Lighting and the Internet of Things

2016 DoE Connected Lighting Workshop
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About Me

8 years
300M sq.ft. installed
45 countries

Geek
Color Kinetics
Robots
What I’ll Cover

• The IoT is going to be huge

• Lighting is poised to play a pivotal role

• Let’s try not to screw it up
In the beginning...

“The Internet” Today

- Video
- Social
- Retail
- Messaging
- Finance
- News
- Mobile
- Travel
- Service Providers
- Search

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“The Internet of Things” in 2025

Segments with potential connected lighting impact

- Vehicles: $0.7T
- Cities: $1.7T
- Homes: $0.3T
- Outdoor: $0.9T
- Work Sites: $0.9T
- Offices: $0.2T
- Factories: $3.7T
- Retail: $1.2T
- People: $1.6T


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IoT Applications

• Information and analysis
  • Tracking behavior
    • Monitoring the behavior of persons, things or data through space and time
  • Enhanced situational awareness
    • Achieving real-time awareness of physical environment
  • Sensor-driven decision analytics
    • Assisting human decision making through deep analysis and data visualization

• Automation and control
  • Process optimization
    • Automated control of closed (self-contained) systems
  • Optimized resource consumption
    • Control of consumption to optimize resource use across network
  • Complex autonomous systems
    • Automated control in open environments with great uncertainty

Four Key Challenges for the IoT

- Where do we put all these IoT devices?
  - Lighting is everywhere the IoT wants to be

- How do we power them?
  - As low-voltage, semiconductor technology, LEDs are inherently compatible with processing, sensing, and networking devices

- How do we connect them?
  - The networks being deployed for lighting can be leveraged to connect a wide range of IoT devices

- How do we pay for them?
  - Lighting is the only IoT platform that pays for itself
Three Potential Topologies

Nodes fully integrated into luminaires

PRO: Easy installation; highest sensing granularity

CON: Requires luminaire customization; higher cost

Nodes installed elsewhere, but sharing power and network

PRO: No luminaire customization required

CON: Have to mount nodes somehow; making remote can add interface cost

Nodes installed elsewhere, powered independently, but sharing network

PRO: Cleanest solution; no impact on luminaires

CON: Have to power nodes somehow; at this point why bother with lighting integration?
Health & Wellness
Active sleep management via wearables and tunable lighting
Clinical light therapy to treat depression and seasonal disorders

Safety & Security
Egress lighting that can interactively guide you to safety
City-scale sensor networks that help police identify emergencies

Tracking & Location Services
Retail lighting with integrated cameras to track shopper expressions
Indoor location services as reliable and pervasive as GPS

Process Optimization
Full-facility granular resource tracking built on top of lighting networks
Shift worker productivity management via spectral stimulus
Enabling Technologies

• More powerful, flexible and inexpensive sensors

• Research on physiological responses

• Low-cost wired and wireless networking

• Software and apps that make lighting easy to use
Another Cautionary Note

- LEDs last a really really really long time

- The economics only work on initial replacement

- Once a socket is filled with a dumb LED, it’s tough to justify an upgrade to an intelligent alternative

- We only get one shot!
The S-curve of adoption

Scenario 1: We Lose

A lag in convergence means the install base turns over to LEDs, but very few are connected.
Scenario 2: We Win

Connected systems end up with dominant market share when convergence happens sooner.
5 mistakes not to make
Mistake #1: Underestimate other players

“Lighting companies are dinosaurs. We own the building. If anybody’s going to lead the convergence, it’ll be us.”*

Building Automation Giant

“Lighting and building automation companies are both dinosaurs. Our products – routers, servers, and edge devices – are the real backbone of the modern building.”*

IT/Networking Giant

“All of these hardware companies are dinosaurs. We’re going over the top with software and services.”*

IoT Pure Play

* - all quotes are fake!
More Mistakes

Mistake #2: Focus on technical specs instead of end user value

Mistake #3: Rely exclusively on the current channel

Mistake #4: Ignore software and user experience

Mistake #5: Downplay interoperability
Recap

• The IoT is going to be huge

• Lighting is poised to play a pivotal role

• Let's try not to screw it up
Thank you!

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