LONMARK® INTERNATIONAL

Presented By

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Sr. FAE – Global Accounts
Echelon Corporation

Open Control Networking Systems for Smarter Building Operations—Fundamentals of System Architecture and Design

ICEBO Oct 18-20, 2011

Agenda

- Welcome and Introductions
- LONWORKS® / LonMark® the Mission
- LONWORKS - the Technology
- LONMARK® - the Organization

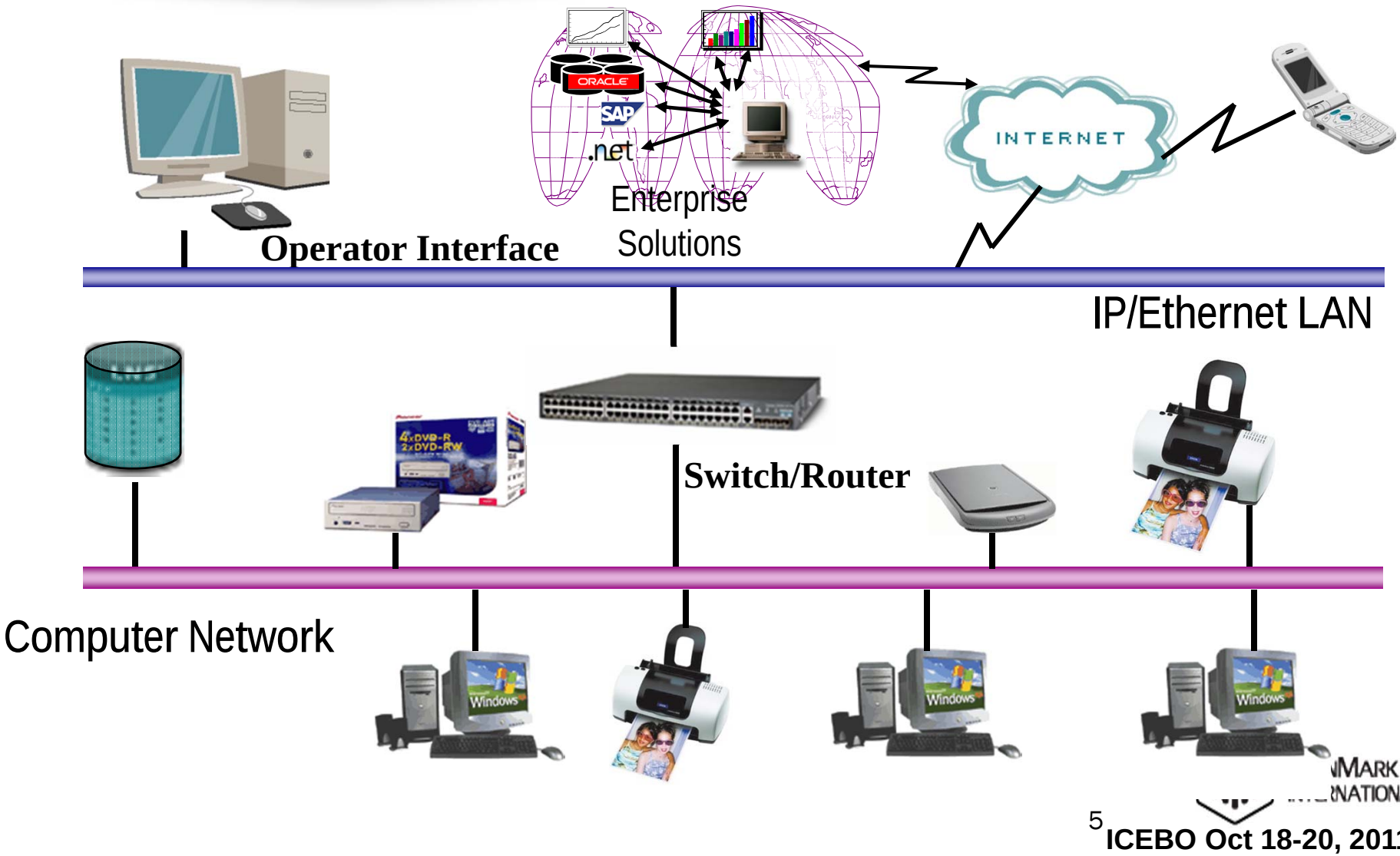
LONMARK
THE MISSION

ICEBO Oct 18-20, 2011

Computer Network

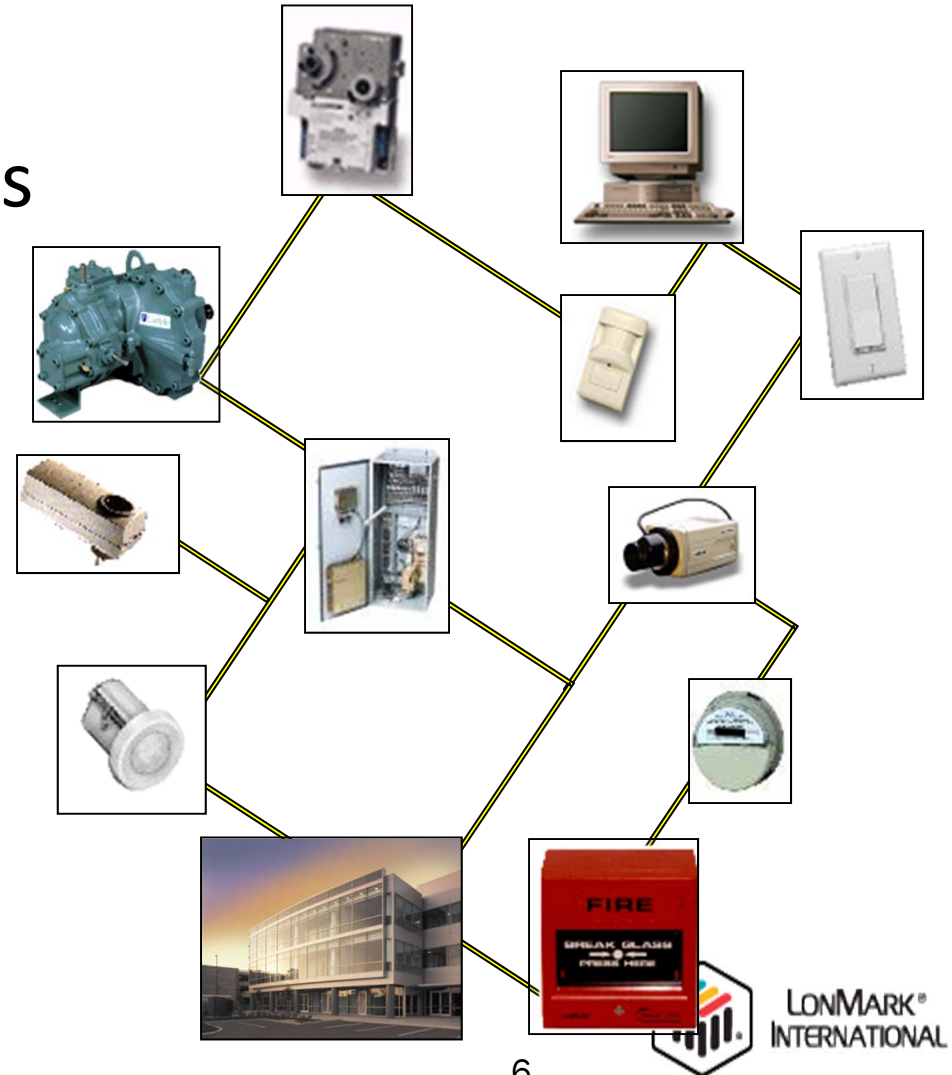
- Standardized
- Compatible products
- Interchangeable
- Interoperable
- Customizable
- Cost-efficient
- Multi-vendor
- Freedom of choice

Computer Network



Device Network

- Standardized
- Compatible products
- Interchangeable
- Interoperable
- Customizable
- Cost-efficient
- Multi-vendor
- Freedom of choice



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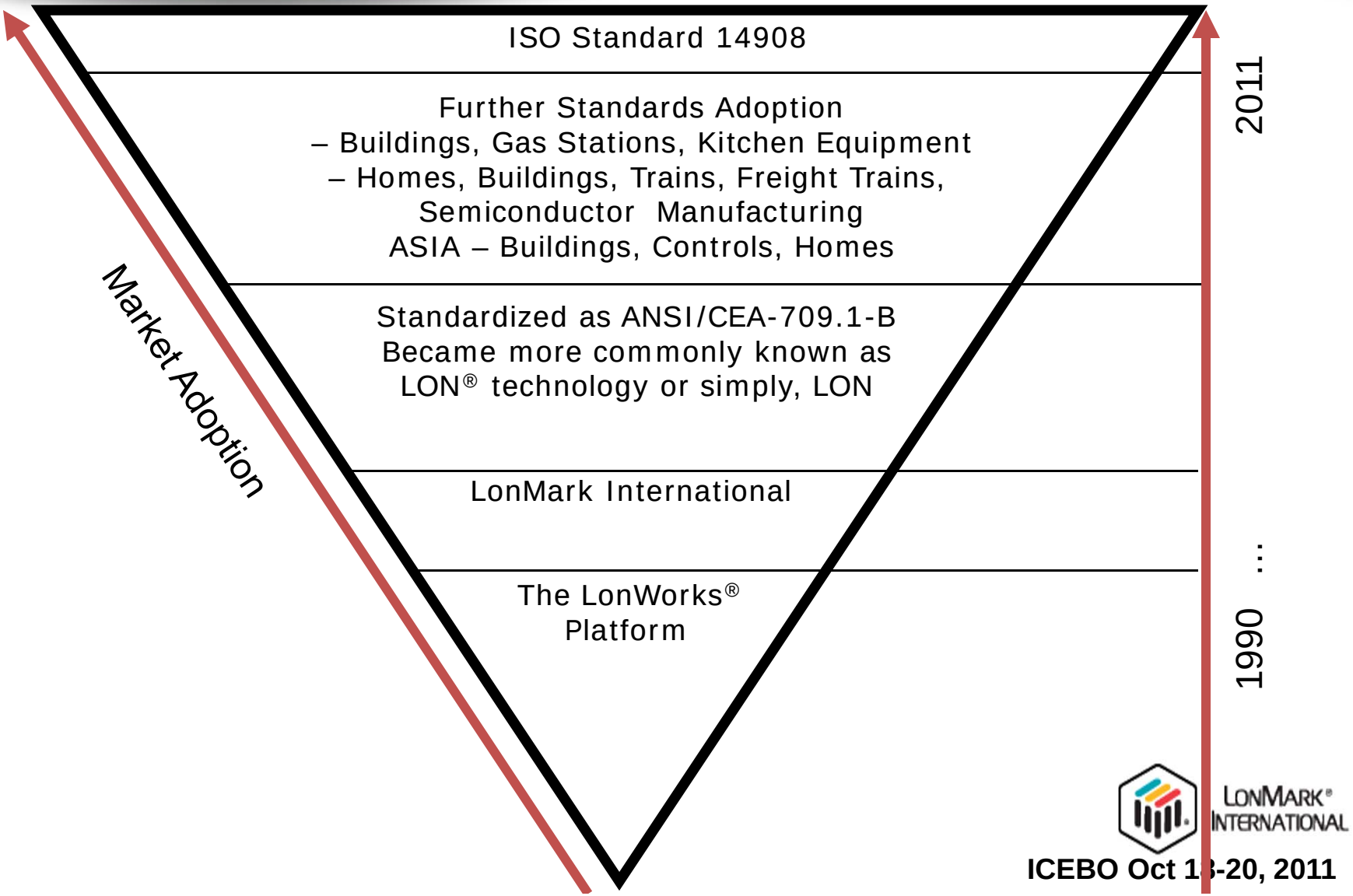
History of LON – Adoption / Time



