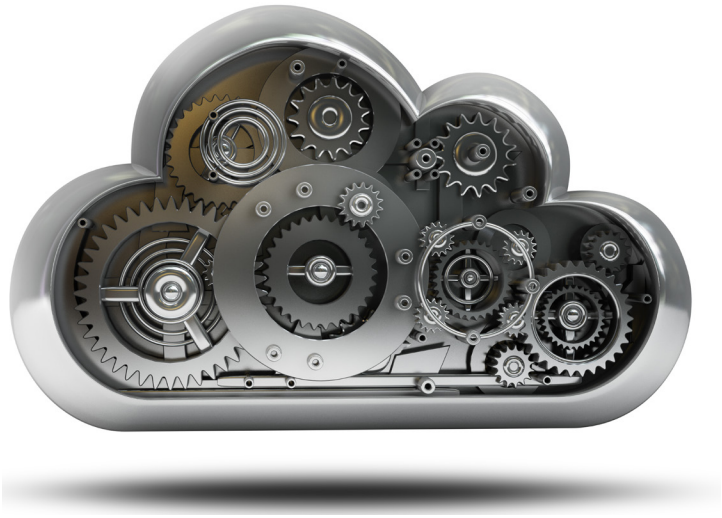
ECHELON

The Industrial Internet of Things is Really Control Networking 2.0

The Internet of Things (IoT) concept is the hottest Internet category today. Within the IoT, the largest segment in the near future will comprise "industrial" applications: everything from building automation, industrial automation, and lighting to commercial transportation, smart cards, test and measurement, and the energy grid.



Distinct from the human IoT—in which human users are integral to the interaction with the Internet—the industrial IoT (IIoT) requires industrial-strength reliability, hardened security, and both wired and wireless connectivity. And despite the "Internet" part of its name, the IIoT is not just about sending data to the cloud. Within the IIoT are autonomous communities of devices able to take action directly, without mediation through a centralized cloud infrastructure.

All of this raises an important question: Is the IIoT something fundamentally different from the control networking that's been evolving for the past 25 years or so, and which is familiar to anyone working with the LonWorks® control networking platform? The answer is no. The IIoT is really the next generation, or version 2.0, of traditional control networking.

Control Networking 2.0 differs from traditional control networking in two fundamental ways:

- Increasing use of IP in the field bus, with field devices rather than just gateways having IP addresses
- Decreasing use of gateways and a greater use of routers to connect networks

Why IP-All-the-Way to the End Point, with Less Static Gateways, is Inevitable

Today IP is in some end points in the field bus, but it's certainly not lurking in every device or controller out there. But in a few years IP will be driven into many more individual end points. At the same time, the static gateways used to connect distinct control networks with the IT network will give way to native IP connectivity all the way to the end device. In essence, gateways will be replaced by routers. There are three main reasons for these shifts:

1. **Big data queries require dynamic access to lots of small data.** Big data, and the analytics enabled by big data, is how the world will run in the future. But before you have big data, you have to have lots of small data. Big data insights are based on dynamic, often counterintuitive, analysis and unstructured database queries. It's impossible to know up front which data elements will be important, so there must be free and unfettered access to all conceivable devices and the small data they sense or produce.

Having a gateway as the static representation of a subset of the data that the control network can produce is an outdated notion, not conducive to the widespread aggregation of small data. Native IP devices are a better fit than static gateways for a big data analytics framework. Extending IP-all-the-way to end points means that more devices can contribute small data to inform the big data picture.

2. **In the future, IT organizations will be more involved in automation networks.** Soon, automation networks will cease to be the sole domain of facilities managers and controls administrators. IT organizations are going to become more involved in automation networks, and IP is familiar territory for IT. Most of IT's tools are built on the IP protocol, and IT has operational frameworks that allow them to manage assets based on IP addresses. This involvement of IT in automation networks will encourage greater use of IP in devices on the field bus.

3. **OEMs will need to add support for more links and protocols.** OEMs that have been working for many years exclusively with LonWorks systems can't compete on BACnet® opportunities, which is a shame. Similarly, OEMs with only wired products are unable to support customers that want wireless extensions.

The use of IP in the end device addresses both issues outlined above. IP can act as an integrating technology that allows both LonWorks and BACnet protocols to run on the same device on the field bus. Similarly, the use of IP allows an OEM to support a rich set of communications links, both wired and wireless. The key is to have an application development environment that can easily facilitate the creation of LonWorks and BACnet devices, with wired and wireless connectivity options.

The IIoT, or Control Networking 2.0, is a big and inevitable trend—and from an electronics perspective, it represents the single largest economic in the next 10 years. There might be some debate on when this transition to the IP world will happen, but it is inevitable. This is great news for LONMARK® members, as the markets our community addresses are poised for great growth.

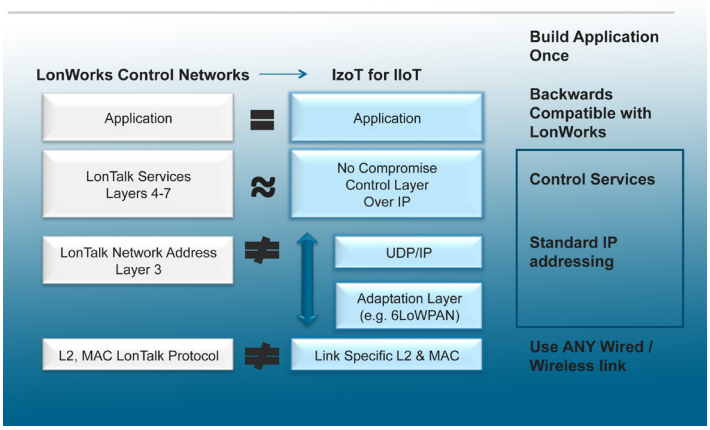
What is needed is an architecture that allows LONMARK members to take advantage of this opportunity. The architecture should be 100% backwards-compatible with LonWorks-based systems. But it should also be forward looking—using IP-based communications all-the-way to the end devices, enabling the same device to be brought to market either as a LonWorks or BACnet device, and providing for a much broader set of connectivity options. This, in essence, is Echelon's new IzoT™ platform for the IIoT.

