



LONWORKS[®]: Defining and Specifying Open Systems

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Open Systems Defined

- Open building systems are created using the products and systems from multiple vendors that in the end offer greater flexibility, easier management, higher levels of scalability, and lower life cycle costs.
- Open Systems should deliver
 - Greater choices in vendors and suppliers
 - Increased business opportunities
 - New revenue opportunities
 - Happier building owners and tenants
 - Cost savings

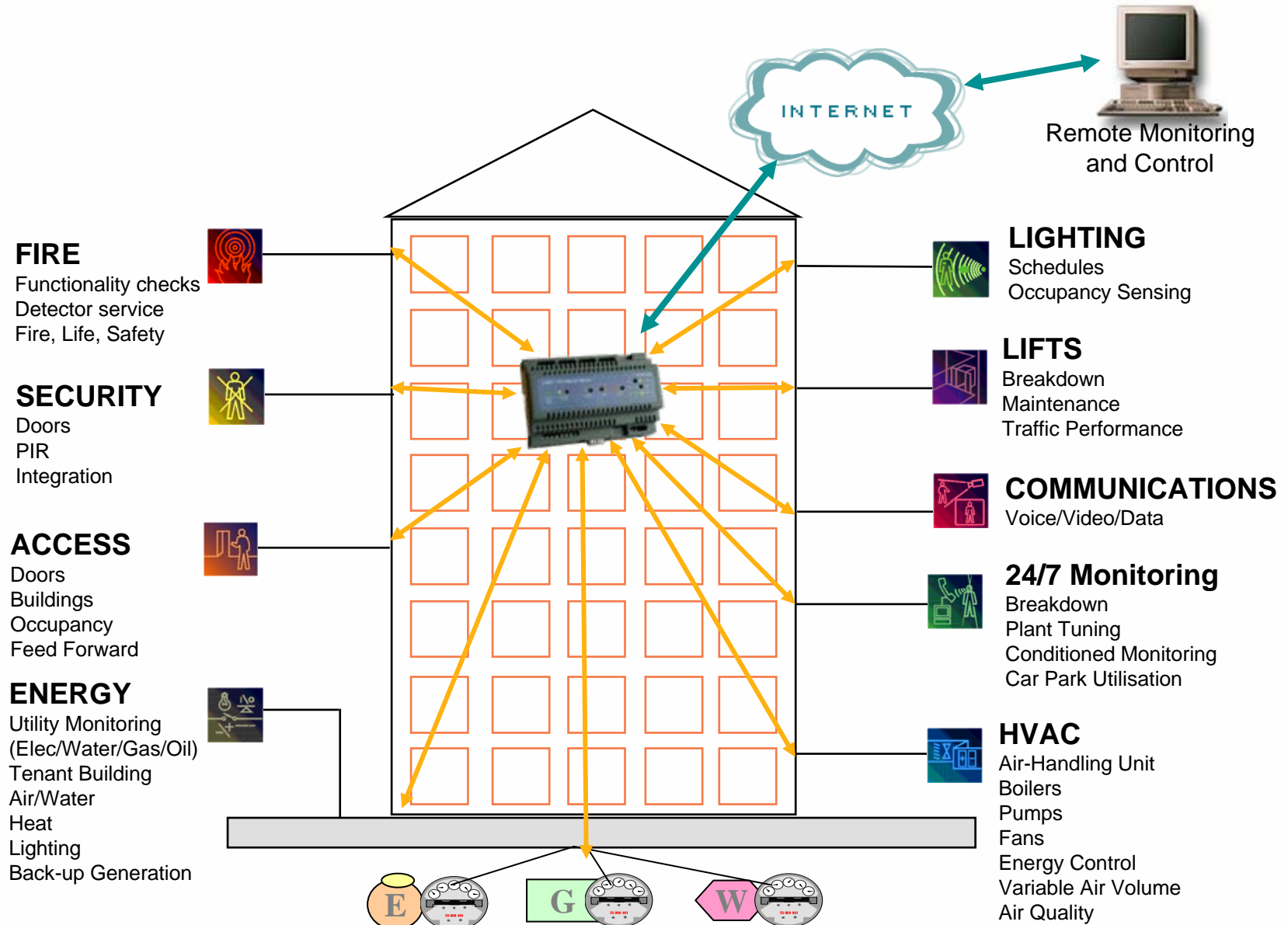
Specifying An Open System

Ensure Openness

- Make sure you are getting an open system
- Verify you will not be locked in on any level of the system
- Encourage multi-subsystem integration for maximum efficiency
- Start from good open specification framework
- Learn the technologies, options, and market directions



