



OVERVIEW HANDBOOK



LONMARK[®]
INTERNATIONAL

committed to energy efficiency through intelligent control



Overview of LONMARK International

Committed to Energy Efficiency through Intelligent Control

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Overview of LONMARK

An open, interoperable revolution is underway in the controls industry and one organization is taking the lead in helping companies deliver effective solutions: LONMARK International. Supported by a who's-who of controls companies, LONMARK International counts among its members not only the manufacturers fueling this revolution but also the end-users, equipment specifiers, and system integrators driving its implementation.

Since its inception in 1994, and new corporate structure in 2003, LONMARK International has become a major driving force in the establishment of interoperable guidelines and is committed to educating the market on the value of open, interoperable systems by providing tools, resources, and support for its members and their markets. LONMARK Affiliates span the globe with local presence in the Americas, APJ (Asia, Pacific, Japan), and EMEA (Europe, Middle East, Africa).

LONMARK International and its Affiliate Organizations have over 400 members worldwide. LONMARK membership is open to any manufacturer, distributor, engineer, system integrator, or end-user interested in the development, specification, and use of open, interoperable products utilizing ISO/IEC 14908-1 and related standards.

Products that have been verified to conform to the LONMARK interoperability guidelines are eligible to carry the LONMARK logo.

Vision Statement

“LONMARK is the recognized industry authority for certification, education, and promotion of interoperability standards for the benefit of manufacturers, integrators, and end users.”

– *LONMARK International Board of Directors, 2007*

LONMARK International's mission is to enable the easy integration of multi-vendor systems based on LONWORKS® networks. Today thousands of companies are using LONWORKS control networks to provide systems and solutions for building, home, industrial, telecommunications, transportation, and other industries. There are millions of LONWORKS technology-based devices installed worldwide. LONMARK provides an open forum for member companies to work together on educational and technical programs to promote the availability of open, interoperable control devices.

Who is LONMARK?

LONMARK International is a global non-profit membership organization created to promote and advance the business of efficient and effective integration of open, multi-vendor control systems utilizing ISO/IEC 14908-1 and related standards, technologies, and solutions.

Members of LONMARK International include the world's leading manufacturers, integrators and users of control systems in a variety of industries, including building automation, security, indoor and outdoor lighting, elevators/lifts, mass transit, semiconductor-manufacturing equipment, home/consumer appliances, sunblinds, energy metering, construction, commercial real estate, and industrial automation.

The LONMARK brand is one of the most recognized marks of excellence in the world. Today, our services extend to helping member companies achieve global acceptance, whether for open-system devices, programmable systems, or quality processes. Manufacturers' products certified by LONMARK International benefit by the organization's undisputed reputation as the leader in the promotion and advancement of open control systems.



What is the Value of LONMARK International?

Few organizations have such a dramatic impact on the development and acceptance of open, interoperable solutions than LONMARK International. For over a decade, the LONMARK organization has been creating and publishing guidelines supporting the independent development of products that can be seamlessly connected together.

Open standards start with the open solutions which provide choices. Good open specifications based upon LonMark guidelines and international standards are the key to fair competitive bidding at all levels of a system.

Background

LONMARK thrived as an international, unincorporated organization since 1994; originally named the LONMARK Interoperability Association. Over that time, LONMARK and its member companies created 80 functional profiles and certified over 750 interoperable products.



Thousands of LONMARK certified products are installed in commercial buildings, buses, mass transit systems, industrial plants, and other environments worldwide.

Demand for open, interoperable products is stronger than ever before. Yet, the market remains in its infancy and even more can be done to bolster awareness and demand for open systems. Competition, resistance to change, and a global recession have challenged the market potential.

LONMARK International, the California-registered, non-profit successor to the original, unincorporated Association, was

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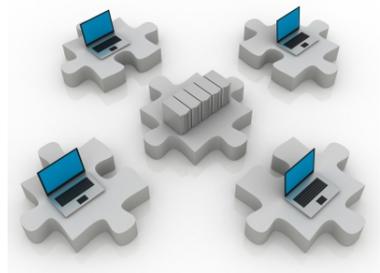
created in 2003 to embrace the changing needs of its members and compete more effectively in the global marketplace. The organization encourages regional LONMARK Affiliate organizations worldwide. Each Affiliate promotes open, interoperable systems to their local markets, addressing unique geographic, demographic, cultural, and language requirements. This strategy allows LONMARK International to create value-added products and services to help each Affiliate develop programs for their local markets.

What is LonWORKS or LON?

Often referred to simply as LON (Local Operating Network), the LONWORKS networking platform is a powerful, pervasive solution for today's advanced control networking systems. It's the foundation for an open, interoperable system in which products and solutions from the world's leading companies are brought together in a simple, straightforward implementation that integrates many system components into one complete solution.

