The Two Tier Specification and the Master Systems Integrator

Overview and History

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Executive Director
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The Purpose of the Spec

- To define the features and functionality of a controls system required to make sure the affected systems (mechanical, lighting, access etc.) function and perform per the engineers intent.
The Value of a Good Spec

- Write the spec to the performance of the system, not the parts and pieces
- Write a spec that various applications of the technology be applied
  - Mechanical, Lighting, Access, Energy, etc.
- Focus on system functionality
- Not on product features, bells and whistles
Basic System Architecture

- Define data flow
  - Peer-to-peer communication
- Define level of IP integration
  - Host workstation interface
- Define common GUI needs
- Define enterprise integration
- Define remote access requirements
- Engineer basic system structure
  - LON – Local Operating Network (control)
  - LAN – Local Area Network (monitor)
  - WAN – Wide Area Network (remote)
Two Tier Specs

- **Tier 1: Building Spec**
  - Field bus, monitoring/control
  - System and cross system functionality
  - Performed by controls contractor (system integrator)
  - Often hired by Mechanical Contractor

- **Tier 2: Enterprise Spec**
  - Integration of multiple building into campus/enterprise
  - IT and GUI integration
  - Facility Master System Integrator
  - Hired direct by owner or by General Contractor

- Provides check and balance
  - Reduces “Lock-in”
  - Encourages fair competitive bidding
  - Provides options for long term service
Architecture – Master System Integrator

Master System Integrator Responsibility

System Integrator Responsibility
A Bit Of History
NASA – Introduced the Concept

- **Scope**
  - Kennedy Space Center - Florida
  - Upgrades to existing control systems – built in the 70s – started in 2002
  - Multi-year, multi-phase project
  - Open bidding process across multiple projects/buildings
  - One Common Front End

- **The Spec**
  - Calls for LNS, LONMARK, and IT connectivity into existing Citect SCADA front end

- **Status**
  - Several projects underway using spec
  - Multiple bidders winning jobs
NYC Schools
Enhanced Concept - Developed 2 Tier Spec

- **Scope**
  - 1200 buildings
  - Upgrades to existing pneumatic systems
- **The Spec – Started in 2002**
  - Has two components
    - Building level
    - Enterprise connectivity
  - Bidders on the buildings cannot bid on the enterprise and vise versa
- **Specs released in January 2004**
  - Multiple buildings bid and won by multiple controls contractors
  - Master Systems Integrator (MSI) contract awarded
Army Corps of Engineers
Broad Adoption Across Multiple Facilities

- Two level specification – Started in 2003
  - Calls for open LONMARK certified devices, LNS® network management and LNS plug-ins for all devices
  - Identifies building and integration requirements in different spec docs
- Released Sept 2004
  - “Tri-Branch” spec - Army, Navy, and Air Force
- CorpsLON enforcement and support
- Spec being used by other government and commercial organizations
Open System Goals

1. **One system.** Multiple buildings with controls installed by multiple vendors are integrated into one system.

2. **One common front-end** that provides users with the capability to interface with all buildings (monitoring, supervisory control, etc.).

3. **One common tool** for network management and device configuration. One common tool for device programming would be great!

4. **No future need for** the original (installing) contractor or any particular device manufacturer. Additions, modifications, and retrofits can be easily (without significant additional cost) made to the system without dependence on the original contractor nor require substantial engineering or other technical development.
Basewide ANSI 709.1B over IP Network (EIA-852) >=100Mbps

BPOC Router

More devices
No more RTRs or RPTRs

One or more servers running:
- LNS Server
- Network Management Tool
- Graphical User Interface (GUI)
- Monitoring and Control Software
- Web Server (optional)

One or more workstation running:
- GUI Clients
- Network Management Tool Clients
- Web Clients (optional)

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UFGS-13801

non-ANSI 709.1 legacy system

RTR=Router
BPOC=Building Point Of Connection
RPTR=Repeater
Circle ○ = node (ANSI-709.1 device)

LONWORKS®
Army Corps of Engineers
UMCS/DDC System
Total Facility Control
The Need for Higher Level Connectivity
Division of Responsibilities

- **Traditional BMS Controls Contractor**
  - Hired by Mechanical/Electrical Contractor
    - Only sees his scope
    - Limited or no integration
- **System Integrator**
  - Performs and or manages all work related to Building Automation Systems
    - Better integration capabilities
- **Master System Integrator**
  - Manages the work at the network level and higher
  - Acts as the owner rep to manage the System Integrators work
  - Long term agreement
  - Applies to larger Multi-Building systems, longer term projects
  - Allows for easier management of multiple vendors
LONMARK Overview Document

- Compilation of all ‘about’ documents
- Available
  - Marketing-in-a-Box CD
  - Information CD
  - Printed copy
  - PDF

http://www.lonmark.org/about/docs/LonMark_Oversreview%20Ver4%20May%202009.pdf
Specs, Tools, and Resources

- **Sample Specifications**
  - LonMark Master System Specification
  - Army Corps Specification
  - Army Corps document library

- **Tools**
  - Sample Point Schedule Template

- **Resources**
  - Product and Services Guide
  - Case Studies
  - Product Database
  - Certified Professional Directory
Additional Resources

- The LonWorks Installation Handbook
- Overview of LonWorks
- LonMark Interoperability Guidelines
- Training and Certification
- www.lonmark.org
Management System Integration (MSI)

LonWorks Based Multi-Vendor Procurement

Sean Kennedy
VP System Integration- Voyant Solutions

Flexible, Cost-Effective Building Automation–IT Integration
(Confidential and Proprietary)
Agenda

• Background
• Benefits of the FMSI Approach
• MSI Solution Utilizing LonWorks
• Why LonWorks?
• Implementing a Multi-Vendor BAS
• BASC requirements
• Issues to Consider
• Case Studies
Background

• Facility managers of multi-building environments (universities, school districts, military bases, restaurants and large office complexes), have had to face unique challenges over the past 30 years in acquiring building automation systems (BAS).

