IP systémy řízení budov

Aneb role počítačové sítě v návrhu modemí budovy

Radek Boch
Systems Engineer, CCIE #7095, rboch@cisco.com

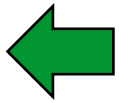
4.4.2012

Agenda

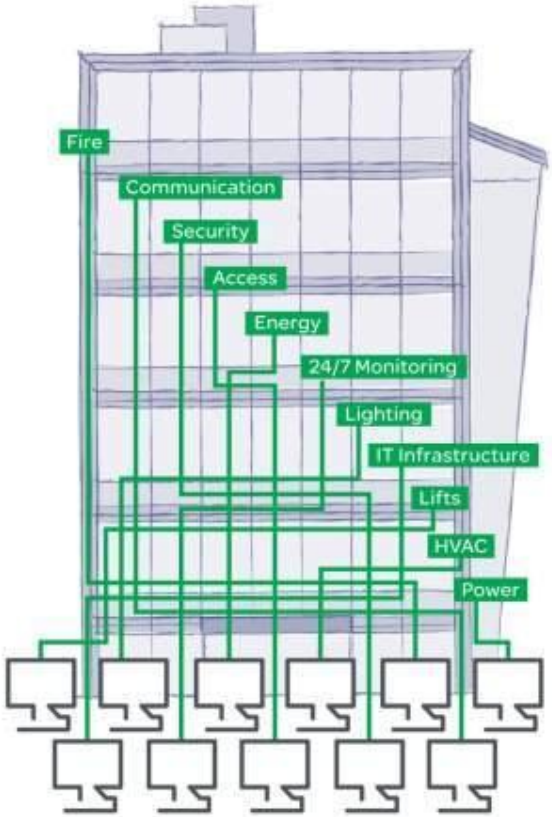
- Systémy v budovách
- IP v systémech budov
- IT v systémech budov
  - Transport
  - Spotřebitel

Agenda

- Systémy v budovách
- IP v systémech budov
- IT v systémech budov
  - Transport
  - Spotřebitel



Systémy v budovách



Různá zařízení / systémy
Náročnost (údržba / znalosti)
Mnoho interface
Nejednotný dohled / přístup

A co vzájemná automatizace?
A co úspory energií?

Systém pro MaR – Měření a Regulace

- Komplexní portfolio produktů pro MaR systémy
- Otevřené komunikační protokoly
- Vysoká kvalita a spolehlivost
- Řídící systém budovy (BMS)

MaR Produkty

- Ventily, pohony
- Čidla
- Termostaty
- Regulátory
- Měřiče tepla
- BMS software

Integrované produkty

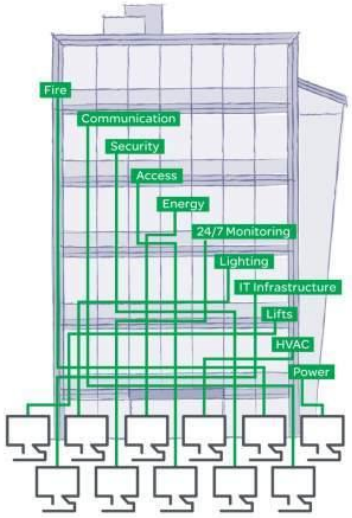
- Frekvenční měniče
- Měřící přístroje
- Řízení osvětlení
- UPSky
- Zabezpečení
- **IT produkty**

Technologie LonWorks®

- Technologii od Echolonu (LONWorks) byl udělen ISO standard
  - ISO / IEC normy pro platformu LonWorks jsou formálně označovány jako: ISO/IEC 14908-1: ČSN EN 14908 (738525)

- Sdružení LonMark
  - Nezávislá organizace výrobců a uživatelů, sdružující více než 400 členů
  - Zodpovídá za schválení produktů LONMARK®

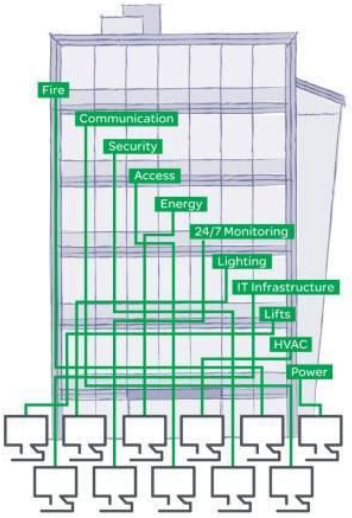
- Co lze připojit na Lon ?
  - bílé zboží (pračky,kávovary), vytápění, osvěžovače vzduchu
  - světla (DALI, HELIO)
  - čerpadla a motory, elektroměry, vodoměry, měřiče tepla
  - security systems, PC technika (HP tiskárny)
  - dveře, brány, dopravní systémy, alarmy (nemocnice)
  - Žaluzie, rolety, výtahy



Technologie BACnet™

- BACnet - A Data Communication Protocol for **B**uilding **A**utomation and **C**ontrol **Net**works
  - ANSI/ASHRAE standard 135 od roku 1995, ISO 16484-5 standard od roku 2003
  - Vyvoj od roku 1987
  - ASHRAE – American Society of Heating, Refrigerating and Air-Condtitioning Engineers, komise s 135 členy

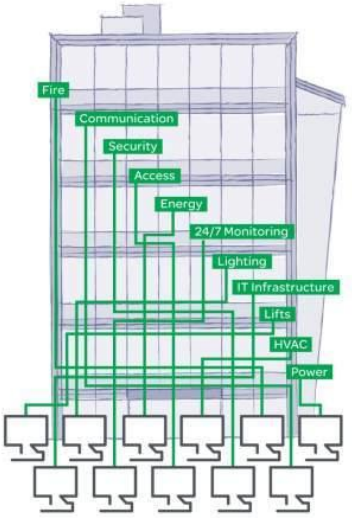
- Co lze připojit na BACnet ?
  - Požární systémy
  - Systémy řízení osvětlení
  - Bezpečnosntí systémy



Technologie Modbus®

- Modbus – komunikační protokol pro programování logických kontrolérů (PLC)
  - Vznikl v roce 1979 ve firmě Modicon (Schneider Electric)
  - Jednoduchý a robustní
  - Stal se standardem v oblasti průmyslové automatizace

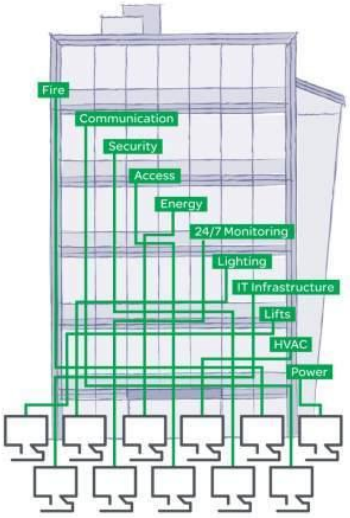
- Co lze připojit na Modbus ?
  - Průmyslová automatiazce
  - BMS
  - Infrastruktura
  - Dopravní systémy



Technologie M-Bus®

- M-Bus – průmyslový měřící protokol určený především pro dálkový odečet hodnot z měřičů spotřeby
  - Součástí standardu EN 13757 pro komunikační systémy pro vzdálené čtení všech typů měřičů
  - Pomalý ale odolný proti rušení

- Co lze připojit na M-Bus ?
  - Měřiče tepla/chladu
  - Měřiče spotřeby elektrické energie
  - Plynoměry
  - Vodoměry

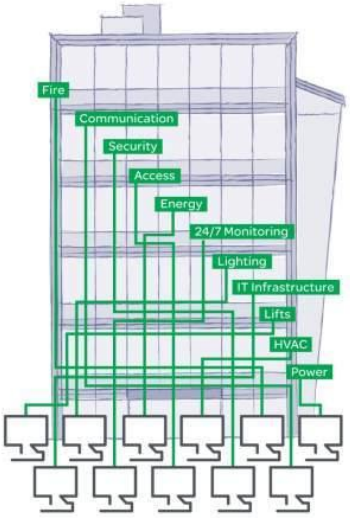


Technologie KNX®

- Technologie pro systémovou techniku budov
  - Sdružuje tři předchozí standardy (EIB, EHS a BatiBus)
  - Jeden programovací nástroj
  - V KNX asociaci je 250 členů

- Evropská i celosvětová norma
  - evropská: CENELEC EN50090 a CEN EN 13321-1
  - mezinárodní: ISO/IEC 14543-3

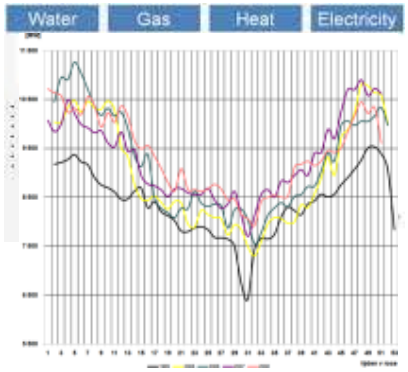
- Co lze připojit na KNX?
  - Ovladače světel, žaluzií
  - Řízení MaR
  - Monitorování alarmů
  - Měření energií
  - Distribuce audio/video signálů



Trendy úspor

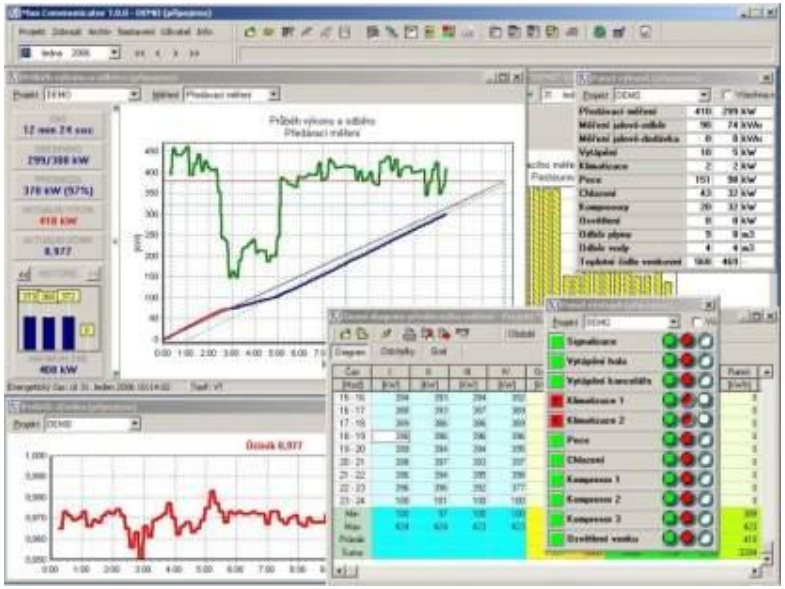
- Monitoring
  - Psychologie
    - Vidím spotřeby
    - Znám náklady
    - Chci ušetřit !

  - Mám přehled kde jsou jaké náklady, ne jen jedno číslo za celek !



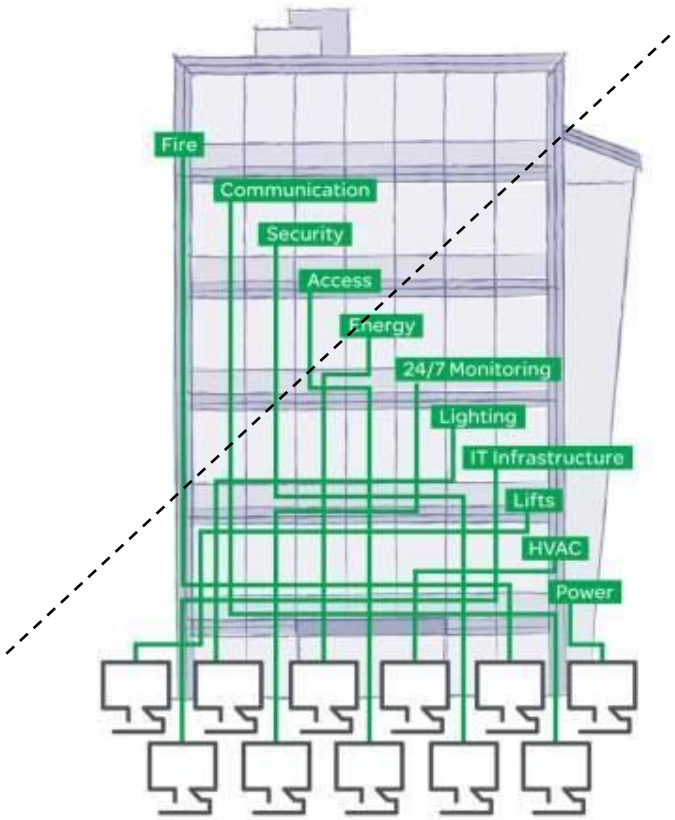
Trendy úspor

- ¼ hod maximum
  - Sledování spotřeb elektrické energie
  - Vyhodnocení vzrůstajícího odběru
  - Odpínání zátěží
  - Úspora energií / nákladů

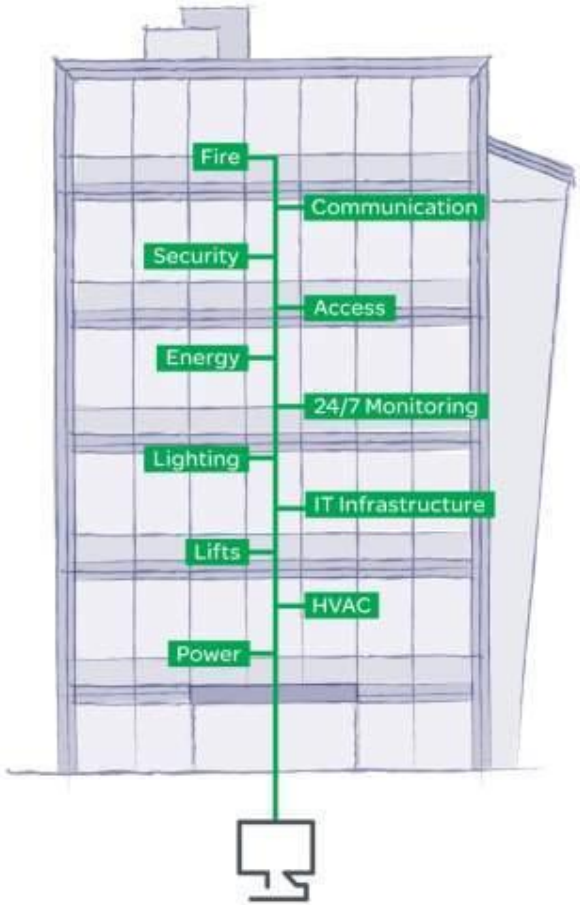


Komplexní integrovaný řídící systém

je jednou z nutných podmínek pro **moderní inteligentní budovy**



Různá zařízení / systémy
Náročnost (údržba / znalosti)
Mnoho interface
Nejednotný dohled / přístup