The basic premise is to facilitate the need to integrate multiple system components using a common system architecture and infrastructure - in essence, one set of wires through which all components are attached and can share common information. Data can travel from any device on the network to any other device with no single point of failure, embedding high-level security and allowing full component interoperability in a peer-to-peer fashion. Each device adheres to an agreed upon set of rules for interoperability. LonMark ensures that each tested device conforms to the guidelines and providing the assurance that devices work together.

What does this mean to the market? The platform provides a fully open, interoperable system of components from multiple sources - with no system lock-in. No single component will force owners into a proprietary, single-vendor solution; thus providing end-users with multiple products, integrators, user interfaces, and choices for service contracts. With a well-structured system, all of the proprietary hooks are removed, leaving nothing but a wide variety of options.



Part of national, regional, and industry-specific standards around the world - including ANSI/CEA, EN, IEEE, AAR, SEMI, SAC, and others - the LONWORKS platform is now also a set of international ISO/IEC standards for commercial building automation, controls and building management; and the standards continue to be enhanced to include new and useful functionality while remaining compatible with current installations..

To date, more than 350,000 LONWORKS systems and over 100 million LONWORKS devices have been installed worldwide. LONWORKS systems have saved companies tens of millions of dollars in energy costs, installation time and money, and lower long-term service costs through competitive bidding. Case studies have shown that a LONWORKS system can save

as much as 50% on the initial installation costs of a traditional home-run wired system, while integrating systems and reducing system complexity can provide additional savings through energy reduction. A single-system interface is smarter, more cost-effective, and easier to maintain than multiple, non-integrated systems - and that's one of the reasons why organizations large and small are choosing LONWORKS open systems over closed proprietary, non-integrated systems.

Technical Overview

From the beginning, LonMark branding has been about differentiating products built in the spirit of interoperability from others: about separating the wheat from the chaff. In this vein, defining new rules and a structure for interoperation allowed for competing manufacturers to sit down at a neutral table and design for the betterment of their industry. Though a monumental task, it was fueled by the desire to grow the market from a level playing field—irrespective of company size and market dominance.

“LonMark Task Groups” were formed to allow experts to focus on the vertical markets for which they could contribute the most: building automation, lighting, security, homes, transportation; right down to specific applications like sunblind control. It was the goal of the groups to accomplish interoperability by profiling the interfaces to a device's functions at the exchange level—leaving the definition of algorithms and processes to each manufacturer. The result: “functional profiles” that allow for modular implementation with the assurance of being able to connect data points in a logical, meaningful way regardless of manufacturer.

How was it done?

By defining the “dictionary and encyclopedia of control networking.” For example, the technical components of LonMark communications can be compared to a human language like English; where without context, a person may have difficulty conveying their thoughts to another person:

English

Letters/Sounds	=	a, b, c
Words	=	dog, cat, bonnet
Dictionary	=	bonnet: engine hood of automobile
Sentences	=	“Lift the bonnet.”
Context	=	“...to put oil in the engine” – Manual for Car Repairs

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Bits/Bytes	=	0xFF, 1111 1111, 256
Basic Types	=	char, unsigned long
SNVTs/SCPTs	=	SNVT_temp_p: temperature by 1/100° Celsius
NVs/CPs	=	“nvoTemp”
Profiles	=	“...present temperature of the room” –Thermostat Functional Profile

Just as a bonnet is the term for an automobile hood, it can also be a metal cover for a fireplace, a hat for a baby, or a cap for a man. Without a common, singularly defined dictionary, there is no common definition. Likewise with temperature data, it must be defined in a common resolution and units—like Celsius to 100th of a degree, for commercial and residential heating systems.

Is that enough?

Not really. In a thermostat, there are several points of temperature data. To know which is which, sentences must be given context, and data points must be given templates that define their context: functional profiles—the little encyclopedias of a device’s interoperable interface. Certification to the LonMark Interoperability Guidelines ensures use of LonMark functional profiles in the development of interoperable devices. This has been the cornerstone of LonMark for more than a decade.

What’s next?

Our technical reach doesn’t stop at Certification of devices: We have taken things an extra step and have begun qualifying System Integrators. We believe this expanded direction will give building owners and specifiers more confidence in the concept of “open” control-systems maintenance and the longevity of their investments—again, separating the wheat. We hope you now have a little better understanding of our role in the industries that interest you, we welcome you to browse our Technical Resources section to experience where we have been and where we are going, and we invite you to come along for the ride.

Additional Resources

For additional information on the technology we highly recommend: “The LonWorks Installation Handbook” available from LonMark International. This well written guide to the

technology provides significant detail on the core technology, interoperability, and installation concepts. Please contact LonMark for information on purchasing this textbook.