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Larger Markets Served

- HVAC/R
- Building Lighting
- Kitchen Equipment
- Transportation
- Home Automation
- Smart Grid

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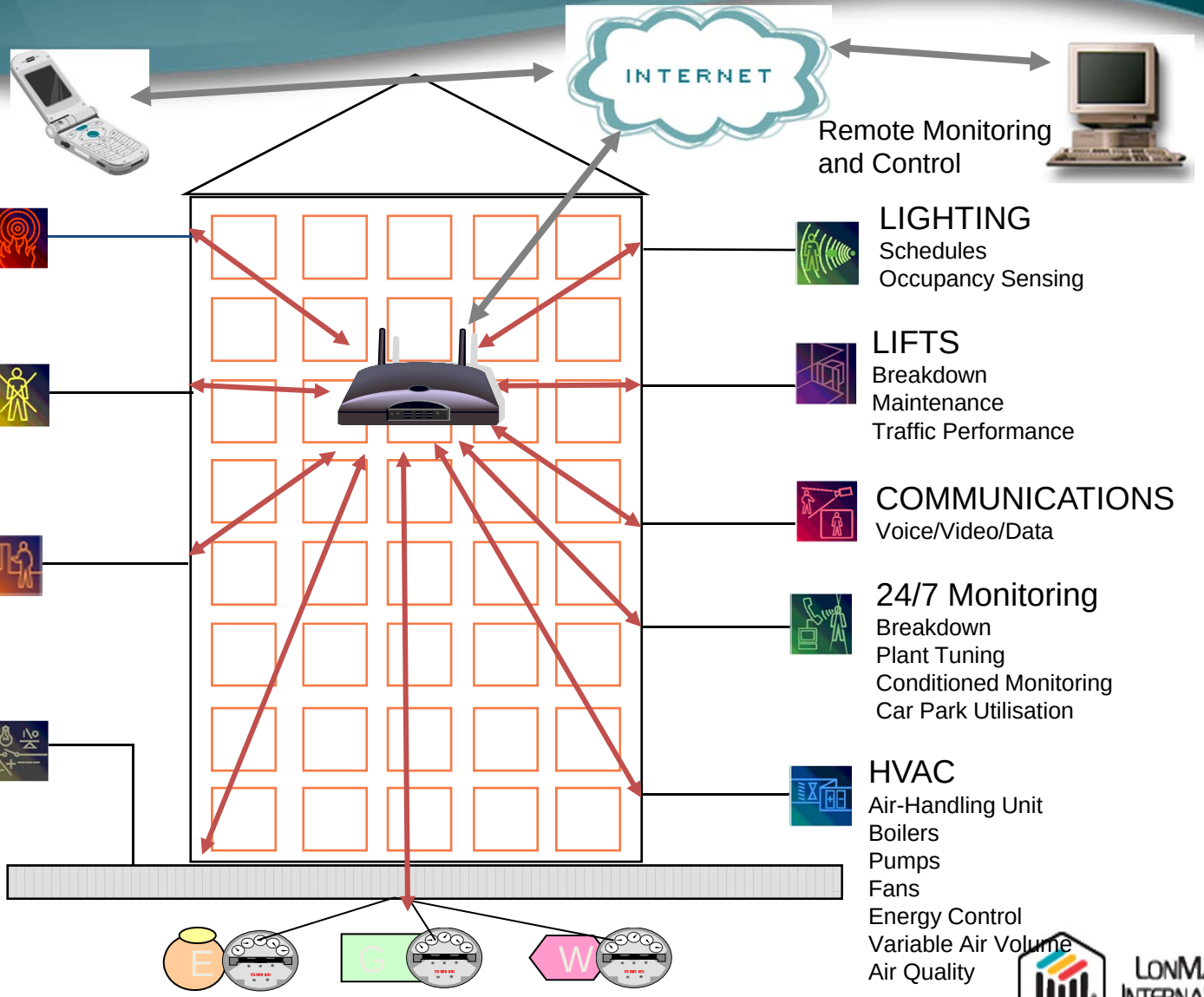
Integrated Building Automation



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QSR - *LonWorks Connected Kitchen*

In-Store Applications

- Food Production Management
- Product Quality Monitoring
- Equipment Configuration
- Crew Management
- Customer Interface

Enterprise Applications

- Operations Management
- Inventory Management
- Product Development
- Equipment Performance
- Remote Diagnostics & Repair

Firewall / VPN / Router

Store Ethernet / IP LAN

LonWorks Interface

FT-10

FT-10 / PL-20 Router

Embedded Production Supervisor

- Production Alarm Management
- Operations Scheduler
- Data Logging

PL-20

Lighting

HVAC

Refrigeration

Signage

Drive-thru Control

Kitchen Equipment

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New Markets

- Street Lighting
- Demand Side Management
- Solar Energy

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Trends lead to Open, Simple, Integrated

- Standards Based
  - LON Is
- Solid Technology Foundation
  - LON Is
- Proven, Reliable, Secure, Accepted, Adopted
  - LON Is
- Flexible, Scaleable Solutions
  - LON Is
- No Built-In Obsolescence
  - LON Is

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LONMARK
THE TECHNOLOGY

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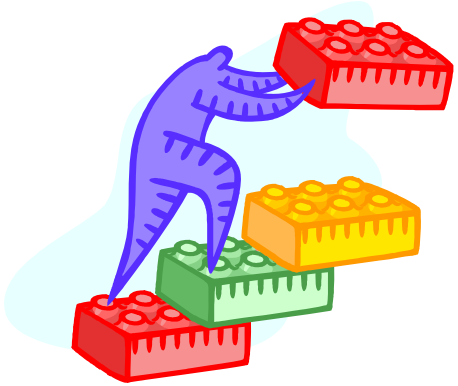
LonWorks Platform
Open System Building Blocks

Building an open system platform



- Design, and Installation Standards
- Network Infrastructure Standards
- HMI/Installation Standards

LonMark System Definition

- Standardized Device FB's
- Standardized System FB's

LonMark Functional Profiles

- Standard Data Types
- Standard Configuration Properties
- Function Blocks (FB)

LonMark Object Model

- Device data exchange
- Standard Network Management
- Network Variable Services

ANSI/EIA 709.1 Communications Protocol

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Proceedings of the Eleventh International Conference Enhanced Building Operations, New York City, October 18-20, 2011

LonMark Standards - ISO/IEC 14908
ANSI/EIA/CEA-709.1 Protocol

ANSI American National Standards Institute

ISO International Organization for Standardization

- An open standard protocol for control applications
  - Reference document available from Global Engineering
- Protocol implementations are available from multiple vendors
  - Protocol can be ported to any processor
  - Echelon's implementation is called the *LonTalk® protocol*
  - Echelon's Neuron® firmware includes the LonTalk protocol
  - Echelon development systems include a royalty-free unlimited license to use the Neuron firmware implementation

EIA Electronic Industries Alliance

CEA Consumer Electronics Association

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LonMark Channels Types

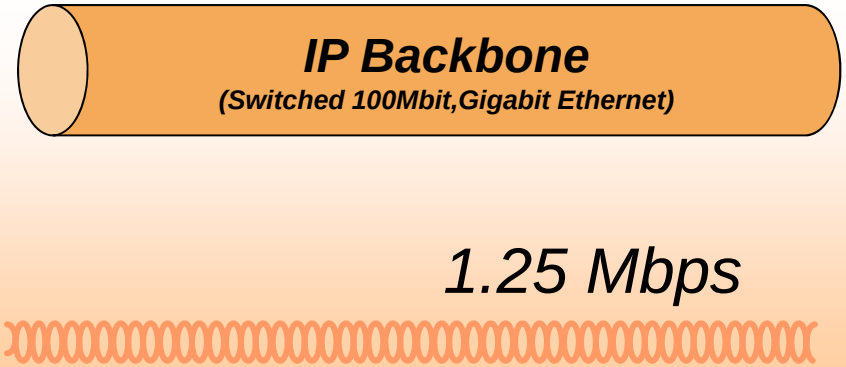
Some Common Standard Channels

IP-852 Channel

~ 35,000 PPS on 10baseT(10 Mbit)
scales with channel (100/1000 Mbit)
Supports aggregation

