Enabling the Connected Lifestyle

Infrastructure Perspective

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In the course of my Presentation...

DRIVING TRENDS

ENABLING IoT

BUILDING APPLICATIONS

PROVISION INFRASTRUCTURE

Evolving Standards
Driving Trends
Integrating IT into business operations set to redefine Building Owners and Executives their IoT capabilities

- Business asset – reduce the operating cost
- Evolutions in technology, delivery models, and customer

(Source: Navigant Research)
Critical Dynamics Shaping Digital Transformation of Buildings

**Trend 2 – Digital Building & Venue**

<table>
<thead>
<tr>
<th>VENDORS</th>
<th>UTILITIES</th>
<th>CUSTOMERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive management, strategic marketing, product development</td>
<td>Executive management, program managers, marketing, education, outreach</td>
<td>Building owners, facilities and energy management, sustainability</td>
</tr>
<tr>
<td>Technology revolution to transform component offerings to platform solutions</td>
<td>Transformational opportunity to redefine offerings beyond energy supply to enhance customer satisfaction with deeper and ongoing engagement</td>
<td>Data-driven insight for CAPEX/OPEX strategy and management, risk mitigation, reporting and regulatory compliance, new revenue</td>
</tr>
<tr>
<td>Partnerships are critical to leverage domain expertise and positional strength in the value chain</td>
<td>White label technology offerings, integrated energy efficiency and advisory engagements, performance-based incentives</td>
<td>IoT investment, energy efficiency retrofits, SaaS deployment, turnkey advisory engagements</td>
</tr>
<tr>
<td>New business models and offerings translate to new revenue, stronger margins, cleaner corporate footprint</td>
<td>New revenue streams for utilities in an era of industry disruption and threats against the traditional business model</td>
<td>Energy cost savings, revenue from energy generation and transaction, reduction in OPEX, redefined asset valuation</td>
</tr>
</tbody>
</table>

(Source: Navigant Research)
Trend 3 – Data & Power Ports

IoT driving 12-17% annual growth in fixed line devices through 2020 (PoE port growth 64m/2010 to 136m/2016)²

- Network extends into non-traditional IT environments (factories, warehouses, etc)
- Growing overlap between facility and IT systems
Trend 4 – Evolving Ecosystem

Digital India -
• A flagship programme of the Government of India with a vision to transform India into a digitally empowered society and knowledge economy

Digital Infrastructure as a core Utility to every citizen
Governance and Services on Demand
Digital Empowerment of Citizens

(Source: http://www.digitalindia.gov.in)
ENABLING
IoT
Enabler 1 – Trifecta

Cheap sensors
Current = $0.60
2007 = $1.30

Cheap bandwidth
Decreased = 40X over the past 10 yrs.

Cheap processing
Decreased = 60X over the past 10 yrs.

(Source: Goldman Sachs Global Investment Research, IoT)
Enabler 2 - Wireless

- LTE Plays Vital role in the success of IoT
- LTE enabled Devices – Consumer electronics, M2M Space etc.
- 5G - Shifting from an Industry Vision to a tangible Next Generation Technologies

10 GBPS PER USER / DENSER NETWORKS & SUPER-LOW LATENCY SPEEDS / 5G TRIALS AND PRE-STANDARD DEPLOYMENTS
Enabler 2 - Wireless

- **Ubiquitous Wi-Fi coverage** – Connectivity is available for free or at a very low cost

- **Wi-Fi beats LTE** - given Wi-Fi utilizes unlicensed spectrum, it does not require monthly access fees to a carrier.

- Increasing number of People believe that “WiFi is a human right” (?)
**Enabler 3 - Smartphone**

- Personal gateway to the IoT, serving as a remote control or hub for the connected home, connected car, or the health and fitness devices consumers are increasingly starting to wear.

