliance's CPU.** That CPU executes the application software which controls the appliance. TapNLink connects directly to its debug port¹, or to any two of its pins (GPIOs), or to a UART port.
- **Connecting a TapNLink module directly to an appliance's analog or digital circuitry** (ex. I²C, SPI, UART, counter, etc.). The TapNLink can execute a Java program to communicate signals directly to the system or to any of its components, or sensors. This Java is run by TapNLink's embedded Java Virtual Machine.



Connect TapNLink to the appliance's CPU



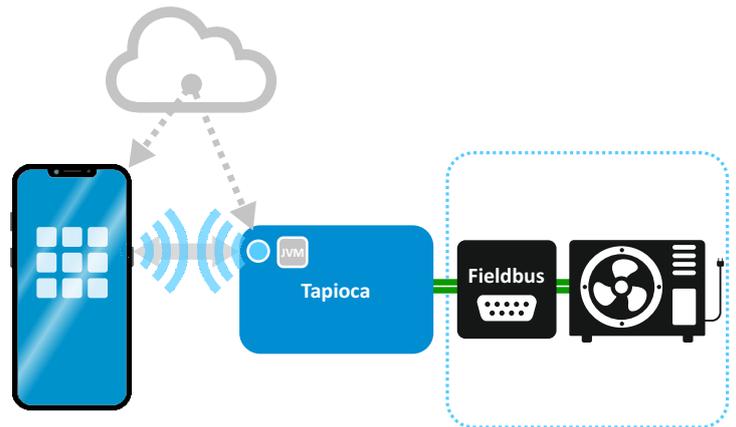
Connect TapNLink directly to system IOs, sensors or actuators

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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- Or finally, **by connecting a Tapioca adapter to an appliance's fieldbus** port that supports the Modbus-RTU or the Modbus-TCP protocol.

This type of fieldbus port is found on many home heating appliances. This makes it possible to even retrofit products that are already installed.



Connect Tapioca directly to sensors with fieldbus (Modbus)

Wireless that connects your sensors to mobiles and more

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

Contactless technology for easy, efficient appliance configuration

NFC can be used for appliance installation and periodic configuration. Used alone it functions 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. In this case, NFC simplifies the connection process by automatically:

- Initiating the connection when the mobile approaches the NFC device on the appliance (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.

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.

This combination of features, security and ease-of-use have made TapNLink NFC-only modules a particularly attractive device for appliances that require occasional configuration of programming.

Wireless technology to connect to mobiles or networks

TapNLink and Tapioca devices also offer wireless channels that allow users to maintain a continuous connection with an appliance. These can allow direct connection to a mobile phone or other types of network gateways.



NFC for 3-stroke configuration or for device pairing

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- **Bluetooth** offers local connection with low-energy consumption when the user needs to maintain a continuous, direct connection between the mobile and the appliance (ex. to monitor the appliance during a performance test). 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 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 network settings at commissioning.



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

➔ IMPLEMENTING IOTIZE DEVICES

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.

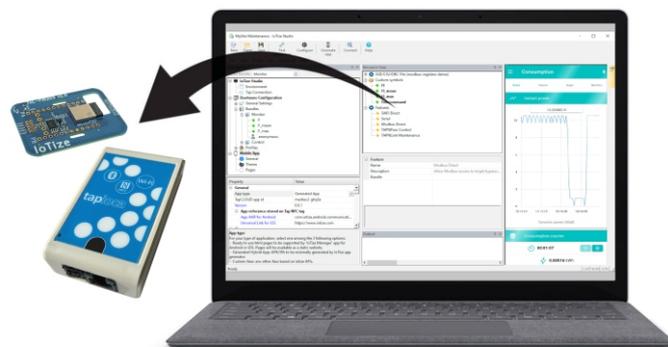
When connecting the IoTize device to an appliance via an extension port (I2C, SPI, ADC, etc.), writing a few lines of Java allows you to retrieve data and store them as 'Intap' variables. Intap variables are available for access by the mobile app. Just add them in the configuration and send that configuration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

Create a mobile app from the configuration

After your IoTize Device has been configured, IoTize Studio lets you **set the options for graphical appliance controls and representations of data in the app**. Choose to view data as gauges or graphs. Create buttons and sliders to set 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 control of visual aspects like 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.



IoTize Studio free PC software for wireless device configuration



Automatic App Generator to create mobile HMI without coding

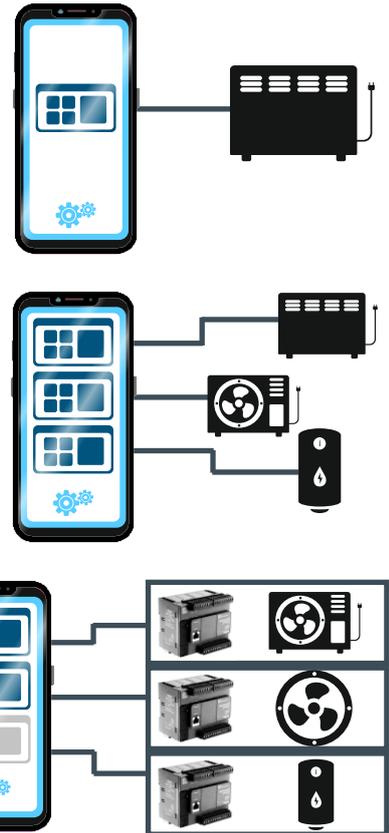
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The generated mobile application can be run locally installed on the mobile, or can be run remotely and accessed by mobiles when an internet connection is available (i.e. with IoTize Wi-Fi, LTE-M, NB-IoT devices).

Types of mobile apps

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

- **Static apps** designed for a single model of appliance,
- **Static apps with interfaces for several models of appliances**, where the first exchanges with the app define the appliance and the correct interface to display,
- **Dynamic apps for several appliance types**, where the first exchanges with the app define the appliance and the correct interface is retrieved from a server. ²



Advanced features

Edge computing

IoTize devices have a Java Virtual Machine which can be used to format data from an appliance. 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 a 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 different types of electronics.

Examples available at: support.iotize.com

² Note 2: Dynamic apps are for companies that offer devices like PLC where the final use is not known until the PLC is implemented. This allows them to offer a common app that can then be easily modified for different customer implementations.

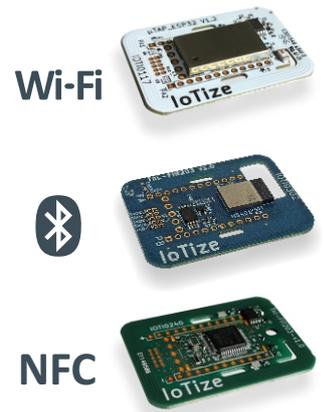
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ASSOCIATED PRODUCTS

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 components. 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 wireless modules

TapNLink products online:

[iotize.com/tapnlink](https://www.iotize.com/tapnlink)

Tapioca fieldbus-wireless adapters

Tapioca implements on any appliance or equipment that has a serial fieldbus. It allows external access to equipment data and configurable features from mobile apps or the cloud. 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 fieldbus-wireless adapters

Tapioca products online:

[iotize.com/tapioca](https://www.iotize.com/tapioca)

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:

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](https://www.iotize-apps.com)



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