Workplace and Building Trends
Digital Transformation and Buildings
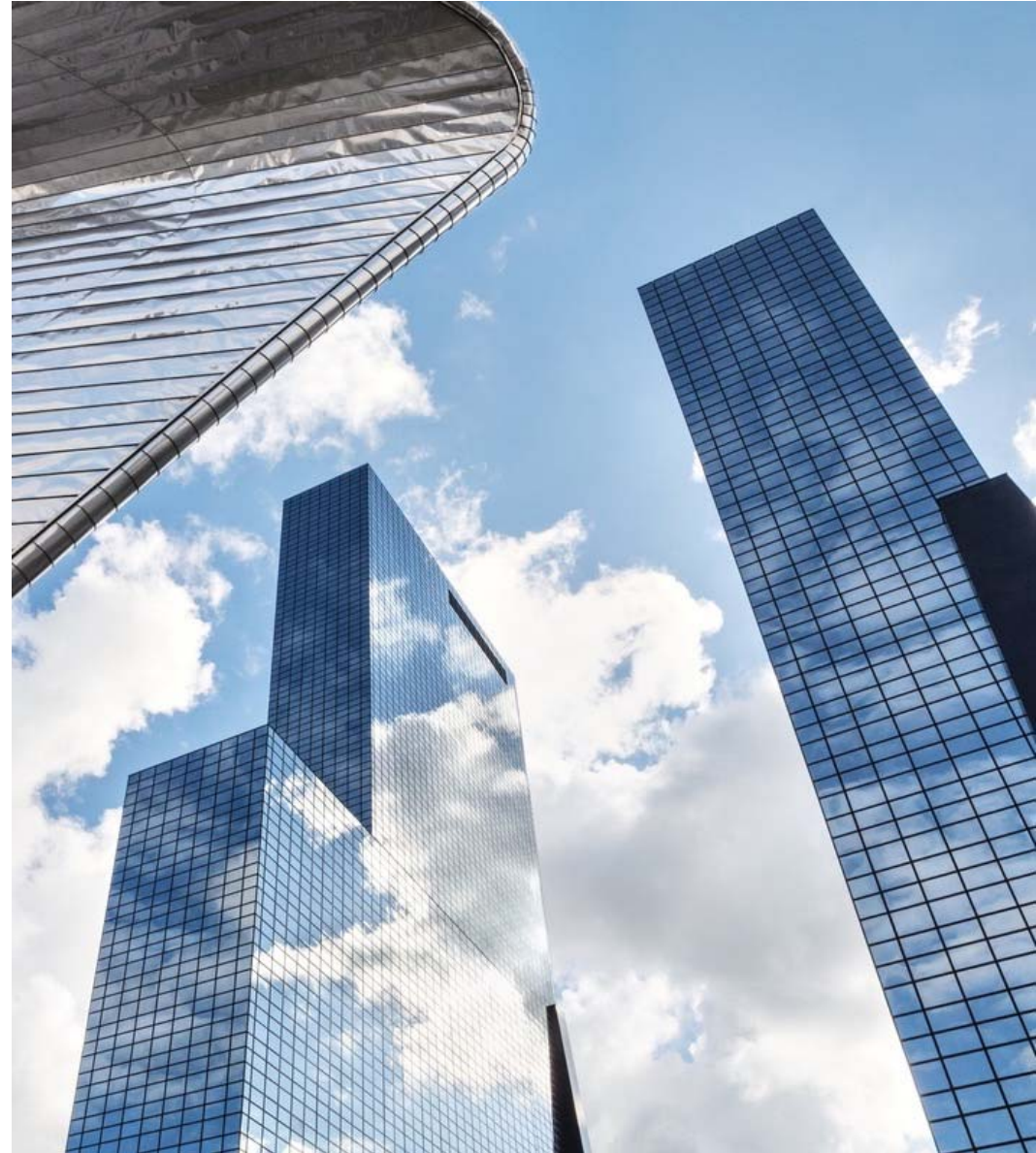
Todd Frederes
Cisco

