

# ***New Jersey Higher Education Partnership for Sustainability***



## ***ENERGY MANAGEMENT SYSTEMS OVERVIEW***



**CONCORD ENGINEERING GROUP,  
INC.**



**Michael Fischette P.E.**

# Objectives

- **Provide measurement, trending and control of HVAC, lighting, process and onsite generation systems.**
  - Comfort control
  - Remote monitoring
- **Reduce Energy Costs**
  - Demand Side Control, *ex. night set back*
  - React to utility rates, *ex. real time dispatching*
- **Reduce Maintenance Costs**
  - Trend and monitor maintenance & outage schedule
  - Alarm and safety trips

# Energy Management

## mfgs, integrators & service Companies



### Building Management

Johnson Controls

Honeywell

Seimens

Automated Logic

Allerton

### Load Management

Powermeasurement

Encorp

Caterpillar- Power Lynx

Rockwell

# *Critical Features*

- Web Based
- Open protocol
- Dynamic Graphics
- Pre Engineered Algorithms
- Open source code

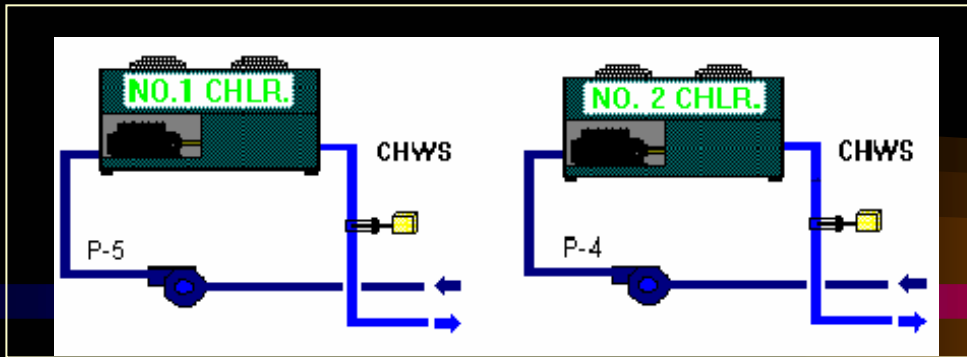
# ***DDC Controls - Energy Management***

Demand Control Ventilation (CO2 Reset)

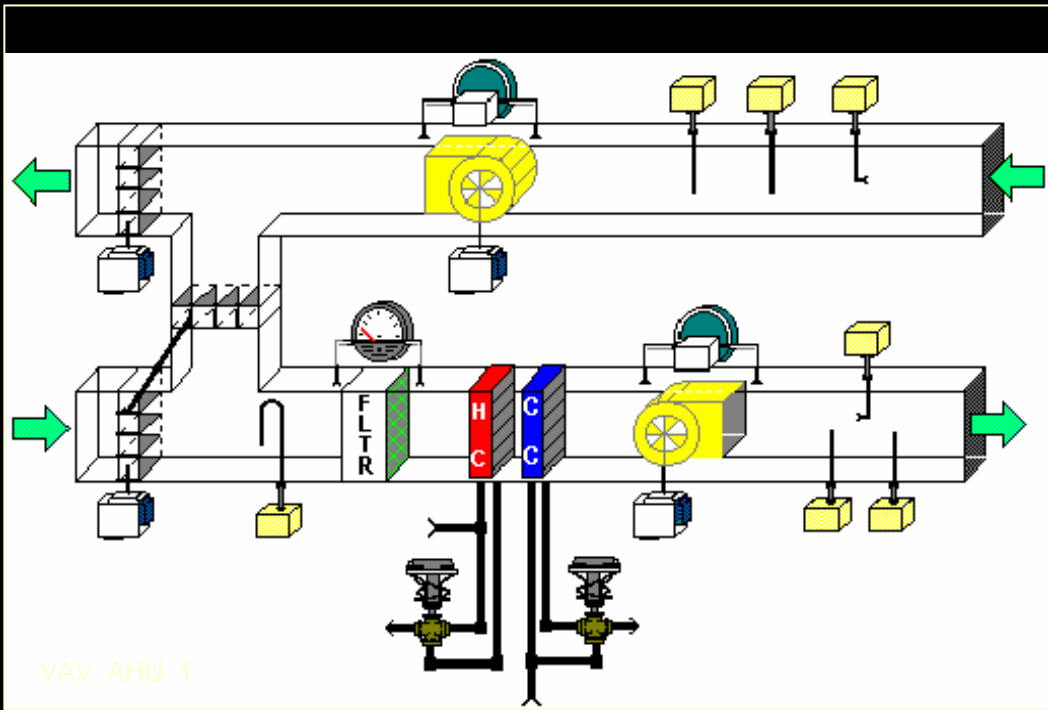
- PID Loop Control
- Smart Economizer
- Occupied/Unoccupied Schedules
- Night Setback/Morning Warmup
- Load Shedding/Shifting
- Outside Air Reset
- Cycling Equipment
- Fuel Switching Equipment

# *Lighting Controls*

- Occupancy Sensors : Turning lights on and off automatically based on occupancy and providing an override switch for Teachers
- Lighting control panels : Lights are centrally controlled by automation from time schedules ,switches and other controlling devices
- Intelligent wall switches : Operate small rooms e.g. Toilets, Closets and Mechanical spaces
- Daylighting controls : Taking advantage of natural sunlight by reducing electric lighting levels via dimming ballast or switching arrangements.



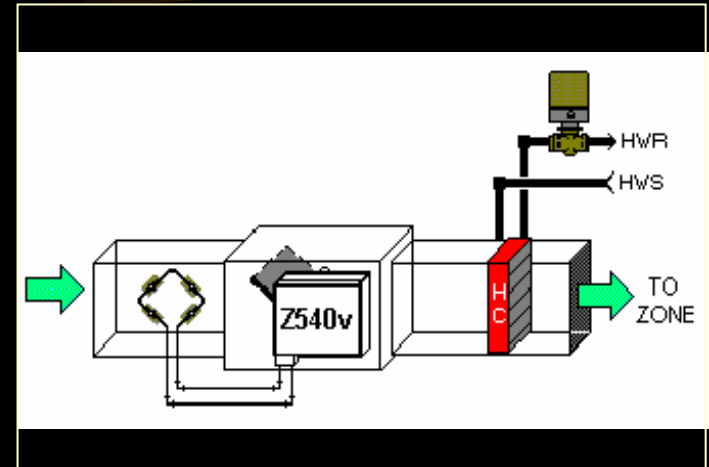
AHU will Request Cooling from Chiller



VAV AHU 1

Using the Trim and Respond control theory the AHU will determine how much cooling is needed

Air Handler Units will receive cooling requests from VAV Boxes



VAV Boxes will Request Cooling from AHU

# *Load Management*

- Submeter Aggregation
- Onsite Generation Control
  - Breaker Control
  - Synchronizing Logic
- NetMetering Control
- Real Time Electric Pricing Algorithms
- Load Shedding/Shifting
- Fuel Switching

# Classes of Electric Service

## Large Industrial

BGS-CIEP (Hourly Service)

Peak Load greater than 1500KW

PSEG

HTS-HV

HTS-Sub

LPL-P

JCPL

GP

GT

ACE

TGS

AGS-TOU Transmission

AGS-TOU Sub-Transmission

PECO

Primary TOU

## Other Commercial and Residential

BGS-FP (Fixed price)

750KW or greater can switch to CIEP as of June 2004

Will have \$0.005 added on bill to encourage independent suppliers

# ENCORP Communications Architecture



Site Devices



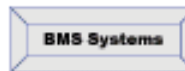
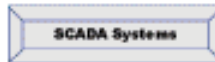
Communications Gateway



