



U.S. Department of Energy  
Energy Efficiency and Renewable Energy

# Total Building Controls

Facility Control from a Single Energy  
Management System  
Pros & Cons & the Future



# Overview

- What and Why?
- The Industry Today?
- Technologies available
- Trane's Strategy
- Trane's System Integration Platform
- The future ?
- Summary



# Definitions

## **Interface**

Ability for products not originally designed to work together, to share information – custom, specific, “one-off”

## **Interoperate**

Digital communications between products designed independently to the same communication standard, e.g, any BACnet interface

## **Interchange**

Ability for multiple vendors' products to functionally replace each other on the same communication network

## **Integration**

Connecting various facility-wide systems in a manner that allows single-seat operation by operators



# A Short Review...

What control system from the past allowed interchangeability?

Remember pneumatics?



# What Are Open Systems?

- Interoperability between vendors
- Open, standard protocols
- Available to any vendor
- Flexible infrastructure



# Why ?.....

## What Are the Benefits to You?

- Single operator interface
- Seamless integration of multiple vendors
- Cost savings
- Time savings



# Cost Savings

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- Increased flexibility
- No vendor monopoly
- Shared information
  - Seamless system efficiencies
  - More information for better decisions



# Time Savings

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- Single operator interface
  - Less training
  - Greater familiarity by operator
- Commissioning/maintaining systems
  - Common protocols





# Where is the Market Today?

**Interface**

**Interoperate**

**Interchange**





# Where is the Market Today?

- Since the dominance of proprietary DDC, there has been a lot of progress towards a more open environment
- “plug and play” can be achieved with cooperation and an understanding of the limitations
- Disparate systems can work together, using gateways, tools and open technologies
- Open Systems Technology includes BACnet, LonTalk, Modbus, Internet Protocol (IP)



# BACnet

- ASHRAE Standard developed by consensus committee
- A global ISO standard
- Defines standard method of moving data as well as how to model and physically transport this data
- BACnet is under constant revision



# BACnet Pros and Cons

- BACnet is designed to work on networks and IP
- Clearly defines how to exchange data, schedule, trend, alarm, and manage the network
- Implementation can vary as the standard gives choices
  - e.g., physical media, alarm management

