Connected Lighting and beyond, Self-Configuration

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DoE Connected Lighting Meeting

innovation + you

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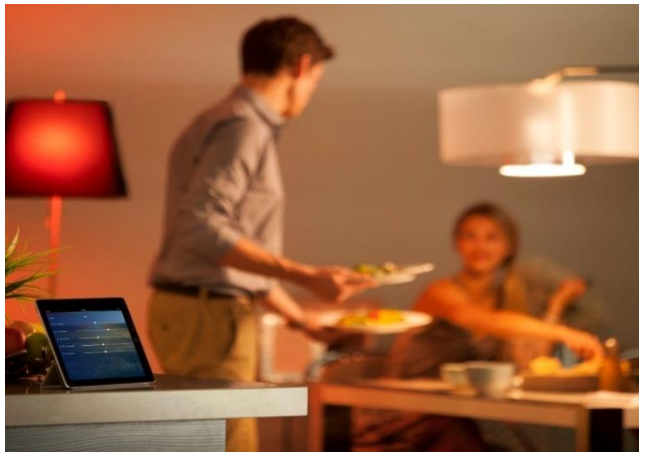
Outline

- Connected Lighting and self-configuration
- Examples of current state
  - Cities
  - Buildings
- Next wave
- Summary

Lighting has gone digital, redefining what is possible with light

Energy efficiency

Creating amazing experiences



Enhancing attractiveness of cities

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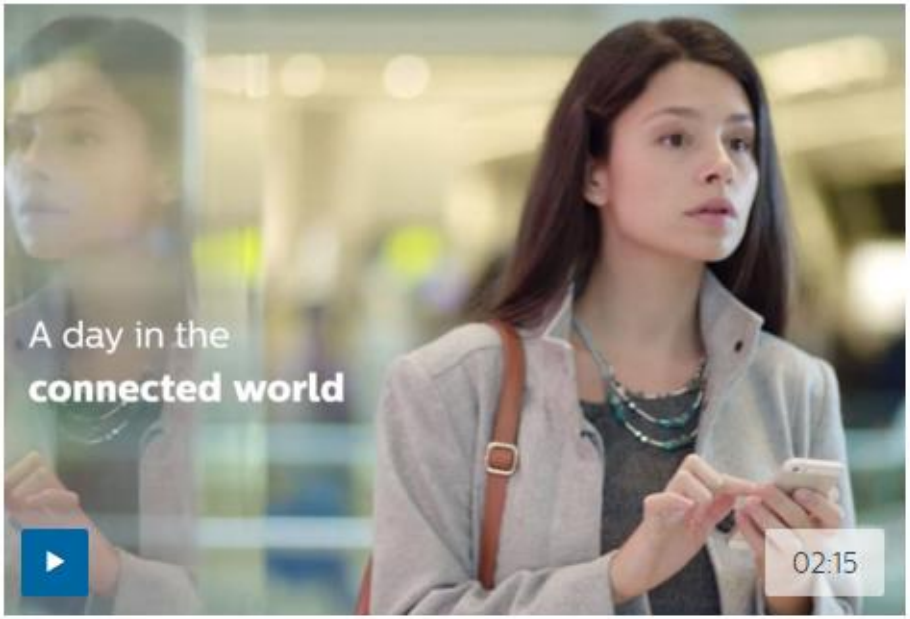
The Future of Lighting: Connected Lighting



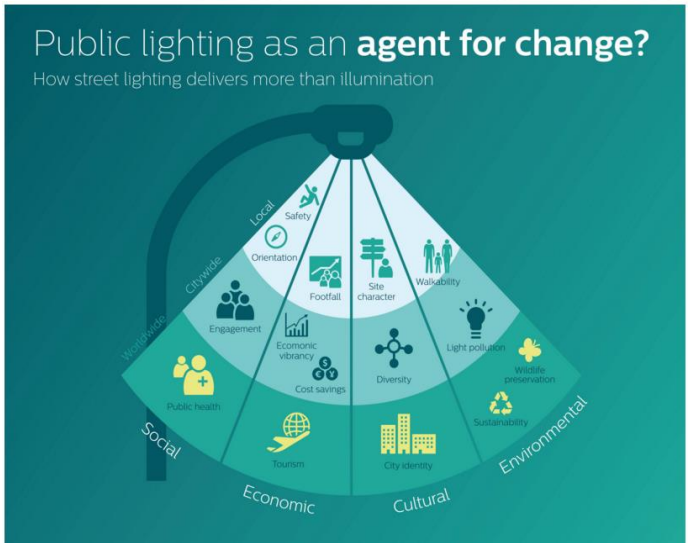
Imagine . . .

