eBuilding Overview
Elemco’s eBuilding

gives building owners and operators the benefits of more efficient operation and lower system costs by integrating BAS open systems standards with IT standards and best-practices, in an Internet-powered, BACnet compliant, IT-friendly building automation system that maximizes compatibility with existing IT infrastructure and preserves current investments as BAS and IT technologies evolve.
eBuilding Product Family

- Open, standards-based, Internet-powered BAS solution
- Rapid application development through built-in support for modular application logic and screen components
- Powerful flexibility for demanding applications through component-level JavaScript
- IT compatible connectivity and open integration over LANs, WANs, Internet and Intranet networks
- Complete product line with configuration and user interface software, network level controllers, modular I/O system, and programmable and pre-programmed unitary controllers.
eBuilding System Components

- **EASEL and EDIFICE** programming and configuration software
- **eNC** eBuilding Network Controllers
- **ENVOY** eBuilding Site Server
- **TSC** Application Specific Controllers
- **eTRAC** modular I/O
- **MODBUS** device
- **Web Browser** For User Access
- **Integrator interface**
- **eNC GATEWAY** for other BACnet or legacy systems
- **XML** over **HTTP** data access for analysis aggregation and reporting
- **Remote Web Browser** For User Access
eNC

- eBuilding Network Controller
- Control program execution
- Event (alarm) generation
- BACnet communications
- Flash memory for application program
- Two sub-networks
- Multiple configurations
  - 128 eTrac points maximum
  - 64 TSCs maximum
eNC (eBuilding Network Controller)

- BACnet MS/TP
- RS485 network
- 115Kbaud
- MS/TP repeater
- eNC (eBuilding Network Controller)
  - eTRAC modular I/O; up to 128 eTRAC points per eNC.
- Teletrol TSC Protocol
  - RS485 network
  - 19.2kbaud
- BTL Tested TSC
- Application Specific Controllers; up to 64 TSC's per eNC unit.

10/100 Mbs TCP/IP Ethernet

- BACnet/IP protocol used between eNC's
- eBuilding Network Controller - eNC
  - Windows CE
  - built-in web server
  - XML data format
  - HTTP communication
  - 10/100 Ethernet
  - BACnet communication
  - Local Control logic
  - Global sharing
eBuilding Software Components

EDIFICE
configuration, logic integration and website development

EASEL
graphical programming environment control logic

WEB BROWSER
communicates with ENVOY over LAN, Intranet or the Internet

EDIFICE
configuration, logic integration and website development

EASEL
graphical programming environment control logic

WEB BROWSER
communicates with ENVOY over LAN, Intranet or the Internet

EDIFICE
configuration, logic integration and website development

EASEL
graphical programming environment control logic

WEB BROWSER
communicates with ENVOY over LAN, Intranet or the Internet

EDIFICE
configuration, logic integration and website development

EASEL
graphical programming environment control logic

WEB BROWSER
communicates with ENVOY over LAN, Intranet or the Internet
eNC – ENVOY Operation

ENVOY
- Provide user access to system alarms, logs, graphics and schedule via Web browser
- Enterprise information exchange using HTTP/HTML/XML
- Alarm processing, management and routing (email, pager, browser …)
- Manage user access rights
- Remote SW update services
- Stores and manages back up eNC programming and configuration
WEB BROWSER communicates with ENVOY over LAN, Intranet or the Internet.
Single-site Remote Monitoring and Analysis with eBuilding

Site

- eNC: eBuilding Network Controllers
- TSC: Application Specific Controllers
- eTRAC: modular I/O

10/100 Mbps Ethernet

ENVOY: eBuilding Site Server

Firewall

Internet

Remote Web Browser
for data access for analysis and monitoring

10/100 Mbps Ethernet
Multiple-site Remote Monitoring and Analysis with eBuilding

Site #1

Local Web Browser and/or POS terminal

Router

Intranet Or VPN

Central Monitor and Control Site

ENVoy
- Web browser access to system alarms, logs, graphics
- Enterprise data exchange using HTTP/HTML/XML/SQL
- User access rights administration
- Program download management

