Integrated Building Solutions

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Agenda

- What is Integration
- Traditional Approach
- Integrated Approach
- Market Philosophy
- Case Studies
- Understanding how Integration Creates Value
- Complete Building Solutions
- Putting the Pieces Together
- How Can We Help
What does TAC mean by Integration

- Integration has many interpretations
- Our ideal is
  - A combination of multiple systems from different building control disciplines
  - A single user interface
  - All configuration and operator tools contained in a single package
  - A single install
  - Share as much common network as possible
  - Systems that share data and interact with each other
  - Use open interoperable solutions when available
  - Offer as many variations and standards as practical
  - Ensure the end user perceives a single system
Traditional Approach

- Systems implemented separately, by separate vendors
  - HVAC, Lighting, Security, VFDs, Electrical Distribution, Power Monitoring, Power Quality, etc.

- Systems operate and are maintained separately
  - Little communication or coordination

- Result
  - Multiple interfaces, vendors and service providers
  - Uncoordinated system behavior
  - System incompatibilities
  - Operational inefficiencies
  - Limited energy savings
  - Missed opportunities
Integrated Approach

- Integrating building systems
- Mixture of gateways and open protocols
  - Link multiple systems together
- Benefits currently recognized by facility engineers*
  - Control of multiple systems from a single interface
  - Labor cost savings/productivity gains
  - Enhanced operations
  - Reduced need for training
  - Better understanding of all facility operations
  - Improved reporting
  - Realized energy cost savings
  - Improved comfort

* Building Operating Management Survey
Further Benefits

- Systems implemented separately, by separate vendors
  - Benefits of this Traditional Approach
    - Spread risk
    - Systems can be class leading
    - Access to larger number of personnel (more vendors)

- Systems implemented by integration/project management vendors
  - Benefits of this Integrated Approach
    - No conflict between vendors, less finger pointing
    - Single point of contact
    - Faster problem resolution

- Systems operated and maintained in separately
  - Benefits of this Traditional Approach
    - Segregation increases security
    - Reduce risk of failure, smaller pieces

- Systems operated and maintained integrated
  - Benefits of this Integrated Approach
    - Changes and updates accommodated by all systems
    - Ability for systems to interact to improve performance
    - Reduced training, lower cost of ownership
Multi Vendor Integrated Approach
An Opportunity to Improve

- Integrated System Approach Common Obstacles
  - Inconsistencies between systems and vendors
  - Customized interfaces/gateways between vendors
    - Higher engineering and installation costs
    - Incompatibility between new versions
    - “Finger-pointing” when things go wrong
  - Rarely are all building subsystems integrated
    - Reduces overall effectiveness and ease of use
Single Vendor Integrated Approach
An Opportunity to Improve

- Integrated System Opportunities
  - Reduce vendors to reduce management cost
  - Work with specialists
    - Integration and Project Management companies
  - Bring them in early to aid design
  - Fewer customized interfaces/gateways
    - Lower engineering and installation costs
    - Incompatibility issues with new versions reduced
    - Clear owner of problems
  - More building subsystems integrated
    - Increased integration = Increased opportunity
Our Market Philosophy
Openness Facilitates Integration

Environmental Access

Video

Access Control

Shared Resources

System Cost

Network Installation
Network Management
Embedded Hardware
Sensors
Actuators

Client Devices
User Interface
Understanding Costs

Development Period

- Concept: 2%
- Design: 23%
- Construct: 75%

25-30 years

Operating Period

Maintain & Operate: 75%
The ‘Customer for Life’ Value Chain

- Risk management
- High productivity
- Financing options
- Management information
- Rapid response to problems
- Performance guarantees
- Operational efficiency
- High system availability
- Minimum disruption
- Efficient energy usage
- Safe and secure
- Flexible configuration
- Help and assistance

Construction

25 year life of the building

The 'Customer for Life' Value Chain
Customers for Life
Why do Customers Integrate?
Genzyme Center - Cambridge, MA
Introduction to Genzyme