Local & Remote Interfaces



GPC's, UPC's & MMC's



Communications Processor Module



Local Site Interface



Remote Site Interface



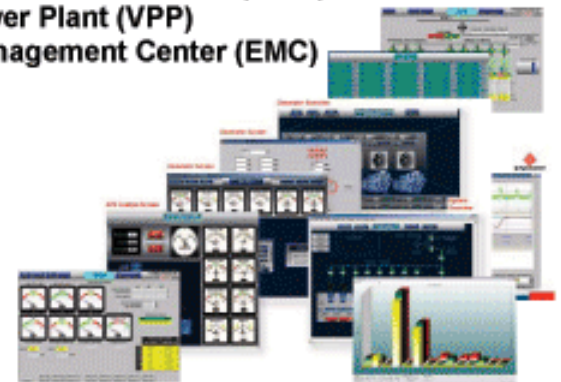
Alarm Notifications

ENCORP SOFTWARE

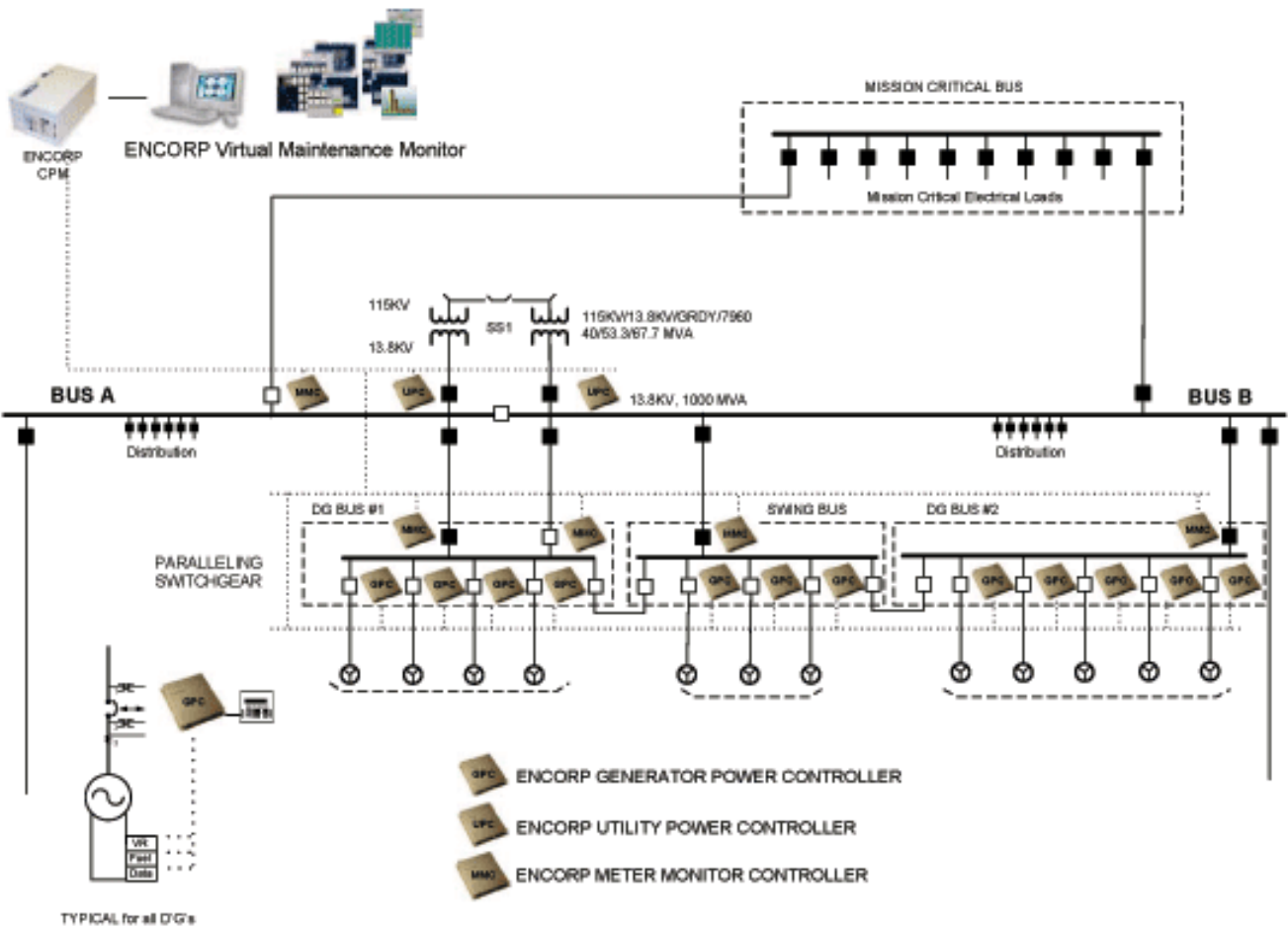
Virtual Maintenance Monitor (VMM)

Virtual Power Plant (VPP)

Energy Management Center (EMC)