TP/XF-1250 Channel

~ 720 Peak / 576 Sustained PPS

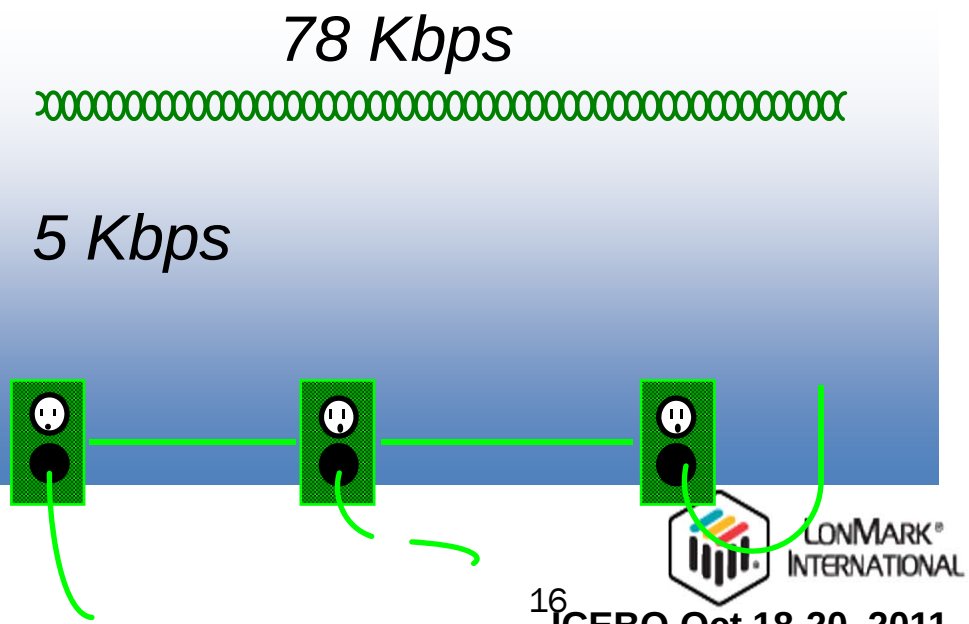


FT-10 Channel

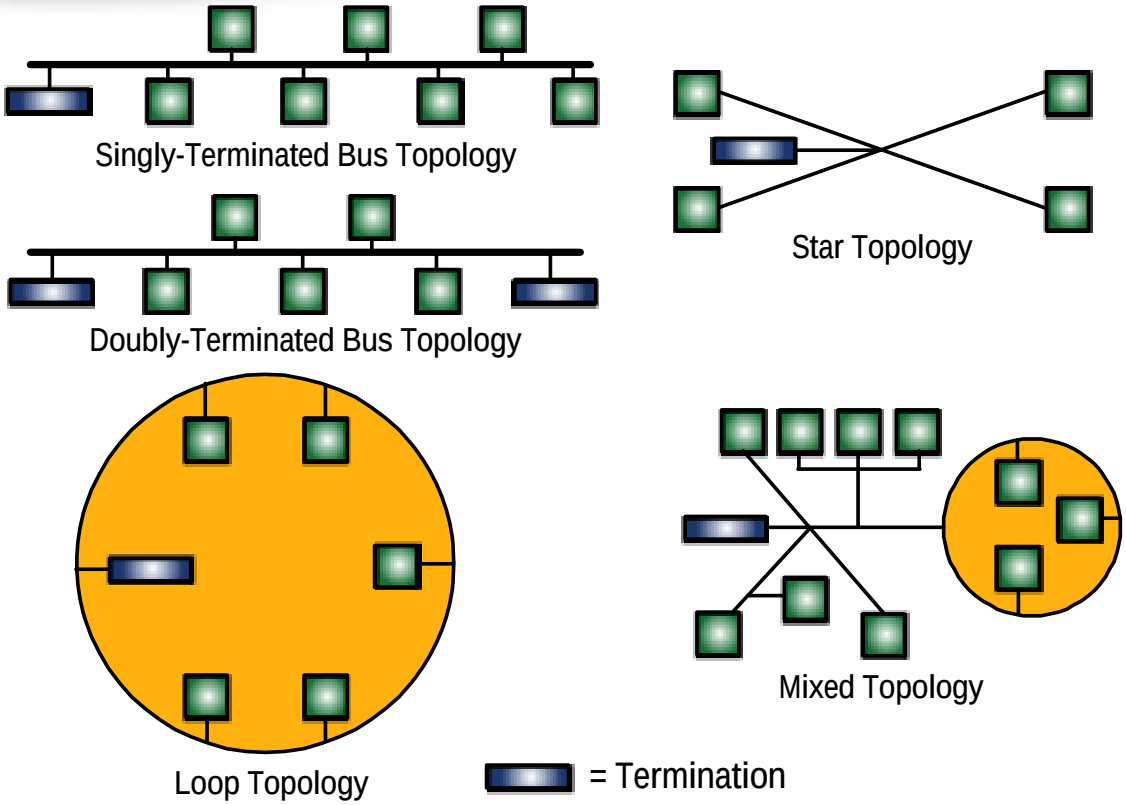
~ 220 Peak / 180 Sustained PPS

PL-20 Channel

~ 20 PPS

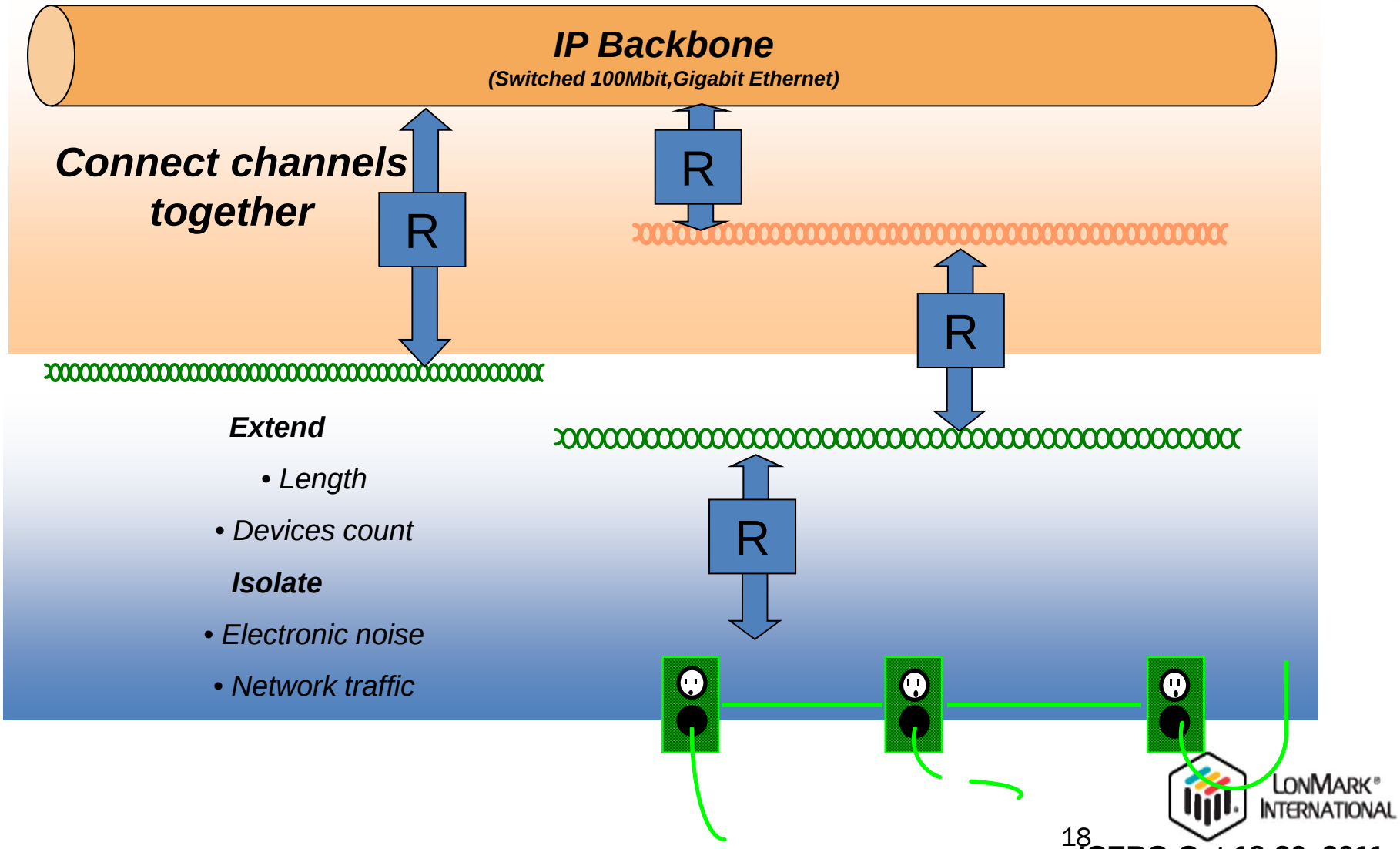


ANSI/EIA/CEA 709.3-A
TP/FT-10 Channel

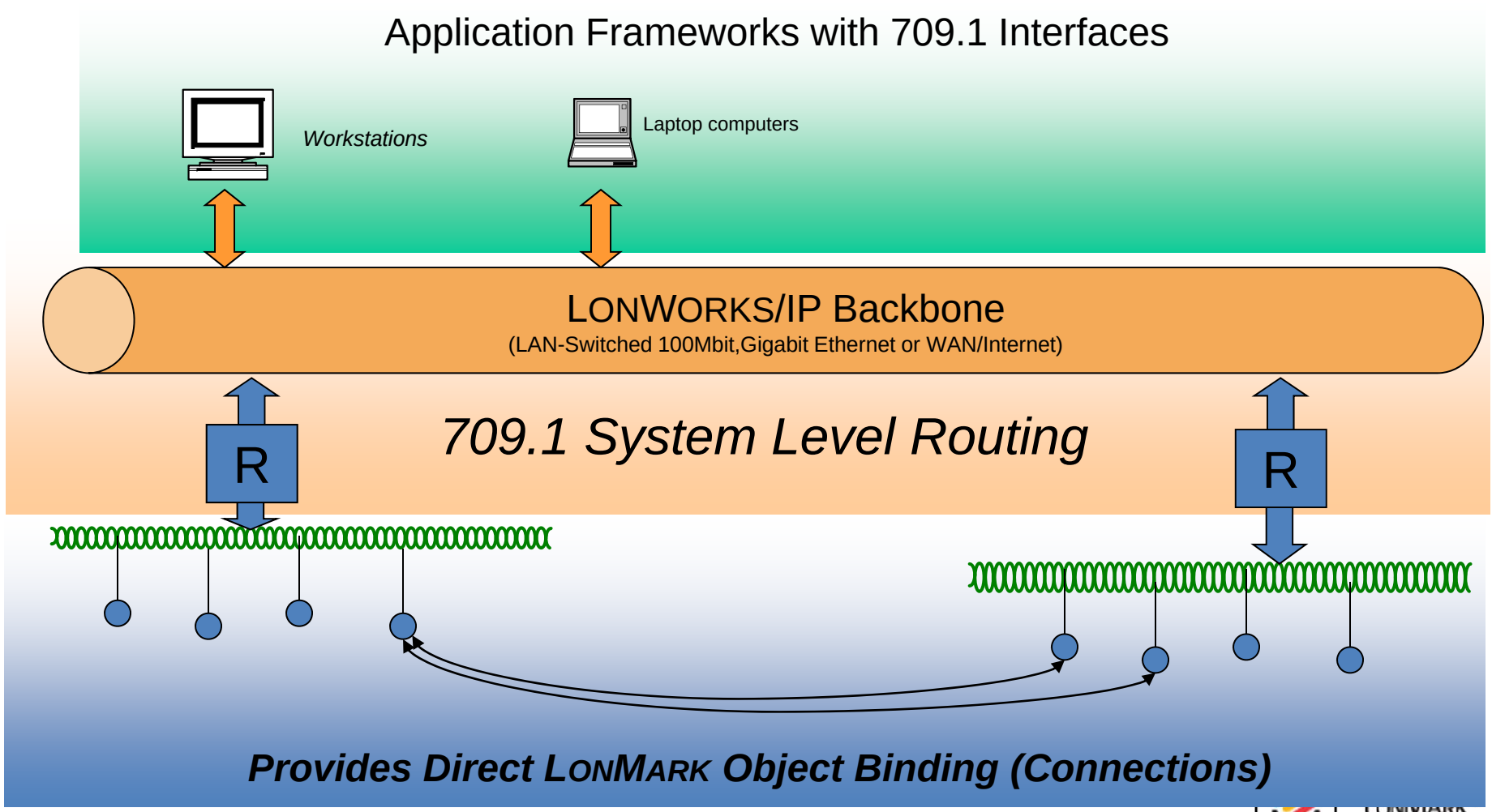


- Unshielded & Shielded Twisted pair
  - Level IV, CAT 5, 24AWG ,16AWG
  - Polarity insensitive wiring
- 64 (128 linked power) devices on a single channel segment