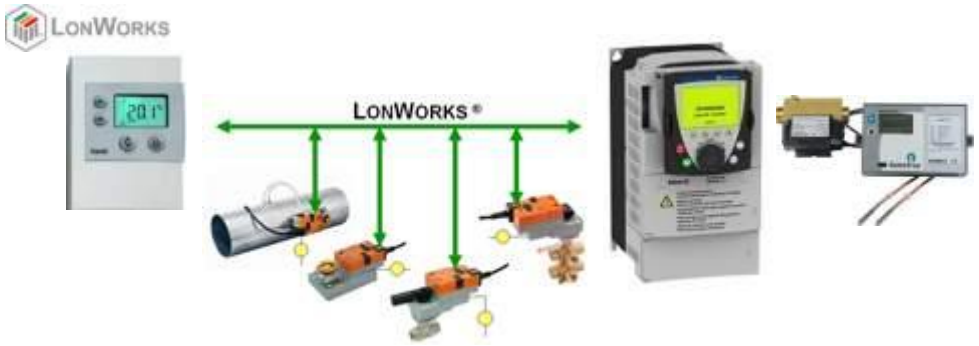


Nižší náklady
Vyšší produktivita
Jednotný servis
Snadný přístup k datům

Trendy úspor

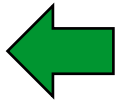
- Využití otevřených protokolů a sběrnic i na té nejnižší úrovni

  Úspora realizačních nákladů a více dostupných informací v provozu

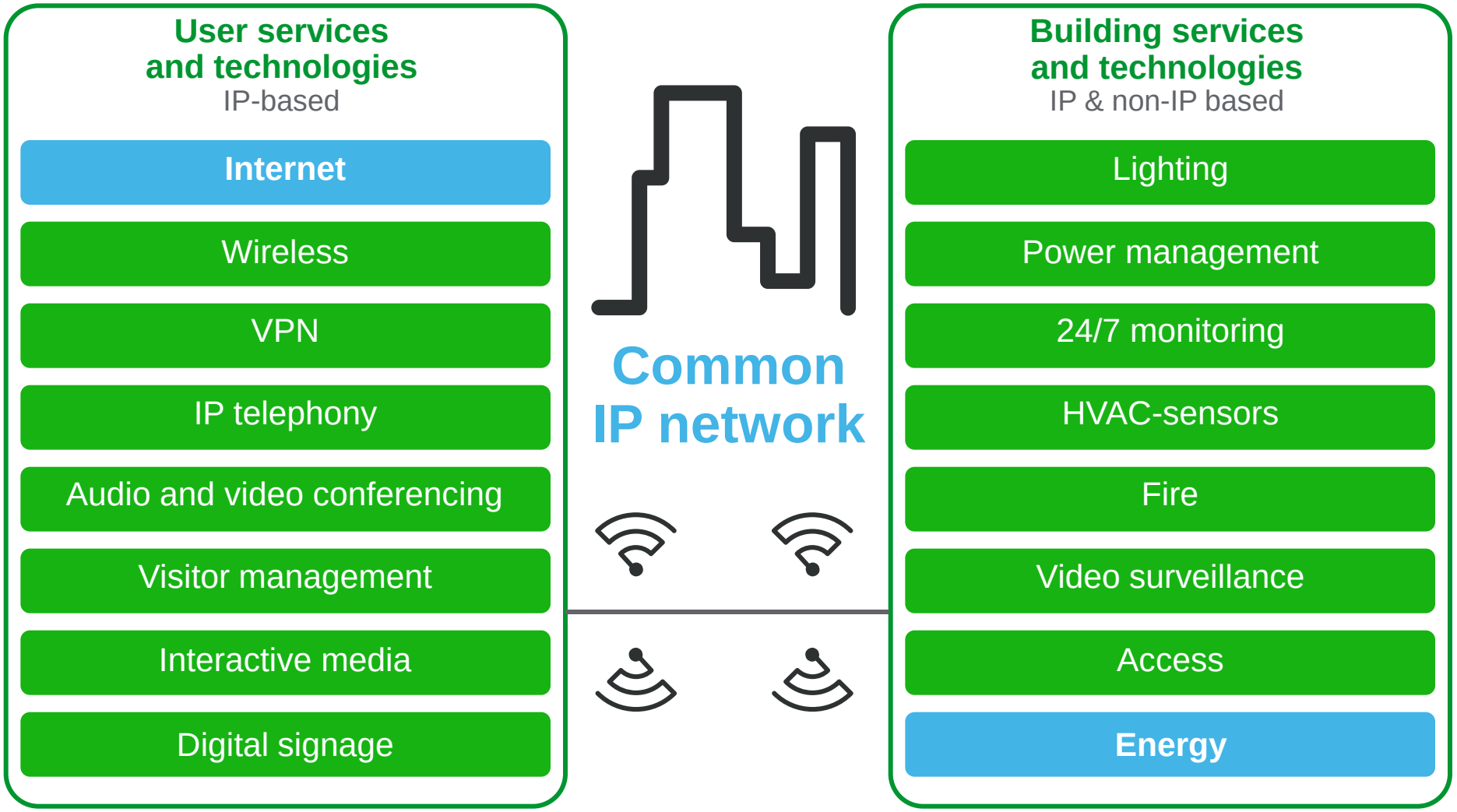


Agenda

- Systémy v budovách
- IP v systémech budov
- IT v systémech budov
  - Transport
  - Spotřebitel



Converge user & building services

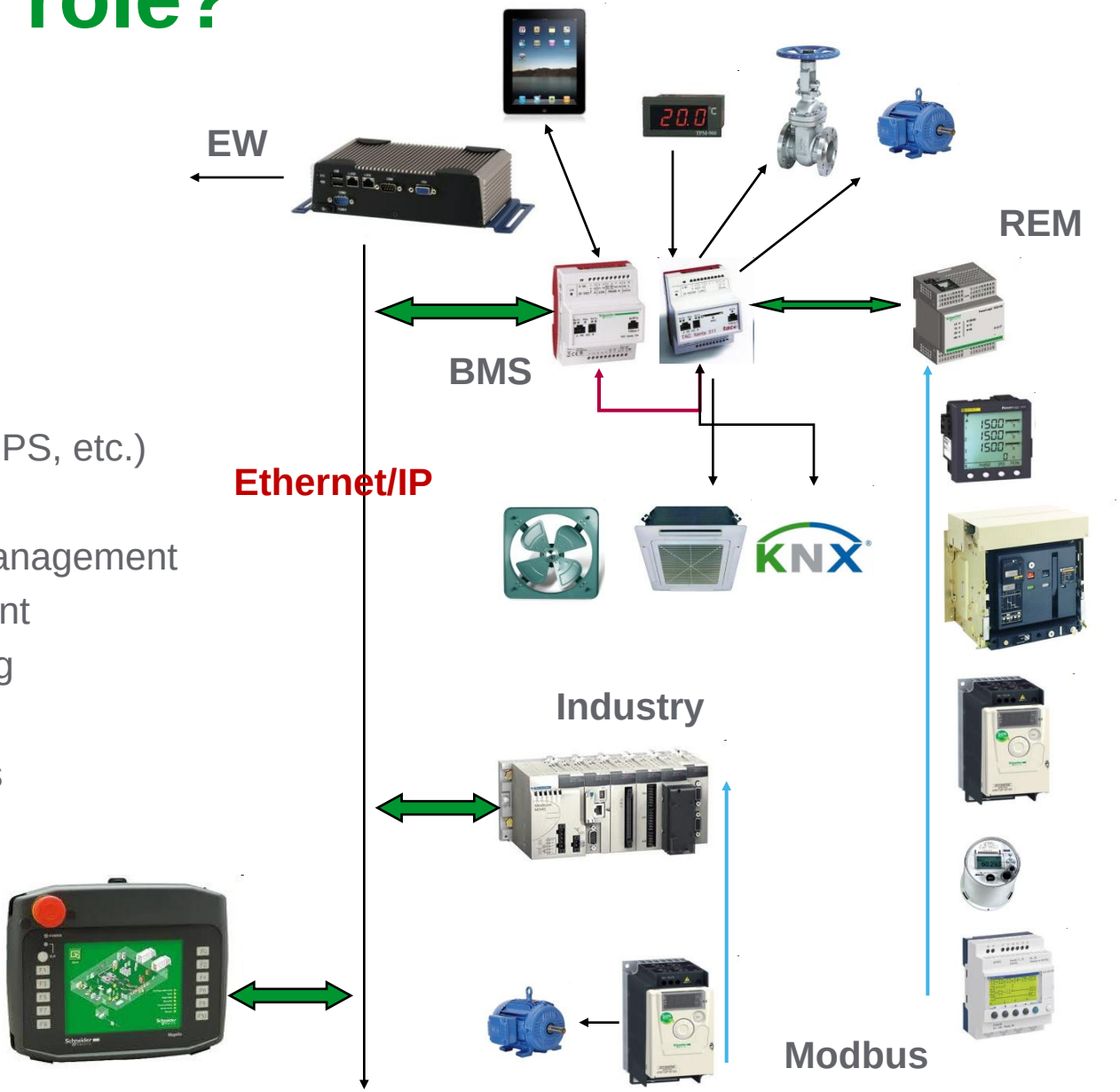


Switches, routers, WiFi, - IP endpoints: telephones, PCs, printers

- Plug load management via smart outlet strips
- Building Management: HVAC, Access control

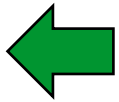
Ethernet/IP role?

HVAC control
- Access control
- Intrusion detection
- Video surveillance
- Fire safety
- Equipment alarms (lifts, UPS, etc.)
- Energy monitoring
- Distributed ICT energy management
- HVAC energy management
- Remote energy monitoring
- Lighting
- Motorized window shades

