High Performance Buildings
Integrating Intelligent Systems
Into your Business Plan

Moderator
Al Underhill
General Manager
Building Automation
Siemens Building Technologies
Panel

- **John Mathews** – General Manager Simplex Grinnell
- **Chris Hollinger** – Product Manager – Siemens Building Technologies
- **Alan Osz** – Vice President HMA Consulting Inc.
- **Blair McCarry** – Senior Vice President Keen Engineering
- **Gary Vickanes** – 3Si Risk Strategies Inc.
Topics

• Purpose
• What is interoperability?
• The challenge
• Myths & realities
• Conclusions
• Questions
System View: Protocols within building subsystems

Information Technology

- Open Data Exchange
- Internet HTML, HTTP, XML
- Paging
- E-mail

Graphical Control
Information Mgmt
Data Archival
Interoperability
Alarming

- BAS
- HVAC
- Fire/Life Safety
- Security
- Lighting
- Power Measurement
- Process Control

BACnet
LonTalk
Modbus
OPC
Proprietary
BACnet
LonTalk
Modbus
Proprietary
BACnet
Proprietary
BACnet
Modbus
Proprietary
Modbus
LonTalk
BACnet
EIB
Proprietary
Modbus
Proprietary
Modbus
Profibus
OPC
Proprietary
Protocols within building subsystems

- **HVAC**
  - **Chillers**: BACnet, LonTalk, Modbus, Proprietary
  - **Boilers**: Modbus, LonTalk, Proprietary
  - **Air Units**: LonTalk, BACnet, Modbus, Proprietary
Integration - keys to success

- Understand expectations
- Define requirements well
- Document appropriately
- Select a partner that understands your issues – RFQ/RFP
  - open platform
- Communication
  - team work
- Proper commissioning
- Customer training
Questions
HIGH PERFORMANCE BUILDINGS

• There are an immense number of considerations facing building Owners, Developers and Managers today.
• A small number of the considerations are:
  • Cost (Initial Capital Cost, Life Cycle, Maintenance, etc.)
  • Marketability
  • Security and Risk Avoidance
  • Space utilization and flexibility
  • Emergency preparedness
  • Energy costs and green house gas/carbon emissions
  • LEED Certification
  • Mission Critical/ “High Availability” Buildings and Processes
    - Uptime Institute, 2N+1, etc.
HIGH PERFORMANCE BUILDINGS

• There are countless building design considerations and technologies that will influence the performance and success of the building
  • Site selection
  • Needs analysis, scope, scheme design process, etc.
  • Design/Construction issues:
    - Structural construction
    - Curtain Wall construction
    - Mechanical, Electrical, Plumbing design
    - Security Design
    - Low Voltage Building Systems
    - Etc.
## Low Voltage Building Systems

<table>
<thead>
<tr>
<th>BUILDING MANAGEMENT SYSTEM</th>
<th>PAGING AND PUBLIC ADDRESS SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FACILITY MANAGEMENT SYSTEM:</strong></td>
<td><strong>PEDESTRIAN AND VEHICLE TRACKING SYSTEMS:</strong></td>
</tr>
<tr>
<td>Cable Management</td>
<td>Pedestrian Tracking</td>
</tr>
<tr>
<td>Inventory Control</td>
<td>Vehicle License Plate Recognition</td>
</tr>
<tr>
<td>Maintenance Management (Preplanned and emergency repair work order generation, etc.)</td>
<td>Vehicle Brand Recognition</td>
</tr>
<tr>
<td></td>
<td>Vehicle Tracking Systems</td>
</tr>
<tr>
<td><strong>PARKING CONTROL AND MONITORING SYSTEMS:</strong></td>
<td><strong>HVAC STAND-ALONE MONITORING AND CONTROL SYSTEMS:</strong></td>
</tr>
<tr>
<td>Access Control and Monitoring System</td>
<td>Chillers</td>
</tr>
<tr>
<td>Revenue Collection Systems (Ticket Spitters, Parking Booths, Pay Stations, Etc.)</td>
<td>Packaged A/C units</td>
</tr>
<tr>
<td>Traffic Control/Signage Systems</td>
<td>Packaged Roof-Top Units</td>
</tr>
<tr>
<td>Valet Parking System</td>
<td>Chemical Treatment Systems</td>
</tr>
<tr>
<td>Car Wash Fees</td>
<td>Pressurization and Make-Up Units</td>
</tr>
<tr>
<td><strong>VOICE AND DATA SYSTEMS:</strong></td>
<td><strong>ELECTRICAL MONITORING AND CONTROL SYSTEMS:</strong></td>
</tr>
<tr>
<td>PABX</td>
<td>Metering Systems</td>
</tr>
<tr>
<td>Internet</td>
<td>Generator/Breaker Monitoring And Control Systems</td>
</tr>
<tr>
<td>Tenant Networks</td>
<td>Power Distribution Units</td>
</tr>
<tr>
<td>Cabling Infrastructure</td>
<td>Uninterruptible Power Supplies</td>
</tr>
<tr>
<td><strong>POINT OF SALE SYSTEM</strong></td>
<td><strong>FIRE DETECTION, ALARM AND CONTROL SYSTEMS</strong></td>
</tr>
<tr>
<td><strong>TRANSPORTATION SYSTEMS:</strong></td>
<td><strong>BUILDING INTEGRATED SECURITY SYSTEMS:</strong></td>
</tr>
<tr>
<td>Vertical Transportation</td>
<td>Access Control, Monitoring and Badging Systems</td>
</tr>
<tr>
<td>Horizontal Transportation</td>
<td>Voice Intercom Systems</td>
</tr>
<tr>
<td></td>
<td>CCTV and Digital Image Storage Systems</td>
</tr>
</tbody>
</table>