Site #n

Local Web Browser and/or POS terminal

Router

Internet

Remote/Mobile Web Browser data access

Central Web Browser data access for analysis and monitoring

10/100 Mbps Ethernet

Firewall
eBuilding Expanded Site Diagram

- **eNC**
  - eBuilding Network Controllers

- **MODBUS**
  - device

- **eTRAC**
  - modular I/O

- **TSC**
  - Application Specific Controllers

- **EASEL** and **EDIFICE**
  - programming and configuration software

- **Web Browser**
  - For User Access

- **Integrator interface**

- **ENVOY**
  - eBuilding Site Server

- **Internet**

- **ENVOY**
  - eBuilding Site Server

- **Remote Web Browser**
  - For User Access

- **XML over HTTP**
  - data access for analysis, aggregation, and reporting

- **Firewall**
Internet Powered
BACnet Compliant
IT-friendly
**Internet Powered**

**much more than just “web-based” or “web-enabled”**

- eBuilding has the Internet standards at its core so can take full advantage of the Internet now and in the future.
- eBuilding uses HTTP for all transactions between development system & controller “just like a browser”.
- eBuilding is built on XML – the language of the Internet.
  - all information passing between the controller and the development system.
  - all system configuration and programming files.
View and monitor systems with Explorer-like points lists in automatically generated web pages

Provide animated graphical User Interface pages for more sophisticated applications

Update SW, configuration, control logic or graphics over the Internet without compromising firewalls
Practical BACnet

- BACnet MS/TP for modular I/O communications
- BACnet over IP for controller-controller communication
- IT standards (HTTP/XML) for controller to workstation communications
- BACnet device morphing.™
BACnet Device Morphing

Typical BACnet System

Front-end Software

View and Modify Operator Screen

Set_point
Set_mode
...

BACnet Controller

Device Object

Set_mode

Set_point
Typical BACnet System

Front-end Software

Energy Management Software

BACnet Controller

Device Object

Set_mode

Set_point
• Typical BACnet controller
  – Fully exposes all inputs and outputs
  – Fully exposes all internal value points
  – Fully exposes all other objects (schedules, etc.)
  – Relies on front-end software and operator to protect against dangerous inadvertent actions.
Main Entry: **morph**
Function: *verb*
Etymology: short for *metamorphose*

1 to change the form or character of;
2 to undergo transformation;
3 transform

Merriam-Webster
BACnet Device Morphing

BACnet System with Morphing

Front-end S/W

Custom Energy Management S/W

BACnet Controller

Device Object

Set_mode

Set_point
BACnet Device Morphing

• Typical BACnet device
  – Fully exposes all inputs and outputs
  – Fully exposes all internal value points
  – Fully exposes all other objects (schedules, etc.)
  – Relies on front-end software and operator to protect against dangerous inadvertent actions

• Morphing allows controls designer to limit external visibility of objects in controller
  – Simplify higher-level system design
  – Reduce risk of inadvertent access
  – Protect against malicious access.
BACnet Compliant

- **BTL – BACnet testing lab**
  - Funded and administered by BACnet Manufacturers Association (BMA)
  - Tests conformance to the standard
  - Currently testing low-level devices

- **Teletrol has BTL certification**
  - eTRAC tested and certified
  - eNC testing slated for future
  - Front end software testing not yet available

- **Teletrol participates in BMA voluntary “plug-fest” events.**
IT-friendly

- HTTP/XML data exchange
- Firewall compatible without special ports open
- Native Ethernet communications (no gateway)
- Fully standard browser configuration
  - no ActiveX
  - no custom plug-in
- Single server for BAS functions and web pages
- Industry standard web server components
  - Apache
  - Tomcat.
Market Share for Top Servers
Across All Domains August 1995 - October 2002