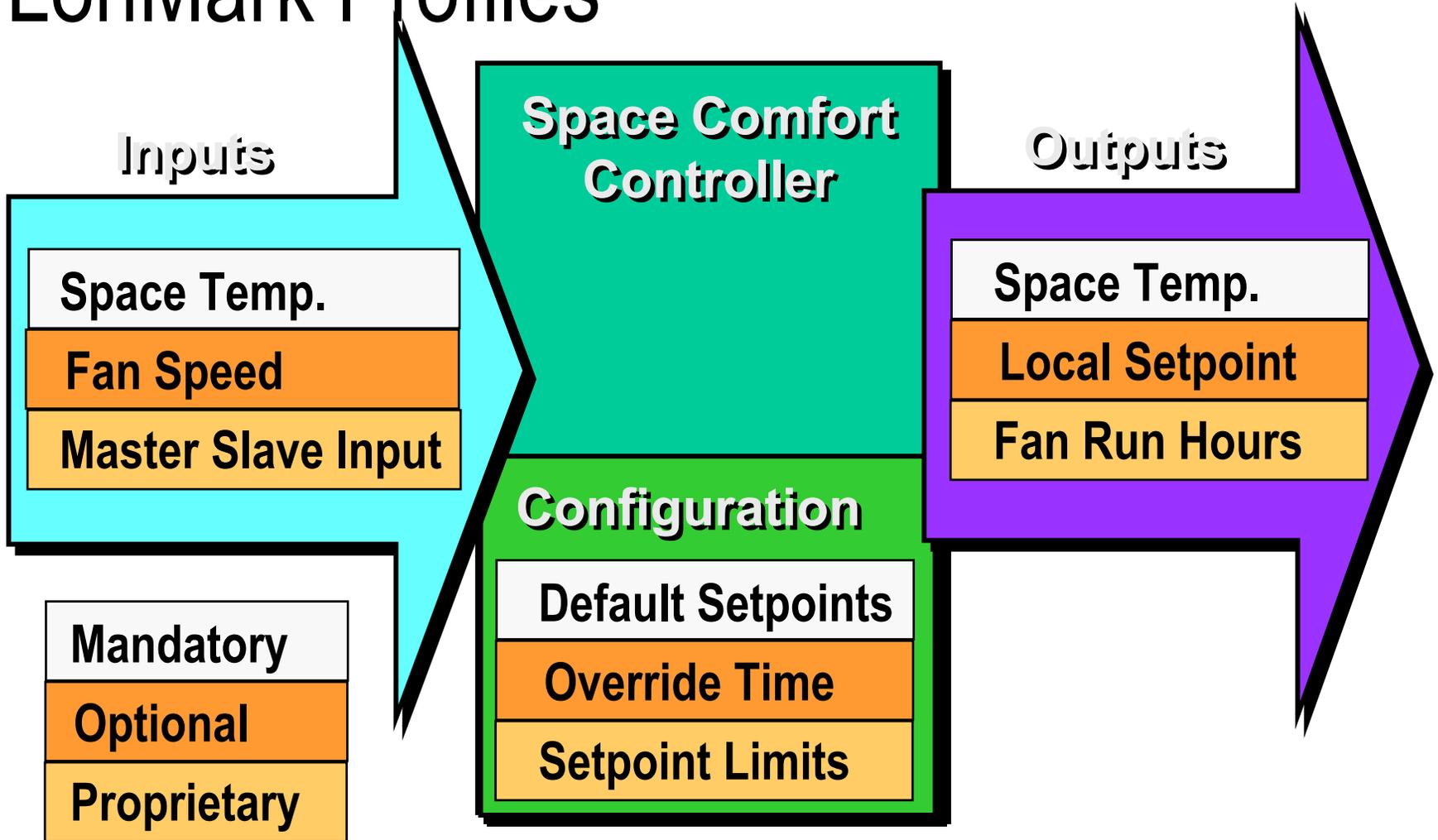


# LonTalk

- Developed by Echelon Corporation - now an EIA standard
- Requires the use of an embedded chip - the Neuron
- LonMark is an organization that has created a series of standard equipment profiles
  - For example Space Comfort Controller, Discharge Air Controller, Chiller, etc



# LonMark Profiles





# LonTalk Pros and Cons

- LonTalk is easy to implement with the use of the Neuron chip
- LonTalk protocol works great for controllers
- The Profiles makes equipment relatively interchangeable
- Networking management & configuration are not standard
- Using LonTalk over Ethernet/IP is presently proprietary



# ModBus

- **Industrial defacto standard**
- **Developed originally by Modicon**
- **Allows data exchange only**
- **many variations exist –Modbus RTU (remote terminal unit) is most common**
- **Implemented in a variety of HVAC & Industrial equipment, e.g.,**
  - variable frequency drives , fume hood controllers, power monitoring equipment, lighting control panels, etc.