Topics

1 Building Transition

2 Digital Building Trends

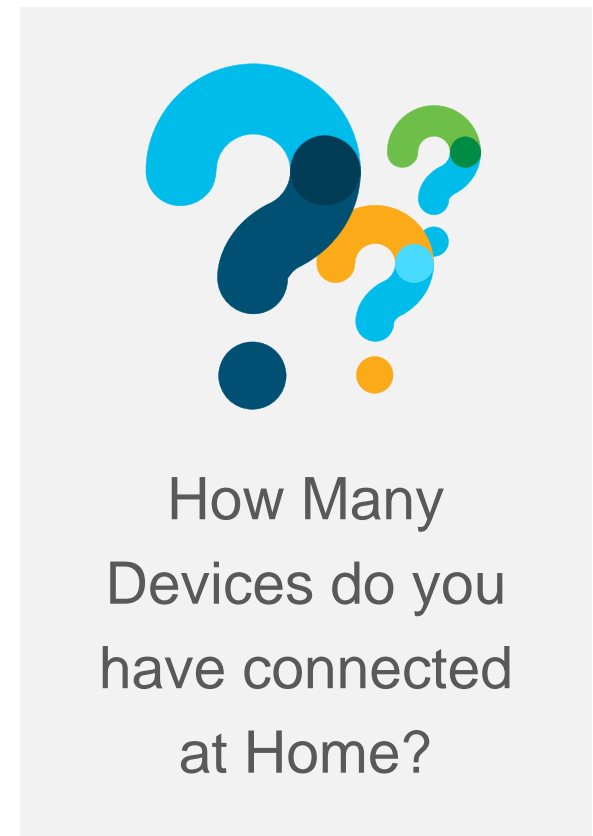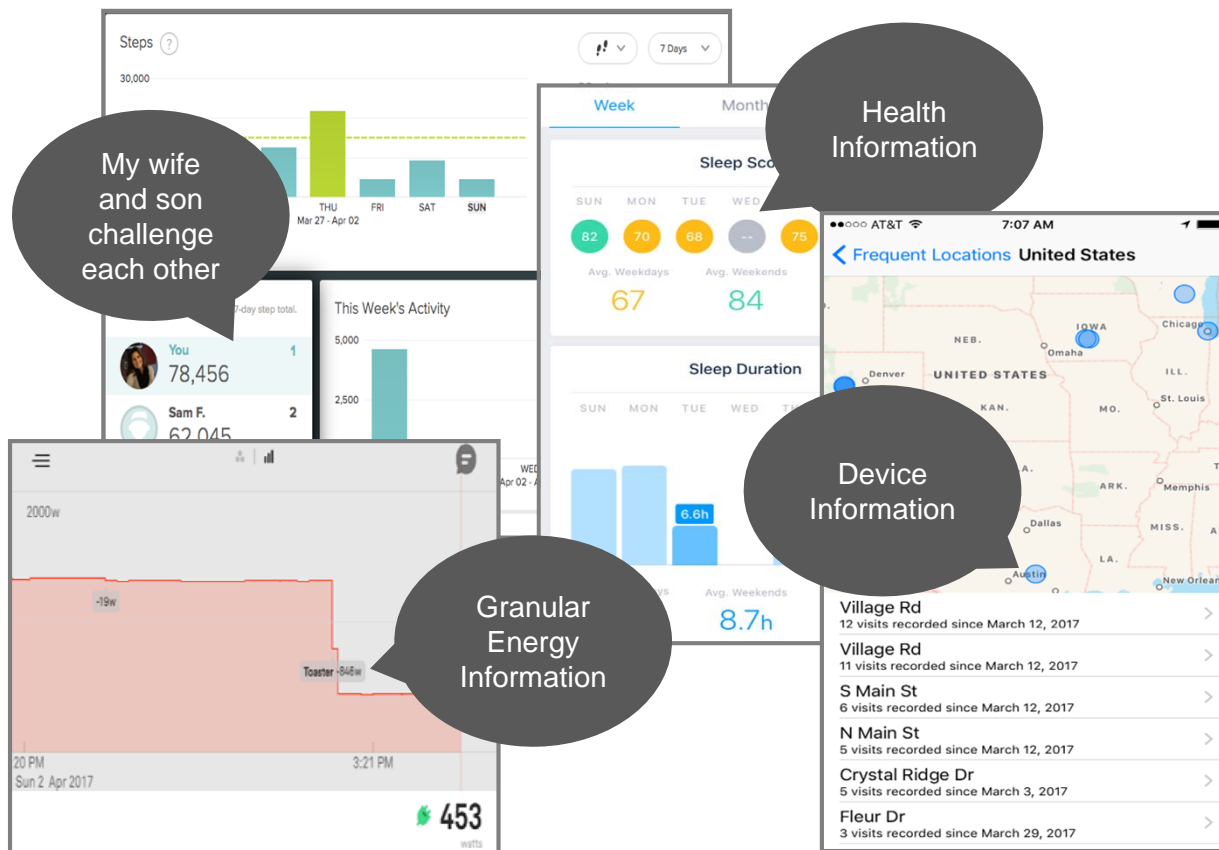**3** Big Industry Questions