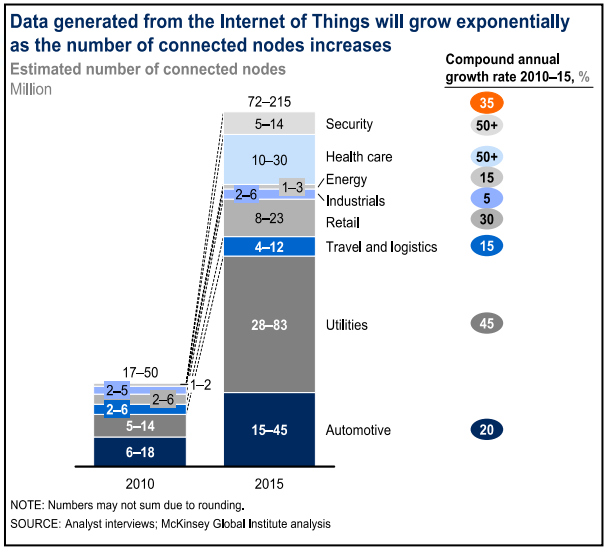
a world of **beautifully illuminated** indoor and outdoor spaces . . .

where every light point is connected to an **intelligent system** that delivers high-quality, reliable illumination . . .

and that serves as **a pathway for information and services . . .**

to deliver extraordinary **value beyond illumination** to the users and managers of spaces.





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Beyond Illumination User Benefits

Save energy
Up to 80% savings over conventional lighting

Personalize spaces
Enhance user comfort, productivity, and safety

Transform environments
Create ambience and spectacle with targeted, dynamic light

Track performance
Get real-time data on lighting system status and operations

Optimize management
Remote, point-by-point lighting control, indoors and outdoors

Connect with customers
Use online experiences to encourage in-store sales

Streamline operations
Simplify workflows with end-to-end system integration

Guide and inform
Deliver in-context information and services to people in illuminated spaces

Gain deep insight
Use historical data and analysis to continually improve operations and experiences

Integrate with other systems
Make your lighting system part of the digital ecology in your building or city

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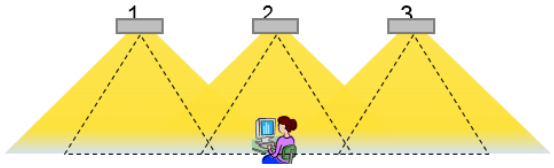
Self-Configuration in Lighting

- Auto or simplified commissioning
  - Grouping/zoning
  - Placement in physical space
- Auto calibration of control parameters
- Self-diagnosis of faults
- Algorithms that seek global optimal performance
  - Distributed and centralized
- Responsive to the application, usecase

Sensor are automatically calibrated daily to adapt to changing environments. This is done via a synchronous calibration of all the sensors in a controlled area



Synchronous calibration:

Electric Lights that contribute to workplane Illuminance Level are forced to make a known and synchronous step in light level

<u>Automatically adapting</u> to the environment, providing <u>contextual lighting</u> based on <u>*Ambient Intelligence*</u>

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Samples of Current State

CityTouch: connected lighting + beyond

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Imagine …

a world of **beautifully illuminated** streets and places where every light point is connected to an **intelligent system** that delivers high-quality, reliable illumination …

and that serves as a **pathway for information** and services to deliver extraordinary **value beyond illumination** to the users and managers of city spaces.