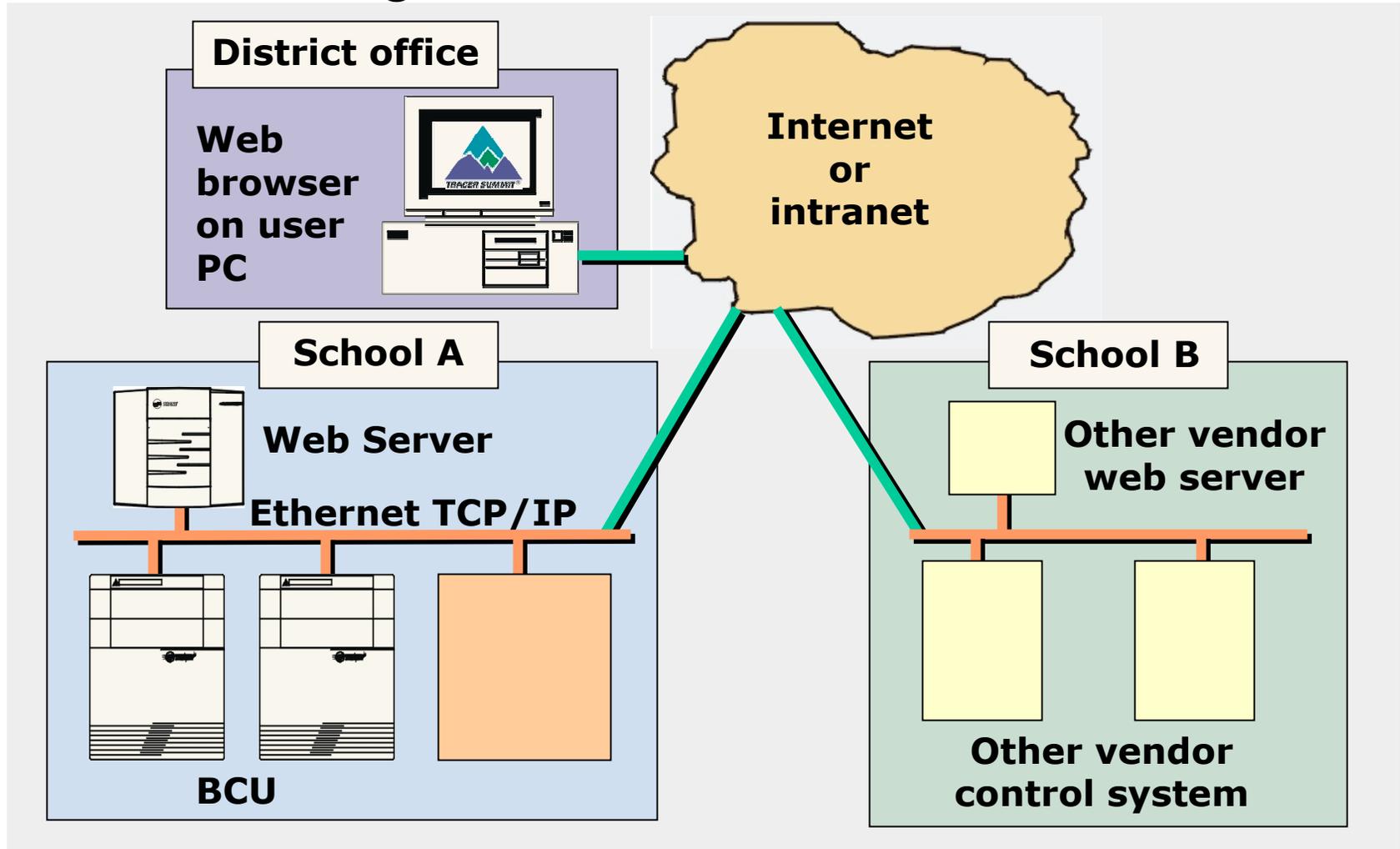


# Modbus Pros & Cons

- Well understood and implemented due to wide spread use
  - Electrical switchgear, VFDs, Lighting Panels, industrial process control
- Freely available - no license required
- Defacto standard without review and amendment procedures
- Sub-versions not always compatible with each other
- PLCs using same version are interchangeable