4 Pulling it All Together

"Revenue related to installations of sensor-equipped lighting, climate control equipment, thermostats and other automation systems could quadruple over the next decade to about $732 billion"
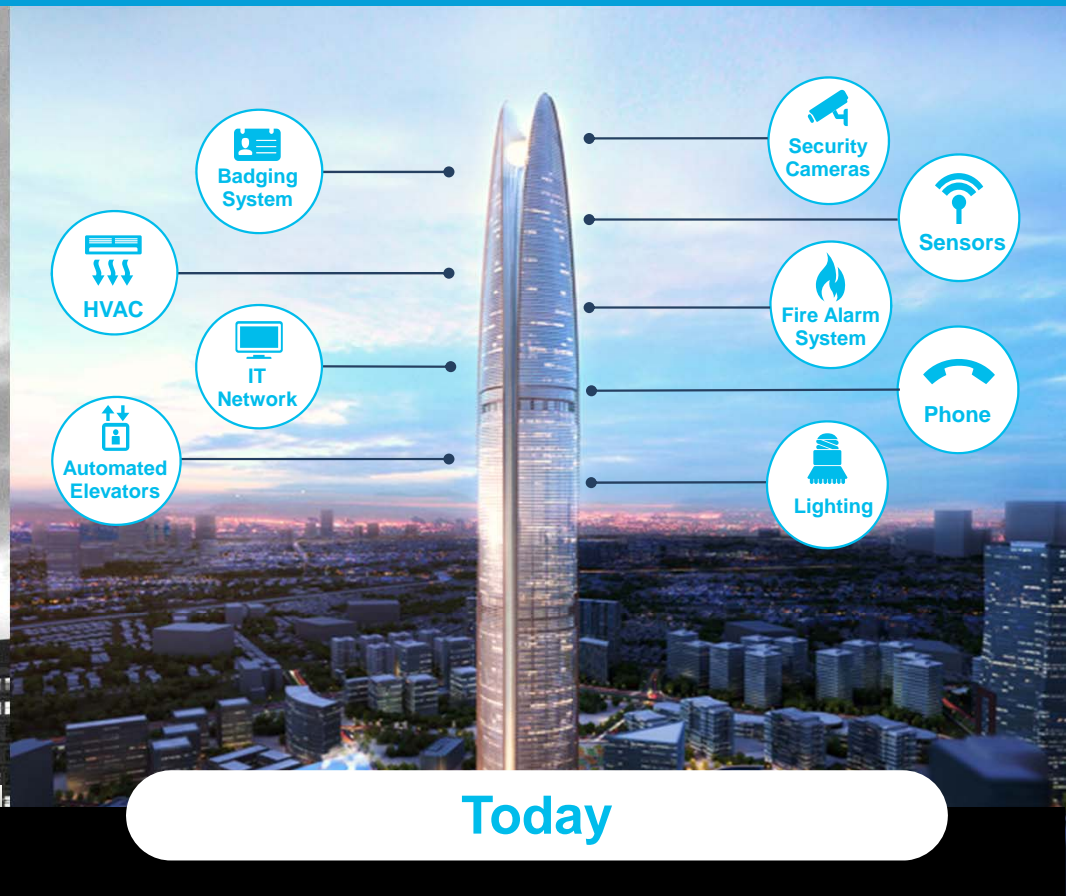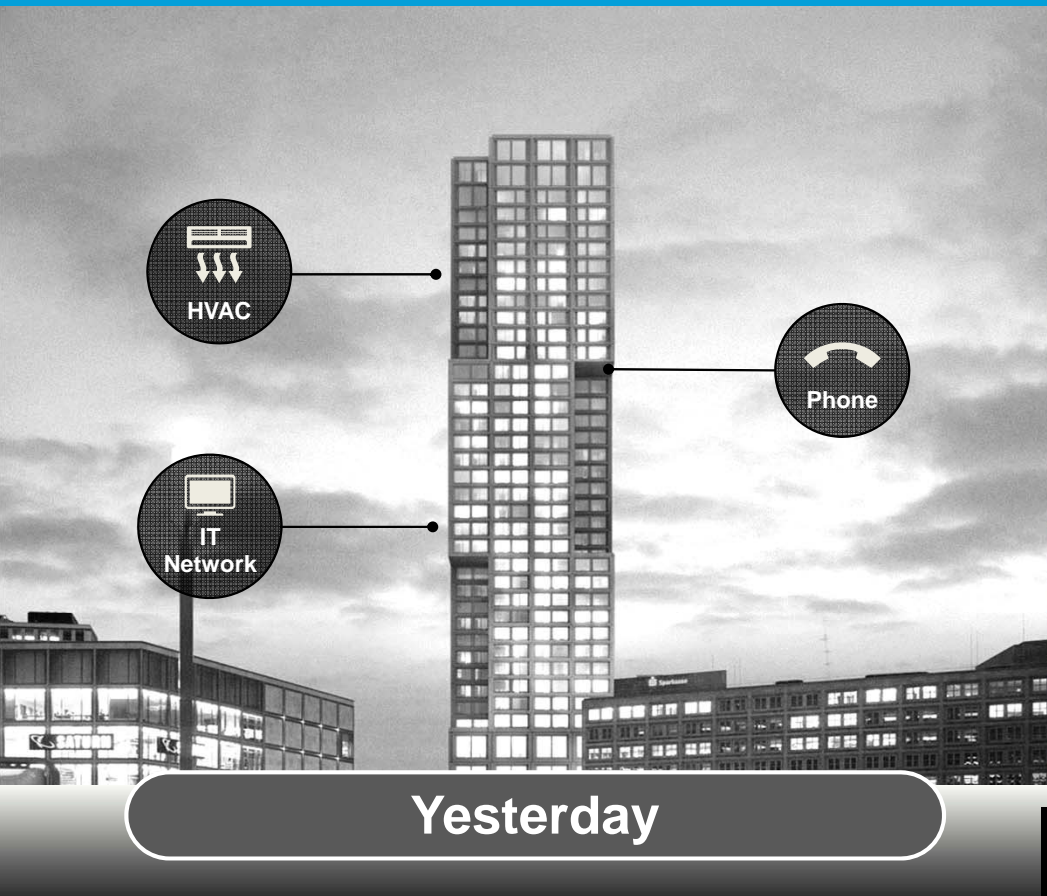
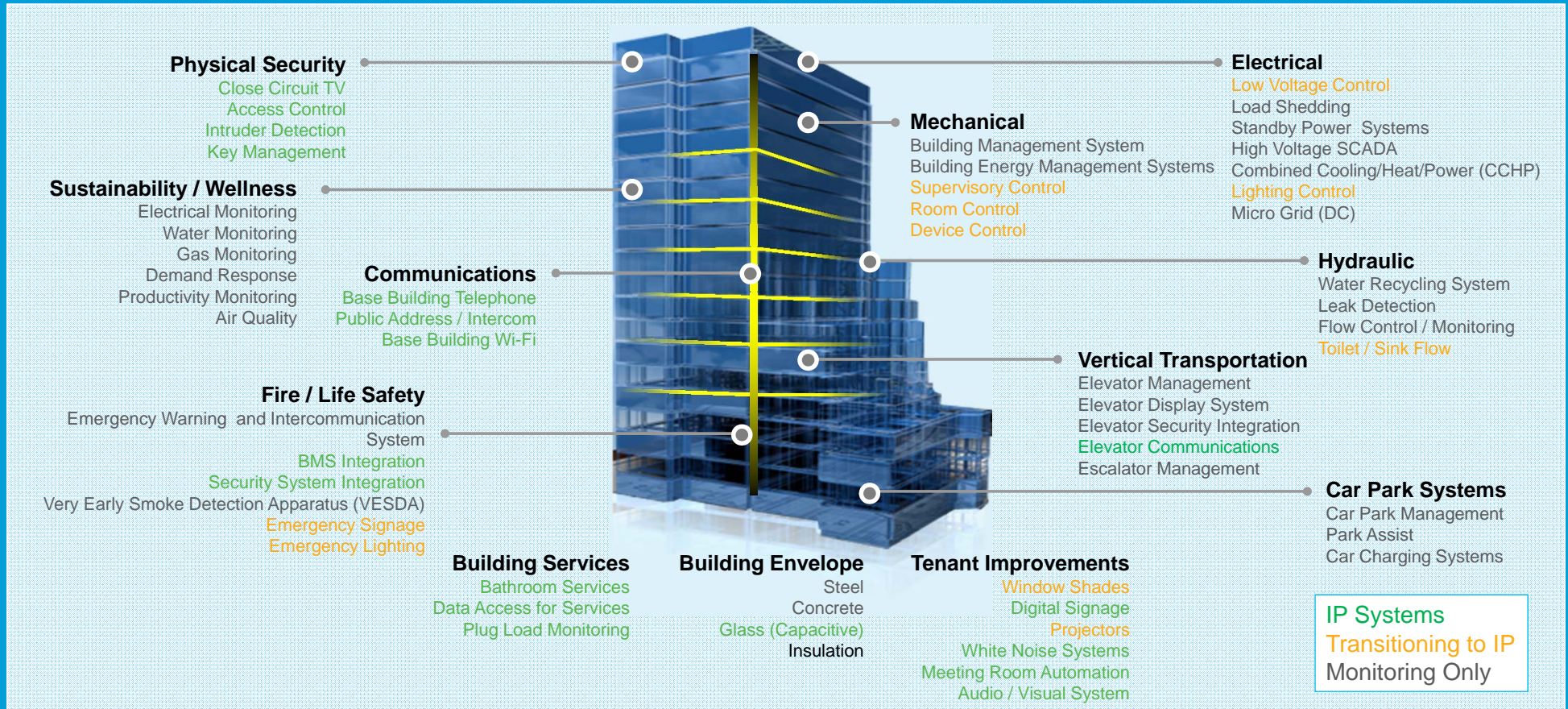Navigant Research – December 2016