LonMark 709.1 Network Routers

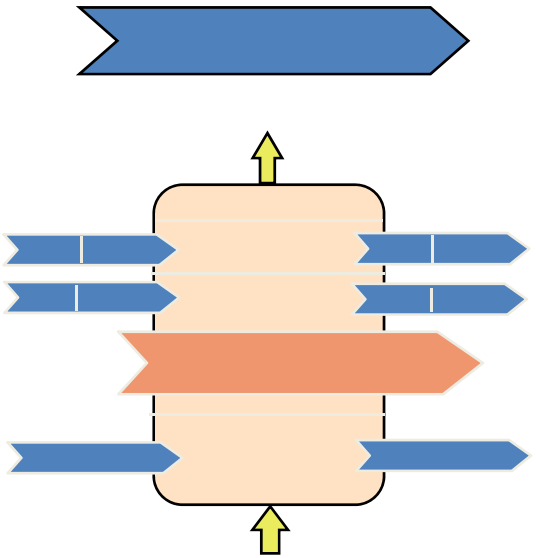


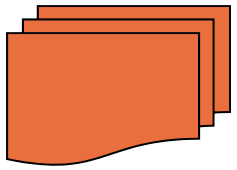
LONMARK 709.1 Network Routers



Interoperability Guidelines

- Data interpretation
  - Standard representation of data types
- Standardized functional behavior of a nodes
  - LonMark objects
  - encapsulated network interaction of defined functions
- Standardized support of smooth and trouble free installation
  - Self documentation of a network oriented external interface
  - Guidelines for Network Management





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Standard Network Variable Types
Are The Core Of Interoperability

SNVT_temp	Temperature	Degrees Celsius degree	-274..6271	0.1
SNVT_angle	Phase/Rotation	Radians	0 - 65	0.001 rads
SNVT_speed	Speed	Meters/Sec	0 - 6553	0.1 m/s
SNVT_elapsed_tm	Elapsed Time	HH:MM:SS	0 - 65535 days	1 msec
SNVT_lev_cont	Continuous Level	Percent	0 - 100%	0.5%
SNVT_ascii	ASCII String	Characters	30 Chars	N/A
SNVT_count	Events	Count	0 - 65535	1 Count

Ref: SNVT Master List und Programmer's Guide

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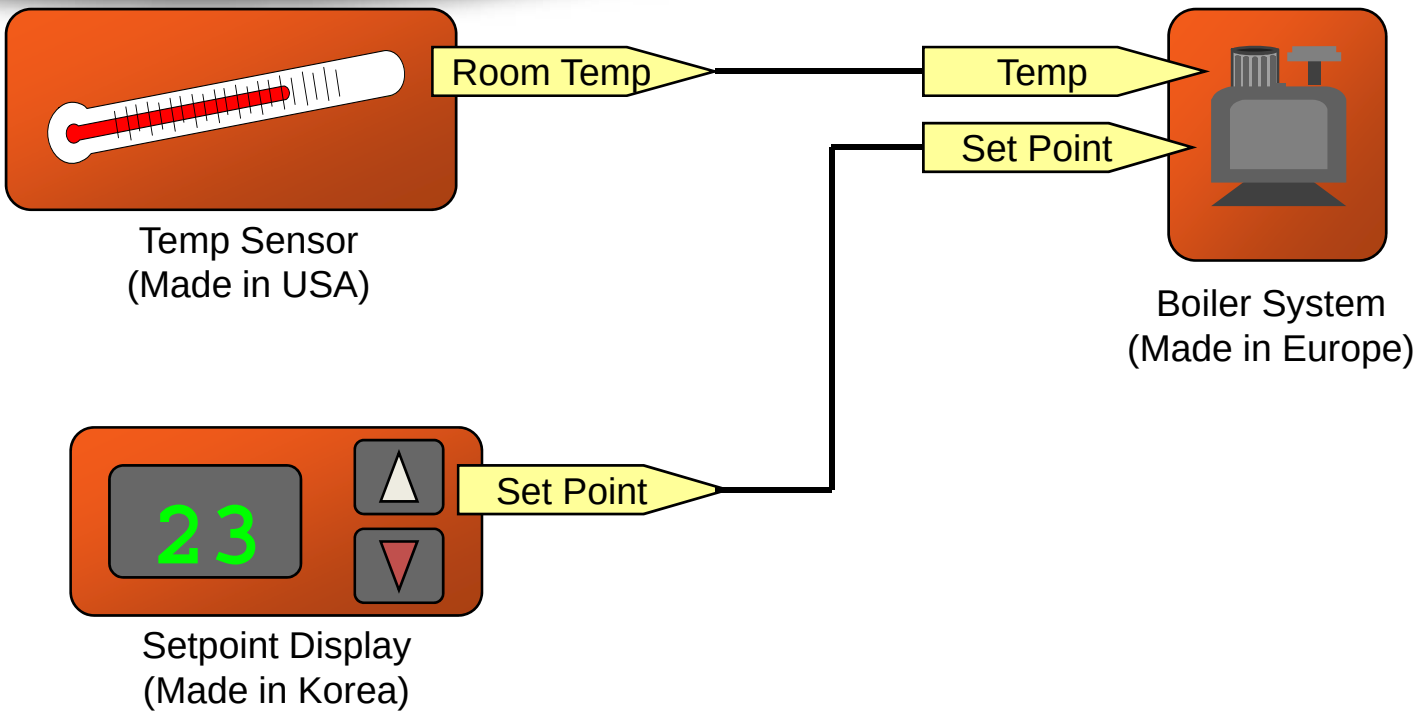
Layer 6 - Presentation Layer



- Data exchanged using *network variables*
  - Propagation automatically handled by Neuron firmware
  - Provides fastest and most compact code
- Devices from different manufacturers can exchange data with a common interpretation

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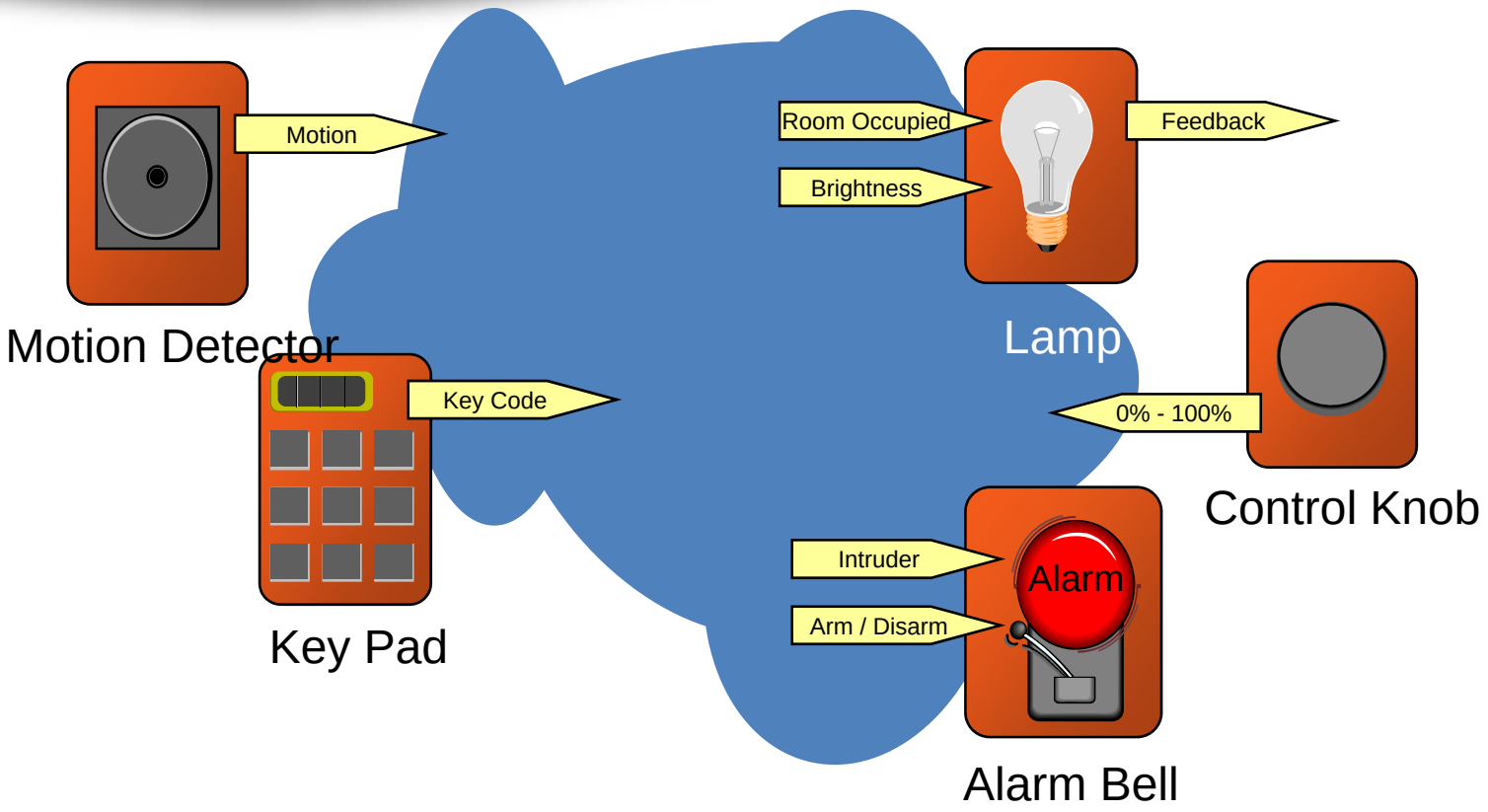
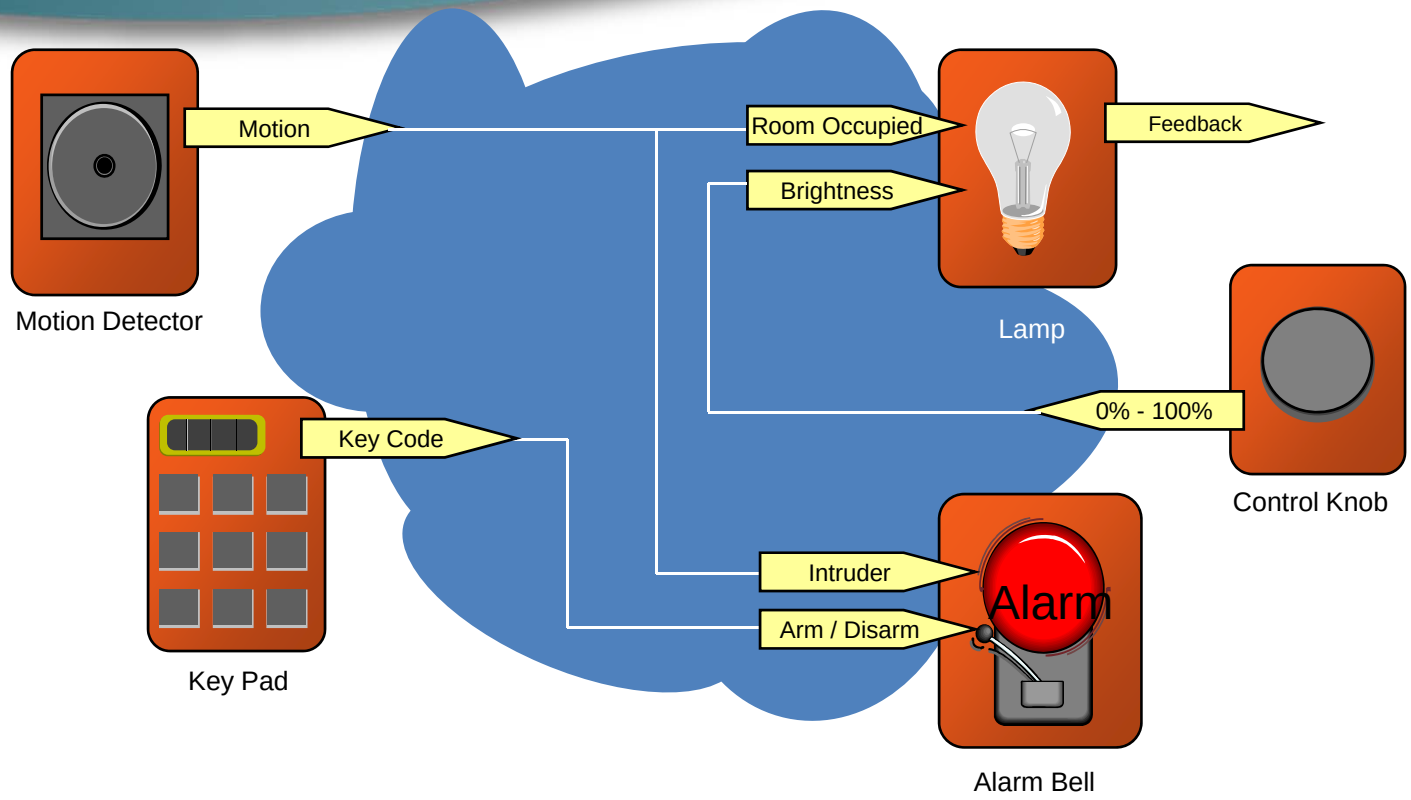
Presentation Layer—Using Network **Variables**