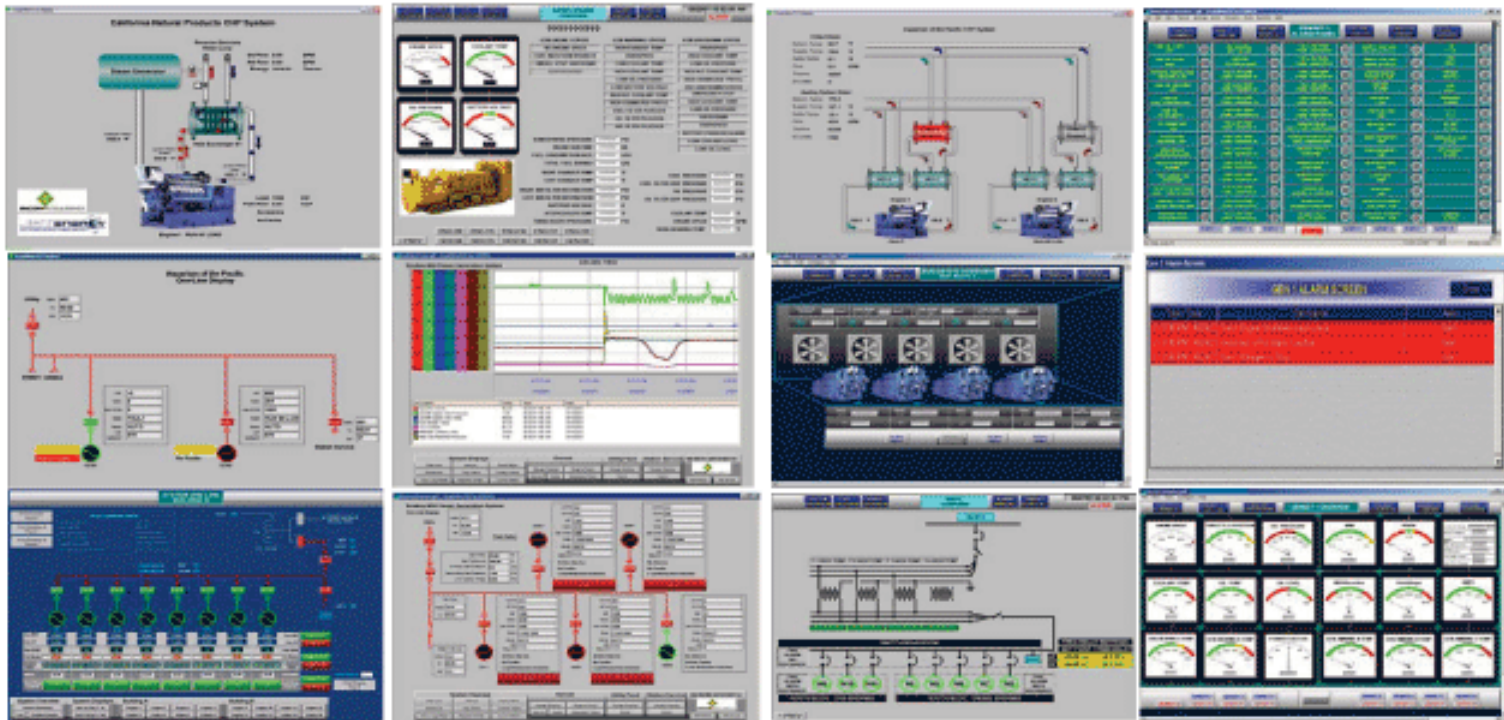


# ENCORP Controls & Monitoring Equipment in an electrical architecture



# Real Time Energy Management System

Trending, Event Capture, Alarm Notifications, Diagnostics





# ENCORP Products & Services



## ENCORP Products



**Generator Power Controllers  
Utility Power Controllers  
Meter Monitor Controllers**



**Central  
Processing  
Modules**



**Software & Communications  
Virtual Maintenance Monitor (VMM)  
Virtual Power Plant (VPP)  
Energy Management Center (EMC)**



**Digital Paralleling  
Switchgear**



**Automatic  
Paralleling  
Switches**



**Automatic Transfer  
Switches**

## ENCORP SERVICES

- Power, Control, Network Communication & Software Design Services
- Power & Utility Interconnect Engineering
- Equipment & Software Maintenance Services
- Equipment Performance Reporting
- Equipment Failure, Alarm Notifications
- Data Archiving
- Remote Emergency Gen Testing
- Extended Warranties and Spare Parts
- Training Services (in-house and onsite)
- 24/7 Technical Support Services

## *Energy Management*

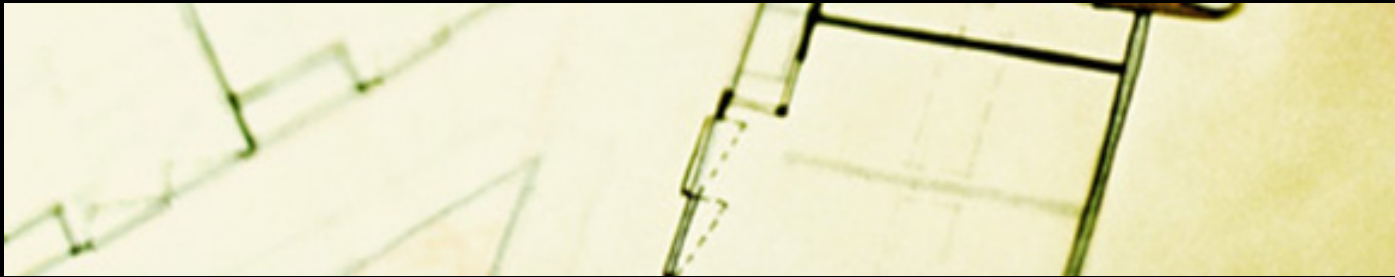
Knowledge is power.

Energy Management is not about turning the lights off when you leave the room: it's about lowering your operational costs through effective power usage strategies. Our energy management solutions will lower the cost of your energy commodity supplies while showing you how to use them more efficiently and effectively to meet your core business objectives. And while we're at it, we'll also improve the quality and reliability of these commodity supplies.

We can provide you with a customized bundle of professional services designed to support your individualized needs.

- Strategic energy planning, budgeting, strategy development & engineering.
- Procurement management services in the following commodities, Electric, Gas, Water, Oil, Wood, Wind, Solar, Biomass, Landfill, etc.
- Utility Bill Analysis, Rate Tariff Analysis and recommendation
- Price / Risk / Weather management Instrument Recommendations
- Energy Market Information
- Consolidated Energy Bill Verification and Payment Services
- Real Time Price Signals

## Energy Optimization Services



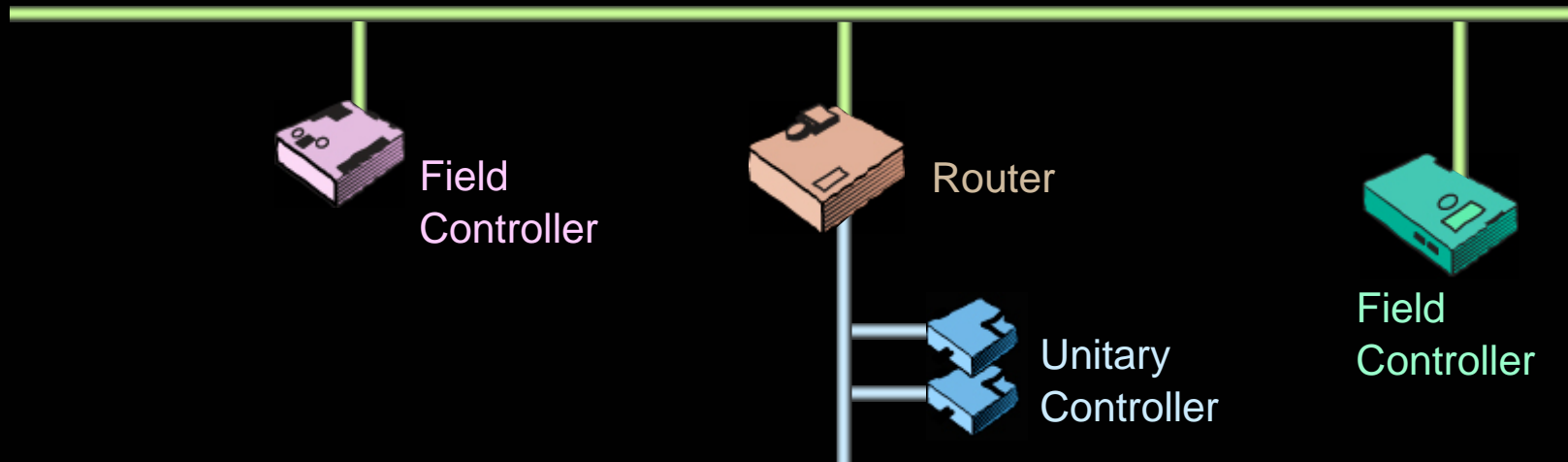
Ever wish your facilities could function at peak efficiency? We can help. We'll help you develop and implement a customized strategy to increase the performance of your facilities while consuming less energy and operating resources. Our solutions include:

- Continuous energy system performance measurement, verification, reporting, commissioning, benchmarking and consulting.
- Predictive / Proactive testing, diagnostics, operations and maintenance services
- On site management expertise
- Continuous commissioning of energy consuming equipment, envelope, etc.
- Energy awareness training
- Power assurance and quality services

