

Control Systems Escape Traditional Boundaries

A “Lon” Day at the Office...
And at Home

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The following is a fictional depiction of real world applications that are currently possible and implemented using LonWorks® open and interoperable control technology. The various manufacturers identified by name may or may not be currently adopting LonWorks technology. They are used only to illustrate that we live, work, and interact in a multiple vendor world and that there now exists the potential to connect these systems to our lives in ways never before dreamed possible.

*Integration—to form, coordinate,
or blend into a functioning whole—Webster’s*

From my Steelcase desk high above Wall Street I glance down at my Casio watch and then out the office window. White snowflakes are drifting slowly down to the street below. It’s 7 PM, way past time to go home. “Looks cold out there,” I shiver to myself.

Fingering my Logitech mouse, I click the “good-night” icon on my Windows NT PC screen, grab my overcoat, and stroll out the door of the office. Soon after I leave, the Leviton occupancy sensor high on the wall above detects my absence and conveys a digital signal over the LonWorks® building control network to an array of Phillips dimmable fluorescent light fixtures perched above my cube. The lights fade away to a dusky minimum.

Simultaneously, the same little LonWorks message is delivered to the Honeywell air conditioning controller and the temperature begins to drop—set back to the night mode. The Schindler elevator controller residing on the network also picked up the little digital packet, alerted to my imminent departure, and dispatches an idle car to pick me up high on the 21st floor. As I stroll out the building an Alya card reader wired on the same control system passively scans the access card inside my shirt pocket, records the event, and messages the Schlumberger security system that I have left the building.

In the old days, to carry out this kind of building control you'd need five different proprietary control networks. And it would be difficult, if not impossible, to share information among them. Today, LonWorks technology allows multiple vendors to “plug & play” multiple devices on one common network. And all of those controllers and sensors can communicate seamlessly with each other without expensive black boxes or complicated programming.

Down on street level, I merge into the mass exodus of office workers making my way toward the New York City subway. Entering the MTA station, I swipe my new MetroCard through the turnstile reader and a dollar fifty is deducted from the card's magnetic strip. The security gate swings open, beckoning me to the departure platform, and snaps shut loudly behind as I exit.

Waiting for the Jersey train amongst a crowd of commuters, I scan my memory for the evening social plan, thinking to myself, “I have a strange feeling there's something I'm supposed to do tonight...”

Before I can pull out my 3Com Palm-III to refresh my memory, the train arrives. Electronically controlled regenerative brakes on six shiny new Bombardier R142 rapid transit cars glide the train silently to a halt in front of me. All 12 passenger doors slide open with a whoosh. Riders rush in jockeying for a scarce seat. I grab a ceiling ring and stand behind a little old lady precariously gripping her pile of packages just inside the door. The door tries to close but her hat box prevents it. She doesn't notice the predicament until the conductor appears quickly out of nowhere and extricates the blockage.

The R142 pulls away as silently as it arrived.

The Bombardier R142 represents the new generation of transit railcars that use LonWorks technology to carry out all of the train control and sensor information over a two-wire network. The older generation of trainline control used hundreds of dedicated wires to control and monitor train functions. The new LonWorks networks integrate train communications, propulsion, braking, passenger information, auxiliary power, monitoring, diagnostics, and redundancy on a common network. This, for example, makes it possible to report quickly exactly which door failed to close.

My mind returns to the subject of memory lapse. Reaching for my 3Com palm III, I suddenly recall the evening appointment in a panic. The chirping alarm affirms my fear as I open the cover and read in dread the reminder flashing on the display.

“Dinner, video, and hot tub with Nikki at my place, 8:00 PM.”

“How could I forget!” I chastised myself. “I’ve been after that girl for months.” My heart racing, I check the time: 7:33 PM—I’ll never make it! This commute is at least 40 minutes away! Taking a deep breath I search for solutions, “Maybe there’s a way I can be there virtually if not physically.”

I reach into my jacket and pull out my new Nokia WAP (Wireless Application Protocol) cell phone, select the number of my local Earthlink internet service provider, and push the send button. Within seconds I’m connected to my personal home network and a web page prompts me for a password. I punch the six-character access code and click on the enter button. I’m now home, at least virtually.

The little hand-held WAP phone has connected me to my integrated home network through an Echelon I.Lon 1000 LonWorks to IP (Internet Protocol) router installed on my home control network. The I.Lon device serves up web pages—combinations of graphics, icons, and text.