- Sensors “publish” information, and actuators “subscribe” to the information of interest to them!

Presentation Layer—Adding Devices



- Devices are logically connected ("bound") together without affecting the application program in the device!

Presentation Layer
Standard Network Variable Types

- SNVT_speed
- SNVT_speed_f
- SNVT_speed_mil
- SNVT_state
- SNVT_state_64
- SNVT_str_asc
- SNVT_str_int
- SNVT_switch
- SNVT_telcom
- SNVT_temp
- SNVT_temp_diff_p
- SNVT_temp_f
- SNVT_temp_p
- SNVT_temp_ror
- SNVT_temp_setpt
- SNVT_therm_mode
- SNVT_time_f
- SNVT_time_hour
- SNVT_time_min
- SNVT_time_passed
- SNVT_time_sec
- SNVT_time_stamp
- SNVT_time_zone
- SNVT_tod_event
- SNVT_trans_table

SNVT_temp_p

Overview:

Temperature (degrees Celsius).

Details:

Standard:	*yes*
Resource Set:	*Standard 00:00:00:00:00:00:00:00-0*
Index:	*105*
Obsolete:	*no*
Size:	*2*
Programmatic Name:	*SNVT_temp_p*
Neuron C Type:	signed long
Minimum:	*-27317*
Maximum:	*32767*
Invalid:	*32767*
Scaling (A,B,C):	*1, -2, 0*
Scaled value:	$1 * 10^{-2} * (Raw+0)$
Resolution:	*0.01*

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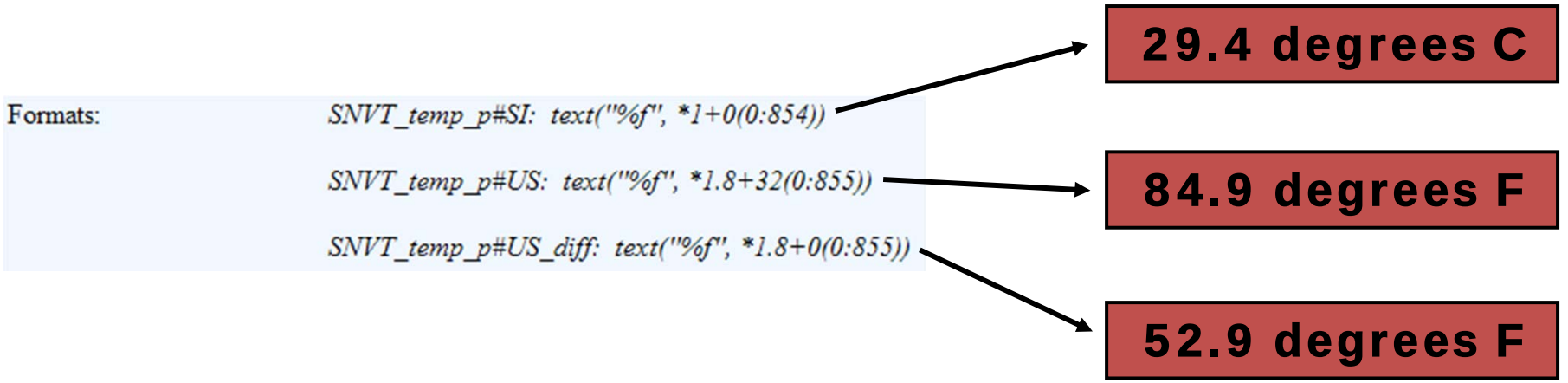
Presentation Layer—Standard Formatting

- Standard formatting for standard types ensures consistent data presentation in tools and HMIs
- Example
  - A **SNVT_temp_p** value of 2940 is displayed as follows:



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Application Layer
Configuration Properties

- SCPTmaxSupplyFanCapacity
- SCPTminDefrostTime
- SCPTminDeltaAngl
- SCPTminDeltaCO2
- SCPTminDeltaFlow
- SCPTminDeltaLevel
- SCPTminDeltaRH
- SCPTminDeltaTemp
- SCPTminDischargeAirCoolingSetpoint
- SCPTminDischargeAirHeatingSetpoint
- SCPTminDuctStaticPressureSetpoint
- SCPTminFlow
- SCPTminFlowHeat
- SCPTminFlowHeatStby
- SCPTminFlowSetpoint
- SCPTminFlowStby
- SCPTminFlowUnit
- SCPTminFlowUnitHeat
- SCPTminFlowUnitStby
- SCPTminOutdoorAirFlowSetpoint
- SCPTminPressureSetpoint
- SCPTminRemoteFlowSetpoint
- SCPTminRemotePressureSetpoint
- SCPTminRemoteTempSetpoint
- SCPTminReturnExhaustFanCapacity
- SCPTminRnge
- SCPTminSendTime
- SCPTminSetpoint
- SCPTminSndT
- SCPTminStroke
- SCPTminSupplyFanCapacity
- SCPTmixedAirLowLimitSetpoint

SCPTminSendTime

Overview:

Minimum send time. The minimum period of time between consecutive transmissions of the current value

Details:

Standard:	*yes*
Resource Set:	*Standard 00:00:00:00:00:00:00:00-0*
Index:	*52*
Obsolete:	*no*
Size:	*2*
Programmatic Name:	*SCPTminSendTime*
Default:	*0.0*
Neuron C Type:	*SNVT_time_sec*

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Application Layer—Network Configuration and Diagnostics

Network Management and Diagnostic Messages	
Query Status	Update Group Address Data
Proxy Command	Query Domain
Clear Status	Update Net Variable Config
Query Transceiver Status	Set Node Mode
Query ID	Read Memory
Respond to Query	Write Memory
Update Domain	Checksum Recalculate
Leave Domain	Wink
Update Key	Memory Refresh
Update Address	Query SNVT
Query Address	Network Variable Fetch
Query Net Variable Config	Device Escape Code

- Common standard foundation for network installation and diagnostic tools

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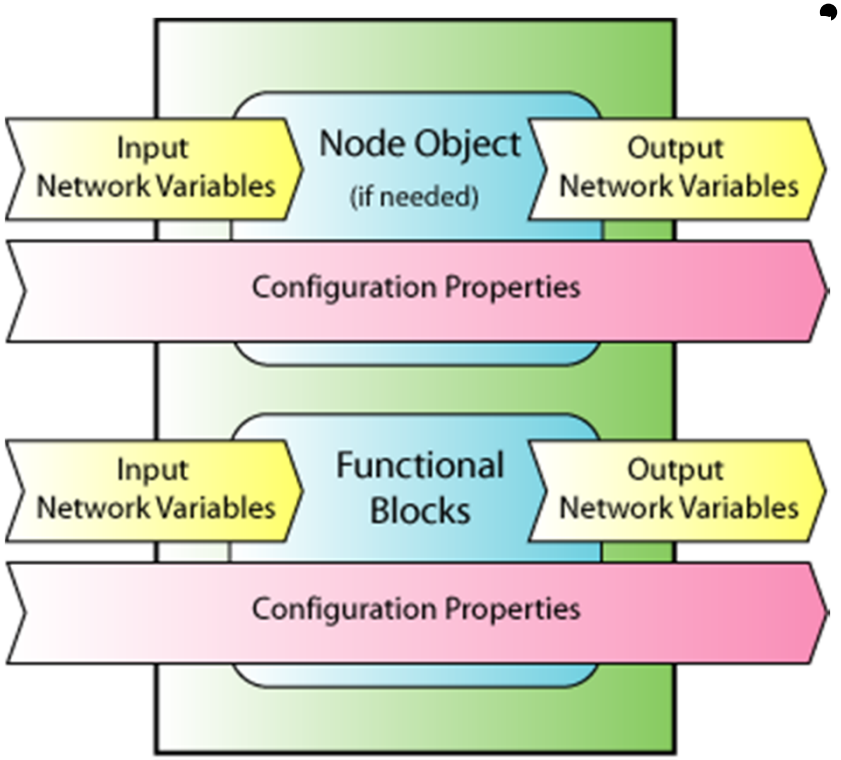
Layer 7—Application Layer