Integration At the Building Level Means Access To Information



Some Definitions

- *Open device* - a control device with local intelligence which leverages the use of a standard, common protocol to provide object level communication AND provides an open configuration interface: plug-and-play.
- *Open control network* - a control network which is based on a standard network management scheme AND is installed using standard tools and/or vendor provided configuration plug-ins

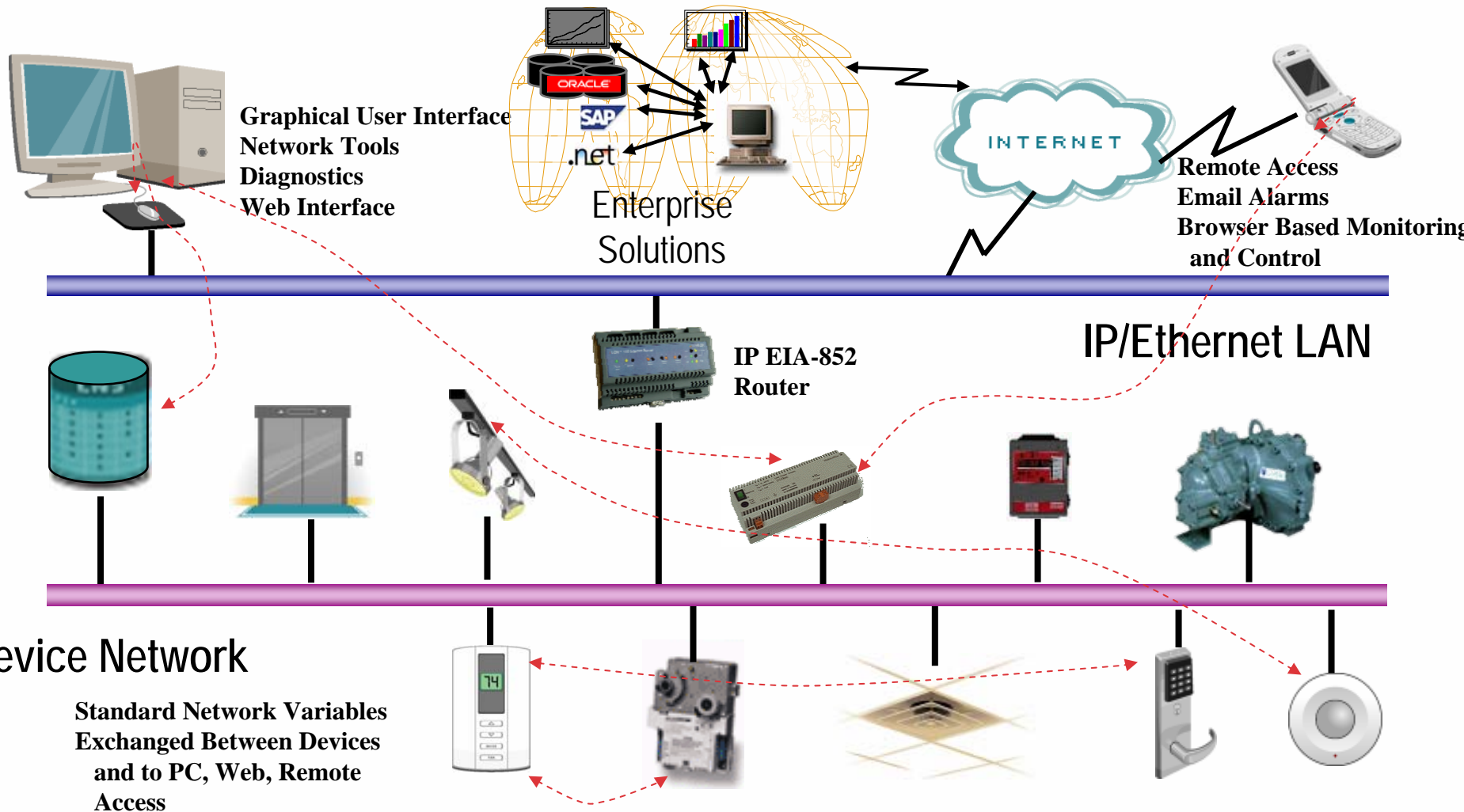
Some Definitions

- “Gateway” - System to system connection providing access to selected information through custom programming typically using custom hardware. Not recommended for an open system. Useful for legacy system integration only.
- “Driver” - System to system connection providing access to selected information through custom programming typically using custom software running on a PC. Useful for legacy system or system to system integration.
- “Router” – Network to network transfer of data according to a standard, transparent protocol. Devices on the network need not know or care that a router is between it and its destination. Routers allow for system to grow without requiring specific engineering at the device level. Routers can route between LON[®] to LON channels or between LON to LAN networks (using EIA-852 standards).