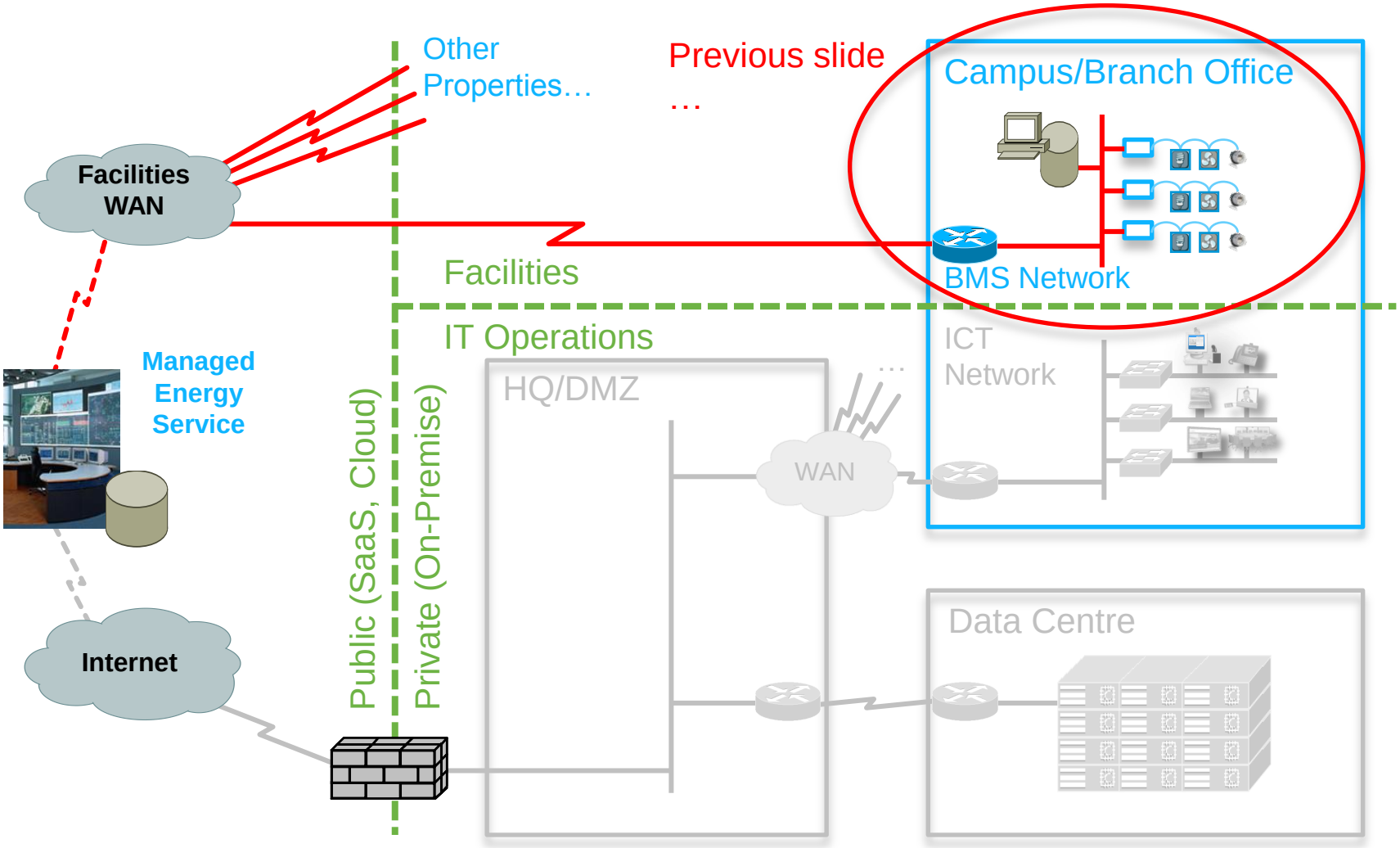


Agenda

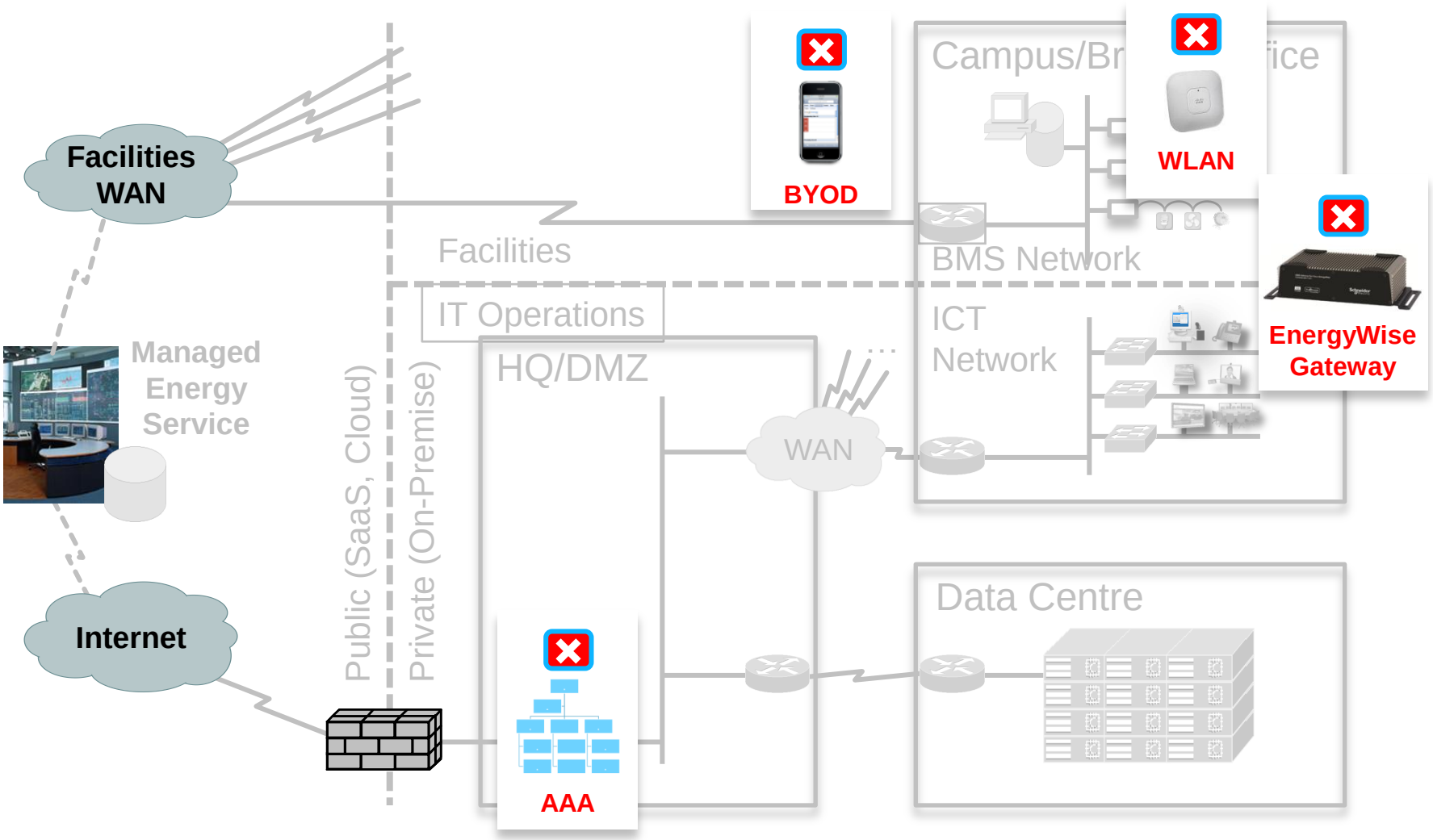
- Systémy v budovách
- IP v systémech budov
- IT v systémech budov
  - Transport
  - Spotřebitel