Personal Data Experiences

Intelligent Buildings are Connected

Physical Security
Close Circuit TV
Access Control
Intruder Detection
Key Management

Sustainability / Wellness
Electrical Monitoring
Water Monitoring
Gas Monitoring
Demand Response
Productivity Monitoring
Air Quality

Communications
Base Building Telephone
Public Address / Intercom
Base Building Wi-Fi

Fire / Life Safety
Emergency Warning and Intercommunication System
BMS Integration
Security System Integration
Very Early Smoke Detection Apparatus (VESDA)
Emergency Signage
Emergency Lighting

Mechanical
Building Management System
Building Energy Management Systems
Supervisory Control
Room Control
Device Control

Electrical
Low Voltage Control
Load Shedding
Standby Power Systems
High Voltage SCADA
Combined Cooling/Heat/Power (CCHP)
Lighting Control
Micro Grid (DC)

Hydraulic
Water Recycling System
Leak Detection
Flow Control / Monitoring
Toilet / Sink Flow

Vertical Transportation
Elevator Management
Elevator Display System
Elevator Security Integration
Elevator Communications
Escalator Management

Car Park Systems
Car Park Management
Park Assist
Car Charging Systems

Building Services
Bathroom Services
Data Access for Services
Plug Load Monitoring

Building Envelope
Steel
Concrete
Glass (Capacitive)
Insulation

Tenant Improvements
Window Shades
Digital Signage
Projectors
White Noise Systems
Meeting Room Automation
Audio / Visual System

IP Systems
Transitioning to IP
Monitoring Only

Market Trends and Observations

- Building demands are changing
  - Lower operating expense
  - Increased functionality and interoperability
- Data is driving efficiencies and experiences
- IP closer to the edge
- Cybersecurity is paramount
- OT and IT worlds are interacting
- Significant shortage of qualified personnel
- The workforce experience is changing

- Lighting is disrupting channel and providing an anchor system for connecting building systems
- Building control systems are pulling in and controlling more sensors, actuators, and analytics
- Building control is being regulated through code
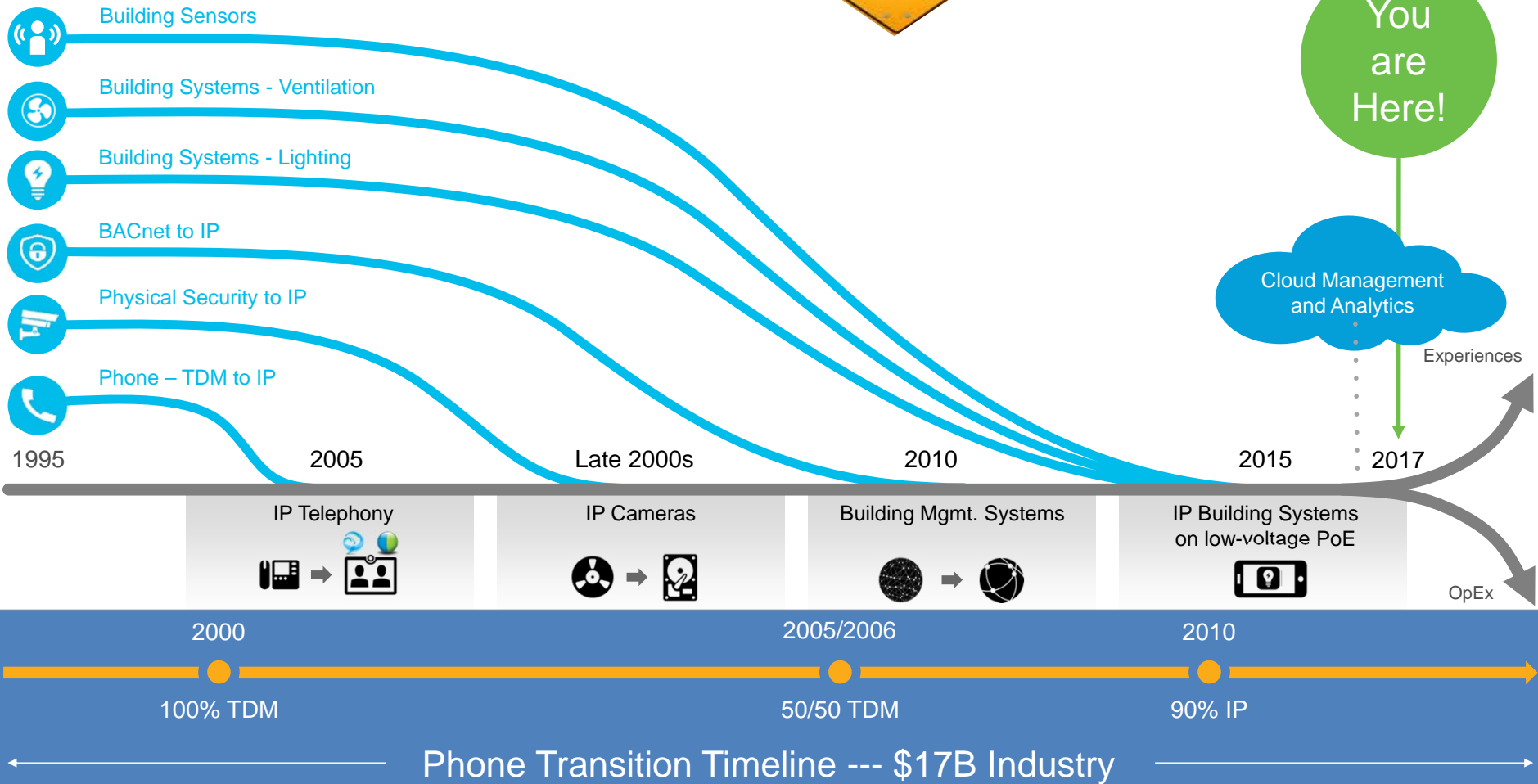- Microgrid DC is becoming a feasible option; in many cases it can be low voltage

