

July 2015

# Next Generation of HMI

*Cloud-Based Remote Monitoring and Diagnosis Solutions for Production Management*

Author: Advantech

E-mail: [eainfo@advantech.com](mailto:eainfo@advantech.com)

Over the next few years, the industrial automation industry will change dramatically. There are several trends that will impact it and, like the “perfect storm” they will impact the industry all at once. These trends include the demographic changes as Baby Boomers retire and are replaced by Millennials, the ubiquity of sensors, embedded computers, the Cloud and Big Data, and the network-of-all-networks—the Industrial Internet of Things.

## **The Cloud, Big Data and the Industrial Internet of Things**

The increase in storage capability, with the decrease in storage cost, has made it possible to set up groups of servers in “clouds” to act as data storage and even program repositories for Software as a Service (SaaS).

Both software and data can run in a server located anywhere and can be accessed using a client from anywhere. Clients can be anything from an embedded computer in a device to a smartphone or laptop or desktop computer.

This means that users have access to vast volumes of data and the analysis tools they need to make sense of it.

Couple this with the trend toward simpler, less expensive sensors and the amount of data that can be developed from devices in industrial, municipal, and utility applications is going to grow exponentially. Originally called M2M or “machine to machine” communications, this connectivity is now called the Industrial Internet of Things. Gartner predicts 26 billion devices will be connected to Internet of Things networks by 2020, a figure that does not include desktops, laptops, or cellphones.

Combined with the Cloud, the Industrial Internet of Things will change the entire architecture of manufacturing automation and production control. Manufacturing engineers and operators will collect data and have the ability to use it directly to optimize manufacturing systems and production. Asset managers will have the data they have always needed to make predictive maintenance actually work, and reduce maintenance costs and downtime on an ongoing basis.

## **What Millennials Want in Manufacturing**

One of the issues managers must deal with is the different demographics in automation, manufacturing and production control. Baby Boomers are retiring and are being replaced with Millennials. Two issues arise from that. The first is that additional automation will be required because there are simply fewer Millennials than Boomers. Second, Millennials work differently than Boomers, and are “digital natives.” That is, they have been working with computers and graphical interfaces since they were very young. Only some members of the Baby Boomer generation are “digital immigrants” and few have the inborn facility with electronic devices that Millennials have.

Millennials have already expressed preferences for working with mobile interfaces, rather than large screen computer interfaces in many cases and since there will be fewer operators in the future, making them mobile and providing them with graphical user interfaces to control processes in the field makes a great deal of sense.

There are concrete differences between the ways yesterday's operators (Boomers) and today's operators (Millennials) desire to control processes.

Yesterday's operators follow the process based on defined procedures. Today's operators make decisions based on real-time data. Yesterday's operators work within a linear sequence, step by step, and follow standard rules. Today's operators work within a multi-functional organization and contribute to driving process changes. Yesterday's operators make decisions based on training, while Today's operators leverage institutionalized knowledge.

## **The Ubiquity of Sensors and Wireless**

Sensors are becoming simpler, less costly, and smarter all at the same time. Most applications do not require heavy, costly hazardous area enclosures and simple housings are effective and cheap.

Battery operated sensors are becoming normal, and in the future will be dominant, even when AC wiring is available, because not having to wire sensors saves money and time.

Wireless for sensors is becoming ubiquitous as well, with several different protocols to choose from, including cellular. Wireless networks for sensors, controllers and final control devices are being used in many enterprises for non-critical control applications in building automation, factory automation, and production monitoring and control.

## **Smart, Integrated and Embedded Computers Will Be Everywhere**

By 2020, 90% of all computers will be embedded. They will be small, smart, low power, and networked—usually wirelessly.