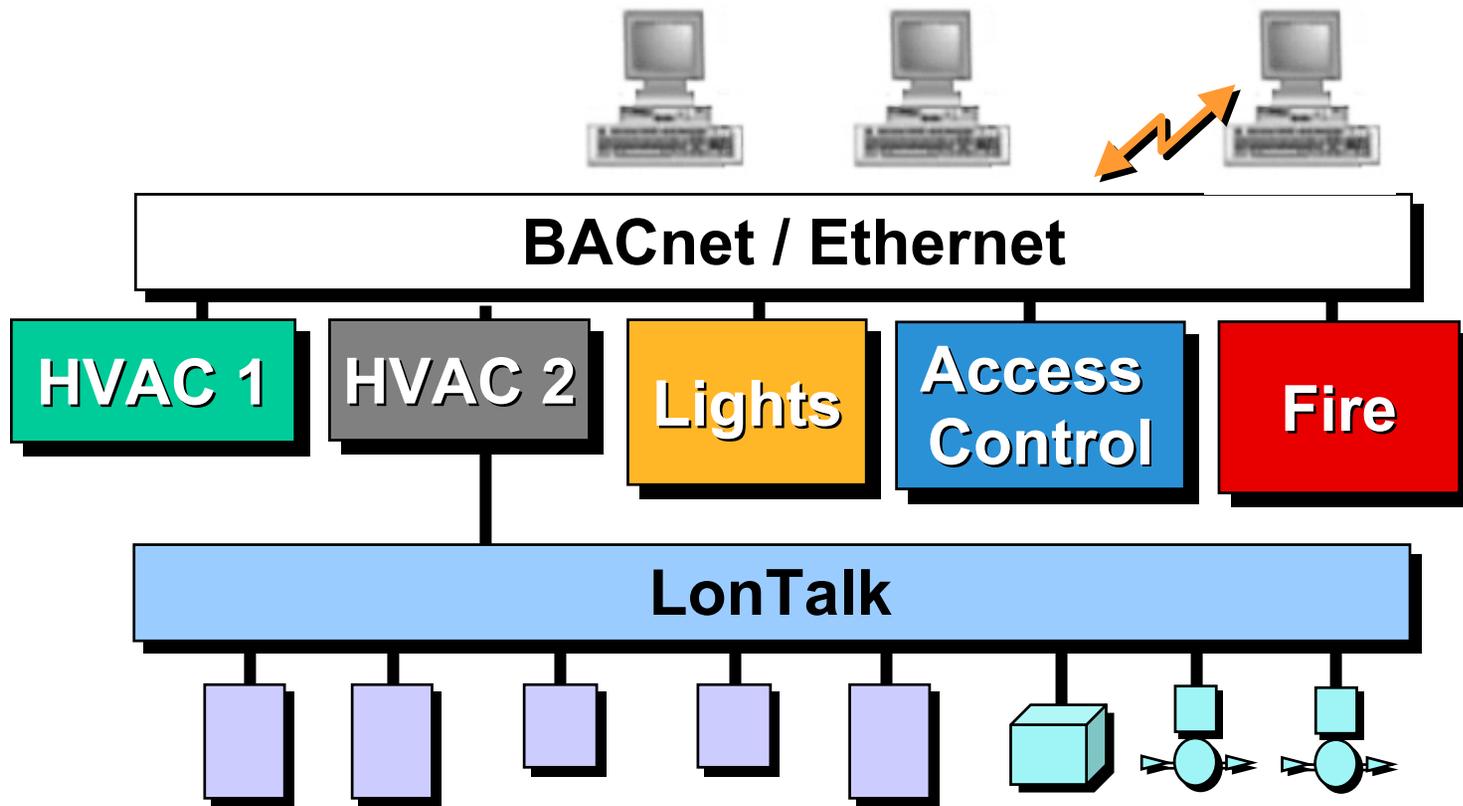


# IP – an Integration Platform





# Integrated Facility Management Architecture



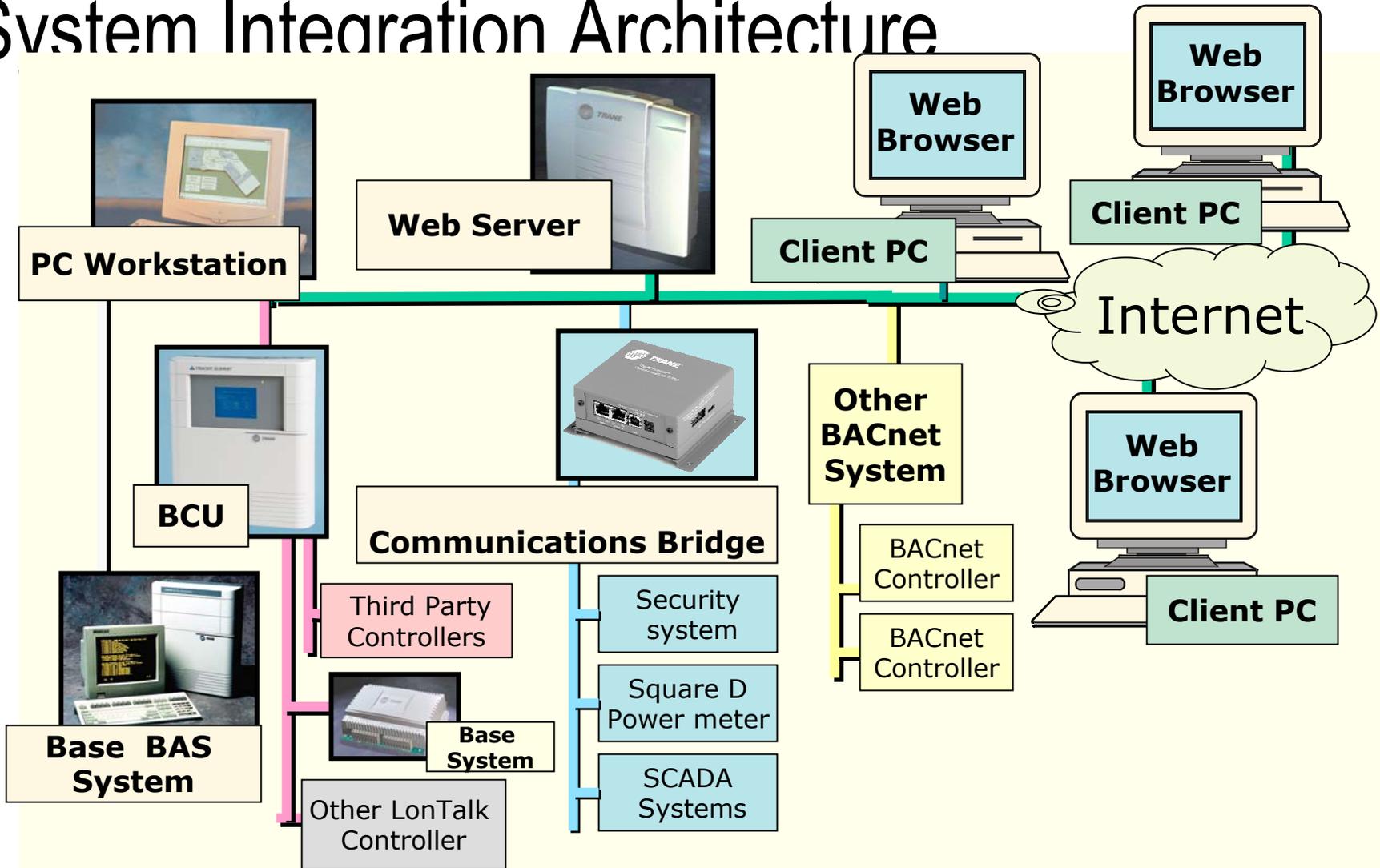


## Some commonly requested interfaces

**Alerton, Andover, Automated Logic, CSI, Delta, Honeywell, Intellution, Invensys, Johnson Controls, Liebert, McQuay, Multistack, Phoenix, Siemens (incl Landis & Staefa), Simplex, Square D, ABB, Airflow CRAC, Bell & Gosset, Danfoss, Fireye, Magnetek, Trane, Tek-Air, TSI, Veris, etc, etc,**



# System Integration Architecture





# Integration Summary

- Using standard protocols and standard technologies, the goals of Integration and Interoperability can be met
- Look for a system that Supports BACnet, LonTalk, Modbus and Internet Protocol communications