I scroll the mini web pages on the phone display browsing the status of the energy management, lighting, security system, life safety, HVAC, entertainment, hot tub, and even the motorized window blinds. The house is in the unoccupied mode. I tap on the hot tub icon and a pop-up window appears prompting me for the temperature setpoint, I enter ‘102’ into the box and click the ‘On’ button next to the filter pump symbol. In a few seconds I see the water temperature begin to rise. I know it’s running.

Now, to set the mood, I click on a violin icon and a list box appears with options for various environments. The choices include alarm, sleep, wake, work, vacation, clean, sports, day, night, party, and romance. I make the selection *du amour* and watch the blinds go down. The fire-place ignites, lights dim, and I can observe the entertainment system playing Sinatra's greatest hits.

From the security window I unlock the front door, disable the alarm system, and enter a greeting into the entrance display pane: "Hi, Nikki. Come in and make yourself comfortable." Click. "Now, let's cook some dinner," I mumble to myself. I select the letter symbol and enter the mail system.

My friend Mario runs a little Italian restaurant down the street and he's hooked up with the web. I whip off an e-mail to *venividivici@aol.com* and within a couple of minutes they mail back a reply confirming my order for a romantic Italian dinner for two—delivered within the hour. Glancing at the time, I see that it's almost 8:00; she'll be arriving any minute. I'll be there in 10. Breathing a sigh of relief, I settle back comfortably into the seat, envisioning the pleasures yet to come.

The LonWorks technology described in this fictional scenario exists, is commercially available, and has been implemented in over 10 million devices worldwide. The illustrations of building control systems, train controls, and home automation systems are examples of how truly open peer-to-peer networks can apply to an abundance of applications. And a tiny microprocessor called the Neuron® chip is the common hardware component that makes it possible.

The Neuron includes 3 powerful data processors inside one tiny silicon chip about the size of a postage stamp. Developed by Echelon Corporation of Palo Alto, California, the chip is now manufactured and distributed by Motorola and Toshiba, and soon, Cypress Semiconductor. The Neuron enables controllers and sensors to send and receive messages with each other while carrying on their own specific applications. And the communication protocol, known as LonTalk, can take place over a variety of media including twisted-pair wiring, existing power lines, radio signals, infrared, fiber optics, and data networks including ethernet and TCP/IP—also known as the internet. A Lon Works network operating system (LNS) allows for a variety of design and installation tools necessary for designing, installing, and maintaining open systems. The

traditional methods for delivering automation systems to the end user are changing as well.

A new breed of technicians, engineers, and contractors is rapidly entering the control industry. Part controls engineer, part electrician, and part information systems technician, they're known as Network Integrators (NIs). These integrators provide the direct link to the end user. It's the NI team that assembles the network components, engineers the design, installs and commissions the hardware devices, creates the user's interface, and supplies a complete solution to the customer. And the solution that customers are asking for is one that includes openness to multiple device manufacturers and interoperability among network devices—one network with multiple choices.

The LonMark® Interoperability Association is a global organization of device manufacturers, software developers, and network integrators who have adopted LonWorks technology as an open interoperable solution. Members include the big guns of the building control world. Honeywell, Johnson Controls, Siebe, CSI, Danfoss, Hubbell, Leviton, and Square-D are just a sampling of the more than 200 members. The primary purpose of LonMark is to define guidelines for device manufacturers, certify device interoperability, and promote LonWorks as the open protocol of choice. If the device sports the LonMark logo you can be confident of its ability to plug & play.

The display above the R142's door flashes that my stop is up ahead. As I reach down to deactivate my network connection I can see the mail icon is flashing on the WAP phone display indicating I have mail. It's from Nikki: "Have to work late, can't make it tonight, sorry...." Shaking my head, I navigate back to my home network page and click the mood select icon. From the pull down menu I choose... "The Blues."

ABOUT THE AUTHOR

Greg Powell has been a technical trainer for Echelon Corporation since early 1998. He currently conducts training courses related to LonWorks® network design and implementation in North America, UK, Europe, and Asia. Previously, he worked for 15 years as a mechanical/electrical contractor in Los Angeles, California, focusing on energy efficiency retrofits as well as traditional HVACR and electrical services.

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