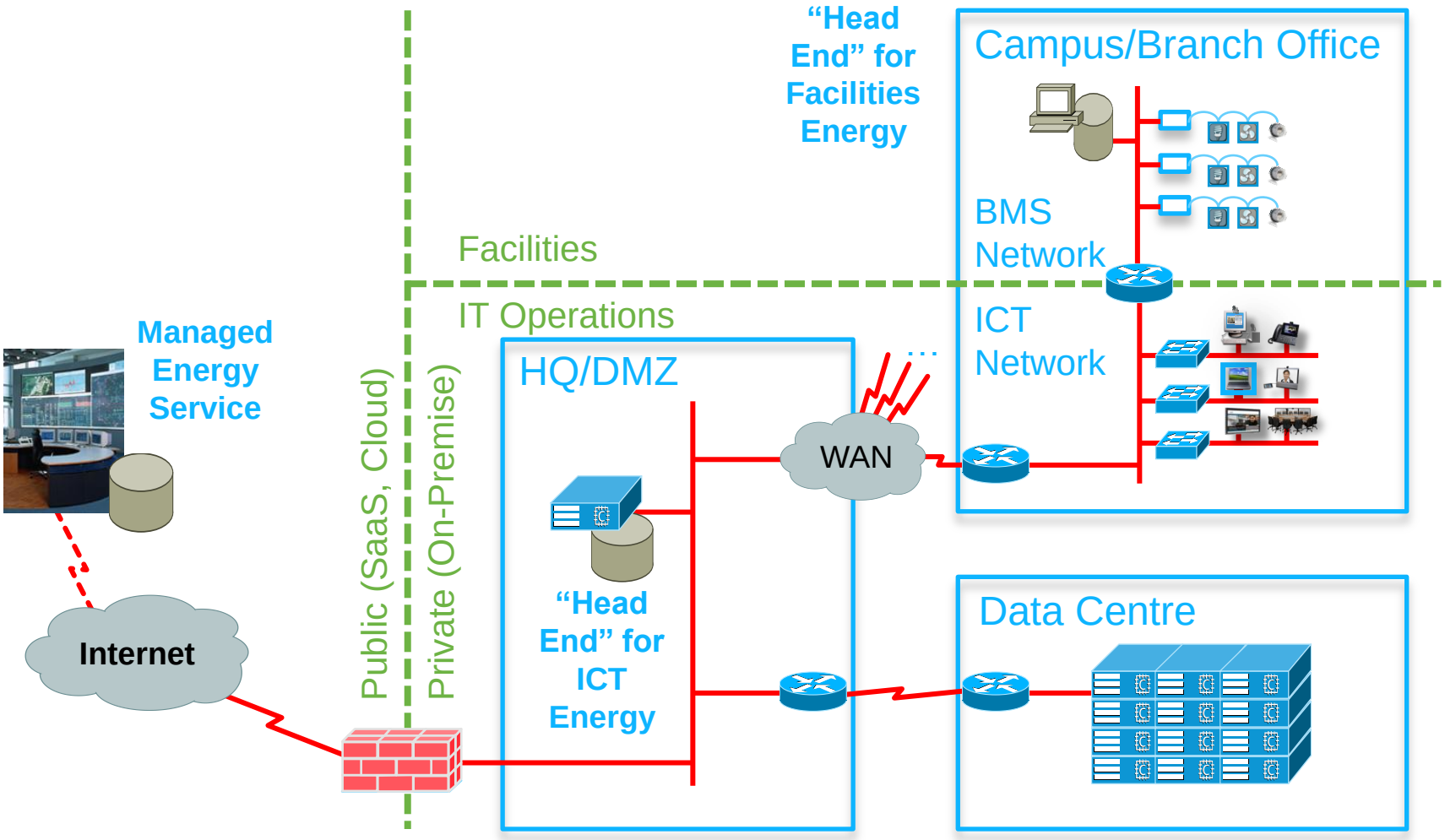
Today: Typical Managed Energy Service



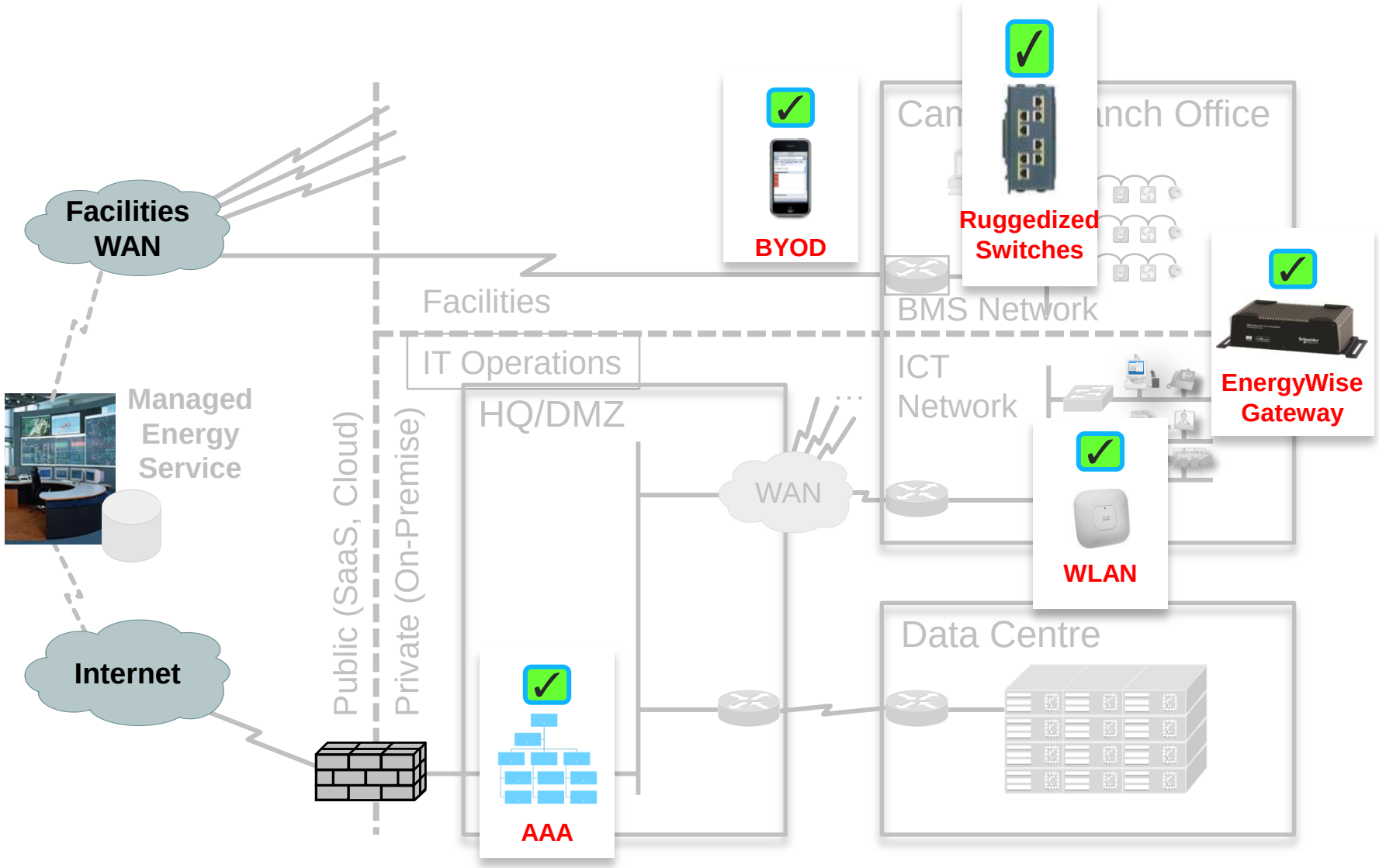
Overlay Approach: Barriers



Converged Network: Reference Architecture – the long term solution

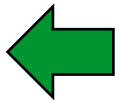


Converged Network: Value-Add

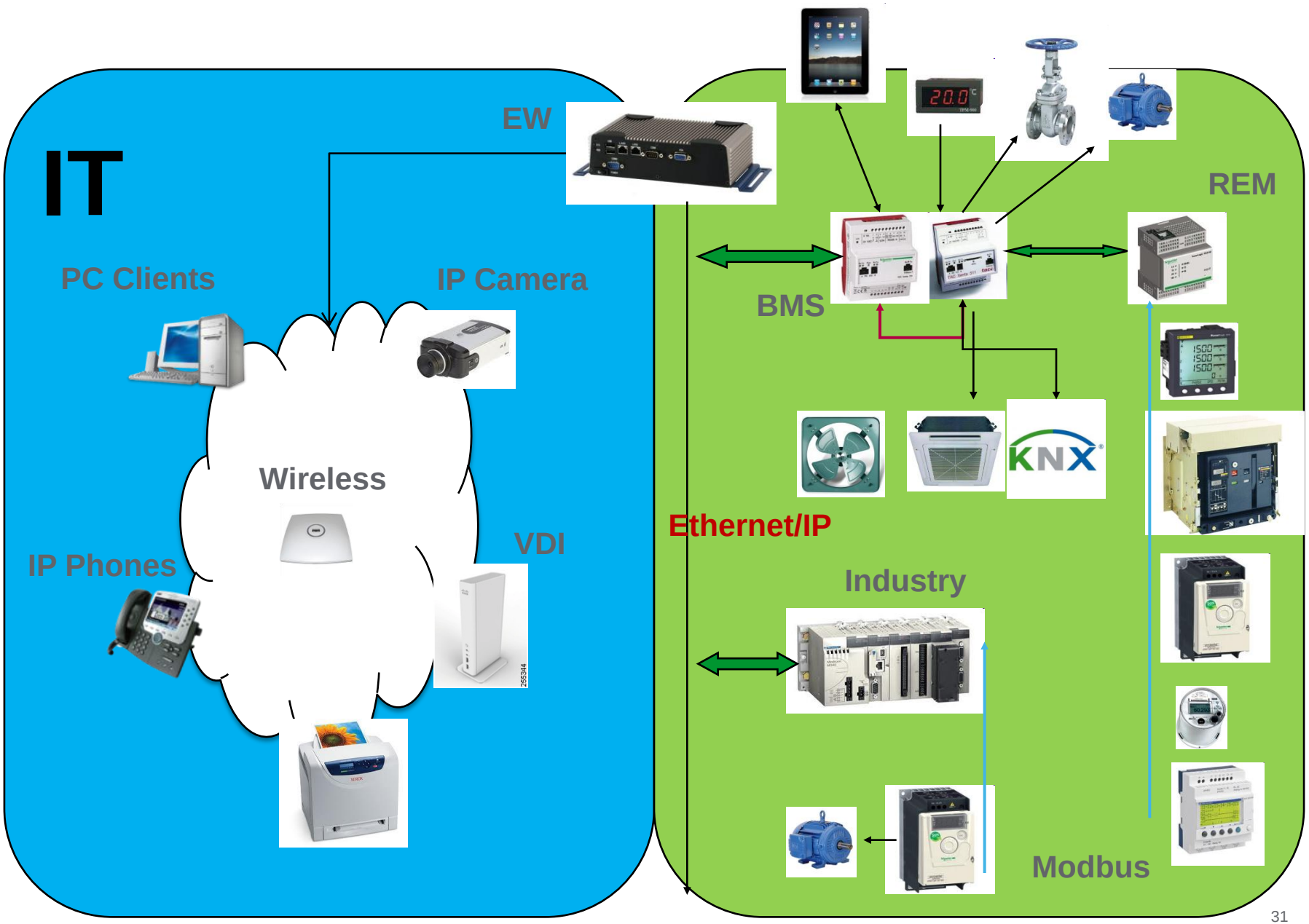


Agenda

- Systémy v budovách
- IP v systémech budov
- IT v systémech budov
  - Transport
  - Spotřebitel

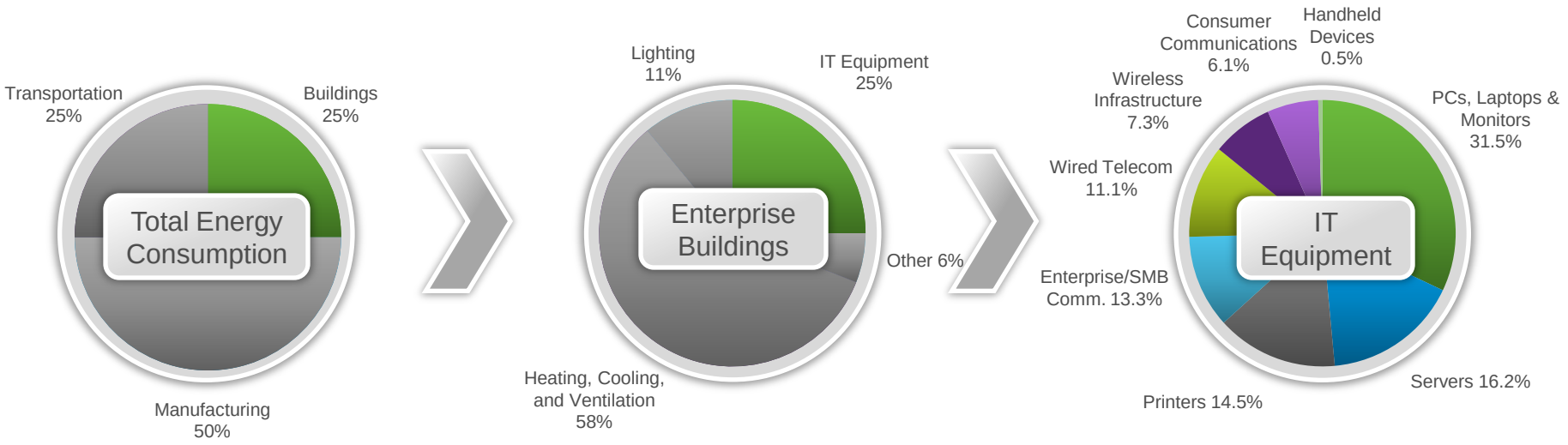


Building energy management/automation



Energy Operational Costs

Opportunity in Enterprise IT



Cost Savings

- Rising energy costs
- IT device proliferation
- Video applications

Sustainability Mandates

- Regulatory compliance
- Government mandates
- Company requirements

Source: BOMA 2006, EIA 2006, AIA 2006
Source: UK Energy Efficiency Best Practice Program; Energy Consumption Guide 19: Energy Use in Offices
Source: Gartner Dataquest, Forecast of IT Hardware Energy Consumption, Worldwide, 2005-2012.

Power Management Scenario

	Hours	Days	Hours	Total
ON	Working days Mon-Fri	251 *(x 12h)*	3012	3012
OFF	Working days Mon-Fri	251 *(x 12h)*	3012	5748
OFF	Weekends	104 (x 24h)	2496	
OFF	Holidays	10 (x 24h)	240	
Total		365	8760	8760

66% of the Time It Could Be Off

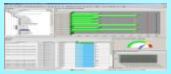
EnergyWise

EnergyWise Overview

Management Applications

Prime LMS 4.1 | Verdiem Surveyor | Joulex JEM | CA ecoMeter | 1E (Q3 CY11)





Building Management Systems (BMS)

EnergyWise Toolkit Management API

EnergyWise Domain
(switches and routers)

EnergyWise Gateways and Protocol Translators (eg. FieldServer, Schneider Torana, ...)

EnergyWise-enabled Endpoints Using SDK

IP Phones | PC Clients (Lenovo) | Smart PDU



Non-Energywise, PoE Devices

IP Camera | Wireless | VDI



Non-Energywise, Non-PoE

Building Devices Non-Energywise

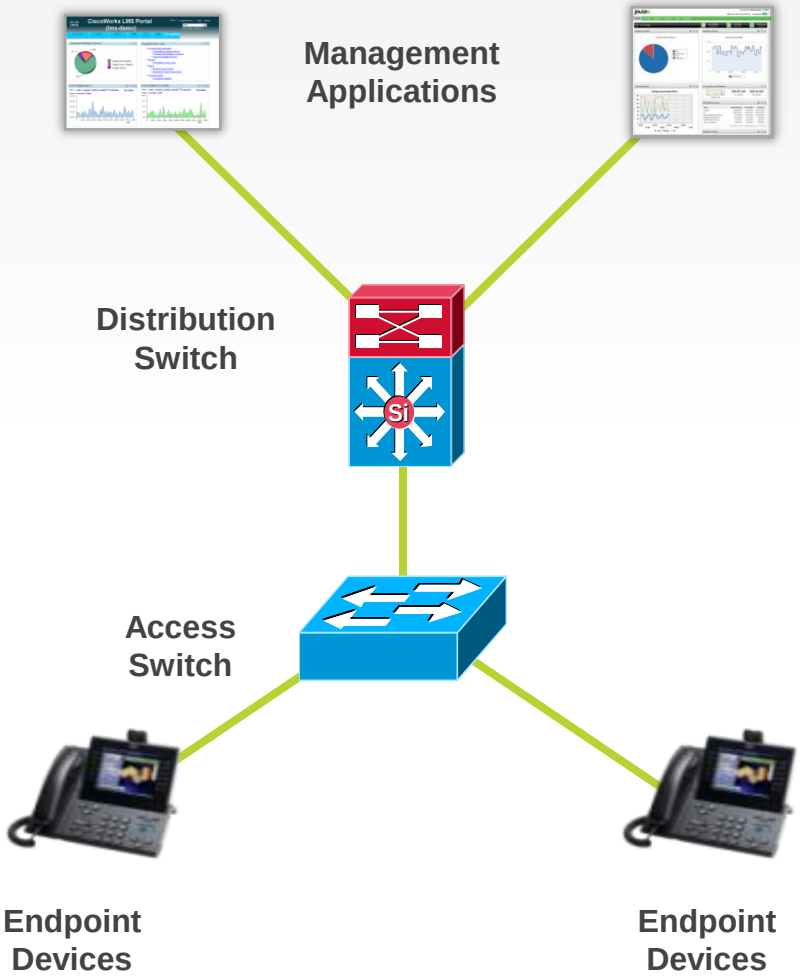



*) Most Lenovo laptops are supporting EnergyWise in the pre-installed "Lenovo Power Manager" application.

EnergyWise Partners for Devices and Applications

EnergyWise Technology

Network-Based Energy Management

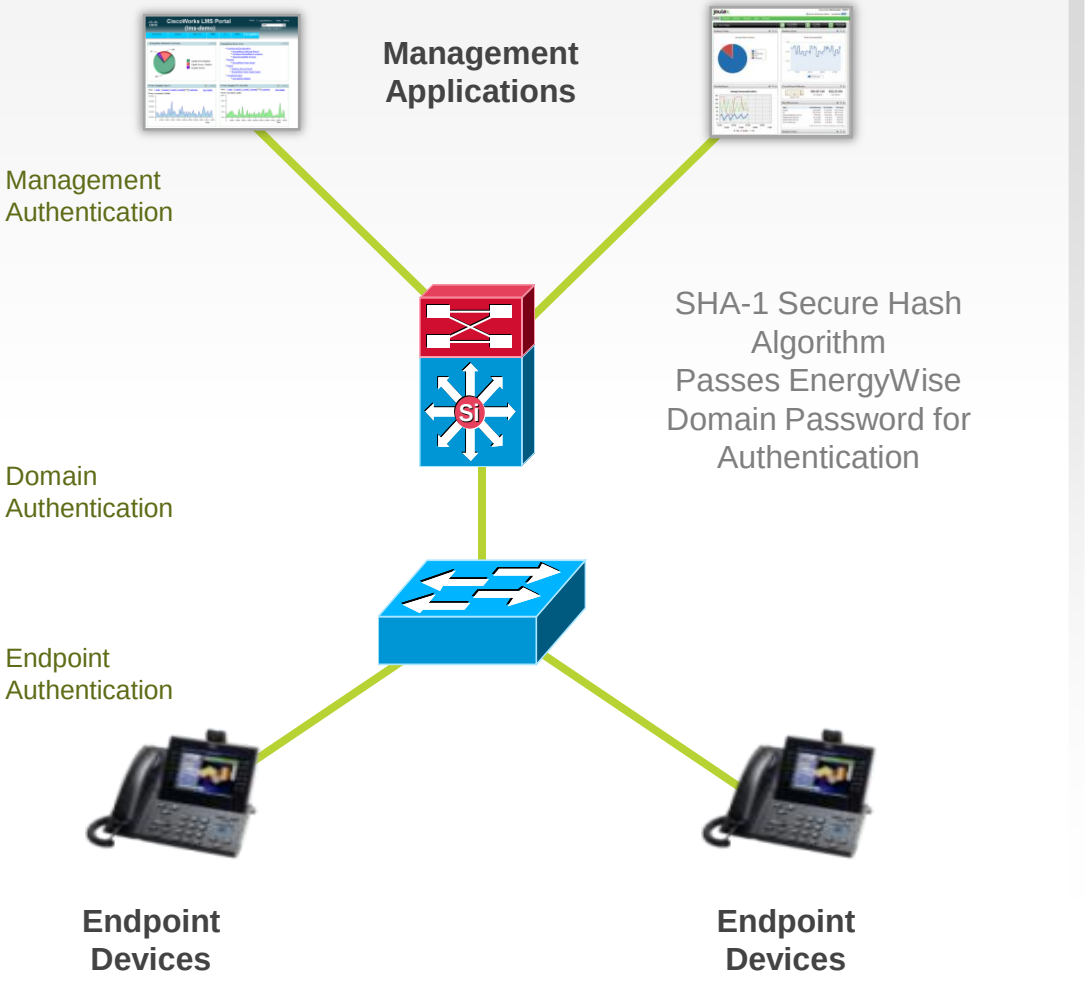


Process:

1. **Secure Authentication**
2. Auto-discover devices
3. Collect energy consumption
4. Set power level modes
5. Configure Time of Day Policies