CityTouch: **connected lighting + beyond**

CityTouch is a **lighting asset management system**

Asset management broadly defined refers to any system that monitors and maintains things of value to an owner or operator of assets

Software

Software applications are typically the core element of a modern asset management providing the right tools at your fingertips

Communication

Once a **way of communication** is established, the assets can also remotely be managed and monitored

Assets

Next to more general solutions there are specialized systems dedicated to a certain kind of **city assets** available in the market

- Asset management is the combination of management, financial and engineering practices applied to assets with the objective of **providing the required level of service in the most cost-effective manner**
- It includes the **management of the entire lifecycle** from design, installation and commissioning to operation, maintenance and disposal of assets

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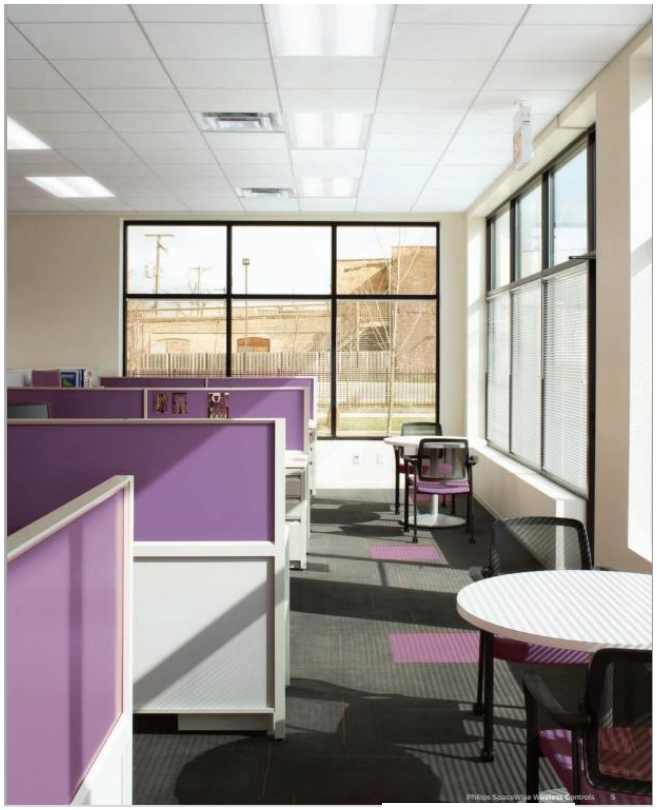
Connected lighting and the
Smart Building

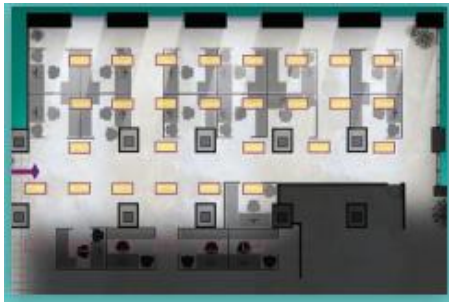
Philips Spacewise Technology for Office

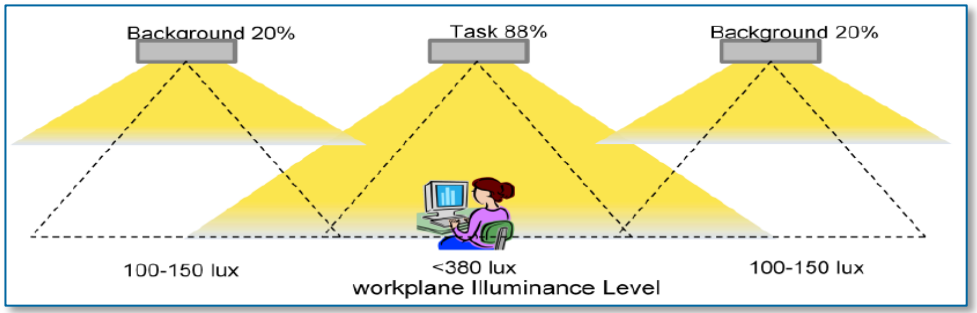
Wireless for easy installation

Aggressive energy savings



- Luminaires with SpaceWise technology solutions are simple to install
- Plug and play with easy grouping
- Stand alone system—no network, computer, or light meter required
- Auto calibration, no manual daylight commissioning





Open Plan | Corridor | Conf Room | Private Office

Office

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Focus: Deloitte HQ, Amsterdam

Fully connected, PoE

Lighting that can create a digital ceiling infrastructure as a pathway for information and data

- Indoor positioning for advanced in-context information and indoor navigation
- Every mobile phone becomes a personal service portal that is location aware
- A wide range of sensors to learn from the indoor environment, enabling operational efficiency of the building

