Automated Facility Energy Management

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AdvanTek

STRATEGY

Fully Integrated,
Multiple Facility,
Building Automation System

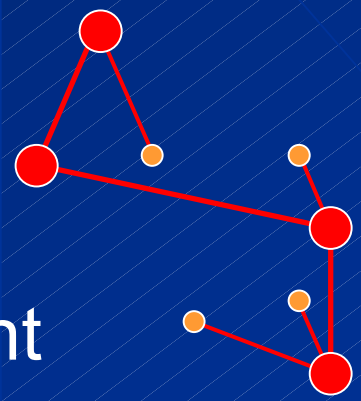
- **Personal Comfort**
- **Energy Efficiency**
- **Reduced Expenses**

VISION

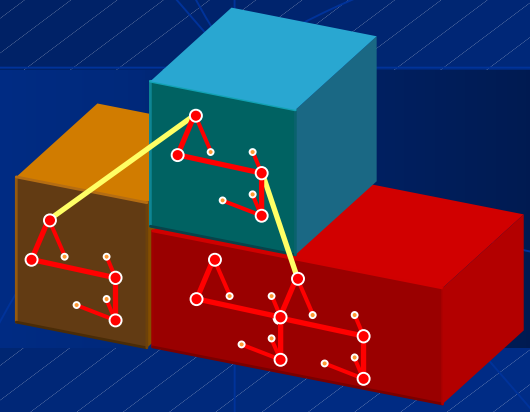
Clusters of buildings aggregated and managed as a *Single Facility*,

by an intelligent computer network that optimizes comfort and energy costs in response to occupant needs, equipment performance, and energy price signals;

and alerts and debriefs O&M personnel whenever intervention would be beneficial.



BENEFITS



- Extended energy manager reach and influence
- Reduced energy consumption and costs
- Lower power demand and charges
- Aggregated energy purchasing power
- Minimally invasive emergency response
- Improved indoor environmental quality
- Increased productivity of facilities staff

Today's Situation

- Commissioning rarely happens
- Building design doesn't match actual usage
- Run-to-failure prevails
- Service life is severely compromised
- Energy is wasted throughout the reduced system life