They have had the following choices:

- Single, proprietary vendor systems
- Multiple, proprietary systems (Islands of Automation)
- Multiple, “Open” systems
Background

These options have resulted in:

- Limited, or no choice when it comes to product, service and support
- Locked in maintenance contracts
- Costly additions and expansions
- No common networking tools
- No common interfaces
- No device-level interoperability (information sharing)
Open protocol technology now gives facility managers of multi-building environments the ability to “master plan” a facility-wide control system that provides for a common technology platform, common system interface, and integration of multiple systems, from multiple vendors in a competitive bid environment. The standardization of the Open Systems platform is a critical component of this approach.
Benefits of the MSI Approach

- Competitive initial cost
- Lower life-cycle cost
- Common system platform:
  - One network management tool-set
  - Owner only needs to support one platform
  - Incorporation of new technology quicker and cheaper
- Common system interface throughout
- Direct access to the technology
- Multiple sources (vendors and distributors) for products
Implementing a Multi-Vendor BAS

- Decide on open systems platform (LonWorks). “Why not BACnet or Niagara?”
- Decide on Graphical User Interface System and Architecture
- Determine systems to be automated and controlled (HVAC, Lighting, Card Access, CCTV)
- Determine acceptable manufacturers and specific-allowable product
- Write BAS specification
- Write MSI RFP
Why LonWorks?

- Epitomizes Open System structure and design
- Common Protocol and Database structure (LNS)
- Common Network Management Tool
- Multiple Common user interfaces
- Simplified access to technology
- Thousands of compatible (LonMark) products
- Simple and readily available access to Training
- Distributed intelligence (no hierarchical architecture)
- Functional Profiles supported and regulated (LonMark)
-Supported and standardized Plug-Ins (LNS)
BASC Requirements

• Limit the number of acceptable vendors (3-5) to make on-going support easier
• Require “Flat LonWorks” (no gateways or global controllers)
• Require LNS as a standard for database, system components and software tools
• Require LNS Plug-Ins
• Specify and Require Programming Tool and Training
• Require LonMark certification on products and installer
Issues to Consider

- System-wide Interface should be standardized and supplied by a single vendor
- BAS to be provided on an individual contract (building-by-building) basis by pre-approved vendors (contractors)
- Awarded MSI cannot bid on individual building BASC contracts
- How to approach and implement legacy integration
- Length and terms of MSI contract
- How much on-going maintenance will be provided by in-house facility staff?
- Systems to include in BAS (lighting, metering, card access)
Akron Public Schools- Project Background

Aging building infrastructure- Average building age was over 50 years old.

Funding was secured to replace all 45 schools starting in 2005 and 2015.

Most schools need to be demolished and the new building constructed on the same site.

New buildings must be energy efficient. Total current utilities over $9.2 million.

Total project budget over $1 billion.

25 Buildings completed to date. Over 37,000 data points.
Goals and Results

Maintain “Durable Competitive Environment”

Promote “open systems” at all levels. Make it easy to “change the wallpaper”.

Provide common user interface throughout school system.

Provide global control and functionality. Snow Day Override, Emergency Shut Down, Global Holiday Schedule

Ability for in-house maintenance staff to support system. Common network tool that is easy to use.

Ability to integrate other sub-systems (lighting, metering etc.).

Clear separation between device level and EBMS level

Average system price 20% less than comparable school projects.

All system components open or available from multiple sources.

EBMS across school system

Provided global control and functionality. Snow Day Override, Emergency Shut Down, Global Holiday Schedule

Voyant Intervision Pro provided as common network tool.

OEM Controls, lighting and metering integrated by FMSI (Voyant).

LNS database hand-off is delineation point

Flexible, Cost-Effective Building Automation—IT Integration (Confidential and Proprietary)
Akron Schools FMSI Architecture

Flexible, Cost-Effective Building Automation–IT Integration (Confidential and Proprietary)

School System LAN (VPN)

Echelon i.Lon-100 e4 with routing- Web Services/XML Interface and LOYTEC L-IP (Provided by FMSI (Voyant)

Device Level control provided by the Building Automation System Contractor (BASC) using common LNS tools and LonMark devices.
Quick Serve Restaurant

- 65 sites to date
- 18 month payback
- Single login interface
- Global scheduling, trending, alarming and analytics
- Utilize LonWorks at building level
- Panelize solution
- Local contractors install system
- Voyant integrates using RNI and hosted server
Master System Integrator
New Opportunities and Requirements

John Huston PE
VP Technology Integration
Teng & Associates

May 12, 2011
1:00PM – 2:00PM
Opportunity or Requirement?
Design

- Concept Development
  - Basis of Design

- Design Development
  - Split Specification (NI vs. SI)
    - Two Division 25 Specifications
  - Design Documents

- Construction Administration
  - Submittal Reviews and Site Inspections

- Commissioning
  - Performance Verification Testing
Implementation

- Consistent
  - Installation/Maintenance
  - Sequences of Operation
  - Graphical User Interface
    - Navigation
    - Presentation
    - Scheduling
    - Alarming
    - Trending
Application Integration

- Custom Web Dashboard for Facility Managers
- Asset Management
- Portfolio Management
- Capital Planning
- Project Management
- Maintenance Management
- HAZMAT Inventory Management
- Environmental System Management
Point of Demarcation
Point of Demarcation

System Integrator
Point of Demarcation
Point of Demarcation

Network Integrator

System Integrator