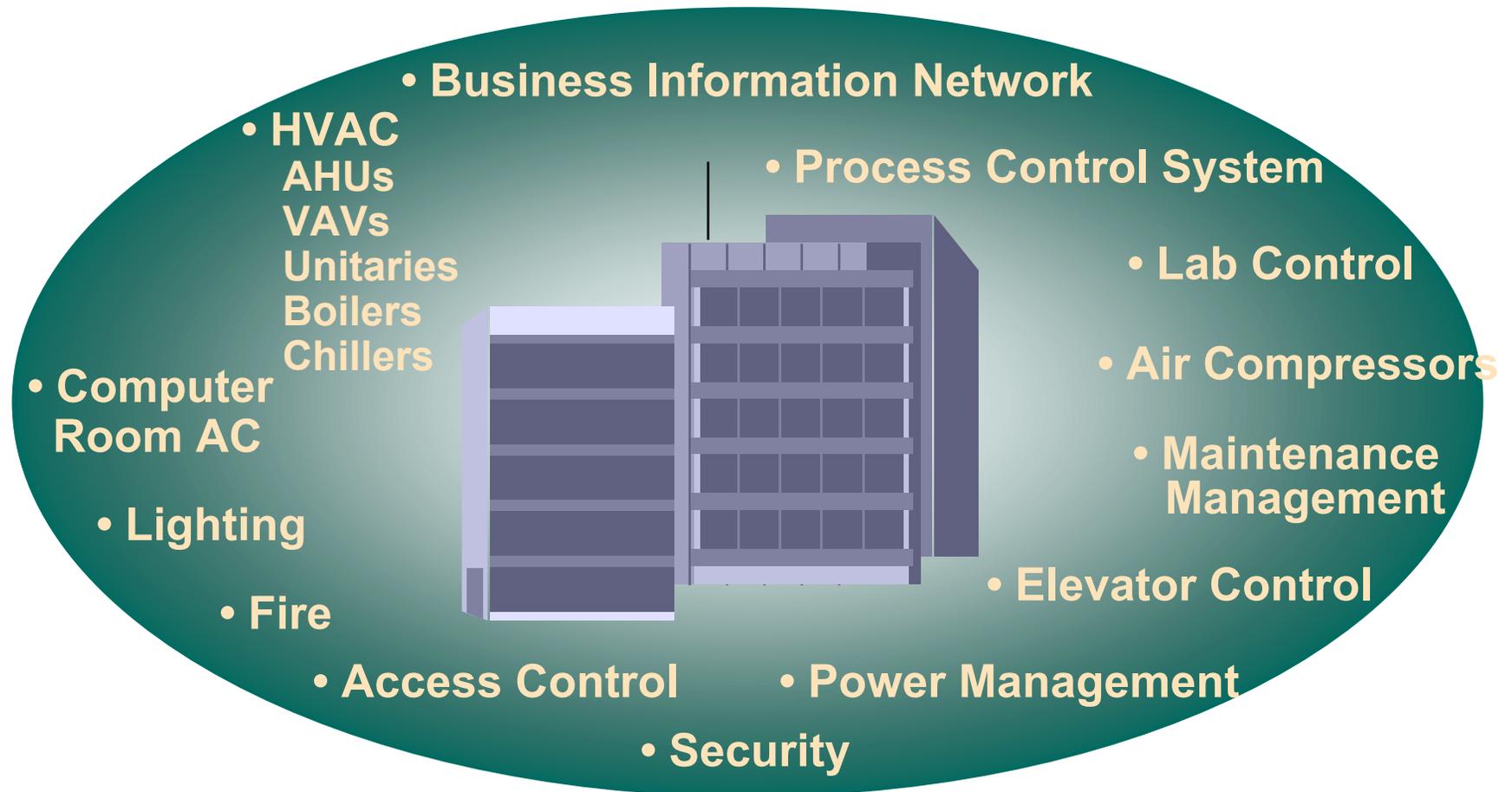


# Integration Summary

- Integrate to other HVAC control systems ✓
- Integrate to other facility-wide systems ✓
- Provide platform for future growth while remaining “open” ✓
- Utilize standard network backbone ✓
- Provide Web browser access ✓
- Factory and local training/support ✓