Why Open?

The term “open systems” means different things to different people. To some, it simply means you can share information between closed or proprietary subsystems. This approach, however, offers no cost savings and often leads to more expensive proprietary gateway solutions. Building owners and system installers must be wary of vendor claims of having more than one system “talk” at a high level to another, which is simply another way for system vendors to maintain their lock on their components. This is neither open nor interoperable. It’s misleading and, in the long run, expensive.

LONWORKS solutions obviate the need for costly gateways. Standards exist for system-to-system communication and for interfaces to subcomponents. One of the most powerful aspects of a local operating network is that any device can share data with any other device, and that user interfaces are treated the same as any system controller - they’re neither masters nor slaves, just devices on the network.

Sound familiar? It’s the same way the Internet works. Any computer can request information from any server anywhere in the world without restrictions as from whom or where the information is coming. Computers from any standards-abiding company can be added to the network without restriction. LONWORKS operates the same way and follows many of the same rules as the Internet, but it’s designed for the more-real-time, demanding needs of control networks. It also simplifies the management and significantly reduces the cost to implement control devices. Manufacturers have the flexibility and freedom to implement both simple and complex devices without having to spend millions on development. Very low-cost solutions exist in chip-level form. For more demanding, higher-volume applications, manufacturers can add LONWORKS to their devices by using their own implementation of the standard.

More than 4,000 products are available for the LONWORKS market. LONWORKS product manufacturers often sell their products through both closed channels and worldwide distribution. Anyone can buy open LON products - without high-priced, long-term contracts. Many other solutions don’t support an open distribution model.

What does this mean for an owner? If your service contract expires and you need spare parts, you don’t have to pay the high prices that some vendors charge for their products (unless you re-sign with their service department for a non-competitively bid and costly annual service contract; see Vendor Lock-In). Simply buy your product from any of the LONWORKS distribution companies - and pay a competitive price.

Many owners find that LONWORKS technology offers their staffs more flexibility and options when it comes to adds, moves, and changes. Staff members often become proficient in LONWORKS so they can take on simple projects internally. Good system specifications always require that the installer train the owner on the system and the tools, as well as provide all the tools and software needed for basic system enhancements. This does not reduce the need for qualified system integrators. On the contrary, it encourages good partnerships and smart decisions based on options.

Who Uses LONWORKS?

Perhaps the better question is: who doesn't? Owners who don't use LONWORKS are unaware of the vast pitfalls of closed, proprietary systems or those seemingly "open protocol" systems that some system vendors offer.

There's a growing need for information and training regarding the pitfalls and benefits in selecting a path. Building owners and system installers need to be sure they're selecting the right long-term solution by asking the hard questions:

- Will my system be open to competitive bids after the initial installation?
- Can I install a system with multiple user interfaces from multiple suppliers?
- Is there built-in security at the low-level network-infrastructure level?
- Can I maintain my system by myself?
- Will I receive all the tools and training I need to fully maintain my system?
- Can I choose multiple bidders for my subsystems and have their products all integrated into one enterprise system?
- Is my system designed for only a small portion of my integration needs, or can it work with all of the components?
- Can I select products from multiple vendors and distributors and not be locked into a single vendor or source?
- Will all of the products that I select be guaranteed to work on the same network infrastructure?

A "no" answer to any of these questions, is cause to be wary. An open system is not just an open protocol; it must take into account all the aspects of the system, from the lowest-level devices to the highest-level enterprise integration. LONWORKS was designed, and is being implemented, to these exacting standards; fulfilling the needs of many different industries and markets. From buildings to utilities, homes to trains, semiconductor equipment to concert halls, LONWORKS is the most widely used and accepted solution available.



LONMARK = Open Systems

Saving time and money are two key benefits of an open, interoperable control system. Specifying an open system with good planning and coordination up front saves time and money later during system design and commissioning. Good consulting engineers consider the entire system, not just an individual subsystem, when writing specifications.

Defining a common system architecture using standard, open methods is more appropriate than specifying the “buffet” style that allows anything to be used. When defining an open specification, we need to remember that it is more than just the protocol that needs to be specified. There are five elements that need to be defined:

- The network infrastructure;
- The system’s control devices;
- The network management and diagnostic tools;
- The user interface; and
- The enterprise/IT-level interface.

The network infrastructure includes the protocol, routers, media type, IT connectivity, etc. The control devices are the workhorses that produce, consume or manipulate data, and control/monitor the system. The network management tools configure, commission, and maintain the system.

User interfaces (human-to-machine interfaces, or HMIs) are typically the visualization tools that the user or controls manager uses to obtain a view into the system, including both PC software and instrumentation panels.