Big Industry Questions

? How fast is the industry going to move

? Who will own the generated data

? How do we keep everything secure

? Who is installing/commissioning/owning/managing

? What is the standard that will allow interoperability
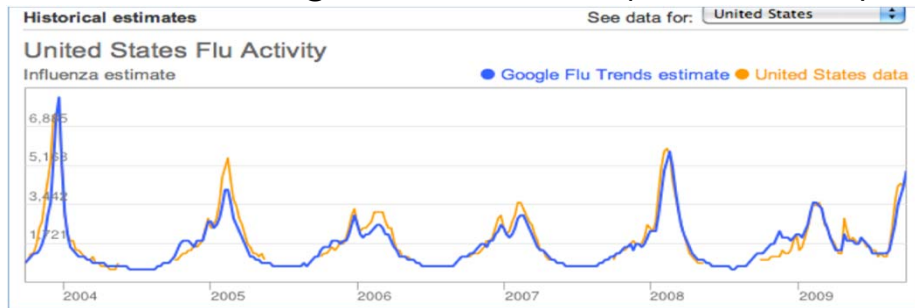
? Why isn't everything use wireless technology

Market Speed

FULL SPEED AHEAD

You are Here!

Building Sensors

Building Systems - Ventilation

Building Systems - Lighting

BACnet to IP

Physical Security to IP

Phone – TDM to IP

Cloud Management and Analytics

Experiences

OpEx

| 1995 | 2005 | Late 2000s | 2010 | 2015 | 2017 |

| IP Telephony | IP Cameras | Building Mgmt. Systems | IP Building Systems on low-voltage PoE |

| 2000 | 2005/2006 | 2010 |
| 100% TDM | 50/50 TDM | 90% IP |

Phone Transition Timeline --- $17B Industry

Data is King - *No one owns the King*

2010 Google Flu Trends (#2 Wildfire)


Data Creation and Transfer
- Data is everywhere
- We can't give everyone access to all systems
- It's going to be important to publish and subscribe

Data Collection and Organization
- Who is responsible for normalizing data
- What is normal
- Can we make interoperability simple
- Do we really need to collect data

Data Usage and Storage
- Historical archives, new use cases
- Everyone has a different idea on how to use data
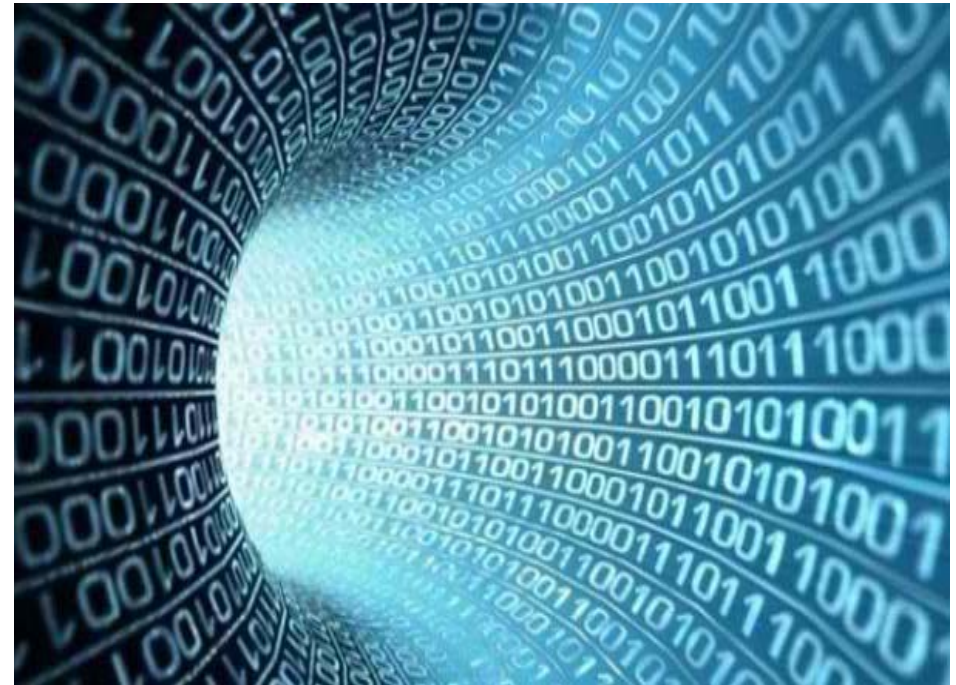
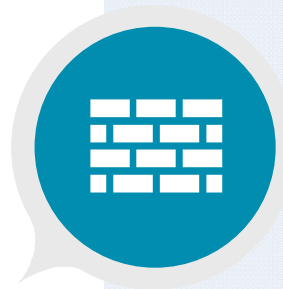brunkfordbraun/Flickr

Comprehensive Security

Visibility & Analysis

- Device / User identity
- Visibility of connections and relationships

Remote Access

- Secure Connection in/out of OT network
- Dynamic access control
- Observe remote activities
- Remote site risk protection