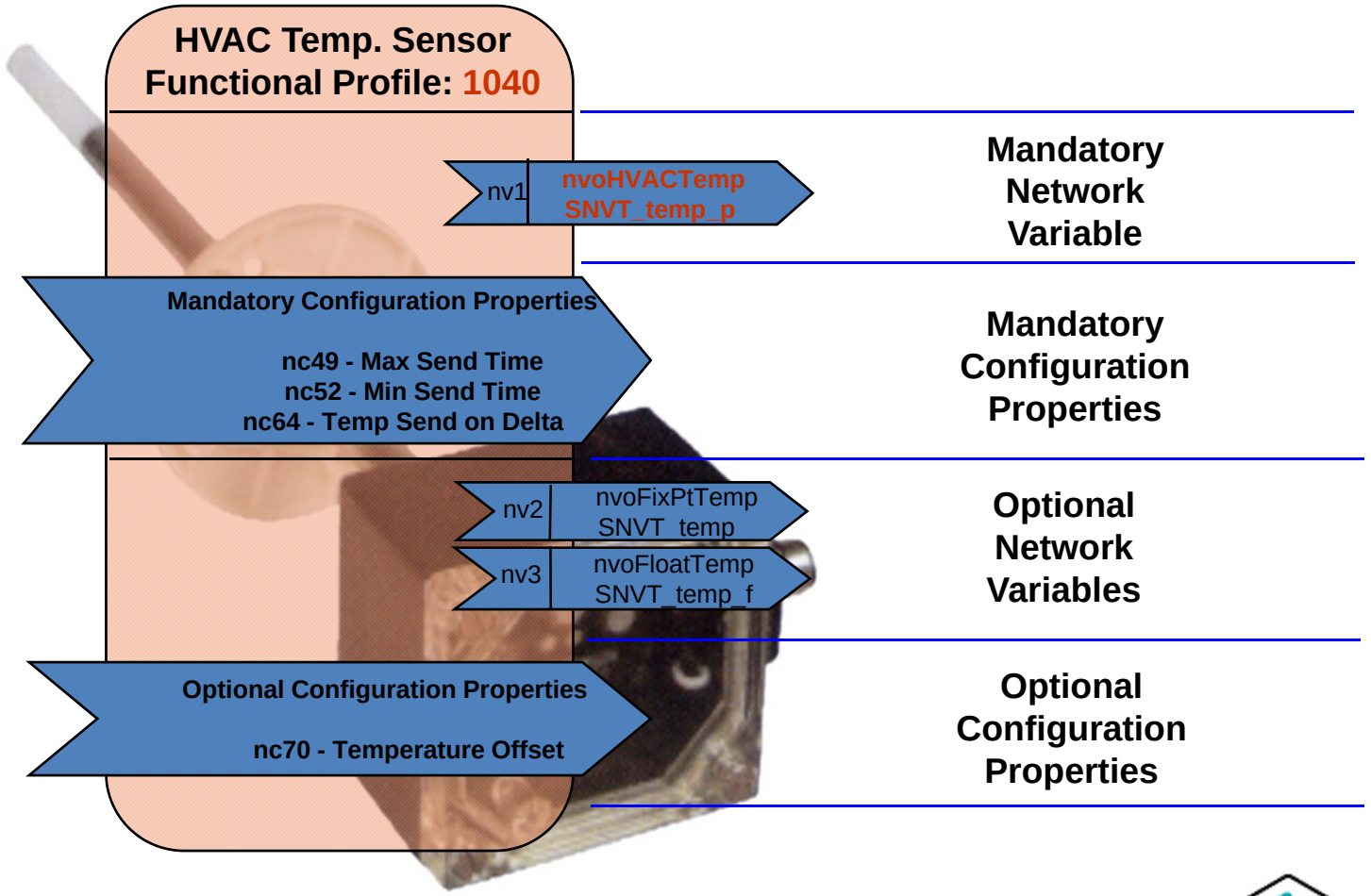
- Defines standard network services that use data exchanged by the lower layers
  - Network configuration
  - Network diagnostics
  - File transfer
  - Application configuration
  - Application specification
  - Alarming
  - Data logging
  - Scheduling

Application Layer—
Application Model

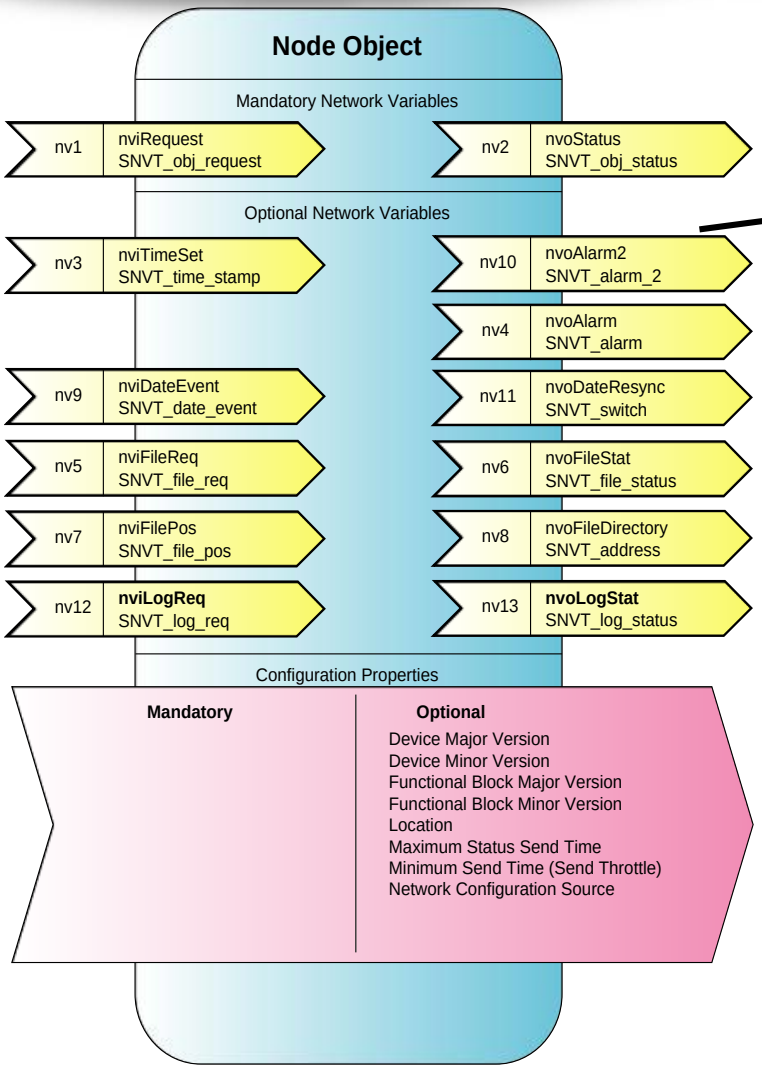


- Functional block
  - Portion of a device's application that performs a task
  - Receives configuration and operational data inputs
  - Processes the data
  - Sends operational data outputs

Functional Profile:
HVAC Temperature Sensor

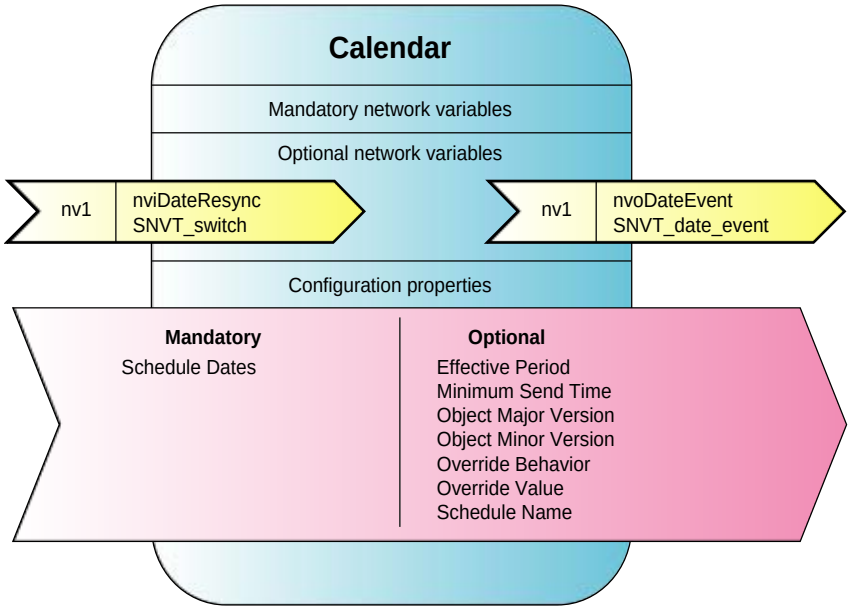


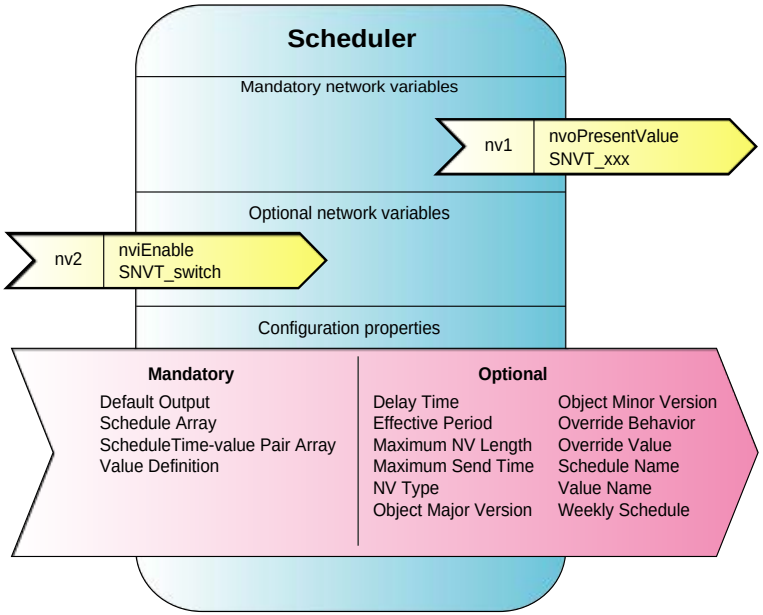
Application Layer—Alarming



- Standard alarm reporting output, includes:
  - Alarm type
  - Alarm priority
  - Alarm time
  - Sequence number
  - Alarm description
- Ensures consistent reporting of alarm events