The enterprise/IT-level interface is the method for connecting the control network into the data network. We call it the LON-LAN-WAN architecture and it is defined in the specifications using standard Open Systems methodologies. No gateways but using standard routers and IT-based data exchange mechanisms instead.

Along with these elements, system specifiers must design each subsystem and define the system functionality and requirements for how each subsystem will share information with another.

For example: consider an occupancy sensor, which determines if someone is in a particular space, such as a building, train, or parking lot. The sensor does not determine what happens when presence is detected; it merely provides the “occupancy detected” data.

Traditional systems may connect the occupancy sensor to the lighting system: Someone enters the space, and the lights turn on. But that information is vitally useful to many other systems. For example, a heating, ventilating, and air-conditioning (HVAC) system can use the information to provide more conditioned air into an occupied space rather than an unoccupied space. A security system can use the “occupancy detected” information to determine if there is presence in a secured area. An elevator system can use it to determine if a car needs to be sent to a floor as a person enters a defined space - even before the person pushes the elevator-call button. In a parking lot, occupancy sensor information can be used to brighten lights but it can also alert security personnel that someone is in an area after hours.

These are just a few examples where one piece of information can be useful to different subsystems. But far too often, these simple, cross-system data connections are overlooked when the system is designed. Why? Until recently, specifiers have tended to focus on subsystem design only, not considering the value of integration. Open, interoperable systems now enable more complete system integration with very little extra design effort. The process is relatively straightforward: Start by designing each subsystem, then design the cross-system functionality, and then design the user interface for monitoring, reporting, alarming, scheduling, and data logging.

Unified System Architecture

Having a specification that allows for any system option and protocol, will ensure a more complex system - one that will be more cumbersome to install, commission, and maintain. It can be compared to allowing PCs, Macs, UNIX, and Linux computers for all employees and also allowing Ethernet, ARCNET, and Token Ring as network communications media, and then insist that the IT department maintain and service all of these. The workload becomes unbearable; which is typically why IT departments pick one platform and stick with it.

Likewise, it is typically recommended to pick one common protocol for the entire infrastructure and stick with it. The costs go down and the maintainability goes up. If there is a specific application or sub-system component that is not available on this standard protocol or if there is a specific need for using an alternate, that should be justified and a gateway (protocol translator) identified and specified. Tying in legacy equipment is a good use of gateways, however, this should be the exception, not the norm.

Given this summary, it is strongly suggested to limit the main specification to just one methodology for communication. This is assuming there is a desire to reduce costs, improve flexibility and choices of products, provide the option for multiple system integrators, and to allow for competitive bidding on both the initial installation and the long-term service contract. This is even more critical for larger, multi-phase projects where separate installations need to interface to the same enterprise system. Developing a strong cohesive master plan is a catalyst for long term success.

Vendor Lock-In

An open system's value is based upon its ability:

- to be created from a variety of products from a variety of vendors;
- to be installed by multiple integrators;
- to be maintained by competitive service providers; and
- to take advantage of the highest level of system integration.

Many people think interoperability pertains only to the installed devices; however, there's more to an open system than its devices. Open encompasses many layers of the system. The physical elements of an open system include the five elements, mentioned on earlier.

A bad "open system" forces users to install products from a single source. If they later want to change vendors, they'll need to replace some or all of the system with a new, competitive system. This adds significant cost to the facility and often reduces its efficiency and maintainability, thanks to the high cost of locked-in service contracts and the reluctance to replace older, proprietary systems.

How can each of these system elements be closed or locked in? If a vendor puts a barrier between something they offer and the ability of a competitor to interface to their offering, the system becomes locked-in or proprietary. An open system can be closed by any one of these offerings:

Devices

System devices such as controllers, sensors, and actuators should be able to interoperate and to be replaced by competitive products. If a product has a unique functionality, it should not force users to install another component that's not competitively available. Some vendors require their devices to be installed along with their proprietary gateway or user interface; this locks in the system.



Infrastructure

Typical systems are based on networked devices that use a common protocol and common media type (such as twisted pair wire, power line, fiber optic cable, or radio frequency). To ensure an open system, each networked device should be able to be installed on a common, specified media; and the protocol running on the devices should be fixed and standardized for the system. The infrastructure also includes the routers, network interfaces to computers, and bridges to other networks, like Ethernet. All of these should be specified based upon open standards - not based upon one vendor's specific product. Without careful specifying, any one of these can lock a system in to a single vendor.

Tools

Networks are installed, configured, and commissioned using software tools that typically run on a computer. Some vendors use these tools - some complex, others relatively simple - to configure their devices. If the tools used on the system cannot co-exist with anyone else's tool, they're likely locking-in the user to some degree. Device-configuration plug-ins were developed to solve this problem. These software-based configuration modules can be used by any standard network management tool that follows the LONMARK Interoperability Guidelines. This lets integrators configure vendors' devices with an open tool, instead of forcing integrators to use only that vendor's tool on the entire network.