- Global Biotechnology Company
  - 8,200 employees; 30 countries
- The largest LEED Platinum building in the world (LEED = Leadership in Energy and Environmental Design; www.usgbc.org)
- Objective: Create a building that reflected Genzyme’s innovative vision
  - Aesthetically pleasing
  - Environmentally responsible
  - Energy efficient
- “Built for people”
Genzyme Center BMS Integration

- Utilities
  - Water, Electricity, Steam
- Control
  - Hot Water, Chilled Water
  - Two AHUs, Makeup Air Units
  - 480 FCUs, Liebert Cooling Units
- Monitor results
  - Supply air & room temperature
  - supply/exhaust air RH
  - AHU supply air pressure/flow rate
  - Building CO₂ levels

- Integration and Saving Initiatives
  - On/Off Lighting in Hallways and Common Areas
  - Variable Office Lighting
    - Lighting modulates based on outside light level
    - Manual Override; returns to automatic after 60 minutes
  - Life/Safety Equipment
    - Monitor Fire Alarms; monitor/test fan operation
  - Monitor Other Equipment
    - Heliostats, kitchen refrigerators
    - Liebert Coolers in Data Center
  - Separate Security system
    - Card Access, CCTV monitoring
Benefits of Integration

- Smart Sensor Interface
  - Room Temperature Set point
  - Light Level Override
  - Occupancy Override
- Simplifies Display of Information
- Better Equipment Control
- Water conservation reduces potable water usage

Green roof reduces storm water and heat island
Results

- Green Design, supported by integrated systems
  - Reduced projected overall energy costs by 42%
- Conservation reduces potable water usage by 32%
- Increase in Employee Productivity and Satisfaction
  - Employee Survey comparing old building with Genzyme Center
    - 74% believe Genzyme to be more supportive of their work
    - 58% report they are more productive
    - 73% attribute lighting control to increased productivity
    - 88% report improved well-being due to connections with nature (views, gardens, outdoor air, etc)
  - Sick Time decreased
Established 1920
29th University in the UK
One four original Colleges of the University of Wales
Located overlooking the Gower Peninsula
Research led University
12,000 Students
500 Undergraduate and 150 Postgraduate courses
American Studies - Zoology
Voted #1 in UK Student Satisfaction Survey
Background

- **HVAC Systems**
  - Obsolete HVAC control systems
  - ‘Stand alone’ systems
  - Various manufacturers equipment
  - Differing protocols
  - No overall controls philosophy
  - No remote access to information

- **Condition Survey**
  - £25M investment required
  - Potential 20% reduction in energy
  - 30% reduction in emissions
Impact

- Increasing energy consumption
  - 5% per annum
  - 380 kWh per m²
- High Emissions Level
  - 107 kg per m²
- Variable Internal Environment
  - Temperature/Humidity
  - Air Quality
  - Lighting
- Increasing Costs
  - 200% Increase in 5 years
  - £3.4M per annum
Constraints

- Limited Available Capital
  - £1.2M per annum

- Occupied Buildings
  - Disruption to core activities
    - Teaching
    - Research
Existing Implementation

- Existing HVAC control Systems
  - Full engineering functionality
  - Common fault alarms

- Fire Detection Systems
  - Full integration on addressable systems
  - Alarm integration on older systems

- Security Systems
  - Full integration Access Control systems
  - TAC I/NET

- Total Points Connected
  - 46,500
Benefits of Integration

- Reduced costs
- Single front end access
- Interconnectivity of systems
- Improved maintenance regime
- Future Opportunities
Common Presentation System

Fire System

Security System

Drill Down Menu’s
Latest Project
Institute of Life Sciences

- £10M Medical Research Facility
- Completion March 2007
- Geo-thermal heating & cooling – supplemented by the CHP plant
- High security levels
- Fully integrated systems
  - TAC Vista
Future Projects

- Replacement of HVAC control Systems
  - Full integration capabilities
  - Additional Zoning

- Integration of Further Security System Components
  - CCTV
  - Intruder alarm systems

- Replacement Fire Detection Systems
  - Full integration

- Integration of other systems
  - Lifts
  - Lighting Controls
Partnerships are Key

