CMC Wireless Report

ISA100.11a and WirelessHART – Your Future Wireless

By Dick Caro, CMC Associates, Acton, MA

There are plenty of wireless instruments for process automation available today, but they are all proprietary, do not conform to any standard, and generally are not interoperable. Each network constructed from these instruments generally uses a standards-based interface to the host system using OPC, Modbus, or similar protocols. Users would generally like to see a more integrated approach for host systems, but vendors tend to use such open protocols for connection capability to almost any host.

ISA100.11a is the name of the ANSI standard being developed by the ISA SP-100 standards committee. The committee was officially chartered in 2005, with an editing team created in early 2007 to actually write the standard. Completion of the standard's first draft is scheduled for November 2008, and it appears likely that this schedule will be met. ISA100.11a is being targeted to serve the data acquisition and limited control needs of the process industries for this first release. Products designed to this specification are expected on the market before the end of 2008, with compliance certified products available shortly after release of the standard.

HART 7.0 planning began in 2005 and the specification containing WirelessHART was ratified in September 2007. Like all the HART specifications before it, WirelessHART is targeted to serve the data acquisition and limited control needs of the process industry. Even more focused, is the need for providing a wireless path to capture the digital data contained in more than 20 million older HART

instruments without a direct digital connection to their control system. Similar but incompatible products are already available in the market to provide this functionality. However, products designed to the official HART 7.0 specification have been announced to be available for sale later in 2008, and compliance certified products are likely to be on the market by the end of 2008.

Most observers question why there are two competing wireless standards for the same small industry. Many users involved in the development of ISA100.11a are questioning why these two very similar standards that are both based on the same radio (IEEE 802.15.4:2006) operating at the same frequencies cannot be united into one standard. These are excellent questions and deserve an answer that we will try to provide here.

The two standards are the result of the free-market. The HART Communications Foundation (HCF) members assumed that the open standards process used by ISA to create a wireless standard usable for process data acquisition and control would take a long time. They thought that wireless networking specifications could be added to the already planned improvements for the HART 7.0 specification in much less time to provide a wireless solution for HART users. Since the HART specification was produced by a small, focused, full-time, and dedicated group, it could move much faster than the open development process of ISA100 that is required to be voted upon during a public comment and review period. The HART standard is only reviewed by the HCF members.

Some suppliers have questioned the haste in producing the ISA100.11a standard that has not integrated the WirelessHART protocol. They also have questioned the value of the ISA100.11a standard when the WirelessHART standard is already available. As with the previous questions, these too are valid alternatives and should

be examined. First, the haste in producing the ISA standard comes from the sense of competition from WirelessHART itself and the general desire to complete a comprehensive work, once begun, as soon as possible.

ISA100 and HART Joint Analysis Team

The question remains: why can't the WirelessHART specifications just be embedded into ISA100.11a? There are a number of reasons, mostly technical, but the main reason is that the HCF did not offer the wireless technology embedded in the HART 7.0 specification to be used in the ISA100.11a standard until the design of ISA100.11a was nearly completed. The ISA100 technical committee has not yet requested the release of those wireless portions of the HART 7.0 specification, because there was no obvious reason to request it. Instead, a Joint Analysis Team (JAT) was formed with members from both the ISA100 standards committee, and members selected by the Board of Directors of the HCF to study the issues.

The JAT considered several alternatives and came to the conclusion that full integration of the two specifications will not be considered until a later release of the ISA100.11 standard, because no simple solution existed and inclusion could become very complicated and would delay completion of the first release with no technical benefit. However, this committee did succeed in defining a host network interface to a dual-mode gateway that would be the same for both ISA100.11a and WirelessHART field networks. Interpreting these words into more simple language: the DCS or other host system can access information from a field device on either a WirelessHART or ISA100.11a network in identically the same way, from the same dual-mode gateway. While the wireless field networks are separate, distinct, and not interoperable, they can coexist and are joined at this common gateway.

How did this remarkable level of unity occur? ISA100.11a had not previously defined a host level interface, but a core host interface was already existed in the HART 7.0 specification. The ISA100.11a editorial team created the specification for a host level interface to the gateway in the ISA100.11a Release 1 draft standard that simply used the same core interface already in the HART 7.0 specification as the basis technology. This host level interface will be very easy for the consortiums representing FOUNDATION™ Fieldbus and PROFIBUS to build upon as they develop their common interface to WirelessHART. In so doing, they will have also created a common interface to ISA100.11a as well. These two consortiums had previously agreed to specify a common interface to a WirelessHART gateway. The dual-mode gateway interface proposed by the JAT and embedded into the ISA100.11a Release 1 specification seems to accomplish most of this task with the added benefit that it allows that same interface to be used with ISA100.11a Release 1 networks. Although it seemed, at first, to be a trivial solution from the JAT, it turns out to be a highly significant move toward unification between WirelessHART and ISA100.11a Release 1.

Integration of the Standards

Now, lets turn to the rest of the problem: integration of WirelessHART and ISA100.11a. There are three different ways in which these two standards may be integrated:

1. ISA100 may adopt the entire wireless protocol specification of HART 7.0 replacing the current draft standards work of ISA100.11a,

2. HCF may adopt the entire wireless protocol specification that is ISA100.11a replacing the current wireless protocol contained in the HART 7.0 specification, or

3. Merge the WirelessHART protocol into ISA100.11a by inserting a protocol splitter just above the common MAC (Media Access Control) layer creating a dual-protocol stack. Then messages would be handled by the proper protocol stack for routing and servicing according to the network identity configured into the field device.