User Interfaces

Computer-based user interfaces come in a variety of categories: Web/IT-based tools (HTML,XML, SOAP), PC based interfaces (OPC, DDE, SMNP), and custom user interfaces. Web/IT-based tools have become increasingly popular because they leverage the same level of openness that the Internet provides: Users launch a web browser from any computer and, with password access, can interface with the system. User interfaces allow for control, monitoring, reporting, alarming, scheduling, and diagnostics. In some cases, vendors try to sell the extensive features of their user interface but allow only *their* user interface on the control network - thereby locking in the system. A good open system will let multiple tools from multiple manufacturers co-exist simultaneously on the same networked control system. Well written specifications will help to ensure this.

Enterprise Connectivity

Connecting a control system to an IT network provides visibility via a much wider audience. The LON-LAN-WAN concept ensures that the control system becomes an element of all of the data sources available to the enterprise. IT professionals are quickly learning that the control system offers access to information that managers need. To provide this connectivity, enterprise-level infrastructure devices are needed; and they must be specified as open. Open interfaces have been developed to ensure that data communications between the LON and LAN are accessible by any vendor. The LONMARK IP-852 standard was developed for this reason. By specifying IP-852 for LON-LAN routing, any user interface can access any device anywhere on the network - without custom gateways or drivers and without needing to be physically at the facility. Additionally, other options have emerged to allow IT back-office computers to access information from the network and more are in development.

To ensure an open system, be sure to specify that all five system elements are open. We highly recommend that each element is interoperable, and that training and servicing are also specified as open. This will help create as open a system as possible, yielding the best return on investment and the lowest lifecycle costs.

Value of Integration

Control systems are more than a collection of subsystems that interact to sense, monitor, or control. Integrating various subsystem components reduces energy demands, increases responsiveness, and reduces overall system costs. It also reduces system complexity.

Having a single user interface to many different subsystems reduces staff training requirements and removes the need to monitor different interfaces, leading to greater efficiency. Single-seat monitoring, control, alarming, reporting, and scheduling are part of the established baseline requirements for improving system efficiency.

With recent developments in the IT world and reduced system costs, new standards are emerging that directly affect the controls market. Standard web browsing technology are a common part of today's control system architecture.

Imagine interfacing with your control system through a web browser from any computer attached to your system, or even remotely through a secure connection. You can perform simple monitoring or complex alarm-handling functions, request maintenance work, generate reports, or receive real-time data - all from a common user interface. Additional integration with PDAs and cell phones can provide even greater flexibility and connectivity. Security concerns are being addressed by a myriad of IT based solutions that LonWorks can fully utilize due to its seamless connectivity. Data integrity remains consistent from the LON to the LAN to the WAN.

Integration makes all this possible, and at its foundation is device level, peer-to-peer communication. LONWORKS enables open system integration.

Master Systems Integrator

In today's environment, standalone, single-source, locked-in system designs are out and the multi-vendor, fully integrated, fair-bid contracts of open systems are in. When facilities managers investigate options for new projects, the most sought-after benefits are:

- Open procurement
- Flexibility
- Future-proofing
- Sustainable design

More consulting engineers are embracing this concept due to the demands of the procurement offices. Each step - from the initial engineering effort, to the initial system contract, to the service contract - needs to be



open bid. Multiple bidders are needed to keep costs in line.

Several key factors are involved in orchestrating successful multi-phase, multi-building, multi-bid campus projects. To achieve these benefits, a master plan must be identified, including the short-term and long-term design criteria and the procurement methods. The current method of contracting building projects must be adapted to the campus master plan.

Enter the **Master Systems Integrator (MSI)**. This consultant sets up best practices, advises on the campus master plan, and makes sure specifications are installed and enforced so the desired benefits are achieved. Like the IT consultant who designs the campus data network, backbone, and systems, the MSI focuses on the control systems, graphical user interfaces (GUIs), and common databases for the subsystems, communications protocols, and system architectures for all new projects. The MSI often consults directly with the campus IT group on issues such as security, scalability, and energy management to make sure the objectives for all new building systems are met.

In the building automation world, we must design a common architecture and infrastructure for the various subsystems and follow the IT model as much as possible. This requires a coordinated effort, with campus standards developed and delivered to each design engineer. The MSI works directly with the owner making sure open systems, open procurement, and fair and competitive bidding practices are used. The MSI can also be responsible for the design and implementation of the system GUI, ensuring a common look and feel for the various buildings and systems. Web browser technology makes this possible; preventing a system from being locked in to a single vendor's user interface.