The IzoT Platform: The Next Generation of LONWORKS

Echelon's IzoT platform for the IIoT allows control networking to be done using IP-all-the-way to the end device. The platform—to be delivered over time as software, chips, modules, and routers—can be thought of as the next generation of the LonWorks platform, or a "LON®-over-native-IP" approach.

As shown in Figure 1, we have developed the functionality of the LonTalk® Layers 4-6 (ISO 14908-1) on top of a UDP/IP stack, which allows all the familiar LonTalk services to be offered natively over IP. This software can run on any processor in an environment providing UDP/IP sockets connectivity and be used with any underlying supported communications link.

Figure 1



Additionally, Echelon will deliver a next generation of our popular Free Topology (FT) system on a chip. The IP-enabled FT 6000 chip has this software along with the IP layer already ported onto it, and it uses the FT channel for communications. Alternatively, a device maker can use the IP-enabled Neuron® 6000 and an RS-485 channel under-

neath that. This approach makes possible the scenario outlined in Figure 2: a peer-to-peer LonWorks community of devices that uses a variety of IP-based communications options, such as Ethernet, Wi-Fi, 15.4, FT, and RS-485.

Figure 2

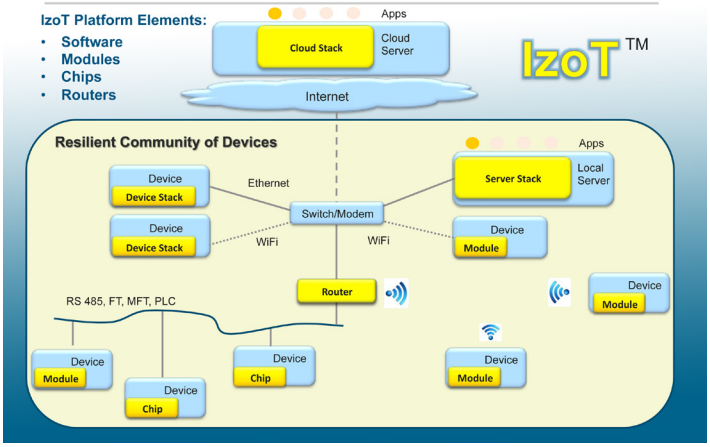
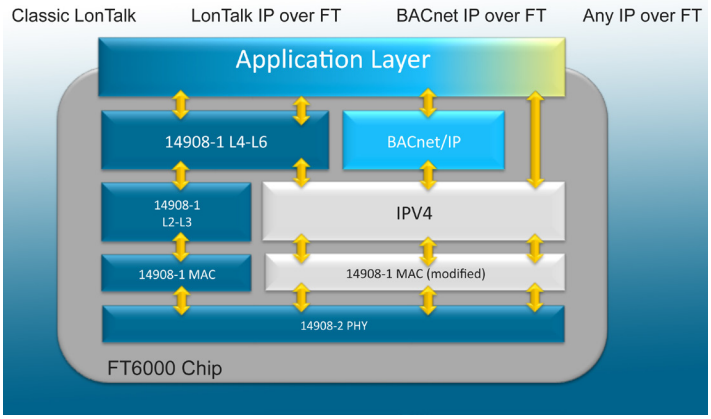


Figure 3 outlines how a device developed using the IP-enabled FT 6000 chip can act as both a LonWorks and a BACnet device with the same application. The application on top of the ISO 14908-1 L4-L6 services can present itself as a traditional LonWorks node (using LonTalk ISO 14908-1 L2-L3 addressing) or as a LON-over-IP node (using IP addressing instead of 14908-1 L2-L3 addressing). Additionally, the same application can present itself as a "BACnet-over-IP" node because of a unique BACnet mapping layer that is built into the FT 6000. The advantage is that BACnet/IP is available over the FT channel, which is far superior to the less-reliable RS-485 channel, as well as being lower cost and more flexible than using Ethernet for BACnet/IP.

Figure 3



In this way, it is possible for the same application to be delivered as a LonWorks or BACnet node, and over a range of communications options.

Of course, customers can continue to remain on today's LonWorks platform for as long as they want. Echelon's LonWorks commitment remains as strong as ever, and we will continue to supply traditional LonWorks technology.

LonWorks customers desiring the option to migrate to IP in the future can use IzoT products to either stay with the existing LonWorks protocol or migrate to LON-over-IP—or to other protocols over IP, including the BACnet/IP protocol.

The Future Begins Now

The IIoT is not some fanciful mirage. It's a trend that's happening now and growing fast, and it holds tremendous promise for the realm of control networking.

As an early proof of concept for our IzoT platform for the IIoT, Echelon is working with a few select LonWorks customers who are using alpha versions of the FT 6000 chip to build products that can simultaneously behave as a traditional LonWorks device, a LON-over-IP device, or a BACnet-over-IP device—all over the same FT channel. This proof of concept will be demonstrated at the AHR 2014 show in Echelon's booth and also at the Light & Building 2014 show in the LONMARK Germany booth.

By using IP as common ground among the various control networking protocols, and building on proven LonWorks concepts such as application profiles, the IzoT platform promises to help expand LONMARK International's appeal and enable developers of all stripes to find success in the expanding IIoT market.