Some Definitions

- “Interoperable” - The ability to easily integrate devices and seamlessly access all information from different manufacturers, and different trades without the need for proprietary tools, gateways, or custom programming. LONMARK[®] sets the standards for the LONWORKS market.
- “Plugin” – A software configuration wizard usually launched by a host application that performs a specific set of functions on a specific device on the network. Device configuration plug-ins greatly enhance the integrators ability to commission an open system in a cost effective, timely manor.
- “LNS[®]” – LONWORKS Network Services – A open standard network management platform for LONWORKS network tool development. LNS incorporates access to a standard way of defining the LONWORKS database of devices, routers, channels, address, etc. Any manufacturer can develop tools, plug-ins, or GUIs based upon the LNS standard.

Device Network



Include All Essential Network Components

- **Devices**

- The controllers on the network
- Applications specific devices
- Programmable devices
- Packaged equipment
- Scheduling, Alarming, Data logging

- **Infrastructure**

- The wire the nodes connect to
- The routers that pass the data
- Termination
- Traffic issues
- Systems architecture
- IT Routing
- When are gateways necessary?

- **Tools**

- Design Tools
- Commissioning Tools
- Database issues
- Plugins
- Scheduling, Alarming, Data logging

- **Host Interface**

- PC Based
- Web Based
- Flexibility and Choices

- **Enterprise Connectivity**

- IT Interface
- Large project architecture
- Design for the future
- Scalability issues

Don't get locked in!

Open Versus Closed

Open	Closed
Published industry standard	Single company promoted
Adopted by major industry suppliers	Adopted by only a few or single supplier
Multiple vendors products work on single system	Only one/limited vendors product works on system
No engineering effort needed to "make them talk"	Complex engineering effort required to "make them talk"
Multiple integrators can work on same job	Only one integrator can work on job
More than one GUI type on system	Only one GUI type usable on system
Multiple sources of competitive, interoperable product	Limited or sole source of product
Service of system from multiple sources	Service of system by single source
Network management tools available for installation from multiple sources	One or limited tools available. Can only work with one suppliers devices.
Flat architecture	Tiered architecture
Expandable with transparent Routers	Limited expandability, no routing
No Gateways or gateway to legacy system only	Extensive use of gateways, new or legacy system
Empowers independent integrators	Empowers single company solution

**“The engineer specifies
functionality, not features.”**

Do not get caught up in bells and whistles;
specify a system that meets the requirements
and is in the best interest of the both the
building and the end-user today and into the
future.

Ten Questions To Open Systems

ABCs of Specifying An Open System

- All building systems are a unique.
To get the desired result, the system must be properly specified.
- Do the upfront engineering work
 - Specify your open protocol standards
 - ANSI/EIA-709.1
 - IP - The Internet Protocol
 - Specify the technology platform
 - Require that any device on the system be capable of peer to peer communication with any other node
 - Limit gateways to legacy systems
 - Follow the “Open Systems Specification Framework”

ABCs of Specifying An Open System

- Stick to the standards
- Define functionality per sub-system
- Define cross sub-system functions working with fundamental parameters;
 - Examine LONMARK functional profiles to define available cross functionality (occupancy inputs to VAV controllers, etc.)
 - Look for device plug-ins to make installation and maintenance simple
- Design the infrastructure
- Design the system
- For multiple buildings, campuses, or enterprises, consider defining a two part spec
 - One for the building
 - One for the Enterprise Integration

The Questions

1. Can the devices from different manufacturers be installed and commissioned on the same physical wire and be capable of true peer-to-peer communication?

"All devices on the network shall be capable of true peer-to-peer communication, without requiring a host or zone controllers. Logical layer 3 routers shall be used to logically isolate channels of devices."

2. Have the devices been tested for interoperable compliance? Are the manufactures of the device level products adhering to the interoperable standards when designing and delivering their products? Are there any closed aspects of these products that would inhibit an open system in which they are intended to be used?

"All devices shall implement the ANSI/EIA 709.1 protocol; a common, defined protocol for communication with other devices and shall do so using standard mechanisms for sharing data as defined by LONMARK International. Closed or non-standard communications protocol implementations will not be accepted. All devices (nodes) on the network shall conform to the LONMARK International Interoperability Guidelines and application specific devices shall be tested and certified as interoperably compliant."