Standard databases of devices, interfaces, routers, and controllers can be designed and can include naming conventions, alarming standards, scheduling methods, and trend analyses. Once someone has created a common backbone for the subsystems to communicate over, and a standard set of design criteria to follow, it's easy to achieve the full campus integration objectives.

Start with a good master plan, develop the best practices and objectives for both short-term and long-term integration, and then develop the specification standards around this plan. When hiring a consulting engineer, make sure he or she understands the objectives and knows how to design the controls strategy to meet the plan. Use the services of a good master system integrator to help coordinate full campus integration.

Global Presence

Globalization is a common theme among large institutions and organizations. Finding common technology and solutions that can be implemented anywhere on the planet without re-engineering, is a significant advantage over regionally based solutions.



LONMARK International is answering this call with an expanding global presence. Over the past several years, LONMARK International has established Affiliate organizations in countries around the world. These organizations are providing local and regional solutions based on the LONMARK standards.

Significant effort is being undertaken to ensure the protocol is implemented uniformly - no matter which country. The various components of an open controls solution follow internationally recognized guidelines and are not “open to interpretation”. LONMARK tests each certified product to verify conformance. This ensures product vendors can build a product and it can be used anyplace on the planet; which significantly reduces engineering time and costs as also provides a global market for interoperable products.

Additionally, LONMARK’s training, testing, and educational programs follow a global model. Material has and will continue to be translated into local languages. Local language support is paramount to global acceptance. The LONMARK Magazine now delivers editions in English, German, Russian, Japanese, Swiss, Italian, and Chinese, with more to come. The LONMARK website is being upgraded to support browser language identification, where pages will be displayed based upon the desired languages set in a visitor’s web browser software. LONMARK testing programs are currently available in English and German; and soon in Russian and Spanish.

The global support of LONMARK continues to expand. Current active Affiliates and users groups include:

- Americas
- China
- Denmark
- Finland
- France
- Germany
- Italy
- Japan
- Netherlands
- Poland
- Russia
- Spain
- Sweden
- Switzerland
- UK

Affiliate organizations support the local markets with educational programs, technical and marketing support, solution development, local trade shows and conference support, press

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support, addressing of local regulatory issues, and much more. A complete listing of Affiliates and a link to their websites can be found at www.lonmark.org.

LONMARK's 400+ members provide a wide variety of control-system hardware, software, and integration solutions for practically any application and can help with:

- Enterprise system integration
- Master System Integration expertise
- Master-planning strategies
- Specification development
- Fair, competitive bidding support

LONMARK is helping the green/eco-friendly movement achieve the energy efficiency requirements of today and tomorrow. Looking for guidance in taking advantage of open, interoperable, integrated systems? We can help. LONMARK International offers the following resources and services:

- Complete listing of certified, interoperable products
- Training programs for organizations looking to implement a strong, energy efficiency program through intelligent control
- Educational seminars for conferences, trade events, or corporate teams
- Sample specifications for open-systems projects
- Guidance in developing a solid, energy-control master plan
- Support in securing multiple, competitive bidders for your projects
- Technical support for LONMARK product certification
- LONMARK Certified Professional Credentialing program and directory of qualified professionals
- Extensive database of case studies and reference projects

As a non-profit trade and standards development association dedicated to helping organizations change the way they think about energy control, LONMARK is eager to help. Our worldwide team of Affiliates and support staff are at your disposal.

Frequently Asked Questions

If you have a general question related to LONMARK that is not addressed in this document, send your question to info@lonmark.org.

How do members benefit from LONMARK International?

Membership is extended to any person, firm or corporation engaged in the development, distribution, or marketing of open, multi-vendor control systems utilizing ISO/IEC 14908-1 and related standards and technologies. Member categories include Sponsors, Partners, Associates, Affiliates, and Individuals. Benefits at various levels include:

- Board representation

- Company listing and profile on LONMARK website
- Use of LONMARK logo
- Access to license the web-based in-lab certification tool
- Technical support concerning interoperability
- Web access to marketing materials, promotions, specifications, success stories, and sales tools
- Participation in press articles and interviews
- Co-marketing opportunities through exhibitions, case studies, seminars, and conferences
- And much more... (for a full list of benefits see: www.lonmark.org/membership)

How is LONMARK International different from other organizations?

The landscape of open-system trade associations is scattered and fractional. The organizations that exist today are industry-specific and geographically limited. LONMARK International is the only independent organization that addresses the global market for open control systems consisting of devices, connectivity products, tools, and management interfaces. The dynamic nature of LONMARK profiles, the object-based standard for device connectivity, provides an industry-independent architecture for connecting products from multiple manufacturers. Devices, subsystems, and systems containing LONMARK certified products can be linked together to create completely open solutions using an impressive collection of tools from multiple vendors.