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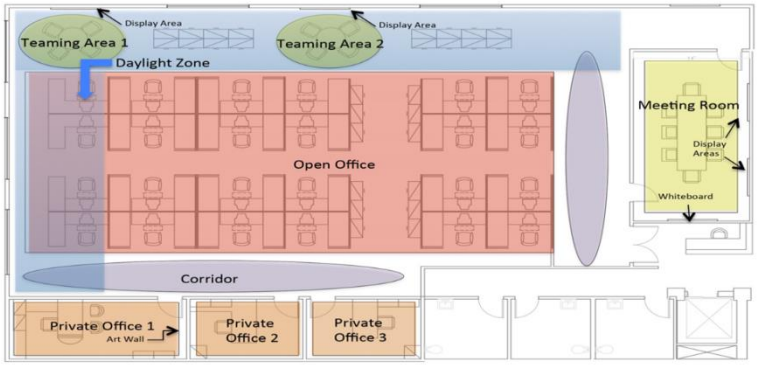
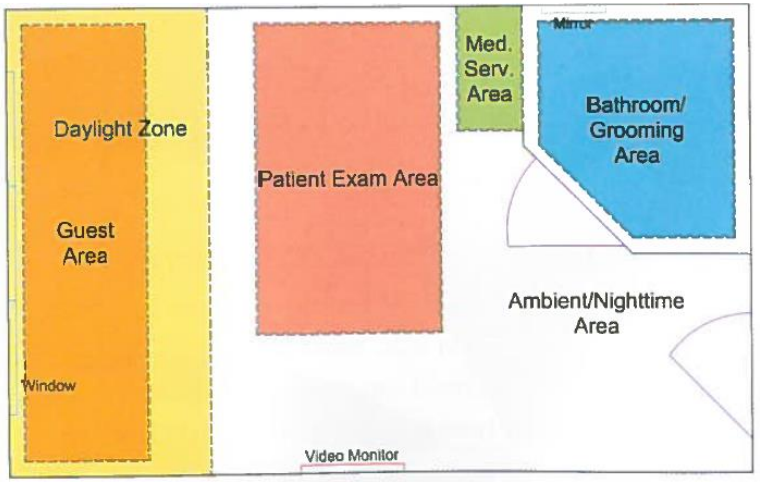
Human Centric Lighting

DoE Patient Room and Office Projects at Philips Research NA





Key Features:

1. Spectral tuning throughout the day
2. Application-based Lighting Recipe
3. Address visual and non-visual needs
4. Deep energy savings through controls
5. Granular Energy Measurement and Analytics

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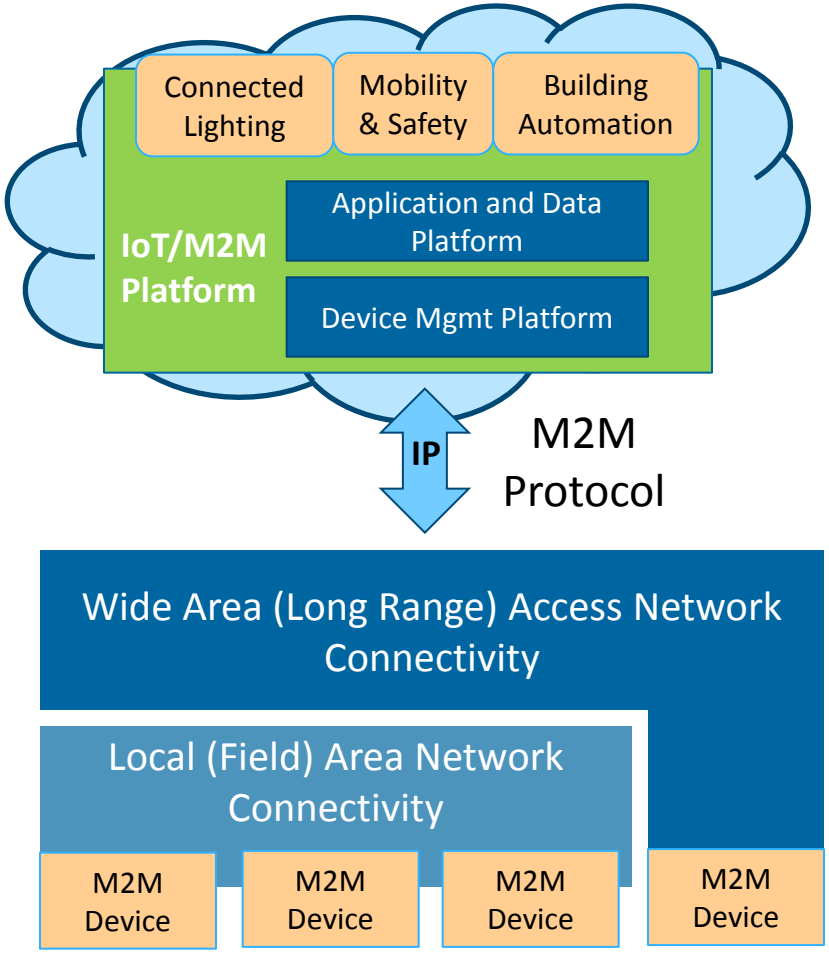
Next Wave