Buildex 2005 Vancouver
INTELLIGENT BUILDINGS - THE CHANGING DEFINITION

“AN INTELLIGENT BUILDING IS ONE THAT COMBINES INNOVATIONS, TECHNOLOGICAL OR NOT, WITH SKILLFUL MANAGEMENT TO MAXIMISE RETURN ON INVESTMENT”
TORONTO SYMPOSIUM ON INTELLIGENT BUILDINGS - 1985

“AN INTELLIGENT BUILDING IS ONE THAT PROVIDES A PRODUCTIVE AND COST EFFECTIVE ENVIRONMENT THROUGH OPTIMISATION OF ITS FOUR BASIC ELEMENTS: STRUCTURE - SYSTEMS - SERVICES - MANAGEMENT

AND THE INTERRELATIONSHIPS BETWEEN THEM. INTELLIGENT BUILDINGS HELP OWNERS, PROPERTY MANAGERS AND TENANTS REALISE THEIR GOALS IN THE AREAS OF COST, COMFORT, CONVENIENCE, SAFETY, LONG-TERM FLEXIBILITY AND MARKETABILITY.”
INTELLIGENT BUILDING INSTITUTE, WASHINGTON, DC - CA 1990

“AN INTELLIGENT BUILDING IS ONE THAT MAXIMISES THE EFFICIENCY OF ITS OCCUPANTS WHILE AT THE SAME TIME ALLOWING EFFECTIVE MANAGEMENT OF RESOURCES WITH MINIMUM LIFE TIME COSTS”
EUROPEAN INTELLIGENT BUILDINGS GROUP - CA 1990

“AN INTELLIGENT BUILDING IS A BUILDING AND ITS INFRASTRUCTURE THAT PROVIDES THE OWNER, OPERATOR AND OCCUPANT WITH AN ENVIRONMENT THAT IS FLEXIBLE, EFFECTIVE, COMFORTABLE AND SECURE THROUGH THE USE OF INTEGRATED TECHNOLOGICAL BUILDING SYSTEMS, COMMUNICATIONS AND CONTROLS.”
CABA TECHNOLOGY ROADMAP (TRM) FOR INTELLIGENT BUILDINGS TECHNOLOGIES - 2002
Low Voltage Building Systems

• Some Key Terms
  • Integration:
    - “The coming together of two or more disparate disciplines or technologies.”¹
  • Interoperability
    - “The ability of software and hardware on different machines from different vendors to share data.”¹
  • Open Architecture
    - “allows the system to be connected easily to devices and programs made by other manufacturers. Open architectures use off-the-shelf components and conform to approved standards.”¹
  • Convergence
    - “The coming together of two or more disparate disciplines or technologies.”¹

¹ – www.webopedia.com
Low Voltage Building Systems

• (cont’d)
  • Web Services
    - “standardized way of integrating Web-based applications using the XML, SOAP, WSDL and UDDI open standards over an Internet protocol backbone. XML is used to tag the data, SOAP is used to transfer the data, WSDL is used for describing the services available and UDDI is used for listing what services are available. Used primarily as a means for businesses to communicate with each other and with clients, Web services allow organizations to communicate data without intimate knowledge of each other's IT systems behind the firewall.”
    - “The applications interface, not the users.”

1 – www.webopedia.com
Low Voltage Building Systems

• Integration
  • Allows data transfer between systems/equipment.
  • Relatively commonplace and today the implementation is less painful
  • Allows data communication between BMS and equipment/systems such as:
    - Refrigeration machines
    - Lighting controls systems
    - Emergency Generator Systems
    - Variable Speed Drives
    - Etc.
  • Allows integration of various security subsystems:
    - Access control
    - Voice Communications
    - CCTV and DVR systems
    - Pedestrian counting systems
Low Voltage Building Systems

• Interoperability
  • Generally considered as capabilities that allow products of multiple vendors/manufacturers to operate in a cohesive manner.
  • Far more complicated design and implementation issues
  • Industry standards organizations and manufacturer efforts have recently resulted in significant advances in this area
  • Typical applications include:
    - Multiple BMS manufacturer devices on one system
    - Multiple buildings administrated from single user interface/GUI.
    - BMS interface with FIDS, lighting controls, etc.
    - Access control interoperability with BMS
• Industry work in this area is by no means complete, there is considerable outstanding work in this area
Low Voltage Building Systems