The key differences of LONMARK International include:

- Promotion of a single, industry-leading platform for open systems
- Support for system-level solutions
- Global penetration through regional LONMARK Affiliates
- Cross-functional System Integrator training and certification programs
- Providing web-based in-lab certification tools

What does LONMARK International do to drive Interoperability and Open Systems?

LONMARK International develops and maintains technical design guidelines to help manufacturers build interoperable products based upon ISO/IEC 14908-1 and related standards, offering a complete, open, off-the-shelf networking technology platform for designing and implementing interoperable control networks.

LONMARK International is also working to certify whole systems, simplifying the definition of open systems by combining guidelines that detail the various tools and functionality that comprise the system. Incorporating standard interfaces for machine-to-machine communications extends the footprint of an open LONMARK system providing added benefits to end-users in the form of open procurement (bidding) and vendor independence.

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LONMARK International “functional profiles” provide guidelines to precisely layout the network interface for a particular control or system function. Functional profiles ease the specification process and enhance interoperability and open systems without compromising the ability of specifiers to call for unique capabilities, nor compromising the ability of manufacturers to differentiate products. Profiles are developed through a rigorous analysis and approval process that includes a cross-functional review to ensure that profiles not only interoperate within an individual subsystem, but also provide interoperability with other subsystems. For example, the Fire profiles incorporate an Alarm network variable that is an essential characteristic of a fire system but is also available for use anywhere else in the building; for coordination of elevator control, ventilation-damper control, and exit lighting.

What is a Control Network?

A control network is a group of devices that are networked together to sense, monitor, communicate, and control. In some ways, a control network resembles a data network (such as a LAN). Whereas, data networks consist of computers networked together, control networks consist of sensors, actuators, and controllers networked together. Similar to data networks, control networks consist of devices attached to various communications media, connected by routers that communicate to one another using a common protocol. Network management software allows administrators to configure and maintain their networks. In control networks, the components are optimized for the cost, performance, size, and response characteristics of control applications, which enables these networks to extend into a class of applications that data networking technology cannot reach.

Control networks can range in sophistication from small networks embedded in machines to large networks with thousands of nodes controlling fusion lasers, paper manufacturing machines, building automation systems, semiconductor tools, and diffusion furnaces. Buildings, trains, airplanes, factories, and hundreds of other entities and processes can use control networks.

Before the advent of control networks, most control systems required thousands of feet - even miles - of expensive wiring to connect unintelligent components to a custom-programmed central controller; commonly referred to as “home-run wiring”. Expansion required costly rewiring and custom programming. These systems were vulnerable to failure of the central controllers- a single point of failure.

Intelligent control networks have changed all this. By distributing processing among all of the control devices and networking them, the central point of failure is eliminated. By allowing free flow of information between devices in a peer-to-peer fashion, control is improved and new applications are enabled. Additionally, plugging in new devices can expand control networks without new programming of a central controller or expensive rewiring.

Why a Control Network?

In contrast with traditional networks, intelligent device manufacturers and integrators provide a single, cohesive, interoperable control system that does not depend on one proprietary vendor or require costly customization.

Why is Interoperability so important to control networks?

With interoperable control devices, end-users and network integrators can purchase devices “off-the-shelf” from different manufacturers. Plugging in new interoperable devices, which work together regardless of manufacturer, can seamlessly expand control networks.

What is an Open System?

Open Systems use industry-standard network services for design, installation, and commissioning of devices. An Open System does not include proprietary, vertical sub-system implementations and does not require gateways; although gateways may be used to connect legacy systems. And finally, an Open System contains interoperable, interchangeable devices from multiple manufacturers. A control network designed to be “open” according to this definition is flexible, simple, cost-effective, and competitive.

What are the benefits of LONMARK certification?

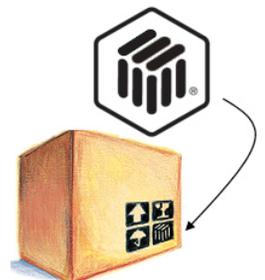
Demand for open, LONMARK certified products is growing rapidly. Products that have been verified to conform to LONMARK interoperability guidelines are eligible to carry the LONMARK logo. Displaying the LONMARK logo on a product is an indicator that it has completed the LONMARK certification tests and has been designed to interoperate with other LONMARK certified products.

The LONMARK Certification Tool (LCT) is a web-based tool designed to speed the time and reduce the cost of certifying devices. The LCT is now available for licensing to all LONMARK Sponsor and Partner members that manufacture devices. The tool provides members with a user-friendly interface that guides them through the certification process using an intuitive checklist. In addition to testing the usual device-interface files and device resource files associated with certification, the tool supports physical testing of a device as well.