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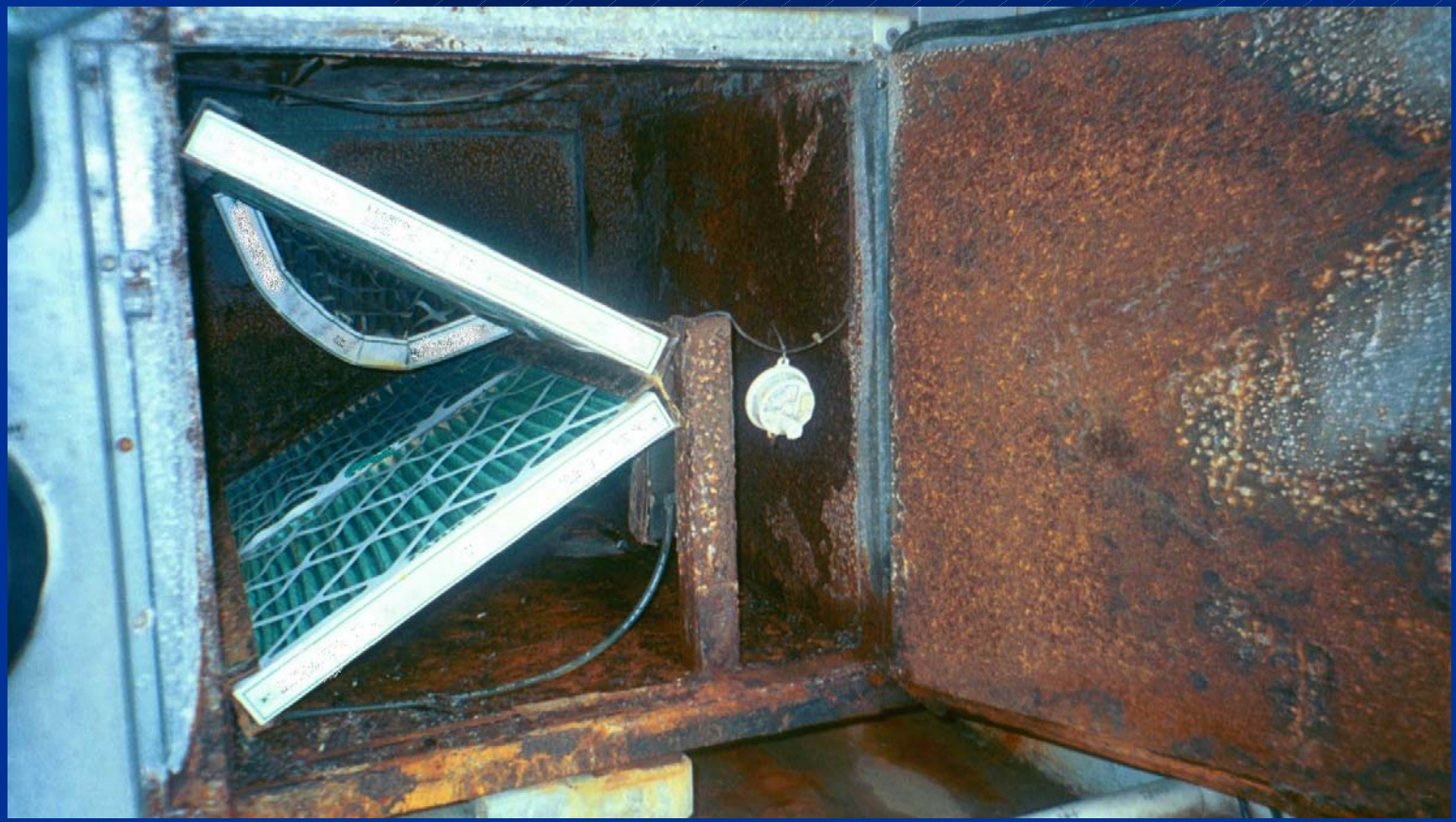