- Global Mobile Data Traffic
  - Grew 63% in 2016
  - Projected to grow another 8 folds by 2021

Source: Cisco VNI Mobile, 2017

**Big data** – As the IoT will by definition generate voluminous amounts of unstructured data, the availability of big data analytics will continue to grow.
Building Applications
1. Electronic Safety & Security

- Access Control
- Video Surveillance
- Intrusion Detection
- Fire Alarm and Protection

To Manage Unauthorized Access by Authorized Person – Physical security is less effective

AIM is an invaluable tool - immediate & auto detection of newly-added rogue unauthorized devices, including their physical location.
2. Integrated Building Automation

- Building Automation Systems
  - HVAC
  - EMS
  - Lighting Control
  - Window and Shade Controls
  - Digital Signage

*Common infrastructure* offers a cost-effective means of supporting many diverse applications. It is also ready to accommodate new and emerging applications—whether wired or wireless.
3. Audio/Visuals & HDBASE-T

- **HDBASE-T**
  - Allows one Cat 6A cable to support transmission of:
    - Uncompressed ultra-HD video and audio, including 4K
    - 100BASE-TX Ethernet
    - Device control
    - Power over HDBaseT (PoH), up to 100 watts of dc power

Works on universal interface of RJ-45 and is being standardized on IEEE 1911
4. Wireless (Wi-Fi & IBW)

- Plan it as a UTILITY
- Wi-Fi Network OR Cellular Network – Its MUST

- Need Power – PoE, PoE+, PoE++
- Need Planning – Grid Network spread across the facility
- Need Bandwidth – 2.5 Gbps, 5 Gbps, 10Gbps

Cabling is Critical for Effective Wireless Network – Cat 6A, SM & MM Fiber, Coax
## 5. Power Over Ethernet

- **4-Pair High Power Target Markets** (Source – IEEE CFI)

<table>
<thead>
<tr>
<th>Markets</th>
<th>Typical Power Consumption</th>
<th>Cabling Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse Call System - Healthcare</td>
<td>80% Market Needs &gt; 30W</td>
<td>• <strong>Category 6A</strong> for new installations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Avoid conditions that result in temperature rise &gt; 15 C Based on maximum 45 C ambient and 60 C cable rating</td>
</tr>
<tr>
<td>Building Management etc.</td>
<td>40-50W</td>
<td>• Minimize cable bundling</td>
</tr>
<tr>
<td>IP Security Cameras (PTZ)</td>
<td>30-60W</td>
<td>• Use open wire trays or similar*</td>
</tr>
<tr>
<td>Industrial</td>
<td>&gt; 30W</td>
<td>• Consider mixing powered/unpowered cabling in bundles</td>
</tr>
<tr>
<td>IP Turrets – BFSI Phone systems</td>
<td>Typically 45W</td>
<td>• Consider bundle separation techniques</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* An addendum to TIA-569D to cover pathways and spaces considerations for remote powering is being developed</td>
</tr>
</tbody>
</table>
Provision Infrastructure
Number Of Devices (Things)

- Anticipation for at least next 10 years
- machines, sensors, cameras, controllers, drives etc
Provision | Bandwidth

Bandwidth Consumers

- Traffic flow help determine Bandwidth needs
- Device capacities & data rates

**Densification**

**Virtualization**

**Optimization**
Downtime

- What is the cost of downtime?
- Resiliency and protection
- Design Architectures
Network Management – Cabling Infrastructure

- Up-to-date documentations
- Easy Move Add Changes, Security alerts etc.
- Automated Infrastructure Management (AIM)
Evolving Standards
Standards | Alliances & Protocols

Standards
- Open Mobile Alliance (OMA)
- Eclipse Foundation
- IoT-A (Internet of Things - Architecture)
- Weightless
- Hyper/CAT
- AllSeen Alliance
- Project Haystack
- Open Interconnect Consortium
- IPSO Alliance
- Internet of Things Consortium
- IEEE
- IoT-GSI
- Global Standards Initiative (GSI)

Protocols
- IEEE 802.3
- 3G
- ZigBee
- XMPP
- Thread Group
- Bluetooth
- WiFi
- LoWPAN
- MQTT
- Z-Wave
- Bicsi
- CommScope
TIA TSB-162-A: Cabling Guidelines for Wireless Access Points

ISO/IEC TR 24704: Customer Premises Cabling for Wireless Access Points
Summary

1. Communication is the basis of Connected Lifestyle
2. The Connectivity requirements are changing
3. Drivers of Change – IoT, Wireless, Intelligence and Management
4. There is a Need for Speed
5. Choose an Infrastructure which is Simple, Efficient, Agile and Scalable