***Building Control  
Technologies, Inc.***

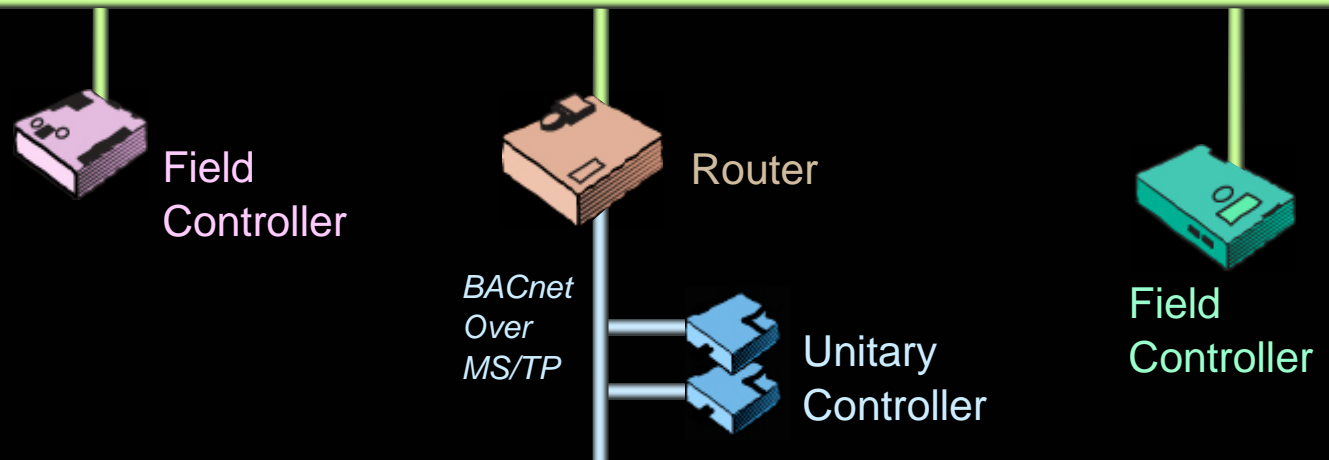
**AUTOMATED LOGIC<sup>®</sup>**  
**C O R P O R A T I O N**

# *Architecture of an Open, Web based Control System*



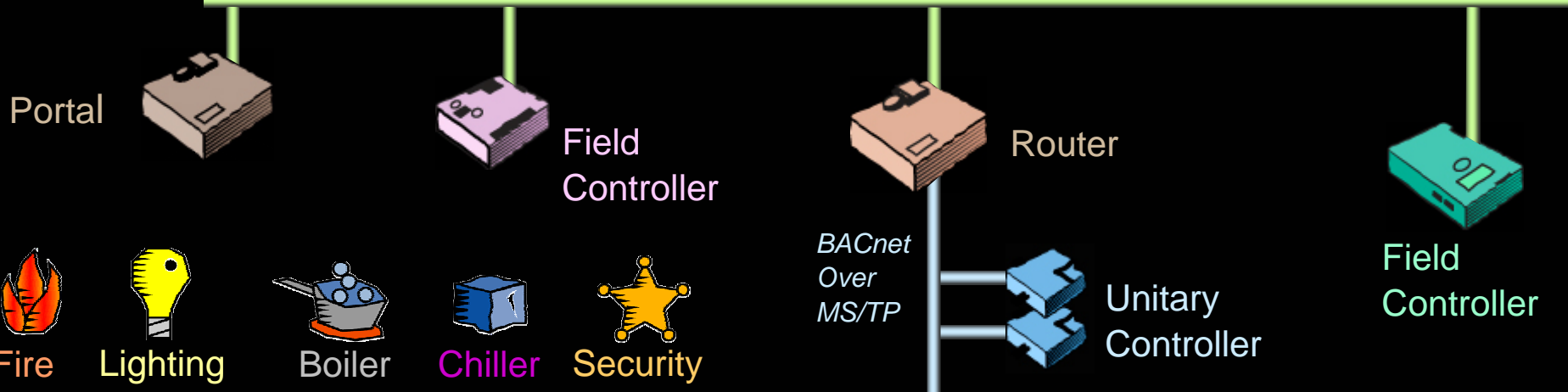
# The Controllers Communicate using an Industry Standard Open Protocol such as BACnet(TM), MODbus or even LON