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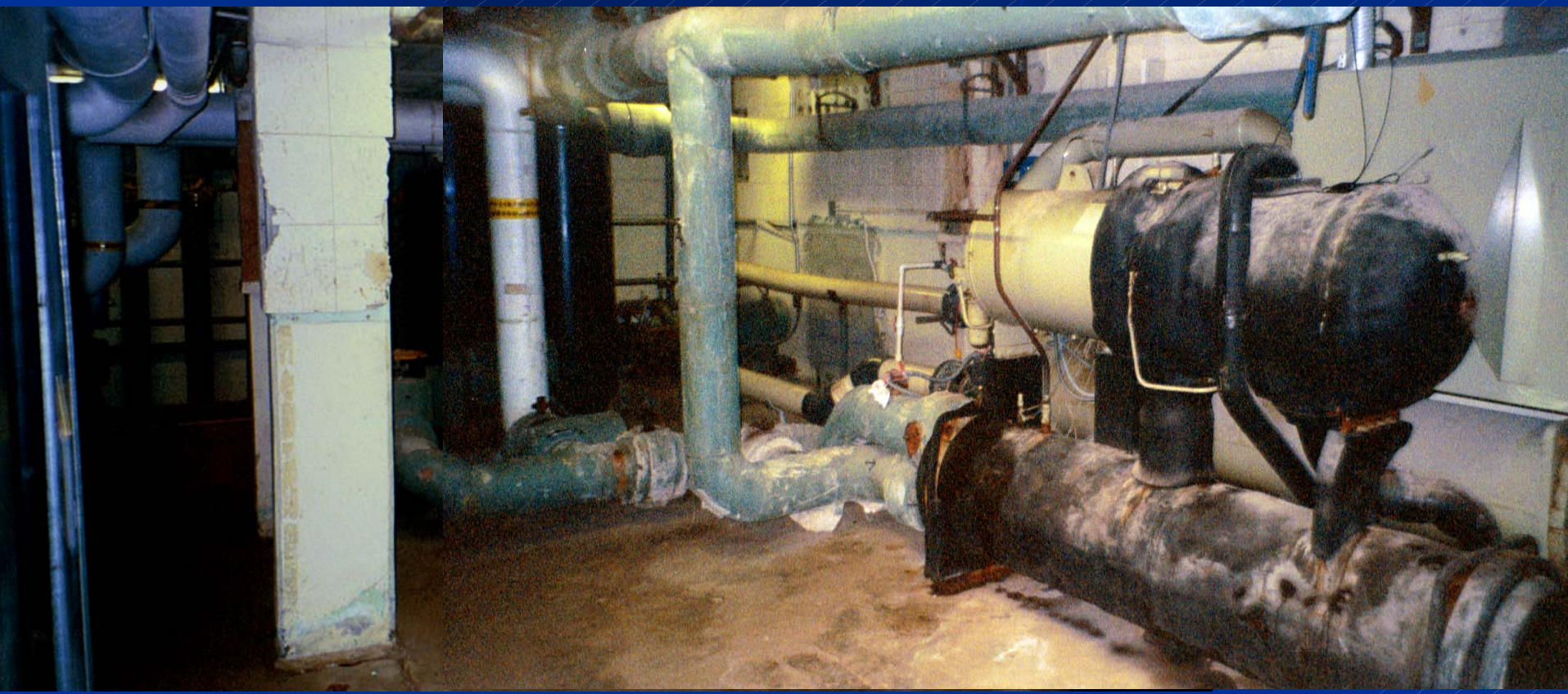

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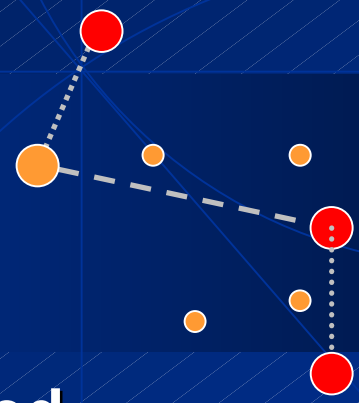

Most buildings are essentially unsupervised

- Energy Management functions are limited by distances
- Problems go undetected until failure occurs
  - "Emergency" O&M is the normal modus operandi
  - Cannot curtail loads or defuse power emergencies
  - Power quality is not monitored or managed
- Incompatible proprietary systems from many vendors
  - No capability to track energy efficiency (other than bills)
  - Little or no interconnection between buildings
  - No capability to optimize comfort and energy use

How Did We Get Here?

- Numerous designers and design approaches
- Primary system / equipment selection criteria is usually *low first-cost*
- O&M staff concentrated at large buildings and HQ
- Controls typically not upgraded to keep pace with technology, vendors don't support legacy systems, many are non-functional, operate in manual override
- Energy O&M is only a fraction of facility manager's responsibility
  - Usually lower priority than mission-oriented tasks

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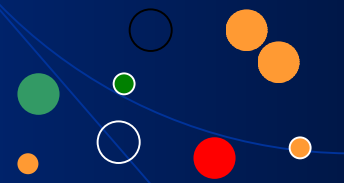
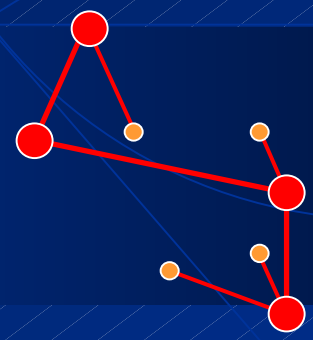


- Most energy audits biased towards replacement: it is easier to simply replace one with another one, not people-dependent
- Optimal O&M requires a more intense approach, is harder to implement, and needs lots of data.
- About half of Federal O&M at is contracted out
  - No performance-based incentives
  - Typical contract term is 3 to 5+ years