• Open Architecture
  • The “Holy Grail”, so to speak
  • True “plug and play” functionality
  • Common interface between Humane User Interface and multiple, disparate systems and equipment
    - Single manufacturer GUI
    - Web based interface
      - Web Services, network appliances, etc.
• Industry standards organizations and manufacturer efforts have recently resulted in significant advances in this area
• Typical applications include:
  - Corporate enterprise/WAN connectivity to remote buildings
  - Multiple buildings administrated from single user interface/GUI.
  - Lighting, security, fire and life safety, etc. systems “plug and play”
• Industry work in this area is by no means complete, there is considerable outstanding work in this area
Low Voltage Building Systems

• Convergence
  • A great deal of industry activity in the “convergence” of building systems with the corporate IT infrastructure
  • Technology advances and equipment development is happening at incredible speed
  • Application of structured cable plant to accommodate all low voltage building systems
  • Intention is to leverage IT cable plant infrastructure and make building systems data available as IT friendly data
• Some typical applications:
  - BMS and access control systems developed using “COTS” components, embedded OS, network appliances, etc.
  - I/P addressable CCTV cameras
Low Voltage Building Systems

• Convergence
  • BMS and access control systems manufacturers are now using IT terminology when referring to what has typically been industry proprietary equipment. Terms such as:
    - “Edge Devices” – Thin, Thick
    - “COTS” components
    - Network appliances
Low Voltage Building Systems

- Web Services
- This area of development will use the benefits of the previously listed technology developments
- Will potentially have the most significant and beneficial impact to building Owners, Developers and Managers
- There are numerous industry related initiatives working to develop industry related standards (e.g. OBIX).
- Some benefits and applications already make use of the technology
- Applications could typically include data sharing between:
  - BMS and ACMS
  - BMS, electrical and utility metering, and real time energy/utility purchase
  - BMS and Facility Management Systems
  - BMS and process control applications
  - Space reservation and utilization scheduling
Recent Real World Implementations

- Banking Centre, High Availability/Mission Critical
  - Tier IV, 2N+1 Redundancy
  - Dual Ethernet primary communication network paths
  - Dual fault tolerant, automatic hot swap communications control panels
  - A and B source electrical power with matching A and B source secondary controllers
  - IT class dual CPU, server equipment with RAID 5 memory redundancy
  - Integration with:
    - PDU’s
    - CRAC’s
    - UPS and battery monitoring
    - Emergency Generators
    - ASCO electrical switchgear
    - Diesel and Domestic Water Storage and Control
    - Lighting Control System
    - FDACS
- Complicated and sophisticated sequences of operation based on building normal vs. emergency operation
Recent Real World Implementations

• Integrated Security Systems
  • Integration between the Access Control and Monitoring System and various subsystems including:
    - CCTV matrix switcher
    - CCTV DVR
    - Security Voice Communications System
    - 2 Way voice communications recording system
    - Pedestrian Counting System
    - Vehicle License Plate Recognition System
    - Point of sale equipment
• Typically security related integration is achieved through API’s and SDK’s between proprietary systems
Recent Real World Implementations

• Several BMS Interoperability Feasibility Studies, Master Plans and Design Guideline Documents
New Developments

• Security Access Control Product announcement.
• Will facilitate central station monitoring and administration of building access control and alarm monitoring through “open” structured panel equipment.
• Potentially the equipment is not proprietary to the central station service and could be utilized by other central station service providers.
Implementation Considerations

• Very little integration and interoperability is truly “plug and play”
• Integration between two systems should result in the exchange of information that aids in the operations of the facility.
• There should be a perceived benefit for interaction between building systems.
• If at all possible, you should strive to solve your integration needs with standards based architectures and protocols
• If this can’t be easily sourced for your solutions, use open protocols
• Minimize, at all costs, the use of custom programming and configuration, mapping, etc.
Implementation Considerations

- In some respects the competitively tendered building construction industry is not suited to complex integration projects.
- Specify the requirement for integrated operation demonstrations during the project construction prior to installation on site.
- Clearly identify the parties responsibilities related to integration between systems.
- Limit responsibility to lowest number of parties.
- Document and manage the revision level and firmware upgrade process for all integrated software/databases.
- Consideration must be given to which party will “own” the system equipment on converged networks, who’s budget manages the servers, network administration, etc.
Implementation Considerations

- What is the service model for the building
  - Single building location, Owner occupied, managed and operated?
  - Multiple buildings distributed on a single campus, managed, maintained and monitored controlled in house?
  - Multiple buildings with separate service contracts?
  - Security and reliability issues should be considered carefully for integrated and “converged” systems
  - Commissioning services