Smart Buildings, Smart City, IoT
Leverage open *connectivity platforms, cloud,…*



- (semi)-self configuration on multiple scales
- Device, zone to building or city scale
- Addressing certain needs
  - Commissioning
  - System performance, Continuous tuning
  - Fault detection and diagnosis
  - Enable new business models and use cases
- Different economies of scale through scalable platforms
- Link to other subsystems, e.g. with HVAC in buildings

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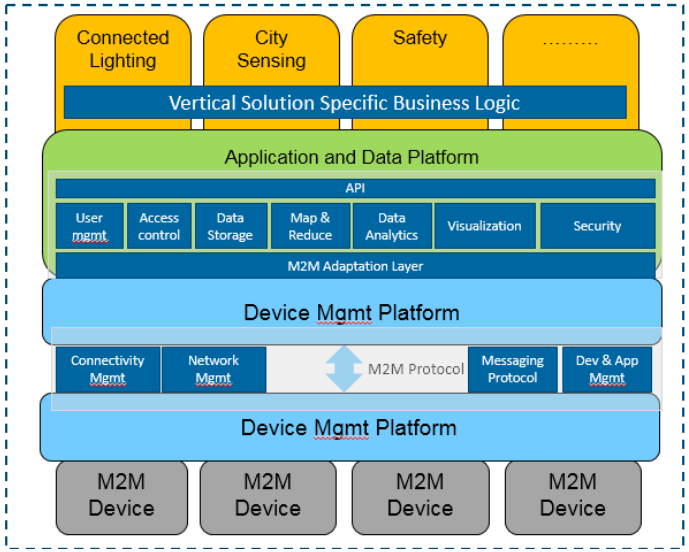
The Keys to Success

Scalable, ease of integration, auto, ….

Open Interfaces & platforms



- Open Interfaces -> codes and standards
  - Able to extend but remain backwards compatible over time
  - Easy to test and certify compliance
- Leverage broader deployments and infrastructure

Smart Systems (data and analytics)

- Smart algorithms, situation aware
- Predictive response and controls
- Self configuring, self-healing, auto calib.
- Remote monitoring and configuration
- Plug and Play
- New data-driven propositions
- …..

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Opportunities to accelerate adoption

- **Interoperability: various proprietary vertical protocols used by each building vertical :** Standard IT interfaces used by each building vertical
- **Facility manager vs IT domain :** offices need to think about IT as one universal building backbone linking multiple verticals
- **Cost-down vs Value : promote and get acceptance of new value drivers**
- **Legacy codes : LPD vs EUI – we need to go to performance based metrics**

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In Summary

Digitalization is resulting in a paradigm shift for the lighting industry to connected lighting

Connected lighting enables value creation **beyond illumination** in the Internet of Things, **yet to be tapped**

Creating solutions to the problems facing our cities

However, the **focus on payback time based on energy-savings** can hinder speed of adoption of fully connected systems

Gov't/codes/associations: role to speed up the mass adoption of intelligent lighting infrastructures, e.g.

- Technology development, piloting
- EUI incentive program instead of LPD
- Promote interoperable systems
- R&D support for breakthrough systems and algorithms

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