*Native BACnet over ARCNET*

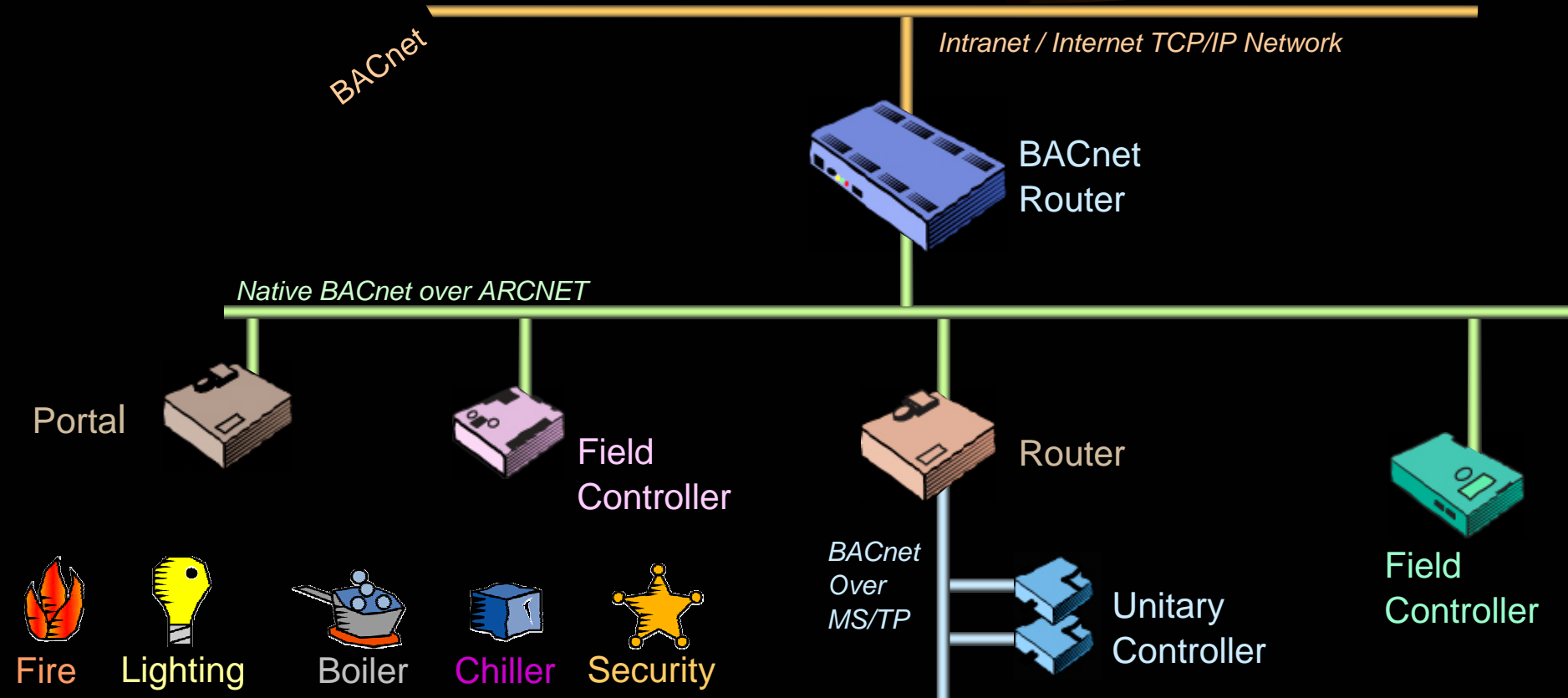


# Analogous Systems such as Power Monitoring and HVAC Mfr. Controllers communicate with the Open Protocol Systems

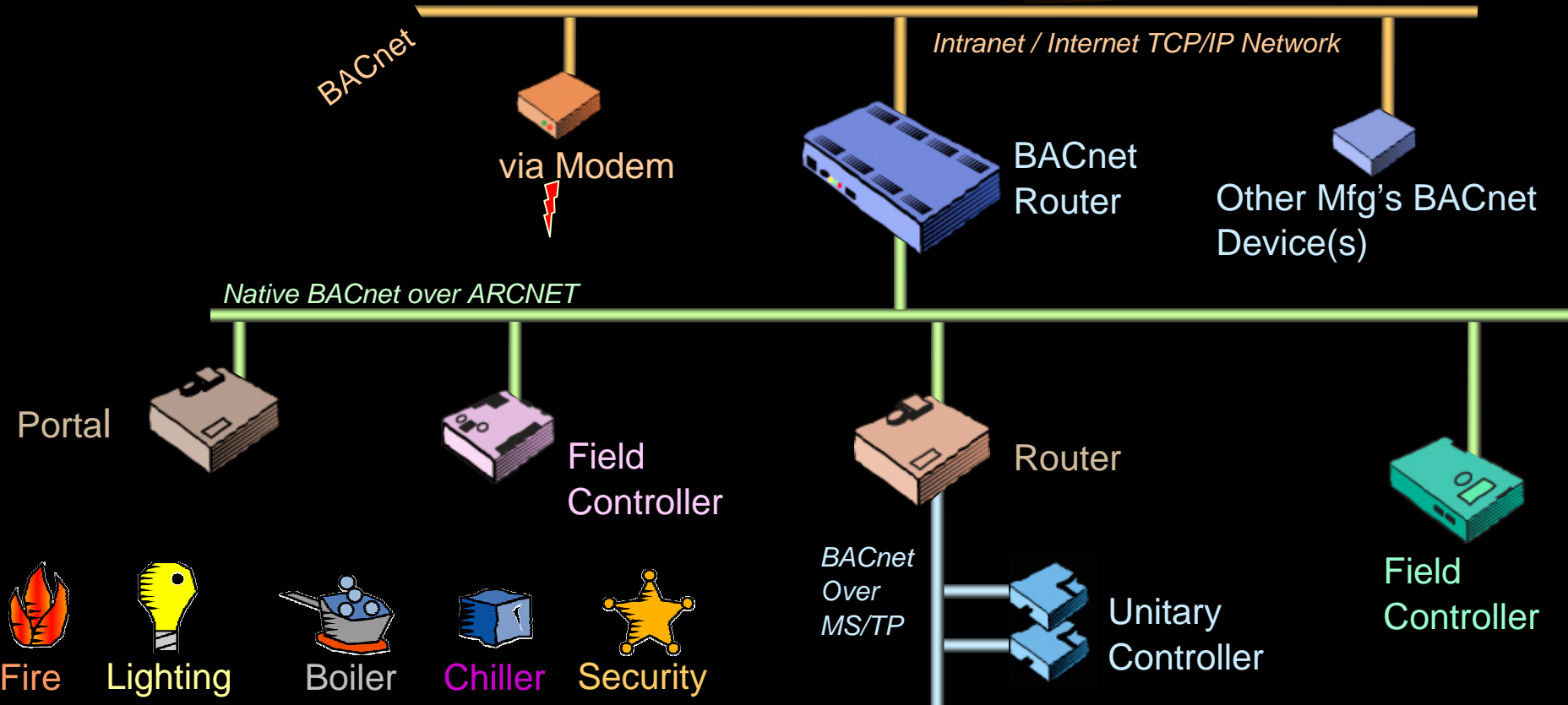
*Native BACnet over ARCNET*



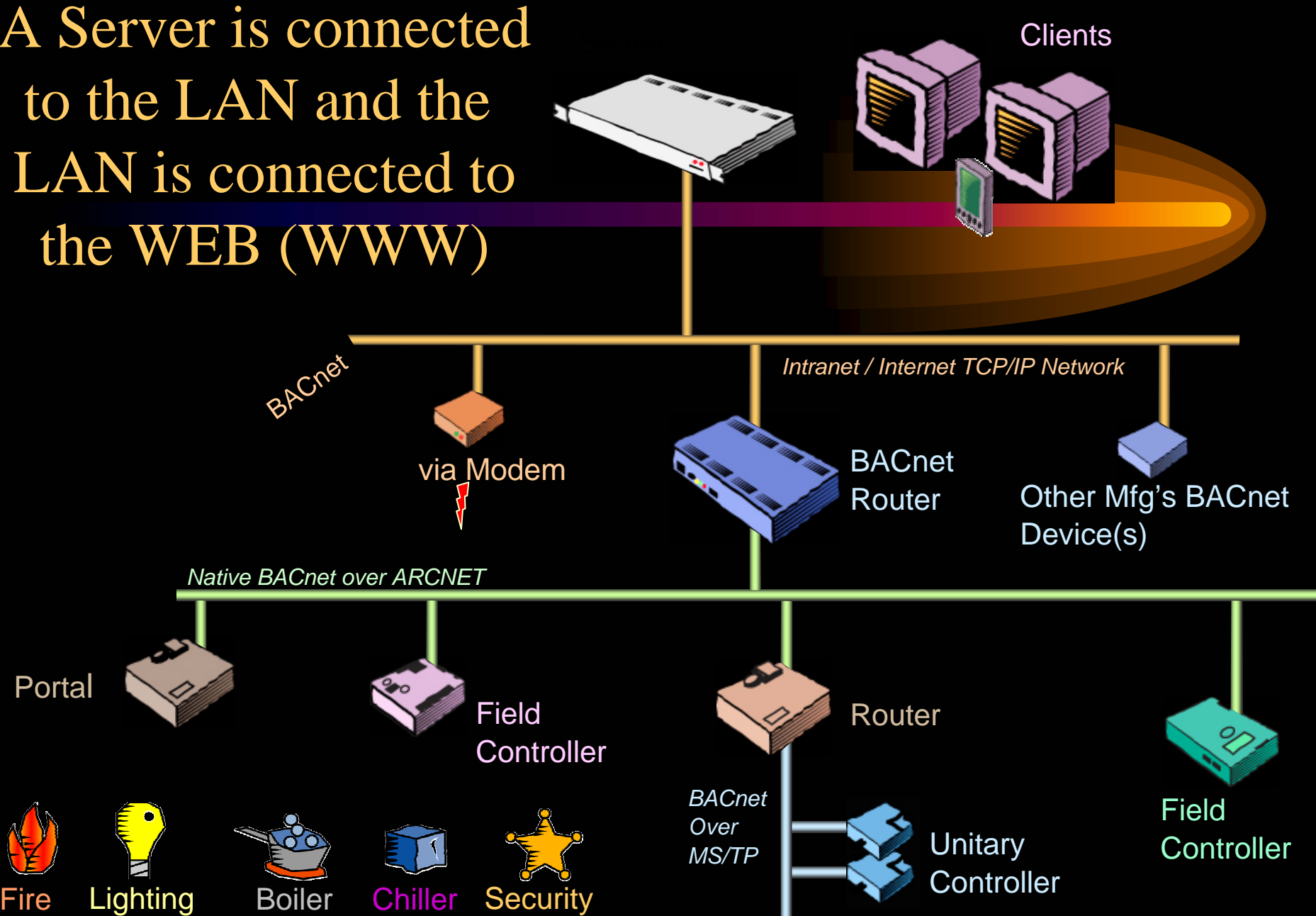
# A Router connects the facility Control Bus to the Ethernet MIS LAN



# Standard Open Protocol Devices Cohabitate from any Manufacturer's BAS System



A Server is connected to the LAN and the LAN is connected to the WEB (WWW)



Clients

BACnet

Intranet / Internet TCP/IP Network

via Modem

BACnet Router

Other Mfg's BACnet Device(s)