EnergyWise Technology

Network-Based Energy Management

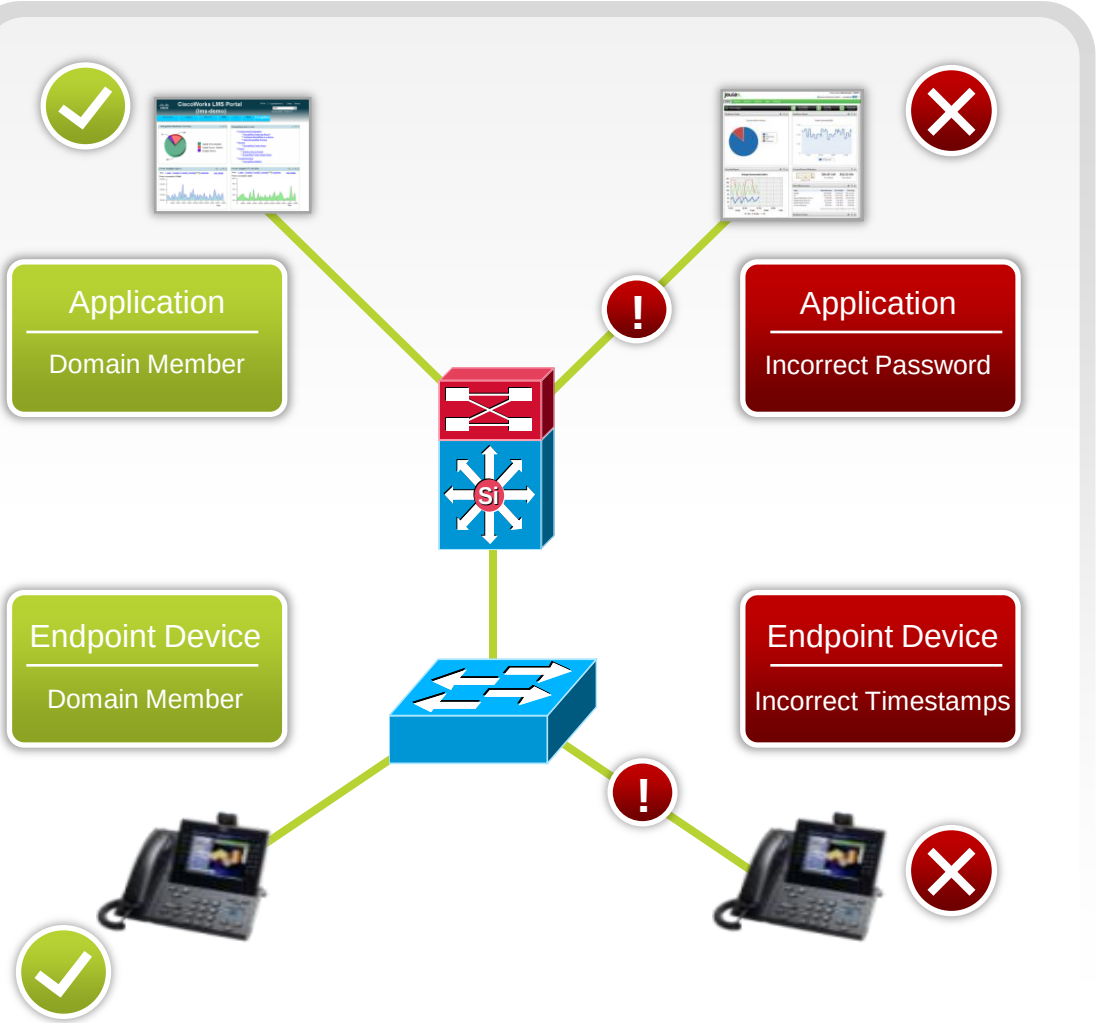


Process:

1. **Secure Authentication**
2. Auto-discover devices
3. Collect energy consumption
4. Set power level modes
5. Configure Time of Day Policies

EnergyWise Technology

Network-Based Energy Management

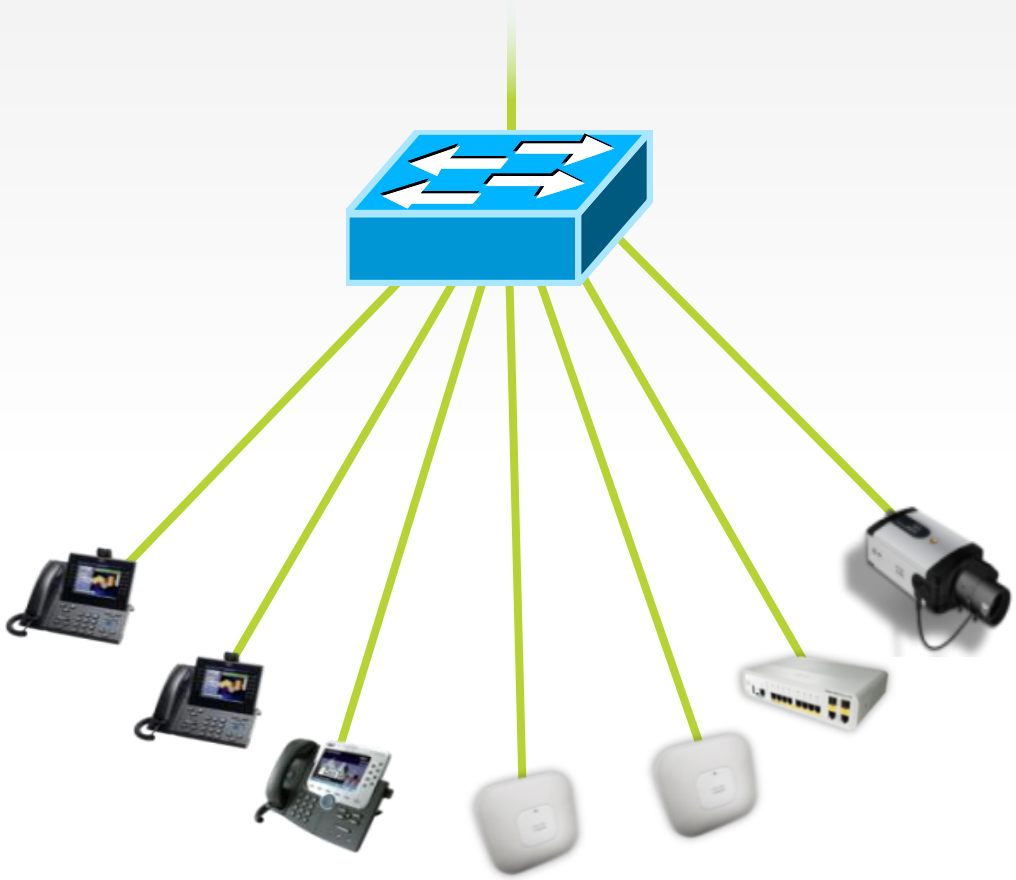


Process:

1. **Secure Authentication**
2. Auto-discover devices
3. Collect energy consumption
4. Set power level modes
5. Configure Time of Day Policies

EnergyWise Technology

Network-Based Energy Management

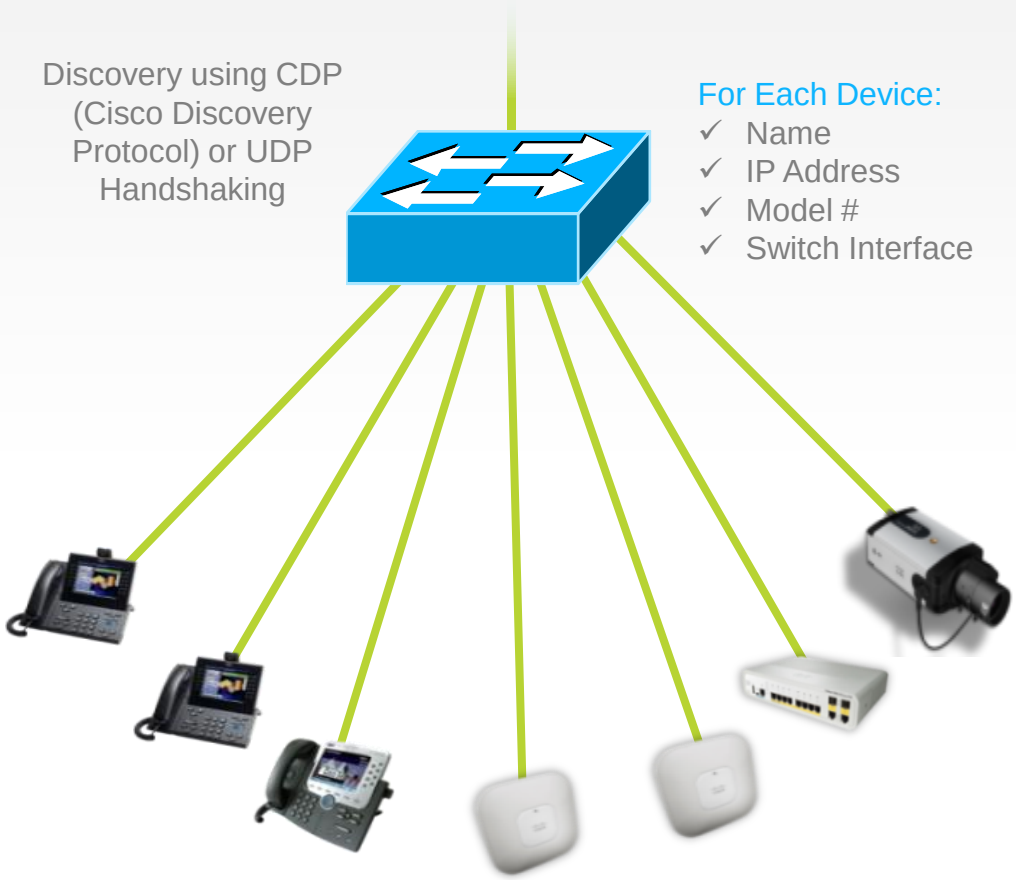


Process:

1. Secure Authentication
2. **Auto-discover devices**
3. Collect energy consumption
4. Set power level modes
5. Configure Time of Day Policies

EnergyWise Technology

Network-Based Energy Management

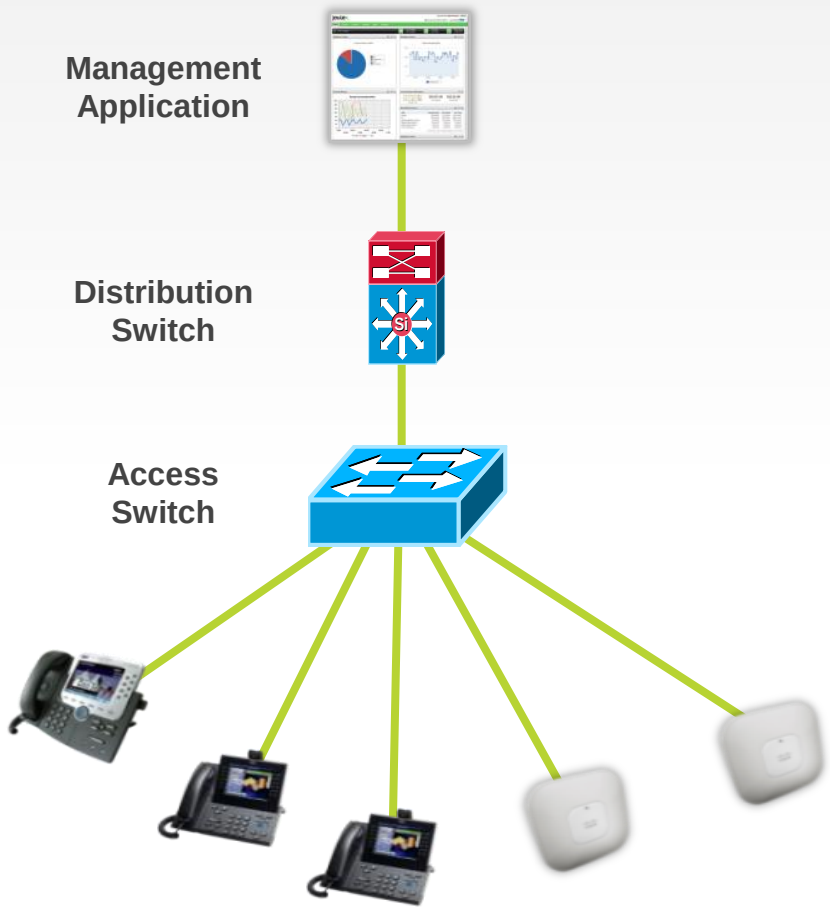


Process:

1. Secure Authentication
2. **Auto-discover devices**
3. Collect energy consumption
4. Set power level modes
5. Configure Time of Day Policies

EnergyWise Technology

Network-Based Energy Management



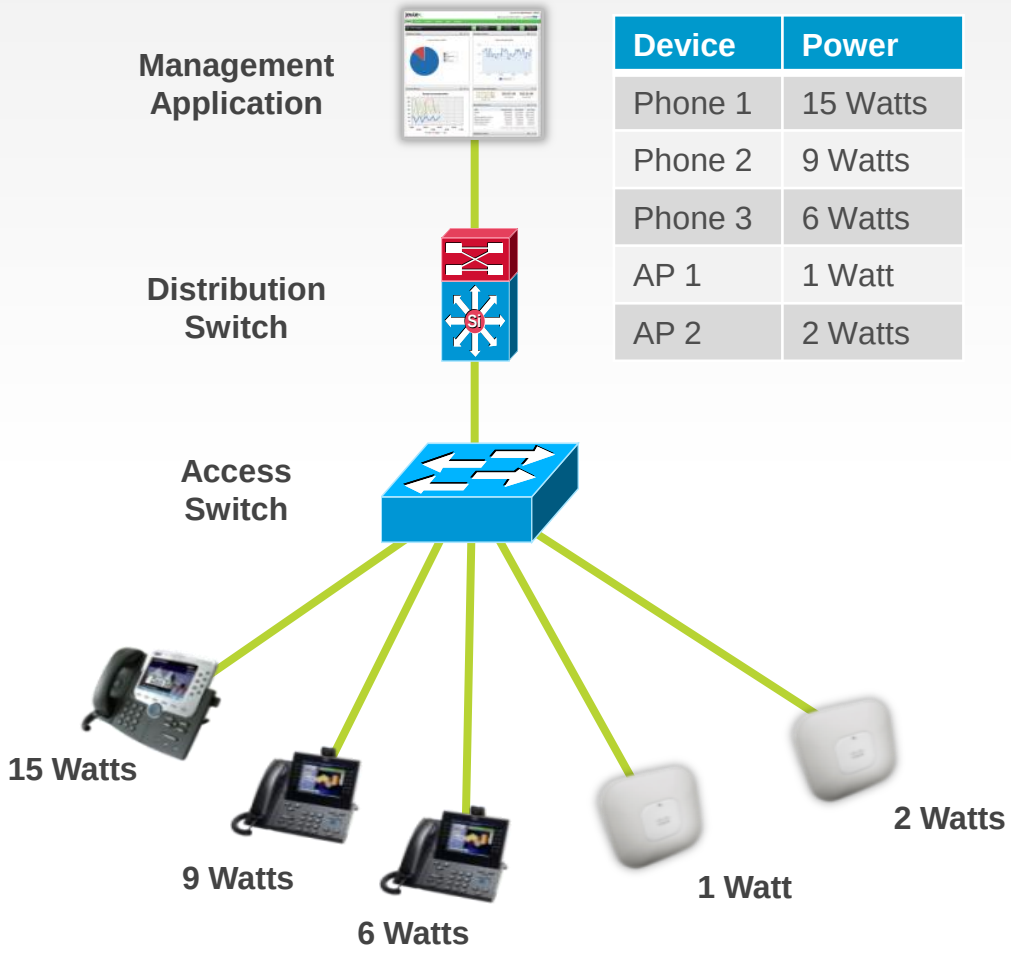
IP Phones and Access Points

Process:

1. Secure Authentication
2. Auto-discover devices
3. **Collect energy consumption**
4. Set power level modes
5. Configure Time of Day Policies

EnergyWise Technology

Network-Based Energy Management



Device	Power
Phone 1	15 Watts
Phone 2	9 Watts
Phone 3	6 Watts
AP 1	1 Watt
AP 2	2 Watts

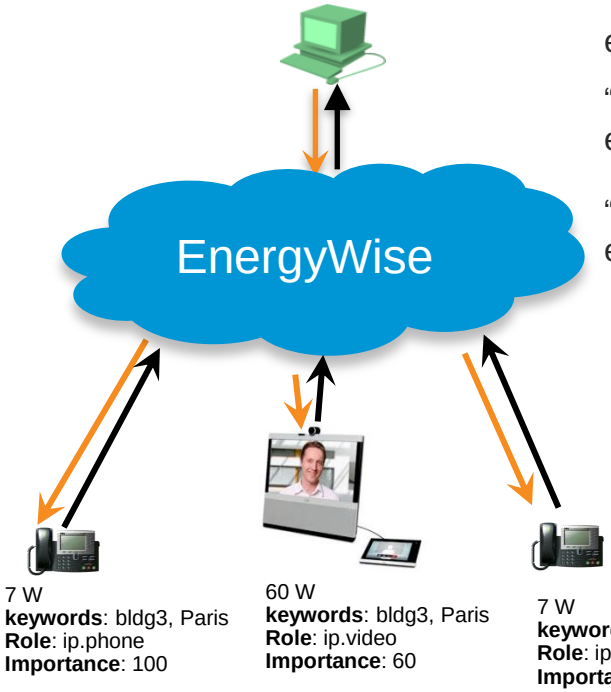
Process:

1. Secure Authentication
2. Auto-discover devices
3. **Collect energy consumption**
4. Set power level modes
5. Configure Time of Day Policies

ICT Energy Management
Cisco EnergyWise

Services:

- Finely Measure (per device, per type of device, per location)
- Control (per device, or group of devices, granular power level 0-10)
- Organize (keywords, name, role, importance, business impact)
- Optimize and Report



"What is the total power usage in Paris?"
energywise query importance 100 keyword paris name * sum usage

"What is the power usage of all video endpoints?"
energywise query importance 100 keyword ip.video name * sum usage

"Shut down non-critical equipment in Paris"
energywise query importance 60 keyword paris name * set level 0

A new paradigm in Energy Management!

Displaying Usage

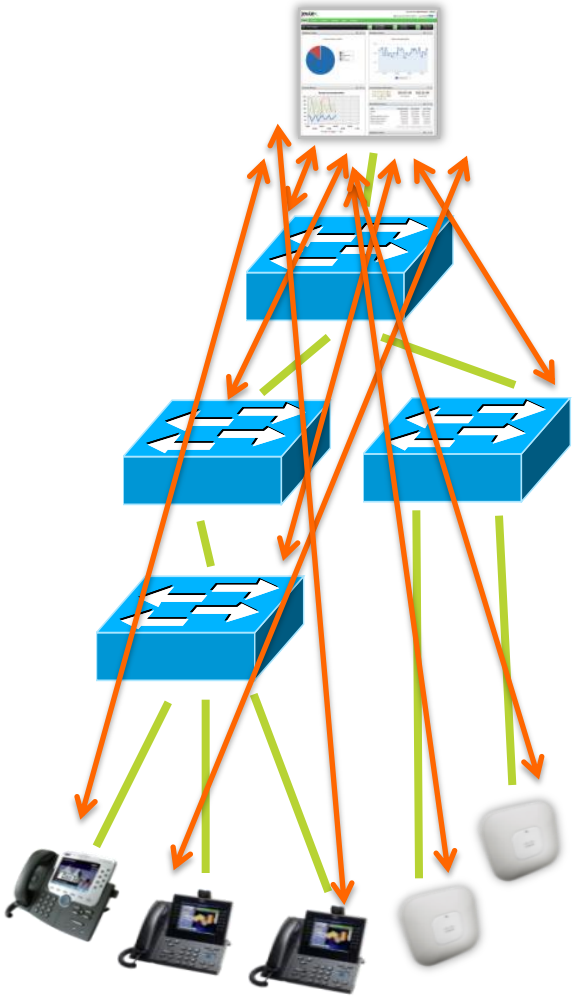
```
c2960S-1#show energywise usage
Interface   Name                          Usage        Category  Caliber
---------   ----                          -----        --------  -------
            c2960S-1-1                    81.0  (W)    consumer  max
Gi1/0/4     SEP000E84C063C1               1.9   (W)    consumer  actual
Gi1/0/5     PVC300-1                      4.4   (W)    consumer  actual
Gi1/0/6     Gi1.0.6                       2.1   (W)    meter     actual
            SEP5475D02B3F46               6.0   (W)    consumer  presumed
Gi1/0/7     Gi1.0.7                       6.0   (W)    meter     actual
            SEP8CB64FF6723F               8.8   (W)    consumer  presumed
Gi1/0/8     Gi1.0.8                       2.2   (W)    meter     actual
            SEP5475D02B40BE               6.0   (W)    consumer  presumed
Gi1/0/10    Gi1.0.10                      6.1   (W)    meter     actual
            SEPC0626B62AE93               8.8   (W)    consumer  presumed

Total Displayed: 11    Usage: 116.9
```

Message Propagation (without EnergyWise)

Process:

1. Retrieve the list of IP addresses where devices are configured, ie using SNMP
2. For each device, you need the correct community string, and MIB to be used
3. Each device to be queried individually... scalability?

With thousands of devices to query or control, this can be slow.



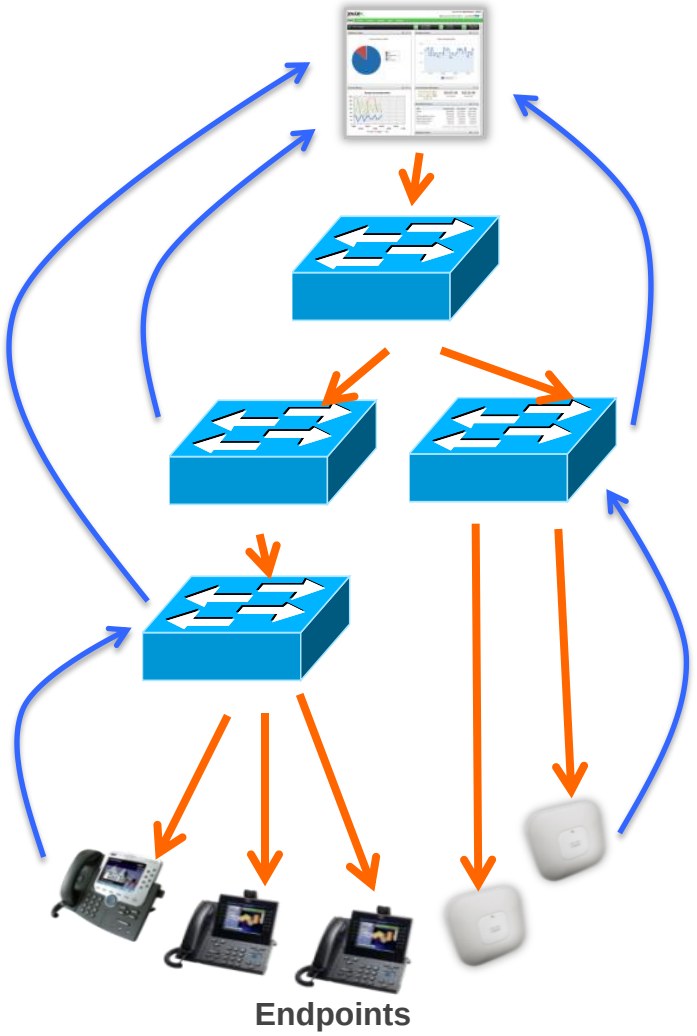
Message Propagation (with EnergyWise)

Process:

1. Send a query to one switch
2. Network propagates message down to endpoints
3. Results are back within seconds.

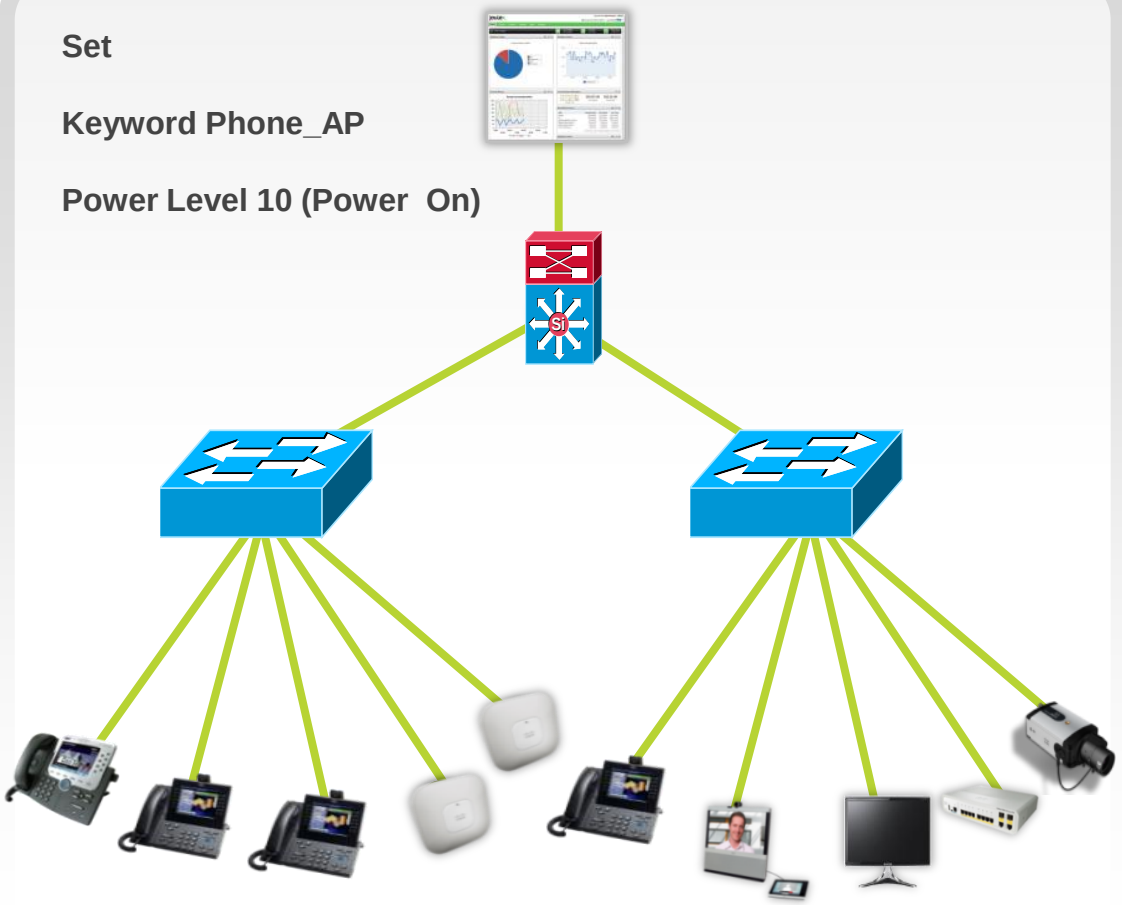
A single query can command thousands of devices instantly.

Policies can be applied from within the network itself.