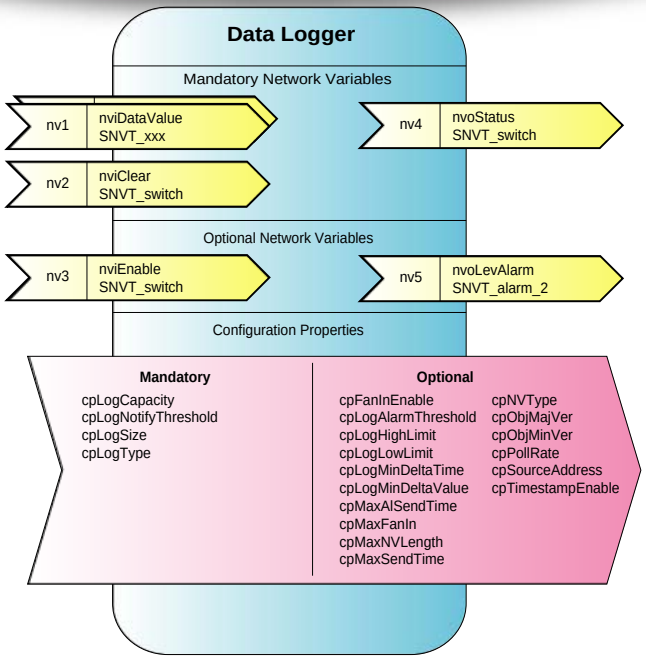
Application Layer—Scheduling





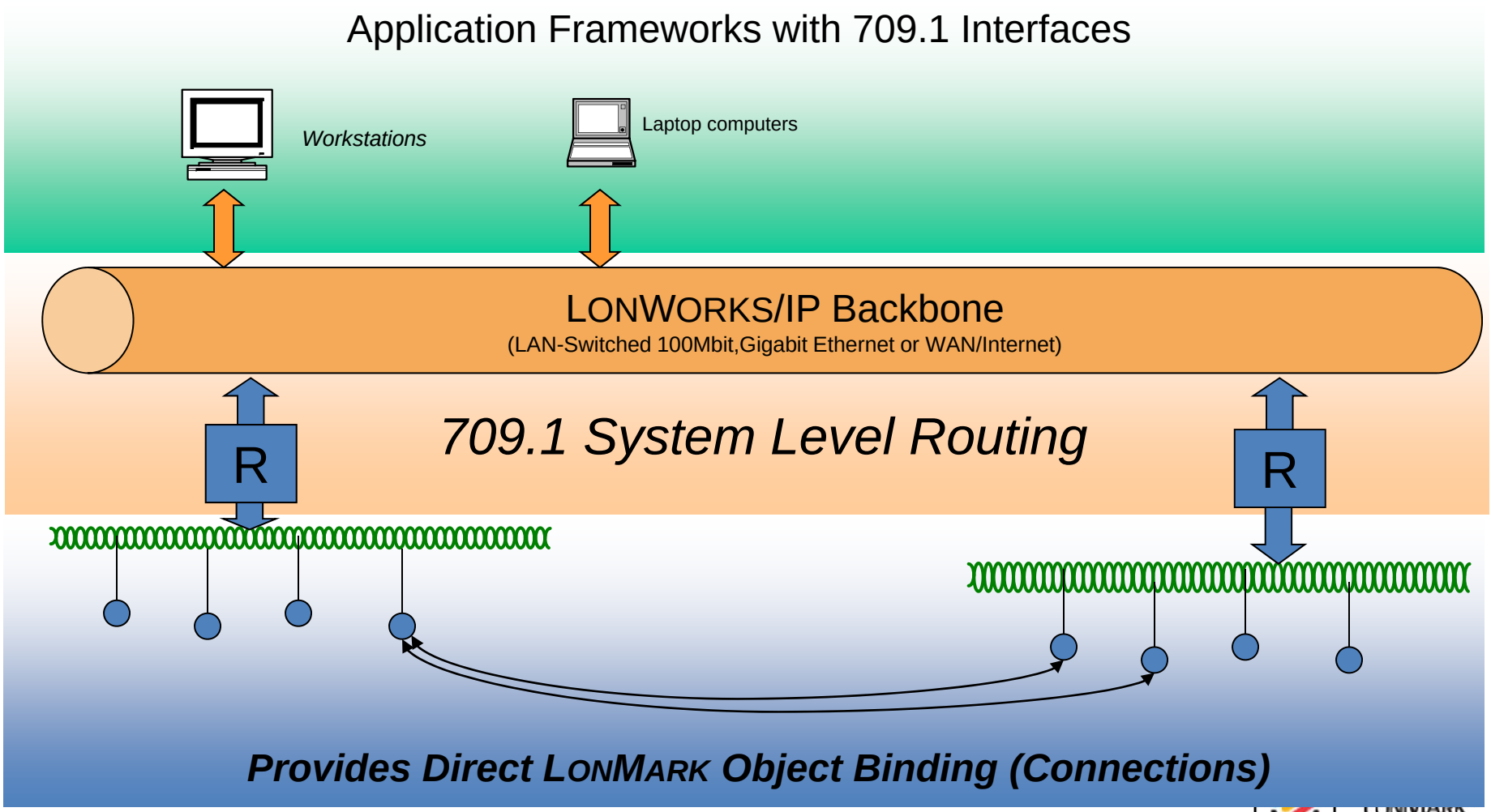
- Standard profile for identifying events based on date and time
- Supports scheduling applications that work with scheduling devices from multiple manufacturers

Application Layer—Data Logging

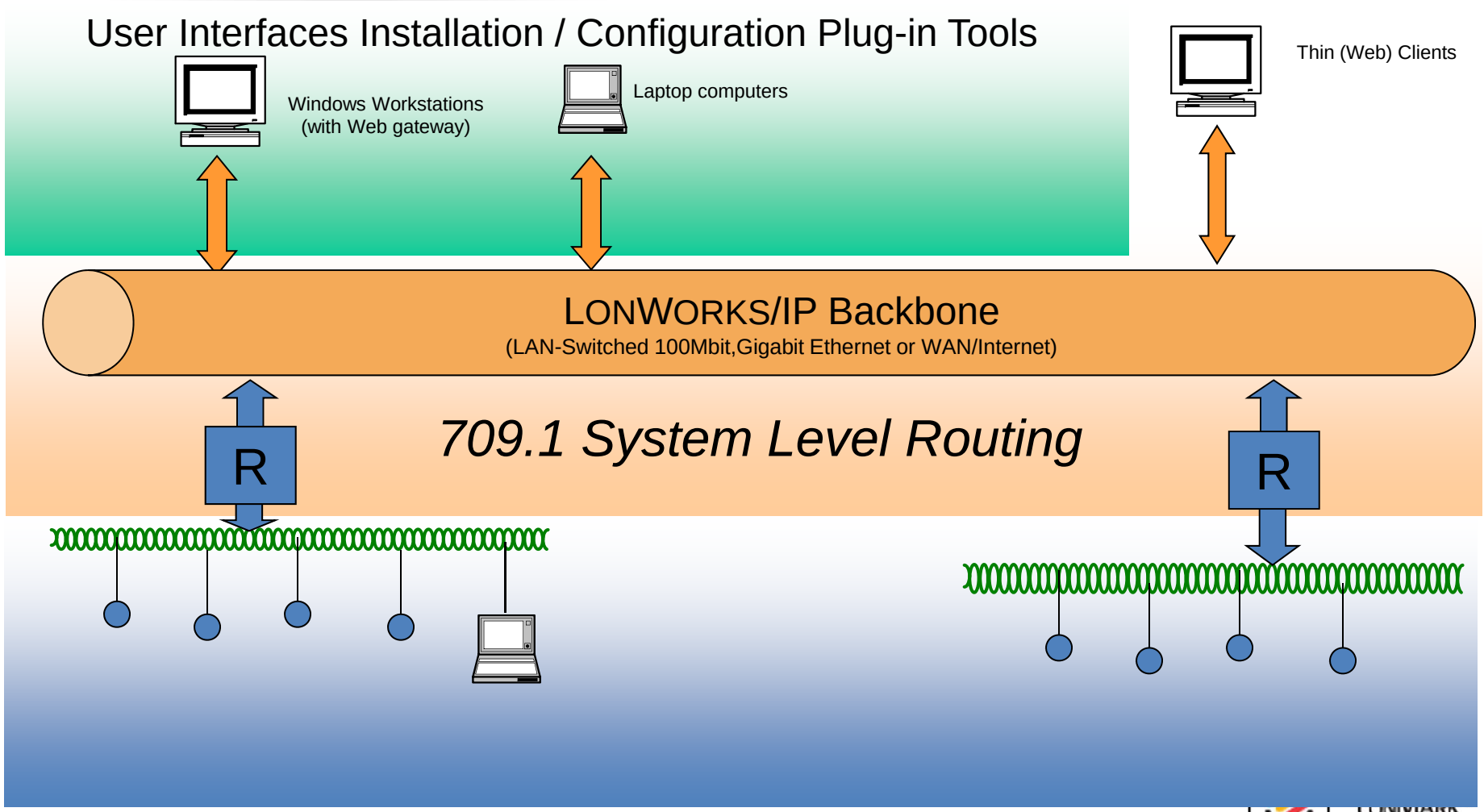


- Standard profile for collecting data in a log
  - Currently if final review by the LONMARK BAS Task Group
- Collect data locally
- Archive data remotely
- View data locally or remotely