Native BACnet over ARCNET

Portal

Field Controller

Router

Field Controller

BACnet Over MS/TP

Unitary Controller



Fire



Lighting



Boiler



Chiller



Security

**server**

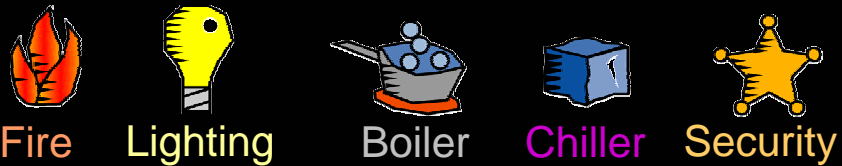
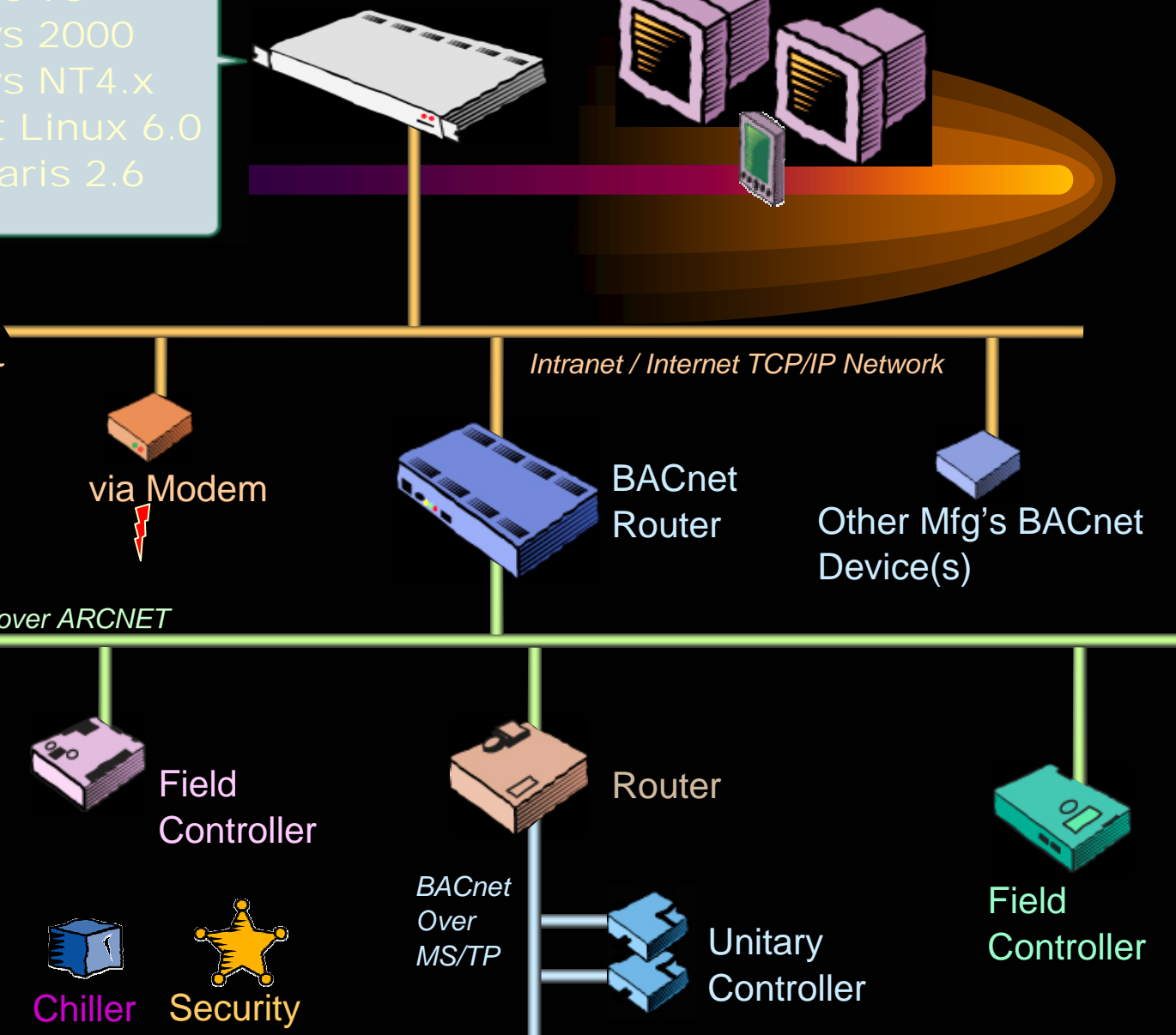
Runs on:

- Windows 98
- Windows 2000
- Windows NT4.x
- Red Hat Linux 6.0
- Sun Solaris 2.6



ANY Operating System can be used on the Server

BACnet

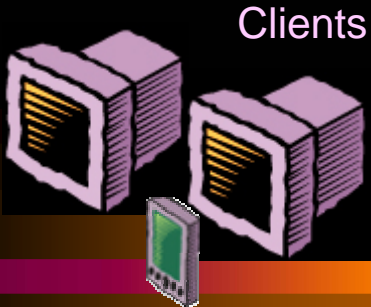


Can Use:

- MS Access
- MS SQL Server
- Oracle
- IBM DB2

server

DB



Clients



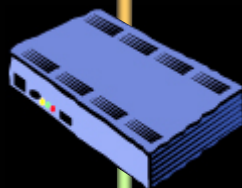
Automated Logic Controls

BACnet

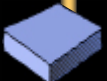
Intranet / Internet TCP/IP Network



via Modem



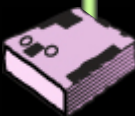
BACnet Router



Other Mfg's BACnet Device(s)

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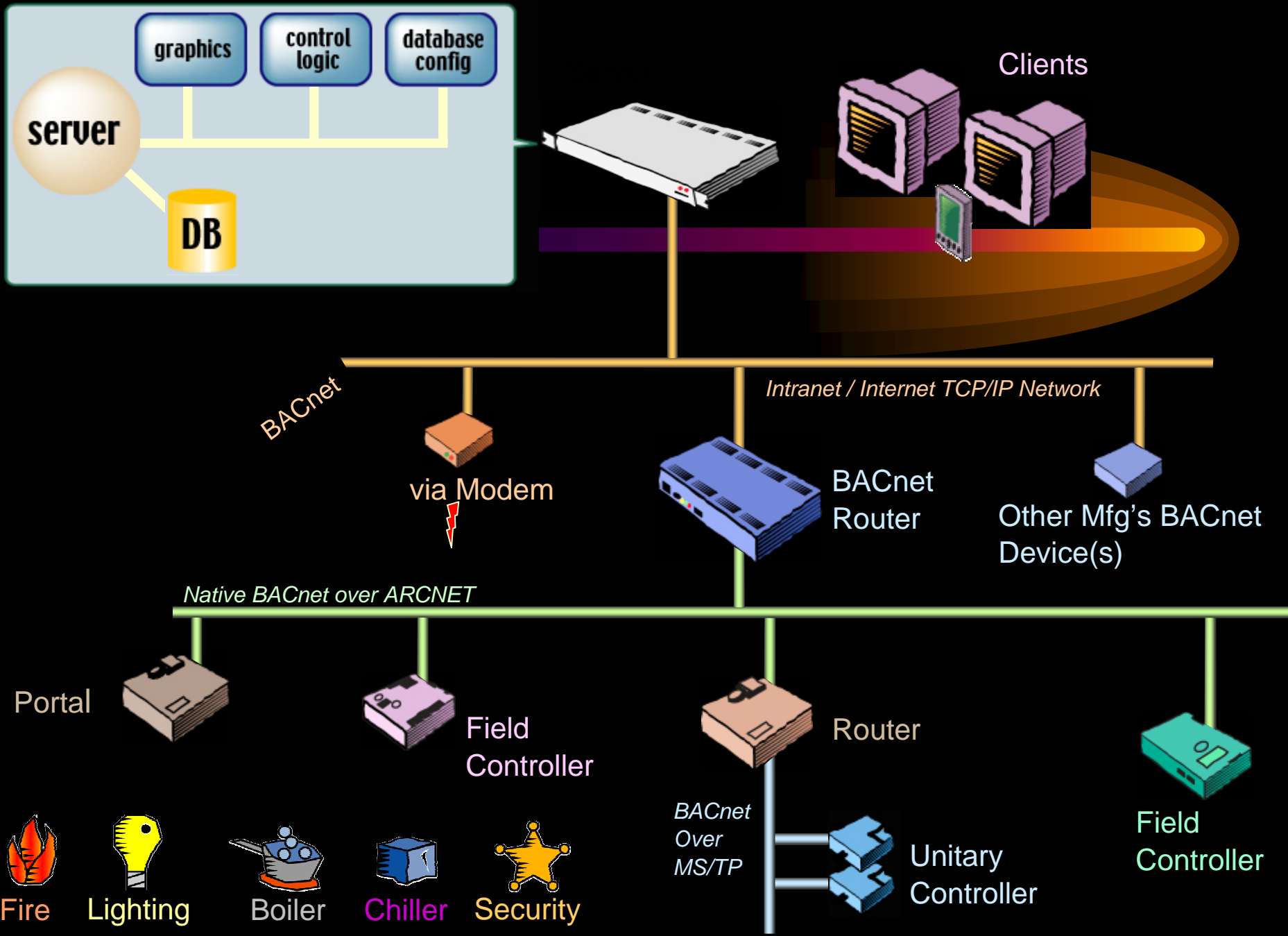