Licensed users of the tool can conduct the entire certification process online, and a web-based payment system is on its way to allow certification-testing payments to be made online. The tool supports localization and is available in multiple languages to better support member needs around the world.

What does it mean, if a product is certified by LONMARK International?

Products that have been verified to conform to LONMARK Interoperability Guidelines are eligible to carry the LONMARK logo. The LONMARK logo is an indicator that a product has completed the LONMARK conformance tests and has been designed to interoperate across a LONWORKS network.



What does it mean, if a system is certified by LONMARK International?

Working together, LONMARK members have driven the development of a new “Open System Definition” that divides the systems description into five categories: System Behaviors, Devices, Connectivity, Device Interfaces, and Network Software and Tools. Also addressed in the definition is the technique for communicating via the Internet. This allows

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data to be reviewed in a standard fashion using web services, such as SOAP and XML. Systems that meet the criteria as defined in this documentation are considered to be LONMARK Open Systems.

What are the primary markets for products and systems using LONMARK certified products?

- **Building Control**

The LONMARK brand is recognized worldwide as an ISO/IEC international standard, and the protocol is in use in buildings around the world. Regional and national standards bodies have adopted and standardized LonWorks for usage in the US (ANSI/CEA), Europe (EN,CECED), and China (GB/Z) standard for building control networks in all facets of the controls industry: access control, elevators, energy management, fire/life/safety, HVAC, lighting, metering, security, home automation; just to name a few.

- **Industrial Control**

LONWORKS networks are recognized as the market leader in industrial sensors and device bus/networks, according to independent research performed by Automation Research Corporation (ARC) and Venture Development Corporation (VDC).

Open systems based on ISO/IEC 14908-1 replace complex wiring harnesses and eliminate expensive programmable logic controllers (PLCs) and PCs, distributing control throughout a network and reducing system life-cycle costs. They serve as the brains in semiconductor fabrication plants, gas compressor stations, gasoline tank farms, oil and water pumping stations, textile dyeing machinery, pulp and paper processing equipment, automated conveyor systems, and many other applications.

Additionally industries such as the Semiconductor market have specified LonWorks as the equipment to equipment control standard through SEMI. Other vertical industry markets are working with LonMark to enhance their interoperable offerings as well.

- **Transportation**

The Institute of Electrical and Electronics Engineers (IEEE) adopted IEEE-1473-L in 1999, achieving the organization's goal of allowing intra-car and inter-car communications between products from different manufacturers in passenger rail vehicles. Based upon ISO/IEC 14908-1, IEEE-1473-L is widely mandated and deployed in rail vehicles throughout the United States including trains and sub-systems for public transit, commuter rail, railroads, and passenger rail applications. It's also in use today for train braking, positive train control, signage, fault monitoring, propulsion control, lighting, HVAC, safety, and indicator lights. Furthermore, it is used in avionics control and monitoring, airport runway lighting, and remote device control.

- **Home & Utility Automation**

The home automation market is a growing arena for control networks. As a result of industry deregulation, many utilities are giving businesses and homeowners the opportunity to use automation as a method of managing energy more efficiently. From the utility perspective, automation is viewed as value-added services, which helps pay for expenditures associated with demand-side management, automatic meter reading, demand-response programs, and improved energy delivery methods.

In addition to energy savings, the home automation market has embraced interoperable control networks for their ability to provide a wide array of control functions. These functions include security, remote monitoring, and white-goods/appliance management. These functions take the automated home from simply a novelty to an efficient, enjoyable, and manageable system.

What are the LONMARK International Task Groups?

The main driving force behind adopting guidelines is input from the LONMARK members through task groups. The association's Task Groups provide the forum for LONMARK members to develop the functional profiles that define the scope of products and systems.

A cross-functional review team of Task Group Leaders addresses issues that overlap individual task groups. The goal of the cross-functional team is to harmonize design approaches in the varied task groups to avoid duplication of effort and to make functional profiles as widely applicable as possible.

Task groups meet periodically and exchange proposals and comments via the LONMARK International website. Members can subscribe to e-mail lists for each task group and receive immediate notification of new documents and opportunities pertinent to a particular group.

How can I join LonMark?

Membership is open to anyone. A simple membership application can be downloaded from the LonMark website at: <http://www.lonmark.org/membership/application>. As a non-profit organization our primary source of revenue is from membership dues. These dues are used to develop valuable programs for our members and for the market in general. End users, engineers, integrators, and manufacturers are the primary makeup of our supporters, each of which gains significant value from open standards.

If you have questions or would like to discuss membership for your organization, please contact us at info@lonmark.org.

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