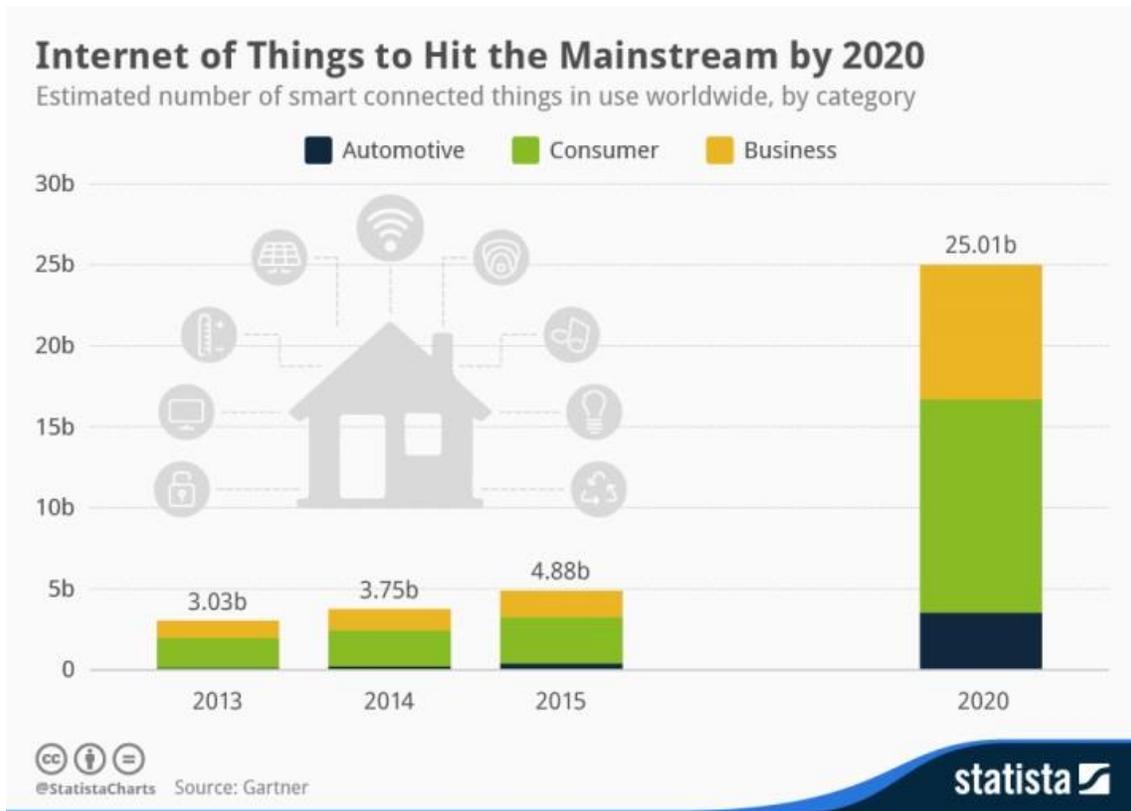


Figure 1 Growth of the Internet of Things

"By 2020, component costs will have come down to the point that connectivity will become a standard feature, even for processors costing less than \$1. This opens up the possibility of connecting just about anything, from the very simple to the very complex, to offer remote control, monitoring and sensing," said Gartner's Peter Middleton, in December 2013. "The fact is, that today, many categories of connected things in 2020 don't yet exist. As product designers dream up ways to exploit the inherent connectivity that will be offered in intelligent products, we expect the variety of devices offered to explode."

### Transforming Industrial Automation

Industrial automation has always been about control. By 2020, it will be about data. Data will be used to populate automated controllers, and provide operators with the real-time information they will need to run the process they are working with.

In order to produce that shift, we will see the growth of embedded intelligence, with Internet of Things ready components of all types. Vendors and system integrators will produce solution-ready packages because end users will have lost the capability to engineer and integrate these systems themselves.

But most importantly, we expect to see services, both maintenance and asset management, and SaaS, to increase to more than 50% of revenue for automation vendors.

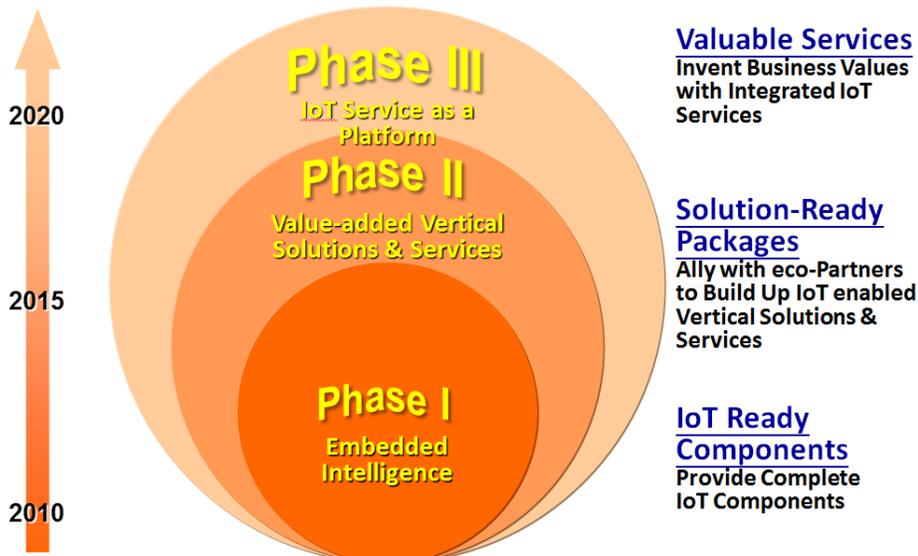


Figure 2 Transforming Trends in Industrial Automation

By 2020, we will expect vendors and end users working together in ways they do not now. We would expect to see different control modalities and the use of Software as a Service for both data storage and control.