For this report, we will assume that option 2) is strategically unacceptable by the vendor communities backing WirelessHART. We will consider only options 1) and 3).

Option 1) questions the necessity for an ISA standard when the WirelessHART protocol is available. If the process control needs of industry could be fulfilled through the use of the WirelessHART protocol alone, then this suggestion would have merit. However, in the opinion of technical experts working on ISA100.11a and many users directly involved with its development, that is not the case. If the needs for wireless field communications were defined by the requirements to support only HART and Profibus-PA applications, then WirelessHART might be adequate. However, the WirelessHART architecture does not yet support direct peer-to-peer data paths necessary to provide for FOUNDATION™ Fieldbus when control in field devices is configured. ISA100.11a has been designed to provide direct peer-to-peer data paths necessary to close control loops using only field instruments similar to FOUNDATION™ Fieldbus H1 wired networks.

The other issue is the speed of a WirelessHART network when used to supply measurement data for control loops. In wired HART, the 4-20mA analog signal is usually used to supply process variable (PV) data for control purposes. It is not clear that WirelessHART networks can supply PV data sufficiently fast for use in DCS host-based control. WirelessHART was designed to deliver data with a

maximum latency of 250ms over a single mesh hop, while ISA100.11a was designed with a maximum latency of 100ms over the same configuration. To minimize the latency of a mesh network, ISA100.11a allows configuration of a field backbone into the network. WirelessHART does not specify such a backbone network, but would require location of its gateway device in the field. Using these criteria, it appears that we cannot adopt option 1).

The purpose of option 3) is integrating these protocols is to allow suppliers to build field devices that will be capable of operating in either a network configured to meet only the "original WirelessHART specifications," or in a more general ISA100.11a network. Therefore, devices requiring the protocol splitter will only be required for installation in plant areas in which there are devices that are NOT capable of using ISA100.11a protocol (do not contain the dual-protocol stack.) This means that the merged protocol is only necessary only to support installations of new devices in wireless network segments that were originally constructed to use only the WirelessHART protocol.

Will there be a significant number of those purely WirelessHART networks to require merged protocols within the ISA100.11a standard? The WirelessHART version of the device that attaches to the 4-20ma wiring for an existing HART transmitter is called a "Thum" by Emerson/Rosemount who has already announced that it will accept orders by mid-2008. No shipping date has yet been announced. No supplier has yet made an announcement for an ISA100.11a equivalent device, but such products are likely to appear before the end of 2008. This apparent time gap is driving several vendors to build product to support WirelessHART without a corresponding commitment to support ISA100.11a.

If the promised launch of WirelessHART devices occurs in mid-2008 and those products are actually shipped later in 2008 in any quantity, then there may be hundreds to thousands of these devices installed. However, vendors of ISA100.11a devices are not ready to relinquish the market to WirelessHART alone. If their ISA100.11a devices are also launched in mid-2008 and actually ship later in 2008, there will be a reduced demand for pure WirelessHART devices.

We know that ISA100.11a can be configured to accomplish ALL of the WirelessHART functions, using a very similar application interface based on EDDL. Furthermore, the host network interface for both protocols will be the same. It also appears that there is little to no cost differences to support either protocol. Furthermore, vendors may at any time choose to support both WirelessHART and ISA100.11a protocols by instantiating the required protocol stack in a number of vendor-specific ways, such as downloading or activation if previously installed. Given that there will be little functional or selling price differential, is it worth the effort to integrate these standards?

Conclusions

Will the effort to create a dual-protocol stack standard actually occur? It is certain that without strong end user pressure, the suppliers will not make any changes to WirelessHART with the result that some products will be installed in the field without the capability to ever be converted to ISA100.11a. Some users will buy WirelessHART because it may be available a few months earlier than ISA100.11a instruments. Others will choose to wait a few months for either devices that are ISA100.11a compliant, or are promised to be convertible to ISA100.11a. However, it is more likely that users will purchase neither in any quantity until the suppliers pick one standard or supply devices that can be configured or downloaded for either protocol. This confusion in the marketplace is just like HD DVD vs. Blue-

Ray – users may decide to buy neither. The market always makes the "best" decision, not always the best technical decision.

Which "camp" will win this battle of the wireless protocols, sometimes called an "air-war?" The vendors seem to be aligned into these two camps, each with their own strategy. Early adopter users must make a "bet" on their perception of the winner. Either way, if this division continues, the users will lose. Do you want to be the proud owner of a brand new, high performance HD-DVD player? In the opinion of this author, the winning product strategy will go to the vendor(s) that offer either a dual-stack or reconfigurable product capable of operating in either a WirelessHART or ISA100.11a network.

You have received this Sample Report as a "Thank You" for joining the CMC Automation Advisory Service. This report prepared in April of 2008 is only out of date by virtue of it's date forecasts that missed the actual events by about a year. WirelessHART products began shipping in quantity in early 2009, not 2008 as stated. The ISA100.11a standard was approved in September 2009, not at the end of 2008 as predicted. Integration efforts between these standards has stalled, for the exact reasons contained in this report. Dual-boot/stack devices appear to be real and will likely ship by late 2009, as predicted by this report. Integration of the two separate standards will probably not occur, except in the IEC standards.

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