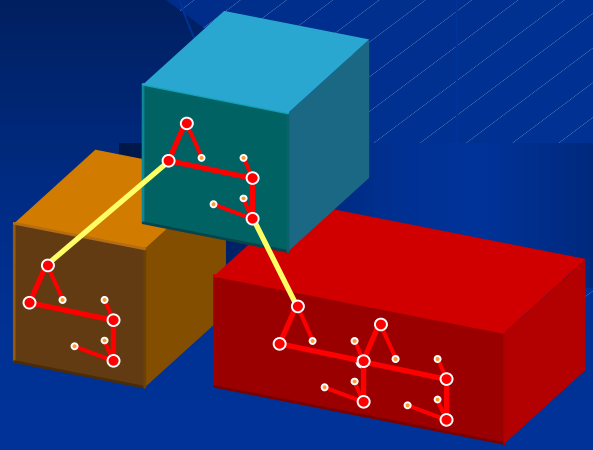
Where can Automation take us?



- Enable one person to monitor and manage virtually every system in many buildings from his/her desk
  - Simplified non-technical graphical user interface
  - Software learns and automates repetitive actions
  - Required staff time is minimized
- **Automatically take action** without involving facilities staff whenever possible
- **Automatically reach the best compromise** between environmental conditions and energy use

When can we go?

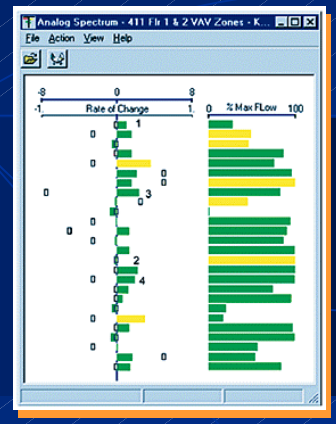
- Feasible *now* by integrating current EMCS products
  - Web server based system with TCP/IP and XML
  - Utilization of web browser allows local control via PLC
  - Use existing facility Ethernet LAN, VPN, and/or Internet
  - EMCS bandwidth usage is extremely small
  - LonWorks, BACnet, and/or MODBus components



Integrated BAS Functionality

- Monitoring HVAC Equipment
- Facility Operations
- Enterprise Energy Management

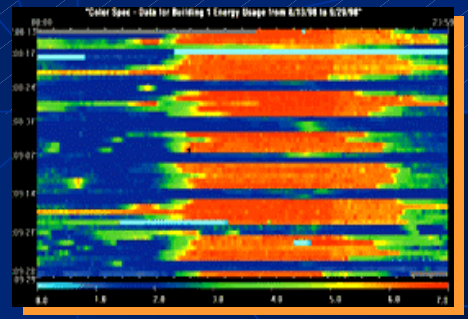
Monitoring HVAC Equipment



- Monitoring typically means manual sensor readings and looking for abnormal conditions.
- *Checking HVAC equipment operation should be done routinely.* In reality, such tasks are left for mythical slow times, and are usually skipped for weeks or months. Degrading performance is the result.
- An automated BAS condenses and prioritizes data, highlights conditions that need attention from an operator, makes contact via e-mail or cell phone, and provides a debrief on the condition and corrections.

Facility Operations

- Operation and service are typically done in a reactive manner in response to comfort complaints.
- Response involves diagnosing the problem and making manual adjustments and/or repairs.
- An automated BAS anticipates equipment failure from trends and historical data. A consolidated report of relevant values expedites troubleshooting decisions.



