

# Intelligent Industrial Automation Devices using Bluetooth™ and Internet Technologies

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**Traditionally many types of devices have been delivered as mechanical devices and more or less all of the intelligence and control has been added at each instance of use. Today there is a growing trend towards a higher level of built-in intelligence in the devices. This built-in intelligence combined with Internet technology gives us means to package a user interface as part of the device. With the introduction of the Bluetooth technology, another dimension is added, the possibility to wirelessly connect to the devices. The technology makes it possible to easily access the built-in user interfaces through portable devices but also to access the device data without the need for a physical connection.**

**This paper discusses the possibilities of combining the technologies; built-in intelligence, Internet and Bluetooth.**

More embedded intelligence in the devices gives the user a more ready and well-tested product in comparison to use a for each use unique version. This gives also the device manufacturer a possibility to "package" his domain knowledge without revealing business secrets. It also makes more efficient maintenance and problem resolution. The device may locally store important information that gives the maintenance engineer means to do more efficient work. The built-in Internet-based user-interface (UI) may visualize the device status from different user categories point-of-view. Bluetooth adds to the ease of use, firstly by providing means to easily get to the user interface of the device and secondly ability to read and write data. Combining Bluetooth and a user interface based on Internet-technology, a user may use the portable Human-Machine-Interface (HMI) devices he normally is carrying (for example a phone, a PDA or a laptop) to access the device UI. There is no need to have anything preinstalled on

the portable device (knowing that Bluetooth is integrated as standard in future portables).

## The technology evolution sets the pace

The current fast technology evolution sets prerequisites for the trend.

A basic prerequisite is the movement towards Internet based communication (that is IP, Internet Protocol). The trend today is that small and low-cost devices are equipped with an Ethernet port or an option to add one. I see Bluetooth adding a new dimension to this, supplying an IP-based wireless connection either as an alternative to the Ethernet port or existing in parallel. This will be even more important seen from the emerging trend moving from specialized industrial communication buses towards IP-based communication. This also sets the need for new Bluetooth profiles focusing on the industrial communication demands that is on issues like performance, real-time and time synchronization.

Traditionally, embedded technology has been a technology for specialist but new open platforms makes it possible to use mainstream tools and platforms to develop embedded systems. In this area we see platforms like Embedded Linux, Window CE and Embedded Windows NT. This gives the means for the developer to use standard tools like Controller technology ("Soft Controller") and traditional computing to create an intelligent device. The open platform makes this relevant for products with modest volumes. On these platforms embedded Internet Servers is standard tools. Bluetooth is also easy to implement on open platforms using components like PcCards and commercially available communications stacks with an easy-to-use Application Programming Interface (API).

Devices built using more traditional embedded techniques are also possible to extend with an Internet Server and Bluetooth technology. Many Real-Time Operating Systems (RTOS) includes possibilities to add Internet servers and there is a growing availability of Bluetooth stacks and components for these environments.

### Thin clients

The HMI of the “intelligent” device is exposed to the user using Internet technology, for example World Wide Web (WWW) and/or Wireless Application Protocol (WAP) interfaces. The basic idea is that the embedded UI may be used in any type of standard HMI device. The only demands is that a standard HTML (or WAP) Browser is available in the HMI device and that Bluetooth is supported as a media for the IP-based communication. The good thing about this is that I believe that more or less all portable devices will include this in the near future. This enables us to use mobile phones, PDAs and portable laptops as HMI towards the industrial devices.

The idea is to include Web pages in the devices for different user categories. For maintenance personnel pages helping out when doing preventive maintenance and locating errors. The device may locally log information helping out in this area. Operators may use HMI to supervise the device. For the person doing the system configuration there are pages helping out when setting up the device.

### Some examples

A frequency inverter contains all necessary control programs and is connected to the outer world using Internet technology and Bluetooth. Typically there are WEB (and/or WAP) pages for setting up the system, maintaining and supervising the inverter. The same may apply to other types of similar devices like one-loop controllers and energy distribution protection devices.

Many other types of devices today connected to Internet using Ethernet may be extended to include Bluetooth interfaces that is gateways to fieldbus protocols.

We will also see traditional Controllers equipped with Bluetooth combined with the availability to download Web pages (an extension to today available techniques using Ethernet like the Siemens S7-400 Network Adapter).

Another possibility is more complex type of devices like dairy centrifuge. Devices with a high level of built-in functionality exposing its user

interface through Internet and using Bluetooth as means to access the device wirelessly.

I also see that the availability of open embedded technologies will make it possible to use this technology for customized systems and small-volume products.

### Conclusions

By combining an open embedded technology, Internet standards and Bluetooth we have the possibility to create intelligent devices with a high level maintainability and usability. I also see a future possibility to use Bluetooth as a way to send and receive real-time information.

I foresee a future of portable devices with Bluetooth and Internet capability as standard, possible to use as efficient and easy-to-use HMI towards Industrial devices.

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#### About the author

Mats Andersson is a senior advisor of connectBlue AB, Sweden. ConnectBlue is specializing in integrating Bluetooth based solutions in industrial and commercial devices. The company's services include consulting, training and complete solutions including hardware and software.

Mats Andersson has more than 20 years experience in the field of industrial automation. This includes managing development of industrial automation products at AlfaLaval Automation and ABB Automation Products. Currently Mats is involved in the work to create an “industrial oriented” working group within the Bluetooth SIG (SIG = Special Interest Group).