- Understanding each others business/culture
  - Education
  - Research
- Mutual Trust
- Long Term Contracts
- Open Book accounting
- Profitable
- Shared project goals
- Shared Risks
- Innovative
- Challenging
- Fun
Converged Building Technologies Group

- 8 Floor Office building
- 13,500sqm - 1500 people
- 2600 point BMS
- 400 fire devices
- 42 Cameras
- 46 Access control readers
- 15 Intruder Alarm points
- Independent Design Review
- In-depth Capex and 30 year Life cycle cost review

Capex Savings – 24%
Opex Reduction- 30%

CBTG: TAC, Molex, Hurley Palmer Flat & ADT. Audited by Turner & Townsend
Integration Cuts Bottom Line

- Independent case study (Unnamed Building)
  - 145,313 square-foot office building
  - 1,500 occupants
  - Costing the traditional approach, versus a fully integrated solution
  - The systems integrated were
    - Structured Cabling
    - Fire and Security
    - Lighting Controls
    - Building Controls
    - Metering and Monitoring
  - Cost-savings were significant
    - Over 24 percent
  - Findings show broad range of commercial and technical benefits
    - Single point of contact
    - Efficient project hierarchy
    - Easier equipment deployment
    - Future proofing.

- SOURCE: STRATEGIC ICT CONSULTING, APRIL 2005
Manchester Royal Infirmary

Application
- Redevelopment of 5 outdated buildings
- 30 Theatres
- 3,600 space car park (largest in Europe)
- 1600+ Beds Facility

Challenge
- 11,000 Point BMS System
- Energy management
- Integrate several different systems
- The ability to grow and develop
- To provide a safe, secure and comfortable environment for staff, patients and visitors

Solution
- Fully networked integrated solution including:
  - Integral digital CCTV recording
  - Vista BMS
  - I/NET Seven access Control
  - LON based intruder
  - Baby tagging and Panic alarms
  - Fire

Benefits of an Integrated Solution
- Reduce operator workload
- Improved visibility
- Reduce maintenance cost
- Improved availability of mission critical facility e.g. operating theatres
Understanding how Integration creates value
“An intelligent building is one that provides a productive and cost effective environment through optimization of its four basic elements and the interrelationships between them” IB Institute
The Case for Integration

Drivers for the Integrated Environment

- Improved reporting
- Better comfort
- Savings on running costs
- More productive staff
- Innovative technology
- Interoperability
- Easy to use systems

Building Systems
- Asset Management
- Security Control
- M&E Control
- Access Control
- Lift Control
- Fire Engineering
- Lighting Control
- Energy Metering
- Billing

IT Services
- Local Area network
- Telephone System
- Audio Visual
- Computers
- Television
- Radio Paging
- Wireless Systems
- Video
- Conferencing
Key Drivers for Integration

- Security and CCTV
- Access Control
- Matriculation
- Catering and Vending
- Information Services
- Energy metering and billing
- Reports
- Maintenance
- Lighting and Power
- HVAC control and monitoring
- Fire and Safety

COST

SERVICE

REVENUE
Traditional Approach to Integration
Desired Approach to Integration

Central Database

Open Systems Interface

Voice & Data

TMR

Open Systems Interface

BHS

FIDS/CUTE

BMS

MET

OPEN SYSTEMS STANDARD INTERFACE

Security
Users Want Systems to be!

- Simple & seamless
- Easy to use
- Easy to maintain
- Easy to change/upgrade
**Complete Building Solutions**
For All Phases of your Facility

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Single Source Solutions throughout the Facility Life Cycle

Fire and Life Safety
Complete Building Solutions: Design & Installation Benefits

- **Single Account Team**
  - Reduces administrative costs
  - Increases communication and coordination
  - Provides shorter lead times for design, deployment and test
  - Facilitates standardization
    - Installation and material
    - Implementation strategy
  - Improves quality control

Changes made during construction can increase design costs by 30% and total project cost by 10%
Complete Building Solutions: Design & Installation Benefits

- **Lower infrastructure costs**
  - Structured/shared cabling
  - Shared system equipment optimize use