## New Generation HMI Supports Production Management in the 21<sup>st</sup> Century

The new generation of operators wants a different type of HMI. They want the ability to see real-time data in quantities and have the ability to use that real-time data to make decisions and control the process. They want to be able to see that data on a variety of HMI platforms, from desktops to smartphones, with the appropriate GUI for each interface. The information must be easy to see, integrated into systems, and the control interface must be capable of intuitive operation.



Figure 3 New Generation HMI for New Generation Operators

HMI and historians need to be capable of integration with the asset management systems, production management systems, and the financial control and management systems of the enterprise. Integration with the asset management system and even the production control system can be done with today's software capabilities, but real integration with the enterprise must be done by including the financial control system. Only then can the enterprise be truly agile.

## **Remote Monitoring and Diagnosis**

The Internet of Things makes remote monitoring of devices, networks and processes practical, and the lack of qualified operators makes remote monitoring necessary. The analytics built into Big Data asset management solutions can provide the diagnosis tools to make remote monitoring worthwhile.

Real-time monitoring and proactive alarm notifications can save up to 70% on the time to repair systems where operators monitor systems by doing rounds. This is important because more and more, system operators are not capable of doing rounds, either because they are too busy, or they are not able to recognize a problem when they see it.

Maintenance costs can be reduced up to 50% by the ability to do predictive maintenance instead of reactive maintenance, allowing onsite recovery in almost any situation. We may see vendors selling "up-time," rather than products, and maximum uptime will require predictive maintenance and remote diagnostics and repair.

In addition, the use of single-source solutions, such as Advantech is capable of providing, can reduce deployment costs as much as 30%.

## **Advantech's Solution: New HMI Generation**

Advantech's cloud- and web-based remote monitoring framework is called SUSIAccess. The recently released version 3.0 is embedded in all Advantech devices and can be easily implemented. SUSIAccess is an intelligent system cloud management software platform that Advantech has designed to enable its customers to more easily take advantage of the opportunities provided by the Internet of Things.

TPC/UNO is Advantech's family of embedded computers and controllers and touch panel computers. All Advantech devices are provided with SUSIAccess. New generation HMI is the combination of the compact TPC/UNO platform with flexible module configuration using iDoor connecting with wide range of sensors. And, SUSIAccess enables users to single source most remote monitoring and diagnostic applications. It's designed to work with virtually any standard, specialty, or remote display unit ideal for applications requiring long distance remote or specialized displays.

SUSIAccess seamlessly monitors both hardware and software, including temperatures, speeds, voltages, other analog and digital inputs, as well as the states of hard disks and other hardware. This proactive monitoring and reporting is designed to help users implement predictive maintenance. SUSIAccess can send alarm notifications to the relevant manager via eMail or SMS messaging. Device grouping for efficient device management is implemented. In a highly innovative move, Advantech has implemented both Google and Baidu map systems so that devices can be accurately and easily located by the operator.



Figure 4 SUSIAccess has console and web based interfaces

Up to 60% of embedded computer device maintenance issues are solvable remotely. Other device issues can be diagnosed and the solution can be decided on before the user's maintenance tech arrives at the site. SUSIAccess integrates Intel AMT for BIOS level KVM. Power schedules for power saving can be implemented remotely for weekly, monthly and annual power schedules.

An important functionality embedded in SUSIAccess is embedded cyber security. McAfee white list technology is embedded in the software and hardware Advantech provides. This means that there is no need to upgrade virus definitions, and there is no need to scan disks—this means very low system loading. SUSIAccess provides a remote backup and recovery solution, with hot backup, differential backup, Hot Key recovery, and scheduled backup and recovery features.

SUSIAccess has two integration modes: a custom-designed integration mode into industry software, and external plug-ins for existing industry software into SUSIAccess. This provides an easy and agile interfacing strategy for any software.

Advantech's TPC/UNO embedded computers and SUSIAccess 3.0 software are excellent examples of the kind of hardware/software integration and the diagnostics and maintenance tools that are being made possible by the Internet of Things.

References:

1. "Gartner Says 4.9 billion Connected "Things" Will Be in Use in 2015"  
<http://www.gartner.com/newsroom/id/2905717>
2. Martin, Peter G., and Boyes, Walt *Real-Time Control of the Industrial Enterprise*, Momentum Press 2014
3. Khalgui, M.; et al. *Embedded Computing Systems: Applications, Optimization, and Advanced Design*, Information Science Reference (an imprint of IGI Global) 2013