Security

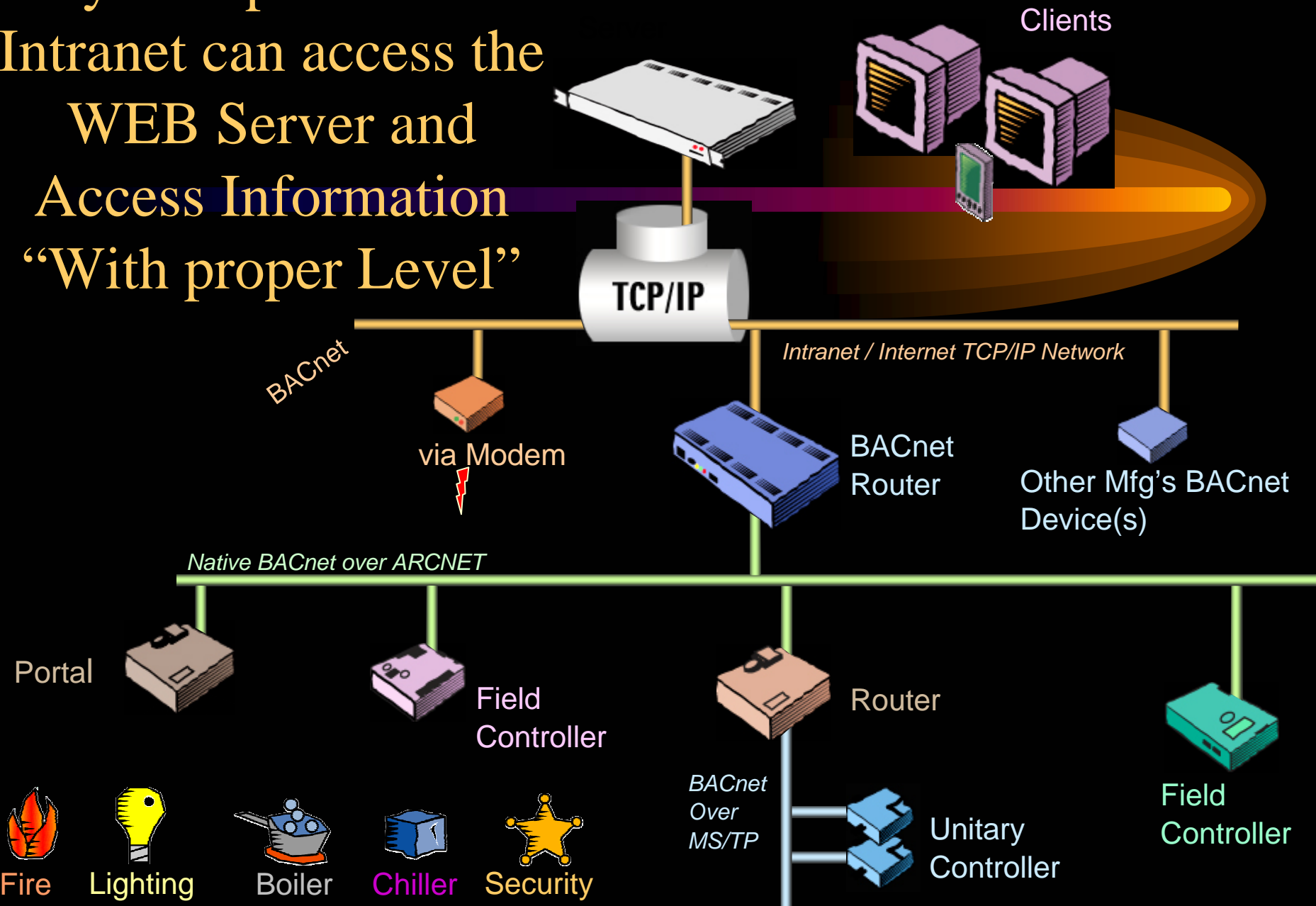
BACnet Over MS/TP



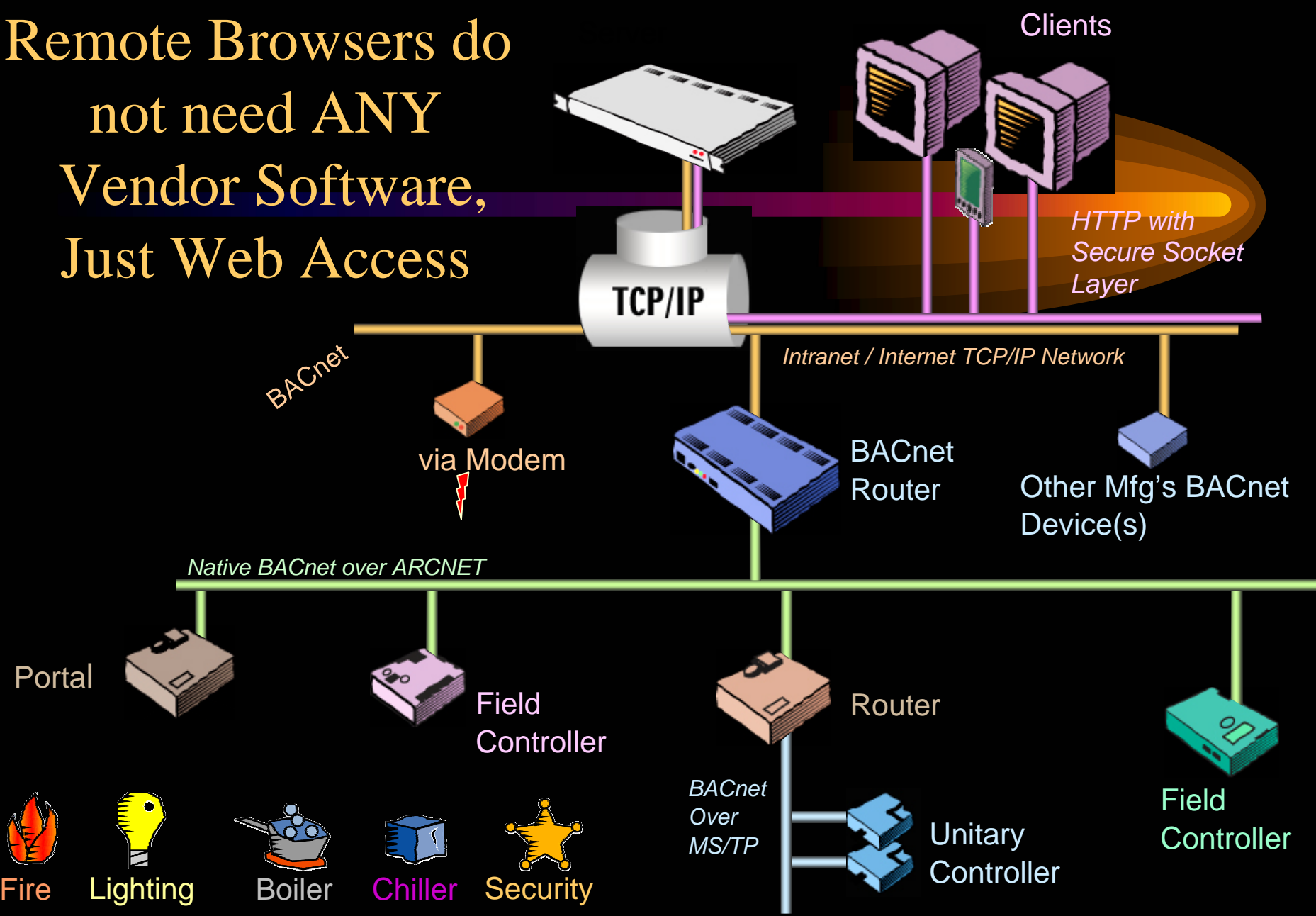
Unitary Controller



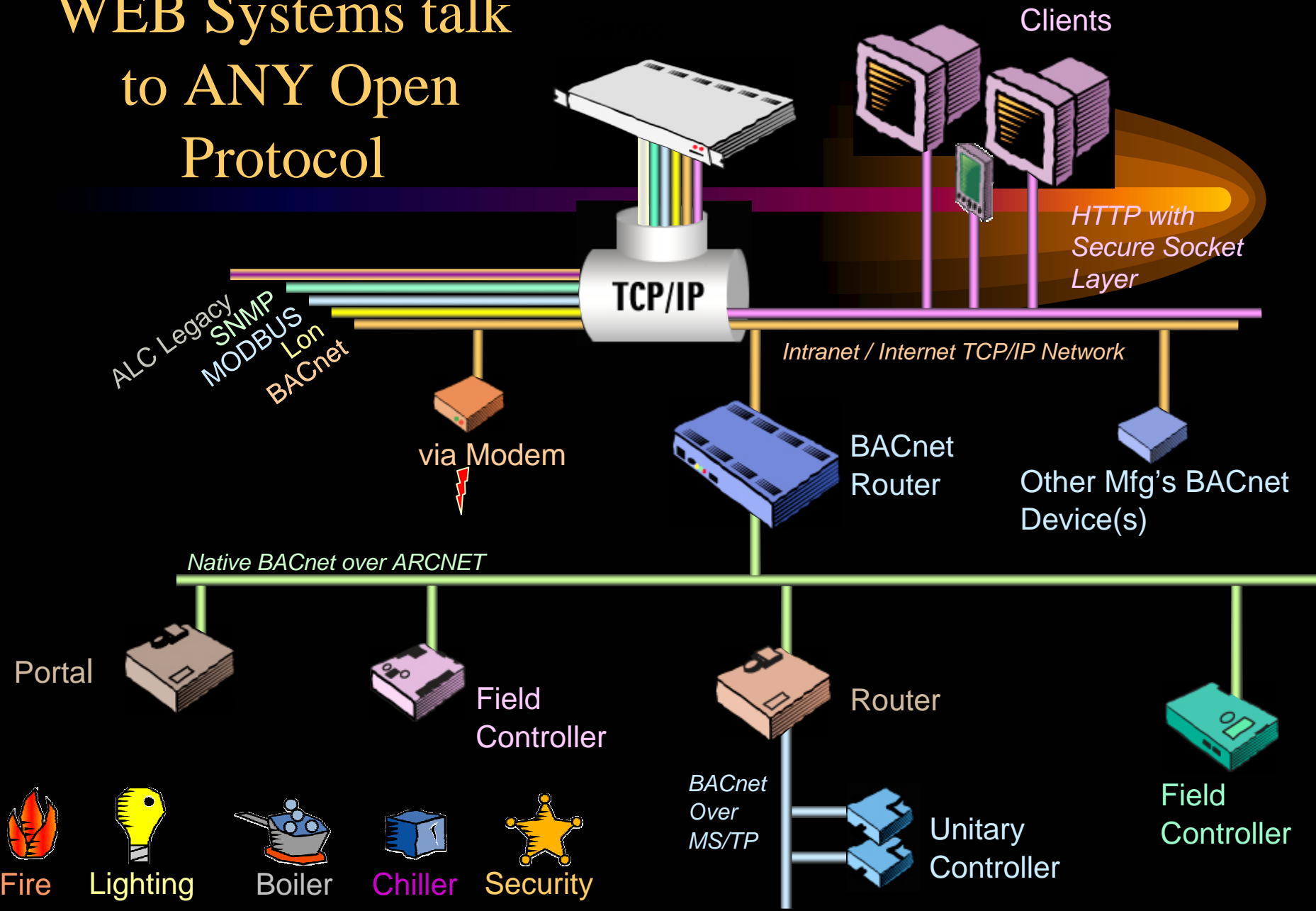
# Any Computer on the Intranet can access the WEB Server and Access Information "With proper Level"



Remote Browsers do not need ANY Vendor Software, Just Web Access



# WEB Systems talk to ANY Open Protocol



Energy or Power Information may be shared with Corporate Software

Clients