Enterprise Energy Management

- Support of Energy Purchasing
  - An aggregate load is presented to utility company as one meter to qualify for lower rates and leverage negotiations
  - Needs forecasting allows buyers to take advantage of lower day-ahead and hour-ahead energy rates
- Benchmarking and Monitoring Energy Usage
  - Automated verification of utility bill's complex rate tiers
  - Ranking and comparison of buildings by type, usage, etc.
  - Easy identification of potential savings opportunities
- Demand Limiting and Load Shedding
  - Load curtailment spread over many buildings so that any changes go unnoticed by occupants

The Energy Industry is Changing

- Trading and hedging energy, power, and transmission is becoming increasingly common
  - 34% of wholesale power was traded in 2002. This figure will reach 90% by 2008.
- More differential between off-peak and on-peak rates
  - For example, PEPCO (MD) off-peak rates averaged $0.02/kWh while on-peak rates reached $0.19/kWh.
- Distributed power generation is becoming a reality
  - Facilities are being paid premium rates to generate and/or curtail load during on-peak times.

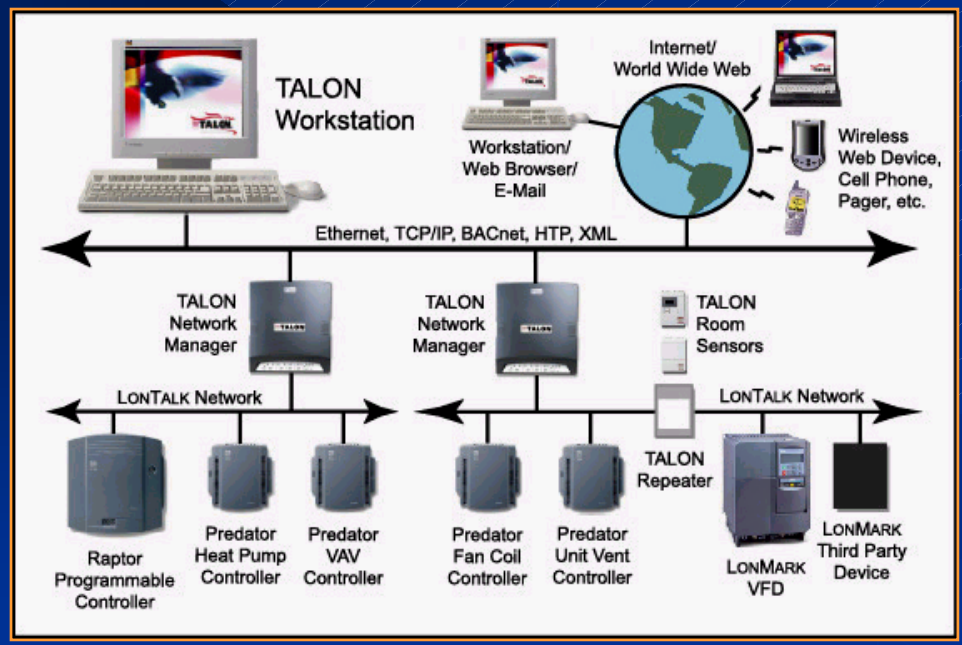
Taking advantage of the new energy market requires sophisticated BAS capabilities.

Hardware Basis

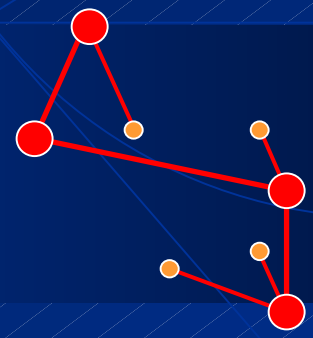
INTERFACES TO EXISTING CONTROL SYSTEMS

invensys BACtalk METASYS SIEMENS METASYS COMPATIBLE TALON KMC CONTROLS KMC KMDIGITAL ABB IBEX™

BACnet™ LONMARK 3.2



KEY POINTS



Integrated Building Automation System

- Links Systems and Buildings
  - Thermal Comfort, Energy Efficiency, Reduced Expenses
- Applies Computer Power to O&M
- Cross-Functional
  - HVAC Equipment Monitoring
  - Facility Operations
  - Enterprise Energy Management

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Thank you!

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