Segmentation

- **Firewall** – Segment IT and OT environments
- **Policy** – Segment OT devices in the IT network
- **Profiling** – Align access with users / device
- **Switches** – Dynamic segmentation enforcement
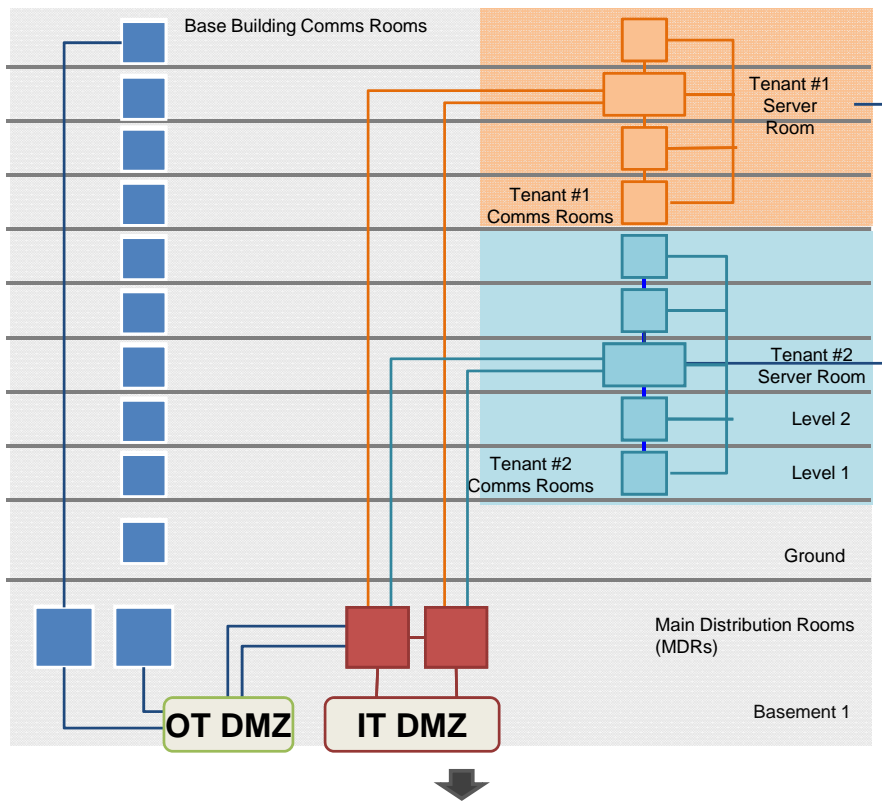
Security Services

- **Risk assessment** for baseline
- **Deployment and Migration**
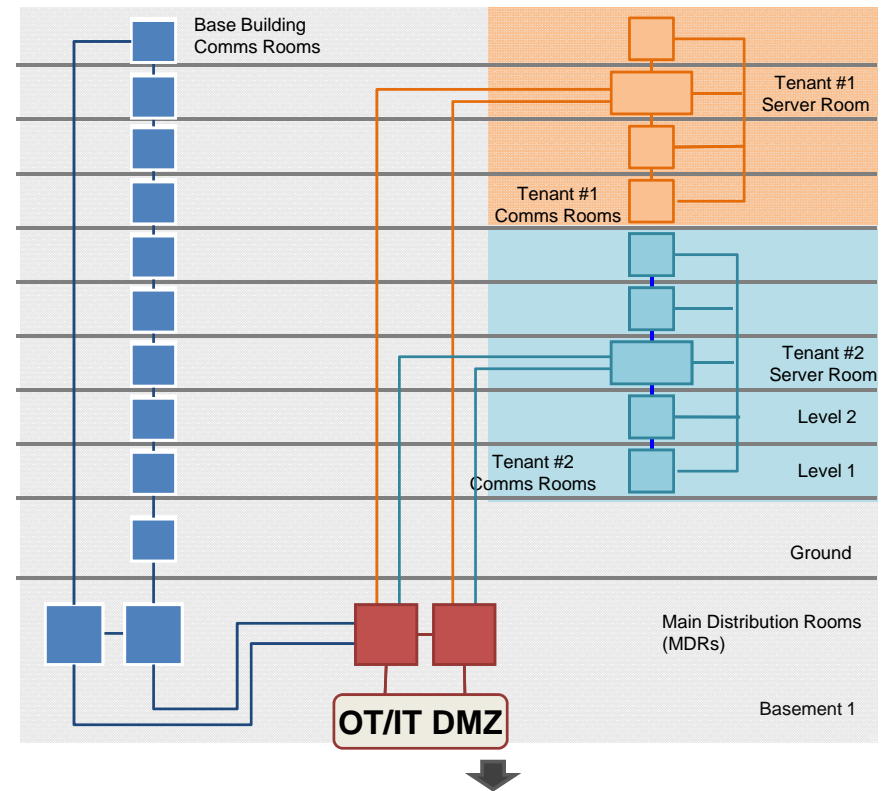- **Incident response Service** for breach situations

Security Zones

Physically Separate DMZs

Base Building Comms Rooms

Tenant #1 Server Room

Tenant #1 Comms Rooms

Tenant #2 Server Room

Level 2

Tenant #2 Comms Rooms

Level 1

Ground

Main Distribution Rooms (MDRs)

Basement 1

OT DMZ **IT DMZ**

Single DMZ with Logical OT and IT Security Contexts

Base Building Comms Rooms

Tenant #1 Server Room

Tenant #1 Comms Rooms

Tenant #2 Server Room

Level 2

Tenant #2 Comms Rooms

Level 1

Ground

Main Distribution Rooms (MDRs)

Basement 1

OT/IT DMZ

Working Together – It's Not Us and Them

IT Functions

- IP Addressing/Subnet
- Network Connectivity
- Security Standards

OT Functions

- Ceiling Access (OSHA)
- Contractor Management
- Code/Building Compliance

- The Digital Building is a "Networked Solution"
- Greatest success occurs when IT & OT (Facilities) work closely together
- Lack of cooperation means one side must make decisions for the other leading to conflict and political problems