3. Is the integrator meeting the requirements for the network infrastructure?

"The network infrastructure shall conform to the published guidelines for wire type, length, number of nodes per channel, termination, and other relevant wiring and infrastructure criteria as published (see reference documentation)."

The Questions

4. Are there network management and commissioning tools available from multiple sources that can completely install all the nodes in the system?

"All devices (nodes) on the network shall be able to be installed and configured using a standard network management tool such as LonMaker® or other LNS based tool. No closed or partially closed tool set for installation or configuration will be accepted. All tools must be generally available for purchase to any integrator from multiple sources. Complex devices shall be configured with a vendor supplied LNS plugin."

5. Are the front-end tools open?

"Any host PC GUI interface shall use openly available software packages that are non-exclusive. No closed software will be accepted. Software must be generally available on the market from multiple sources. Devices must communicate to the GUI workstation using Standard Network Variable Types (SNVT) Standard Configuration Property Types (SCPTs) as defined by LONMARK. No non-standard communication to devices will be allowed."

The Questions

6. Who is doing the work on your building?

“Integration of the controls network shall be performed by a qualified network integrator. A qualified network integrator must have technical staff members who have attended at least 40 hours of LONWORKS network design and network management tool training. It is also recommended that the integrator have staff members competent in IT connectivity and advanced troubleshooting of LONWORKS networks. The integrator shall provide references of prior successful LONWORKS open systems jobs experience. The Network Integrator must demonstrate their ability and intent to design, architect, and install a open, flat, LNS-based, LONWORKS system and have on staff at a minimum two technically trained members.”

7. Do you have control over your building?

“All configuration tools, installation tools, Plugins, databases, software shall remain with the job and be owned by the property. All software tools shall be properly licensed and conveyed at contract sign-off. No exclusive or non-open integration tools, devices, or host software shall be used as part of this open system. The controls contractor shall deliver an up to date LNS database containing all of the database configuration files for the current, active network.”

8. How are you connecting to your data network?

“If Internet or IP connectivity is specified, all devices connecting to the LAN shall use the TCP/IP protocol stack. Any LAN to LON routers shall use the ANSI/EIA-852 standard layer 3 transparent routing protocol. Specific IP interconnectivity shall follow IT standards for security, firewalls, address, etc. published in separate documents (if appropriate).”

The Questions

9. What controls are you using?

“The control system shall be installed using the best available products from the currently available suppliers that meet the system specification. Controllers from multiple manufactures are acceptable and encouraged in order to meet the system integration requirements.”

10. Are you certain your network was designed and installed correctly?

“The system integrator shall provide a protocol analyzer log summary for each channel for a minimum of 24 hours showing system performance. The statistical summary shall show that all bandwidth utilization and error limits are within acceptable ranges and that there are no network traffic problems, node communication problems, or system sizing problems.

Section Summary

- Writing AND enforcing a good open systems specification is a key to success
- A good specification will address all the elements of the system – device, infrastructure, tools, GUI, and the enterprise integration
- Start from a template, use what works
- Ask for help



- Interoperability Guidelines
- Lists of standardized Variables and Parameters
- Reference implementations
 - Code examples for sensors and actuators
 - LONMARK certified products
- Released functional profiles
 - home / utility, HVAC, industry, lighting, refrigeration / air conditioning, security / access control, sun blinds control
- List of LONMARK member companies and certified products

www.lonmark.org

www.lonmarkamericas.org

The Future Of LONWORKS Open Systems

- Open systems are changing the way buildings get built – the old model does not work anymore
- Key market drivers – cost, competitive bidding, future proofing, product availability
- Integration is the key, more systems, more information, greater access
- Open Systems in the buildings market will follow the computer market – LONWORKS will lead
- LONMARK defines the technical guidelines and does product testing and certification – delivers interoperability at the device level – and will continue to gain market acceptance
- Joining LONMARK as an integrator will keep you on the cutting edge of this technology. Be a leader in the market!



Summary

- Open systems reduce risk by providing more flexibility
- The building controls market is marching towards a more open system
- Open systems facilitates better control and integration of building subsystems
- Technology advancements will reduce costs, improve reliability, and expand capabilities
- There is a need for education in order to take full advantage of these new technologies
- When Specifying Open Systems – Make sure you are getting the best products from the best suppliers, employing the best integrators, and getting the best price
- Write a good spec and understand what that entails
- **Don't be afraid to ask for help or seek training!**