Apache > 60% of all web servers in the world
System Development Process

Step 1
Select or build control logic

Step 2
Define the System

Step 3
Add graphics

Step 4
Publish
Step 1: Build the Control Logic

- Review logic blocks in existing catalogs (Teletrol and custom)
- Graphically assemble new logic blocks (if needed) by interconnecting existing blocks
- Sophisticated users can also create new logic blocks using standard JavaScript language
- Simulate operation, forcing variables and observing logic execution
Step 2: Define the System

- “Place” required logic blocks in each eNC
- “Attach” I/O networks and devices to each eNC
- Create calendars and schedules
- Interconnect block inputs and outputs with calendars, schedules and I/O points
- Select configuration parameters
Step 3: Develop Web Pages

- Automatic generation of text-based website
- Select existing graphical pages from catalogs (if desired)
- Create new graphical pages (if needed) without HTML or web knowledge
- Drag, drop and “attach” simple controls to I/O points
- Add navigation links to other graphic pages, auto-generated web pages or any other site
Step 4: Publish

- Publish control system configuration to eNCs over LAN or the Internet (HTTP/XML)
- Publish website to Envoy site server over LAN or the Internet (HTTP/XML)
- Set user permissions in Envoy administration web pages
eBuilding leverages commercial IT and web technology to lower costs, simplify system integration and facilitate information management

- Practical BACnet over IP
- A complete, integrated system from one source
- Graphical, object-oriented block programming with nested internal functions
- Custom JavaScript block editing and creation
- Web Browser User Interface
- ASHRAE BACnet over IP protocol in eNC; BACnet MS/TP used for I/O network
- Windows CE Operating System in eNC
- HTTP/XML data exchanges among system components
- TCP/IP over 100 Mbs Ethernet
- Site Server – data acquisition and web presentation via one machine
- ODBC system database (MySQL)
- Web App API and Web Services API.
The eBuilding Difference

eBuilding is deliberately designed to preserve your investment well into the future

- Reliance on mainstream IT components and technologies eases future migrations
- XML for internal and external data exchange facilitates future extensions and standards
- Equipment-oriented logic block catalogs enable new application-specific business models
- eBuilding uses an object-oriented component software architecture, which allows for “plug in” upgrades to new drivers, applications, and protocols
- Architecture and APIs for Web Services and Web Apps will provide a platform for building powerful distributed solutions
- eBuilding has modular internal controller hardware designed for future changes in unitary or I/O networks, user interface or bus technology.
eBuilding Benefits

• Global accessibility
  – Web browser interface to graphical displays
  – Web browser access to point information

• Reconfigurable to accommodate future needs
  – Simple block programming
  – Extensible site configuration
  – Easy expansion of web pages

• Readily maintainable
  – Zero-client operations solution (web browser access)
  – Enables remote (instant) support
  – Web browser interface to system data
  – Internet access to software updates
eBuilding Benefits

- Natural fit in existing IT infrastructure
  - Standard server components (Apache/Tomcat)
  - No special ports required for remote access (HTTP/XML)
- Personalized to meet local requirements
  - Specialized logic capability
  - Custom graphics capability
- Supported by Industry Standards
  - Preserving current investment
  - BACnet
  - XML
  - HTTP
  - Apache/Tomcat
Elemco’s eBuilding

gives building owners and operators the benefits of more efficient operation and lower system costs by integrating BAS open systems standards with IT standards and best-practices, in an Internet-powered, BACnet compliant, IT-friendly building automation system that maximizes compatibility with existing IT infrastructure and preserves current investments as BAS and IT technologies evolve.
Online eBuilding Demo

TCP/IP Ethernet LAN

ENVOY SITE SERVER
- Communicates with eBuilding Network Controllers (eNC); maintains a real-time table of points and variables status and values
- Presents system and equipment data, alarms, logs, dynamic trends, graphic screens and schedules via Web Pages

Remote Control
- Turn on/off fan
- Turn on/off light
- Open and position damper

"Live images"
- Streaming video or
- Multiple still shots

Internet

"Live images"