Integration – Things Change But Stay the Same

Physical Security

On the network, chain of custody maintained

Different Business Practice

Accounting

On the network, accounting does not report to IT

Different Business Practice

Building infrastructure is now coming on the network

Special skills are required to operate building systems

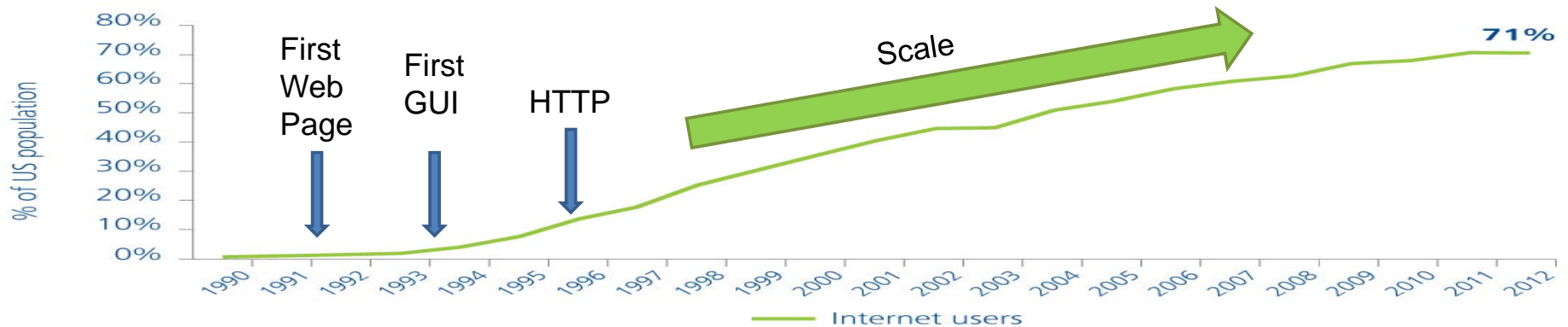Building service become and application on the network

Standards

Def: Universally or widely accepted, agreed upon, or established means of determining what something should be.

ANSI/BICSI 007-2017 is a great start on the physical design and implementation. Now we need some interoperability.

Figure 5. Internet users (1990–2012)

First Web Page

First GUI

HTTP

Scale

71%

% of US population

Internet users

Graphic: Deloitte University Press | DUPress.com

Source: comScore; Deloitte analysis.

Why Not Wireless for Everything

Pros
- Easy in retrofit
- Sensors on batteries
- Low cost to deploy

Cons
- Competes with tenant services
- Prone to interference
- Hard to service
- Difficult to troubleshoot
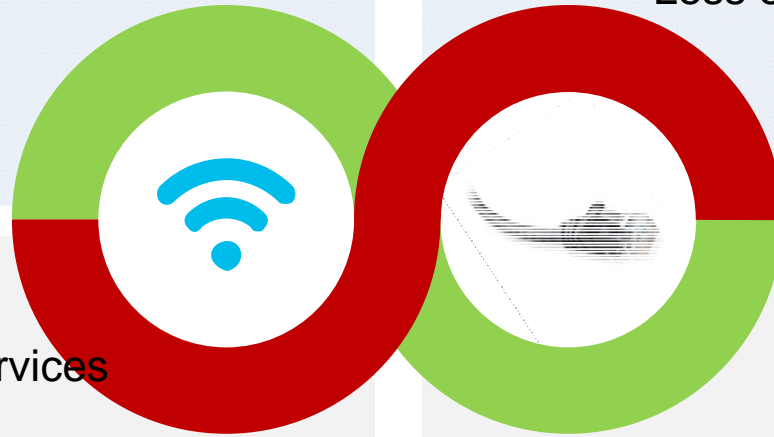
Pros
- Easy to implement (Planning)
- Less expensive than AC for Power
- Easy to maintain
- Easy to monitor
- Easy to troubleshoot

Cons
- More costly (retrofit)
- Limited power capability
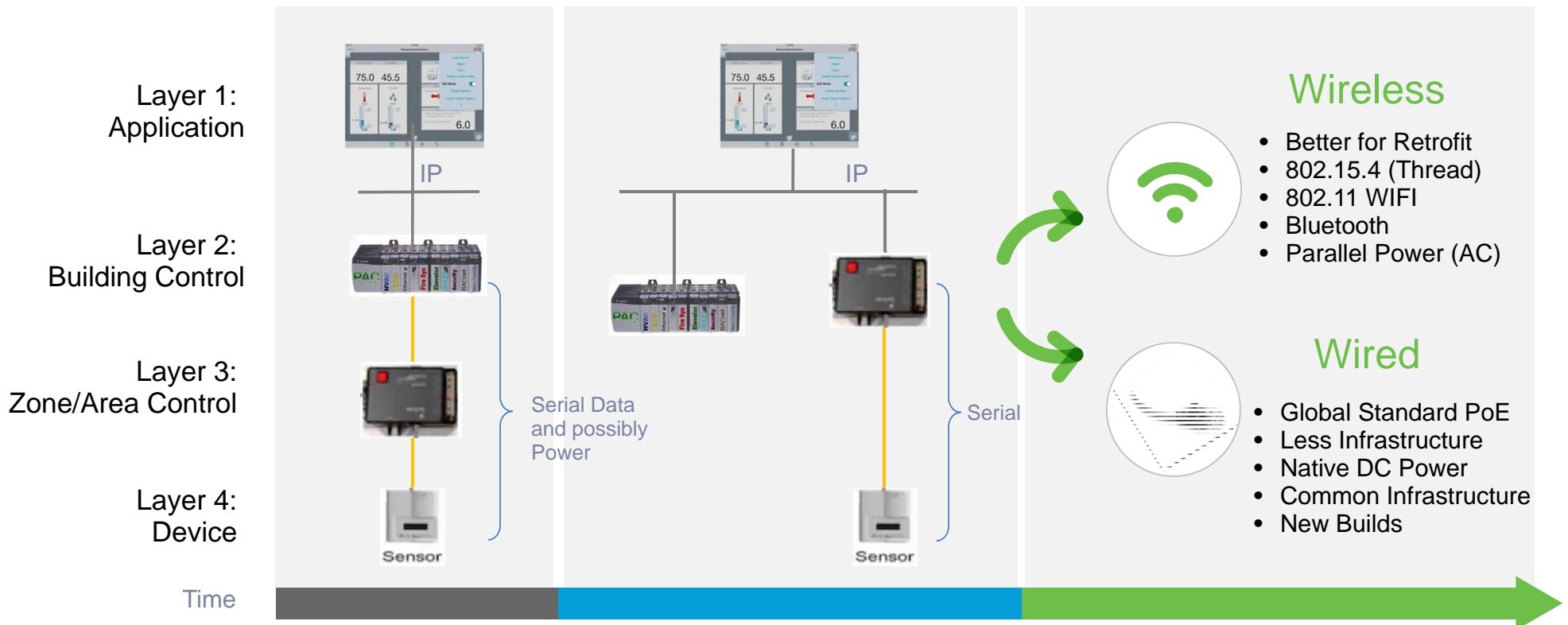- Requires process changes