LONMARK 709.1 Network Routers



LONMARK Configuration Frameworks



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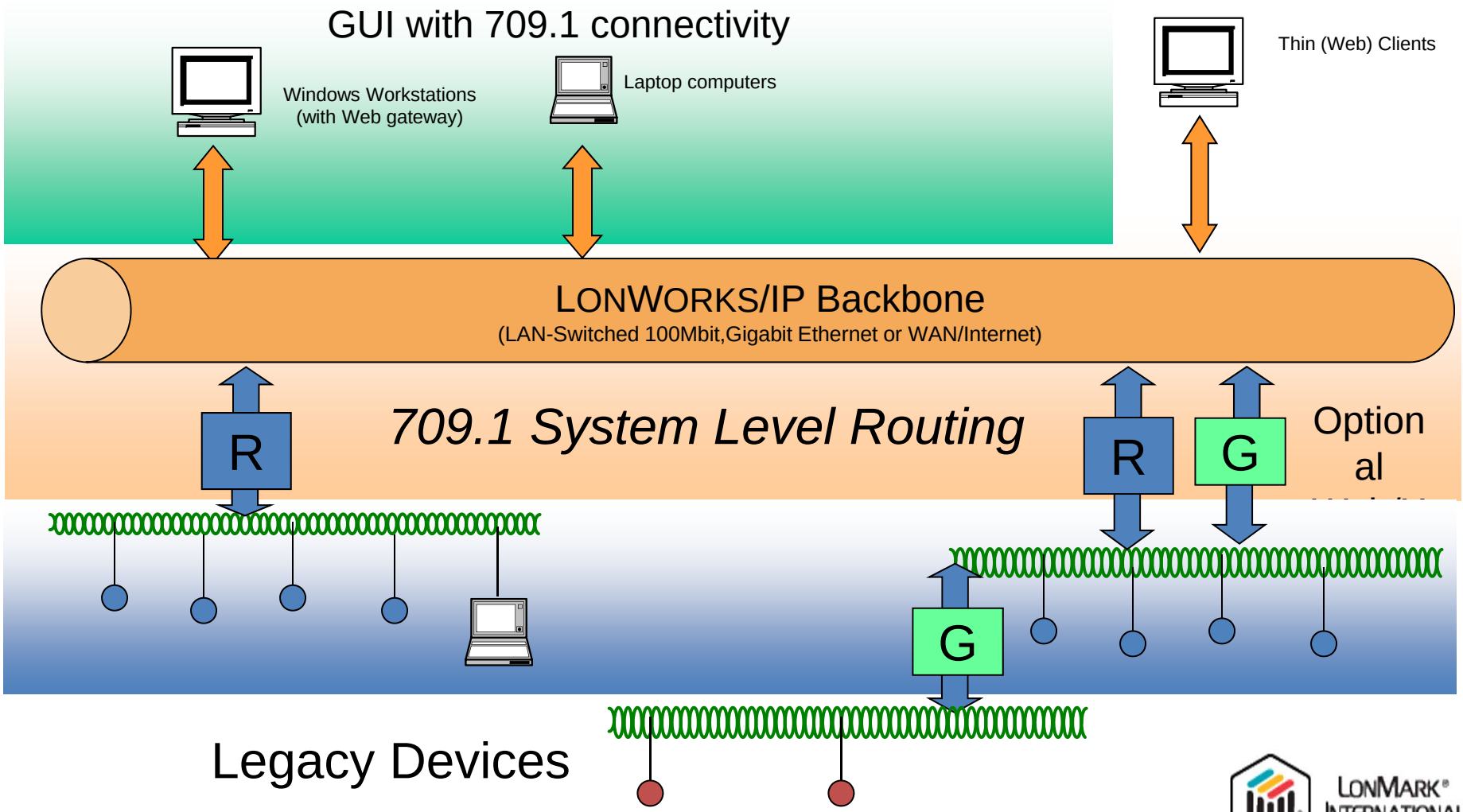
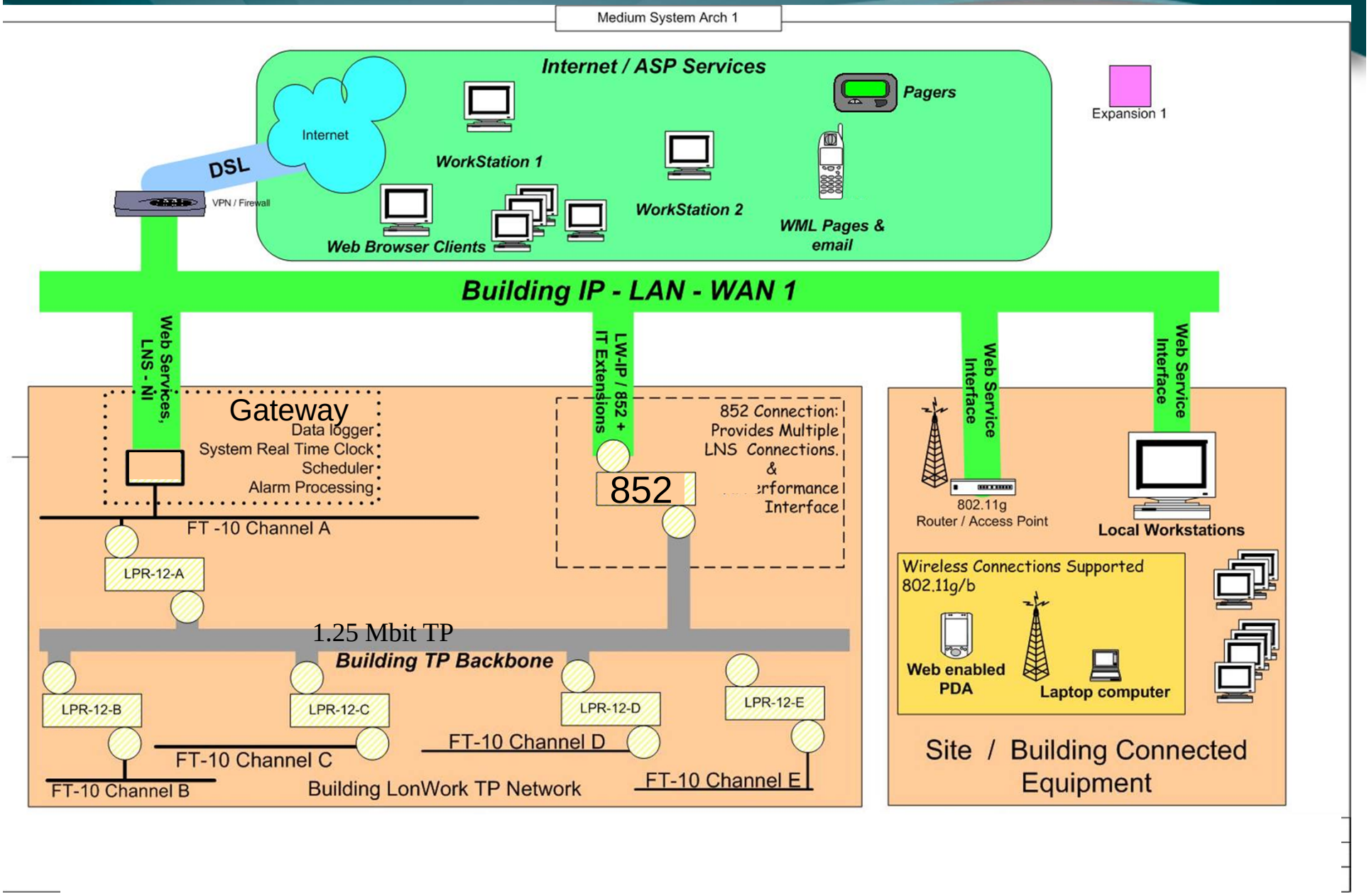
LONMARK System Architecture

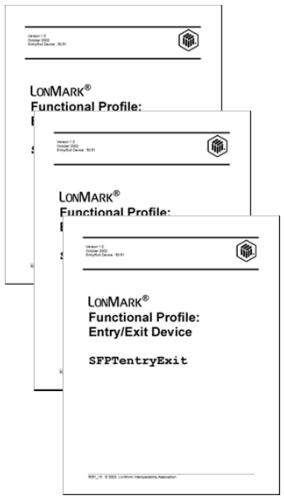


LONMARK Standards
A System Architecture Overview

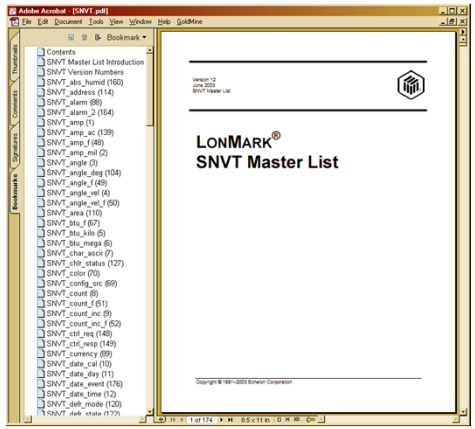


LonMark XML Standards

Functional Profiles into XML

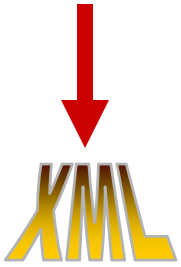


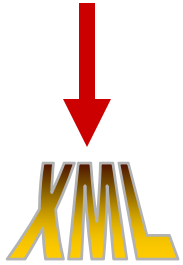
SNVTs and SCPTs into XML

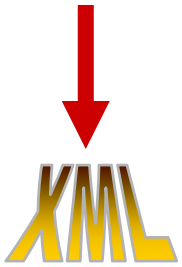


and **XIF Files into XML**

(coming soon)







LONMARK
THE ORGANIZATION

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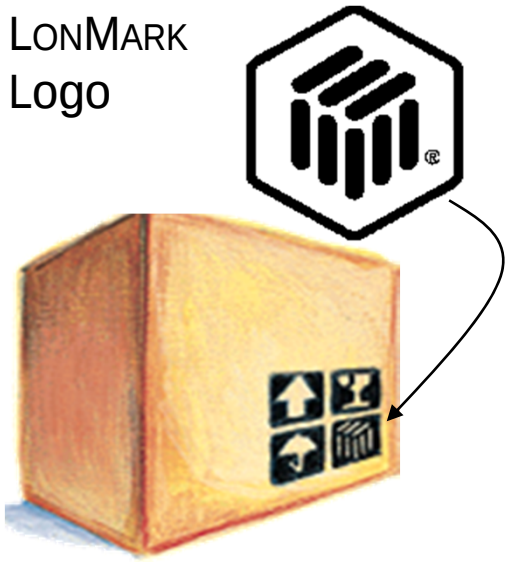
LONMARK Devices Guarantee Interoperability

- LONMARK International
  - Independent Industry Association
  - Established in 1994
  - Task groups focus on specific industry requirements
  - Define device SNVTs, Objects, Profiles, IP connectivity
- What we provide
  - Interoperability design guidelines
  - Product conformance testing
  - Marketing assistance
- LONMARK Stamp of Approval Means Devices Will Interoperate



www.lonmark.org

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LonMark Purpose

- To promote interoperable products and collaborative marketing programs
- To provide a forum to define application-specific design requirements
- To create market demand for open, interoperable systems using LonMark certified products
- To define, develop, and certify truly interoperable products
- To deliver a comprehensive educational programs and professional certification testing program

LonMark® International

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Who is LonMark International?

- Non-Profit Trade Association
- Independent, member supported organization
- Strong LonMark Board of Directors
- Sponsor Companies
  - Honeywell International
  - McDonald's Corporation
  - Philips
  - Schneider
  - Siemens
  - Trane
  - Echelon
  - Distech
- World wide staff support

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LonMark Membership

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Standardization Activities

- LON is an ISO standard: ISO 14908.1
- LON is a China National Standard
- ASHRAE accepted and referenced standard
- Working with CECED (appliances) and IFSF (forecourts) on European standards
- Joint effort with NAFEM on Kitchen Equipment standards
- Working with various governments to create country specific national standards
- Pursuing ISO standardization

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Integrator Testing/Certification Program

- Program to deliver a comprehensive professional testing and certification
  - Certified Professional
  - Certified System Integrator
- Web-based exam
- www.lonmark.org/testing

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LonMark Magazine

- Quarterly magazine
- European Edition
- International Edition
- Self funding through ads
- Great resource of case studies, tech info, applications
- More info: www.lmimagazine.com
- Free subscription

LonMark International

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Activities

- Global
  - Interactive Technology Demonstration with members products in a single integrated system
    - Permanent setup for worldwide access
    - Continuous upgrades, enhancements
    - Take to various trade events
  - Educational/Trade Show events
    - AHR LONMARK Sessions
    - LonCom LONMARK Sessions
    - ISH – (Frankfurt)
    - LIGHTFAIR
    - Connectivity Week
    - Electrical Building Technology Guangzhou (China)

LONMARK® Sessions

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The Future of LonMark

- Development new of LonMark standards
  - LON/IP-852.1 – new enhancements
  - oBIX – XML standards
  - Referenced within standard ASHRAE specification
  - Enhance profiles (data loggers, schedulers, network management tools, diagnostic tools, alarm managers)
- Product Certification
  - Certification of Programmable Controllers
  - Certification of Routers, Interfaces, Gateways
- Professional Certification programs

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Summary

- Demand is growing for open systems
- LONMARK is expanding to meet the market needs
- We are committed to
  - Expanding the market for LONMARK certified products
  - Enhancing the standards as technology advances
  - Providing value for our members
  - Increasing the number of certified products
  - Enhancing the success of our members
- Develop new programs, initiatives, and tools
- Focus on education

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Getting Started

- Where do I go for help?
  - www.lonmark.org
  - www.lonmarkamericas.org
  - www.echelon.com
- Attend training classes
  - Classes are available for anyone on a variety of subjects
- Suggestions for a good Consulting Engineer?
  - Several very knowledgeable engineers are specializing in open systems
- More information?
  - CDs, Brochures, Success Stories, Data Sheets, White Papers
  - Just ask…
- Join the LONMARK organization

Thank You !

- Questions