HTTP with Secure Socket Layer

TCP/IP

ALC Legacy  
SNMP  
MODBUS  
Lon  
BACnet

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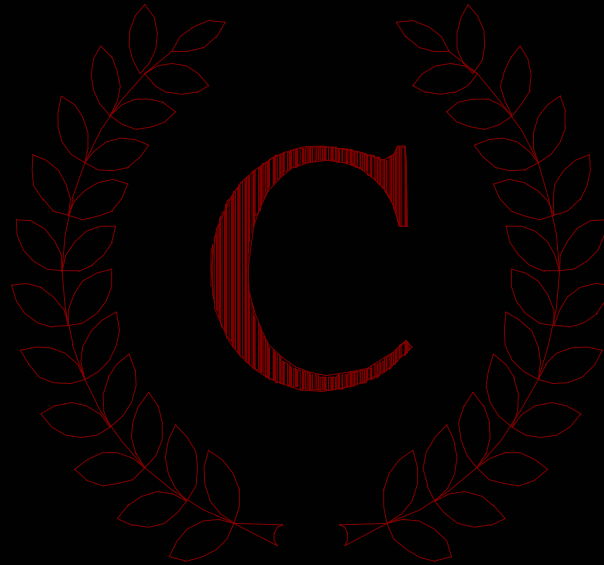


Security

# *Selection Hints*

- Established Reputation
- Agreements with equipment mfg's
- Local Office properly staffed
- Several Operating Installations
- Service Contracts are not the goal!!
- Negotiate long term Service Technician Rates in Advance!!

# *Questions and Answers*



**Michael Fischette P.E.**