IFTEST

Smart sensors, data communication and visualisation in the Internet of Things (IoT)

Factsheet

Applications in the Internet of Things (IoT = Internet of Things) require the appropriate technology, methods and standards to function at an optimum level. In this paper, Iftest AG describes the function and possibilities of smart sensors and data paths into the cloud and back again. Iftest also offers up-to-date standard solutions for display of data and operation of medical devices or industrial plants.

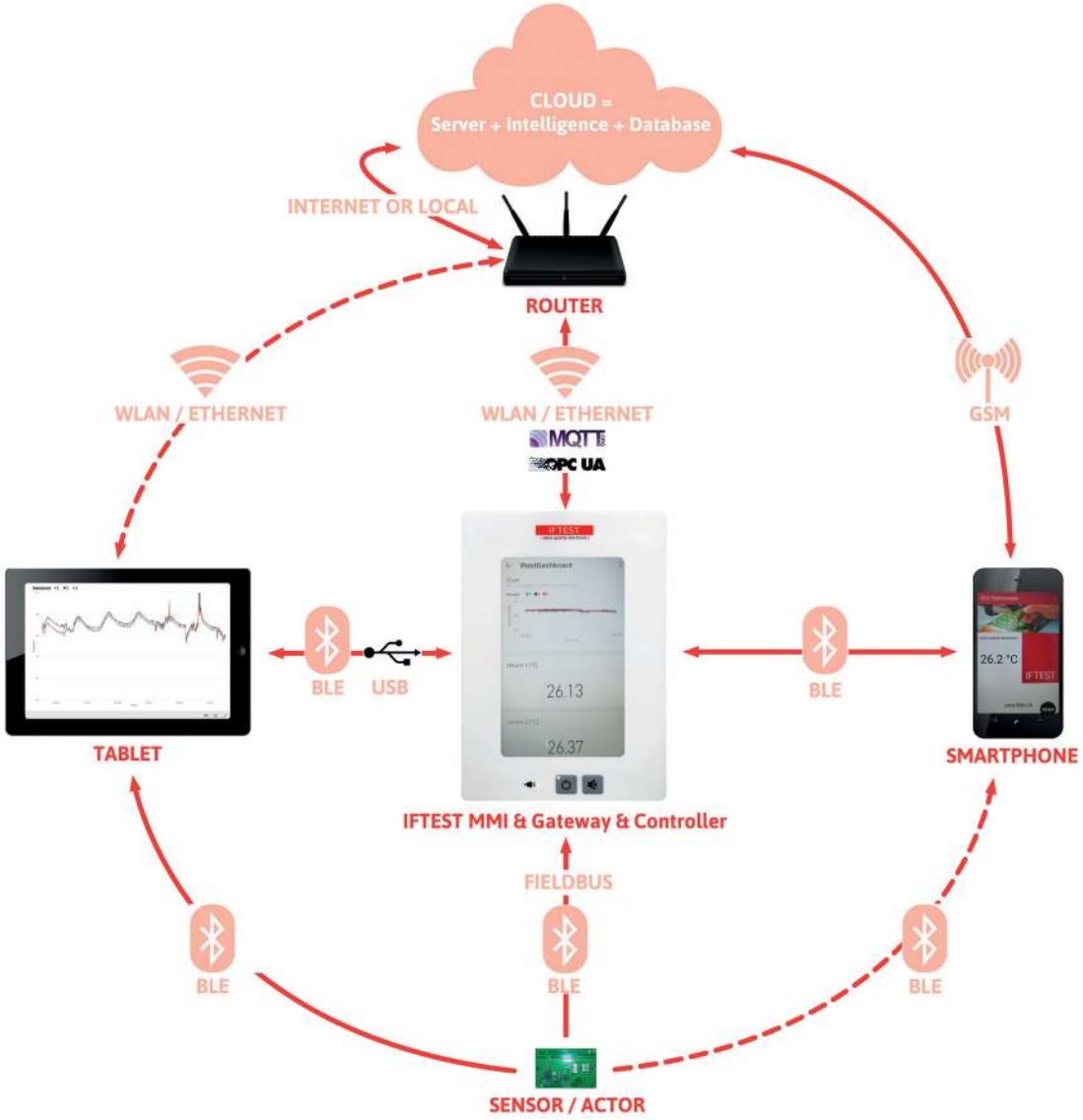

Fig: Communications model

1 Introduction

The cloud allows data to be captured, stored, archived, evaluated and forwarded to the user in a suitable format. All data is available for recall at any time and anywhere, decentralised and via mobile devices. The data transfer technologies described in this paper show the options and ways in which data can be sent to the cloud and then retrieved.

2 Iftest Smart Sensor

The smart sensor, which is the source of the data, is where it all starts. These types of sensors are called 'smart' as they have a certain degree of inherent 'intelligence'.