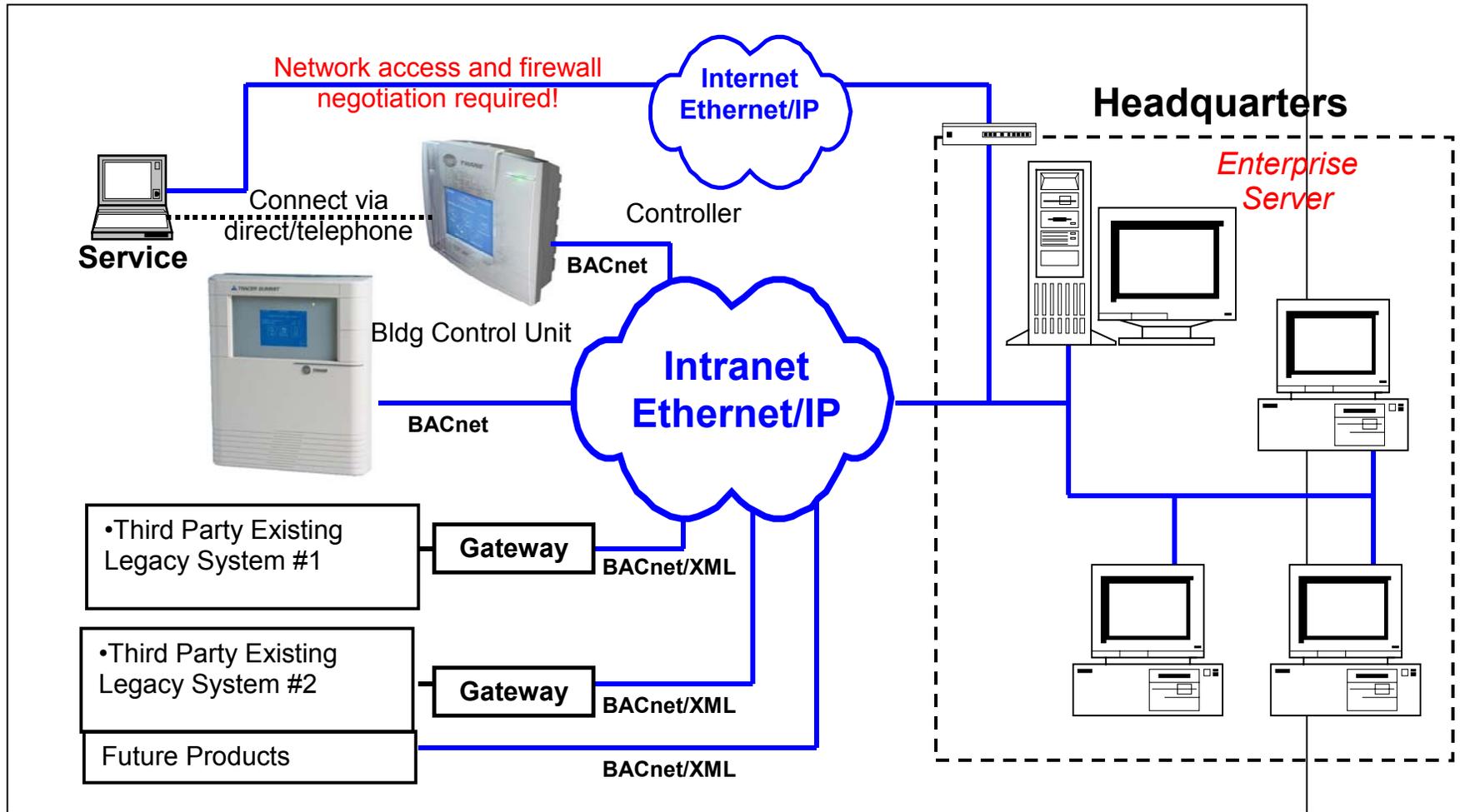


# Facility-wide Integration is possible





# Wide Area Network Enterprise Server





# What's in the Future?

- Continued growth in use of existing IP networks
- Enterprise Web Server
- Using web based technologies and the Internet
- Wireless communications
- The Next Generation...



Thank you  
for being our guest today!



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# Questions?