- **Lower installation costs**
  - Factory packaging simplifies installation
  - Reduced installation labor
  - Reduced multiple levels of contractor markup

**Typical Turnkey Project Profile**

- **Installation** 40%
- **Engineering and Commission** 20%
- **Hardware & Equipment** 20%
- **Control Systems** 10%
- **Warranty** 2%
- **Profit** 8%

**Save 3 – 5%**

**Save 5%**

**Save 15 – 25%**

**Save 5%**
Complete Building Solutions: Operation & Maintenance Benefits

- Maximum system coordination
  - Improves system operation and reliability
  - Improves security and reliability
  - Facilitates standardization across multiple facilities

- Lower operating costs
  - Single interface reduces complexity, easier to train
  - Centralized management and reporting provides efficient use of maintenance staff
  - Maximizes network bandwidth and usage
Complete Building Solutions: Operation & Maintenance Benefits

- Maximum energy savings
  - Energy management and control systems
  - Demand controlled ventilation
  - Lighting

- Single Source for service.
  - Increases response time
  - Removes need for multiple service agreements and providers

Coordinated behavior across systems maximizes energy efficiency
Complete Building Solutions: Upgrade & Retrofit Benefits

- Single Source team to evaluate performance of all building systems and recommend enhancements and upgrades.
- Common upgrade strategy
  - Reduces compatibility issues
  - Faster implementation time reduces labor and downtime
- Structured cabling continues to save costs, up to 20% for retrofits *
- Many of same benefits as realized in initial design and installation

* HPAC Engineering, April, 2000
Study Results – Integration Improves Your Bottom Line

- Converged Building Technologies Group, April 2005
  - Lifecycle analysis examines operating and maintenance costs of over 30 years
  - **36% reduction** in average cost per square foot operating and maintenance cost
    - Savings derived from reduced energy usage, reduced labor, faster maintenance and upgrades, and less downtime

- CABA and Reed Construction Data – August 2005
  - Survey of 22 buildings with varying degrees of integrated systems.
  - Results show up to a **10 year cost savings of $11.47/SF**
    - Installation Savings - Shared network and components
    - Operational Savings
      1. Direct Savings due to Energy Conservation
      2. Reduced Labor Maintenance Costs
      3. Avoidance of certain periodic expenses such as wasted maintenance time and dissatisfied tenants/occupants
TAC and Schneider Electric Provide Complete Building Solutions

- Electrical Distribution and Management
- Power Management and Monitoring
- Power Quality Correction and Availability
- Lighting Control
- Variable Frequency Drives
- Security and Digital Video Management
- Building Automation
Integrated Security Solutions

- Powerful, reliable security solutions from TAC
  - Integrated Digital Video Management Systems from Integral Technologies
  - Integrated HVAC/Building Management

- Access Control
- Intrusion Detection
- Fire and Life Safety integration
  - Fire system information reporting
  - Exit door control and elevator restriction
  - Muster reporting
Building Automation Solutions

- Next Generation building solutions from TAC
  - Leverage the best in technology and open systems
    - LonWorks, BACnet and industry-standard interfaces (Modbus, OPC, ODBC)
    - SQL databases for an Open Database architecture
    - IT friendly
    - Internet connectivity for *anytime, anywhere* access
    - Secure Data Access and Integrity (CFR Part 11 compliance)

Building automation is much more than HVAC ... it is the key to pulling all the building systems together.
Building Automation Pulls All the Pieces Together

- One single interface into all building systems
  - Reduce complexity and training
- Manage all facilities – one building, multi-campus, and remote sites – from one computer
- Manage from a variety of devices: *anytime, anywhere*
  - PCs, web pages, touch screens
  - PDAs, cell phones, pagers....
TAC Has the Experience

- World's leading resource for next-generation integrated systems
  - 2006 Projected Revenue: $1.3 billion US
  - Employees: 4500
  - 80 years experience
  - Global installation and services in over 80 countries in 3 regions
    - Americas HQ: Dallas
    - Europe HQ: Malmö
    - Asia-Pacific HQ: Sydney