Smart sensors contain not only the actual means of capture of measured values but also the complete means of preparation and processing of the signal. The sensor can be connected via a range of different interfaces using non-contact, optical/inductive connections or 'wirelessly' via passive or active radio technology.

Possible interfaces include: I^2C, ethernet, Profibus, USB, FireWire, CAN, RFID, Bluetooth, WPAN, WLAN, GSM, UMTS, etc.
The choice of interface depends on the requirements and demands, such as the power supply, range and miniaturisation.

Iftest's demonstration model contains extremely accurate temperature measurement, a BLE low-power Bluetooth interface, and a button cell battery power source.

The advantages of this architecture are:

+ low energy requirement
+ relatively wide range
+ compact design
+ low cost components
+ standard interface for mobile devices, telephones, PCs, tablets, etc.

This concept is extremely well suited to medical sensors for use on the body ('wearables'), diagnostic systems, decentralised sensors on devices and machines, and many other application areas.

Key data

Power supply	3V
Currency requirement	approx. 100uA
Accuracy	±0.1°C
Interface	BLE (Bluetooth Low Energy)
Data rate	every 2 seconds
Range	> 100m
Protocol	GATT, GAP (Advertising)

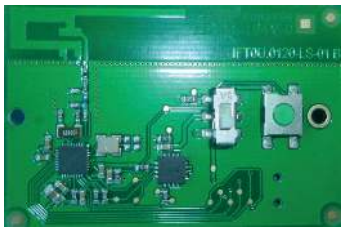

Figure: Iftest Smart Sensor

3 Tablet

In the Iftest demonstration model, the data is transferred via Bluetooth to a tablet PC with a Windows operating system; it is then sent to the internet via WLAN.

Key data

Applications program	C#, .net 4.5
Data range	every 5 seconds

The application program can run on any PC system with Windows 8.1. The sensor data can be downloaded or displayed using Power BI or the Iftest website browser via the internet and WLAN.

Figure: demo screen shot

4 Cloud

The Microsoft Azure cloud computing platform and Power BI are used to store and prepare data. The application is programmed using Visual Studio software. This tool is an inexpensive way of displaying data in suitable diagrams and formats.

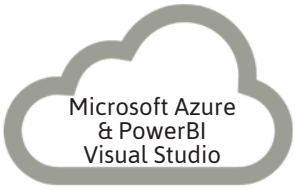

Fig: Cloud services

5 Smartphone

The temperature data can be displayed on a smartphone in three ways.

5.1 Demo app option 1

App with data transfer directly from the sensor to the smartphone via Bluetooth. This allows the smartphone to be used as the data display screen.

Fig: Demo screen shot

Key data

Tool	Android Studio 2.0
Protokoll	GATT data
Data rate	every 3 seconds

5.2 Demo app option 2

In this variant, the data is downloaded from the Cloud server via GSM or WLAN. The data can be displayed anywhere via a mobile phone connection.

Fig: demo screen shot

The Microsoft Power BI app functionality is shown here.

5.3 Browser option

The browser variant allows the data to be displayed using the Iftest website browser. Obviously, not all options can be used in practice. The variants are described in this paper simply as examples of the solutions available.

5 Iftest MMI

The standard Iftest MMI is a single board solution with the following hardware concept:

+ multimedia processor with LCD and touch-screen driver, 450 MHz
+ range of display resolutions and sizes (1.8 to 15”, QVGA to WVGA)
+ resistive or capacitive touch screen
+ high performance up to moving images
+ quick realisation, simple operation
+ established Linux operating system
+ QT Creator, comfortable development environment for GUI (graphics interface)
+ safety concept with first-error security available
+ multiple interfaces available as options (JTAG, ethernet, USB, CAN, Bluetooth, SD card etc.)

In the demonstration design shown here, the data is transferred from the sensor and displayed via a Bluetooth interface.

Key data

Interface	BLE (Bluetooth Low Energy)
Data rate	every 2 seconds
Range	> 100m
Protocol	GAP (Advertising)

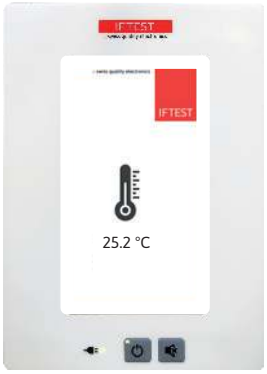

Fig: Iftest MMI

6 Notes

Many aspects of the Internet of Things (IoT) are mentioned only briefly in this document and some not at all. Other subject areas for discussion include technology, architecture, data models, connectivity, security and software tools.

In all cases, Iftest offers practical smart sensor solutions and displays and operating systems for your specific application. We would be pleased to support the data capture, data communication, data processing and display elements of your projects.

Iftest AG

+ System partner for industrial and medical electronics
+ Services
  – Consulting
  – Hardware development
  – Embedded software development
  – PCB design
  – Fast prototyping
  – PCB Assembly: SMT and THT
  – Module and device assembly

Factsheet | January 2017

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