EnergyWise Technology

Network-Based Energy Management

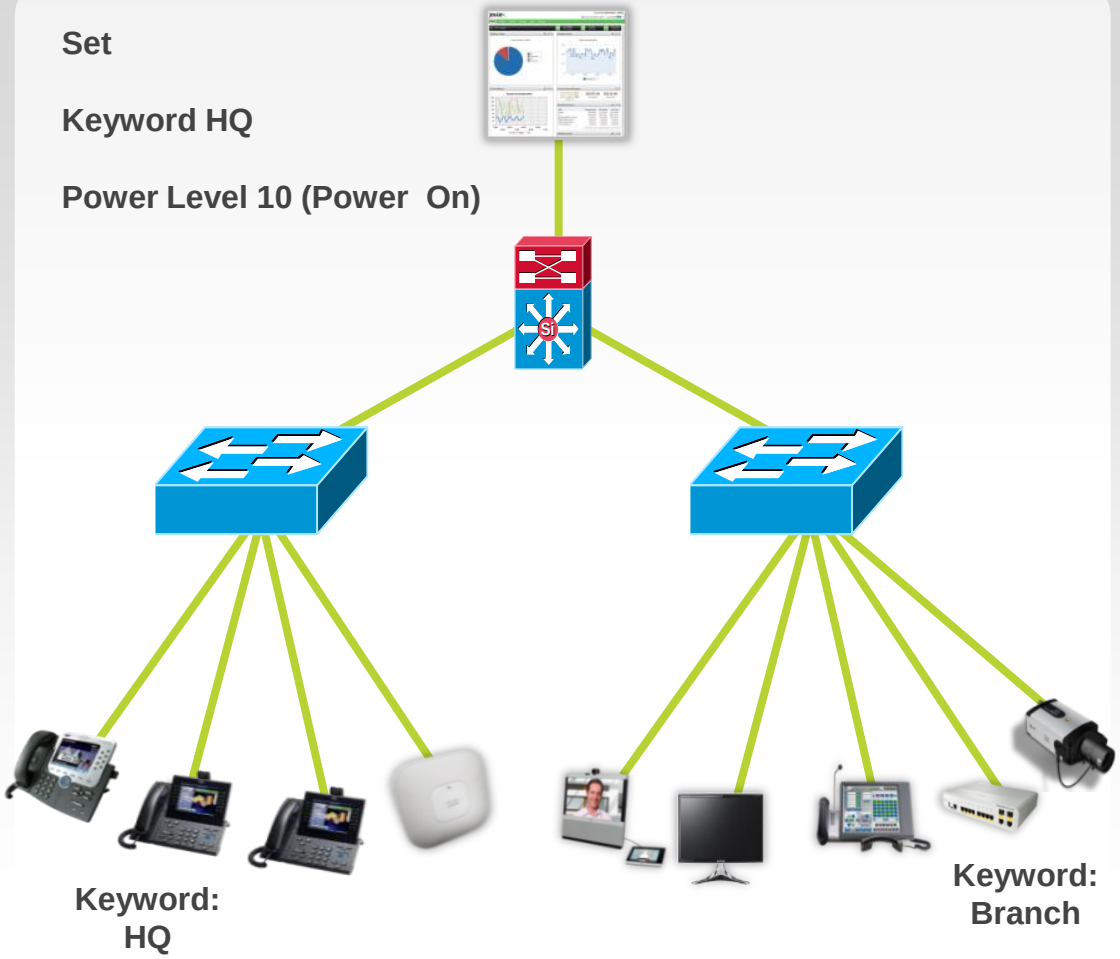


Process:

1. Secure Authentication
2. Auto-discover devices
3. Collect energy consumption
4. **Set power level modes**
5. Configure Time of Day Policies

EnergyWise Technology

Network-Based Energy Management

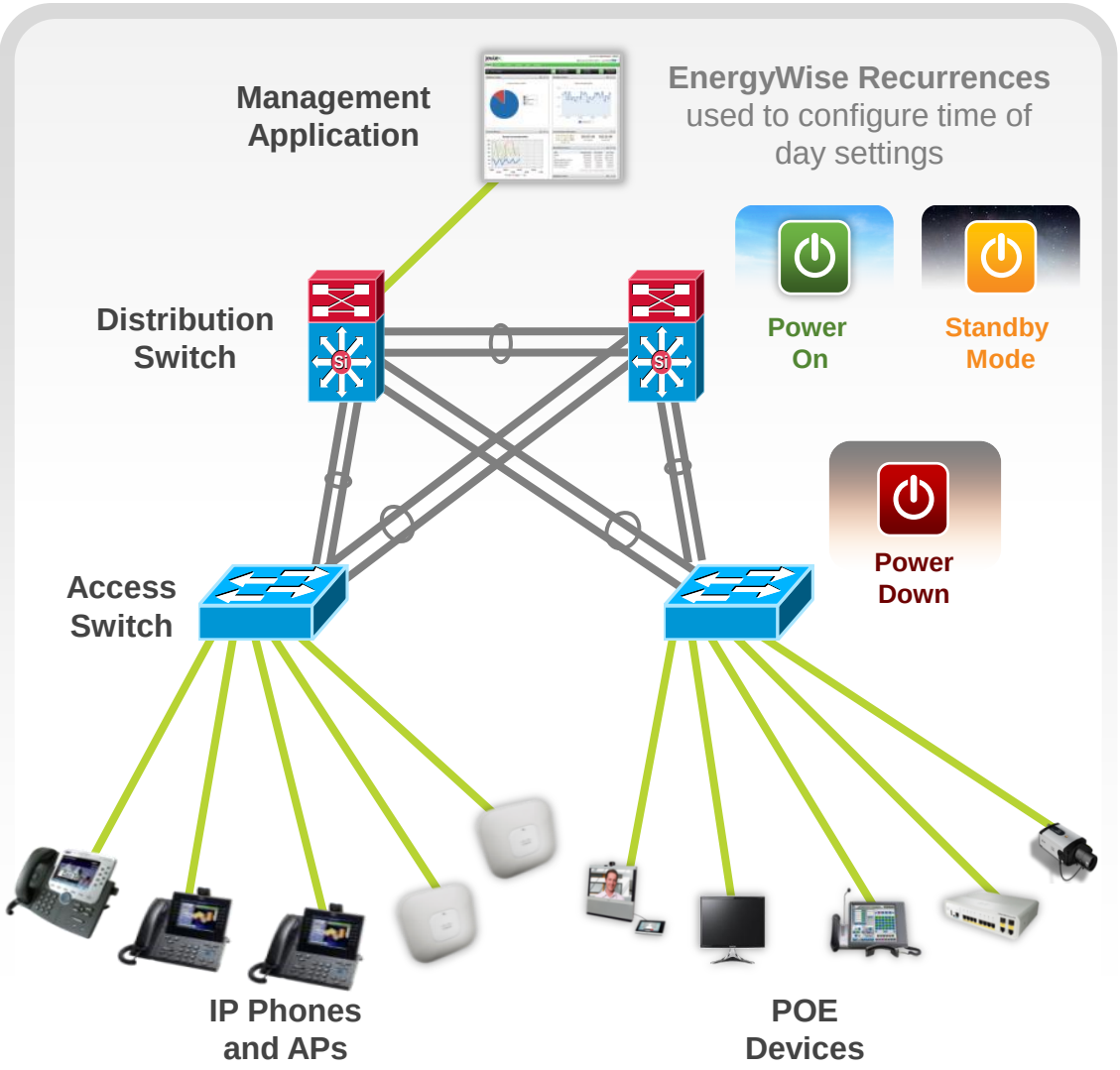


Process:

1. Secure Authentication
2. Auto-discover devices
3. Collect energy consumption
4. **Set power level modes**
5. Configure Time of Day Policies

EnergyWise Technology

Network-Based Energy Management

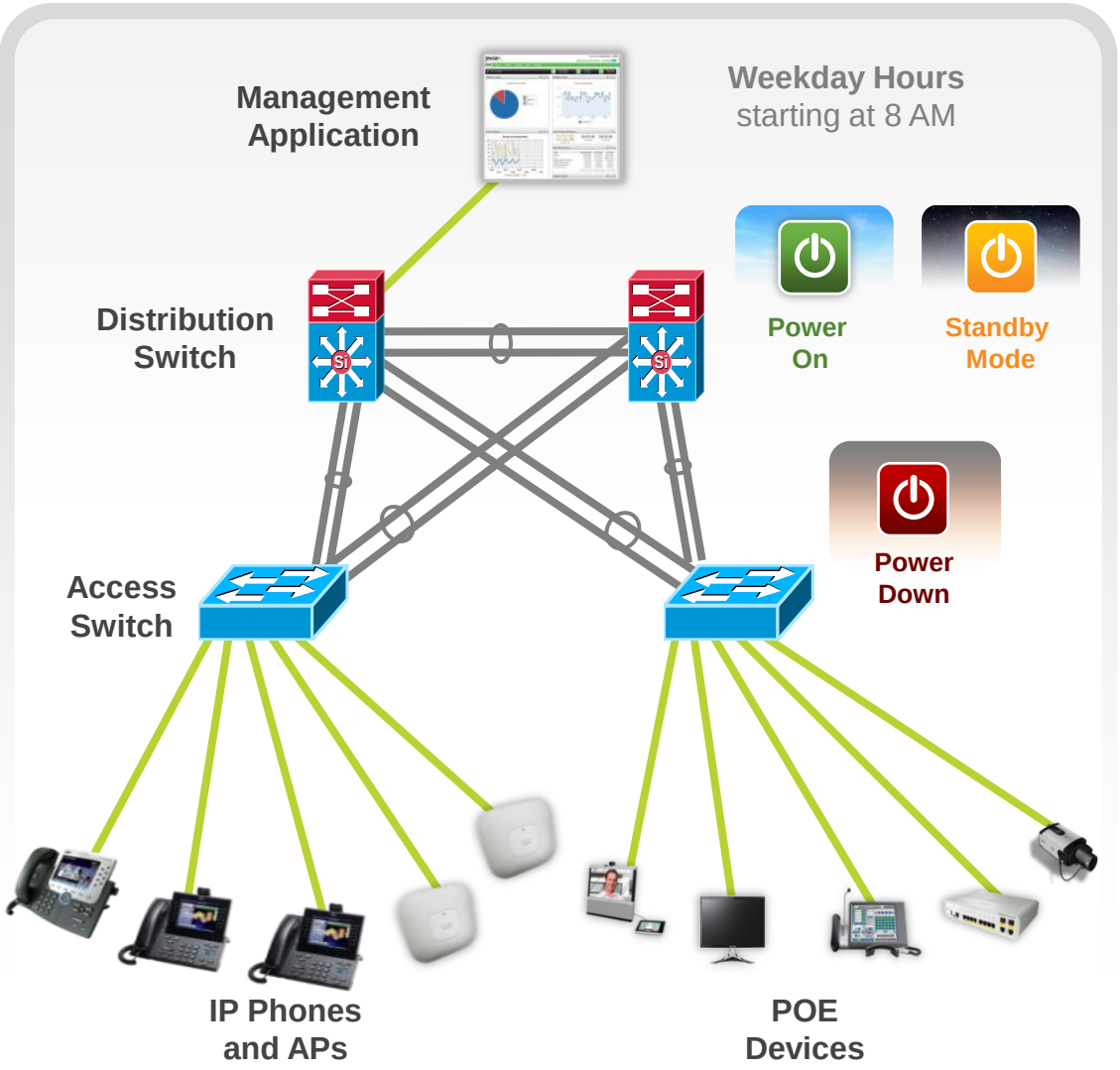


Process:

1. Secure Authentication
2. Auto-discover devices
3. Collect energy consumption
4. Set power level modes
5. **Configure Time of Day Policies**

EnergyWise Technology

Network-Based Energy Management

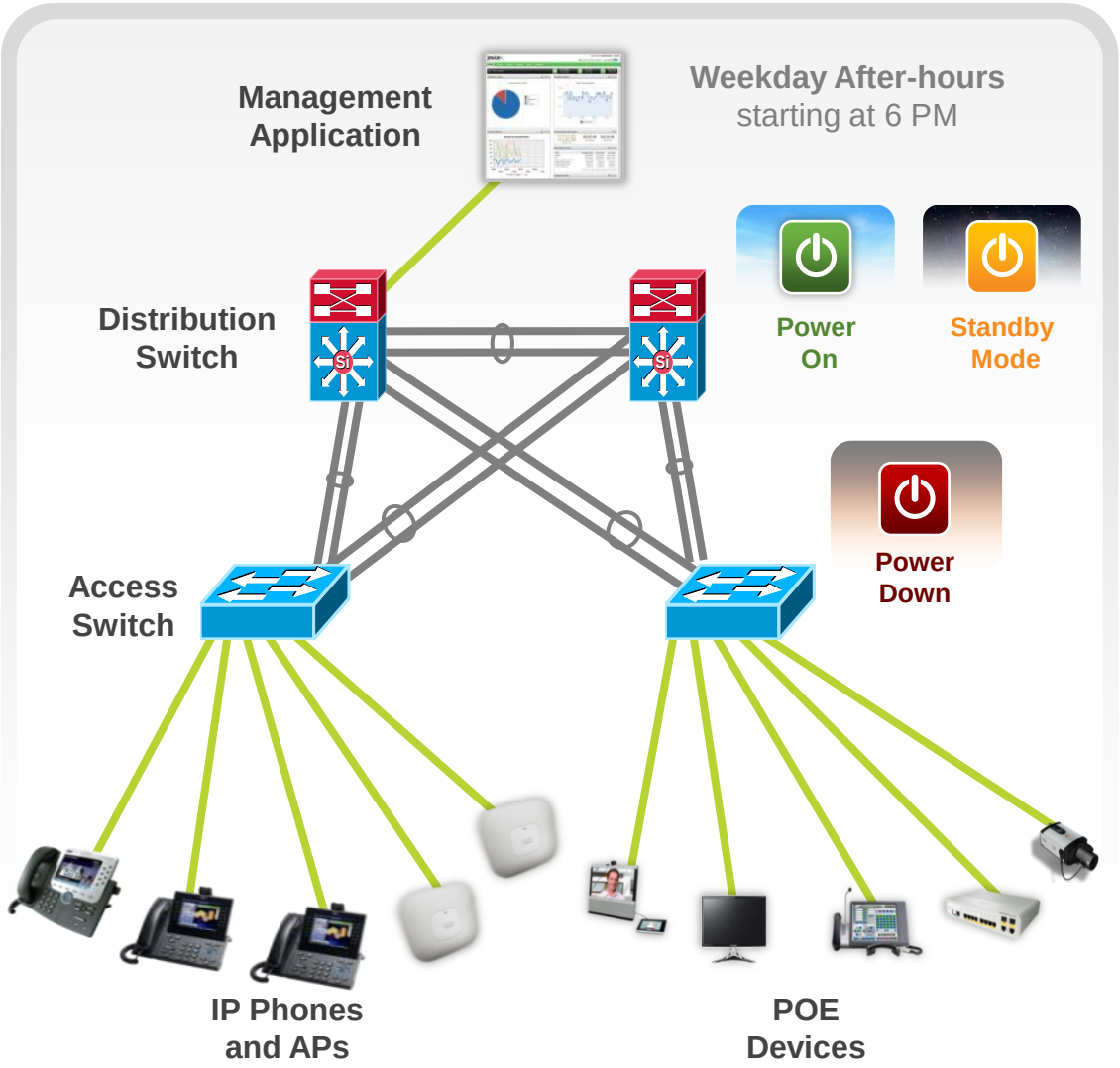


Process:

1. Secure Authentication
2. Auto-discover devices
3. Collect energy consumption
4. Set power level modes
5. **Configure Time of Day Policies**

EnergyWise Technology

Network-Based Energy Management

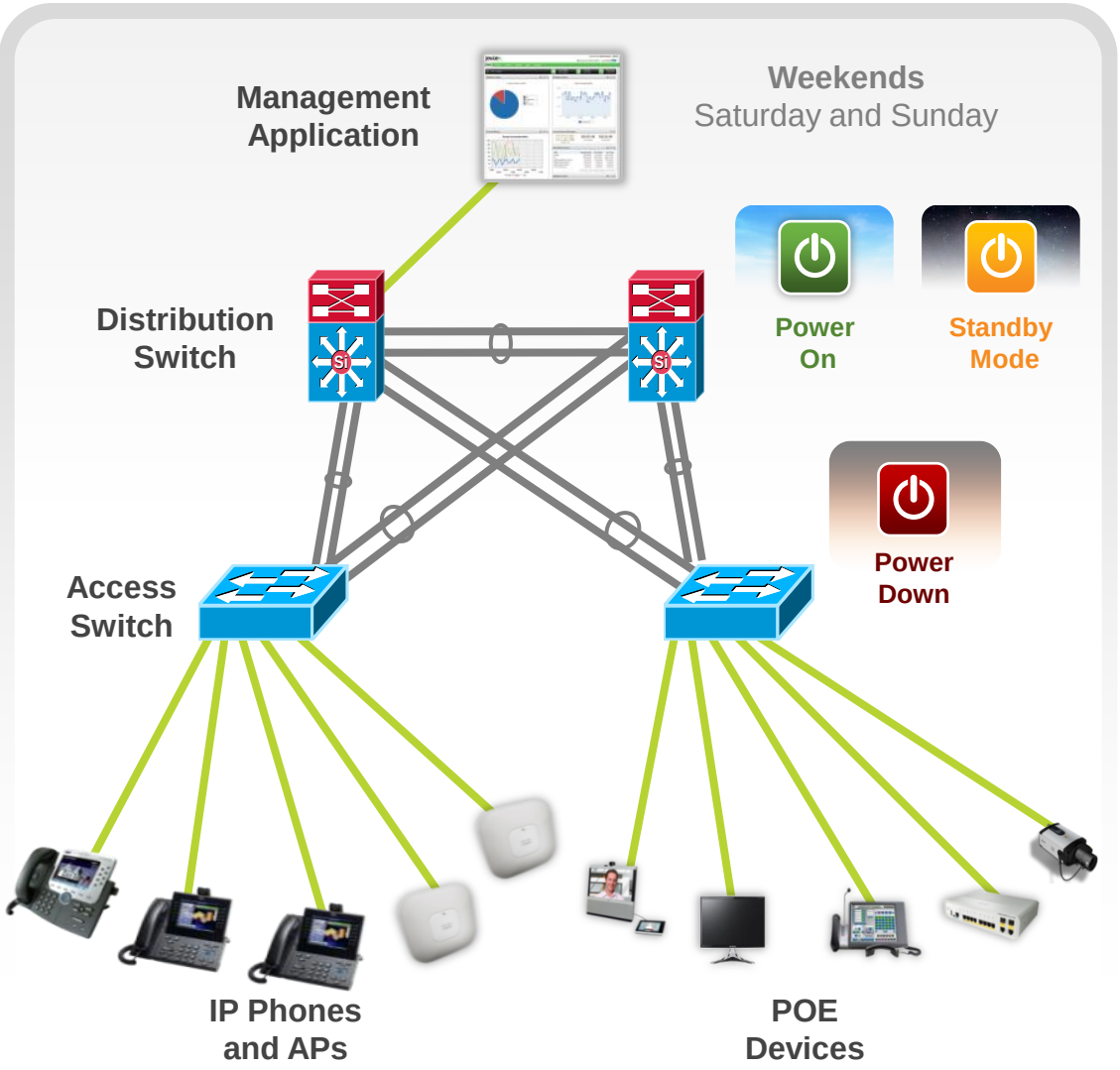


Process:

1. Secure Authentication
2. Auto-discover devices
3. Collect energy consumption
4. Set power level modes
5. **Configure Time of Day Policies**

EnergyWise Technology

Network-Based Energy Management



Process:

1. Secure Authentication
2. Auto-discover devices
3. Collect energy consumption
4. Set power level modes
5. **Configure Time of Day Policies**

EnergyWise Categories

There is a standard set of levels that all devices observe:

Mode	Color	Color	Level	Label
Operational		**Red**	**10**	Full
			9	High
		Yellow	**8**	Reduced
			7	Medium
		Green	**6**	Frugal
			5	Low
Standby		**Blue**	**4**	Ready
			3	Standby
		Brown	**2**	Sleep
			1	Hibernate
Non-Operational		**Black**	**0**	Shut

IP Phone Power States

Function	Full Power	Power Save	Power Save Plus (PSP)
Screen Backlight	On	Off	Off
CPU, Memory, interface	On	On	Off
Daisy Chained PC	Connected	Connected	Disconnected
Can receive calls?	Yes	Yes	No
Time before call can be placed	Instantaneous	250 milliseconds	60 seconds
Seen as a domain member?	Yes	Yes	No

Currently Shipping EnergyWise-enabled endpoints

Cisco IP Phones*

PDUs

PDUs

Lenovo Laptops

Fieldserver gateway

PDUs

Torana Gateway

Windows with Verdiem Agent

Shipping EnergyWise management solutions

Prime LMS 4.1

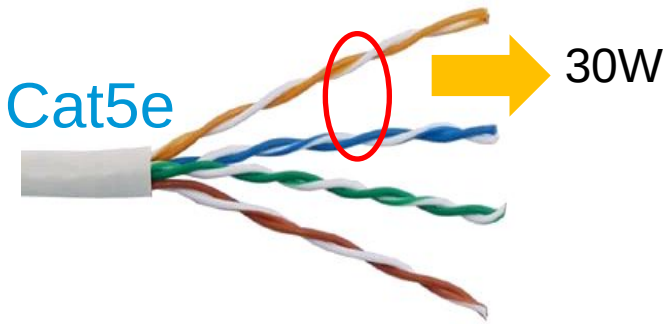
Joulex JEM 2.6

Verdiem Surveyor 6

CA EcoMeter

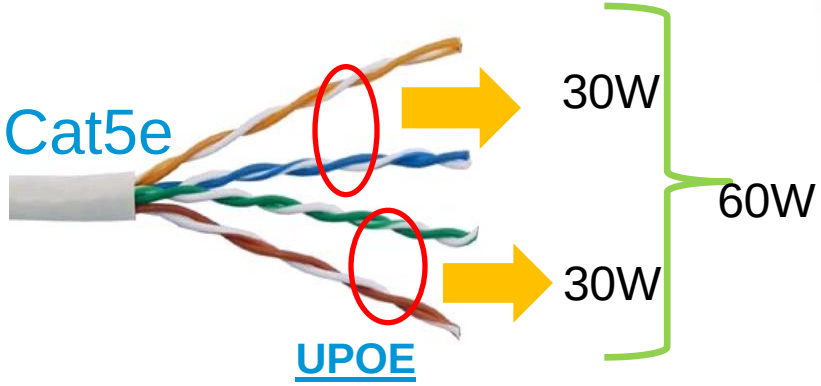
*Requires Call Manager 8.5 and above

Cisco Universal POE (UPOE)



IEEE 802.3at (PoE+)

Maximum power sourced = 30W

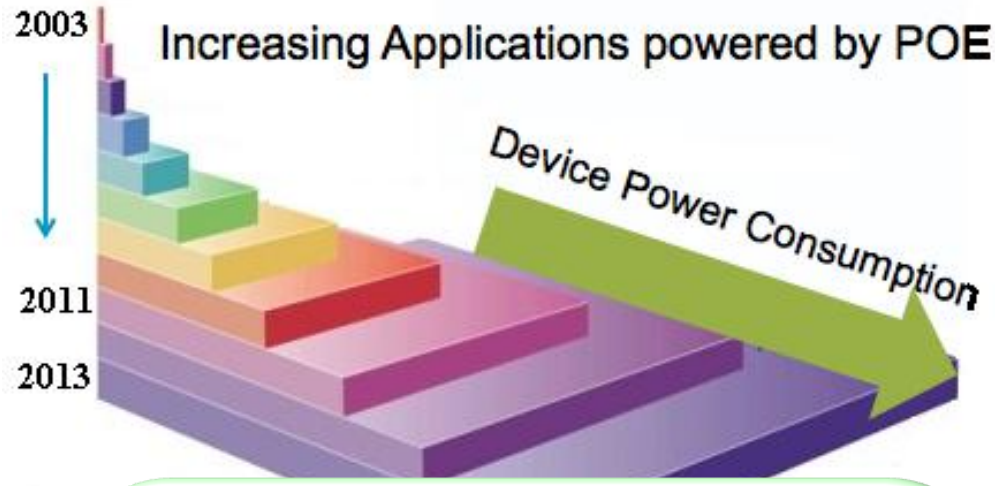


UPOE

Maximum power sourced = 60W

Supported by all cabling standards

Compatible with PoE and PoE+



Universal Nature
- Standard RJ45 Connector
- No Cabling Change from PoE+

High Availability
- Uptime for critical apps (e911)
- Low TCO with UPS consolidation

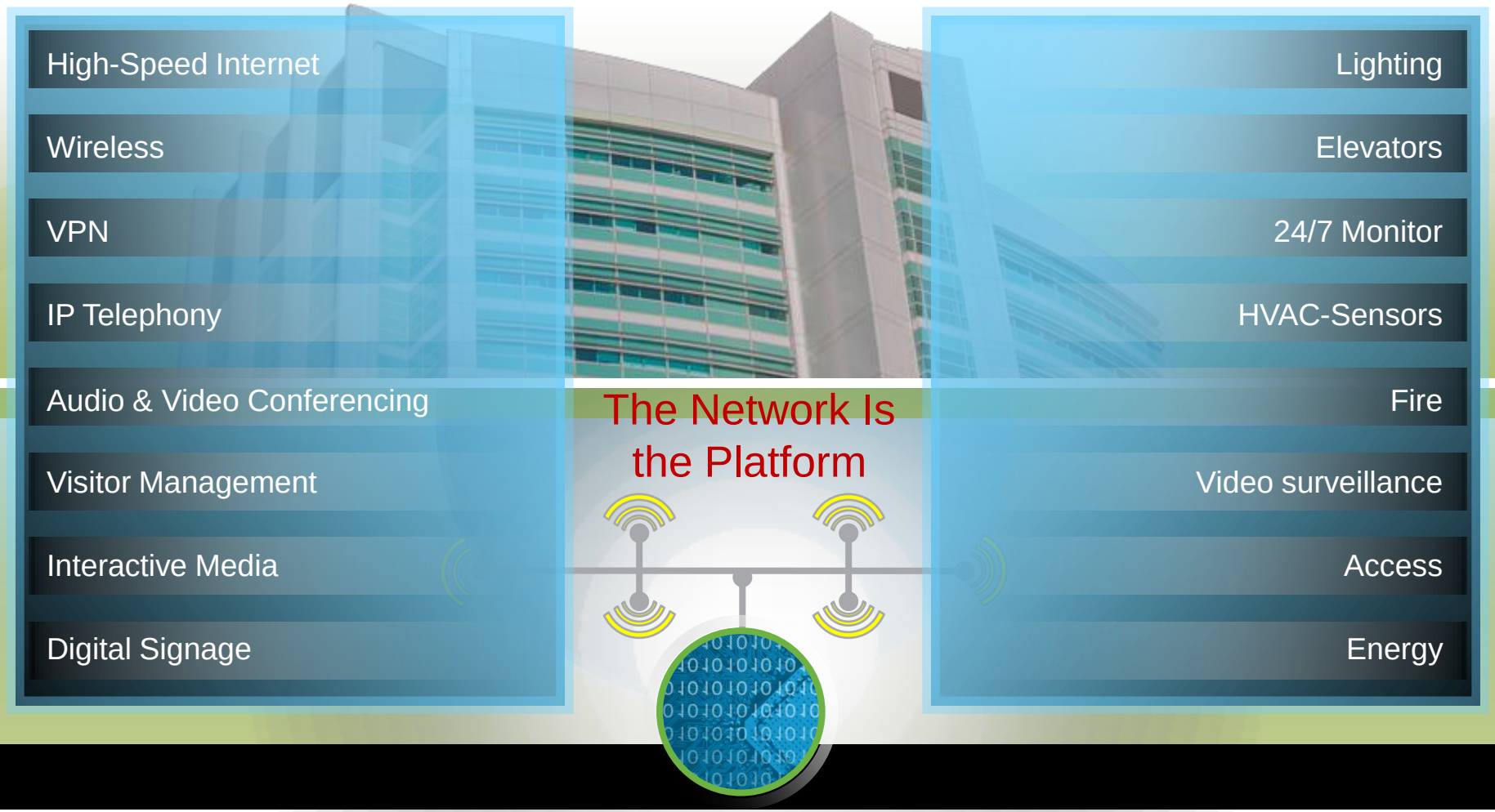
Green
- 10% more efficient than bricks
- Management with EnergyWise

EnergyWise Support for Universal PoE (UPoE)

- UPoE offers 60W per port, opening PoE to a new class of devices and a single cable for both Power and Network
  - Samsung SyncMaster NC220
  - Laptops
  - VDI/VXI terminal (Samsung and Cisco)
  - Apple (Air) – TBC
  - Compact switches
  - LED light ☺
  - PoE power splitter

Summary

- Building Management System
- Various systems integrated
  - Gateways
  - Ethernet/IP network
- Including IT – Energywise protocol



Thank you.