Summary

Serial is Evolving to Ethernet

Yesterday   Today   Tomorrow

Layer 1: Application

Layer 2: Building Control

Layer 3: Zone/Area Control

Layer 4: Device

IP

IP

Serial Data and possibly Power

Serial

Sensor

Sensor

Time

Wireless
- Better for Retrofit
- 802.15.4 (Thread)
- 802.11 WIFI
- Bluetooth
- Parallel Power (AC)

Wired
- Global Standard PoE
- Less Infrastructure
- Native DC Power
- Common Infrastructure
- New Builds

Increasing Number of IP/PoE Devices

Status Signs

Temp Sensor

Blind Motors

Access Points

Ceiling Fans

Cameras

Facial Recognition Systems

Biometric Door Locks

Badge Readers

HVAC VAV's

Horns and Sirens

IP Call Stations

Light Fixtures

Meeting Room Nameplate

Touchscreen PC's

IP Call Tower

Entry Barriers And Turnstiles

Environmental Sensor Hubs

POE Displays

Curtain Motors

Power Meter
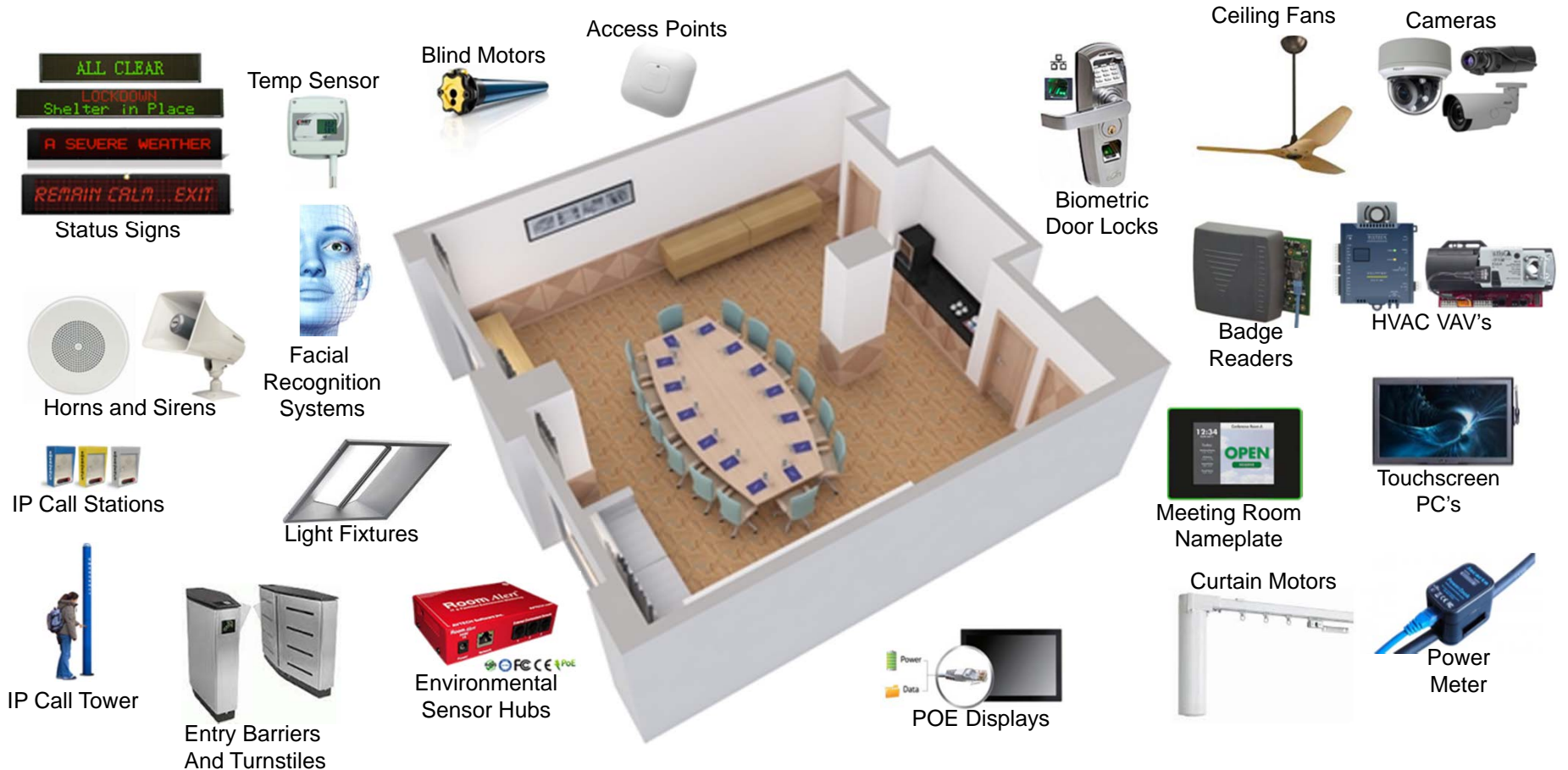
Data Ownership

Who is reading the fine print on all those apps

Information wanted by the manufacture to improve their product or provide extended service

Data sharing across platforms, potential revenue streams??

Where does data management stop and start

Digital Transformation must be part of your Building Strategy

Digital Building

- Buildings are changing
  - IT and OT teams need to work together
  - Buildings are become digital and connected
  - Infrastructure is becoming IP based
  - Power is combined on the network cable

- Digital transformation is essential in the workplace of the future

- Digital building infrastructure will be play a major role in the digital workplace